CHRYSLER
IMPERIAL

Service Manual

1970

IMPERIAL and CHRYSLER

1970

SERVICE MANUAL

FOREWORD

This Imperial and Chrysler Service Manual has been prepared with the latest service information available for use on 1970 models. Diagnosis, disassembly, repair, assembly and installation procedures coupled with complete specifications and tightening references can be found in each group. This publication is one of the most important "tools" available to the service technician. It will prove an invaluable aid in properly performing any phase of service necessary to maintain or restore the fine performance and reliability characteristics designed, engineered, and manufactured into these outstanding automobiles.

IMPERIAL MODELS

CROWN
LE BARON

CHRYSLER MODELS

CHRYSLER NEWPORT
NEWPORT CUSTOM
300
NEW YORKER
TOWN and COUNTRY

For information relative to ordering the special service tools used and illustrated in this manual, or for additional copies of this manual, please refer to the instructions on inside back cover of this manual.

CHRYSLER CORPORATION

Litho in U. S. A.

GROUP INDEX

VEHICLE AND ENGINE NUMBERS

VEHICLE NUMBER: The vehicle number (serial number) is located on a plate (Fig. 1) which is attached to the instrument panel between the left windshield wiper pivot and the left "A" post. It can easily be seen by looking through the windshield from the outside.

All vehicle numbers contain thirteen digits. The vehicle number is a code which tells the carline (1st digit), price class (2nd digit), body type (3rd and 4th digit), engine displacement (5th digit), model year (6th digit), assembly plant (7th digit), and vehicle sequence number (last six digits).

This vehicle number is also stamped on the engine block pad located just to the rear of the right engine mount on the pan rail.

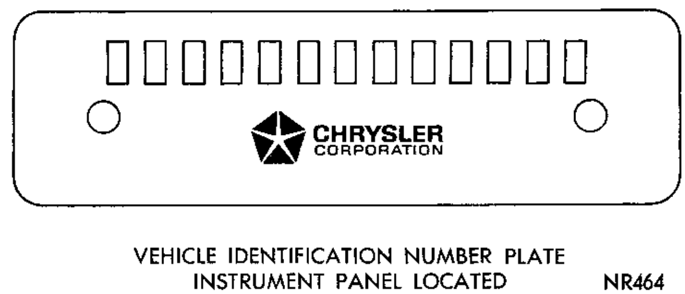


Fig. 1—Vehicle Identification Number Plate

1st Digit Carline	2nd Digit Price Class	3rd & 4th Digits Body Type	5th Digit Eng. Displacement Cu. In.	6th Digit Model Year	7th Digit Assembly Plant
C-Chrysler	E-Economy	23-2 Dr. Hardtop	L-383	0-1970	C-Jefferson
Y-Imperial	L-Low	27-Convertible	N-383 H/Perf.		F-Newark
	M-Medium	41-4 Dr. Sedan	T-440		
	H-High	43-4 Dr. Hardtop	U-440 H/Perf.		
	P-Premium	45-2 Seat Station Wagon	Z-Spec. Ord. 8		
		46-3 Seat Station Wagon			

ENGINE NUMBERS: All engine serial numbers contain fourteen characters and digits. The first two designate power train, the next three are the cubic inch displacement, the next one designates low compression, the next four are based on a 10,000 day calendar and the last four designate engine built that day. All 383 and 440 cubic inch engines have the serial numbers stamped on the cylinder block pan rail at the left rear corner below the starter opening.

On all engines, information identifying undersized crankshaft, oversized tappets, low compression, oversized cylinder bores, engine built that day, the shift and 10,000 day calendar is stamped on the cylinder block at various locations depending on engine. There can be as many as fifteen characters and digits at this location. 383 cubic inch engines are stamped on the right bank joint face just forward of the number 2 cylinder bore. 440 cubic inch engines are stamped on the left bank pad, adjacent to front tappet rail. For additional information on engines, see Group 9 in this manual.

BODY CODE PLATE: Includes schedule date, body type code, engine code, transmission code, tire code, trim code and paint codes (Fig. 2).

It is located on the left front fender side shield or wheel housing.

TIRE PRESSURE: A decal showing the recommended tire pressure is located on the body pillar at the rear of the left front door opening ("B" post). For additional information on tires see Group 22 of this manual.

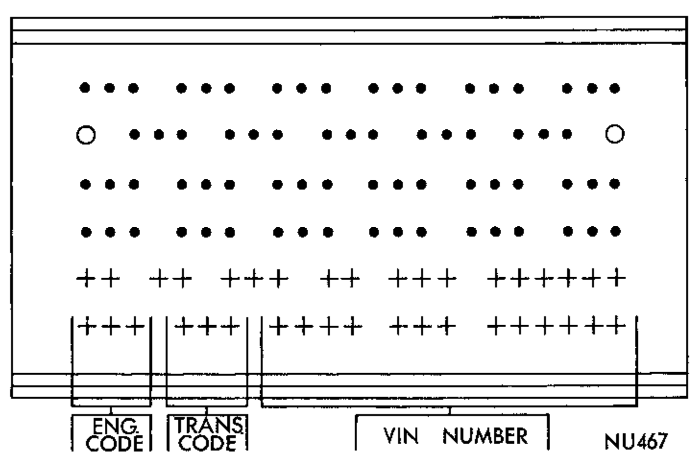


Fig. 2—Body Equipment Identification Plate

GENERAL DATA AND SPECIFICATIONS

Body Styles		Chrysler	Chrysler	Chrysler	Imperial
Two Door Hardtop		Newport, Custom	300	New Yorker	Crown, LeBaron
Convertible		Newport	300		
Four Door Sedan		Newport, Custom		New Yorker	
Four Door Hardtop		Newport, Custom	300	New Yorker	Crown, LeBaron
Station Wagon (2 seat)		Town and Country			
(3 seat)		Town and Country			
Wheelbase	All Models Except— Town and Country	123.5″	123.5″	123.5″	126.5″
	Town and Country	121.5″			
Tread (Front)		62.1″	62.1″	62.1″	62.4″
Tread (Rear)		60.7″	60.7″	60.7″	61.1″
Length with Bumper	All Models Except— Town and Country	224.6″	224.6″	224.6″	229.7″
	Town and Country	219.5″			
Width with Bumper		79.1″	79.1″	79.1″	79.1″

CAPACITY CONVERSION TABLE

U.S.	Imperial	U.S.	Imperial	U.S.	Imperial
1/4	1/4	7	5 3/4	15	12 1/2
1/2	3/8	7 1/4	6	15 1/2	13
3/4	5/8	7 1/2	6 1/4	16	13 1/4
1	3/4	7 3/4	6 1/2	16 1/2	13 3/4
1 1/4	1	8	6 3/4	16 3/4	14
1 1/2	1 1/4	8 1/4	6 3/4	17	14 1/4
1 3/4	1 1/2	8 1/2	7	17 1/2	14 1/2
2	1 3/4	8 3/4	7 1/4	18	15
2 1/4	1 3/4	9	7 1/2	18 1/2	15 1/2
2 1/2	2	9 1/4	7 3/4	19	15 3/4
2 3/4	2 1/4	9 1/2	8	19 1/2	16 1/4
3	2 1/2	9 3/4	8	20	16 3/4
3 1/4	2 3/4	10	8 1/4	20 1/2	17
3 1/2	3	10 1/4	8 1/2	21	17 1/2
3 3/4	3	10 1/2	8 3/4	21 1/2	18
4	3 1/4	10 3/4	9	22	18 1/4
4 1/4	3 1/2	11	9 1/4	22 1/2	18 3/4
4 1/2	3 3/4	11 1/4	9 1/4	23	19 1/4
4 3/4	4	11 1/2	9 1/2	23 1/2	19 1/2
5	4 1/4	11 3/4	9 3/4	24	20
5 1/4	4 1/4	12	10	24 1/2	20 1/2
5 1/2	4 1/2	12 1/4	10 1/4	25	20 3/4
5 3/4	4 3/4	12 1/2	10 1/2	25 1/2	21 1/4
6	5	12 3/4	10 1/2	26	21 3/4
6 1/4	5 1/4	13	10 3/4	26 1/2	22
6 1/2	5 1/2	13 1/2	11 1/4	27	22 1/2
6 3/4	5 1/2	14	11 3/4	27 1/2	23
		14 1/2	12	28	23 1/4
				29	24 1/4
				30	25

CAPACITY CONVERSION—U.S. GALLONS TO LITERS

Gallons	1	2	3	4	5	0
	Liters	Liters	Liters	Liters	Liters	Liters
0	00.0000	3.7853	7.5707	11.3560	15.1413	18.9267
10	37.8533	41.6387	45.4240	49.2093	52.9947	56.7800
20	75.7066	79.4920	83.2773	87.0626	90.8480	94.6333
30	113.5600	117.3453	121.1306	124.9160	128.7013	132.4866
40	151.4133	155.1986	158.9840	162.7693	166.5546	170.3400

LUBRICATION AND MAINTENANCE

CONTENTS

CERTIFIED CAR CARE

Certified Car Care is a thorough servicing program that helps make sure the cars you sell receive the regular attention you know they need.

Certified Car Care helps build business for you in the best way known—through customer satisfaction. Inform your customers that the best approach to trouble-free driving is Certified Car Care.

This is a practical plan to help you build up sales and service volume, by providing regular service customer visits.

SUMMARY OF LUBRICATION AND MAINTENANCE SERVICES

Maintenance and lubrication service recommendations for Chrysler Corporation-built vehicles have been compiled to provide maximum protection for the car owner's investment against all reasonable types of driving conditions.

Since these conditions vary with the individual car owner's driving habits, the area in which the car is operated and the type of service to which the car is subjected, it is necessary to prescribe lubrication and maintenance service on a time frequency as well as mileage interval basis.

Information pertaining to Lubrication and Maintenance requirements is shown on the guide (Fig. 1) and on the Schedule.

Vehicles operated under conditions not classified as normal service for passenger cars, such as in trailer towing service, operation at higher than normal loading or police or taxicab operation, require servicing at more frequent intervals. This information is included in each group under the heading "Trailer Towing Package and Severe Service".

CLASSIFICATION OF LUBRICANTS

Oils, lubricants and greases are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the National Lubricating Grease Institute (NLGI).

Engine Oil

The SAE grade number indicates the viscosity of engine oils, for example, SAE 30, which is a single grade oil. Engine oils are also identified by a dual

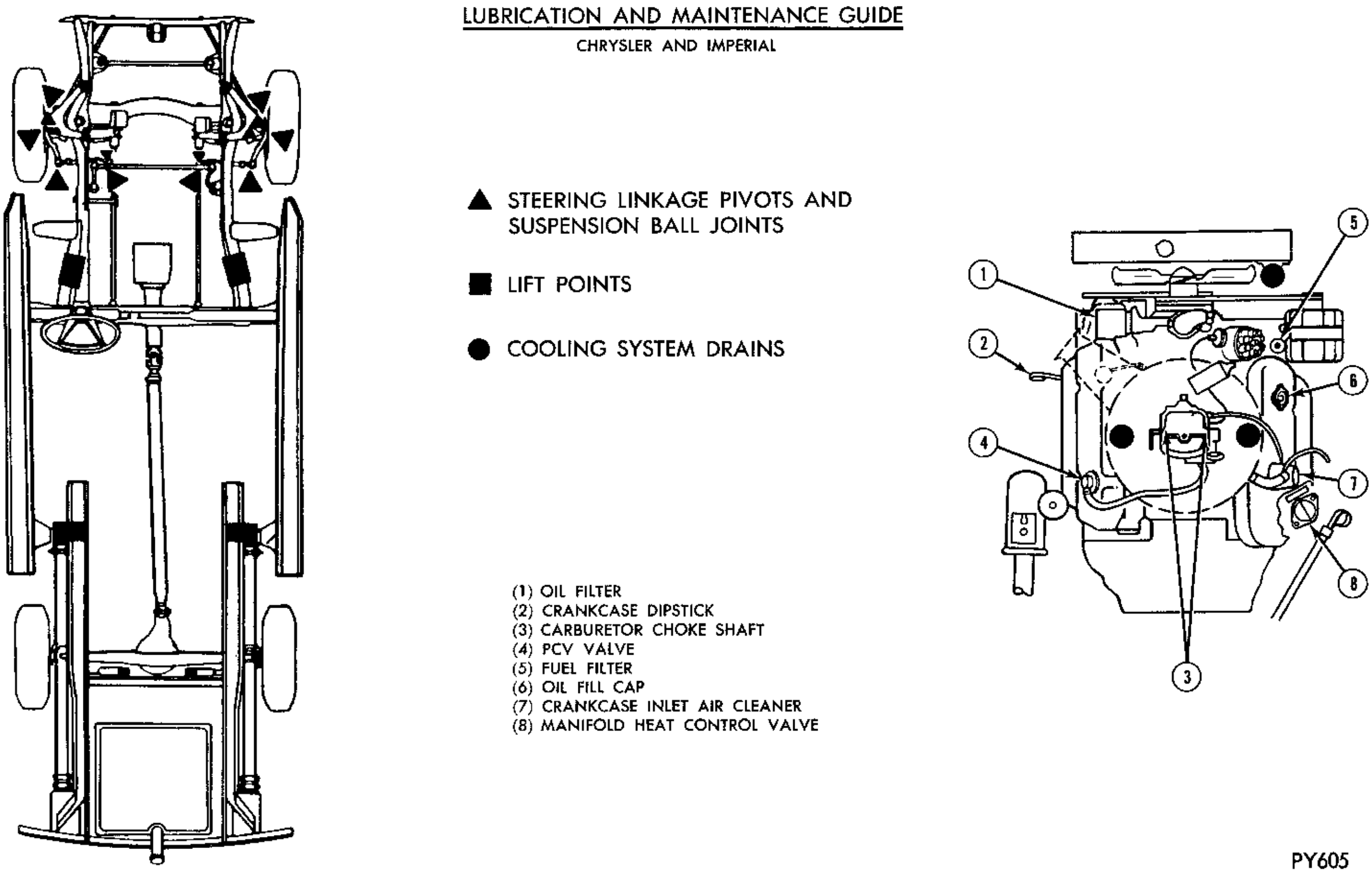


Fig. 1—Lubrication and Maintenance Guide

number, for example, SAE 10W-30, which indicates a multigrade oil.

The API classification system defines oil performance in terms of engine usage. Only engine oils designated "For Service MS" should be used. These oils contain sufficient chemical additives to provide maximum engine protection. Both the SAE grade and the API designation must be found on the container.

Gear Lubricants

The SAE grade number also indicates the viscosity of Multi-Purpose Gear Lubricants, defined by MIL-L-2105B. An example is SAE 75, which is a light viscosity lubricant.

Lubricants—Greases

Semi-solid lubricants, such as specified for suspension ball joints, bear the NLGI designation. They are further classified as grades "O" or "2."

HOISTING

Post Type

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adapters in order that the vehicle will be supported in the correct locations (Figs. 2 and 3).

Conventional hydraulic hoists may be used after determining that the adapter plates will make firm contact with the lower control arms and the rear axle housing.

Floor Jack

A regular floor jack may be used under the rear axle housing, or under the front suspension lower control arms, **however, a floor jack must never be used on any parts of the underbody.**

CAUTION: Do not attempt to raise one entire side of the vehicle by placing a jack midway between front and rear wheels. This practice may result in permanent damage to the body.

Bumper Jack

The bumpers are designed to accept a bumper jack in an emergency, if it becomes necessary to change a tire on the road. Notches are provided in the bumpers for the purpose of raising the vehicle with the bumper jack.

CHASSIS LUBRICATION

Front Suspension Ball Joints

The front suspension ball joints (Figs. 4 and 5) are semi-permanently lubricated with a special lubricant at the factory.

LUBRICATION AND MAINTENANCE SCHEDULE

Service Interval	Item	Page	Service: Replace	Service: Check Fluid Level	Service: Inspect and/or Clean	Service: Lubricate	Service: Service
Every 2 Months	Battery	9		X			
	Cooling System	8		X			
3 Months or 4,000 Miles, whichever occurs first	Engine Crankcase Oil	10	X				
Every Engine Oil Change	Manifold Heat Control Valve	14					X
	Power Steering Fluid	16		X			
Every Second Oil Change	Engine Oil Filter	11	X				
	Tire Rotation	20					X
Every 6 Months	Carburetor Air Filter	14			X		
	Crankcase Ventilation System	11			X		X
	Carburetor Choke Shaft	14			X		X
	Crankcase Inlet Air Cleaner	13			X	X	
	Transmission	17		X			
	Rear Axle	6		X			
	Steering Gear (Manual)	16		X			
	Steering Linkage	6			X		
	Suspension Ball Joints	4			X		
	Universal Joints	15			X		
	Brake Master Cylinder	7		X			
	Brake Hoses	7			X		
	Headlight Aiming	9					X
	Hood Latch and Safety Catch	19			X	X	
Every 12 Months	Cooling System	8					X
	Crankcase Ventilator Valve	12	X				
	Throttle Linkage	22				X	
Every 12 Months or 12,000 Miles, whichever occurs first	Engine Performance Evaluation	13					X
	Brakes*	7			X		
	Front Wheel Bearing Lubricant	18			X		
Every 24 Months or 24,000 Miles, whichever occurs first	Carburetor Air Filter	14	X				
	Fuel Filter	14	X				
	Brake Pedal Linkage Bushings	7				X	X
Every 36 Months or 36,000 Miles, whichever occurs first	Front Suspension Ball Joints	4				X	
	Steering Tie Rod Ends	6				X	
	Clutch Torque Shaft Bearings	8				X	X
When Necessary	Distributor	9				X	
	Body Mechanisms	19				X	
	Clutch Drive Lugs, Release Bearing Sleeve, Fork Fingers and Pivot	8				X	
	Column-Mounted Gearshift Linkage	17				X	
	Floor-Mounted Gearshift Controls	17				X	
	Parking Brake Mechanism	7				X	
	Speedometer Cable	19				X	
Points That Should Not Be Lubricated		22					

* Replace linings if necessary.

LUBRICATION AND MAINTENANCE SCHEDULE TRAILER TOWING PACKAGE AND SEVERE SERVICE

Service Interval	Item	Page	Replace	Check Fluid Level	Inspect and/or Clean	Lubricate	Service
Every 3 months or 4,000 Miles, whichever occurs first	Transmission	16		X			
	Rear Axle	6		X			
	Universal Joints	15			X		
After first 36 Months or 36,000 Miles, whichever occurs first	*Transmission Fluid	17	X				
	*Automatic Transmission Filter	18	X				
	*Automatic Transmission Bands	18					X
	Rear Axle Lubricant	7	X				
	**Universal Joints	15				X	

*And every 12 months or 12,000 miles thereafter
**Police, Taxi

CAPACITIES

	U. S. Measure	Imperial Measure
Crankcase		
All models	4 qts.	3-1/4 qts.
Add 1 quart (3/4 Imp. quart) when filter is replaced		
Cooling System		
Chrysler (383 Cu. In. Engine—2 or 4 BBL)	14-1/2 qts.	12 qts.
(383 Cu. In. Engine—2BBL. W/Air Conditioning)	15 qts.	12-1/2 qts.
(383 Cu. In. Engine—2BBL W/Maximum Cooling)	16 qts.	13-1/4 qts.
(383 Cu. In. Engine—4 BBL W/Air Conditioning)	16 qts.	13-1/4 qts.
(440 Cu. In. Engine)	15-1/2 qts.	13 qts.
(440 Cu. In. Engine W/Air Conditioning)	17 qts.	14-1/4 qts.
(440 Cu. In. Engine W/Maximum Cooling)	18 qts.	15 qts.
Imperial	17-1/2 qts.	14-1/2 qts.
NOTE: Add 1-1/2 qts. (1-1/4 Imperial qts.) for models equipped with rear seat heater.		
Rear Axle		
8-3/4" Axle	4.4 pts.	3-1/2 pts.
Transmission (TorqueFlite)		
383 2 BBL. and 440 Cu. In. Engines	19 pts.	15-3/4 pts.
383 Cu. In. Engine (4 BBL.)	16.3 pts.	13-1/2 pts.
Imperial models with Trailer Tow Package	20.2 pts.	16-3/4 pts.
Transmission (Manual)		
3-Speed	5 pts.	4-1/2 pts.
Fuel Tank		
All models (except Station Wagon)	24 gals.	20 gals.
Station Wagon	23 gals.	19-1/4 gals.

The ball joints should be inspected every six months, or whenever vehicle is serviced for other reasons, for damage to the seals which can result in loss or contamination of lubricant. Clean accumulated dirt and lubricant from outside surfaces of seals to permit thorough inspection. Replace damaged seals or joints immediately to prevent contamination of lubricant or damage to parts. Lubricate ball joints, if necessary.

SOME BALL JOINTS ARE DESIGNED TO OPERATE WITH SOME FREE PLAY. REPLACEMENT SHOULD BE MADE ONLY WHEN FREE PLAY EXCEEDS THE SPECIFICATIONS SHOWN IN **"FRONT SUSPENSION", Group 2.**

Relubrication is required every 36 months or 36,000 miles, whichever occurs first.

When lubricating control arm ball joints, use only the special long-life chassis greases such as Multi-

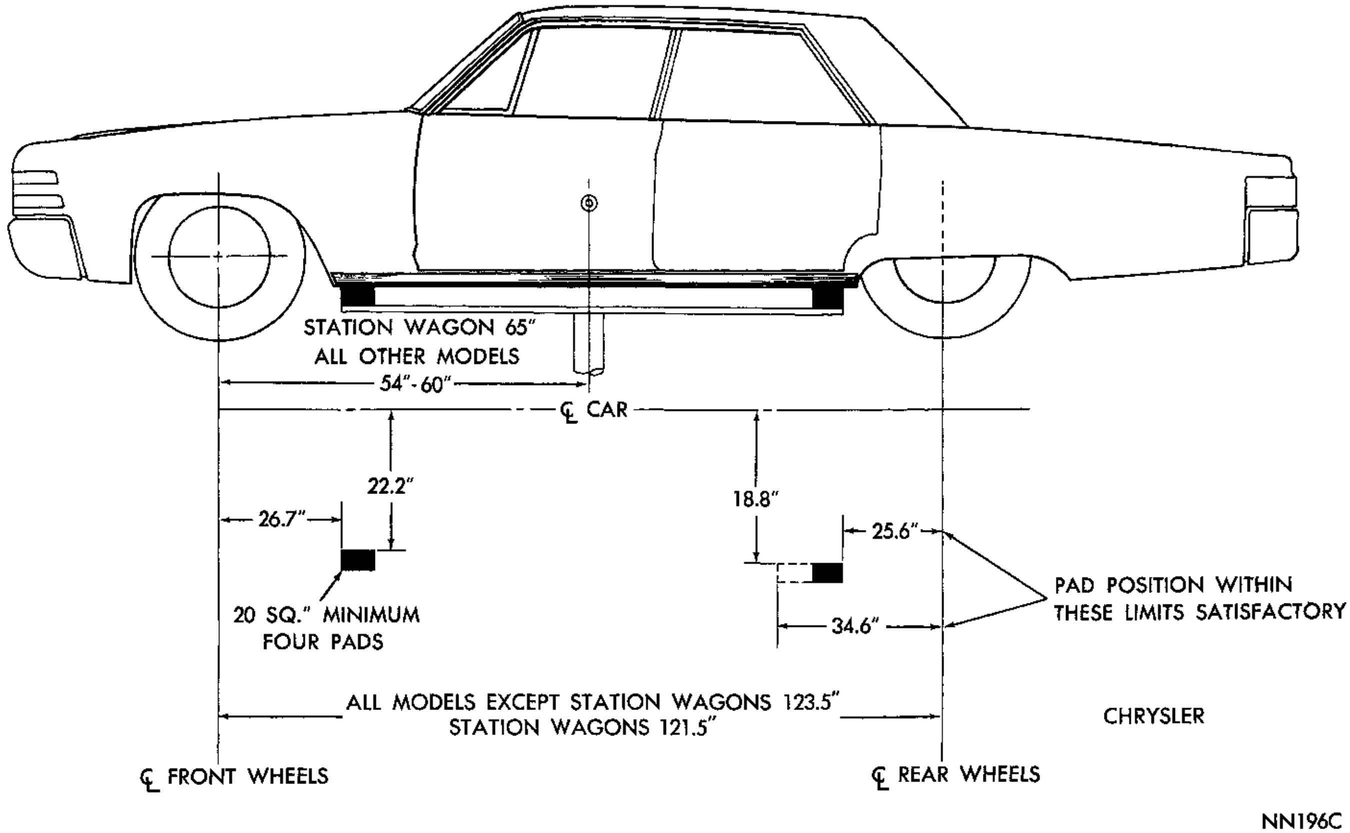


Fig. 2—Support Locations—Frame Contact Hoist (Chrysler Models)

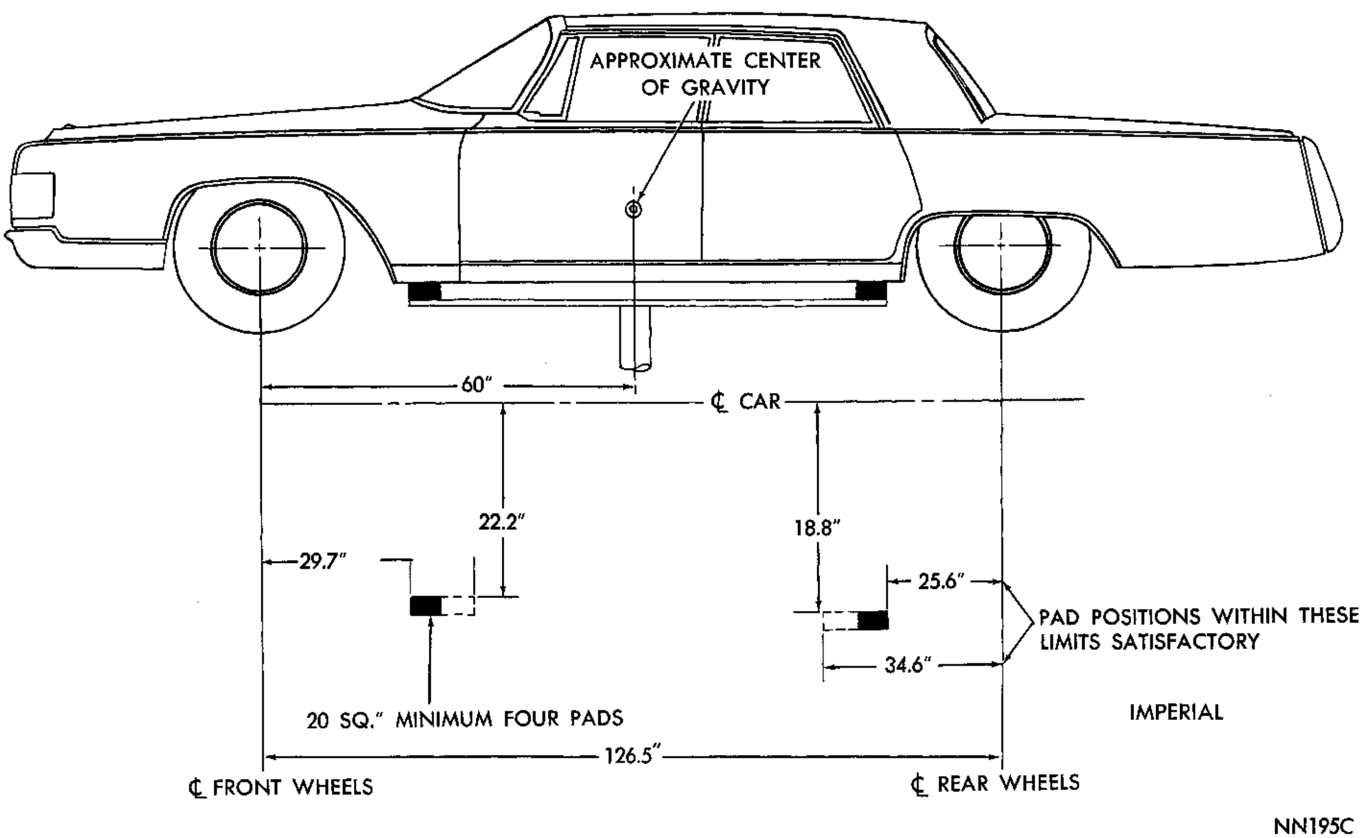


Fig. 3—Support Locations—Frame Contact Hoist (Imperial Models)

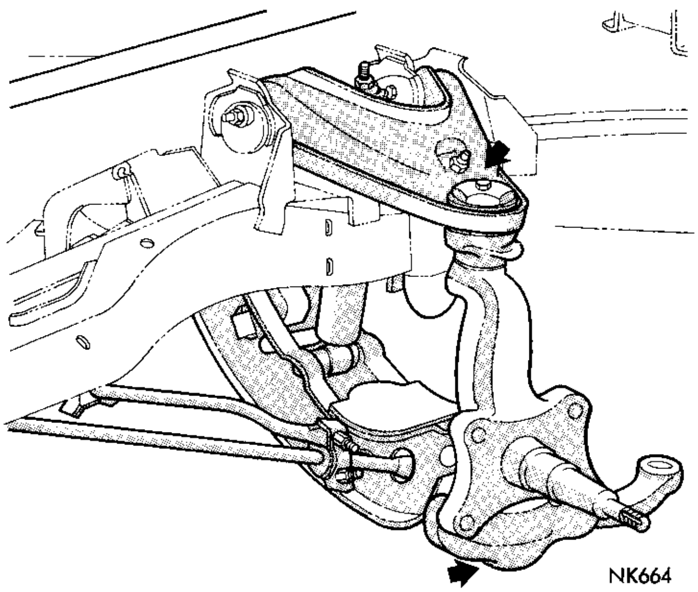


Fig. 4—Upper and Lower Ball Joints (Chrysler Models)

Mileage Lubricant, Part Number 2525035 or equivalent. Remove threaded plug from each ball joint and **temporarily** install lubrication fittings. Inject lubricant until it flows freely from seal bleed area at base of seal. Stop when seal begins to balloon. Remove fittings and reinstall threaded plugs.

CAUTION: If high pressure lubrication equipment is used, stop filling when lubricant begins to flow freely from bleed area at base or at top of seal, or if seal begins to balloon.

Steering Linkage Ball Joints

The four tie rod end ball joints and the steering gear arm ball joint (Figs. 6 and 7) are semi-permanently lubricated with a special lubricant at the factory.

The ball joints should be inspected every six

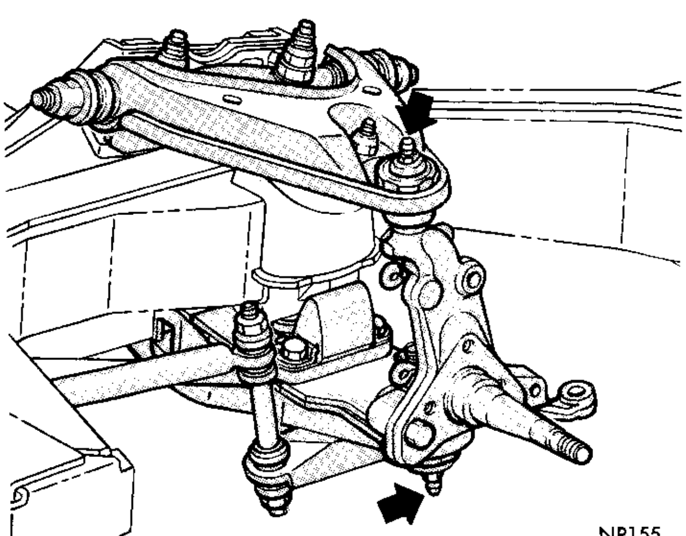


Fig. 5—Upper and Lower Ball Joints (Imperial Models)

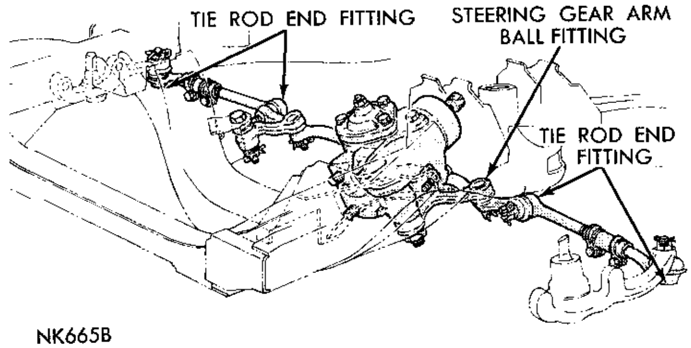


Fig. 6—Steering Linkage (Chrysler Models)

months, or whenever vehicle is serviced for other reasons, for damage to seals which can result in loss of lubricant. Clean accumulated dirt and lubricant from outside surfaces of seals to permit thorough inspection.

Replace damaged seals or joints immediately to prevent contamination of lubricant or failure of parts. Lubricate ball joints, if necessary.

Relubrication of tie rod ball joints is required every 36 months or 36,000 miles, whichever occurs first.

When lubricating steering linkage ball joints, use only the special long-life chassis greases such as Multi-Mileage Lubricant, Part Number 2525035 or equivalent. Remove threaded plug from each ball joint and **temporarily** install lubrication fittings. Inject lubricant until it flows freely from seal bleed area at top or base of seal. Stop when seal begins to balloon. Remove fittings and reinstall threaded plugs.

CAUTION: High pressure lubrication equipment may be used if time is allowed for grease to bleed from seal base.

REAR AXLE

Standard and Sure-Grip

The lubricant installed in the rear axle at time of assembly is a high quality product and regularly scheduled changes of the lubricant are not recommended in vehicles where operation is classified as normal passenger car service.

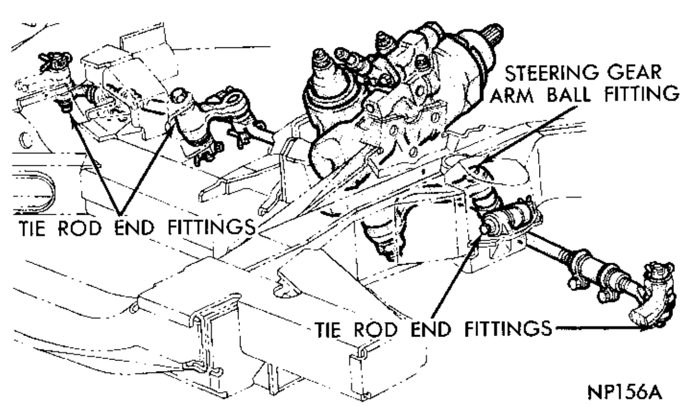


Fig. 7—Steering Linkage (Imperial Models)

The only exceptions, however, would be where the lubricant has become contaminated with water, or to provide the correct viscosity grade for the anticipated temperature range, as indicated by the accompanying table.

The factory fill lubricant is satisfactory to —30°F. ambients.

Anticipated Temperature Range		Viscosity Grade
Above	−10°F.	SAE 90
As low as	−30°F.	SAE 80
Below	−30°F.	SAE 75

When necessary to change rear axle lubricant, remove old lubricant with a suction gun (Fig. 8).

Every six months check the fluid level in the axle through the filler plug hole. When checking the level, be sure the vehicle is in a level position on an axle or drive-on type hoist, and the fluid level is as specified below.

The filler plug is located in the right side of the differential housing (Fig. 8). The level should be maintained at bottom of filler plug hole.

Type of Lubricant

Chrysler Corporation recommends that Multi-Purpose Gear Lubricant as defined by MIL-L-2105B (API GL-5) should be used in all Chrysler and Imperial rear axles with conventional or Sure-Grip differentials; Chrysler Hypoid Lubricant (Part Number 2933565) or equivalent, is an oil of this type and is recommended.

Trailer Towing Service

For vehicles equipped for trailer towing service, the axle fluid level should be checked every 3 months or 4,000 miles, whichever occurs first. The lubricant should be drained and axle refilled with the specified lubricant, every 36,000 miles.

If the axle is submerged in water, such as on a boat launching ramp where water can enter the axle vent, and contamination is suspected or evident, replace the lubricant immediately to avoid early axle failure.

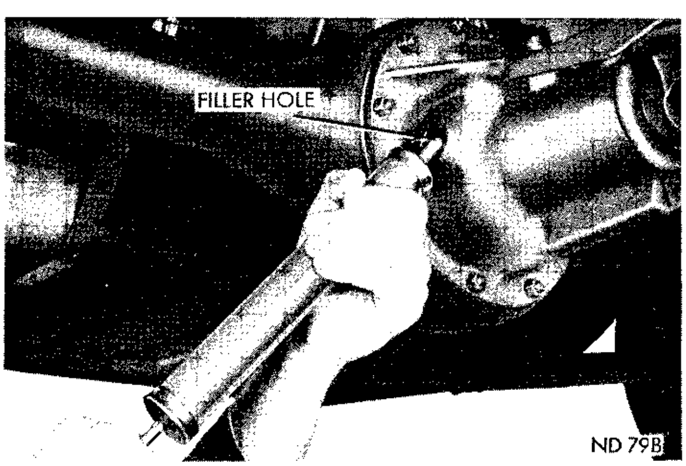


Fig. 8—Removing Rear Axle Lubricant

BRAKES

The brakes on all models equipped with drum brakes, except heavy duty, are equipped with a self-adjusting mechanism which makes it unnecessary to perform major brake adjustments.

Inspect brake linings for wear every 12 months or 12,000 miles, whichever occurs first. Replace linings if necessary. At this time, lubricate contact areas of brake shoe supports, on models with drum brakes, with a thin film of high-temperature lubricant such as Chrysler Support Plate Lubricant available under Part Number 2932524 or equivalent.

To perform this service, first remove the brake shoes. Next, clean the contact surfaces on the shoes and supports by sanding lightly with fine sandpaper. Then, carefully apply lubricant.

On models equipped with disc brakes, inspect the discs, calipers and linings every 12 months or 12,000 miles, whichever occurs first, as outlined under "Brakes," Group 5.

HYDRAULIC BRAKE SYSTEM

Every 6 months the fluid level in the master cylinder should be checked (Fig. 9). **Before removing the master cylinder cover wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder.**

If necessary, add fluid to bring level to within 1/4 inch of the top of the reservoir. **With disc brakes the fluid level can be expected to fall as the brake pads wear. No noticeable drop in level should occur in a car equipped with drum brakes. Low fluid level may have been caused by a leak and a checkup may be needed.**

Only brake fluid conforming to SAE J1703 (70R3 type) should be used. Chrysler Parts Brake Fluid or equivalent, is recommended to provide best brake performance. **Use of a brake fluid that may have a lower initial boiling point, such as fluid identified as 70R1 or unidentified as to specification, may result in sudden brake failure during hard prolonged braking.**

Brake Hoses

Inspect brake hoses for cracking abrasion, cuts or tears in the outer covering. Examine all connections for fluid leakage. Correct leakage and replace hose where cover damage exposes the fabric braid.

PARKING BRAKE MECHANISM

All models use a foot-operated lever (Fig. 10). Pivot points indicated should be lubricated, as required, to maintain ease of operation. Apply a film of smooth, white body hardware lubricant conforming to NLGI

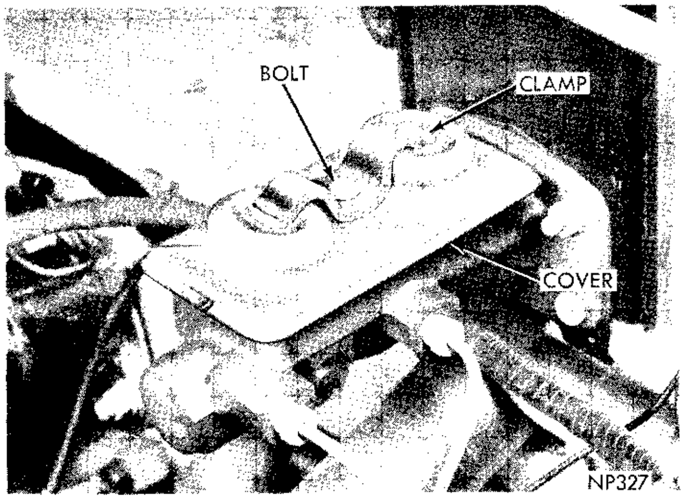


Fig. 9—Brake Master Cylinder

grade 1. Chrysler Parts Lubriplate, Part Number 1064768 or equivalent, is recommended for this purpose.

When the foot pedal can be depressed more than four and one half inches, the brake cable should be adjusted. For adjusting procedure, refer to "Parking Brakes," Group 5.

CLUTCH LINKAGE

Clutch Torque Shaft Bearings

Inspect clutch torque shaft bearings (Fig. 11) for wear and relubricate every 36 months or 36,000 miles, whichever occurs first. To perform this service, refer to "Clutch," Group 6. After removing torque shaft assembly, disassemble and thoroughly clean all parts in a suitable solvent and inspect for wear. Damaged bearings and/or ball studs should be replaced.

When reassembling shaft, coat inside surfaces at ends of shaft, inside and outside surfaces of bearings and ball studs with Multi-Mileage Lubricant, Part Number 2525035, or equivalent.

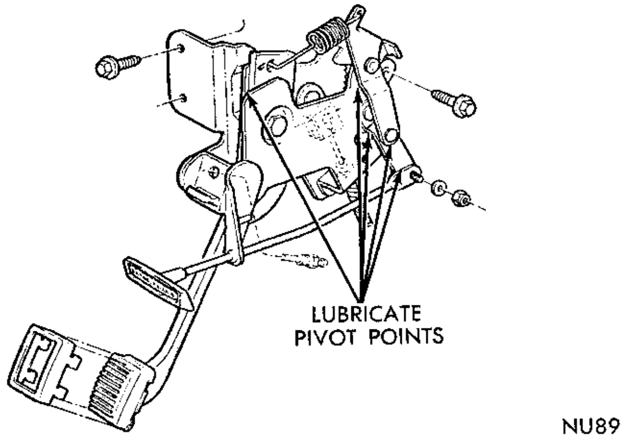


Fig. 10—Foot Operated Parking Brake (Chrysler Models)

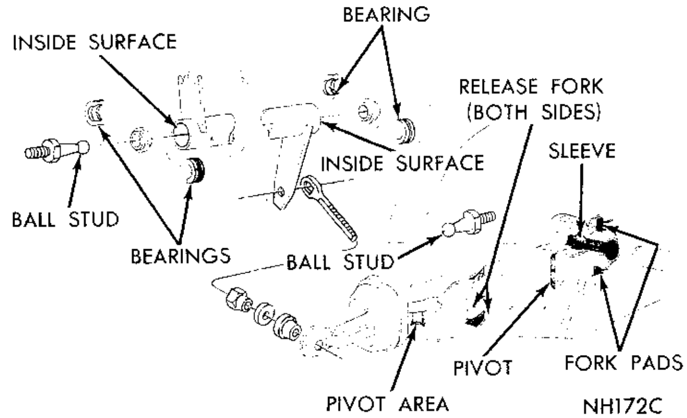


Fig. 11—Clutch Torque Shaft Bearings and Linkage

Clutch Drive Lugs, Release Bearing Sleeve, Release Fork and Fork Pivot

Whenever effort required to depress the clutch pedal becomes excessive, or when servicing clutch torque shaft bearings, lubricate drive lugs, sleeve, fork and pivot (Fig. 11). To gain access to this area, first remove inspection plate at bottom of clutch housing.

CAUTION: Care must be taken to avoid getting lubricant on clutch disc and/or pressure plate.

Fill cavity in sleeve with Multi-Mileage Lubricant, Part Number 2525035, or equivalent. Apply a film of same lubricant to clutch drive lugs, clutch release fork pads on sleeve, contact areas of fork fingers, pivot contact area of fork and fork pivot (Fig. 11).

COOLING SYSTEM

The cooling system of all cars is protected against corrosion and freezing as they leave the factory. A permanent type anti-freeze is added to provide protection to —20°F. Higher percentages of anti-freeze must be added where temperatures below—20°F. are anticipated.

Vehicles equipped with 383 cubic inch engines with 2 barrel carburetors and 440 cubic inch standard engines are equipped with 195 degree thermostats. All other engines are equipped with 190 degree thermostats and only permanent type anti-freeze should be used. Alcohol base anti-freeze products should not be used because of there low boiling point.

Inspect coolant level every two months and refill as necessary. Once a year, preferably in the fall, the cooling system should be drained and refilled. This draining and refilling procedure, however, need not be performed until the fall following the vehicle's first full year of operation. Drain cooling system by removing drain plugs in sides of cylinder block and open drain cock in lower radiator tank.

On models equipped with rear seat heater, drain heater by removing hose clamps at rear on underbody panel and disconnect hoses at heater connections. **Discard old solutions.**

Flush the system thoroughly with water. If there is an indication that the system contains a considerable amount of sediment, use a reliable cooling system cleaner to loosen the sediment. Rinse thoroughly to remove deposits.

At this time, check water pump belt tension and check hose connections for tightness.

In areas where protection from freezing is required, refill cooling system with clean, soft water and a suitable high quality, permanent type anti-freeze, in sufficient quantity to provide full protection for the lowest anticipated temperature, but never less than 40 percent of the cooling system capacity to ensure adequate protection against corrosion. If it becomes necessary to add coolant during the cold weather season, be sure the system contains sufficient anti-freeze to provide protection at least to —20 degrees F. A suitable high quality permanent type anti-freeze available under Part Number 2932531 or equivalent, should be used.

When vehicle is operated in areas where protection from freezing is not required, and vehicle is not equipped with **air conditioning,** refill cooling system with clean, soft water and add a high quality corrosion inhibitor, such as Chrysler Rust Resistor, Part Number 2421778 or equivalent. This need not be done until the first yearly service.

If the vehicle is equipped with **air conditioning,** the cooling system must contain anti-freeze all year round. This is necessary because in the reheat-cycle used on all vehicles, cold, refrigerated air passes through the heater core. Anti-freeze is necessary to prevent coolant in the heater core from freezing in hot weather when the air conditioner is being used. For complete information, refer to "Air Conditioning," Group 24.

ALTERNATOR

The alternator is provided with prelubricated bearings, which require no periodic lubrication.

BATTERY

Every two months, or more often in hot weather and on long trips, check fluid level of cells. Restore level of 3/8 inch above plates, using only water of a known low mineral content. **Do not overfill.**

Check specific gravity, using a reliable hydrometer, every 12 months or 12,000 miles, whichever occurs first, or more often if there is excessive use of water. Clean battery posts and cable terminals and tighten terminals. Coat connections with light mineral grease or petrolatum.

Refer to "Electrical," Group 8, for complete servicing.

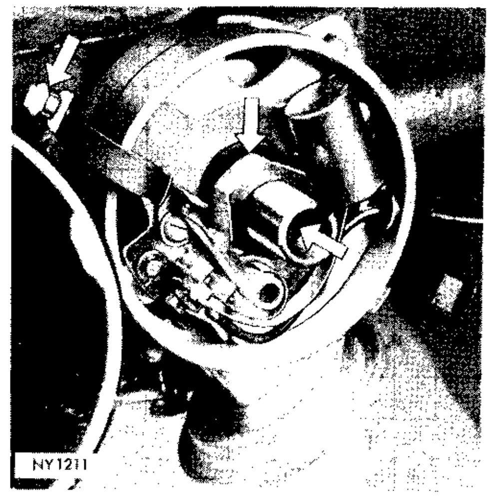


Fig. 12—Distributor Lubrication

DISTRIBUTOR

Two types of distributors are used. One type (Fig. 12), is provided with an oil cup. Every six months apply 3 to 5 drops of light engine oil in the cup.

Distributors without the oil cup have permanent lubrication and no periodic lubrication is required.

Whenever breaker contacts are serviced, lubricate cam surfaces. Wipe old lubricant from cam and rubbing block (Fig. 12) and apply a thin film of Cam Lubricant, Part Number 1473595, or equivalent. At this time, apply 1 drop of light engine oil to felt wick under rotor.

CAUTION: Avoid over-oiling and applying an excessive amount of cam lubricant to prevent lubricants from spreading to breaker contacts.

HEADLIGHTS

To assure correct adjustment of headlight aiming, it is recommended that the headlights be checked and, if necessary, re-aimed properly every six months.

Changes in front and rear suspension, such as front suspension height and/or deflection of rear springs due to heavy loading, will change the headlight beam pattern and may cause unsafe nighttime driving conditions.

If a vehicle is to be loaded abnormally, such as for a vacation trip, or with a salesman's products, the headlight aiming should be checked and adjusted to serve the new conditions. Refer to "Electrical Group," Group 8, for adjusting procedures.

WINDSHIELD WIPER BLADES

Long exposure to heat and road splash tend to harden rubber wiper blades, thus destroying their efficiency. When blades smear or in general do not satisfactorily clean the windshield, they should be replaced.

To replace, depress release on top of blade bridge and slide out rubber blade. Slide new rubber blade refill into bridge and lock it in place. Refer to Parts List for correct rubber blade refill.

ENGINE OIL—SELECTION OF

For best performance, and to provide for maximum protection of all engines for all types of operation, only those lubricants should be selected which:

(a) Conform to the requirements of the API classification "FOR SERVICE MS."

(b) Have the proper SAE grade number for the expected ambient temperature range.

Lubricants which do not have both an SAE grade number and an MS Service classification on the container **should not** be used.

Oils used in our engines, labeled "For Service MS", should equal or exceed the Engine Oil Performance Rating Sequence Tests for varnish, sludge and rusting, when tested according to the methods established by the car manufacturer.

All Season Supreme and Supreme Motor Oils or there equivalent, available through the Parts Division, meet these requirements.

Oil Viscosity Recommendations Multigrades

SAE 20W-40 SAE 10W-40 or SAE 10W-30	Where temperatures are consistently above +32°F.
SAE 10W-30 or SAE 10W-40	Suitable for year long operation in many parts of the U.S.; may be used where temperatures occasionally drop as low as −10°F.
SAE 5W-30 or SAE 5W-20	Recommended where minimum temperatures are consistently below +10°F.

Single Grades

SAE 30	Where temperatures are consistently above +32°F.
SAE 10W	Where temperatures range between +32°F. and −10°F.

IMPORTANT: If the vehicle is to be used for maximum performance service (very high speeds or very rapid acceleration), the engine requires heavier than normal lubricating oil. This is due to the high speeds, loads, and temperature of moving parts developed in these engines during this type of operation.

FOR BEST PROTECTION OF THE ENGINE UNDER THESE CONDITIONS, THE HEAVIEST ENGINE OIL OF MS QUALITY SHOULD BE USED THAT WILL PERMIT SATISFACTORY COLD STARTING. SAE 30 AND 40 ARE RECOMMENDED. MULTI-VISCOSITY OILS SAE 20W-40 and 20W-50 MAY ALSO BE USED.

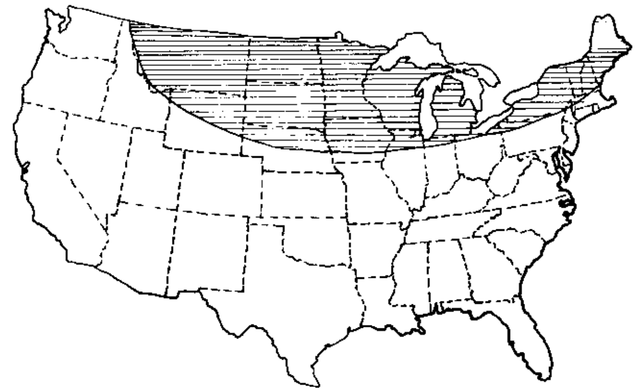


Fig. 13—Shaded Area Covers Region Where Minimum Temperatures May Be Consistently Below 10° During Some Winter Months

When outside temperatures are consistenly below 32°F, SAE 10W-30 or SAE 10W-40 are recommended for ease in cold starting. However, even in cold weather, these grades should not be used if the vehicle is driven in competition or other forms of maximum operation.

MATERIALS ADDED TO ENGINE OILS

It is not necessary to add any other products to engine oils for most types of driving when MS quality oils are used.

In some instances, such as infrequent operation or short trips only, and during break-in after a major overhaul, addition of special materials containing anti-rust and anti-scuff additives is beneficial. A suitable product Engine Oil Supplement, Part Number 1879406 or equivalent, is available for this purpose.

FREQUENCY OF ENGINE OIL CHANGES

The by-products of combustion, such as unburned fuel, condensation and carbon deposits, in addition to dust and other abrasive materials, tend to contaminate engine oil. If permitted to remain in the crankcase for too great a period of time, the contaminants reduce the lubricating qualities of the oil causing excessive wear which can materially affect the operating efficiency of the engine.

To provide maximum protection to engine parts, it is recommended under normal operating conditions, that engine oil be drained and replenished with new oil of the proper viscosity and API classification, every three (3) months or 4,000 miles, whichever occurs first.

When draining the old oil, it is recommended that the engine be at normal operating temperature, as the warmed oil will drain more readily and carry with it such foreign matter which might otherwise cling to the sides of the crankcase and the various moving parts.

A greater degree of contamination of the engine oil takes place when the vehicle is operated under adverse conditions, such as frequent driving in dusty areas, short trips, stop-and-go driving and where long periods of idling are experienced. For oil change frequencies under these operating conditions, refer to the recommendations in the paragraphs under Severe Operating Conditions and Taxi and Police Operation.

During Break-In

Cars should be driven moderately during the first 300 miles. Speeds up to 50 to 60 mph are desirable. While cruising, brief full-throttle accelerations contribute to a good break-in. Wide-open throttle accelerations in low gear can be detrimental and should be avoided for at least 500 miles.

The oil installed in the engine at the factory is a high quality lubricant, classified "For Service MS," and **should be retained** until the first regularly scheduled three-month or 4,000 mile oil change, whichever occurs first. If it becomes necessary to add oil during this initial period, an oil with the "For Service MS" classification and of the proper viscosity grade should be used. **Nondetergent or straight mineral oils must never be used.**

Oil level should be checked during each stop for gasoline. Oil should be added only when level on oil level indicator **is at or below** "ADD OIL" mark.

Frequently, a new engine will consume some oil during its first few thousand miles of operation. This should be considered as a normal part of the break-in and not be interpreted as an indication of difficulty.

Severe Operating Conditions

Severe operating conditions, such as frequent driving on dusty roads, or in sandy geographic areas, or unusually short trip driving in cold weather may reasonably require oil changes more frequently than every three months. Under these conditions, consult and follow the advice of any Chrysler Motors Corporation Authorized Dealer's Service Manager.

Taxi and Police Operation

Severe service such as taxi and city police driving, which is principally short trip operation, including frequent and prolonged idling, requires oil changes more frequently on a regular schedule. For this type of service, it is recommended that engine oil be changed and the crankcase ventilation system serviced every two months, not to exceed 2,000 miles. Replace filter every second oil change.

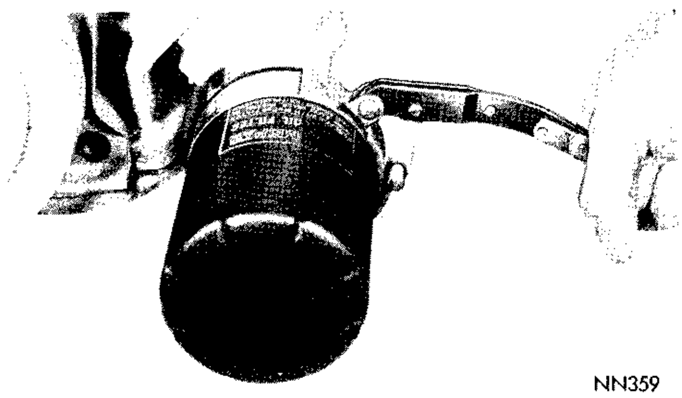


Fig. 14—Removing Engine Oil Filter

ENGINE OIL FILTER

All engines are equipped with full-flow, throw-away oil filters (Fig. 14) to provide efficient filtering of engine oil for maximum engine protection.

The filter should be replaced every second oil change. Since filters vary widely in quality, it is recommended that a Chrysler Corporation Engine Oil Filter, or equivalent, be used for replacement to assure efficient service.

CRANKCASE VENTILATION SYSTEM

All models are equipped with a closed crankcase ventilating system (Figs. 15 and 16). This system consists of a crankcase ventilator valve mounted on the cylinder head cover, and a carburetor with a hose from its base connected to the ventilator valve.

A closed crankcase inlet air cleaner with a hose connecting it to the carburetor air cleaner housing provides the air inlet for the system.

The crankcase inlet air cleaner is also provided

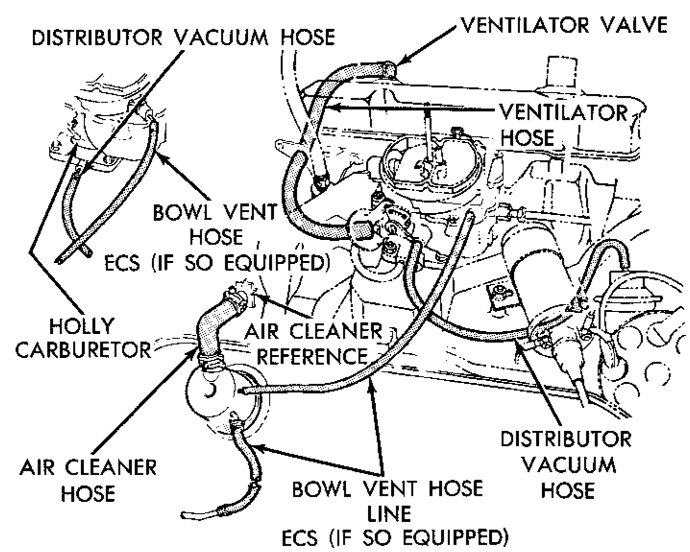


Fig. 15—Crankcase Ventilation System (383 Cu. In. Engine with 2 Barrel Carburetor)

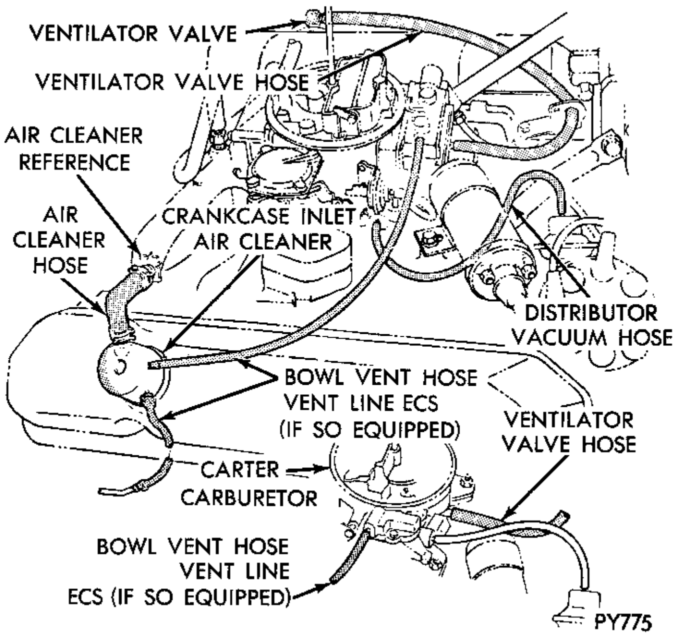


Fig. 16—Crankcase Ventilation System (383 and 440 Cu. In. Engines)

with inlet fittings for a bowl vent hose and vent line hose, where **evaporative control system** (ECS) is required.

VENTILATION SYSTEM OPERATION

The ventilating system operates by manfold vacuum. Air is drawn from the carburetor air cleaner through the air cleaner hose and crankcase inlet air cleaner into the crankcase, (where ECS systems are used the fuel tank and float bowl vapors are also drawn into the crankcase through the crankcase inlet air cleaner), circulated through the engine and drawn out through the ventilator valve, pass through the ventilator valve hose and passage in the carburetor throttle body, into the combustion chamber, are burned and expelled with the exhaust gases.

Servicing Frequencies

Proper maintenance of the crankcase ventilation system is required to keep the system clean and maintain good engine performance and durability. Periodic servicing is required to remove combustion products from the ventilator valve, hoses, carburetor passages and crankcase inlet air cleaner.

Every **six months** the system must be tested for proper operation and cleaned if necessary. This includes inspecting the operation of the valve, checking the hoses and carburetor passages for deposits and cleaning the crankcase inlet air cleaner and carburetor air cleaner.

The crankcase ventilator valve must be replaced with a new one **every year.** The carburetor air cleaner filter element must be replaced **every year** on High Performance Vehicles equipped with "Fresh Air Induction System", and **every 2 years** for vehicles equipped with standard air cleaner.

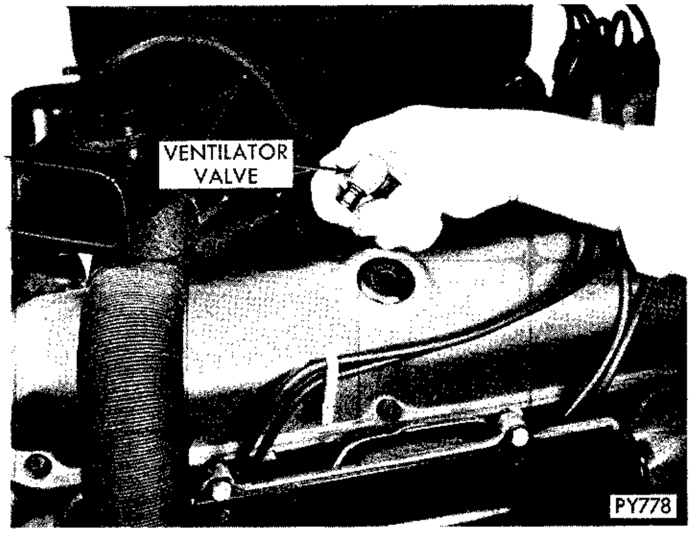


Fig. 17—Checking Vacuum at Ventilator Valve Inlet

If the car is used extensively for short trips with frequent idling, the ventilation system may require servicing more frequently.

Inspection and Service Procedure:

a. With engine idling—

1. Remove ventilator valve from rocker cover.
   If the valve is not plugged, a hissing noise will be heard as air passes through the valve, and a strong vacuum should be felt when a finger is placed over the valve inlet (Fig. 17).
2. Reinstall the ventilator valve, then remove the crankcase inlet air cleaner. Loosely hold a piece of stiff paper, such as parts tag, over the opening in the rocker cover (Fig. 18).

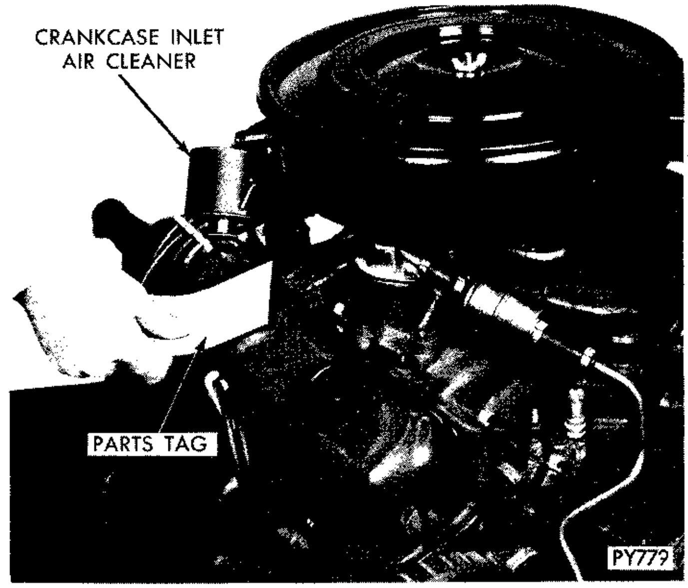


Fig. 18—Checking Vacuum at Crankcase Inlet Air Cleaner Opening

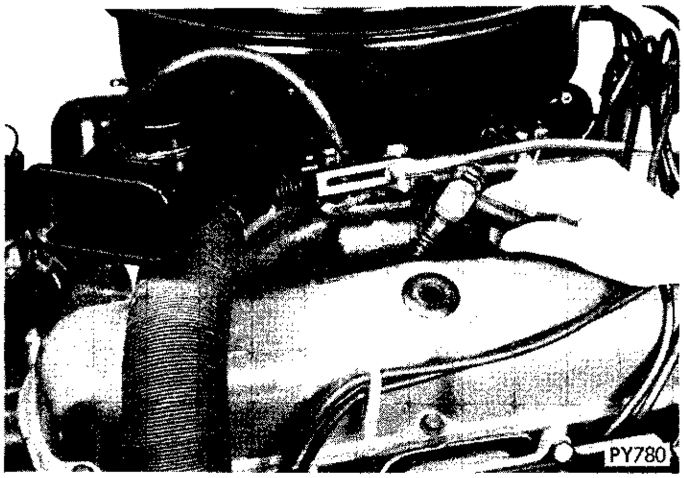


Fig. 19—Shaking Ventilator Valve

After allowing about a minute for the crankcase pressure to reduce, the paper should be sucked against the opening in the rocker cover with a noticeable force.

b. With engine stopped—
   1. Remove ventilator valve from rocker cover and shake (Fig. 19).
   A clicking noise should be heard to indicate that the valve is free.

c. If the ventilation system meets the tests in (a) and (b) above, no further service is required; if not, the ventilation valve should be replaced and the system rechecked. DO NOT ATTEMPT TO CLEAN THE VENTILATOR VALVE!

Use the valve identified by a black end washer (Part No. 2951243 or 2951891) or equivalent.

d. With a new ventilator valve installed, if the paper is not sucked against the crankcase inlet air cleaner opening in the rocker cover with noticeable force, it will be necessary to clean the ventilator hose, vent tube and passage in the lower part of the carburetor.

Carburetor Vent Tube

Remove Carburetor. Dip lower end of carburetor in carburetor cleaner, part number 2933500 or equivalent. Hand turn a 1/4 inch drill through vent tube passage to dislodge solid particles, then blow clean. **IMPORTANT: make sure drill size used will not remove any metal. Use smaller size if necessary. It is not necessary to disassemble carburetor for this service.**

Crankcase Inlet Air Cleaner

Disconnect the hoses from the crankcase inlet air cleaner. Inspect the hose from the crankcase inlet air cleaner to the carburetor inlet air cleaner and clean if necessary. Remove the crankcase inlet air cleaner and wash it thoroughly in kerosene, or similar solvent. Lubricate or wet the filter, by inverting the crankcase inlet air cleaner and filling with SAE-30 engine oil. Position the air cleaner to allow excess oil to drain thoroughly through the vent nipple located on the top of the air cleaner.

Hoses

Clean hoses by immersing in Carburetor Cleaner, Part Number 2933500, or equivalent, followed by drying with compressed air. **Hoses should not remain in solvent more than one-half hour.**

ENGINE PERFORMANCE DIAGNOSIS

The following services should be performed every 12,000 miles or 12 months to provide best vehicle operation and lowest emissions of hydrocarbons and carbon monoxide.

1—SPARK PLUGS—Remove and inspect each spark plug. Most plugs can be cleaned, adjusted, and reinstalled. Rough idle, hard starting, frequent engine miss at high speeds, or apparent physical deterioration; are indications that the spark plugs should be replaced.

2—CABLES—Check all secondary distributor cables for cleanliness and proper connections. Replace all cracked, damaged, or faulty cables. See "Ignition System" Group 8—Electrical for tests.

3—DISTRIBUTOR—Inspect distributor cap and rotor, for carbon tracking and abnormal wear. Check condenser, and points for abnormal pitting, blueing, or misalignment, and adjust, if serviceable, or replace. Lubricate cam and wick. See "Ignition System" Group 8—Electrical for tests and adjustments.

4—AIR CLEANER—Clean and/or replace if necessary. See "Carburetor Air Cleaners."

5—CRANKCASE VENT VALVE—Replace. Check function of the entire crankcase ventilating system. See page 11.

6—IGNITION TIMING—Check timing and set as required. See decal located in engine compartment or "Ignition System" Group 8—Electrical.

7—IDLE RPM—Check after carburetor or ignition timing service. See decal located in engine compartment or "Fuel System" Group 14.

8—MANIFOLD HEAT CONTROL VALVE—Clean pivot areas as necessary.

9—BATTERY—Check specific gravity, clean and tighten terminals; apply grease to posts and terminals after tightening.

10—VALVE LASH—(198, 225, and 426 cu. in. engines): If engine continues to be noisy and/or the idle rough after the above services have been performed, adjust the valve lash to specifications. See "Engine" Group 9 for lash specifications. Idle adjustments of the carburetor should be rechecked after setting lash.

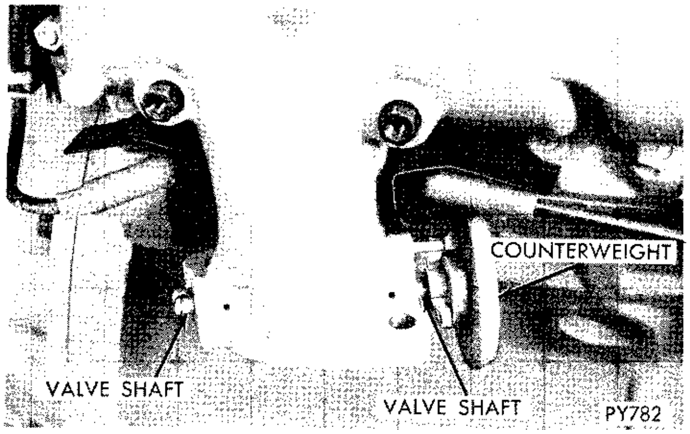


Fig. 20—Manifold Heat Control Valve (383 and 440 Cu. In. Engines)

MANIFOLD HEAT CONTROL VALVE

Freedom of movement of the heat control valve, by removing lead deposits from the valve shaft bearings, is assured by application of suitable solvent. Such a solvent is available under Part Number 2525054, Manifold Heat Control Valve Solvent, or equivalent.

Every engine oil change, apply solvent to both ends of valve shaft where it rotates in bushings (Fig. 20). **Apply solvent only when manifold is COOL.** Allow solvent to soak a few minutes, then work valve shaft back and forth until it moves freely.

CARBURETOR AIR CLEANER

The paper filter element (Fig. 21) in the air cleaner should be inspected and cleaned every six months and replaced every two years. Use a Chrysler Corporation filter element, or equivalent, for replacement.

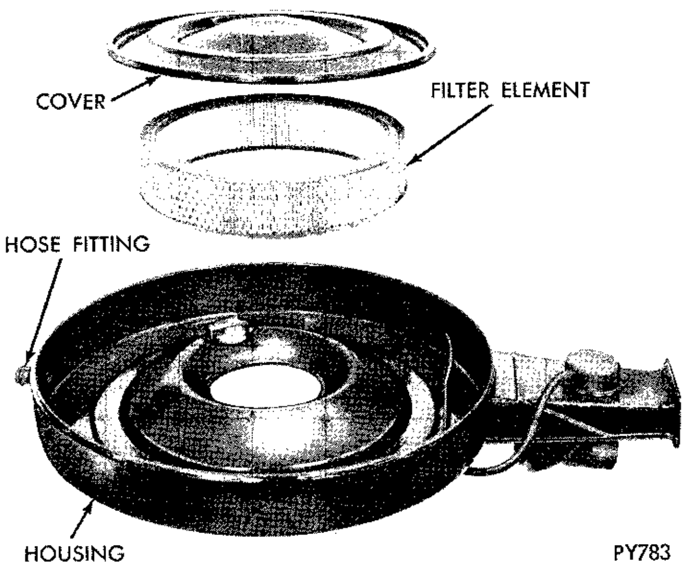


Fig. 21—Carburetor Air Cleaner

Disconnect the air cleaner hose at the air cleaner. Remove cleaner from carburetor and remove filter element from cleaner.

Examine filter element. If the filter element is saturated with oil for more than one-half its circumference, replace the element and check the rest of the crankcase ventilating system for proper functioning.

To clean the element, use compressed air by holding air nozzle at least two inches from inside screen (Fig. 22). **CAUTION: Do not use compressed air on outside surface of element as this will embed foreign matter in the element paper.**

After cleaning, examine element for punctures. Discard an element that has small pin-point punctures. Examine soft plastic sealing rings on both sides of element for smoothness and uniformity.

At this time, also, service the Carburetor Choke Valve Shaft and Fast Idle Cam as outlined.

Reassemble cleaner and install on carburetor.

CARBURETOR CHOKE VALVE SHAFT

Every six months, apply Carburetor Cleaner, Part Number 2933500, or equivalent, to both ends of choke shaft where it passes through the air horn (Fig. 23). At same time, move choke shaft back and forth until deposits are flushed out. Run engine at idle to clean out excess cleaner from carburetor and intake manifold.

Also, apply same type of cleaner to fast idle cam and pivot pin to remove dirt, oil and any other deposits that may have collected and cause sticking or erratic motion.

This service will assure freedom of movement of the choke mechanism.

FUEL FILTER

The fuel filter (Fig. 24) is of the disposable type. Under normal operating conditions, filter should be

Fig. 22—Cleaning Filter Element

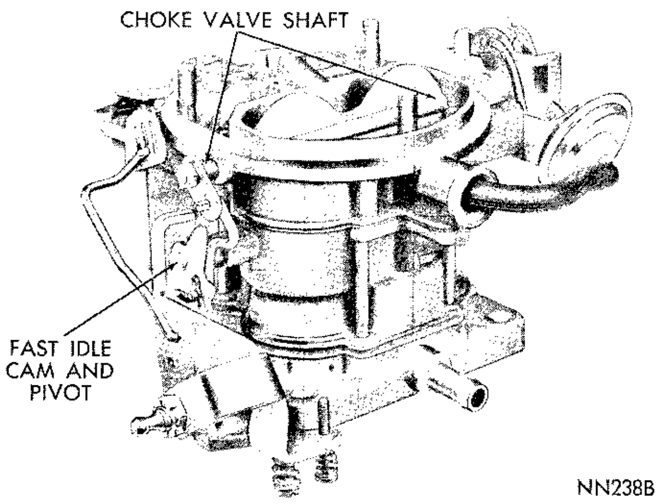


Fig. 23—Choke Valve Shaft and Fast Idle Cam

replaced every 24 months or 24,000 miles, whichever occurs first. Should an excessive amount of foreign matter accumulate in fuel tank, filter may require replacing more frequently.

After installing new filter, run engine for several minutes and check for leaks at connections.

PROPELLER SHAFT AND UNIVERSAL JOINTS

Under normal operating conditions, relubrication of the universal joints on Chrysler models is not required.

Universal joints on Imperial models cannot be relubricated and must be replaced when seals are damaged and leakage is evident.

Every six months, however, the front and rear universal joints on **all** models (Figs. 25, 26, 27 and 28) should be inspected for external leakage or damaged seals.

If external leaks or damage is evident, the universal joint should be replaced.

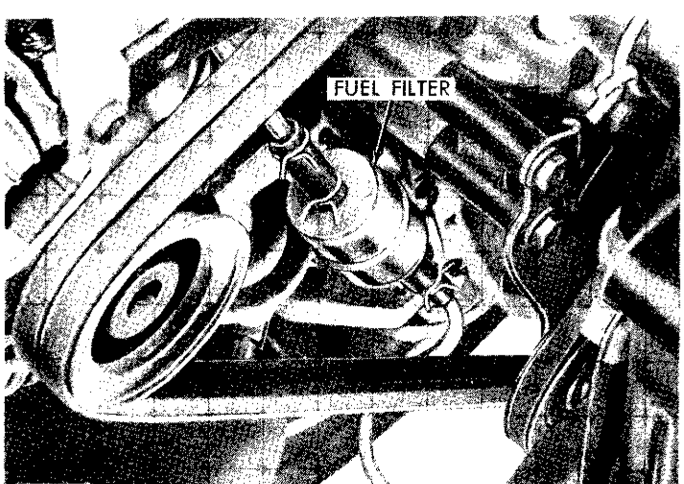


Fig. 24—Fuel Filter

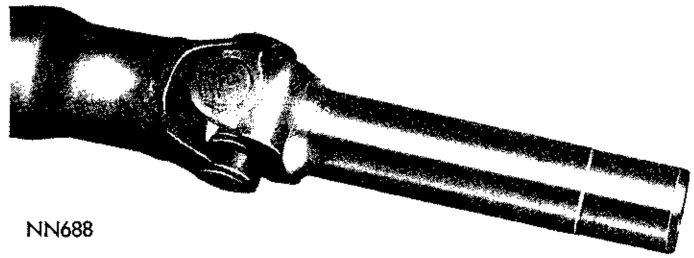


Fig. 25—Front Universal Joint (Chrysler Models)

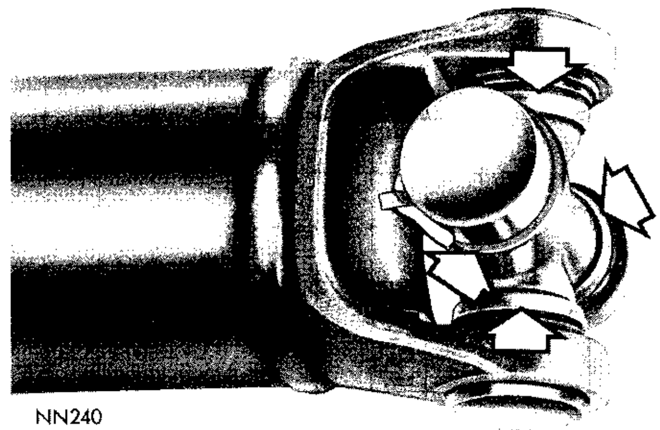


Fig. 26—Rear Universal Joint (Chrysler Models)

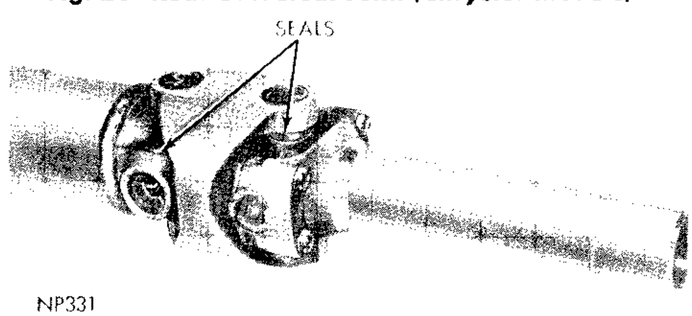


Fig. 27—Front Universal Joint (Imperial Models)

Severe Service Requirements

When the vehicle is operated under the severe conditions as in police and taxi service the universal joints should be disassembled, cleaned, and relubricated every 36,000 miles or 3 years. The units should be disassembled, cleaned, and relubricated with Multipurpose Grease, NLGI Grade 2, E.P., such as Multi-Mileage Lubricant part number 2525035, or equivalent.

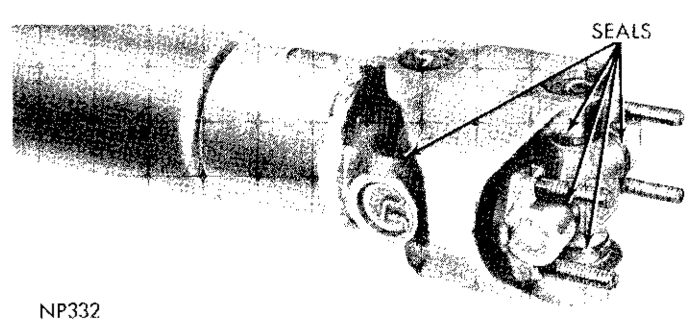


Fig. 28—Rear Universal Joint (Imperial Models)

STEERING GEAR

Manual

The lubricant installed in the steering gear at time of assembly is a high quality product and regularly scheduled changes are not required.

Every six months, remove plug in steering gear housing (Fig. 29) and check lubricant level. Lubricant should cover worm gear.

If lubricant is below prescribed level, replenish with Multi-Purpose Gear Oil SAE 90, as defined by MIL-L-2105B. This is suitable for all temperatures. Special Sure-Grip Lubricant, Part Number 2585318, and Chrysler Hypoid Lubricant, part number 2933565, or there equivalent, are lubricants of this type and are recommended.

CAUTION: When filling, do not use a pressure gun as high pressure may damage the seals.

Power Steering

At every engine crankcase oil change, the power steering fluid level should be checked at the power steering pump reservoir (Fig. 30). When the fluid is checked when **hot**, the fluid level will be approximately 1/2 to 1 inch below the top of the filler neck.

At room temperature (approximately 70°F) the fluid level should be above the joint of the filler neck and reservoir (between 1-1/2 to 2 inches below the top of the filler neck).

If necessary, add fluid to restore these levels.

Units equipped with a dipstick should be filled to the required indicated oil level. Only petroleum fluids specially formulated for minimum effect on the rubber hoses should be used. Power Steering Fluid part number 2084329, or its equivalent, is recommended.

CAUTION: Before removing the reservoir cover, wipe outside of cover and case so that no dirt can fall into the reservoir.

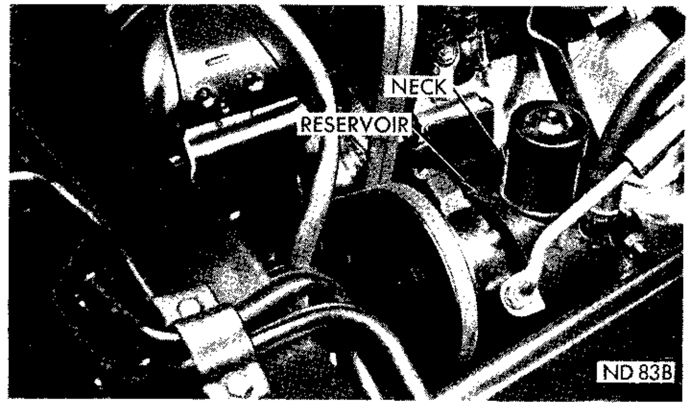


Fig. 30—Power Steering Pump Reservoir

TRANSMISSION (Manual)

Three-Speed

The lubricant installed in the transmission at the time of assembly is a high quality product and regularly scheduled changes are not required for vehicles whose operation is classified as normal service for passenger cars.

The fluid level should be checked every six months. The correct level is at the bottom of the filler plug hole (Fig. 31). Replenish if necessary with automatic transmission fluid. Use only fluids of the type labeled DEXRON Automatic Transmission Fluid or Chrysler Automatic Transmission Fluid AQ-ATF-2848A, available under Part Number 1843314, or there equivalent.

In warm climates, if desired, the Automatic Transmission fluid may be drained and the transmission refilled with Multi-Purpose Gear Lubricant SAE 90, as defined by MIL-L-2105B.

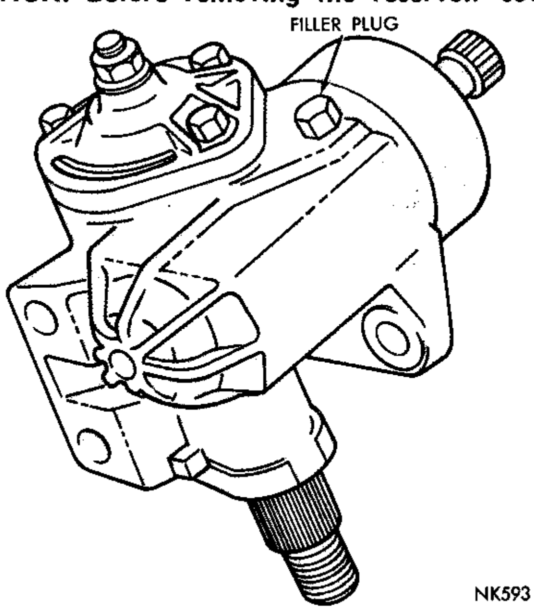


Fig. 29—Manual Steering Gear Filler Plug

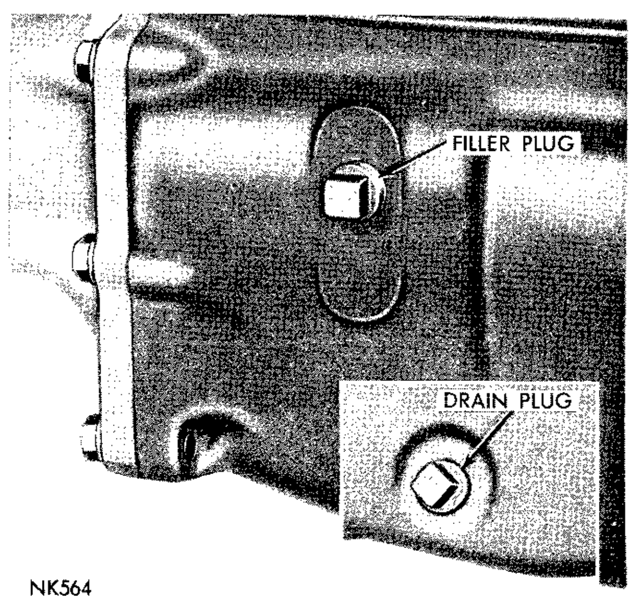


Fig. 31—Transmission Filler and Drain Plug

Trailer Towing and Severe Service

For vehicles equipped for trailer towing service, or if the regular operation of the vehicle is classified as severe, the transmission lubricant level should be checked every 3 months or 4,000 miles, whichever occurs first.

The transmission should be drained and refilled with the specified lubricant, initially after 36 months or 36,000 miles, whichever occurs first, and every 12 months or 12,000 miles, thereafter, whichever occurs first.

Column-Mounted Transmission Gearshift Control

If operation of gearshift controls becomes noisy or shift effort becomes objectionable, lubricate linkage at lower end of steering column (Fig. 32).

Apply a film of Multi-Mileage Lubricant, Part Number 2525035, or equivalent, or Multi-Purpose Grease, NLGI grade 2, to contact surfaces on levers.

TRANSMISSION (Automatic)

Automatic transmissions should be maintained and serviced by an authorized Chrysler Corporation dealer or service center to obtain best performance and long life. It is important that the transmission fluid be maintained at the level prescribed.

Selection of Lubricant

Use only fluids of the type labeled DEXRON Automatic Transmission Fluid or Chrysler Automatic Transmission Fluid AQ-ATF-2848A, or there equivalent.

Special Additives

Chrysler Corporation does not recommend the addition of any fluids to the transmission other than those from the automatic transmission fluids listed above. Exceptions to this policy are the uses of special dyes to aid in detecting fluid leaks, and the use of Chrysler Automatic Transmission Sealer which introduces a small amount of swelling of the seals to reduce fluid leakage resulting from hardening or shrinking of the seals in high mileage vehicles. Such a product is available under Part Number 2298923 Transmission Sealer, or its equivalent.

Fluid Level Check

The fluid level should be checked every six months. This check should be made when engine temperature gauge indicates a normal warmed-up condition and transmission fluid is heated to its normal operating temperature. Check level with parking brake applied firmly and engine idling.

CAUTION: Before removing level indicator, wipe off cap and top of filler tube to prevent accumulated dirt from dropping into transmission filler tube.

After engine has idled for about two minutes, move gearshift lever slowly through all gear positions, pausing momentarily in each position and ending with lever in "N" position.

When fluid is "hot," level should be at the "FULL" mark, or slightly below, but **never above** "FULL" mark (Fig. 33). Fluid should be added or extracted, depending upon the reading, to restore level as specified.

Frequency of Fluid Change

For vehicles operated under normal service conditions, the transmission fluid and filter will provide satisfactory lubrication and protection to the transmission. Therefore, periodic fluid changes are not required.

IMPORTANT: If, for any reason, the factory fill fluid is replaced with another fluid, the fluid and filter must be changed every 36 months or 36,000 miles, whichever occurs first, in normal service. A band adjustment should be made at time of oil change.

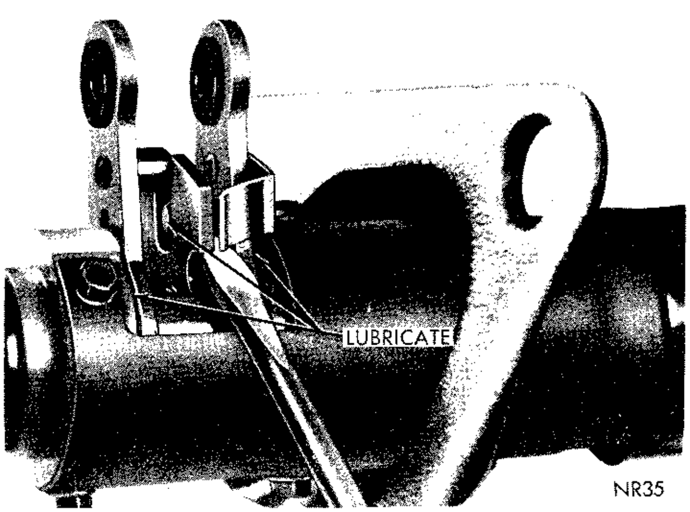


Fig. 32—Column Mounted Gearshift Control

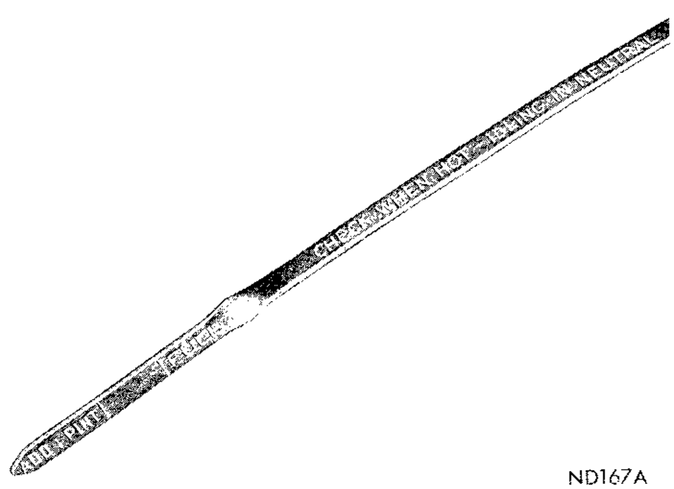


Fig. 33—Transmission Level Indicator Markings

Trailer Towing Service and Severe Usage

If the regular operation of a car is classified as severe, the fluid level should be checked every 3 months or 4,000 miles, whichever occurs first, and the transmission should be adjusted and the fluid and oil filter changed after the first three years or 36,000 miles of operation, whichever comes first, and every 12,000 miles or 12 months of operation thereafter, whichever comes first.

Typical examples of the type of service that comes within this category are:

(a) Police and taxicab operation.

(b) Frequent towing of trailers.

(c) Continuous operation at higher than normal loading.

For transmission fluid draining and refilling service, filter replacement and band adjustment procedures see "TorqueFlite Transmission," Group 21.

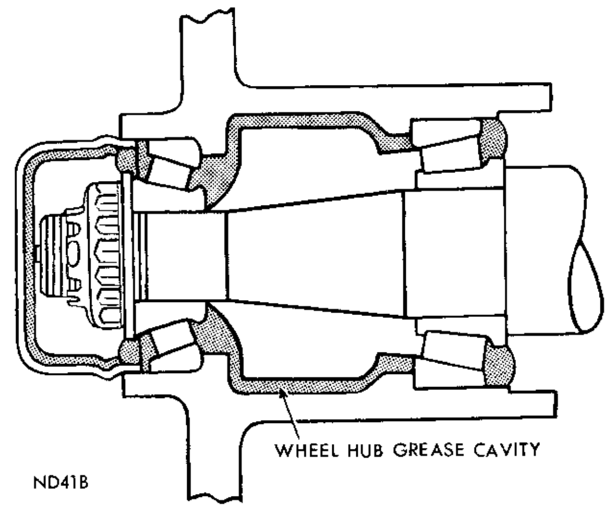


Fig. 34—Front Wheel Bearing Lubrication

FRONT WHEEL BEARINGS

The condition and quantity of the lubricant in the front wheel bearings on cars equipped with either drum or disc type brakes should be inspected whenever the wheels are removed to inspect or service the brake system. Brake system inspection is recommended every 12 months or 12,000 miles, whichever occurs first.

When inspection of the wheel bearing lubricant indicates it is low in quantity, contains dirt, or has been contaminated by water to produce a milky appearance, bearings and hub should be cleaned, inspected and relubricated.

CAUTION: To avoid possible contamination of lubricant by mixing lubricants that are not compatible, do not add lubricant to bearings.

Thoroughly clean old lubricant from bearings and hubs. After cleaning, carefully examine cups, rollers, and inner race of cone for brinnelling or spalling. Bearing should be replaced if any defects exist.

Discard old seals, Repack bearings and hubs with new Multi-Purpose Grease, NLGI grade 2 EP, such as Multi-Mileage Lubricant, Part Number 2525035, or equivalent. When repacking hubs (Fig. 34), make sure all surfaces of hub and outer grease cup interiors are covered with lubricant to minimize condensation and lubricant travel out of bearing. **DO NOT OVER FILL.**

Adjust bearings as follows:

(1) Install wheel and drum assemblies and tighten wheel nuts to 65 foot-pounds.

(2) Tighten wheel bearing adjusting nut (Fig. 35) to 90 inch-pounds while rotating wheel.

(3) Position nut lock on adjusting nut so one pair of cotter pin slots align with hole in spindle.

(4) Back off adjusting nut and nut lock to the next slot and install cotter pin.

(5) Install wheel covers.

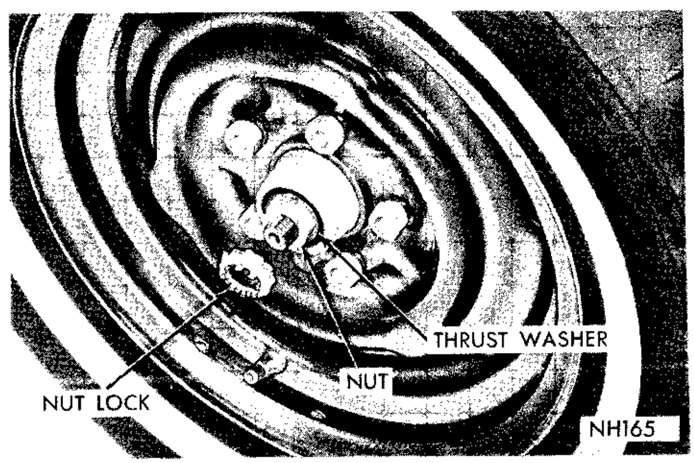


Fig. 35—Front Wheel Bearing Adjustment

TIRES

All tires, especially wide tread, 70 Series and Fiberglass belted tires should be rotated no later than every second oil change (Fig. 36) and should be in correct balance to obtain the most uniform treadwear.

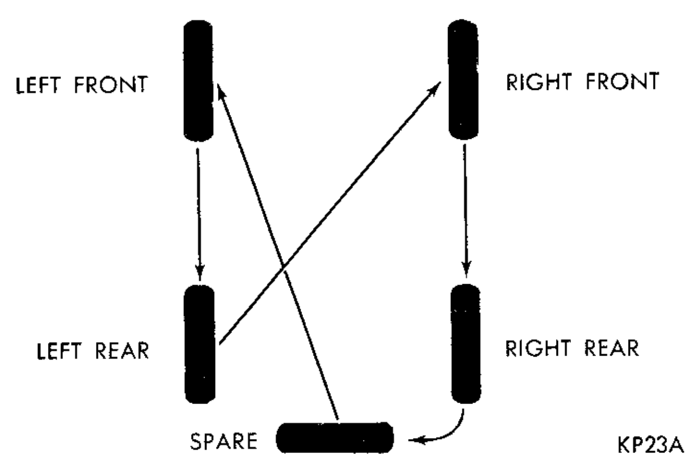


Fig. 36—Tire Rotation Diagram—5 Tires

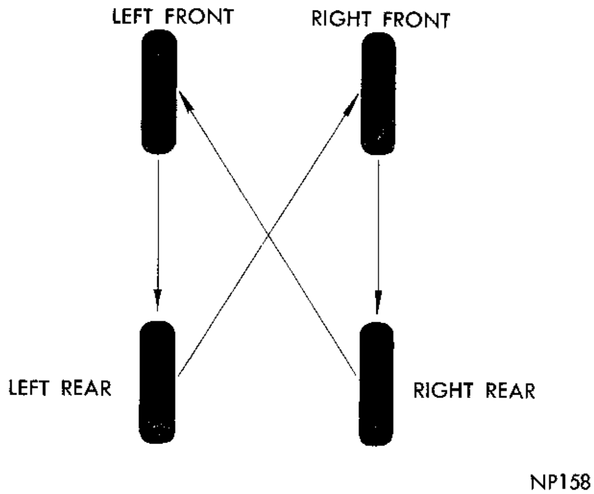


Fig. 37—Tire Rotation Diagram—4 Tires

If owner insists on a four tire switch only, rotate tires according to diagram (Fig. 37).

Tires should be examined at every oil change for unusual wear patterns, foreing material and proper inflation pressures. If irregular tread wear has developed, rotation is suggested at this time.

Unusual wear conditions may indicate a need for a change in driving habits or that mechanical corrections are necessary.

A decal showing the recommended tire pressure is located on the body pillar at the rear of the left front door opening ("B" post). Refer to "Tires", Group 22, for additional information.

SPEEDOMETER CABLE

To service a noisy speedometer cable, it is first necessary to remove the steering column cover.

Then, disconnect housing at speedometer head. Remove shaft and clean it thoroughly. Apply a very thin film of speedometer cable lubricant on the shaft. Such a lubricant is available under Part Number 1243632, Speedometer Cable Lubricant or equivalent. Wipe excess lubricant from the top one-foot of the shaft and from the ferrule.

CAUTION: Excessive lubricant may cause malfunction of the speedometer.

HOOD LOCK, RELEASE MECHANISM AND SAFETY CATCH

Lubrication of the hood latch release mechanism and safety catch is of vital importance and should be inspected, cleaned and lubricated every 6 months to assure ease of operation and freedom from binding.

All Models

Apply Multi-Purpose Lubricant NLGI grade 2 EP, such as Multi-Mileage Lubricant, Part Number 2525-035 or equivalent, sparingly to all sliding contact areas

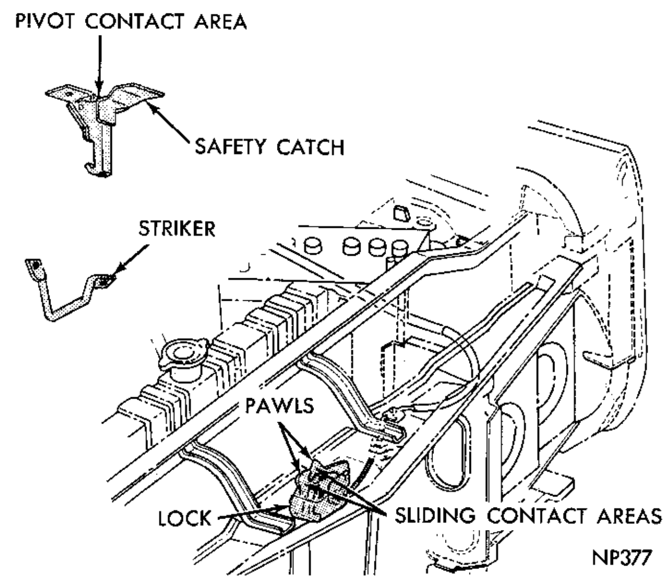


Fig. 38—Hood Lock Lubrication (Imperial Models)

of latch and release lever, and ends of hood lock release links, if so equipped (Figs. 38 and 39).

Work lubricant into the lock mechanism until all frictional surfaces are covered. Also apply a film of the same lubricant to the pivot contact areas of the safety catch.

BODY MAINTENANCE

Body and other operating mechanisms should be inspected, and relubricated as needed. This is necessary to maintain ease of operation and to provide protection against rust and wear.

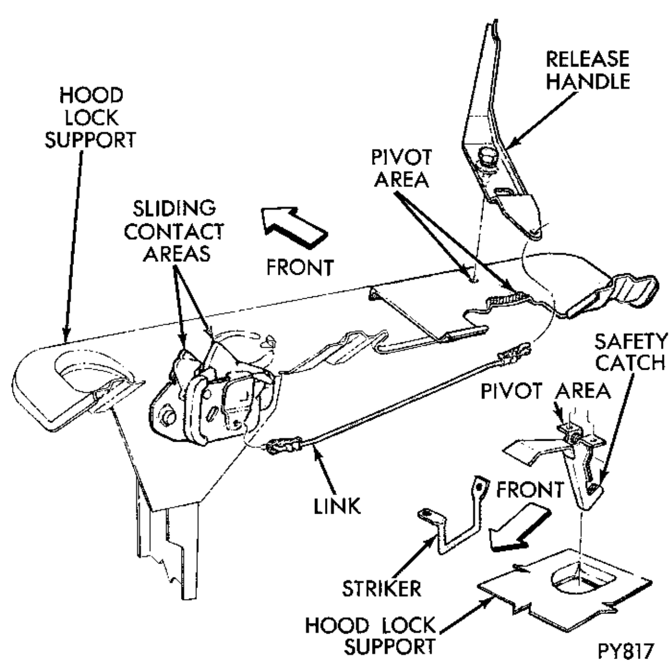


Fig. 39—Hood Lock Lubrication (Chrysler Models)

Prior to applying any lubricant, wipe the parts clean to remove dust and grit. After lubricating parts, remove excess oil or lubricant.

Relubricate mechanisms as outlined in the following paragraphs. **Where Lubriplate is specified, use a smooth, white body hardware lubricant conforming to NLGI grade 1. Chrysler Parts Lubriplate, Part Number 1064768 or equivalent, is a suitable lubricant.**

Where Door Ease Lubricant is specified, use a stainless wax type lubricant such as Chrysler Parts Door Ease, Part Number 774512 or equivalent.

Lock Cylinders

When necessary, apply a thin film of Lubriplate or equivalent, directly to key. Insert key into lock and actuate several times. Wipe excess lubricant from key. Particular attention should be given to external lock cylinders during fall and winter months to insure protection from water and ice.

Hood Hinges (All Models)

Apply engine oil to all link or hinge pivots and Lubriplate or equivalent, to gear teeth and sliding contact areas (Fig. 40).

Door Hinges (All Models)

On all hinges, apply engine oil to hinge pin ends (Fig. 41).

On lower hinges, in addition, apply engine oil to spring ends and contact areas.

CAUTION: Avoid lubricant on roller surfaces of hinge arm and roller on front and read door lower hinges.

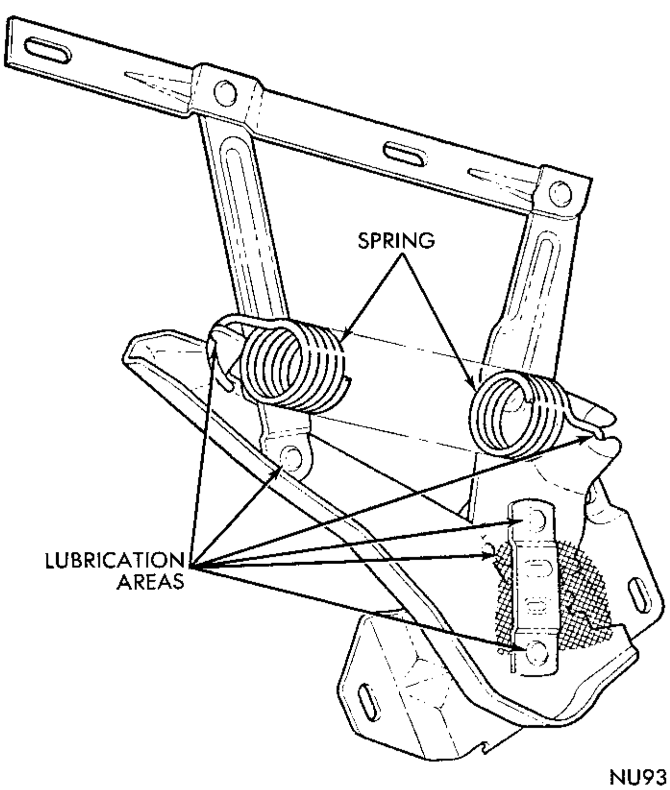


Fig. 40—Hood Hinge Lubrication (All Models)

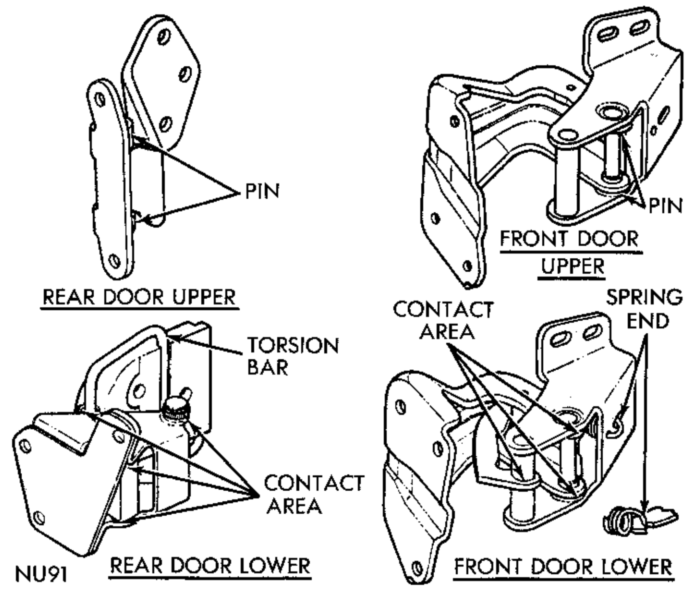


Fig. 41—Door Hinge Lubrication (All Models)

Door Lock Rachet and Striker Bolt (All Models)

Apply light engine oil, sparingly, to ratchet pivot areas (Fig. 42). Wipe off excess oil. Apply Door Ease Lubricant or equivalent to contact area of Striker bolt.

Door Locks and Locking Control Linkage (All Models)

If necessary to inspect operation of and relubricate these parts, remove door trim panel. Apply a thin film of Lubriplate or equivalent, to all pivot and sliding contact areas.

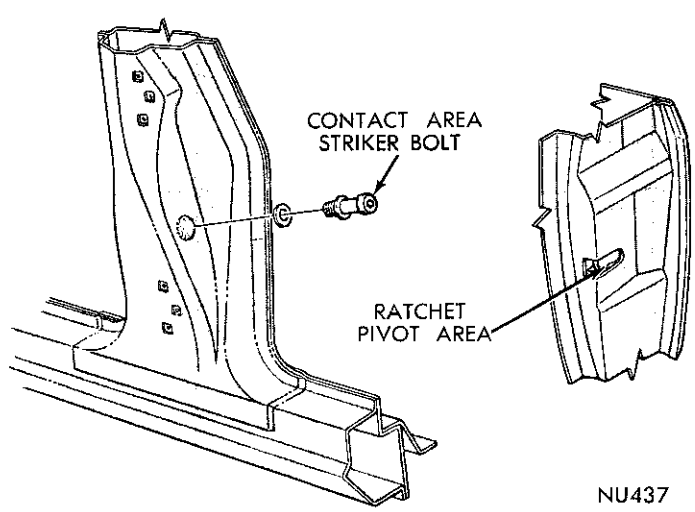


Fig. 42—Door Lock Rachet and Striker Bolt (All Models)

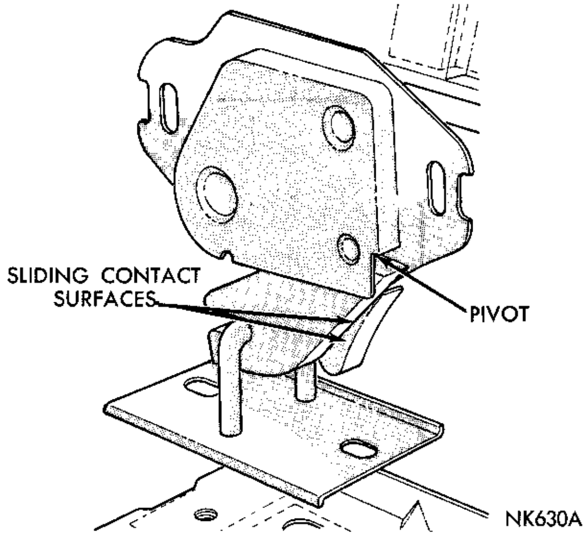


Fig. 43—Deck Lid Latch Lubrication (All Models)

Door Remote Control Link (All Models)

If necessary to inspect operation of and relubricate these parts, remove door trim panel. Apply a thin film of Lubriplate or equivalent, to all link end pivots.

Window Regulator, Glass Lower Frame (All Models)

If necessary to inspect operation of and relubricate these parts, remove door or quarter trim panel. Apply Lubriplate or equivalent, sparingly, to regulator sector gear teeth, assist spring and pivots. Apply same lubricant sparingly, to glass lower frame roller slide tracks and roller and bracket assembly pivot points.

Deck Lid Latch (All Models)

Apply Lubriplate or equivalent, sparingly, to all pivot and sliding contact surfaces (Fig. 43).

Deck Lid Hinges (All Models)

Apply Lubriplate or equivalent, sparingly, to all

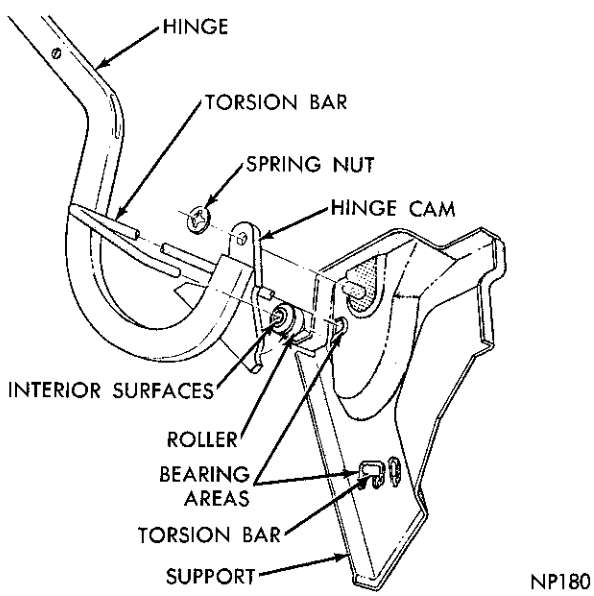


Fig. 44—Deck Lid Hinge (Imperial Models)

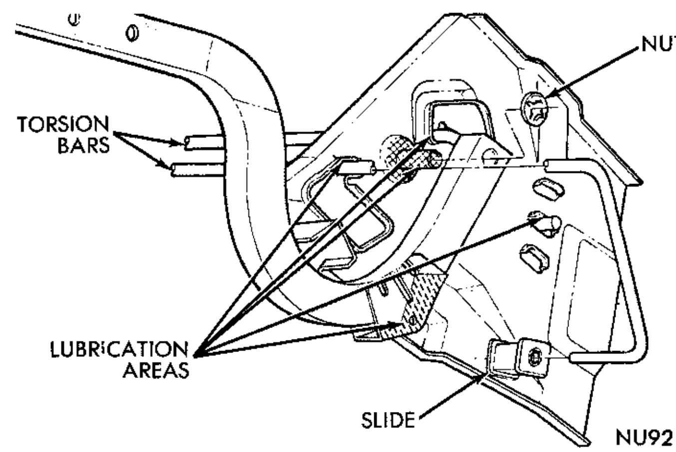


Fig. 45—Deck Lid Hinge (Chrysler Models)

torsion bar support bearing areas and interior surface of torsion bar slide (Figs. 44 and 45).

Also, apply same lubricant sparingly, to contact surface of hinge cam slide.

Tail Gate-Door Lubrication

Apply engine oil sparingly to upper and lower hinge pivot pins. Lubriplate or equivalent, to support links, check strap links, link contact areas and inner pivot or sliding contact surfaces of tail gate and door lock.

Lubricate torsion bar and check arm mechanism with a Multi-Purpose Lubricant NLGI grade 2 EP, such as Multi-Mileage Lubricant Part Number 2525035 or equivalent. Apply stainless wax type stick lubricant such as Chrysler Parts Door Ease Part Number 774512 or equivalent, to tailgate latch striker plate and bolt (Fig. 46).

Tail Gate Window Wiper Linkage

To lubricate this linkage, remove tail gate trim panel. Apply Lubriplate or equivalent, sparingly, to the sliding contact areas between the actuator arm and pin, and between the actuating arm and regulator sector gear. **Do not contaminate wiper blades with lubricant.**

Fuel Tank Access Door Hinge (Chrysler Station Wagon Models)

Apply Multi-Purpose Lubricant, NLGI grade 2 EP, sparingly, to all pivot areas and to spring end contact areas (Fig. 47).

Fuel Tank Access Door Hinge (Imperial Models)

Apply a thin film of Multi-Purpose Lubricant, NLGI grade 2 EP, to all pivot areas and to spring end contact areas.

License Plate Bracket Hinge, Spring and Pin (Chrysler Models except Station Wagons)

Apply a thin film of Multi-Purpose Lubricant, NLGI grade 2 EP, to all pivot areas.

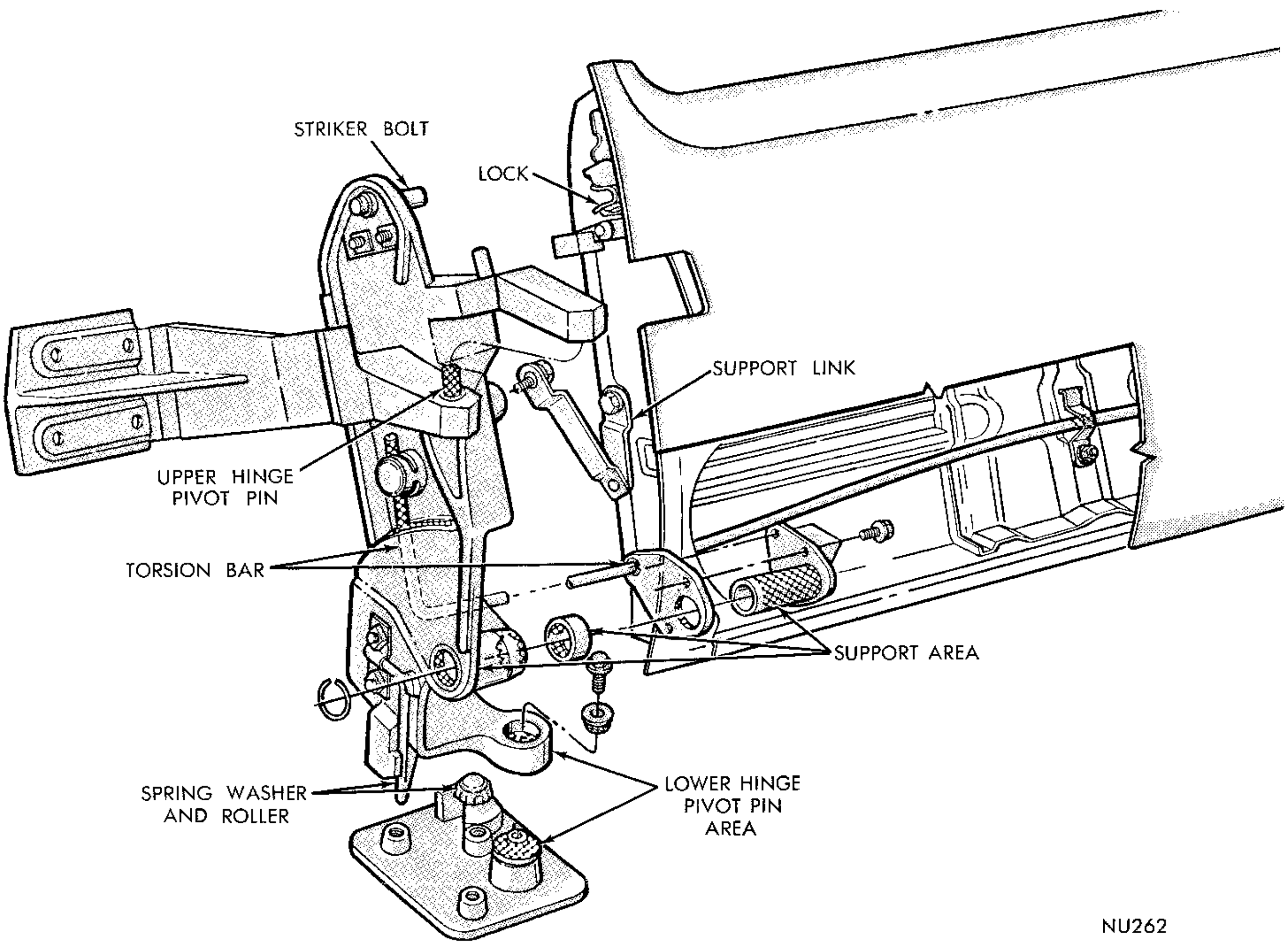


Fig. 46—Tail Gate Door Lubrication

ACCELERATOR LINKAGE COMPONENTS

Every 12 months the accelerator linkage components should be lubricated with Multi-Purpose Grease, NLGI grade 2 EP, such as Multi-Mileage Lubricant,

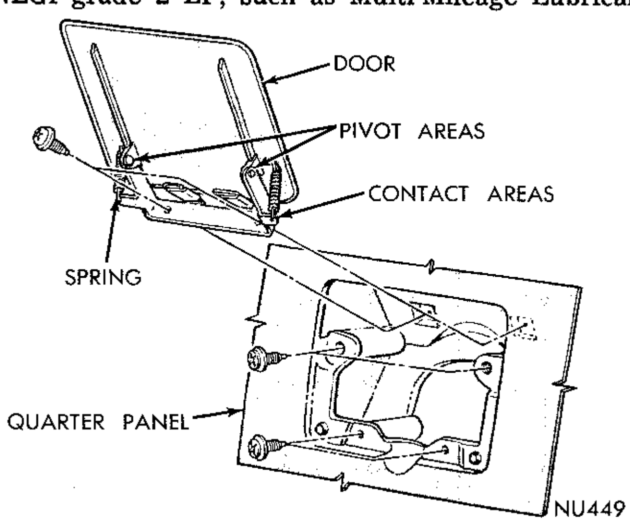


Fig. 47—Fuel Tank Access Door Hinge (Station Wagons)

Part Number 2525035 or equivalent, as described in the following paragraphs. **Do not lubricate ball joints or throttle control cable.**

On models with manual and automatic transmissions, apply a thin film of the prescribed lubricant to both ends of the accelerator shaft where it turns in the bracket (Fig. 48).

The pedal pivot pin, cable ball end and pocket in the accelerator shaft should also be lubricated. Be sure plug is in place.

PARTS REQUIRING NO LUBRICATION

There are many points that should not be lubricated, some because they are permanently lubricated, some because lubricants will be detrimental to their operating characteristics, and some because lubricants will cause component failures. In any event, rubber bushings should not be lubricated, not only because lubricants will cause rubber to fail, but also will destroy their necessary friction characteristics. The following parts should not be lubricated:

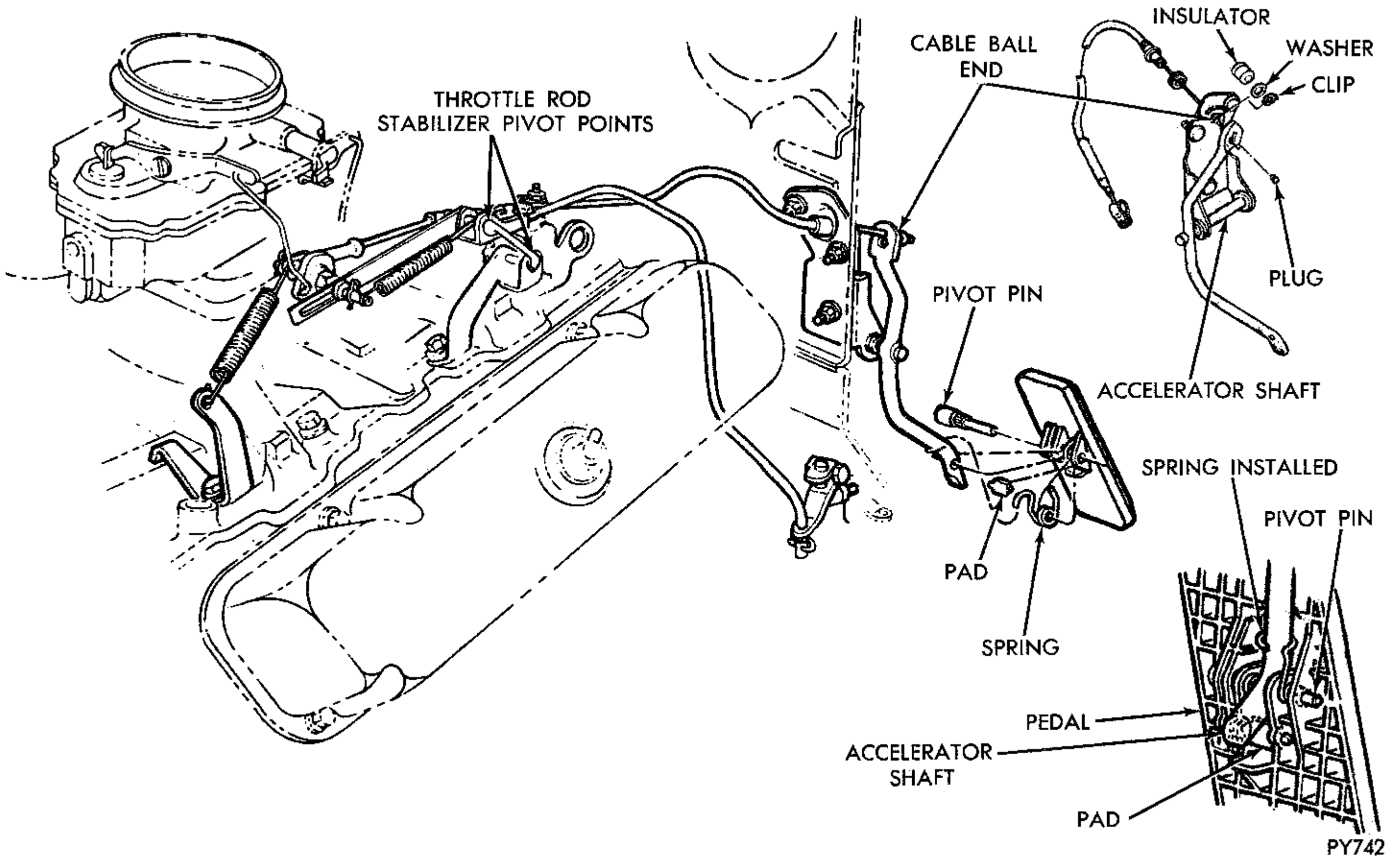


Fig. 48—Throttle Linkage (All Models)

All Rubber Bushings
Alternator Bearings
Automatic Tranmission
  Controls and Linkage
Carburetor Air Cleaner
  (Paper Element Type)
Clutch Adjustment
  Rod Ends
Clutch Pedal Push
  Rod Ends
Clutch Release Bearing
Drive Belts
Fan Belt Idler Pulley
Rear Springs
Rear Wheel Bearings
Starting Motor Bushings
Throttle Linkage Ball Joints
Throttle Control Cable
Upper and Lower Control
  Arm Bushings
Water Pump Bearings

ACCESSORIES

CONTENTS

ELECTRIC CLOCK

GENERAL INFORMATION

The electric clocks have a self-regulating mechanism for automatically correcting time gain or lag when the hands are reset to the correct time. Clocks should be reset as follows:

(1) If the clock runs fast, pull the time set shaft out and reset the hands in a "counterclockwise" direction to the correct time. Push in the time set shaft.

(2) If the clock runs slow, pull the time set shaft out and reset the hands in a "clockwise" direction to the correct time. Push in the time set shaft.

(3) Repeat steps (1) and/or (2) frequently for several days until the correct rate of time is achieved.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
CLOCK DOES NOT OPERATE	(a) Wire loose or off terminal.	(a) Install connector on terminal.
	(b) Internal short.	(b) Repair or replace the clock as necessary.
	(c) Faulty ground.	(c) Tighten clock retaining screws on cluster housing and/or cluster.

SERVICE PROCEDURES

Removal—(Chrysler)

(1) Remove wiring connector from clock terminal.

(2) Remove clock time set stem and the one screw, then roll the bottom of the clock back and down out of cluster.

Installation

(1) Carefully enter clock (working under instrument panel), position clock in cluster panel and install attaching screw.

(2) Install time set stem.

(3) Connect electrical lead to clock terminal.

Removal—(Imperial)

(1) From under instrument panel remove electrical lead from clock terminal.

(2) Loosen the two right mounting screws.

(3) Remove the two left mounting screws, move the clock to the left, and remove the right side from the cluster housing and remove the clock.

Installation

(1) Install the clock with the slotted holes to the right and under the two screws previously loosened, then install the two left screws. Tighten securely.

(2) Connect electrical lead to clock terminal.

RADIO AND ANTENNA

INDEX

GENERAL INFORMATION CHRYSLER

Four radios are offered as optional equipment for Chrysler models:

AM Pushbutton

To operate the radio the ignition switch must be in the **ON** or **Accessory** position. Operation is by two rotary controls and five push buttons.

Left Center Knob—On-Off and Volume
Left Outer (Ring) Knob—Tone Control
Right Center and Outer (Ring)
Knob or Push Buttons—Station Selection

Combination AM Radio and Stereo Tape Player

To operate: Ignition switch must be at "On" or "Acc" position.

The operating controls consist of four thumbwheels and a tape program selector button. The left outside thumbwheel turns on the radio and controls the volume. The right outside thumbwheel is for station selection. The right inside thumbwheel controls tone quality. The left inside thumbwheel controls balance between the left and right channel. At mid-rotation a detent is provided as a reference point to obtain approximately equal output from each channel.

The four program—eight-track stereo tape player provides full stereo reproduction.

To operate, insert the tape cartridge, label side up, into the tape chamber. The door will swing inward and the tape player will begin to play when the cartridge is in position. The tape player unit will play all four programs automatically and in sequence unless manually changed.

Depressing the program selector push button will manually override the automatic sequence of the tape player and allow the driver to change programs at will.

When the tape player is shut off by either the ignition switch or the volume on/off switch, the tape cartridge is automatically ejected. Automatic ejection can also be accomplished by pulling outward on the program selector button.

CAUTION: Avoid removing the cartridge without using automatic eject mechanism.

AM/FM Radio

To operate: Ignition switch must be at "On" or "Acc" position.

Turn the left hand knob clockwise to "On" position. This same knob adjusts the volume tone control, ring behind left knob, provides selection of tone quality.

AM or FM can be selected by pressing either of the two bars located directly above the radio dial marked AM or FM to give the desired band of operation. Automatic station selection is accomplished either by pressing the push buttons fully in, or by turning knob at right or, automatically by pressing the bars marked "Loc" (local) or "DIST" (distant) or by foot-operated button located to the left of the brake pedal.

AM/FM Multiplex with Tape

Operating controls consists of four thumbwheels, five push buttons and AM/FM selector switch:

Left Outside Thumbwheel—On-Off and Volume
Left Inside Thumbwheel—Balance
Center Switch—AM-FM Selector Switch
Right Inside Thumbwheel—Tone Quality
Right Outside Thumbwheel
and Push Buttons—Station Selection

IMPERIAL

Three radios are offered as optional equipment for Imperial models:

AM—Search Tune

To operate: Ignition switch must be at the "On" or "Acc" position. Turn the left hand knob clockwise to "On" position. This same knob adjusts volume. Tone control ring, behind left knob, provides selection of tone quality. Stations can be tuned either by pressing the push buttons fully in, by turning knob at right or by automatic searching.

To operate the search tune, press the bars marked "Loc" (local) or "Dist" (distant). The radio will then automatically search and select a local or distant station.

A foot-operated button located to the left of the brake pedal is provided for searching stations by remote control. Its function is identical to the search bars.

Even though the radio plays immediately when turned on, it will be several seconds before the automatic tuning sections will operate.

AM/FM—Search Tune

Operation is the same as the AM-FM Search Tune for Chrysler models (optional equipment).

AM/FM—Multiplex with Tape and With Push Buttons

Operating controls consist of four thumbwheels:
Left Outside—On-Off and Volume
Left Inside—Speaker Balance
Right Inside—Tone Quality
Right Outside—Station Selection

Push buttons may be set for either AM or FM stations. Mode switch iis between left and right controls. Multiplex stereo light is on the right side of the dial. The tape program automatic ejection button is in the lower left area of the radio. Depressing this button will manually select the next tape program while automatic ejection of cartridge can be accomplished by pulling the button outward.

Tape Cartridge

(1) Stereophonic tape players are designed to use a pre-recorded, four program (eight-track) stereophonic tape contained in a special tape cartridge. **Do Not Use Four-Track Cartridges.**

(2) Protect open end of the cartridge from damage, dirt, water, oil, grease, etc.

(3) Do not attempt to pull out the tape from the cartridge.

(4) Do not attempt to open up the cartridge.

(5) To assure maximum life, tape cartridges should be stored in a **cool, clean** and **dry** place, with the open (tape) end down to keep dust out of the cartridge.

(6) Do not expose cartridge to direct sunlight or other temperature extremes.

(7) Remove or disengage cartridge when not in use.

PLAYBACK HEAD AND CAPSTAN CLEANING

The playback head and capstan in your tape player may accumulate tape coating residue (oxide) as the tape passes over the head. This accumulation should be periodically removed, as part of normal maintenance. Clean the playback head with a cotton swab, slightly moistened with alcohol while holding the player cartridge door open. To clean the capstan, hold the player cartridge door open and swab the surface of the capstan with alcohol. **Do not use carbon tetrachloride.** Dry parts with a clean rag.

Rear Speaker Fader Control

The speaker fader control, located remotely from the stereo unit, serves to proportion the sound level between the front and rear speakers.

AM-FM Reception

The following items should be noted for proper AM-FM radio operation:

(1) If antenna trimming is required, place the band selector control in the AM position and proceed with the antenna trimming procedure as outlined in "Antenna Trimming" in this section of manual.

(2) The antenna should be extended to a height of 31-1/2 inches for maximum FM reception.

(3) The radio push button adjustment is the same as the standard AM radio. It should be noted that a push button adjustment is only good for one station (either AM or FM) not both at the same time.

(4) Should a malfunction occur, the trouble shooting procedures are the same as for the standard AM radio.

Fader Control (Optional)

The fader control is used only when the vehicle is equipped with a rear seat speaker. Fully rotated one way allows operation of the front speaker. Fully rotated in the opposite direction the control allows operation of the rear seat speakers. Partial rotation of the control blends the volume of the speakers.

In **Imperial models** (Service Installation only), the reverberator control on the instrument panel replaces the fader control. Pull the control knob "OUT" to turn "ON" the reverberator unit and push "IN" to turn "OFF". In the "OFF" position, the reverberator switch provides normal fader control.

In **Chrysler models** (Service Installation only), a thumbwheel type control under the cowl pad next to the map light provides the desired blend between the front and rear speakers. If the vehicle is equipped with a reverberator, a toggle switch is added to control "ON"-"OFF" operation of the reverberator and the thumbwheel control still provides fader control.

Foot Switch For Search Tuning

The foot switch for search tuning is located on the left forward end of the floor panel. By depressing the foot switch, it will select a station on the radio.

Push Buttons

(1) Extend antenna fully and turn radio on for fifteen minutes.

(2) Unlock push button by pulling it out and manually tune in desired station.

(3) Push button back into position to lock adjustment.

(4) Repeat operation on the other push buttons.

The radio push button adjustment is the same as the standard AM radio. It should be noted that a push button adjustment is only good for one station either (AM or FM) not both at the same time.

Schematic Wiring Diagrams

The manufacturers of the radios and reverberators make repair service available through their authorized service depots. If a schematic wiring diagram is desired, it should be obtained from the manufacturer of the particular unit.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
RADIO INOPERATIVE	(a) Blown fuse.	(a) Replace fuse, check for short or open in wiring harness.

Condition	Possible Cause	Correction
	(b) Antenna open or shorted.	(b) Test with an auxiliary antenna with lead-in plugged into the receiver set and test antenna head outside of car. If radio plays with test antenna, use original antenna and check antenna mostly for shorts to ground while rocking antenna slightly. Unplug antenna lead from radio and use ohmmeter to check from center contact of antenna to outside of case. If reading on ohmmeter is less than 500,000 ohms, replace antenna. See "Windshield Antenna Test" for Imperial windshield antenna.
	(c) Receiver or speaker connections loose or faulty.	(c) Test the voltage at the fuse and tighten all connections. With speaker control tuned to either stop, rotate control to other stop. If radio plays, replace faulty speaker. If radio does not play, remove radio receiver for servicing.
RADIO RECEPTION WEAK	(a) Unbalanced antenna trimmer.	(a) Carefully adjust the antenna trimmer.
	(b) Shorted antenna lead-in.	(b) Turn on radio and wiggle antenna. If speaker static is heard, check for antenna mounting tightness. If speaker static is still heard after tightening, disassemble antenna and test for faulty insulators or presence of moisture. Make an ohmmeter check step (b) under "Radio Inoperative." If no static is heard, test for faulty or loose receiver or antenna connections at receiver. Also check antenna lead-in at antenna. If antenna checks OK, remove radio receiver for servicing.
RADIO NOISY	(a) Outside electrical interference.	(a) Move the car or eliminate interference.
	(b) Insufficient or faulty interference suppression.	(b) Install effective capacitor in ignition system or voltage limiter.
	(c) Faulty antenna.	(c) Turn on radio and wiggle antenna lead and listen for speaker static. If static is heard, disassemble antenna and check for faulty insulators or presence of moisture. Make an ohmmeter test, Step (b) "Radio Inoperative". If static is heard, check for a loose or faulty capacitor. If capacitor is OK, remove antenna plug from radio receiver and bump receiver with heel of hand. If no static is heard, start engine, turn on headlights and slowly, accelerate engine speed. If a whining noise is heard, turn off headlights and if whining noise is still present, tune in AM to a weak station at left end of dial. Run antenna up and down; if a loud whirring noise is present in the radio unit, the antenna cable connection is loose and should be tightened to 20 to 40 inch pounds. Check alternator for burned out diodes, and voltage regulator setting. If O.K. remove radio receiver for servicing.

Condition	Possible Cause	Correction
RADIO RECEPTION DISTORTED	(a) Speaker voice coil leads rubbing on speaker cone.	(a) Install an auxiliary speaker and compare. Replace if improved.
	(b) Torn speaker cone.	(b) Replace the speaker.
	(c) Faulty radio.	(c) Send radio to authorized radio service station for repair.
	(d) Foreign material in speaker.	(d) Clean or replace speaker.
	(e) Torn cover.	(e) Replace speaker.
INTERMITTENT RECEPTION	(a) Broken or shorted antenna lead-in wire.	(a) Test with a substitute antenna and replace if necessary.
	(b) Faulty radio.	(b) Send radio to authorized radio service station for repair.

SERVICE PROCEDURES

Interference Elimination

Capacitors are used to suppress engine interference. The alternator is equipped with an internal capacitor integral with the output stud. A second capacitor is mounted on the back of the instrument cluster with a self tapping screw.The lead wire of capacitor is connected to the input terminal of the voltage limiter (Figs. 1 and 2). A third capacitor is installed on the ignition coil with the lead connected to the positive primary terminal of the coil (Fig. 4)

On Imperial models equipped with the windshield antenna, a choke capacitor is mounted in series with the voltage limiter. See Group 8 Electrical "Instruments and Gauges".

Radio resistance type wires in the high tension circuit of the ignition system complete the interference suppression.

If radio noises are evident, be sure the capacitor lead wires are making good contact on their respective terminals and are securely mounted. Faulty or deteriorated spark plug wires should be replaced.

ANTENNAS

The power operated radio antenna (Fig. 1) is a telescoping type antenna, extended and retracted by a coiled nylon cord actuated by a reversible electric motor. The main components of the power antenna are the motor and drive assembly, the mast assembly and the support tube assembly. The antenna is serviced as a mast assembly, motor and the drive assembly, connector, pad and pin assembly, lead-in assembly and the necessary switches.

Many antenna problems may be avoided by frequent cleaning of the antenna mast telescoping sections. This may be performed when the vehicle is being washed by cleaning the antenna mast sections with a clean soft cloth. In the winter, wipe the clean antenna sections with a cloth moistened with light oil.

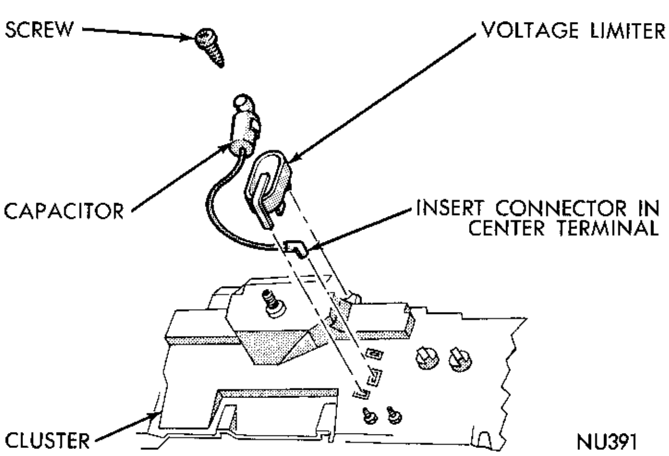


Fig. 1—Installing Radio Interference Capacitor to Cluster—Chrysler

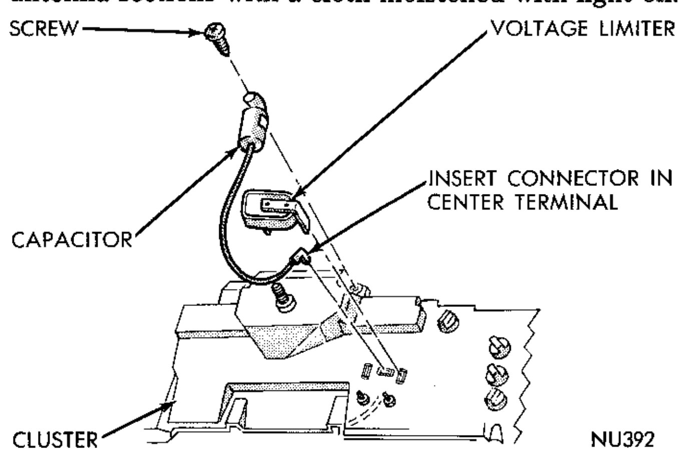


Fig. 2—Installing Radio Interference Capacitor Cluster—Chrysler

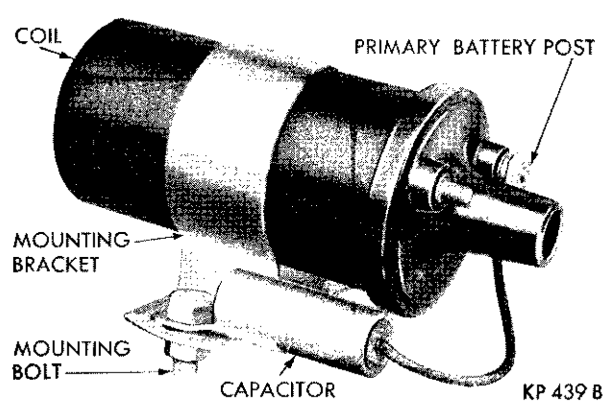


Fig. 3—Ignition Coil Capacitor

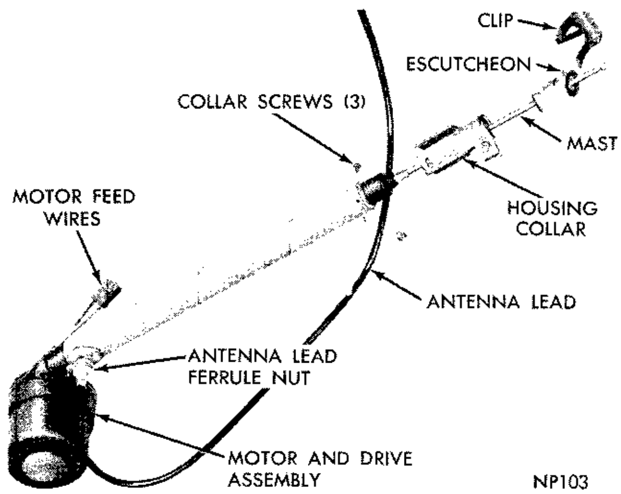


Fig. 4—Power Antenna

Before an antenna is removed, the antenna performance should be tested to determine whether it is a reception problem or an operational problem.

Antenna Trimming

All radios are trimmed at the factory and should require no further trimmer adjustment. However, whenever a radio is being installed after repair, or if verification of trimmer adjustment is desired, proceed as follows:

(1) Operate radio for 15 minutes.

(2) Extend mast type antenna 31-1/2 inches.

(3) Manually tune radio to a weak signal between 1400 and 1600 K.C.

(4) Increase radio volume to full volume and set tone control to maximum treble (fully clockwise) on knob controlled radios or upward position on thumbwheel radios. Use a short screwdriver under instrument panel and adjust antenna trimmer in bottom right hand corner of radio chassis for AM and AM tape radios. Behind right hand knob for Search Tune radios. AM/FM Multiplex-Chrysler—right hand lower corner. AM/FM-Imperial—inside tape door (right hand side).

Adjust antenna trimmer by carefully tuning back and forth until position is found that gives a peak response in volume. Maximum output indicates proper point of antenna trimmer adjustment.

Power Antenna

Clean the antenna and drive assembly before test or disassembly.

(1) With a source of 12 volt (D.C.) power, test the operation of the drive mechanism by grounding the negative (—) lead to the drive housing and with the positive (+) lead, contact the "yellow" (up) lead ter-
scoping sections or bent telescoping mast rods. Clean
minal to extend the antenna, and contact the "brown" (down) lead terminal to retract the antenna.

If the motor will not operate, replace the motor and drive assembly. If the motor runs freely and the antenna does not extend or retract, mast or drive assembly is at fault and should be replaced by either a new mast or motor and drive assembly. If the motor labors and the antenna extends and retracts very slowly, it may be caused by excessive dirt on the tele-
and straighten the telescoping mast rods.

(2) Occasionally poor reception can be corrected by proper adjustment of radio antenna trimmer. If this fails to produce desired results, a substitute antenna known to be satisfactory may be plugged into radio with extended mast held out of car window. (Do not ground mast.)

Upon establishing that the fault is in antenna assembly, it may be traced to one or more of the following conditions:

(a) Broken lead-in wire or shielding.

(b) Grounded lead-in wire or mast assembly.

(c) Moisture in support tube or lead-in assembly.

(3) Poor connection (antenna lead-in assembly or shielding ground).

If preliminary testing indicates removal of the antenna is necessary for repairs or parts replacement, proceed as follows:

Removal—(Figs. 5 and 6)

(1) Disconnect battery cable at battery negative post.

(2) Fully lower antenna.

(3) Turn front wheels all the way to the left and remove the right front fender splash shield screws and pull shield away from the wheel housing.

(4) Disconnect motor leads at the connector.

(5) Remove antenna lead ferrule nut at antenna mast and disconnect lead.

(6) Remove one screw attaching antenna to antenna brace on Chrysler models, and dash bracket for Imperial models.

(7) Loosen screw from clamp attaching antenna to antenna fender adapter.

(8) Remove antenna from under fender being careful not to bend antenna mast.

Installation

(1) Position antenna from under fender and through fender adapter.

(2) Tighten screw on power antenna clamp. Tighten to 25 inch pounds plus or minus 10 inch pounds.

(3) Position antenna on antenna brace (Chrysler), bracket (Imperial), and install attaching screw. Tighten to 25 inch pounds plus or minus 10 inch pounds.

(4) Connect antenna lead to antenna housing. Tighten antenna lead ferrule nut to 20 to 40 inch pounds.

(5) Connect motor leads at connector.

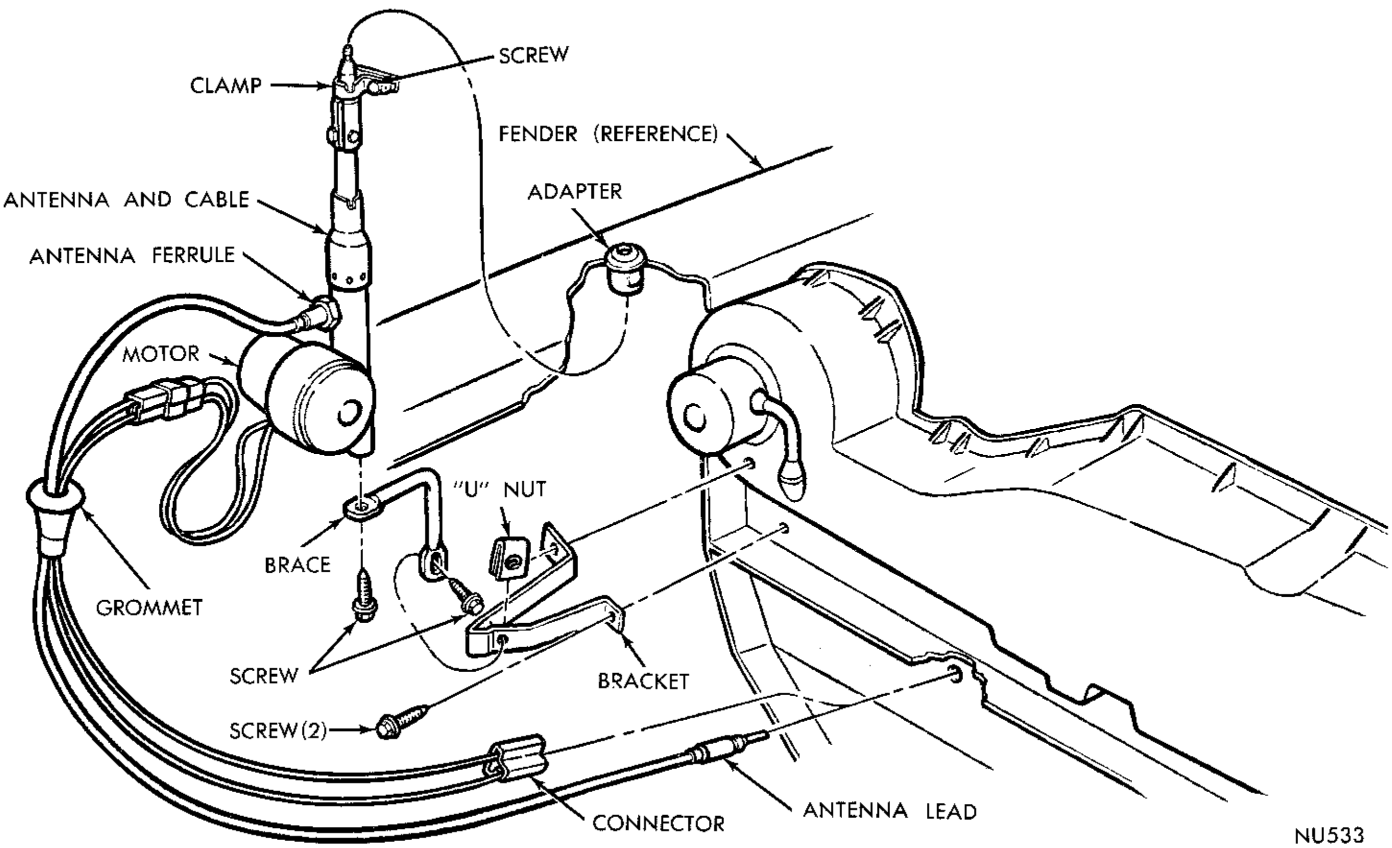


Fig. 5—Removing or Installing Power Antenna—Chrysler

(6) Position right front fender splash shield and install attaching screws.

(7) Connect battery cable at battery and test operation of antenna.

Bench Test for Reception Malfunction

(1) With test lamp and battery in circuit attach one test lead to concentric pin on "lead-in" connector and other test lead to mast sections. The lamp should "light" indicating continuity.

(2) Keeping one lead on connector pin, clip other lead on antenna support tube assembly. The lamp should "not light." If it does, look for a ground between mast and support tube or inner conductor from pin and pad.

(3) Remove clip lead from connector pin and clip on outer shell of connector. Connect other clip lead to antenna support tube assembly. The lamp should "light" again. If it does not "light," antenna shielding has an open circuit.

(4) Locate ground or open circuit and repair or replace component parts as required.

DO NOT attempt to service the details of the Motor and Drive Assembly. This sub-assembly must be serviced as a complete unit.

Disassembly

(1) Remove two screws holding "lead-in" receptacle.

(2) Unsolder pin from wire.

(3) Remove three screws which hold support tube to motor and drive assembly.

(4) Holding motor and drive assembly in one hand and support tube in other hand, pull (applying back and forth rotary motion at same time) until support tube assembly is removed from antenna.

(5) Holding motor and drive assembly in one hand and mast assembly in other hand (grasp near bottom of mast assembly), rock the mast assembly back and forth and pull at the same time to remove housing from motor assembly.

(6) Apply 12 volts D.C. to "yellow" (up) power lead and ground, until entire length of nylon cord has been expelled from the drive. To prevent a kink or bend in nylon cord, keep it taut by pulling on mast.

CAUTION: DO NOT DISASSEMBLE MOTOR AND DRIVE ASSEMBLY FOR ANY PURPOSE.

In order to remove nylon cord from disabled motor and drive assembly, place assembly in a vise so that normal plane of nylon cord is parallel with floor, then using both hands pull on nylon cord until completely expelled from drive.

(7) Remove bottom insulator and water seal washer (Fig. 7) from tubular fitting using a wire hook and long nose pliers.

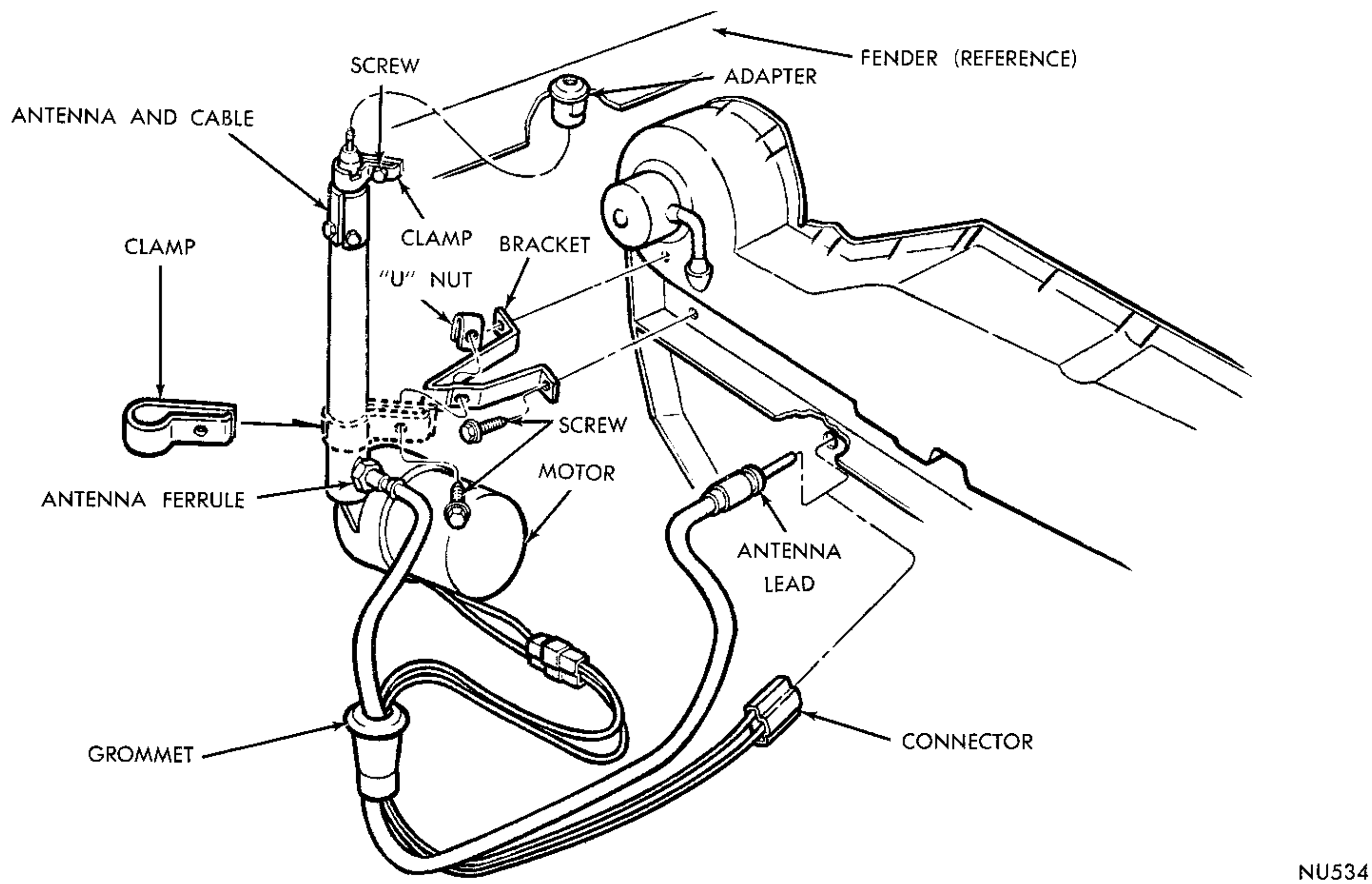


Fig. 6—Removing or Installing Power Antenna—Imperial (Service Only)

Assembly

(1) If original mast assembly is reused, thread nylon cord through bottom insulator with tubular projection down (Fig. 8). Then thread nylon cord through water seal washers.

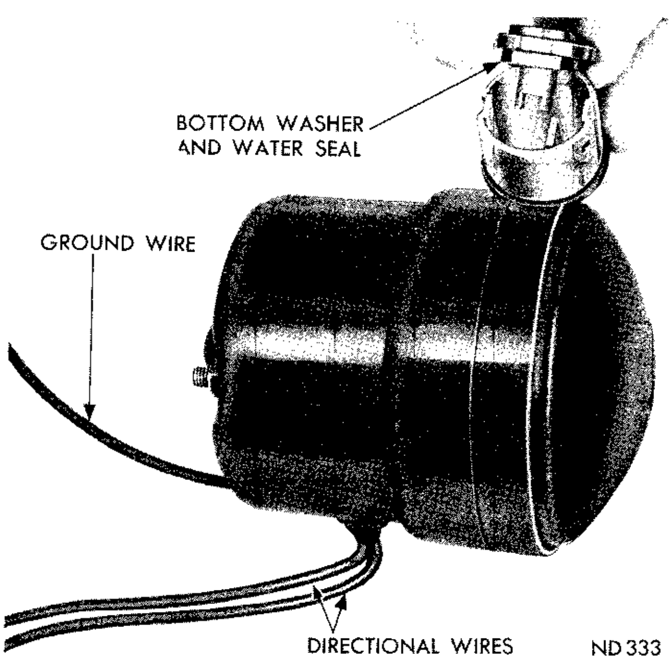


Fig. 7—Removing Bottom Insulator and Water Seal Washer (Typical)

The bottom insulator and water seal washer are included on service replacement mast assembly.

(2) Apply 12 volts D.C. to "brown" (down) power lead and ground. Feed approximately 12 inches of nylon cord into the drive. Push water seal washer and bottom insulator all the way down into the tubular fitting. Apply 12 volts D.C. power until nylon cord disappears.

(3) Push housing down onto tubular fitting. Make sure upper edge of flange on insulator bushing is be-

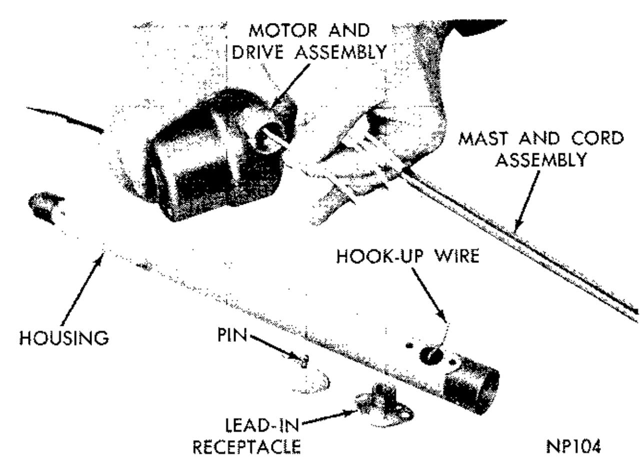


Fig. 8—Assembling Power Antenna (Typical)

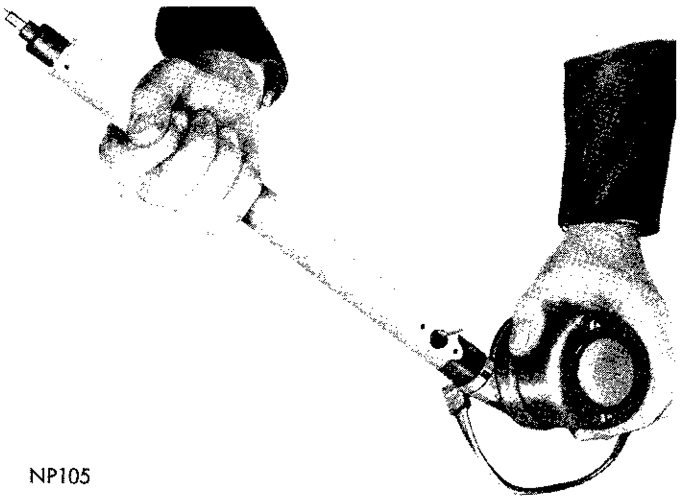


Fig. 9—Installing Antenna Housing (Typical)

low center of the three holes in tubular fitting.

(4) Install support tube assembly in proper position making sure hook-up wire is extended through large hole in body (Fig. 9).

(5) Install three screws to attach support tube assembly to motor and drive assembly.

(6) Solder hook-up wire to pin.

(7) Assemble lead-in receptacle with the two screws.

(8) Apply 12 volt power to "yellow" and "brown" antenna leads and test for up and down operation.

Power Antenna Location

The power antenna, mounted in the right front fender (Figs. 10 and 11). On Imperial models (service only) use the template found in the parts package for locating the antenna mounting hole.

ANTENNAS—MANUAL

Removal—All Models

(1) Unplug antenna lead from radio receiver.

(2) Remove antenna by unscrewing from antenna body (Fig. 12).

(3) Remove capnut (Fig. 13).

(4) Remove the antenna snap-on fender adapter and gasket.

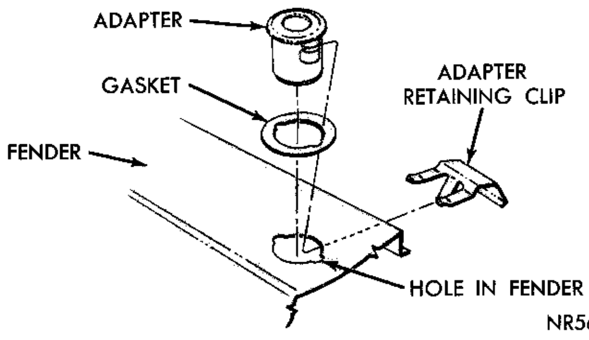


Fig. 10—Installing Power Antenna Adapter—Chrysler

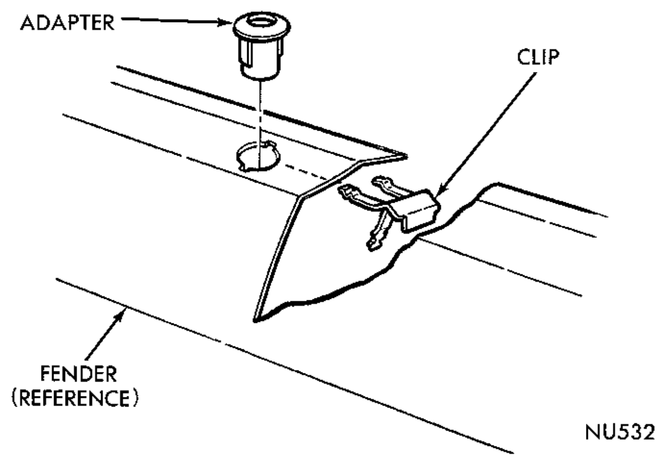


Fig. 11—Installing Power Antenna Adapter—Imperial (Service Only)

(5) From under fender remove the lower adapter mounting collar, antenna body and lead assembly.

Installation—All Models

(1) Assemble mounting collar to antenna body.

(2) Enter antenna body from underneath fender and insert through mounting hole in fender.

(3) Install gasket adapter and capnut. Tighten capnut to 155 inch pounds, plus or minus 25 inch pounds with Tool C-4085 (Fig. 14).

(4) Install antenna mast into antenna until sleeve bottoms on antenna body.

(5) Reroute antenna lead as shown in Figure 15.

Winshield Antenna (Imperial Only)

The Imperial radio antenna is concealed in the windshield glass (Fig. 16). The antenna consists of two of very fine copper wire positioned between the center laminate material of the windshield and the inner glass surface. One wire starts at the right top corner of the windshield glass, the other wire starts at the left top corner and run along the upper part of the windshield glass approximately two inches from the top then down to the center of the glass to a copper termination strip where they are joined by

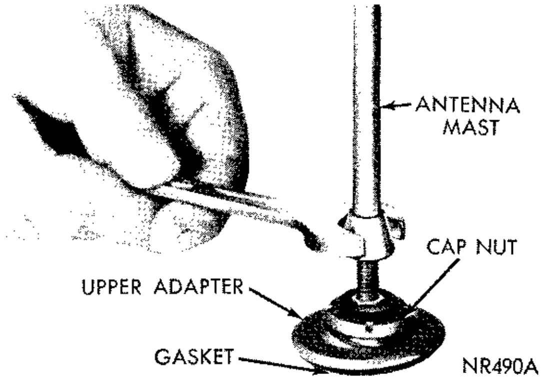


Fig. 12—Antenna Mast—Removing or Installing—Manual

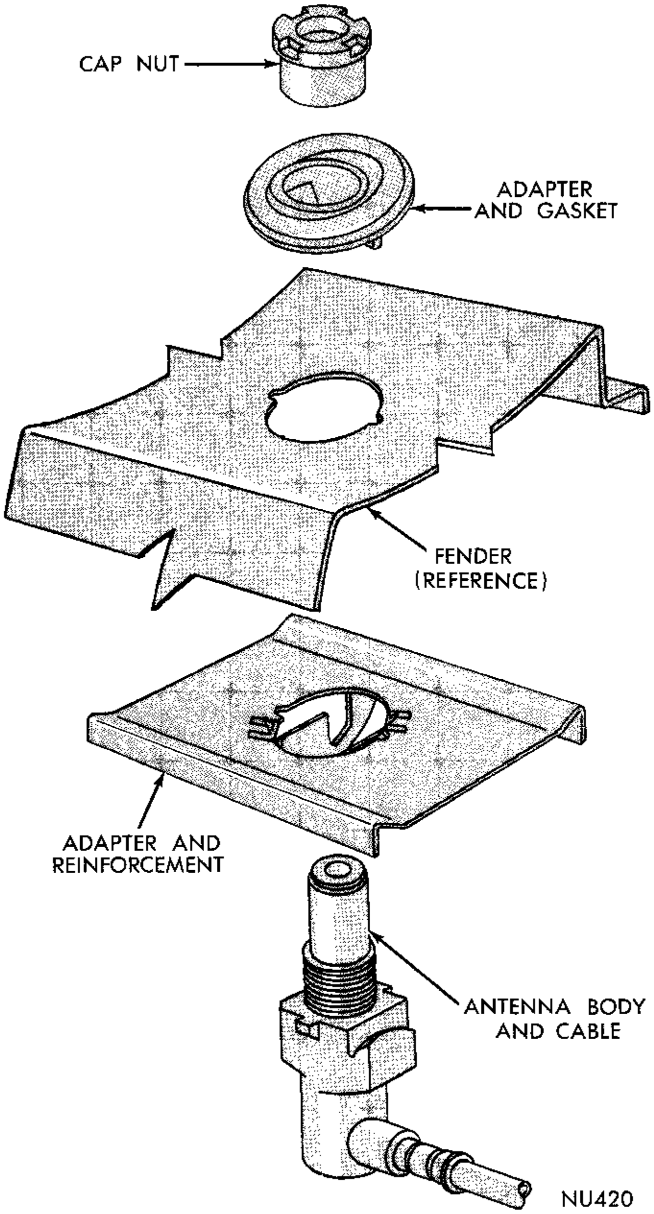


Fig. 13—Antenna Disassembled—Manual

a pigtail terminal which is part of the windshield assembly.

Figure 17 illustrates how the pigtail plugs into the separate rado cable assembly just to the left of the front speaker (Fig. 18). **The radio and defroster grille assembly must be removed before the pigtail can be removed or installed on the cable.** The molded pigtail is installed by placing it over the cable connector and carefully pushing on the connector with the fingers. It must be removed by carefully lifting this molded terminal from the cable connector without tugging at the pigtail as its connection to the windshield **is very fragile.** The bracket end of the radio cable is mounted to the instrument panel with two hexagon head screws, the other end of cable is plugged into the radio as shown in Figure 18.

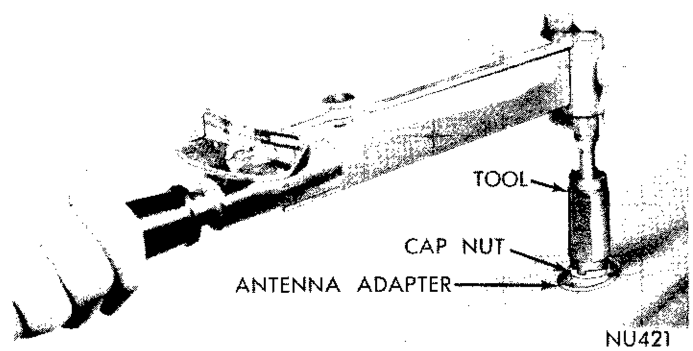


Fig. 14—Tightening Antenna Capnut

Windshield Antenna Electrical Test

If radio is inoperative, check for blown fuse, if fuse is O.K. and radio receiver and speaker connections are proven satisfactory, see "Service Diagnosis" for method for testing, test with an auxiliary antenna with lead-in plugged into the radio receiver and with test antenna mast outside of car.

If radio plays, the antenna cable or pigtail may be the cause of the low resistance to ground and should be checked after carefully unplugging the windshield pigtail at the cable lead bracket. If the resistance of the antenna cable is less than 500,000 ohms, replace this cable and recheck radio performance. If antenna system is still bad even on strong signals, check pigtail for breaks in the insulation which may be exposed to metal contact, if O.K. it will be necessary to replace the windshield. See Group 23 "Windshield Replacement".

Windshield replacement should be made only after radio receiver, speaker, antenna cable or suppression have been eliminated as the source of poor reception. This can be done by substituting known good components.

RADIOS

CAUTION: Do not operate the radio with the speaker detached since damage to the transistors may result.

Removal—(Figs. 16, 17 and 18)

(1) Disconect battery ground cable.

(2) Remove left ash receiver.

(3) Remove steering column cover.

(4) Unscrew stereo tape reset knob (so equipped).

(5) Disconnect battery lead, crossover lead and speaker leads (on top of radio).

(6) Disconnect antenna lead.

(7) Loosen defroster vacuum actuator (dash pad) mounting screws.

(8) Move defroster vacuum actuator to facilitate radio removal.

(9) Remove two radio mounting screws through access openings in the lower instrument panel; (on

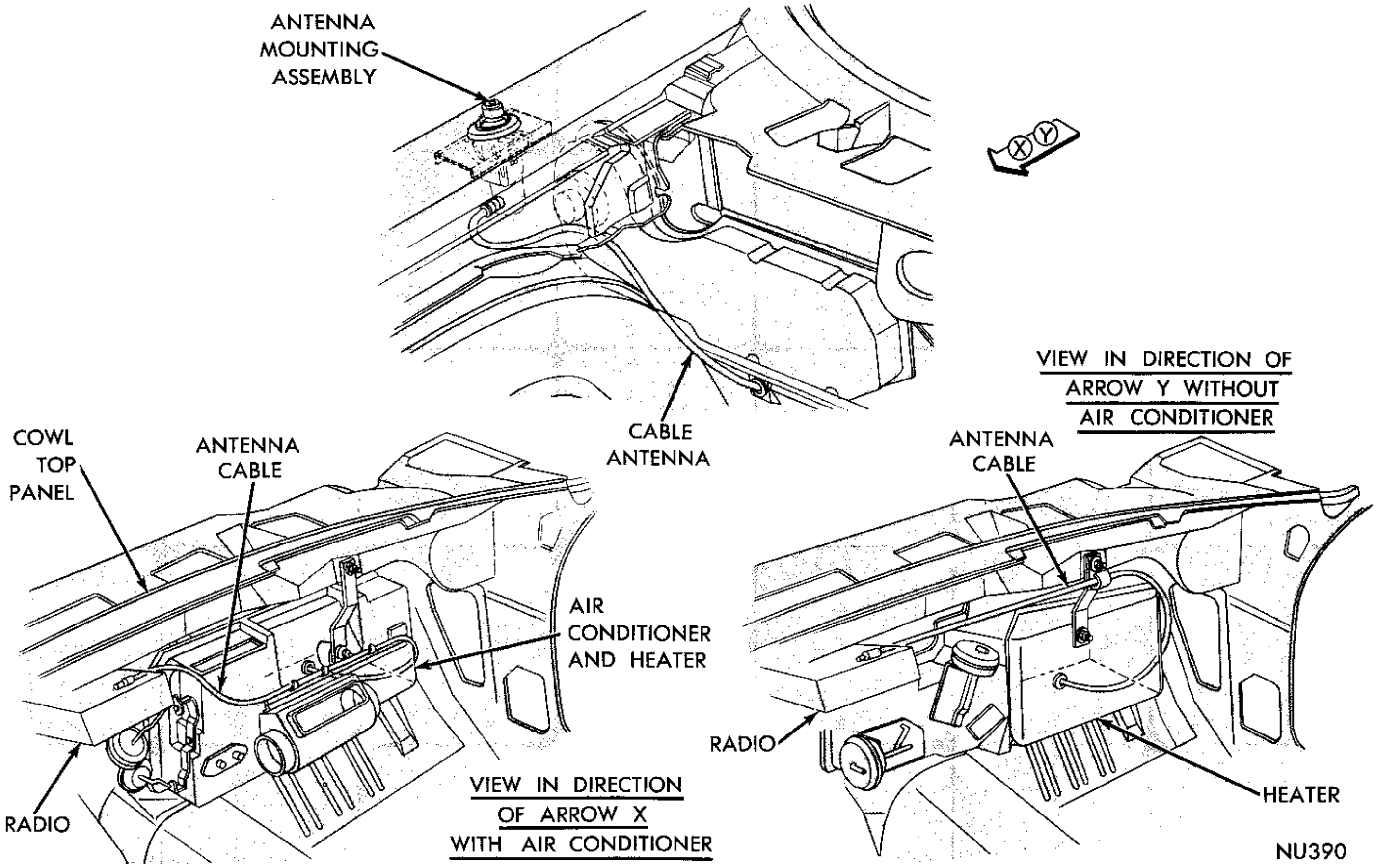


Fig. 15—Antenna Cable Routing—Manual

search-tune, and AM radios; remove knobs, bezels and nuts).

(10) Remove radio support bracket mounting screw from the lower reinforcement. Radio must be supported to prevent dropping.

(11) Working through ash receiver opening, remove radio support bracket from the radio by loosening the support bracket mounting nut at the base of radio.

(12) Remove radio from under instrument panel.

Installation

(1) From under instrument, position radio in instru-

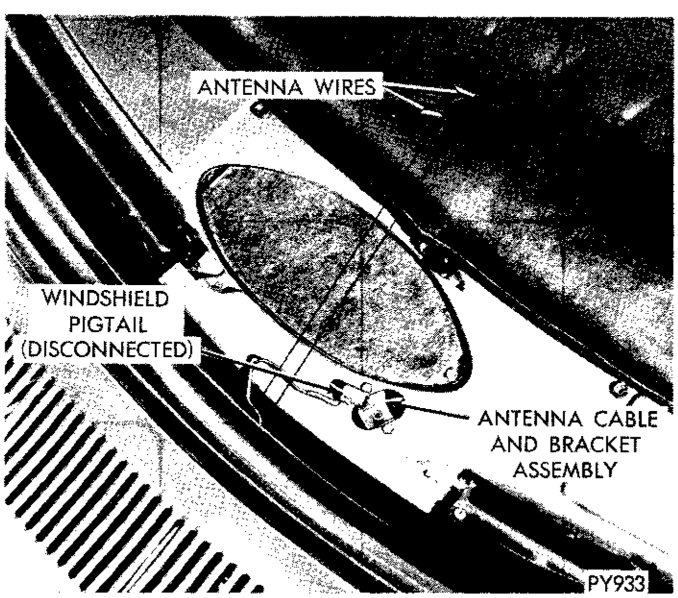


Fig. 16—Windshield Mounted Antenna (With Antenna Pigtail Disconnected from Radio Lead)

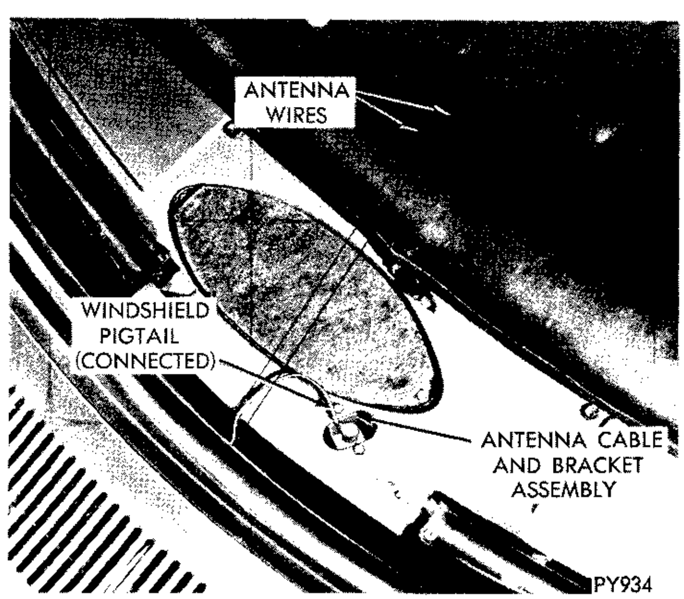


Fig. 17—Windshield Mounted Antenna with Windshield Pigtail Connected to Radio Cable

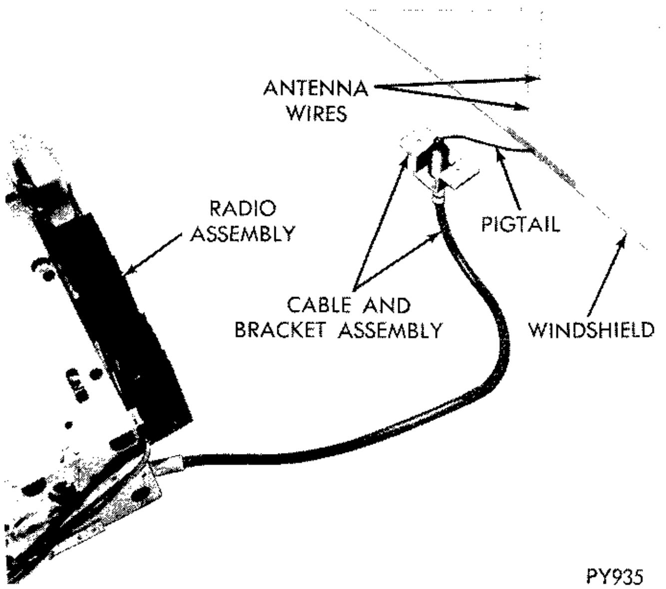


Fig. 18—Antenna Lead and Radio Cable and Bracket Installation

ment panel opening and install the two radio mounting screws, radio support bracket and bracket mounting nut. On Search-Tune radios; install the nuts, bezels and control knobs.

(2) Attach defroster vacuum actuator.

(3) Connect antenna lead, battery lead, cross over lead and speaker leads.

(4) Install stereo tape reset knob (so equipped).

(5) Install steering column cover.

(6) Install left ash receiver.

(7) Connect battery ground cable and test operation of radio and speaker.

Radio Speaker

Removal

(1) Remove the radio speaker and defroster grille (seven screws).

(2) Remove the radio speaker mounting screws (two) and lift the speaker from the top instrument panel.

(3) Disconnect the speaker leads and remove the speaker.

Installation

(1) Position the speaker and attach speaker leads.

(2) Install speaker attaching screws.

(3) Install speaker and defroster grille and attaching screws.

STEREO SPEAKER LEFT

Removal

(1) Remove the instrument cluster, (See "Group 8 Electrical").

(2) Remove the four stereo speaker grille mounting nuts from under the instrument panel.

(3) Remove the stereo speaker grille from top of instrument panel.

(4) Remove four mounting screws and remove speaker from grille.

Installation

(1) Position speaker on speaker grille and install four mounting screws.

(2) Position speaker grille and speaker on instrument panel, indexing speaker and grille studs with holes in instrument panel and install mounting nuts.

(3) Install instrument cluster, (See "Group 8—Electrical").

STEREO SPEAKER RIGHT

Removal

(1) Remove the glove box, (See "Group 8—Electrical).

(2) Remove the four stereo speaker grille mounting nuts from under the instrument panel.

(3) Remove the stereo speaker grille from the top of instrument panel.

(4) Remove four mounting screws and remove speaker from grille.

Installation

(1) Position speaker on speaker grille and install four mounting screws.

(2) Position speaker grille and speaker on instrument panel, indexing speaker and grille studs with holes in instrument panel and install mounting nuts.

(3) Install glove box, (See "Group 8—Electrical").

STEREO MULTIPLEX CROSSOVER

Removal

(1) Remove glove box door.

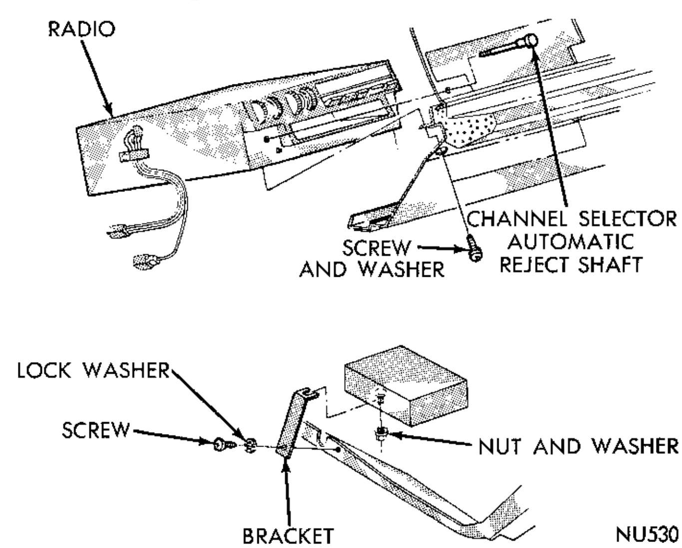


Fig. 19—Radio-Multiplex AM/FM and Stereo Tape

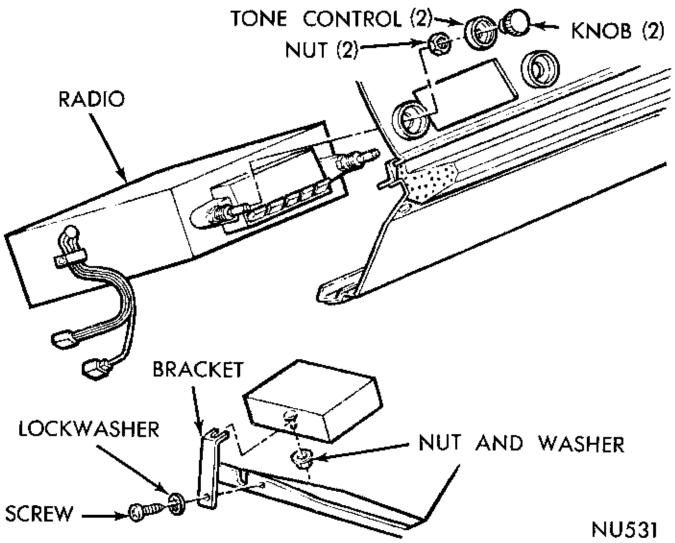


Fig. 20—Radio-Search-Tune—(Typical for AM Radio except Location of Knobs)

(2) Remove glove box door check arm (two screws).
(3) Remove glove box mounting screws (six).
(4) Remove latch catch.
(5) Remove glove box through glove box opening.
(6) Disconnect electrical leads.
(7) Remove crossover attaching screws at panel upper retainer (two).
(8) Carefully remove crossover assembly.

Installation

(1) Carefully install crossover and attaching screws.
(2) Connect electrical leads.
(3) Install glove box and attaching screws.
(4) Install latch catch.
(5) Install glove box door check arm.
(6) Install glove box door.

REAR SEAT SPEAKER

Removal

(1) Working through trunk compartment, disconnect speaker leads.

(2) Remove the four sheet metal screws holding speaker to shelf panel.

Installation

(1) Position speaker under shelf panel and install the four mounting screws.

(2) Connect speaker leads and test operation of speaker.

AUTOMATIC HEADLIGHT BEAM CHANGER

GENERAL INFORMATION

The automatic beam changer is an automatic headlight control unit which senses the light intensity from approaching vehicles and automatically adjusts the headlights to a high or low beam.

The automatic beam changer will dim the headlights when an oncoming car with headlights on low beam is seen at a distance of approximately 1200 feet. The unit will return the headlights to high beam within approximately one-half second after the approaching car has passed.

Major components of the automatic beam changer are: a photo-amplifier unit, a power relay, a foot switch, a sensitivity control (driver control), and an interconnecting wire harness (Fig. 1).

The photo-amplifier unit combines a light sensing optical device and a transistorized amplifier into one unit with sufficient power to operate a power relay for switching headlight beams. The unit is mounted under the hood just ahead of the radiator cradle assembly. A level assembly for use in setting correct vertical aim is attached as part of the unit. **Do Not Disturb** Factory Calibration of level.

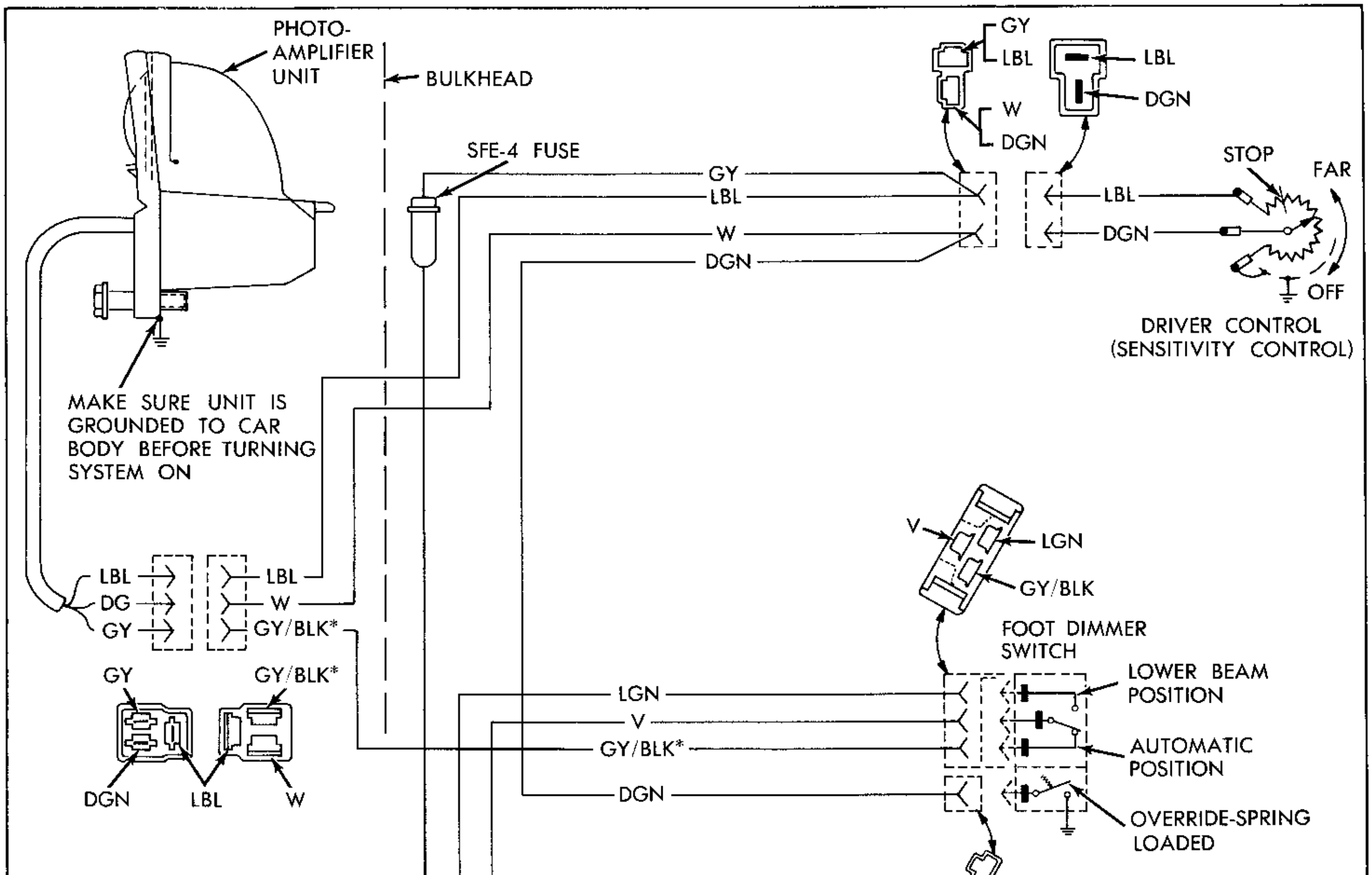
The power relay is a single pole, double throw twelve volt unit which provides for switching the headlight beams. The upper beam position is the "normally closed" position. The power relay is mounted on the front floor pan just above the combination dimmer—over-ride type foot switch mounted on the conventional dimmer switch location.

The over-ride foot switch replaces the standard foot dimmer switch. One position of the over-ride foot switch provides automatic control of the headlight beams. The other position provides low beam only.

In the automatic position, partially depressing the foot switch provides an over-riding high beam as long as the switch is held in this position. Automatic operation is restored when the driver releases the foot switch.

An in-line 4 ampere fuse is also incorporated into the wire harness. If this fuse should blow, the circuit will revert to manual control of the headlight beams by means of the foot switch.

A sensitivity control is located on the instrument panel to the right of the light switch. See Fig. 1 and Headlamp Sentinel and Headlamp Dimmer Wiring diagrams under "Wiring Diagrams." This unit provides a driver sensitivity adjustment. Rotating the knob clockwise increases sensitivity and headlights will switch to low beam when an approaching car is farther away. Rotating the knob counterclockwise toward the word off decreases sensitivity, allowing an approaching car to come nearer before switching occurs. The extreme counterclockwise position of the control is an "Off" position and gives manual control of the headlight beams by means of the foot switch.



COLOR CODE	
BLK	BLACK
DGN	DARK GREEN
GY	GRAY
GY/BLK*	GRAY WITH BLACK STRIPE
LBL	LIGHT BLUE
LGN	LIGHT GREEN
N.C.	NO CONNECTION
R	RED
V	VIOLET OR PURPLE
V/W*	VIOLET WITH WHITE STRIPE
W	WHITE OR NATURAL
*	WITH TRACER

SYMBOLS

→ PUSH-ON CONNECTOR—MALE TERMINAL

+ WIRES CROSSING (NO SPLICE)

≺ PUSH-ON CONNECTOR—FEMALE TERMINAL

PUSH-ON MULTIPLE CONNECTOR MALE TERMINALS

PUSH-ON MULTIPLE CONNECTOR FEMALE TERMINAL

NOTE—POWER RELAY CONTAINS DAMPENING DIODE TO PROTECT PHOTO-AMPLIFIER FROM POWER RELAY SURGES DURING SWITCHING.

CAUTION—REPLACE POWER RELAY WITH EXACT PART NUMBER ONLY. SUBSTITUTION OF DIFFERENT PART NUMBER WILL PROBABLY RESULT IN A RUINED PHOTO-AMPLIFIER.

NU539

Fig. 1—Automatic Headlamp Beam Changer Wiring Diagram—Schematic

SERVICE DIAGNOSIS

Place the vehicle in a well lighted area. Start the engine and operate at fast idle (Note this transistorized unit does not require a warm-up time). Trouble shoot the wiring, foot switch, driver sensitivity control and power relay with a 12 volt battery and test lamp equipped with a number 53 bulb (one candle power). The test procedures must be performed in the sequence as outlined below:

(1) Set the sensitivity control knob to approximate center of its rotation.

(2) Turn the headlight switch "On"; headlights should remain on lower beam in both positions of the foot dimmer switch. If not see "Condition 1."

(3) Depress foot switch slightly. If high beams come on, the switch is in "Automatic" position. If high beams do not come on, completely depress and release foot switch to put it in "Automatic" position. Depressing foot switch slightly should cause lights to switch to high beam. If not see "Condition 2".

(4) With the foot switch in "Automatic" position, cover the photo-amplifier with a black cloth; headlights should switch to high beam. If not see "Condition 3".

(5) Remove the black cloth from the photo-amplifier; headlights should return to low beam. If not see "Condition 4".

(6) With headlights on "Automatic" lower beam, rotate driver control counterclockwise to "off" position; headlights should switch to high beam. If not see "Condition 5."

(7) Fully depress foot switch to the manual position; headlights should switch to low beam. If not see "Condition 6".

Condition	Possible Cause	Correction
1. WHEN HEADLIGHT SWITCH IS TURNED "ON", AND LOW BEAM IS NOT OBTAINED IN BOTH POSITIONS OF FOOT DIMMER SWITCH.	(a) Driver control rotated to "off" position.	(a) Set control to center of rotation and check owner understanding.
	(b) Loose or wrong connection at foot switch, power relay, and driver control or photo-amplifier connectors.	(b) See Fig. 1 and check all connections.
	(c) Incomplete ground on photo-amplifier.	(c) Check ground.
	(d) Poor ground at power relay or defective power relay.	(d) (1) Check ground. (2) Replace defective power relay.
	(e) Blown fuse.	(e) See Fig. 1 and continuity check for blown fuse.
	(f) Defective connection to driver control or defective driver control.	(f) See Fig. 1 and continuity check for: (1) Defective connection. (2) Open driver control.
	(g) Faulty photo-amplifier.	(g) Replace faulty photo-amplifier.
2. FOOT SWITCH FAILS TO GIVE OVERRIDE HIGH BEAM WHEN SLIGHTLY DEPRESSED.	(a) Faulty foot switch.	(a) Ground L-9 (Dark Green) wire at foot switch; if lights go to high beam, replace foot switch.
	(b) Driver control not grounded.	(b) Check ground.
	(c) Faulty photo-amplifier.	(c) Replace photo-amplifier.
3. HEADLIGHTS DON'T GO TO HIGH BEAM WHEN PHOTO-AMPLIFIER IS IN COMPLETE DARKNESS (WITH FOOT SWITCH IN AUTOMATIC POSITION)	(a) Wrong connection at power relay.	(a) Check for reversed connection at power relay.
	(b) Faulty photo-amplifier.	(b) Disconnect photo-amplifier at three way connector. If headlights switch to high beam replace faulty photo-amplifier.
4. HEADLIGHTS FAIL TO GO TO LOW WHEN MEETING OTHER HEADLIGHTS.	(a) Photo-amplifier improperly aimed.	(a) Aim photo-amplifier.
	(b) Loose, disconnected or broken photo-amplifier wiring.	(b) Check all connectors. See Figure 1.
	(c) Blown fuse.	(c) Replace fuse. Correct condition causing fuse to blow.
	(d) Faulty foot switch wiring.	(d) Check for loose connections or open circuit in foot switch wiring. Replace if necessary. See Figure 1.
	(e) Faulty wiring.	(e) Check wiring for open circuit, loose or incorrect connections.
	(f) Faulty photo-amplifier.	(f) Replace faulty photo-amplifier.

Condition	Possible Cause	Correction
5. HEADLIGHTS ON "AUTOMATIC" LOWER BEAM, ROTATING DRIVER'S CONTROL COUNTERCLOCKWISE TO "OFF" POSITION, HEADLIGHTS WILL NOT SWITCH TO HIGH BEAM.	(a) Faulty ground on drivers control.	(a) Check ground to instrument panel.
6. HEADLIGHTS FAIL TO GO TO LOW BEAM WHEN FOOT SWITCH IS COMPLETELY DEPRESSED TO MANUAL POSITION.	(a) Faulty wiring in foot switch circuit.	(a) Inspect for loose connections or open circuit, in wiring from foot switch to power relay.
	(b) Faulty foot switch.	(b) Replace faulty foot switch.

SERVICE PROCEDURES

PHOTO-AMPLIFIER (Fig. 2)

Aiming

Performance of the automatic beam changer is dependent on the proper vertical adjustment of the photo-amplifier. If the unit is aimed too low, reflected road light from the car's own headlights will cause the unit to "Hold" the headlight on lower beam.

(1) Place the vehicle on level floor.

(2) Check tire inflation: tire pressure should not vary more than 3 to 5 pounds.

(3) Rock the vehicle sideways to allow the springs and other suspension parts to assume normal position.

(4) Fuel tank must be at least half full with trunk empty except for spare tire.

(5) Raise car hood.

(6) Adjust vertical aiming screw at front of photo-amplifier unit until level bubble is centered, (Fig. 3).

Always make final adjustment while turning screw clockwise.

Removal

(1) Disconnect battery ground cable.

(2) Disconnect photo-amplifier harness at connector.

(3) Remove two screws attaching photo-amplifier mounting bracket to radiator grille yoke bracket brace (Chrysler), fender headlamp mounting plate (Imperial) and remove photo-amplifier and mounting bracket to work bench for disassembly.

(4) Remove the adjusting screw from the photo-amplifier.

(5) Remove the tension spring and remove the photo-amplifier.

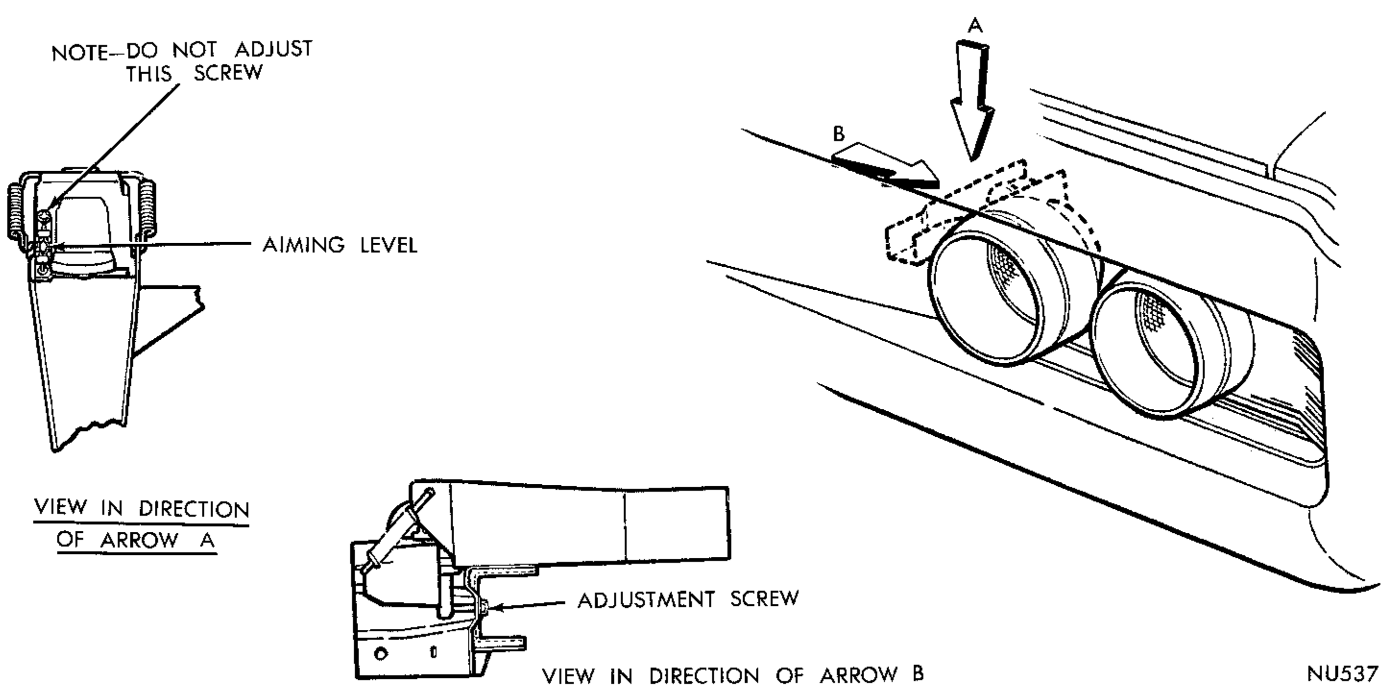


Fig. 2—Photo-Amplifier Installed

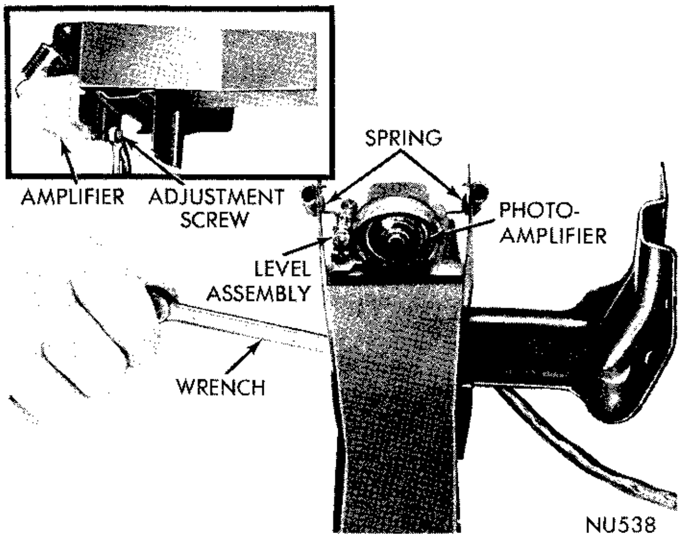


Fig. 3—Aiming the Scanner

Installation

(1) Position the photo-amplifier on the mounting bracket and install adjusting screw.

(2) Install the tension spring.

(3) Install the photo-amplifier and support bracket to fender headlamp mounting plate (Imperial); radiator grille yoke bracket brace (Chrysler). Tighten screws to 35 inch-pounds plus or minus 10 inch-pounds.

(4) Aim photo-amplifier see "Aiming".

(5) Connect harness at connector.

(6) Connect battery ground cable and test operation of system.

POWER RELAY (Fig. 4)

Removal

(1) Disconnect battery ground cable.

(2) Disconnect harness from relay.

(3) Remove two screws attaching relay to dash panel and remove relay.

Installation

(1) Position relay on dash panel and install the two attaching screws.

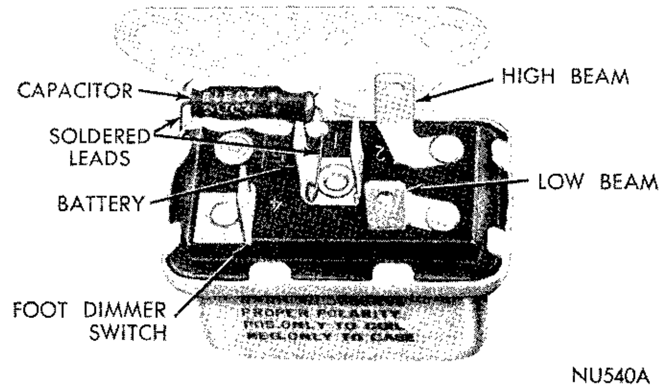


Fig. 4—Power Relay

(2) Connect harness connector at relay.

(3) Connect battery ground cable and test operation of system.

FOOT SWITCH

Removal

(1) Disconnect battery ground cable.

(2) Raise carpet and disconnect wire harness connectors from switch.

(3) Remove the switch mounting screws and remove switch.

Installation

(1) Connect wire harness connectors to switch.

(2) Position switch on floor pan and install attaching screws.

(3) Connect battery ground cable and test operation of system.

SENSITIVITY CONTROL SWITCH REPLACEMENT

This switch is coaxial with the Safeguard Sentinel Time Delay Control Switch. For replacement see instructions under "Safeguard Sentinel."

SAFEGUARD SENTINEL LIGHTING SYSTEM

INDEX

GENERAL INFORMATION

The Safeguard Sentinel Lighting System is a light sensing device that automatically controls the use of the driving lights after the ignition key is turned on. The system automatically activates the taillights and the headlights when the light intensity outside the car requires road illumination. If light intensity reaches a point (selected by the driver with the sensitivity control located on the photocell), when the lights are no longer needed, the Sentinel turns them off. In periods of darkness, the headlights and taillights will remain on and the back-up lights will come on for a period of from one to three minutes after the ignition key is turned off depending on the desired setting of the Time Delay Control Switch. The system can be disconnected at anytime by turning the knob to "OFF". Use of the driving lights is then controlled by the headlight switch.

Three units control the system. See "Wiring Diagrams". The time control switch is mounted on the lower part of the instrument panel adjacent to the headlight switch. Turning the knob on activates the system. The headlight switch remains turned off. Rotating the control knob clockwise increases the period of time the driving lights remain on after the ignition key is turned off.

The photocell, mounted on the top left side of the instrument panel pad, may be adjusted by the driver to automatically determine when the degree of light outside of the car will require the use of the driving lights. Turning the control clockwise decreases the sensitivity of the cell to light. Rotating the knob counterclockwise increases the sensitivity and will turn the lights on earlier.

The amplifier is mounted under the right side of the instrument panel on the heater plenum chamber flange. This unit receives the signals from the photocell and control knob and activates the headlight circuit accordingly. The entire Safeguard circuit is grounded through the Time Delay switch. When the switch is in the "OFF" position, a malfunction of any of the sentinel components cannot interfere with normal operation of headlight switch see "Wiring Diagram".

The backup lights will light regardless of the position of the time control switch when the headlight switch is turned on with the ignition key off. They will go out when the ignition key is turned on.

The circuit breaker in the headlight switch protects the headlight circuit during normal manual operation. When the Safeguard time control switch is turned on, the headlight switch is by-passed. Therefore a second circuit breaker, mounted in the amplifier, protects the headlight circuit.

SERVICE DIAGNOSIS

Before any tests are made, it should be determined that all driving lights are operating manually first. It is important that the steps in the service diagnosis be performed in the sequence shown for each condition. Refer to "Wiring Diagrams" for wiring circuits.

Condition	Possible Cause	Correction
LIGHTS FAIL TO LIGHT AUTOMATICALLY IN PERIODS OF DARKNESS	(a) Loose connections.	(a) Test continuity of all circuits and repair as necessary.
	(b) Poorly grounded time control switch.	(b) Remove switch bezel and clean paint from instrument panel under bezel.
	(c) Faulty time control switch.	(c) Jump white wire (X-7) at switch to a good ground. If lights light, replace switch.
	(d) Faulty photocell.	(d) Remove X-19 wire (gray) from black connector. Connect connector and if lights light replace photocell.
	(e) Faulty amplifier.	(e) Disconnect multiple connector at amplifier and jump from red (X-17) to blue (X-5) in body wiring side of connector. If lights light, replace amplifier.
LIGHTS FAIL TO TURN OFF AUTOMATICALLY IN PERIODS OF LIGHT	(a) Photocell covered up.	(a) Instruct owner in the proper use of system.
	(b) Loose connections in photocell circuit.	(b) Check and tighten wire connector at photocell.
	(c) Faulty photocell.	(c) Test photocell by jumping gray (X-19) and black (X-20) wires at amplifier multiple connector. Replace photocell if lights go off.
	(d) Faulty amplifier.	(d) Disconnect multiple connector at amplifier. If lights go out, replace amplifier.
LIGHTS TURN OFF IMMEDIATELY AFTER IGNITION SWITCH IS TURNED OFF	(a) Taillight fuse blown.	(a) Test circuit for short and replace fuse.
	(b) Short circuit between X-16 and X-8 wires of time control switch.	(b) Repair as necessary.
	(c) Faulty time control switch.	(c) Test with switch known to be good. (Be sure to ground switch.) Replace if necessary.

Condition	Possible Cause	Correction
	(d) Faulty amplifier.	(d) Test with amplifier known to be good. Replace if necessary.
LIGHTS REMAIN ON TOO LONG AFTER IGNITION SWITCH IS TURNED OFF	(a) Loose connection in yellow wire (X-16) or light green wire (X-8).	(a) Repair as necessary.
	(b) Faulty time control switch.	(b) Test with switch known to be good. (Be sure to ground switch.) Replace if necessary.
	(c) Faulty amplifier.	(c) Test with amplifier known to be good. Replace if necessary.
BACKUP LIGHTS FAIL TO LIGHT	(a) Loose wire connections.	(a) Test continuity of violet wire (X-9) and violet wire with white tracer (B-2). Repair as necessary.
	(b) Open windshield wiper circuit breaker.	(b) Test operation of windshield wipers. If inoperative, test for short circuit and repair as necessary.
	(c) Faulty amplifier.	(c) Jump violet wire (X-9) to violet wire with white tracer (B2A) at amplifier. If backup lights light, replace amplifier.
BACKUP LIGHTS LIGHT MANUALLY BUT NOT DURING TIME DELAY	(a) Faulty amplifier.	(a) Disconnect violet wire with white tracer (B-2) at amplifier. If lights turn off, replace amplifier.

SERVICE PROCEDURES

TESTS

Before testing any part of the Safeguard Sentinel Lighting System, it should first be determined that the exterior lighting system of the vehicle is operating properly. Turn on the headlights, and visually test the operation of the lights. The backup lights should light regardless of the position of the time control switch or the gear selector and go out when the ignition key is turned on.

After testing the manual operation of the lighting system, inspect the multiple connectors at the amplifier, the photocell and the time control switch to be sure they are tight and making good contact. If connections are tight, continuity of the entire wire harness should be tested with an ohmmeter.

Should the automatic operation fail, test the time control switch for a good ground. Place a jumper wire from the switch bezel or knob to a good body ground and test the operation of the system. If the system operates properly, remove the switch bezel and clean the paint from the instrument panel, under the bezel, and reinstall the bezel.

The photocell, amplifier and control switch are not to be serviced. If one or the other is defective, it should be replaced.

Photocell (Fig. 1)

If the lights fail to light automatically after dark, test the photocell by covering with a dark cloth. Start the engine, turn on the time control switch and turn off the headlight switch. If the headlights and taillights do not light within a few seconds, uncouple the mulitple connector at the amplifier. Remove the gray wire (X-19) from the connector leading to the body wiring and recouple the connector. If the lights light, replace the photocell and reinstall the gray wire (X-19) in the connector.

Should the lights fail to automatically turn off at day break, shine a bright light into the photocell. Rotate the cap to the centered position between the "Early" and "Late" position. If the lights light, the cap was rotated too far blocking off light to the cell through the window in the cap (Fig. 1). Instruct the owner in the proper use of the Safeguard Lighting System.

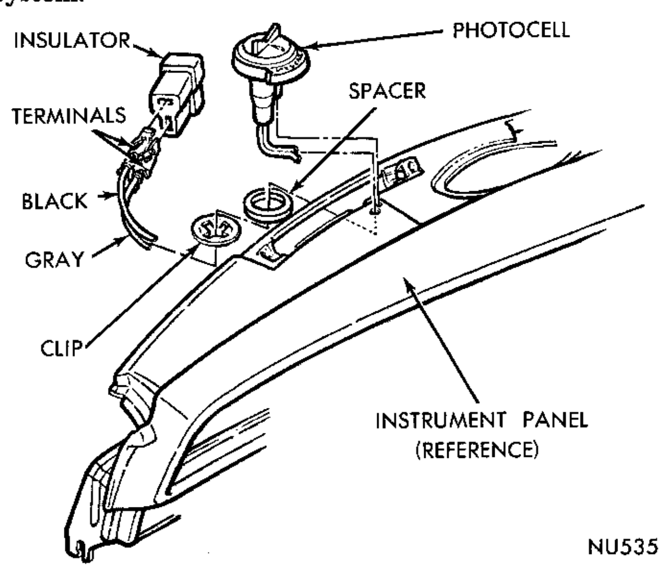


Fig. 1—Photo Cell Installation

If the sensitivity adjustment of the cap still fails to correct the operation, test the photocell by placing a jumper wire from the gray wire (X-19) to the black wire (X-20) at the amplifier. This will close the photocell circuit and the lights should turn off. If they do, replace the photocell.

Time Delay Control Switch

Always test the time delay control switch for a good ground to the instrument panel before condemning the switch.

Ground the switch by connecting a jumper wire from the knob of the switch to a good body ground. Test the operation of the system. If the system operates properly, remove the switch bezel and clean the paint from the panel so a good contact will be made when the bezel is installed.

If the lights fail to turn off automatically after the ignition is turned off and the photocell test is positive, test the switch by jumping the yellow wire (X-16) to the light green wire (X-8) at the switch. If the lights turn off, replace the switch.

Should the lights turn off immediately after the ignition key is turned off, (no time delay) regardless of the time control setting, inspect the taillight fuse. If the fuse is not blown; test for short in switch.

Amplifier

Should the lights fail to light automatically, and the photocell and switch tests are positive, the amplifier should be tested as follows:

Remove the amplifier from the heater plenum chamber flange and disconnect the multiple connector (Fig. 2). Place a jumper wire from the red wire (X-17) to the light blue wire (X-5) in the connector on the body wiring side. If the lights light, replace the amplifier.

Should the lights fail to turn off automatically at day break and the photocell and time delay switch tests are positive, disconnect the multiple connector at the amplifier. If the lights go out, replace the amplifier.

Failure of the lights to turn off automatically when the ignition key is turned off or the lights turn off immediately regardless of time control setting of the switch, test with an amplifier known to be good. If lights operate properly, replace the amplifier.

PHOTOCELL

Removal

(1) Disconnect battery ground cable.

(2) Remove steering column cover and left spot cooler hose from distribution duct if air conditioning equipped.

(3) From under panel, disconnect photocell connector (black and gray wires (Fig. 1), and remove tinnerman clip from photocell base with a small screw driver. Pull photocell up through mounting hole, cut wires and remove.

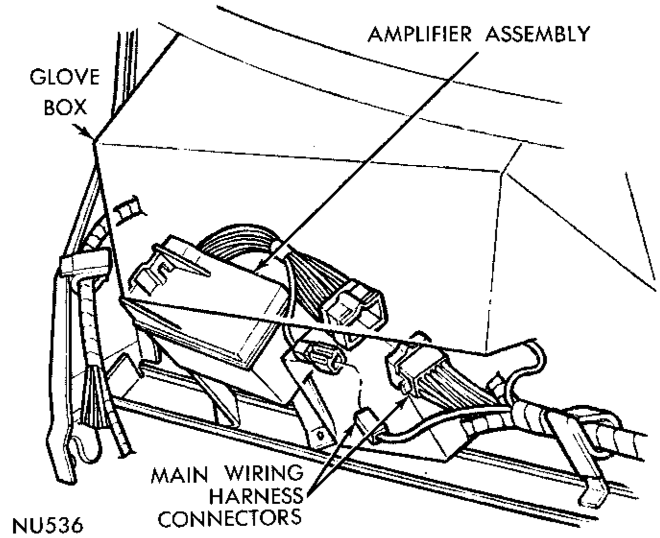


Fig. 2—Amplifier Installation

Installation

(1) From top of instrument panel, feed photocell wires through mounting hole.

(2) Hold photocell in place on panel, press tinnerman clip on photocell base from under panel (Fig. 1).

(3) Install connector insulator on wire terminals.

(4) Couple connectors and install steering column cover.

(5) Install left spot cooler hose to distribution duct if air conditioning equipped.

(6) Connect battery ground cable and test operation of light system.

TIME DELAY CONTROL SWITCH

Removal

To service the time delay control switch, it is necessary to remove the instrument cluster bezel. See "Instrument Cluster Removal", Electrical Group 8. After removing the cluster bezel proceed as follows:

(1) Rotate knob till set screw is visible, loosen set screw and remove knob.

(2) Remove bezel nut with Tool C-3824 and remove switch from back of bezel.

Installation

(1) Position switch in bezel and install bezel nut with Tool C-3824.

(2) Position knob on switch and tighten set screw.

(3) Install instrument cluster bezel as outlined in "Instrument Cluster Installation" in Electrical, Group 8.

AMPLIFIER

Removal

Remove the two nuts retaining the amplifier bracket to the right fresh air vent flange and lower assembly far enough to disconnect multiple connector. Remove two self tapping screws from bracket to separate from amplifier.

Installation

Assemble the bracket to the amplifier with the two self tapping screws and bolt the assembly to the right fresh air vent flange. Connect the multiple connector and the battery ground cable. Test the operation of the Sentinel.

SPEED CONTROL SYSTEM

INDEX

GENERAL INFORMATION

The speed control system (Fig. 1) is electrically actuated and vacuum operated. The turn signal lever on the steering column incorporates a CONTROL RING which when rotated, turns the system "OFF", "ON" or "RESUME SPEED". A SPEED SET button is located in the end of the lever. This device is designed to operate at speeds above approximately 30 M.P.H.

WARNING: The use of "Speed Control" is not recommended when driving conditions do not permit maintaining a constant speed, such as heavy traffic or on roads that are winding, icy, snow-covered or slippery.

TO ENGAGE: Rotate control ring to the "ON" position, attain desired speed then momentarily depress and release "SPEED SET" button establishing speed memory and engaging system. Remove foot from accelerator. Speed will be maintained at this level. Turning the control ring from "OFF" to "ON" while the vehicle is in motion establishes memory without system engagement at that speed.

TO DISENGAGE: Normal brake application or a soft tap on the brake pedal will disengage control unit without erasing speed memory. Fully rotating the control ring in the "OFF" direction or turning the ignition "OFF" also disengages the system and in addition erases the speed memory.

TO RESUME: Rotate control ring fully in the "RESUME" direction. Vehicle will resume to the previously memorized speed.

TO VARY SPEED SETTING: To increase speed, depress accelerator to desired speed and momentarily depress and release SPEED SET button. When speed control units is engaged, tapping SPEED SET button may increase speed setting incrementally.

To decrease speed, tap brake pedal lightly disengaging system. When desired speed has been obtained depress and release SPEED SET button. Decrease in speed can also be attained by holding set button depressed until desired speed is attained. Releasing the button engages the system at that speed.

TO ACCELERATE FOR PASSING: Depress accelerator as needed, when passing is completed, release accelerator and vehicle will return to previous speed setting.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
NO SPEED CONTROL WHEN BUTTON PRESSED.	(a) Control ring in "OFF" position.	(a) Turn ring to "ON" position.
	(b) Fuse blown.	(b) Replace fuse.
	(c) Vacuum leak.	(c) Check vacuum lines.
	(d) Speed control throttle cable disconnected.	(d) Connect and adjust control cable. See "Tests and Adjustments".
	(e) Improper stop lamp and speed control switch adjustment.	(e) Adjust stop lamp and speed control switch. See "Tests and Adjustments".
	(f) Faulty electrical circuit.	(f) See "Electrical Tests".
NO RESUME WHEN CONTROL RING IS ROTATED	(a) Insufficient rotation of control ring.	(a) Rotate ring fully toward "Resume".
	(b) Faulty electrical circuit.	(b) See "Electrical Tests".

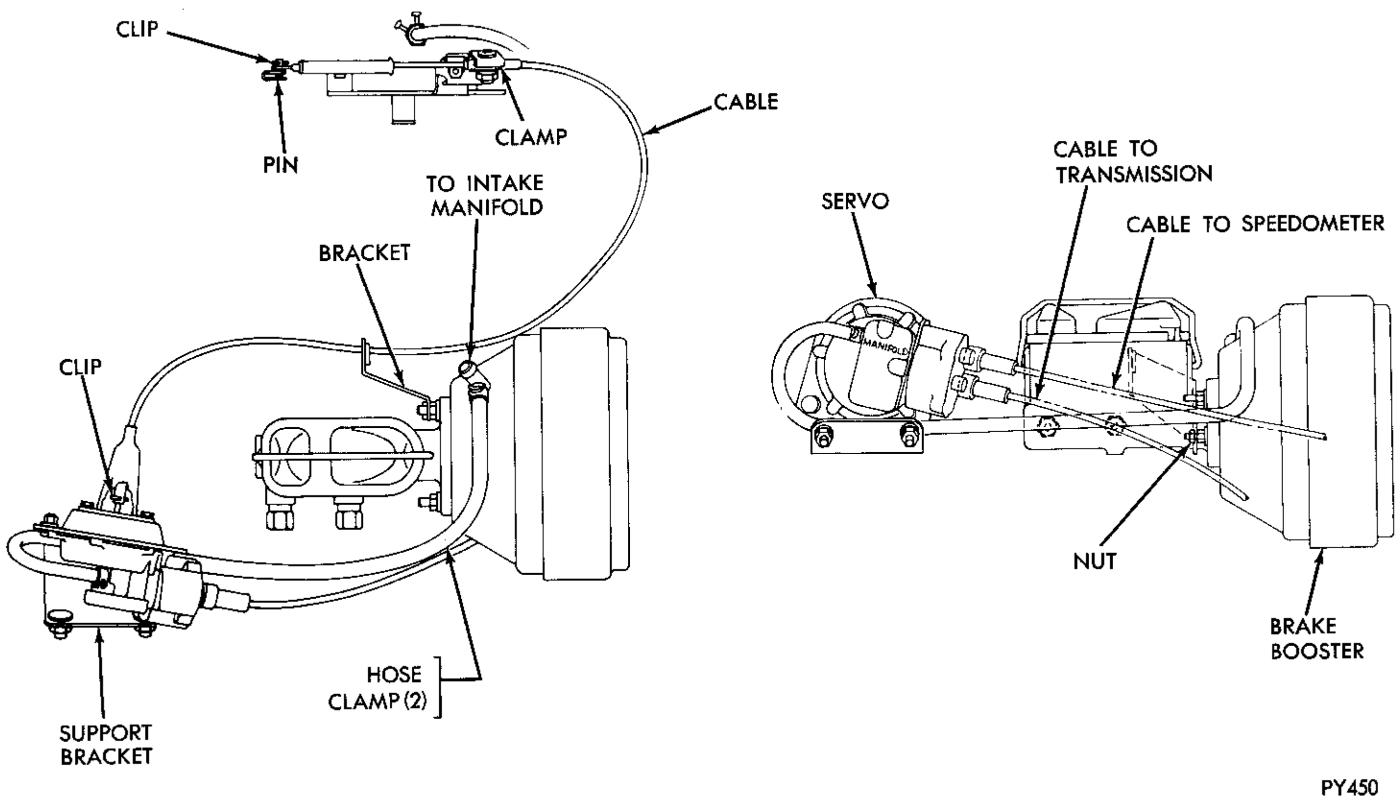


Fig. 1—Speed Control Servo Adaptation—Chrysler and Imperial

Condition	Possible Cause	Correction
NO SYSTEM DISENGAGEMENT WHEN BRAKE PEDAL IS DEPRESSED	(a) Improper adjustment of stop lamp and speed control switch. (b) Faulty electrical circuit.	(a) Adjust switch. See "Tests and Adjustments". (b) See "Electrical Tests".
SPEED CONTROL ENGAGES WITHOUT ACTUATING THE SWITCH	(c) Faulty electrical circuit.	(a) See "Electrical Tests".
CARBURETOR DOES NOT RETURN TO NORMAL IDLE	(a) Speed control throttle cable maladjusted. (b) Speed control throttle cable kinked or damaged. (c) Standard throttle linkage faulty.	(a) Adjust speed control throttle cable. See "Tests and Adjustments". (b) Repair or replace cable. (c) Repair or replace linkage.
SPEEDOMETER NOISE, EXCESSIVE NEEDLE WAIVER OR ERRATIC SERVO LOCK-IN PERFORMANCE	(a) Speedometer cable kinked or damaged. (b) Cable core bent or too long. (c) Cable ferrule nut loose at speedometer head, transmission or speed control servo. (d) No lubricant on speedometer cable core. (e) Noisy speedometer head assembly.	(a) Align cables to avoid sharp bends or replace cable. (b) Replace core. (c) Tighten cable ferrule nuts. (d) Lubricate cables. (e) Repair or replace the speedometer as necessary.
SPEED SETTING AFTER LOCK-IN, TOO HIGH OR TOO LOW.	(a) Improper adjustment of speed control throttle cable. (b) Vacuum leak. (c) Improper speed control servo lock-in adjustment.	(a) Adjust speed control throttle cable. (b) Check all vacuum hose connections. (c) See "Servo Lock-in Screw Adjustment".

Condition	Possible Cause	Correction
UNIT DISENGAGES ON ROUGH ROAD.	(a) Improper adjustment of stop lamp and speed control.	(a) Adjust as necessary. See "Tests and Adjustments".
RESUME SPEED IS POSSIBLE BELOW 20 M.P.H.	(a) Faulty low speed inhibit switch in servo unit.	(a) Replace servo unit.
	(b) Faulty electrical circuit.	(b) See "Electrical Tests".
SPEED CONTROL ENGAGES WHEN ENGINE IS STARTED, OR DOES NOT DISENGAGE WHEN BRAKE PEDAL IS DEPRESSED.	(a) Faulty electrical circuit.	(a) See "Electrical Tests".

SERVICE PROCEDURES

Tests and Adjustments

Servo Lock-in Screw Adjustment

The Lock-in Screw Adjustment (Fig. 2) controls the accuracy of the speed control unit. When the SPEED-SET button is depressed and released at speeds above approximately 30 M.P.H.; the speed control system is activated, the system "locks in" and should hold the vehicle at virtually the same speed at which it is traveling.

IMPORTANT: Lock-in accuracy will be affected by:

(a) **Poor engine performance (need for tune-up etc.)**

(b) **Power to weight ratio (loaded gross weight of car; trailering).**

(c) **Improper slack in throttle control cable, (See "Throttle Control Cable Adjustment").**

This screw should never be adjusted indiscriminately. Need for adjustment can be determined only after accurate diagnosis of the Speed Control System operation.

After the steps (a) (b) and (c) have been considered and speed "sags" (drops) more than 2 to 3 M.P.H. when speed control is activated, the lock-in adjusting screw should be turned counter-clockwise (approximately 1/4 turn per one M.P.H. correction required). If "Pull-up" (speed increase) of more than 2 to 3 M.P.H. occurs, the lock-in adjusting screw should be turned clockwise (approximately 1/4 turn per one M.P.H. correction required. If the screw is loose, stake side of servo housing adjacent to screw to INSURE a snug fit.

CAUTION: This adjustment must not exceed two turns in either direction or damage to unit may occur.

Speed Control Throttle Cable Adjustment

Optimum servo performance is obtained with a given amount of free play in the throttle control cable. To obtain proper free play, insert a 1/16 inch diameter pin between forward end of slot in cable carburetor linkage pin. Use hair pin clip removed from carburetor linkage pin as a gauge (Fig. 3). With choke in full open position and carburetor at curb idle, pull back on cable (toward dash panel) without moving carburetor linkage until all free play is removed. Tighten cable clamp bolt to 45 inch-pounds, remove 1/16 inch diameter pin and install hair pin clip.

Stop Lamp and Speed Control Switch Adjustment

Refer to Figure for proper switch adjustment as follows:

(1) Loosen switch bracket.

(2) Insert proper spacer gauge between brake push

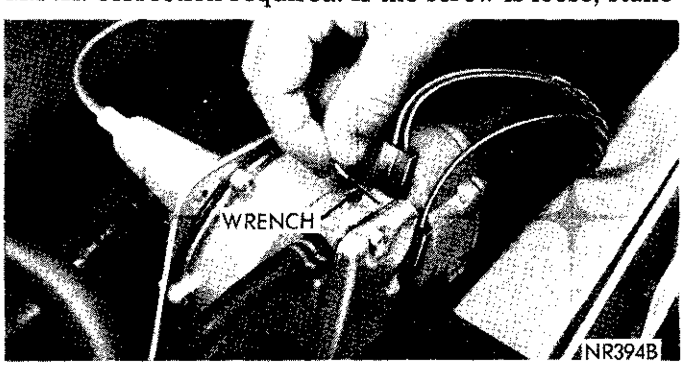


Fig. 2—Lock-in Screw Adjustment

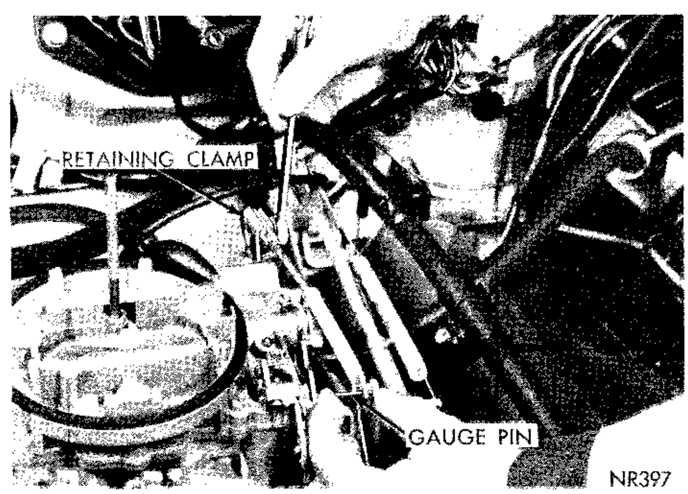


Fig. 3—Servo Throttle Cable Adjustment

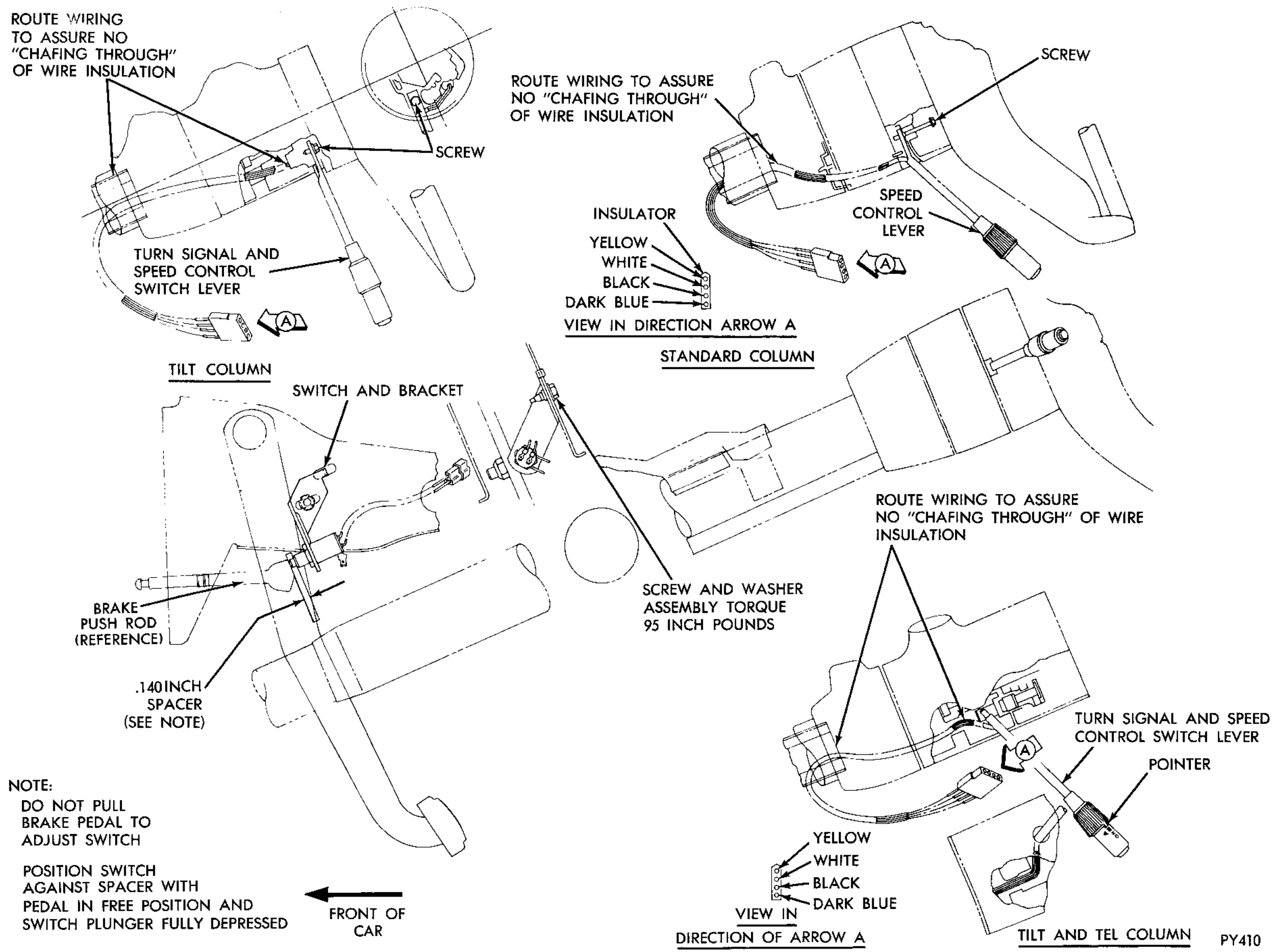
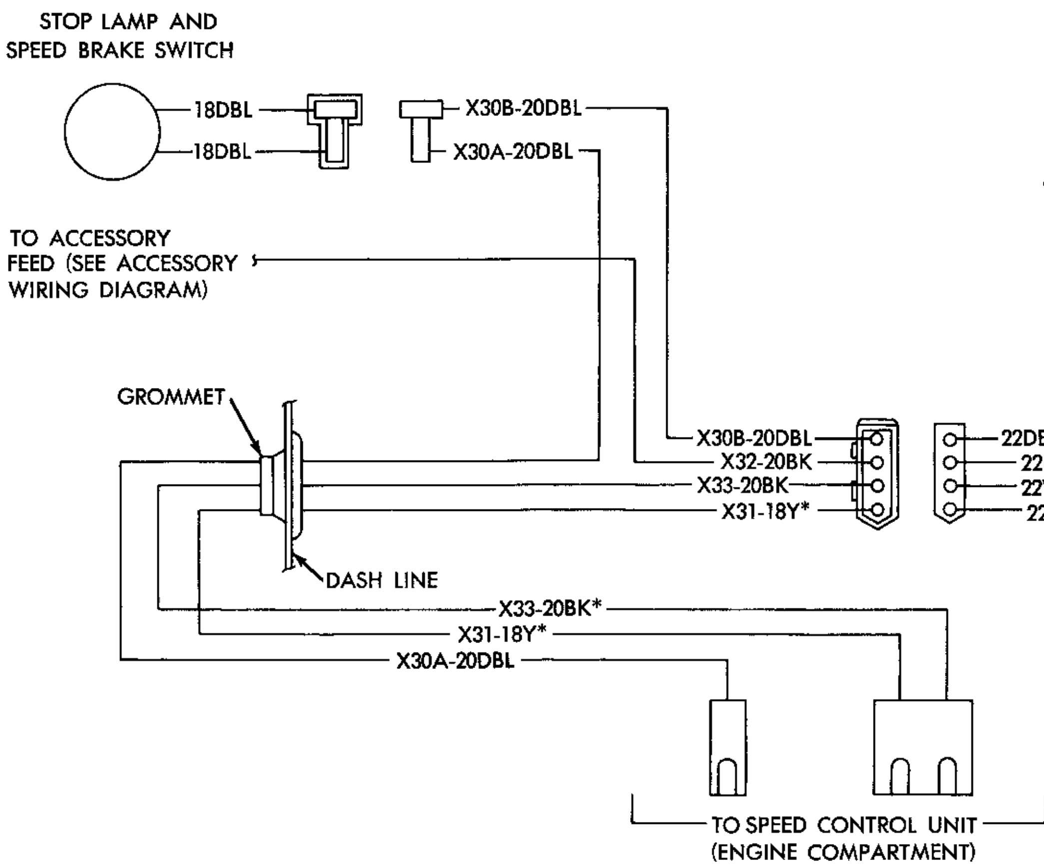


Fig. 4—Stop Lamp and Speed Control Switch Adaptation—Chrysler—Imperial



COLOR CODE	
BK	BLACK
DBL	DARK BLUE
Y	YELLOW
*	WITH TRACER

Fig. 5—Speed Control Wiring Diagram

rod and switch with pedal in free position.

(3) Push switch bracket assembly toward brake push rod until plunger is fully depressed and switch body contacts spacer.

(4) Retighten switch bracket bolt to 100 inch-pounds.

(5) Remove spacer.

Electrical Tests:

Refer to "Speed Control Wiring Diagram", (Fig. 5). It is suggested that the electrical tests be made in the following sequence:

(1) **Check accessory fuse for continuity.**

(2) **Speed control switch (turn signal lever) test.**

(a) Disconnect the four wire electrical connector at the steering column.

(b) Connect a twelve volt positive source to the black wire terminal in the speed control harness connector (male).

(c) With the lever rotary switch in the **ON** position, attach one lead of a test lamp to the connector yellow wire, other lead to a good ground; test lamp should light and should go off when the "Speed Set" button is depressed.

(d) Move the test lamp lead to the connector blue wire; test lamp should light and should go off when the rotary switch is turned to the **OFF** position.

(e) With the rotary switch in the **ON** position, move test lamp lead to the connector white wire; test lamp should light by either depressing the Speed Set button or by rotating the rotary switch fully toward the "Resume" position.

(f) Reconnect speed control lever harness connector to harness connector.

(3) **Stop lamp and speed control switch test:**

(a) Disconnect the double connector at the switch pigtail and connect a twelve volt source to either terminal and connect a test lamp from other terminal to a good ground: test lamp should light when brake pedal is in the normal position and should go off when the brake pedal is depressed to a maximum of approximately one half inch after proper adjustment as outlined under "Stop Lamp and Speed Control Switch Adjustment".

(b) Remove test lamp and reconnect pigtail connector to harness connector.

(4) **Servo unit tests:**

(a) **Locking coil test;** turn ignition to the **Accessory** or **ON** position and rotate the speed control rotary switch to the **ON** position.

(b) Momentarily disconnecting and connecting the double connector at the servo terminals should produce a clicking sound in the servo. Replace the servo if no clicking sound is heard.

(c) **Holding coil and Low Speed switch test;** without removing either connector at servo, place a test lamp probe to the black (with tracer) wire terminal of servo, other probe to a good ground. Block front wheels; raise rear wheels and drive rear wheels to 35 miles per hour; with speed control lever rotary switch in the **ON** position and ignition switch in the **ON** position, depress and release "Speed Set" button. The speed should increase above 35 miles per hour and the test lamp should remain **ON** until the brake pedal is depressed to disengage the system and test light should go **off.**

(d) Remove test lamp.

Speed Control Servo (Fig. 1)

Removal

(1) Remove two self-locking nuts attaching the servo cable cover to servo housing. Pull cover away from servo to expose cable retaining clip (Fig. 6) and remove clip attaching cable to servo diaphragm pin.

(2) Disconnect speedometer and transmission drive cables at the servo housing.

(3) Disconnect vacuum hoses at servo housing (Fig. 7) and electrical connectors.

(4) Remove servo from mounting bracket (two self-locking nuts).

Installation

(1) Position servo on mounting bracket studs and install attaching nuts. Tighten to 95 inch-pounds.

(2) Install vacuum hose and clamp. Make sure the hose clamp is locked securely.

(3) Connect speedometer and transmission drive cables at servo.

(4) With choke in full open position, align throttle cable to servo pin and install retaining clip.

(5) Install cable cover on servo studs and install attaching nuts. Tighten nuts securely.

(6) Install electrical connectors at servo.

Servo Throttle Cable Assembly (Servo to Carburetor)

Removal

(1) Remove air cleaner.

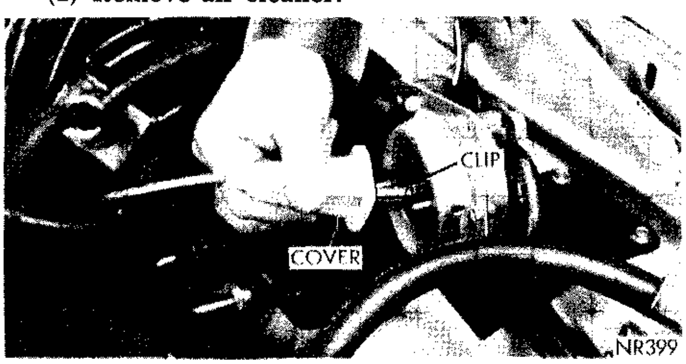


Fig. 6—Removing or Installing Throttle Cable Cover

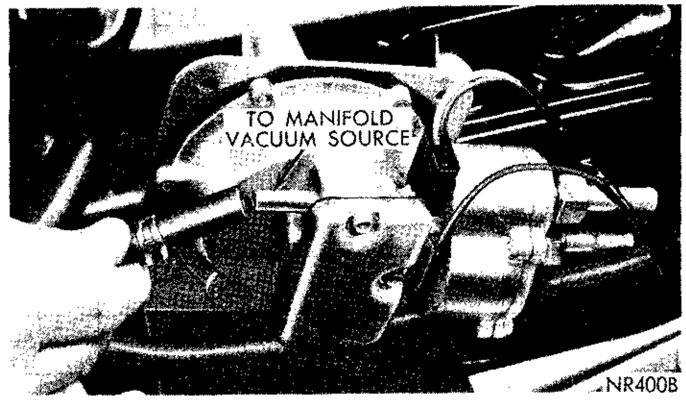


Fig. 7—Removing or Installing Servo Hose

(2) Disconnect cable at retaining clamp and at carburetor lost motion link, removing hair pin clip.

(3) Disconnect cable at servo (Fig. 6) and remove cable assembly.

Installation

(1) Locate cable through routing brackets on dash panel and on master cylinder studs, (so equipped).

(2) Connect cable at servo housing.

(3) Route cable through retaining clamp and connect at carburetor lost motion link lever pin.

(4) Adjust cable free play as described under "Speed Control Throttle Cable Adjustment".

Speed Control Switch (Turn Signal Lever) (Standard Columns)

Removal

(1) Disconnect battery negative terminal at battery negative post and speed control connector at lower end of column.

(2) Remove steering wheel. See Group 19 "Steering".

(3) Remove turn signal switch and lever attaching screw.

(4) Remove steering column cover plate and support steering column while clamp is removed to prevent column from sagging.

(5) Remove wire harness trough to facilitate reaching the lower end of speed control switch lead wires (Figs. 4 through 5) and remove wires and terminals from connector with Wire Harness Tool C-4135.

CAUTION: Check color coding of wires to insure they are installed in the proper connector at reassembly. See Figures 4 and 5.

(6) Tape terminals, then turn direction indicator lever sideways and pull lever up and wires out through opening between column and tube.

Installation

(1) Make a guide wire and thread the harness through the opening in column. **Make guide wire long enough so that it can be reached at bottom of column before harness is attached to the upper hook.** When

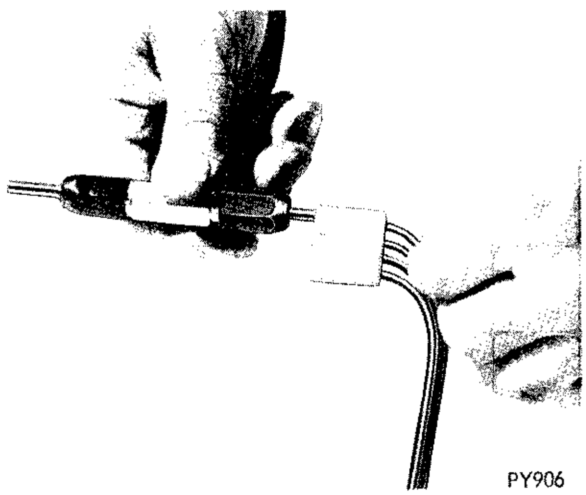


Fig. 8—Removing Wire Terminals with Tool C-4135

harness has been pulled through, install terminal clips into switch connector and connect to harness connector (be sure wires are connected to proper cavity).

(2) Install harness trough, steering column cover plate and column support clamp.

(3) Install turn signal lever (speed control lever switch) and turn signal switch attaching screw.

(4) Install steering wheel, steering column cover plate. See Group 19 "Steering".

(5) Connect battery negative terminal at battery negative post.

Speed Control Switch (Turn Signal Lever) Tilt and Tel Steering Column

Removal

(1) Disconnect battery negative terminal at battery negative post and speed control harness connector from main harness connector at steering column.

(2) Remove wires and terminals from speed control lever harness (male connector) with "Wire Harness" Tool C-4135.

CAUTION: Check color coding of wires to insure they are installed in the proper cavity of connector at installation and assembly. See Figures 4 and 5.

(3) Tape the wire terminals together then make up a guide wire, attaching the hook end to the taped terminals. Make guide wire long enough so that it can be reached at bottom of column tube when harness is withdrawn at speed control lever access hole.

(4) Pull wires out through speed control lever access hole, then unscrew the lever from the turn signal switch.

Installation

(1) With wires held close to speed control lever shank, screw the lever into the turn signal switch until the lever is hand tight.

(2) With a wrench, screw the lever in four full turns, then complete the installation by continuing to turn the lever in the clockwise direction no more than one full turn until the wiring harness has the correct angular index with the steering column. **Do Not turn the lever in a counterclockwise direction at any time during installation.**

(3) Tape terminals of new speed control lever harness and attach the hook of guide wire to wire terminals, pulling on guide wire should guide harness through opening in the steering column hub and down through the hub casting allowing sufficient wire to loop over the end of speed control lever to facilitate screwing the lever into the turn signal switch. Pull wires through to assure there is no wire chafing with hub lever opening.

(4) When wire harness has been pulled through, remove guide wire and install wire terminals in proper cavity of harness connector.

(5) Connect speed control harness connector to main harness and connect battery terminal at battery post.

TAIL GATE WIPER WASHER SYSTEM

INDEX

GENERAL INFORMATION

The tail gate wiper washer system (Fig. 1) is a mechanically activated squeegee wiper with an electric motor driven washer pump for applying water to the tail gate glass.

Operation

The tail gate glass may be cleaned by:

(1) Lowering the glass by activating the tail gate switch.

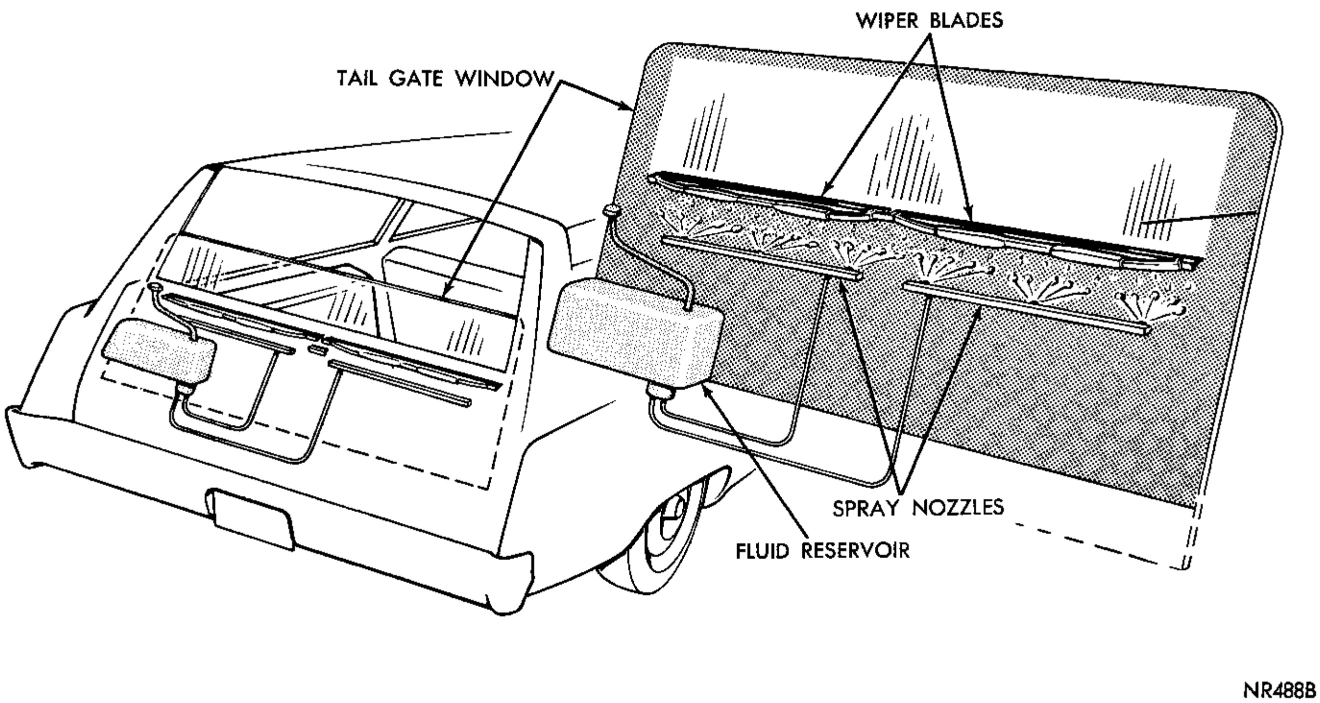


Fig. 1—Tail Gate Window Washer and Wiper System

(2) Activate the tail gate washer switch.

(3) Raising the glass by activating the tail gate switch. The wiped area is accomplished by using two 18″ flexible wiper blades, end to end.

When the glass is lowered to its bottom position an actuator arm is activated which permits the spring loaded blades to move to an "on glass" position. When the glass is raised to its upper limit, the actuator arm is again activated causing the wiper to go to an "off glass" position. This permits the blades to remain in the "off glass" (free) position until the glass is again lowered.

Washer fluid may be applied (as required) to the glass surface (with glass in lower position) by an electric driven pump, supplying nozzle assemblies located inside the upper part of the tail gate.

SERVICE DIAGNOSIS

Condition	Possible Cause	Condition
INTERMITTENT OPERATION OF WASHER.	(a) Loose wiring connection.	(a) Tighten connections and repair as necessary.
	(b) Faulty washer push button switch.	(b) Replace switch.
	(c) Faulty motor.	(c) Replace motor and pump assembly.
PUMP INOPERATIVE MOTOR RUNS.	(a) Nozzle jets plugged.	(a) Clean nozzle jets.
	(b) Broken or loose hose.	(b) Replace hose.
	(c) Faulty pump.	(c) Replace motor and pump assembly.
PUMP ASSEMBLY INOPERATIVE.	(a) Poor ground.	(a) Clean ground wire terminal and tighten mounting screw.
	(b) Loose wiring terminals.	(b) Tighten terminals.
	(c) Broken wires.	(c) Repair or replace wires.
	(d) Faulty switch.	(d) Replace switch.
	(e) Faulty motor.	(e) Replace motor and pump assembly.
WIPER BLADES WILL NOT GO ONTO GLASS.	(a) Loose control arm.	(a) Repair control arm.
	(b) Torsion springs broken.	(b) Replace springs.
WIPER BLADES WILL NOT COME OFF OF GLASS.	(a) Loose control arm.	(a) Repair control arm.
	(b) Actuator pin loose.	(b) Reinstall pin.

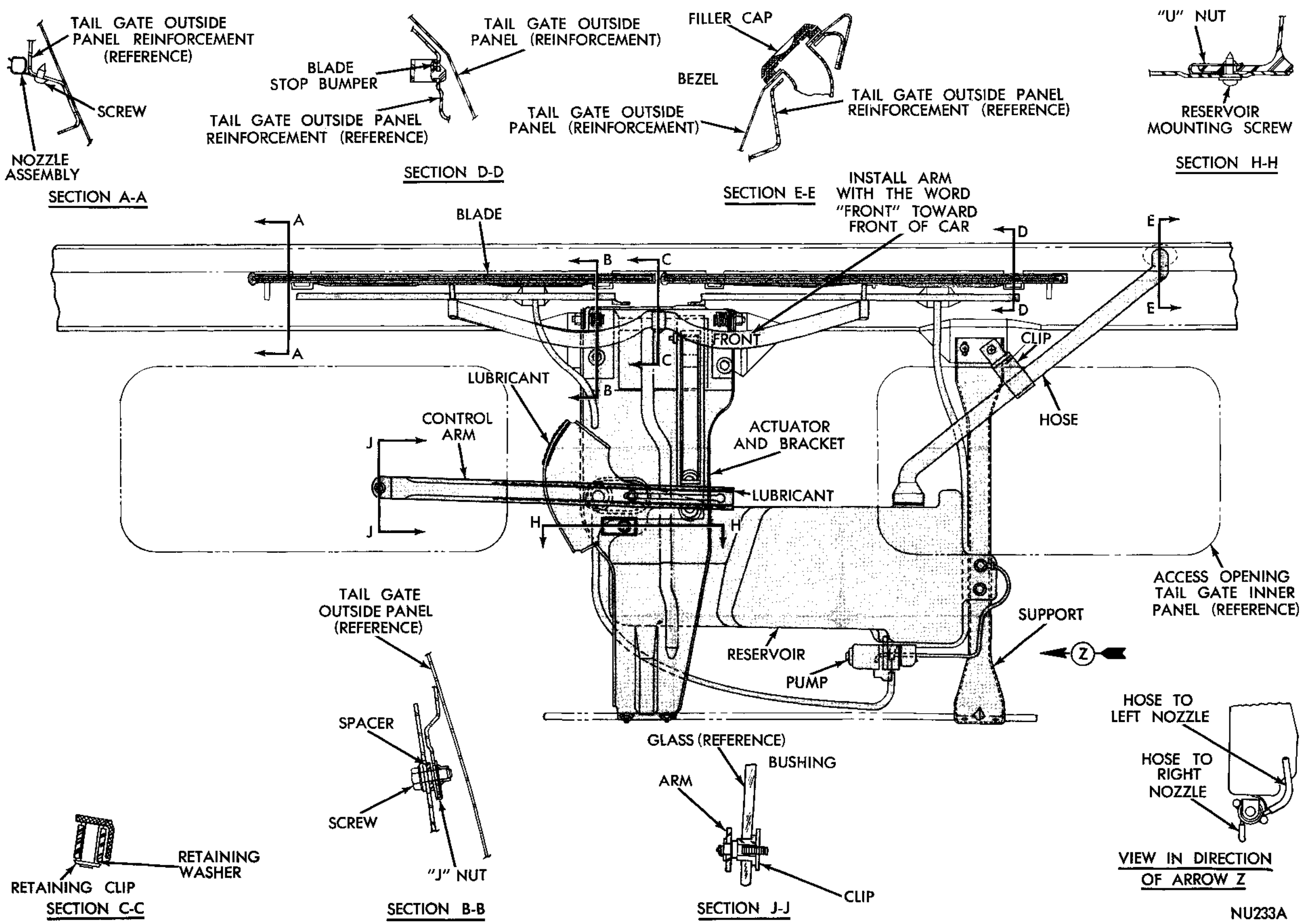


Fig. 2—Tail Gate Window Washer Installed

SERVICE PROCEDURES

Wiper Blade Replacement (18 Inch Blades)

(1) Lower the tail gate glass to full bottom position.

(2) Open tail gate to horizontal position.

(3) Remove inner trim panel of tail gate.

(4) Raise glass approximately half way, after tripping limit switch.

(5) Position the yoke for "off glass" condition.

(6) Remove wiper control arm and pin from glass.

(7) Disengage glass from window regulator arms and remove glass.

(8) Position the yoke for "on glass" condition.

(9) Remove and replace blades, (Locking tab down).

(10) **Do Not get lubricant on new wiper blades.**

(11) Position the yoke for "off glass" condition.

(12) Install glass and assemble to window regulator.

(13) Connect wiper control arm and pin to glass.

(14) Install inner trim panel.

(15) Lower glass to full bottom position and check operation of wiper system.

Water Reservoir and/or Motor Pump Assembly

Removal

(1) Lower tail gate glass to bottom position and open tail gate to horizontal position.

(2) Remove tail gate inner trim panel.

(3) Raise glass sufficient to allow access to reservoir assembly.

CAUTION: Do not exceed normal height of glass travel.

(4) Remove washer hoses from both outlets at washer pump, being careful not to break outlets; identify hoses.

(5) Disconnect one wire to washer motor.

(6) Remove three mounting screws supporting reservoir and remove rubber filler hose at reservoir.

Installation

(1) Position reservoir and install mounting screws.

(2) Connect washer hoses at washer pump, making sure hoses are routed to the correct outlets.

(3) Connect rubber filler hose at reservoir.

(4) Reconnect the wire at washer motor.

(5) Install tail gate inner panel.

(6) Lower tail gate glass to bottom position and recheck motor and pump operation.

Washer Nozzle Replacement

(1) Perform steps 1 through 8 under "Wiper Blade Replacement".

(2) Remove the screws mounting the two nozzle assemblies.

(3) Inspect and clean nozzles. Replace if nozzles are damaged.

(4) Position nozzles and install mounting screws.

(5) Connect washer hose to nozzles.

CAUTION: Do not break nozzle inlets. Do not get lubricant on wiper blades.

(6) Position yoke for "off glass" condition.

(7) Install glass and attach wiper control arm.

(8) Run glass to bottom position.

(9) With tail gate closed, check operation of new nozzles.

(10) If operation is now satisfactory, install inner tail gate trim panel.

REAR WINDOW DEFOGGER

To service the blower motor or fan, the assembly must be removed from the shelf panel from inside the luggage compartment.

After disconnecting the outlet hose and wire connector, remove the mounting screws from the mounting clips and remove the assembly from the vehicle for service.

Disassembly

(1) Remove the blower motor adapter plate to housing mounting screws and withdraw motor and fan assembly from housing.

(2) Loosen fan set screw on fan hub and slide fan from motor shaft.

(3) Remove the motor adapter plate mounting nuts and separate motor from plate.

Assembly

(1) Position adapter plate on motor studs and install the mounting nuts.

(2) Install fan on motor shaft and insert assembly in housing. Check fan to housing clearance and adjust if necessary.

(3) Install the blower motor adapter plate to housing mounting screws.

FRONT SUSPENSION AND STEERING LINKAGE

CONTENTS

GENERAL INFORMATION

The Chrysler front suspension system is basically the same as in previous models, where the torsion bar rear anchors are integral with the engine rear support member. The front anchors are part of the lower control arms and provide the means of adjusting the vehicle front height. Compression type lower ball joints are integral with the steering arm.

The Imperial front suspension system is the same as the previous years model with a front "K" crossmember that is isolated from the stub frame by four large rubber bushing type isolators. The torsion bar rear anchor crossmember is isolated from the stub frame crossmember by two sandwich type rubber insulators. The front torsion bar anchors are part of the lower control arms and provide the means of adjusting the vehicle front height. The upper control arm is mounted on a pivot bar and the front wheel alignment is set by the adjustment of two vertically mounted cam bolts. The sway bar is the link type and mounts to the lower control arm and front crossmember.

The Imperial rubber isolated front suspension system reduces engine and road noises entering the body structure.

All ball joints and the torsion bars at the front of the rear anchors on all model Chrysler and Imperial vehicles are effectively sealed against road splash by tightly fitted balloon type flexible seals.

The lower ball joints, steering arm assemblies on Chrysler models should not be replaced for looseness if the axial end play (Up and Down movement) is under .070 inch. Looseness of this nature is not detrimental and will not affect front wheel alignment or vehicle stability.

On Imperial models the lower ball joints are preloaded (zero axial end play). Therefore, if any axial end play (Up and Down movement) is observed the ball joint and lower control arm should be replaced. The lower ball joints on the Imperial will be serviced as a lower control arm and ball joint assembly complete. This is due to the lower ball joint being a press in type requiring very high removing and installing forces.

The ball joints on all model vehicles are of the semi-permanent lubricated type. When lubrication of the ball joints and tie rod end assemblies is required, remove the plugs and install a lubrication fitting. After lubricating, reinstall the plugs.

Service replacement ball joints are equipped with a "Knock-Off" type lubrication fitting. After lubricating, knock off that portion of the fitting over which the lubrication gun was installed. A ball check installed in the remaining portion of the fitting prevents foreign materials from passing through the fitting.

The tie rod end seals, ball joint and torsion bar balloon seals should be inspected for damage at all oil change periods.

All front suspension points that contain rubber should be tightened while the suspension is at the specified height (see specifications), with full weight of vehicle on its wheels.

Rubber bushings should not be lubricated at any time.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
FRONT END NOISE	(a) Ball joint needs lubrication.	(a) Lubricate ball joint.

Condition	Possible Cause	Correction
	(b) Shock absorber inoperative or bushings worn or loose shock absorber mounting.	(b) Replace bushings or shock absorber or tighten shock absorber mounting nuts.
	(c) Worn strut bushings.	(c) Replace bushing.
	(d) Loose struts—Lower control arm bolts and nuts, (Imperial Only).	(d) Tighten all bolts and nuts.
	(e) Loose steering gear on frame.	(e) Tighten the steering gear mounting bolts.
	(f) Worn upper control arm bushings.	(f) Replace worn bushings.
	(g) Worn lower control arm shaft bushings.	(g) Replace worn bushings.
	(h) Worn upper or lower ball joint.	(h) Replace ball joint.
	(i) Worn tie rod ends.	(i) Replace tie rod end.
	(j) Loose or worn front wheel bearings.	(j) Adjust or replace bearings as necessary.
	(k) Steering knuckle arm contacting the lower control arm wheel stop.	(k) Smooth off the contacting area and lubricate with a water resistant grease.
INSTABILITY	(a) Low or uneven tire pressure.	(a) Inflate tires to correct pressure.
	(b) Loose wheel bearings.	(b) Adjust wheel bearing.
	(c) Improper steering cross shaft adjustment.	(c) Adjust steering cross shaft.
	(d) Steering gear not centered.	(d) Adjust steering gear.
	(e) Worn idler arm bushing.	(e) Replace bushing.
	(f) Loose or excessively worn front strut bushings.	(f) Replace bushings.
	(g) Weak or broken rear spring.	(g) Replace spring.
	(h) Incorrect front wheel alignment.	(h) Measure and adjust front wheel alignment.
	(i) Shock absorber inoperative.	(i) Replace shock absorber.
HARD STEERING	(a) Ball joints—require lubrication.	(a) Lubricate ball joints.
	(b) Low or uneven tire pressure.	(b) Inflate tires to recommended pressures.
	(c) Low power steering fluid level.	(c) Fill pump reservoir to correct level.
	(d) Lack of assist of power steering system.	(d) Inspect, test, and service the power steering pump and gear as required.
	(e) Incorrect front wheel alignment (particularly caster) resulting from a bent control arm, steering knuckle or steering knuckle arm.	(e) Replace bent parts and adjust the front wheel alignment.
	(f) Steering gear low on lubricant.	(f) Fill gear to correct level.
	(g) Steering gear not adjusted.	(g) Adjust steering gear.
	(h) Idler arm binding.	(h) Replace idler arm.
CAR PULLS TO ONE SIDE	(a) Low or uneven tire pressure.	(a) Inflate tires to recommended pressure.
	(b) Front brake dragging.	(b) Adjust brakes.
	(c) Grease, lubricant or brake fluid leaking onto brake lining.	(c) Replace brake shoe and lining as necessary and stop all leaks.
	(d) Loose or excessively worn strut bushings.	(d) Tighten or replace strut bushings.
	(e) Power steering control valve out of adjustment.	(e) Adjust steering gear control valve.
	(f) Incorrect front wheel alignment (particularly camber).	(f) Adjust front wheel alignment.
	(g) Broken or weak rear spring.	(g) Replace spring.
EXCESSIVE PLAY IN STEERING	(a) Worn or loose front wheel bearings.	(a) Adjust or replace wheel bearings as necessary.
	(b) Incorrect steering gear adjustment.	(b) Adjust steering gear.
	(c) Loose steering gear to frame mounting bolts.	(c) Tighten steering gear to frame bolts.
	(d) Worn ball joints or tie rod.	(d) Replace ball joints or tie rods as necessary.
	(e) Worn steering gear parts.	(e) Replace worn steering gear parts and adjust as necessary.
	(f) Worn upper or lower ball joints.	(f) Replace ball joints.

Condition	Possible Cause	Correction
FRONT WHEEL SHIMMY	(a) Tire, wheel out of balance.	(a) Balance wheel and tire assembly.
	(b) Uneven tire wear, or excessively worn tires.	(b) Rotate or replace tires as necessary.
	(c) Worn or loose wheel bearings.	(c) Replace or adjust wheel bearings as necessary.
	(d) Worn tie rod ends.	(d) Replace tie rod ends.
	(e) Strut mounting bushings loose or worn.	(e) Replace strut mounting bushings.
	(f) Incorrect front wheel alignment (particularly caster).	(f) Adjust front wheel alignment.
	(g) Worn or loose upper control arm ball joints.	(g) Inspect ball joints and replace where required.

SERVICE PROCEDURES

WHEEL ALIGNMENT

Front wheel alignment is the proper adjustment of all the interrelated suspension angles affecting the running and steering of the front wheels of the vehicle. The importance of wheel alignment and wheel balancing is considered essential in order to maintain ease of steering, good directional stability and to prevent abnormal tire wear.

Under every day driving conditions the front wheel alignment angles change and therefore it becomes necessary that every vehicle should have an alignment check at least once a year. Such an inspection of the front suspension and steering components is a preventitive maintenance service and also has a definite bearing on the safe operation of the vehicle.

The method of checking front wheel alignment will vary depending on the type of equipment being used. The instructions furnished by the manufacturer of the equipment should always be followed, with the exception of the specifications as recommended by the Chrysler Motors Corporation should always be used.

There are six basic factors which are the foundation to front wheel alignment; height, caster, camber, toe-in, steering axis inclination and toe-out on turns (Fig. 1). All are mechanically adjustable except steering axis inclination and toe-out on turns. The latter two are valuable in determining if parts are bent or damaged particularly when the camber and caster adjustments cannot be brought within the recommended specifications.

Do not attempt to modify any suspension or steering components by heating or bending.

All adjustments should be made in the following sequence:

(a) Front suspension height
(b) Caster and Camber
(c) Toe-in
(d) Steering Axis Inclination
(e) Toe-out on Turns.

Caster is the number of degrees of forward or backward tilt of the spindle support arm at the top. Forward tilt of the spindle support arm at the top is negative caster. Backward tilt of the spindle support arm at the top from true vertical is positive caster.

Camber is the number of degrees the top of the wheel is tilted inward or outward from a true vertical. Inward tilt of the top of the wheel from true vertical is negative camber. Outward tilt of the wheel at the top is positive camber. Excessive camber is a tire wear factor; negative camber causes wear on the inside of the tire, while positive camber causes wear to the outside.

Toe in is measured in inches and is the distance the leading edges of the tires are closer than the

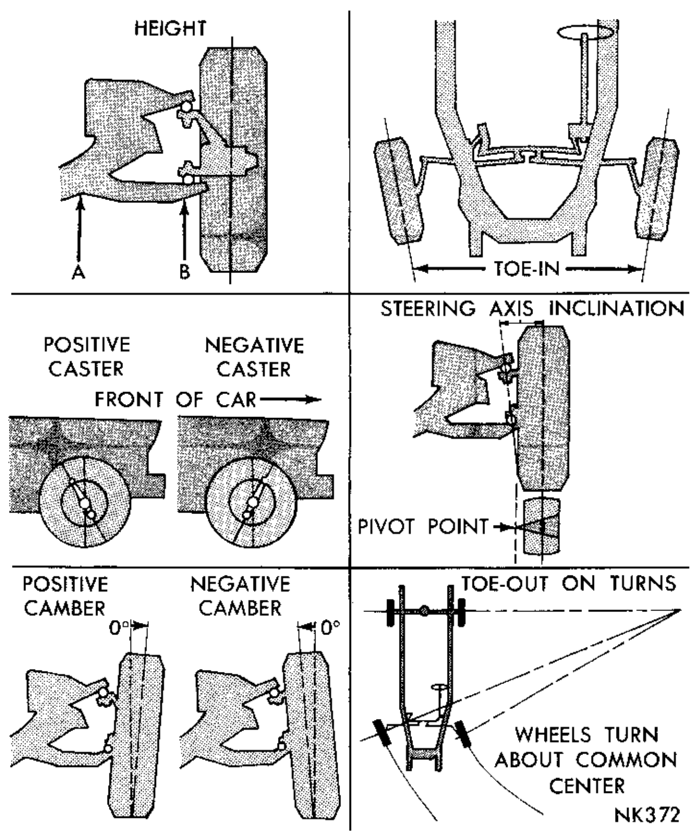


Fig. 1—Wheel Alignment Factors

trailing edges. Toe-in is considered the most serious cause for excessive tire wear. Toe-in is the last of the alignment angles to be set in the front wheel alignment operation.

Steering Axis Inclination is measured in degrees and is the amount the spindle support center line is tilted from true center. It has a fixed relationship with camber settings and does not change except when components are damaged or bent. This angle is not adjustable and damaged parts must be replaced.

Toe-out on Turns (Turning Radius) is measured in degrees and is the amount one front wheel turns sharper than the other on a turn. This angle is designed into the steering arms in relationship to the wheelbase of the vehicle and is not adjustable. When checking the turning radius and it is found not to be within the recommended specifications, look for possible bent or damaged components.

PRE-ALIGNMENT INSPECTION

Before any attempt is made to change or correct the wheel alignment factors the following inspection and necessary corrections must be made on those parts which influence the steering of the vehicle.

(1) Check and inflate tires to recommended pressure. All tires should be same size and be in good condition and have approximately same wear. Note type of tire tread wear which will aid in diagnosing (Group 22).

(2) Check and adjust front wheel bearings (Group 22).

(3) Check front wheel and tire assembly for radial and lateral runout (follow the Equipment Manufacturers Instructions (Group 22).

(4) Check wheel and tire for unbalance conditions both static and dynamic which could affect steering.

(5) Inspect ball joints and all steering linkage pivot points for excessive looseness.

(6) Check shock absorbers for leaks and jounce vehicle to determine if shock absorbers have proper control.

(7) Check steering gear for roughness, binding or sticking condition and adjust as necessary.

(8) Check rear springs for cracks or broken leaves and "U" bolts for proper tightness and measure height differential between left and right sides of vehicle. (Vehicle should be on level floor or on alignment rack) with a full tank of fuel and no luggage or passenger load.

(9) Front suspension heights must only be checked after the vehicle has the recommended tire pressures, full tank of fuel, no passenger load and is on a level floor or alignment rack.

To obtain accurate readings, vehicle should be jounced in following manner just prior to taking each measurement (Height - Caster - Camber and Toe): Grasp bumpers at center (rear bumper first) and jounce up and down several times. Always release bumpers on the down cycle after jouncing both rear and front ends an equal number of times.

WHEEL ALIGNMENT ADJUSTMENTS

Front wheel alignment settings must be held to specifications to hold tire wear to a minimum and to maintain steering ease and handling of vehicle.

The equipment manufacturers recommended procedure should always be followed. Any parts of the front suspension system should be replaced if they are found to be bent. **Do not attempt to straighten any bent part.**

Height

Front suspension heights must be held to specifications for a satisfactory ride, correct appearance, proper front wheel alignment and reduced tire wear.

The heights should only be measured when vehicle has the recommended tire pressures, a full tank of fuel, no passenger load and is on a level floor or an alignment machine rack.

(1) **On Chrysler Models** clean all foreign material from bottom of steering knuckle arm assemblies and from lowest area of the height adjusting blades directly below center of lower control arm inner pivots.

On Imperial Models clean all foreign material from bottom of lower ball joint assemblies and bottom of torsion bar front anchors.

(2) Jounce vehicle several times releasing it on downward motion.

(3) **On Chrysler Models** measure distance from lowest point of one adjusting blade to floor (measurement A) and from lowest point of steering knuckle

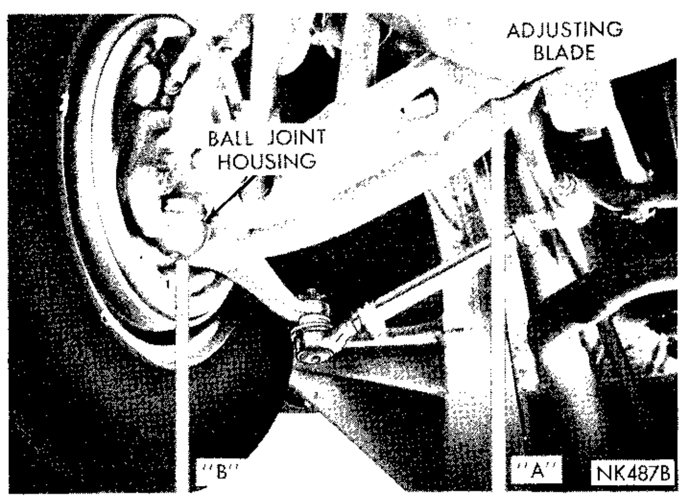


Fig. 2—Measuring Front Suspension Height (Chrysler)

arm, at the centerline, on same side (measurement B) to floor (Fig. 2). Measure only one side at a time.

On Imperial Models measure distance from lowest point of front torsion bar anchor at the rear of lower control arm flange to floor (measurement A) and from lowest point of ball joint housing on same side (measurement B) to floor (Fig. 3) measure only one side at a time.

The difference between A and B (A always being greater than B) is the front suspension height.

(4) Refer to Specifications and adjust if necessary by turning torsion bar adjusting bolt clockwise to increase height and counterclockwise to decrease height.

(5) After each adjustment, jounce vehicle before remeasuring. Both sides should be measured even though only one side has been adjusted.

(6) Measure other side in same manner. The maximum allowable difference in suspension height from side to side is 1/8 inch on all Models.

Camber and Caster

(1) Prepare vehicle for measuring wheel alignment.

(2) Remove all foreign material from exposed threads of cam adjusting bolts.

(3) Record initial camber and caster readings before loosening cam bolt nuts.

(4) Camber settings should be held as close as possible to "preferred" setting. Caster should be held as nearly equal as possible on both wheels. Tighten cam bolt nuts 65 foot-pounds (Chrysler) and 160 foot-pounds (Imperial) after wheel alignment adjustment.

Toe-In

The toe setting should be the final operation of the front wheel aglinment adjustments. The front wheels must be in a straight ahead position. Follow the

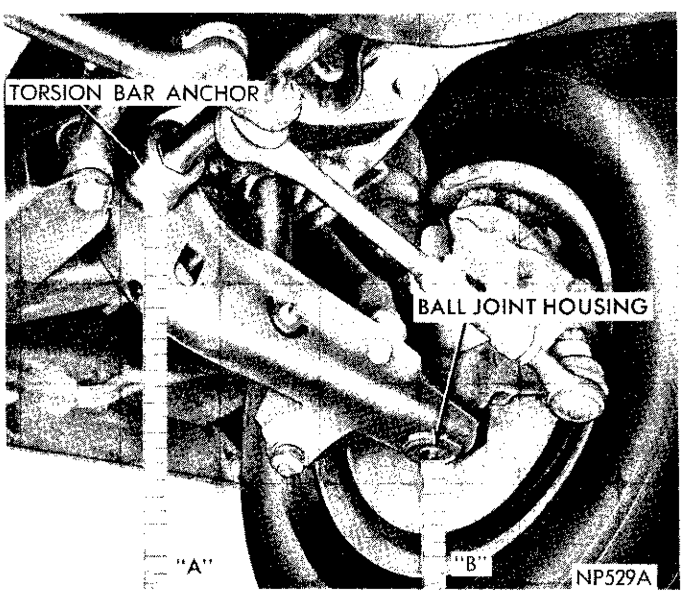


Fig. 3—Measuring Front Suspension Height (Imperial)

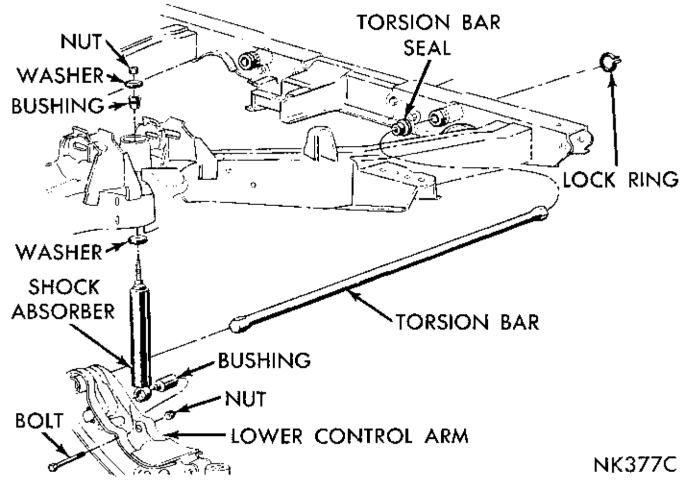


Fig. 4—Torsion Bar (Chrysler)

equipment manufacturers procedure. The steering wheel should be centered during this operation.

Turning both tie rod sleeves will "center" the steering wheel. If the steering wheel was centered, make the toe-in adjustment by turning both sleeves an equal amount. Tighten clamp bolt nuts 150 inch-pounds with the clamp rotated so bolts are on bottom, otherwise interference with torsion bars in jounce may result.

TORSION BARS (Figs. 4 and 5)

The torsion bars are not interchangeable side for side. The bars are marked either right or left by an "R" or an "L" stamped on one end of bar.

Removal

(1) Remove upper control arm rebound bumper.

(2) If vehicle is to be raised on a hoist, make sure it is lifted on body only so front suspension is in full rebound (under no load).

(3) **On Chrysler models,** release all load from torsion bar by turning anchor adjusting bolt counterclockwise.

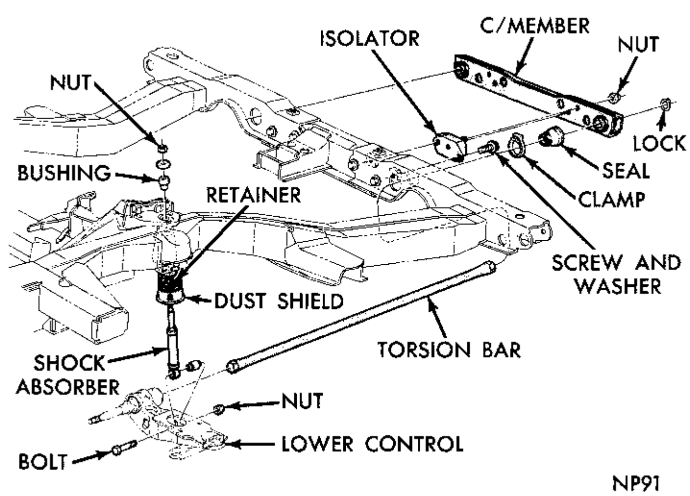


Fig. 5—Torsion Bar (Imperial)

(4) **On Imperial models,** load on **both** torsions bars will have to be released by turning anchor adjusting bolts counterclockwise. **This is necessary because the rubber isolator rear crossmember would be under load and could possible cause severe damage or personal injury.**

(5) Slide rear anchor balloon seal off of rear anchor and remove lock ring from anchor.

In some instances, it may be necessary to use Tool C-3728 to aid in removing torsion bar (Fig. 6). It is advisable to place Tool C-3728 toward rear of torsion bar to allow sufficient room for striking pad of tool. **Do not apply heat to torsion bar, front anchor or rear anchor.**

(6) Remove torsion bar by sliding the bar out through rear of the rear anchor. Use care not to damage balloon seal when it is removed from torsion bar.

Inspection

(1) Inspect balloon seal for damage and replace if necessary.

(2) Inspect torsion bar for scores and nicks. Dress down all scratches and nicks to remove sharp edges, then paint repaired area with a rust preventative.

(3) Remove all foreign material from hex openings in anchors and from hex ends of torsion bars.

(4) Inspect torsion bar adjusting bolt and swivel and replace if there is any sign of corrosion or other damage. Lubricate for easy operation.

Installation

(1) Insert torsion bar through rear anchor.

(2) Slide balloon seal over torsion bar (cupped end toward rear of bar).

(3) Coat both hex ends of torsion bar with Multi-Mileage Lubricant, Part Number 2525035 or equivalent.

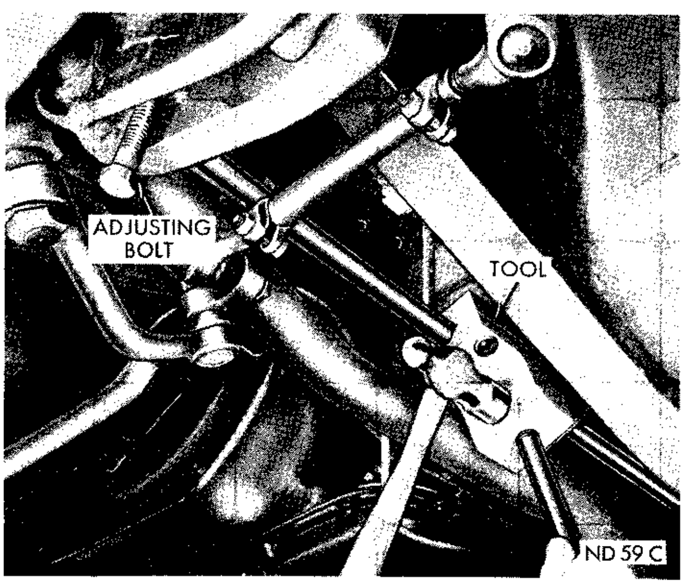


Fig. 6—Removing Torsion Bar

(4) Slide torsion bar in hex opening of lower control arm.

(5) Install lock ring, making sure it is seated in its groove.

(6) Pack annular opening in rear anchor completely full of Multi-Mileage Lubricant, Part Number 2525035 or equivalent. Position lip of balloon seal in groove of anchor. On Imperial models, install balloon seal clamp.

(7) On Chrysler models, turn adjusting bolt clockwise to place a load on torsion bar.

(8) On Imperial models, turn both adjusting bolts clockwise to place a load on both torsion bars.

(9) Lower vehicle to floor and adjust front suspension height.

(10) Install upper control arm rebound bumper and tighten nut 200 inch-pounds.

TORSION BAR RUBBER ISOLATOR (Imperial Fig. 5)

Removal

(1) Raise vehicle so front suspension is in full rebound.

(2) Remove all load from torsion bars by turning adjusting bolts counterclockwise.

(3) Remove lock rings from rear anchors and loosen torsion bar seal clamp and slide seal forward on torsion bar.

(4) Loosen and remove two bolts each side attaching torsion bar rear anchor crossmember to the isolators.

(5) Remove crossmember from torsion bars.

(6) Remove nuts attaching rubber isolator assembly to engine rear support crossmember and remove isolator assembly.

Installation

The rubber isolator and mounting bracket is serviced as an assembly only.

(1) Position isolator assembly on engine rear support crossmember bolts and install nuts and tighten nuts 30 foot-pounds.

(2) Position torsion bar anchor crossmember over the hex ends of torsion bars and install bolts and tighten 75 foot-pounds.

(3) Install lock rings in rear anchors and position seal over lip of crossmember and install clamp.

(4) Place a load on torsion bars by turning adjusting bolts clockwise.

(5) Lower vehicle and adjust front suspension heights.

STEERING KNUCKLES

On Chrysler models equipped with disc brakes, see

Brakes Group 5 for brake disc and caliper removal and installation procedure.

Removal—Chrysler

(1) Remove upper control arm rebound bumper.

(2) Raise vehicle so front suspension is in full rebound (under no load).

(3) Remove wheel, tire and drum as an assembly.

(4) Remove all load from torsion bar by turning the adjusting bolt counterclockwise.

(5) Remove tie rod end from steering knuckle using Tool C-3894.

(6) Remove upper ball joint stud from steering knuckle using Tool C-3964.

(7) Remove two upper bolts securing steering knuckle to brake support.

(8) Remove two lower bolts attaching steering arm to steering knuckle and remove steering knuckle. **Support the brake assembly during this operation to prevent damage to brake hose when lower bolts are removed.**

Installation—Chrysler

(1) Position steering knuckle on brake support and install upper mounting bolts and nuts finger tight only.

(2) Position steering knuckle arm on steering knuckle and install mounting bolts and nuts finger tight only.

(3) Install upper ball joint stud in steering knuckle and tighten the ball joint stud nut 100 foot-pounds. Install cotter pin.

(4) Tighten steering knuckle upper bolt nuts 55 foot-pounds. Tighten lower bolt nuts 120 foot-pounds and install cotter pin.

(5) Place a load on torsion bar by turning adjusting bolt clockwise.

(6) Install tie rod end in steering knuckle arm and install nut, tighten 40 foot-pounds and install cotter pin.

(7) Install wheel tire and drum assembly and adjust front wheel bearing (Group 22).

(8) Lower vehicle to floor and install upper control arm rebound bumper. Tighten nut 200 inch-pounds.

(9) Adjust front wheel alignment as necessary.

All Imperial models are equipped with front wheel disc brakes. For brake disc and caliper removal and installation, see Brakes Group 5 for correct procedure.

Removal—Imperial

(1) Raise vehicle so front suspension is in full rebound (under no load).

(2) Remove wheel and tire assembly.

(3) Remove all load from **both** torsion bars by turning adjusting bolts counterclockwise.

(4) Disconnect brake hose to disc brake caliper brake line.

(5) Remove disc brake caliper and brake disc, see Brakes Group 5.

(6) Remove tie rod end from steering knuckle arm using Tool C-3894. **Use care not to damage seals.**

(7) Remove upper and lower ball joint studs from steering knuckle using Tool C-3564. Turn threaded portion of tool locking it securely against ball joint stud. Spread tool enough to place ball joint stud under pressure, then strike steering knuckle sharply with a hammer to loosen stud. Do not attempt to force stud out of knuckle with tool alone.

(8) Remove bolts attaching steering arm to steering knuckle and remove steering knuckle.

Installation—Imperial

(1) Align steering knuckle mounting holes with those of steering arm, insert mounting bolts and tighten finger tight at this time.

(2) Install upper and lower ball joint studs in steering knuckle and install nuts, tighten upper 125 and lower 155 foot-pounds and install cotter pins.

(3) Tighten steering knuckle bolts to 160 foot-pounds.

(4) Install tie rod end stud in steering knuckle arm and install nut. Tighten 40 foot-pounds and install cotter pin.

(5) Install disc brake caliper and brake disc, see Brakes Group 5.

(6) Connect brake hose to disc brake caliper brake line and bleed brakes.

(7) Place a load on **both** torsion bars by turning adjusting bolts clockwise.

(8) Install wheel and tire assembly and adjust front wheel bearings (Group 22).

(9) Lower vehicle to floor and adjust front suspension heights and wheel alignment as necessary.

STEERING LINKAGE (Figs. 7 and 8)

The tie rod end seals should be inspected at all oil change periods. **Removal of tie rod ends from the steering knuckle arm or center link by methods other than using the recommended tools may damage tie rod end seal.**

Damaged seals require removal of the seals and inspection of the tie rod assembly end at the throat opening. If the parts have not lost all the lubricant and are not contaminated, worn or rusted, use new seals and reinstall, otherwise, a new complete tie rod end assembly should be installed. Lubricate the tie rod end assembly. Special long-life chassis greases such as Multi-Mileage Lubricant, Part Number 2525035 intended for this purpose.

Removal

(1) Remove tie rod ends from steering knuckle arms using Tool C-3894 (Chrysler and Imperial) (Fig.

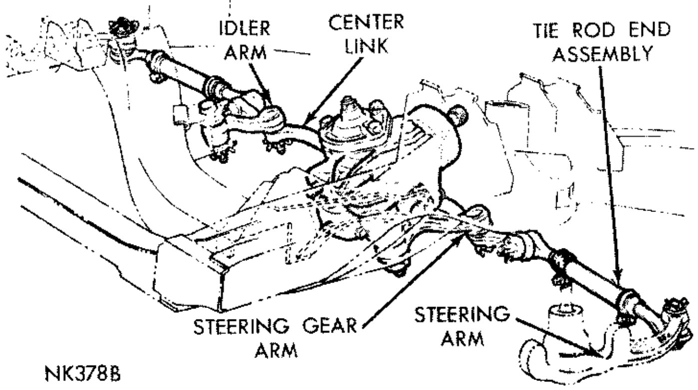


Fig. 7—Steering Linkage (Chrysler)

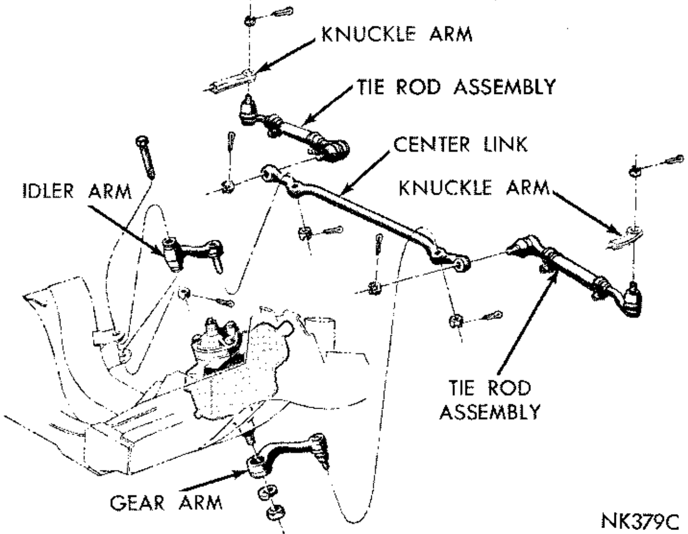


Fig. 7—Steering Linkage (Chrysler)

8). **Use care not to damage seals.**

(2) Using Tool C-3894 remove inner tie rod ends from center link.

(3) Remove idler arm stud from center link using Tool C-3894. Remove idler arm bolt from crossmember.

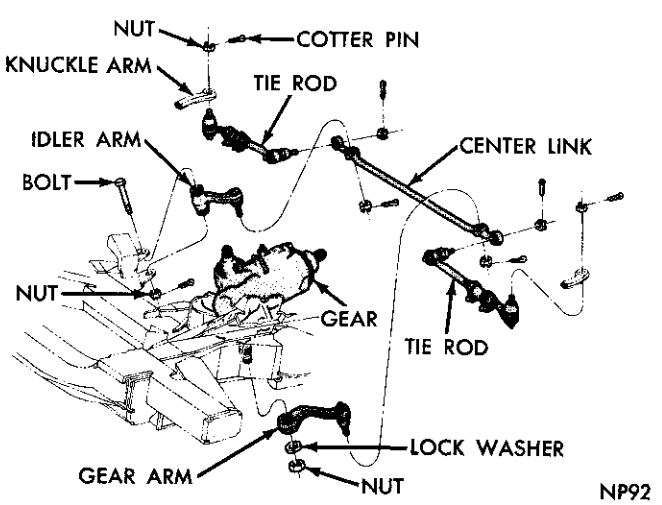


Fig. 8—Steering Linkage (Imperial)

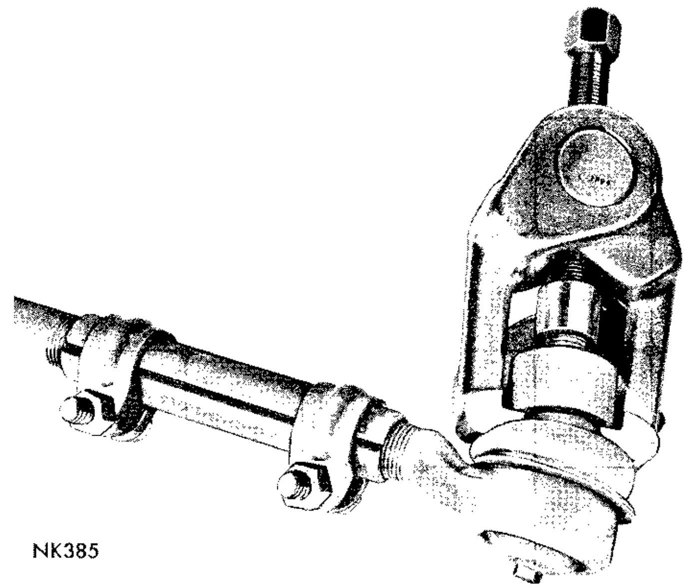


Fig. 9—Removing Outer Tie Rod End

(4) Remove steering gear arm stud from center link, using Tool C-3894, and remove steering gear arm from gear.

Installation

Replace all tie rod and steering arm assemblies that are damaged or excessively worn. Damaged seals are replaceable.

(1) Insert idler arm and bushings assembly into bracket using care not to damage bushing. Insert bolt and tighten to 65 foot-pounds.

(2) Insert center link over idler arm and steering arm studs and tighten nuts to 40 foot-pounds. Insert cotter pins.

(3) Connect tie rod ends to steering knuckle arms. Tighten nuts to 40 foot-pounds, install cotter pins.

(4) Measure and adjust front wheel toe-in.

SWAY BAR (Figs. 10 and 11)

Removal—Chrysler

(1) Remove two sway bar link retaining nuts and concave retainers.

(2) Remove two sway bar cushion retaining nuts, lockwashers, straps, and bolts, (one to each strut). Slide sway bar out through control arm struts and away from vehicle. **The sway bar bushings are not serviced separately. If replacement is necessary, install a new sway bar assembly. Remove lower concave retainer.**

(3) Remove sway bar link insulating bushings from frame bracket. If bushings are worn or deteriorated, install new bushings as required.

Installation—Chrysler

(1) Dip sway bar link bushings in water and install opening in frame bracket, using a twisting motion.

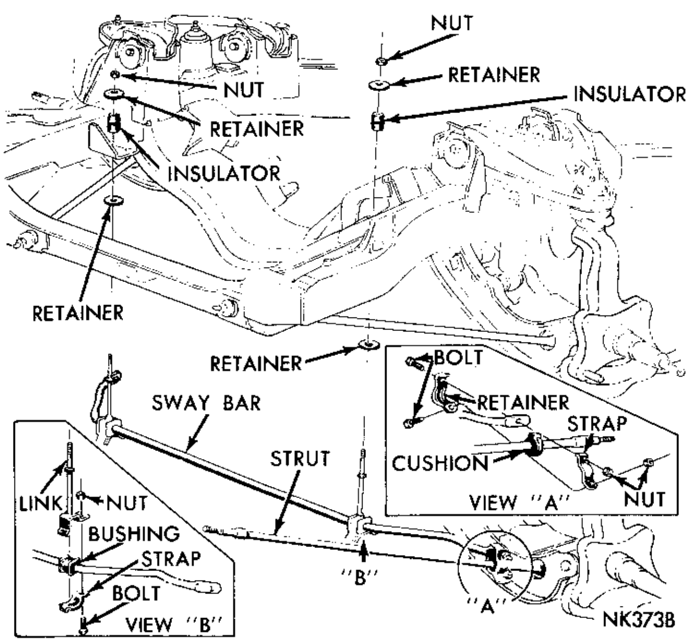


Fig. 10—Sway Bar (Chrysler)

When installed properly, groove in bushing will index with opening in frame bracket.

(2) Thread sway bar into position over top of lower control arm struts.

(3) Engage sway bar cushion housing with struts and install straps, bolts, lockwashers and nuts. Tighten to 30 foot-pounds.

(4) Install retainers over ends of links (concave side up), then slide links up through bushings. Install retainers (concave side down) over ends of links and down on bushings. Install nuts and tighten to 100 inch-pounds.

Removal—Imperial

(1) Raise vehicle on hoist so front suspension is in full rebound (under no load).

(2) Remove one wheel and tire assembly from vehicle, which will aid in removal of sway bar.

(3) Loosen and remove upper link nut, retainer and rubber insulator on both sides.

(4) Loosen and remove screw and washer assemblies attaching both bushing retainers to front cross-member.

(5) Remove sway bar from vehicle.

(6) Loosen and remove nuts, retainers and rubber insulators and remove links from lower control arm bracket.

(7) If the rubber insulator bushings show excessive wear or deterioration of rubber, install new bushings.

The sway bar bushings are not serviced separately. If replacement is necessary, install a new sway bar assembly.

Installation—Imperial

(1) Position link with retainer rubber insulator in lower control arm bracket followed by rubber insulator and retainer (concave side toward rubber insulator) and nut. Tighten nut to 100 inch-pounds.

(2) Position sway bar assembly in vehicle and install attaching screw and washer assemblies and tighten finger tight only.

(3) Install retainer on link followed by rubber insulator and sway bar. Using a screwdriver or pinch bar between strut and sway bar apply pressure and install upper rubber insulator retainer and nut and tighten nut 100 inch-pounds.

(4) Lower vehicle to floor so full weight is on wheels. Tighten the bushing retainer screw and washer assemblies to 200 inch-pounds.

LOWER CONTROL ARM AND SHAFT (Figs. 12 and 13)

On models equipped with disc brakes, see Brakes group 5 for brake disc and caliper removal and installation procedure.

Removal—Chrysler

(1) Loosen and remove lower shock absorber attaching bolt and push up and out of the way, and

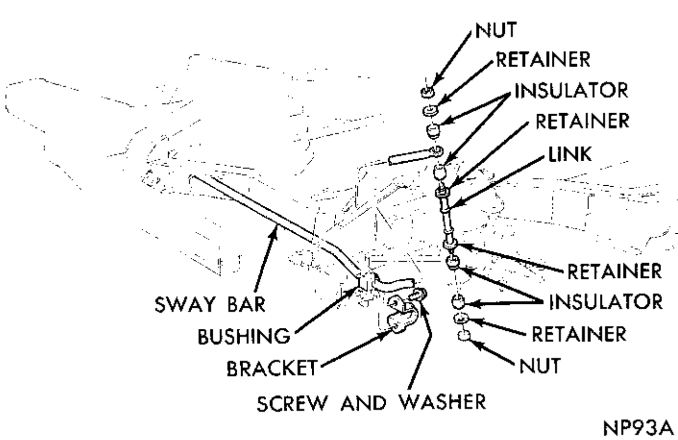


Fig. 11—Sway Bar (Imperial)

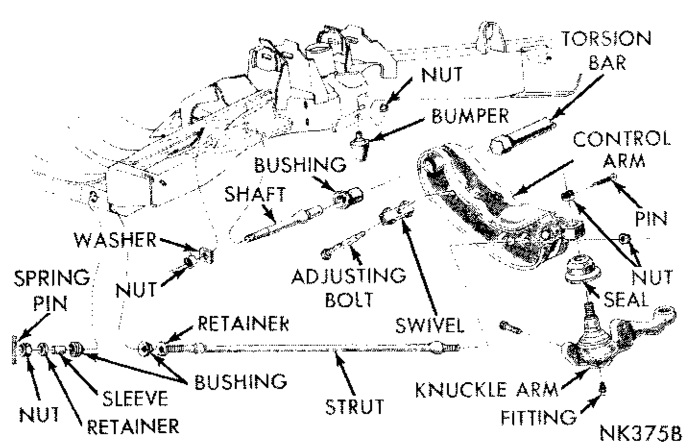


Fig. 12—Lower Control Arm (Chrysler)

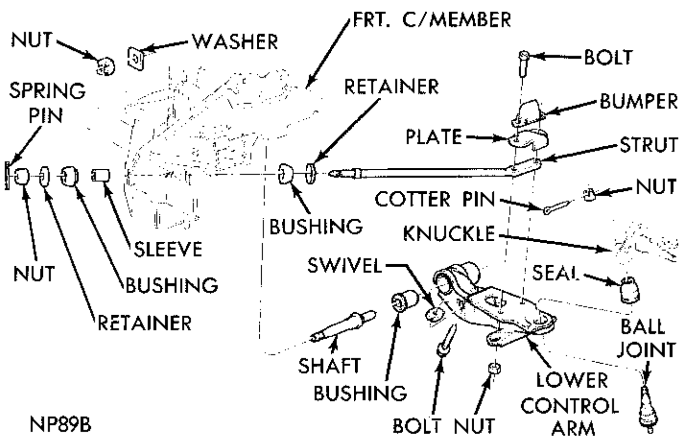


Fig. 13—Lower Control Arm (Imperial)

remove torsion bar from lower control arm.

(2) Remove cotter pin and nut. Remove tie rod end from steering knuckle arm using Tool C-3964 or Tool C-3742. **Use care not to damage seal.**

(3) Remove sway bar to strut attaching straps.

(4) Remove steering knuckle arm to brake support bolts and remove steering knuckle arm. Move brake support assembly out of the way. **Do not allow brake support to hang by brake hose.**

(5) Remove ball joint stud from lower control arm using Tool C-3964 (Fig. 14). The bottom portion of tool must be positioned between seal and control arm to avoid seal damage.

(6) Remove strut spring pin, front nut and bushing retainer.

(7) Remove nut and washer from lower control arm pivot shaft.

(8) Tap end of lower control arm shaft with a "soft end" hammer, to aid in removal of shaft from crossmember, and remove lower control arm, shaft and strut as an assembly.

(9) Remove strut bushings (Fig. 15) from crossmember.

(10) Remove strut bushing inner retainer from strut.

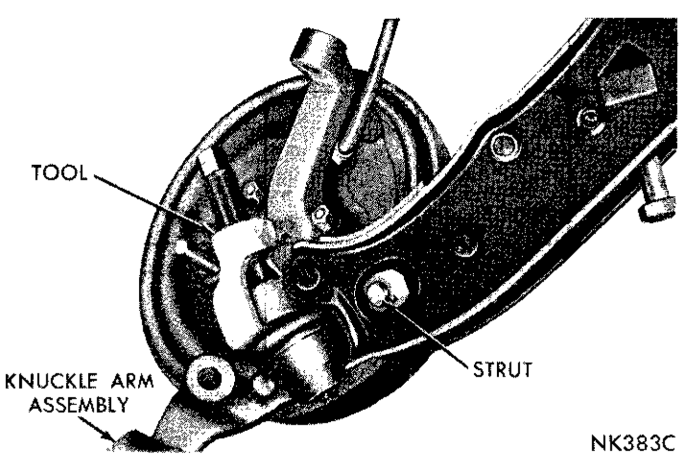


Fig. 14—Removing Lower Ball Joint Stud

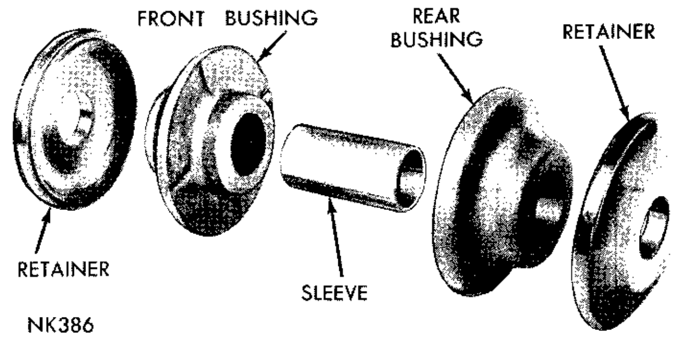


Fig. 15—Strut Crossmember Bushing (Chrysler)

Disassembly—Chrysler

(1) Place strut portion of control arm assembly in a vise and remove nut from strut.

(2) Remove strut from control arm.

(3) Remove torsion bar adjusting bolt and swivel from control arm.

(4) Place control arm assembly in an arbor press with torsion bar hex opening up and with a support under outer edge of control arm (Fig. 16).

(5) Place a brass drift into hex opening and press shaft out of control arm (Fig. 16). The bushing inner shell will remain on shaft.

(6) Remove bushing inner shell from pivot shaft.

(7) Remove rubber portion of bushing from control arm.

(8) Remove bushing outer shell in control arm by cutting with a chisel. **Use care not to cut into control arm.**

Assembly—Chrysler

(1) Position new bushing on shaft, flange end of bushing first, and seat the bushing on shoulder of shaft.

(2) Press shaft and bushing assembly into control arm using Tool C-3556 and an arbor press. **In some instances, it may be necessary to reduce shoulder diameter of shaft to facilitate use of Tool C-3556.**

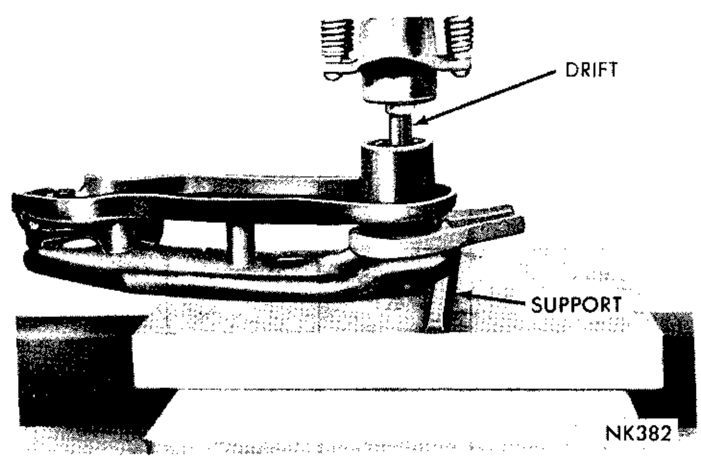


Fig. 16—Removing Pivot Shaft (Chrysler)

(3) Install torsion bar adjusting bolt and swivel.

(4) Position strut in control arm and tighten nut 110 foot-pounds.

Installation—Chrysler

(1) Place strut bushing rear retainer and bushing rear half on strut and position control arm, shaft and strut assembly into crossmember.

(2) Install front strut bushing half, sleeve and retainer. Install nut finger tight only.

(3) Install control arm pivot shaft washer and nut finger tight only.

(4) Position lower ball joint stud into tapered hole in control arm. Tighten nut 115 foot-pounds and install cotter pin.

(5) Position brake support on steering knuckle and install two upper bolts and nuts finger tight only.

(6) Position steering knuckle arm on steering knuckle and install two lower bolts and nuts finger tight only.

(7) Tighten upper bolt nuts 55 foot-pounds and lower bolt nuts 120 foot-pounds.

(8) Inspect tie rod for damage. Connect tie rod end to steering knuckle arm and tighten nut 30 foot-pounds and install cotter pin.

(9) Connect shock absorber to control arm and tighten nut finger tight.

(10) Install torsion bar.

(11) Install wheel, tire and drum assembly and adjust front wheel bearings (Group 22).

(12) Lower vehicle to floor and tighten strut nut, at crossmember, 50 foot-pounds and install spring pin. Tighten shock absorber nut 50 foot-pounds.

(13) Tighten lower control arm shaft nut 180 foot-pounds.

(14) Measure and adjust front suspension height and wheel alignment as necessary.

Removal—Imperial

(1) Raise vehicle on hoist so front suspension is in full rebound (under no load).

(2) Remove wheel and tire assembly.

(3) Remove all load from **both** torsion bars by turning adjusting bolts counterclockwise.

(4) Disconnect shock absorber at lower control arm shock mounting bolt, then push shock absorber up into frame out of way.

(5) Remove nuts and bolts attaching strut to lower control arm.

(6) Disconnect brake hose to disc brake caliper brake line.

(7) Remove upper and lower ball joint stud nuts. Slide Tool C-3564 over upper stud until tool rests on steering knuckle. Turn threaded portion of tool locking it securely against lower stud. Spread tool enough to place lower ball joint stud under pressure, then strike steering knuckle sharply with a hammer to loosen stud. **Do not attempt to force stud out of knuckle with tool alone.**

(8) Remove tool and disengage ball joint from knuckle.

(9) Remove nut and washer attaching lower control arm pivot shaft to frame.

(10) Using a brass drift and hammer, tap end of shaft to loosen (shaft is a tapered fit in front crossmember). This will aid in removal of shaft from crossmember.

(11) Remove lower control arm and shaft as an assembly. **The lower control arm and ball joint will be serviced as an assembly only. This is necessary due to lower ball joint being a very tight press fit into the arm.**

Disassembly—Imperial

(1) Position lower control arm in an arbor press with torsion bar hex opening up and with a support under out edge of control arm.

(2) Insert a brass drift into hex opening and press shaft out of lower control arm. The bushing inner shell will remain on shaft.

(3) Remove bushing inner shell from pivot shaft.

(4) Remove bushing outer shell in torsion bar anchor by cutting with a chisel. Use care not to cut into control arm.

(5) Remove torsion bar adjusting bolt and swivel from lower control arm.

Assembly—Imperial

(1) Position new bushing on shaft, flange end of bushing first, and seat bushing on shoulder of shaft.

(2) Press shaft and bushing assembly into control arm using Tool C-4037.

(3) Install torsion bar adjusting bolt and swivel.

(4) Position new ball joint seal on ball joint body and using Tool C-4034 install seal. **To facilitate installation of seal, the ball joint stud should be perpendicular to ball joint body.** Lubricate ball joint, see Lubrication section Group 0.

Installation—Imperial

(1) Position lower control arm assembly in frame crossmember in approximate operating position. Install washer and nut. **DO NOT TIGHTEN** nut until full weight of vehicle is on wheels.

(2) Raise the lower control arm assembly and insert the lower ball joint stud in steering knuckle. Install ball joint stud nuts (upper and lower) and tighten upper 125 and lower 155 foot-pounds and install cotter pins.

(3) Position strut bushing rear half and rear retainer on strut and insert strut through crossmember.

(4) Install strut bushing front half and retainer on strut. Install nut finger tight only.

(5) Position rear of strut over lower control arm

strut mounting holes and install bumper and plate assembly and insert bolts and install nuts, and tighten to 100 foot-pounds.

(6) Connect shock absorber to lower control arm and install nut finger tight.

(7) Install torsion bar and apply some load on both torsion bars by turning adjusting screws clockwise.

(8) Connect brake hose to disc brake caliper brake line and bleed brakes.

(9) Install wheel and tire assembly and adjust wheel bearings (Group 22).

(10) Lower vehicle to floor and tighten strut nut at crossmember to 50 foot-pounds with full weight of vehicle on wheels and install spring pin. Tighten lower control arm pivot shaft nut 190 foot-pounds and install cotter pin. Tighten lower shock absorber nut to 50 foot-pounds.

(11) Measure and adjust front suspension height and wheel alignment as necessary.

LOWER CONTROL ARM STRUT (Figs. 12 and 13)

Removal—Chrysler

(1) Remove lower control arm, shaft and strut as an assembly.

(2) Remove nut holding strut to lower control arm and remove strut from control arm.

(3) Inspect strut bushings (Fig. 15). If bushings are worn or deteriorated, install new bushings.

Installation—Chrysler

(1) Install new strut bushings, if necessary.

(2) Position strut into control arm and tighten nut 110 foot-pounds.

(3) Position strut bushing rear retainer and strut bushing rear half on strut. (Concave side of retainer in contact with bushing). Position control arm shaft and strut assembly into crossmember. Install strut front bushing, sleeve and retainer. Tighten nut finger tight only.

(4) Install control arm pivot shaft washer and nut finger tight only.

(5) Connect shock absorber to lower control arm and tighten nut finger tight only.

(6) Lower vehicle to floor so full weight is on its wheels.

(7) Adjust front suspension heights to specifications.

(8) Tighten front strut nut to 52 foot-pounds and install spring pin. Tighten pivot shaft nut 190 foot-pounds. Tighten shock absorber nut 50 foot-pounds.

(9) Adjust front wheel alignment as necessary.

Removal—Imperial

(1) Raise vehicle on hoist so front suspension is in full rebound (under no load).

(2) Loosen and remove lower control arm strut spring pin nut and retainer.

(3) Loosen and remove attaching bolts to lower control arm bumper and plate assembly and remove bumper assembly.

(4) Slide strut and bushing retainer from strut bushing in frame.

(5) Separate front and rear halves of strut bushing from frame using a screwdriver. If the rubber bushings show excessive wear or deterioration of rubber, install new bushings.

Installation—Imperial

(1) Position rear retainer and strut bushing rear half on strut (concave side of retainer in contact with bushing).

(2) Insert strut into frame. Install strut bushing front half, spacer and retainer (concave side of retainer in contact with bushing) on strut and install nut finger tight.

(3) Position rear of strut over lower control arm strut mounting holes and install bumper and plate assembly and insert bolts and install nuts and tighten to 100 foot-pounds.

(4) Lower vehicle to floor and with weight of vehicle on wheels, tighten forward end strut nut to 50 foot-pounds and install strut spring pin.

(5) Check and adjust front wheel alignment.

LOWER BALL JOINTS

On models equipped with disc brakes, see Brakes group 5 for brake disc and caliper removal and installation procedure.

The lower ball joints, steering arm assemblies on Chrysler models should not be replaced for looseness if the axial end play (Up and Down movement) is under .070 inch. Looseness of this nature is not detrimental and will not affect front wheel alignment or vehicle stability.

On Imperial models the lower ball joints are preloaded (zero axial end play). Therefore, if any axial end play (Up and Down movement) is observed the ball joint and lower control arm should be replaced. The lower ball joints on the Imperial will be serviced as a lower control arm and ball joint assembly complete. This is due to the lower ball joint being a press fit and requires very high removing and installing forces.

Inspection—Chrysler

(1) Raise the front of vehicle and install safety floor stands under both lower control arms as far outboard as possible. The upper control arms must not contact the rubber rebound bumpers.

(2) With the weight of vehicle on the control arm,

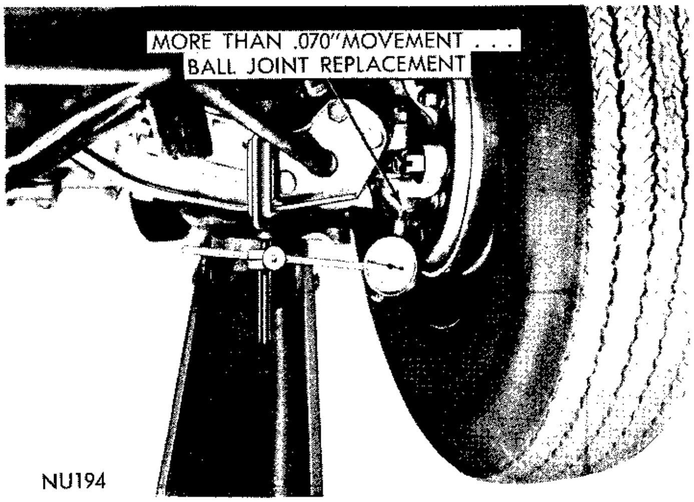


Fig. 17—Measuring Lower Ball Joint Axial Travel

install dial indicator and clamp assembly to lower control arm (Fig. 17).

(3) Position dial indicator plunger tip against ball joint housing assembly and zero dial indicator.

(4) Measure axial travel of the ball joint housing arm with respect to the ball joint stud, by raising and lowering the wheel using a pry bar under the center of the tire.

(5) If during measurement you find the axial travel of the housing arm is .070" or more, relative to the ball joint stud, the ball joint should be replaced.

Removal—Chrysler

(1) Remove upper control arm rebound bumper.

(2) Raise vehicle so front suspension is in full rebound. Remove all load from torsion bar by turning adjusting bolt counterclockwise.

(3) Remove wheel, tire and drum as an assembly.

(4) Remove two lower bolts from brake support attaching steering arm and ball joint assembly to steering knuckle.

(5) Remove tie rod end from steering knuckle arm using Tool C-3894. **Use care not to damage seal.**

(6) Using Tool C-3964 remove ball joint stud from lower control arm (Fig. 14) and remove steering arm and ball joint assembly.

Installation—Chrysler

(1) Place a new seal over ball joint stud (if necessary) and press seal fully down on ball joint housing until it is securely locked into position using a 1-7/8" socket.

(2) Position steering arm and ball joint assembly on steering knuckle and install two mounting bolts. Tighten nuts 120 foot-pounds.

(3) Insert ball joint stud into lower control arm.

(4) Install stud retaining nut and tighten to 115 foot-pounds. Install cotter pin and lubricate ball joint.

(5) Inspect tie rod end seal for damage and replace if damaged. Connect tie rod end to steering knuckle arm and tighten nut 40 foot-pounds and install cotter pin.

(6) Place a load on torsion bar by turning adjusting bolt clockwise.

(7) Install wheel, tire and drum assembly and adjust front wheel bearing (Group 22).

(8) Lower vehicle to floor and install upper control arm rebound bumper. Tighten to 200 inch-pounds.

(9) Measure front suspension height and adjust if necessary.

(10) Measure front wheel alignment and adjust if necessary.

Replacement—Imperial

The lower ball joints on the Imperial will be serviced only as a lower control arm and ball joint assembly complete. This is due to the lower ball joint being a press fit and requires very high removing and installing forces. See Lower Control Arm and Shaft for replacement procedure.

UPPER CONTROL ARM (Figs. 18 and 19)

Removal—Chrysler

(1) Place a jack under lower control arm as close to wheel as possible and raise vehicle until front wheel clears floor, and upper control arm rebound bumper is free.

(2) Remove wheel and tire assembly.

(3) Using Tool C-3964 (Fig. 20) remove upper ball joint stud.

(4) Remove nuts, lockwashers, cams and cam bolts

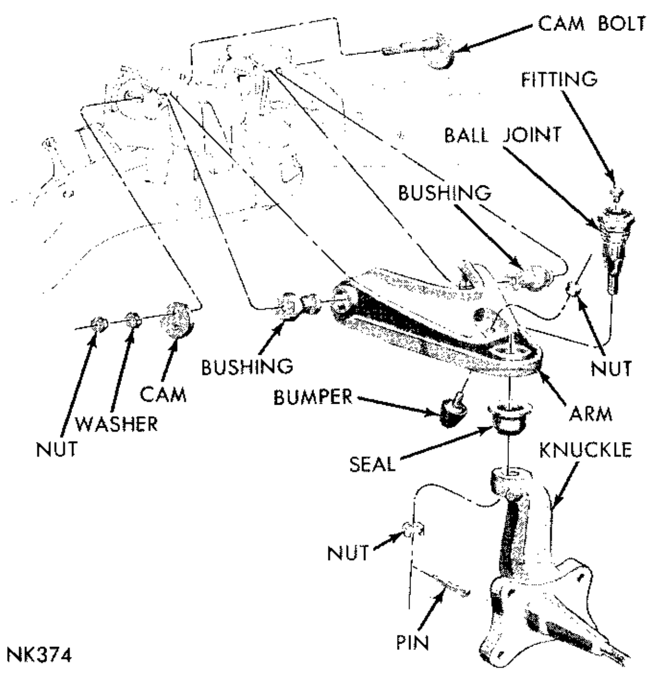


Fig. 18—Upper Control Arm (Chrysler)

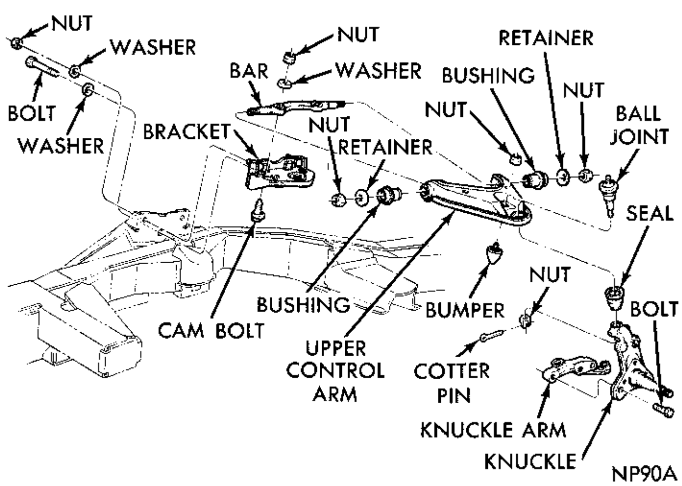


Fig. 19—Upper Control Arm (Imperial)

attaching upper control arm bushings to front and rear support. Lift upper control arm up and away from support.

Disassembly—Chrysler

(1) Remove ball joint using Tool C-3560. The ball joint balloon type seal will come off as ball joint is removed.

(2) Assemble Tool C-3962, using adapter SP-3953 over bushing and press bushings out of arm (from inside out) (Fig. 21). **Be sure control arm is firmly supported if a hammer and drift is used in place of tool.**

Assembly—Chrysler

When installing new bushings, be sure control arm is supported squarely at the point where bushing is being pressed in. Do not use oil or grease to aid in installation.

(1) Position flange end of new bushing in Tool C-3962, with control arm supported squarely press bushings into control arm (from outside) until flange

Fig. 20—Removing Upper Ball Joint Stud (Chrysler)

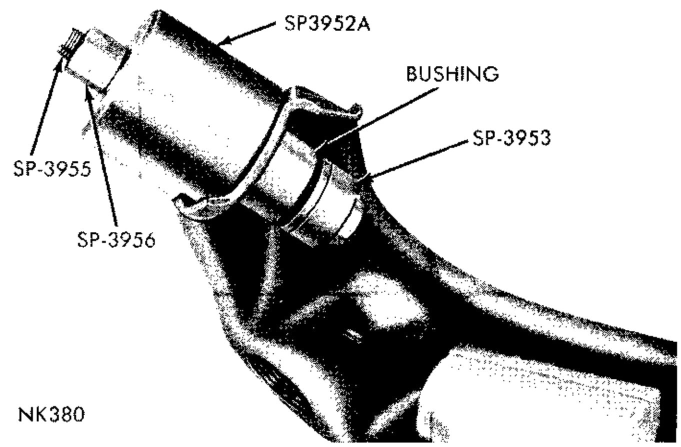


Fig. 21—Removing Upper Control Arm Bushing (Chrysler)

bushings seats on arm (Fig. 22).

(2) Thread ball joint into arm using Tool C-3560, tighten to a minimum of 125 foot-pounds until seated. The ball joint will cut threads into a new arm during tightening operation.

Installation—Chrysler

(1) Slide upper control arm into position. Install cam bolts, cams, washers and nuts. Tighten nuts 65 foot-pounds **after** adjusting front wheel alignment.

(2) Position new ball joint seal on ball joint body and press seal on using a 2″ socket making sure it is seated fully down on housing. To facilitate installation of seal the ball joint stud should be perpendicular to ball joint body. Lubricate ball joint, see "Lubrication" section, Group 0.

(3) Position stud in steering knuckle and install washer and nut. Tighten nut 100 foot-pounds and install cotter pin.

(4) Install wheel and tire and adjust front wheel bearing (Group 22) and lower vehicle to floor.

(5) Adjust suspension height and wheel alignment as necessary.

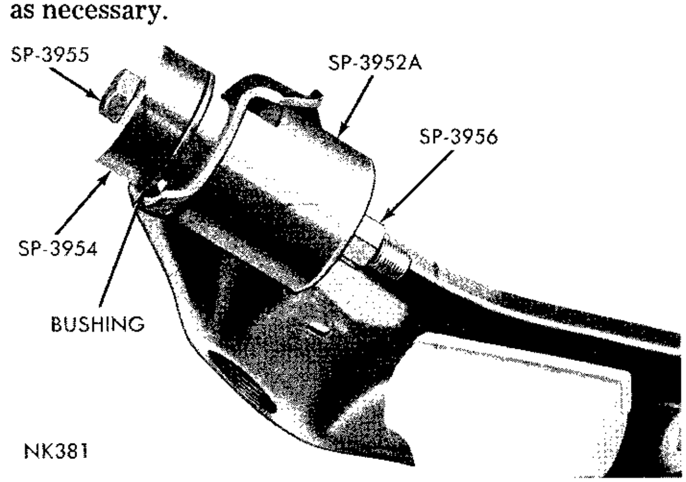


Fig. 22—Installing Upper Control Arm Bushing (Chrysler)

Removal—Imperial

(1) Place a jack under lower control arm as close to wheel as possible and raise vehicle until front wheel clears floor, and rebound bumper is free.

(2) Remove wheel and tire assembly.

(3) Disconnect brake hose at disc brake caliper brake line.

(4) Remove upper and lower ball joint stud nuts. Slide Tool C-3564 down over lower ball joint stud until tool rests on steering knuckle. Turn threaded portion of tool locking it securely against upper stud. Spread tool enough to place upper stud under pressure then strike knuckle sharply with a hammer to loosen stud. **Do not attempt to force stud out of knuckle with tool alone.**

(5) Remove tool, then disengage ball joint from knuckle.

(6) Remove cam bolt nuts, cone washers attaching upper control arm pivot bar and control arm assembly to front "K" member bracket assembly.

(7) Lift upper control arm and pivot bar assembly up and away from bracket. **The upper control arm and pivot bar including bushings are not serviced separately. If replacement is necessary, install a new upper control arm which will include pivot bar and bushings installed.**

Disassembly—Imperial

(1) Remove upper control arm pivot bar nuts and retainers.

(2) Remove upper control arm bumper assembly.

(3) Remove ball joint using Tool C-3561. The ball joint balloon type seal will come off as ball joint is removed.

Assembly—Imperial

(1) Position upper control arm in a vise supported squarely for ease of installation of upper ball joint.

(2) Thread ball joint into upper control arm using Tool C-3561. Make sure threads properly engage those in control arm.

(3) Tighten to a minimum of 150 foot-pounds until seated. The ball joint will cut threads into a new arm during tightening operation.

(4) Install upper ball joint balloon seal using Tool C-4034. **To facilitate installation of seal the ball joint stud should be perpendicular to ball joint body.** Lubricate ball joint, see "Lubrication" section, Group 0.

(5) Install upper control arm bumper assembly and tighten nut 200 inch-pounds.

(6) Install upper control arm bushing retainers and nuts and tighten finger tight only. All front suspension pivot points should be tightened when front suspension heights are as specified with full weight of vehicle on wheels.

Installation—Imperial

(1) Position upper control arm assembly into position over cam bolts and install cone washers and nuts and tighten to 160 foot-pounds. (After setting alignment).

(2) Insert upper ball joint stud in steering knuckle. Install ball joint stud nuts (upper and lower) and tighten upper 125 and lower 155 foot-pounds and install cotter pins.

(3) Connect brake hose to disc brake caliper brake line and bleed brakes.

(4) Install wheel and tire assembly and adjust front wheel bearing (Group 22).

(5) Lower vehicle to floor and adjust front suspension heights and wheel alignment as necessary.

UPPER BALL JOINTS

Removal—Chrysler

(1) Raise vehicle by placing a jack under lower control arm as close as possible to wheel.

(2) Remove wheel and tire assembly.

(3) Remove upper ball joint stud from steering knuckle using Tool C-3964 (Fig. 20), making sure bottom portion of tool is positioned between steering knuckle and seal, otherwise, damage to seal will result.

(4) Using Tool C-3560 (Fig. 23), unscrew ball joint from upper control arm. The ball joint balloon type seal will come off as ball joint is removed.

Installation—Chrysler

When installing a new ball joint, it is very important that ball joint threads properly engage those in control arm. Balloon type seals should always be replaced once they have been removed.

(1) Screw ball joint squarely into control arm as far as possible by hand.

(2) Using Tool C-3560, tighten until ball joint

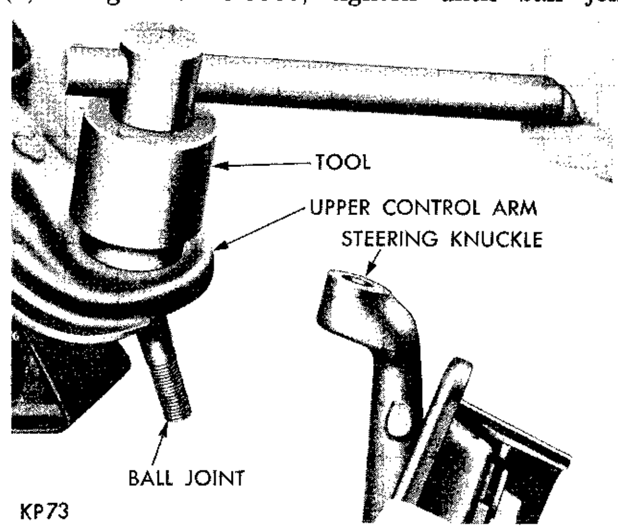


Fig. 23—Removing Ball Joint

housing is seated on control arm. Tighten to a minimum of 125 foot-pounds. **If ball joint cannot be tightened to 125 foot-pounds, inspect threads on ball joint and also in control arm and replace ball joint or control arm as necesary.**

(3) Position new ball joint seal on ball joint body and press seal on using a 2" socket making sure it is seated fully down on housing. To facilitate installation of seal, the ball joint stud should be perpendicular to ball joint body. Lubricate ball joint, see "Lubrication" section, Group 0.

(4) Position stud in steering knuckle and install washer and nut. Tighten nut 100 foot-pounds and install cotter pin.

(5) Install wheel and tire and adjust front wheel bearing (Group 22) and lower vehicle to floor.

(6) Adjust suspension height and wheel alignment as necessary.

Removal—Imperial

(1) Raise vehicle by placing a jack under lower control arm as close as possible to wheel.

(2) Remove wheel and tire assembly.

(3) Disconnect brake hose at disc brake caliper brake line.

(4) Remove upper and lower ball joint stud nuts. Slide Tool C-3564 down over lower ball joint stud until tool rests on steering knuckle. Turn threaded portion of tool locking it securely against upper stud. Spread tool enough to place upper stud under pressure then strike knuckle sharply with a hammer to loosen stud. **Do not attempt to force stud out of knuckle with Tool alone.**

(5) Remove tool then disengage ball joint from knuckle.

(6) Remove upper ball joint using Tool C-3561 to unscrew ball joint from upper control arm. The ball joint balloon type seal will come off as ball joint is removed.

Installation—Imperial

When installing a new ball joint, it is very important that ball joint threads properly engage those in control arm. Balloon type seals should always be replaced once they have been removed.

(1) Screw ball joint squarely into control arm as far as possible by hand.

(2) Using Tool C-3561 tighten until ball joint housing is seated on control arm. Tighten to a minimum of 150 foot-pounds. **If ball joint cannot be tightened to 150 foot-pounds, inspect threads on ball joint and also in control arm and replace ball joint or control arm as necessary.**

(3) Install upper ball joint balloon seal using Tool C-4034. **To facilitate installation of seal, the ball joint stud should be perpendicular to ball joint body.** Lubricate ball joint, see "Lubrication" section, Group 0.

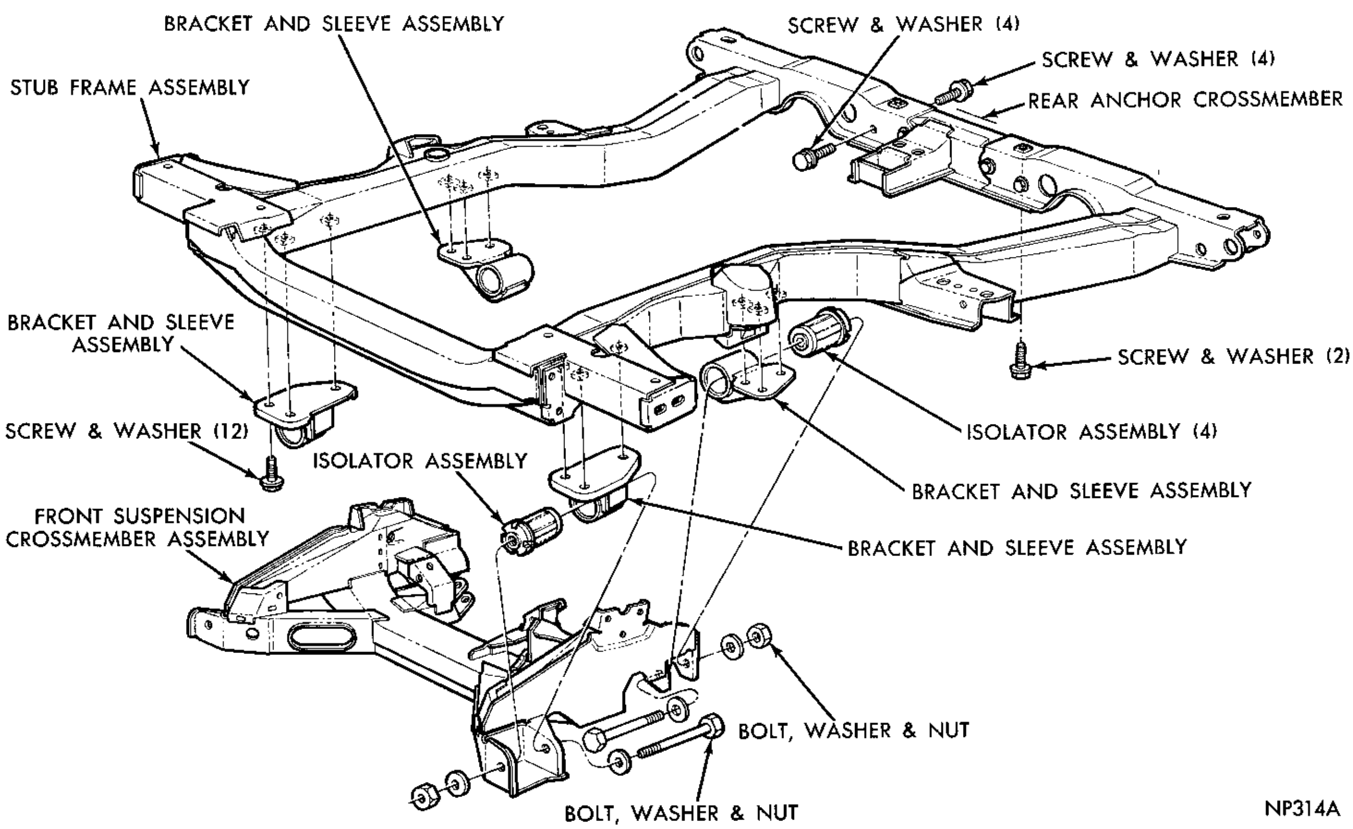


Fig. 24—Rubber Isolated Front Crossmember and Stub Frame Assembly

(4) Insert upper ball joint stud in steering knuckle. Install ball joint stud nuts (upper and lower) and tighten upper 125 and lower 155 foot-pounds and install cotter pins.

(5) Connect brake hose to disc brake caliper brake line and bleed brakes.

(6) Install wheel and tire assembly and adjust front wheel bearing (Group 22).

(7) Lower vehicle to floor and adjust front suspension heights and alignment as necessary.

RUBBER ISOLATED FRONT CROSSMEMBER (Imperial)

Refer to body and frame alignment for crossmember replacement.

The rubber isolated front crossmember is a drop out member which is isolated from the stub frame assembly by four bushing type rubber isolators (Fig. 24). **The bracket and sleeve assembly with rubber isolator will be serviced as an assembly only.**

Removal

(1) Raise vehicle so front suspension is in full rebound (under no load).

(2) Position a jackstand under front crossmember, which will support crossmember when bracket and sleeve assembly is loosened and removed.

(3) Loosen and remove bracket and sleeve assembly attaching bolts and washer assemblies.

(4) Loosen and remove nut, washer and bolt attaching isolator bracket and sleeve assembly in front crossmember brackets.

(5) Using a screwdriver, pry bracket and sleeve with rubber isolator from front crossmember.

Installation

(1) Position bracket and sleeve with isolator assembly in front crossmember mounting brackets so holes align and install bolt followed by washer and nut and tighten finger tight only.

(2) Align bracket and sleeve assembly holes with those in stub frame and install bolt and washer assemblies, tighten 75 foot-pounds.

(3) Remove jackstand and lower vehicle to floor and tighten isolator assembly nuts 30 foot-pounds.

(4) Adjust front suspension heights as necessary.

SPECIFICATIONS

Model	Chrysler	Imperial
CAMBER—Left	+1/4° to +3/4° (Preferred +1/2°)	
Right	0° to +1/2° (Preferred +1/4°)	
CASTER—Manual Steering	0° to −1° (−1/2° preferred)	
Power Steering	0° to −1° (−1/2° preferred)	
Power Steering Imperial Models only	+1/4° to +1-1/4° (+3/4° preferred)	
HEIGHT (Inches)	1-1/8 ± 1/8	1-3/4 ± 1/8
Side to Side Difference (Maximum)	1/8	
STEERING AXIS INCLINATION	7-1/2°	9°
TOE-IN	3/32 inch to 5/32 inch (Preferred 1/8 inch)	
TOE-OUT ON TURNS (When inner wheel is 20°) Outer Wheel Is	18.8°	17.9°
TREAD (Inches) Front	62.0	62.4
Rear	62.0	62.0
Rear (Station Wagon)	63.4	
TORSION BAR		
Length (inches)	47	50.0
Diameter (inches)	0.96	1.00
With Air Conditioning	0.98	1.00
Heavy Duty	0.98	1.06
Hi. Perf. 440 Eng.	0.98	
WHEEL BASE (Inches)	123.5	127

TIGHTENING REFERENCE

	Pounds Foot	Pounds Inch
BALL JOINT (Chrysler)	125 (Min.)	
(Imperial)	150 (Min.)	
Stud Nut (Chrysler) (Upper)	100	
(Lower)	115	
(Imperial) (Upper)	125	
(Lower)	155	
Bumper Nut		200
Bracket Nuts (Imperial)	75	
Cam Bolt Nut (Chrysler)	65	
(Imperial)	160	
Pivot Bar Bushing Nuts (Imperial)	75	
CONTROL ARMS (Lower)		
Bumper Nut		200
Pivot Shaft Nut (Chrysler)	190	
(Imperial)	190	
CROSSMEMBER (Front)		
Bracket and sleeve screws	75	
Isolator Bolts	150	
SHOCK ABSORBERS (Front)		
(Lower)	50	
(Upper)	25	
TIE ROD CLAMP BOLT NUTS		150

	Pounds Foot	Pounds Inch
STEERING LINKAGE		
Idler Arm to Bracket Bolt Nut		
(Chrysler)	65	
(Imperial)	65	
To center Link Nut	40	
Steering Gear Arm to Center Link Nut	40	
Steering Knuckle Arm to Tie Rod	40	
Steering Knuckle (Chrysler) (lower)	120	
(upper)	55	
To Knuckle Arm (Imperial)	160	
STRUT (Chrysler) (Front)	52	
(Rear)	115	
(Imperial (Front)	52	
(Rear)	105	
SWAY BAR		
Link Nut		100
Cushion Strap Bolt Nut (Imperial)		200
Bar to Strut Strap Nut (Chrysler)	30	
TORSION BAR REAR ISOLATOR		
Isolators to Rear Crossmember	75	
Crossmember to Isolator Bolt Nut	30	

REAR AXLE

CONTENTS

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
REAR WHEEL NOISE	(a) Wheel Loose.	(a) Tighten loose wheel nuts.
	(b) Spalled wheel bearing cup or cone.	(b) Check rear wheel bearings. If spalled or worn, replace.
	(c) Defective, brinelled wheel bearing.	(c) Defective or brinelled bearings must be replaced. Check rear axle shaft end play.
	(d) Excessive axle shaft end play.	(d) Readjust axle shaft end play.
	(e) Bent or sprung axle shaft flange.	(e) Replace bent or sprung axle shaft.
SCORING OF DIFFERENTIAL GEARS AND PINIONS	(a) Insufficient lubrication.	(a) Replace scored gears. Scoring marks on the pressure face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear axle to required capacity with proper lubricant. See Specification section.
	(b) Improper grade of lubricant.	(b) Replace scored gears. Inspect all gears and bearings for possible damage. Clean out and refill axle to required capacity with proper lubricant. See Lubrication section.
	(c) Excessive spinning of one wheel.	(c) Replace scored gears. Inspect all gears, pinion bores and shaft for scoring, or bearings for possible damage. Service as necessary.
TOOTH BREAKAGE (RING GEAR AND PINION)	(a) Overloading.	(a) Replace gears. Examine other gears and bearings for possible damage. Replace parts as needed. Avoid Overloading.
	(b) Erratic clutch operation.	(b) Replace gears, and examine remaining parts for possible damage. Avoid erratic clutch operation.
	(c) Ice-spotted pavements.	(c) Replace gears. Examine remaining parts for possible damage. Replace parts as required.
	(d) Improper adjustment.	(d) Replace gears. Examine other parts for possible damage. Make sure ring gear and pinion backlash is correct.
REAR AXLE NOISE	(a) Insufficient lubricant.	(a) Refill rear axle with correct amount of the proper lubricant. See Specification section. Also check for leaks and correct as necessary.
	(b) Improper ring gear and pinion adjustment.	(b) Check ring gear and pinion tooth contact.
	(c) Unmatched ring gear and pinion.	(c) Remove unmatched ring gear and pinion. Replace with a new matched gear and pinion set.
	(d) Worn teeth on ring gear or pinion.	(d) Check teeth on ring gear and pinion for contact. If necessary, replace with new matched set.

Condition	Possible Cause	Correction
	(e) End play in drive pinion bearings.	(e) Adjust drive pinion bearing preload.
	(f) Side play in differential bearings.	(f) Adjust differential bearing preload.
	(g) Sure-Grip Differential moan and chatter.	(g) Drain and flush lubricant. See procedure in Sure-Grip section of Group 3.
LOSS OF LUBRICANT	(a) Lubricant level too high.	(a) Drain excess lubricant by removing filler plug and allow lubricant to level at lower edge of filler plug hole.
	(b) Worn axle shaft oil seals.	(b) Replace worn oil seals with new ones. Prepare new seals before replacement.
	(c) Cracked rear axle housing.	(c) Repair or replace housing as required.
	(d) Worn drive pinion oil seal.	(d) Replace worn drive pinion oil seal with a new one.
	(e) Scored and worn companion flange.	(e) Replace worn or scored companion flange and oil seal.
	(f) Clogged breather.	(f) Clean breather thoroughly.
	(g) Loose carrier housing bolts or housing cover screws.	(g) Tighten bolts or cover screws to specifications and fill to correct level with proper lubricant.
OVERHEATING OF UNIT	(a) Lubricant level too low.	(a) Refill rear axle.
	(b) Incorrect grade of lubricant.	(b) Drain, flush and refill rear axle with correct amount of the proper lubricant. See Specification Section.
	(c) Bearings adjusted too tightly.	(c) Readjust bearings.
	(d) Excessive wear in gears.	(d) Check gears for excessive wear or scoring. Replace as necessary.
	(e) Insufficient ring gear to pinion clearance.	(e) Readjust ring gear and pinion backlash and check gears for possible scoring.

REAR AXLE NOISE DIAGNOSIS

Most rear axle failures are relatively simple to locate and correct, although rear axle noise is a little more difficult to diagnose and make the necessary repairs. The most essential part of rear axle service is proper diagnosis of the problem.

All rear axles are noisy to a certain degree. Gear noise is usually associated with older axles, but this is not always true. New axles can also be noisy if they are not properly adjusted or lack lubrication. Usually when new improperly set gears are noisy; the disturbing noise cannot be "adjusted out" once the gears are broken in. Recent experience has shown that axle gears can often be readjusted to reduce excessive gear noise, if they have been operated at normal break-in speeds for less than 500 miles. Regardless of what you've heard to the contrary, noisy gears will not get quieter with added mileage . . . they will stay the same or get worse.

Slight axle noise heard only at certain speeds or under remote conditions must be considered normal. Axle noise tends to "peak" at varying speeds and the noise is in no way indicative of trouble in the axle.

If axle noise is present in an objectionable form, loud or at all speeds, an effort should be made to isolate the noise as being in one particular unit of the vehicle. Many noises, reported as coming from the rear axle actually originate from other sources such as tires, road surfaces, wheel bearings, engine, transmission, exhaust, propeller shaft vibration, universal joint noise or body drumming. A thorough and careful check should be made to determine the source of the noise before any disassembly and teardown of the rear axle is attempted.

The complete isolation of noise in any one unit requires considerable skill and previous experience. Eliminating certain type noises often baffle even the most experienced personnel. Often such practices as raising tire pressures to eliminate tire noise, listening for the noise at varying speeds under different load conditions such as; drive, float and coast, and under certain highway conditions, turning the steering wheel from left to right to detect wheel bearing noise, will aid even the beginner in detecting certain alleged axle noises. Axle noises normally fall into two categories: gear noise and bearing noise.

To make a good diagnostic check for rear axle noise, a thorough road test is necessary. Select a level smooth blacktop or asphalt road. This will reduce tire noise and body drumming. Drive the car far enough to thoroughly warm up the axle to normal operating temperature.

Drive the car and note speed at which noise occurs.

Then stop car and, with clutch disengaged or automatic transmission in neutral, run engine slowly up and down through engine speeds, corresponding to car speed at which noise was most pronounced, to determine if it is caused by exhaust roar, or other engine conditions. Repeat, while engaging and disengaging clutch (transmission in neutral), to determine if noise can only be isolated by removing propeller shaft and operating transmission in high).

TIRE NOISE

Tire noise is often mistaken for rear axle noise even though the noisy tires may be located on the front wheels. Tires that are unbalanced or worn unevenly or have surfaces of non-skid type design, or worn in a saw tooth fashion are usually noisy and often produce noises that seem to originate in the rear axle.

Tire noise changes with different road surfaces, but rear axle noise does not. Inflate all tires to approximately 50 pounds pressure (for test purposes only). This will materially alter noise caused by tires, but will not affect noise caused by rear axle. Rear axle noise usually ceases when coasting at speeds under 30 miles per hour; however, tire noise continues, but with lower tone, as car speed is reduced. Rear axle noise usually changes when comparing drive and coast, but tire noise remains about the same.

Distinguish between tire noise and differential noise by noting if noise varies with various speeds or sudden acceleration and deceleration; exhaust and axle noise show variations under these conditions while tire noise remains constant and is more pronounced at speeds of 20 to 30 miles per hour. Further check for tire noise by driving car over smooth pavements or dirt roads (not gravel) with tires at normal pressure. If noise is caused by tires, it will noticeably change or disappear and reappear with changes in road surface.

FRONT WHEEL BEARING NOISE

Loose or rough front wheel bearings will cause noise which may be confused with rear axle noises; however, front wheel bearing noise does not change when comparing drive and coast. Light application of brake while holding car speed steady will often cause wheel bearing noise to diminish, as this takes some weight off the bearing. Front wheel bearings may be easily checked for noise by jacking up the wheels and spinning them, also by shaking wheels to determine if bearings are loose.

Rear suspension rubber bushings and spring insulators help to dampen out rear axle noise when properly and correctly installed. Check to see that no metallic interference exists between the springs and springs hangers, shackles or "U" bolts. Metal to metal contact at those points may result in telegraphing road noise and normal axle noise which would not be objectionable if properly installed and tightened to specifications.

GEAR NOISE

Abnormal gear noise can be recognized easily because it produces a cycling tone and will be very pronounced through the speed range in which it occurs. Gear noise may be developed under one or more of the following conditions, "drive", "road load", "float" or "coast". Gear noise usually tends to peak in a narrow speed range or ranges. Gear noise is more prominent between 30 to 40 mph and 50 to 60 mph. Abnormal gear noise is quite rare and if present it usually originates from scoring of the ring and drive pinion gear as a result of insufficient or improper lubrication of the axle assembly. The differential side gears and pinions very seldom cause trouble as they are only under loads when the rear wheels travel at different speeds; such as when turning corners.

When objectionable axle noise is heard, note the driving condition and speed range. Remove the differential and carrier from the axle housing on the 8-3/4" axle. Perform a tooth contact pattern check to determine if the best possible pattern has been obtained. If pattern is found to be unacceptable, reshim and adjust to obain the best possible pattern. If after readjustment noise still persists, replace with new gear set.

PRE-DISASSEMBLY INVESTIGATION

A close examination of the rear axle assembly prior to disassembly can reveal valuable information as to the extent and type of repairs or adjustments necessary. This information coupled with the road test results will provide a basis for determining the degree of disassembly required. Since the most frequent causes of axle noise are improper backlash or differential bearing preload, or both, a few simple adjustments may be all that is necessary to correct the complaint.

Therefore, before disassembly the following checks should be made; drive gear and pinion backlash, pinion bearing preload, and tooth contact pattern and these results recorded and analyzed. It is felt that these measurements and their results will aid you in making the necessary repairs to the axle assembly.

BEARING NOISE (DRIVE PINION AND DIFFERENTIAL)

Defective or damaged bearings generally produce a rough growl or grating sound, that is constant in pitch and varies with the speed of the vehicle. This fact will allow you to diagnose between bearing noise and gear noise.

Drive pinion bearing noise resulting from defective or damaged bearings can usually be identified by a constant rough sound. Front pinion bearing noise is usually most pronounced on "coast", whereby rear pinion bearing is loudest on "drive". Pinion bearings are rotating at a higher rate of speed than the differential side bearings or the axle shaft bearings. These particular noises can be picked up best by road testing the vehicle in question on a smooth road (black top). However, extreme caution should be taken not to confuse tire noise with bearing or gear noise. If doubt should exist tire treads should be examined for irregularities that will often produce such noise.

Differential bearing noise will usually produce a constant rough tone which is much slower than the noise caused by the pinion bearings.

REAR WHEEL BEARING NOISE

Defective or damaged rear wheel bearings produce a vibration or growl which continues with car coasting and transmission in neutral. A brinneled rear wheel bearing causes a whirring noise. Spalled rear wheel bearings normally produce a noise similar to a growl, created from either flaked or pitted rollers or bearings races. Unless the damage is severe, rear axle bearing noise is seldom heard above 30 mph.

To differentiate between wheel bearings and gear noise, road test the vehicle on a smooth road (blacktop) at medium and low speed. With traffic permitting, swerve the vehicle sharply right to left. If the noise in question is caused by wheel bearings, it will usually increase when the vehicle is swerved and will probably be coming from the bearing on the loaded side. If the noise in question cannot be isolated an inspection of bearings will be necessary.

KNOCK AT LOW SPEEDS

Low speed knock is usually caused by brinneled universal joints or differential side gear hub to counterbore clearance being too great. Inspect and replace universal joint or differential case and side gear as required.

DRIVE-LINE SNAP

A snap on a sudden start, either forward or reverse, may be caused by a loose companion flange. Remove the propeller shaft and flange and reinstall 180 degrees from original position. Pinion bearing preload and pinion nut torque must be reset to original settings upon reinstallation.

BACKLASH CLUNK

Excessive clunk on acceleration and deceleration can be caused by anyone of the following items or a combination; (excessive clearance between) (1) Differential pinion shaft to differential case, (2) Axle shaft to differential side gear splines, (3) Differential side gear hub to differential case counterbore, (4) Differential side gear to pinion, (5) Worn thrust washers, (6) Drive gear backlash. Measure and inspect components and replace as required and/or adjust to proper specifications.

ENGINE AND TRANSMISSION NOISE

Sometimes noises which seem to originate in the rear axle are actually that of the engine or transmission. To diagnose which unit is actually causing the noise, observe the approximate vehicle speed and conditions under which the noise is most pronounced; stop the vehicle in a quiet place to avoid any interfering noises. With engine running and transmission in neutral, run engine slowly up and down through engine speeds corresponding to approximate car speed at which the noise was most pronounced. If a noise similar is produced in this manner it usually can be assumed that the noise was caused by the engine or transmission and not that of the rear axle.

PROPELLER SHAFT VIBRATION

Objectional vibrations at high speed (65 MPH or higher) may be caused by a propeller shaft that is out of balance or worn universal joints. Out of balance may be due to a damaged or bent shaft.

To determine whether propeller shaft is causing the vibration in question; road test the vehicle through speed range and note speed at which vibration is most pronounced. Shift transmission into lower gear range and drive car at same engine speed as when vibration was most pronounced in direct drive and note any effect on vibration.

If the vibration is still present at the same engine speed, whether in direct drive or in the lower gear, since the propeller shaft speed varies, this cannot be the fault. If the vibration decreases or is eliminated in the lower gear, then propeller shaft is at fault and should be rebalanced or replaced.

REAR AXLE ASSEMBLY 8¾" RING GEAR

INDEX

GENERAL INFORMATION

The 8-3/4" Rear Axle Assembly shown in (Fig. 1), is a semi-floating type and may be divided into four subassemblies; flanged axle drive shafts with related parts (Fig. 2.) differential with drive gear, drive pinion with carrier, and the axle housing. Servicing of the above mentioned subassemblies, with exception of the axle housing may be performed without removing the complete rear axle assembly from the vehicle.

Gear ratio identification numbers will be stamped on a metal tag and attached by means of the rear axle housing-to-carrier bolt.

Some 8-3/4" large stem differential and carrier assemblies have incorporated a collapsible spacer which bears against the inner races of the front and rear bearing. This collapsible spacer is used to establish preload on the pinion bearings.

Adjustment of pinion depth of mesh is obtained by placing a machined shim between the pinion head and the rear pinion bearing cone.

The differential bearings are larger on both the conventional and Sure-Grip Differentials and are not interchangeable with previous years bearings.

The Sure-Grip Differential is available as optional equipment in the 8-3/4" rear axle assembly. The new Sure-Grip Differential is of a two piece construction similar to the old type and is completely interchangeable with the previous type and will be serviced as a complete assembly only. Refer to the "Sure Grip Differential" Section of the Axle Group for the servicing procedure.

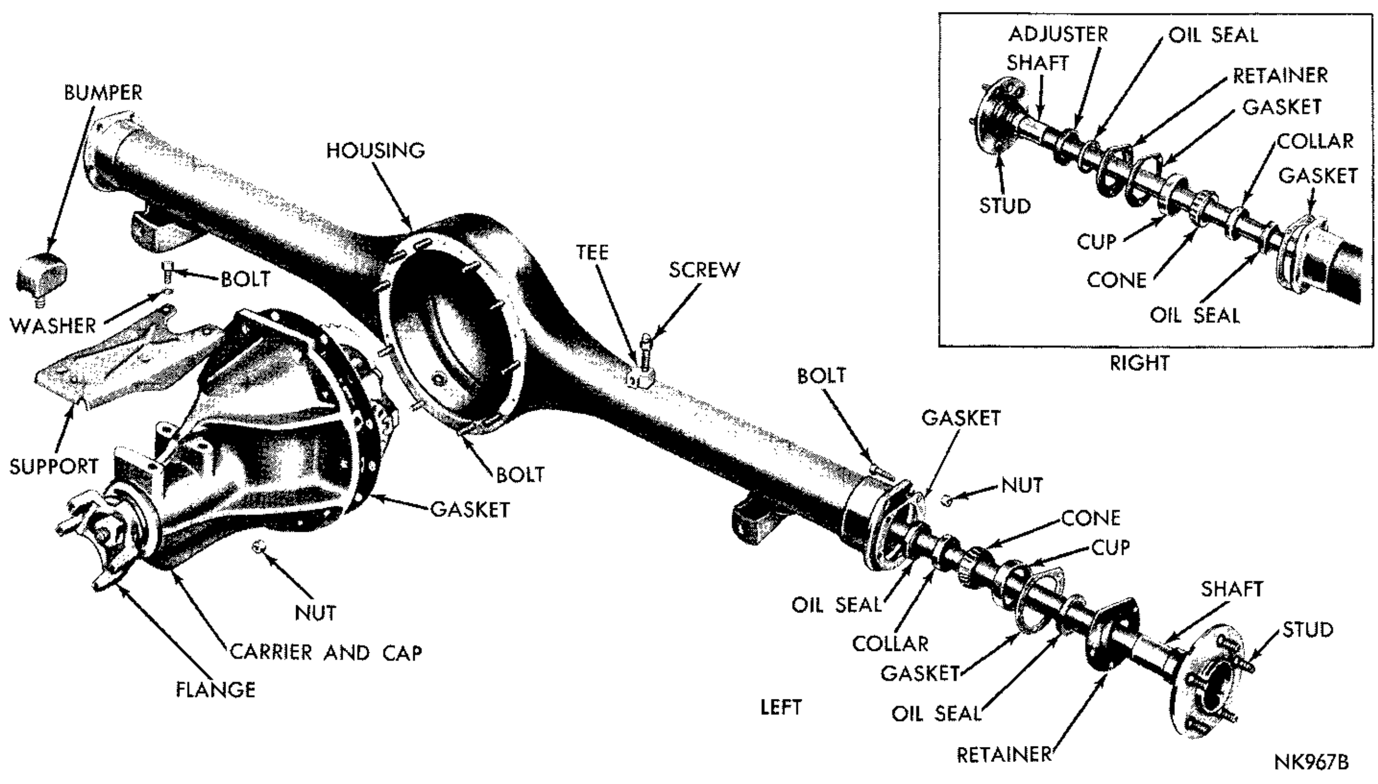


Fig. 1—8-3/4" Rear Axle Assembly

SHOULD THE REAR AXLE BECOME SUBMERGED IN WATER, THE LUBRICANT MUST BE CHANGED IMMEDIATELY TO AVOID THE POSSIBILITY OF EARLY AXLE FAILURE RESULTING FROM CONTAMINATION OF THE LUBRICANT BY WATER DRAWN INTO THE VENT.

SERVICE PROCEDURES

AXLE SHAFTS AND BEARINGS

CAUTION: It is absolutely necessary that anytime an axle assembly is serviced, and the axle shafts are loosened and removed, the axle shaft gaskets and inner axle shaft oil seals must be replaced.

The service procedures for the removal and installation of the axle shaft bearings and collars differ on the Imperial, due to a change in the material hardness of the collar. It will be necessary that this procedure be followed to assure that axle shaft is not damaged in any way during the servicing.

Removal (All models)

(1) With wheels removed, remove clips holding brake drum on axle shaft studs and remove brake drum.

(2) Using access hole in axle shaft flange, remove retainer nuts, the right shaft with threaded adjuster in retainer plate will have a lock under one of the studs that should be removed at this time.

(3) Attach axle shaft remover Tool C-3971 (Fig. 3) use Tool C-3971 and adapter SP-5168 on Imperial only, to axle shaft flange and remove axle shaft. Remove brake assembly and gaskets.

(4) Remove axle shaft oil seal from axle housing using Tool C-637 (Fig. 4).

(5) Wipe axle housing seal bore clean and install a new axle shaft oil seal using Tool C-839 (Fig. 5).

Disassembly (All Models except Imperial)

CAUTION: To prevent the possibility of damaging axle shaft seal surface, slide protective sleeve SP-5041 over the seal surface next to bearing collar.

CAUTION: Under no circumstances should axle shaft collars or bearings be removed using a torch. The use of a torch in the removal of the axle shaft collars or bearings is an unsafe practice, because heat is fed into the axle shaft bearing journal and thereby weakens this area.

(1) Position axle shaft bearing retaining collar on a heavy vise or anvil and using a chisel, cut deep grooves into retaining collar at 90° intervals (Fig. 6). This will enlarge bore of collar and permit it to be driven off of axle shaft.

(2) Remove bearing roller retainer flange by cutting off lower edge with a chisel (Fig. 7).

(3) Grind a section off flange of inner bearing cone (Fig. 8) and remove bearing rollers (Fig. 9).

(4) Pull bearing roller retainer down as far as pos-

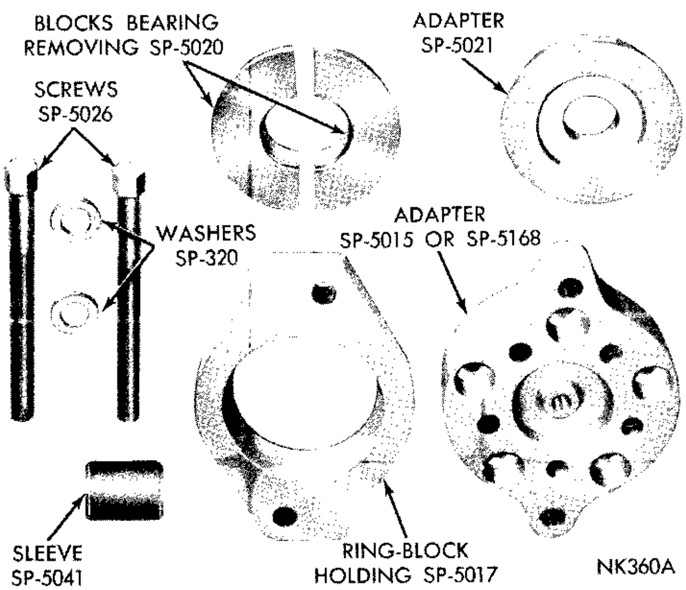


Fig. 3—Tool Set C-3971

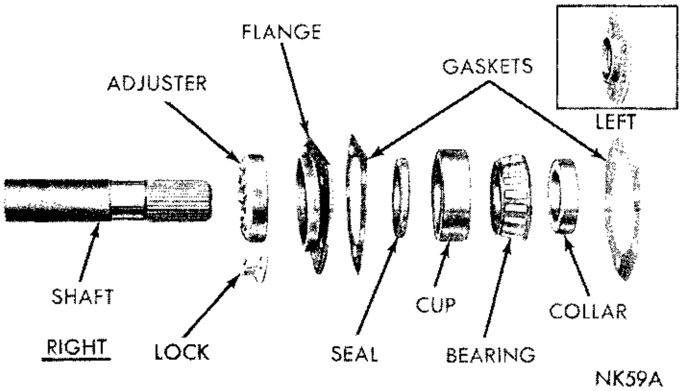


Fig. 2—Axle Shaft Disassembled

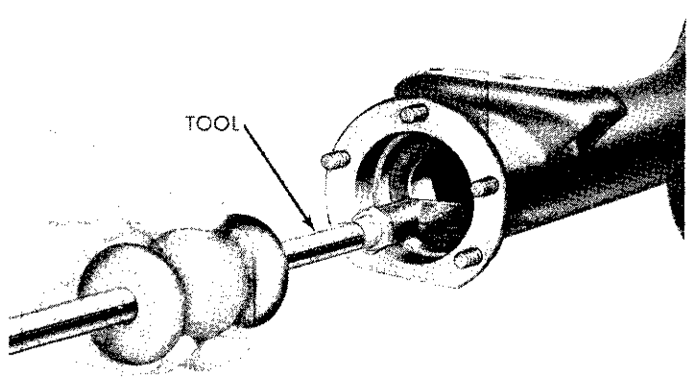


Fig. 4—Removing Axle Shaft Oil Seal

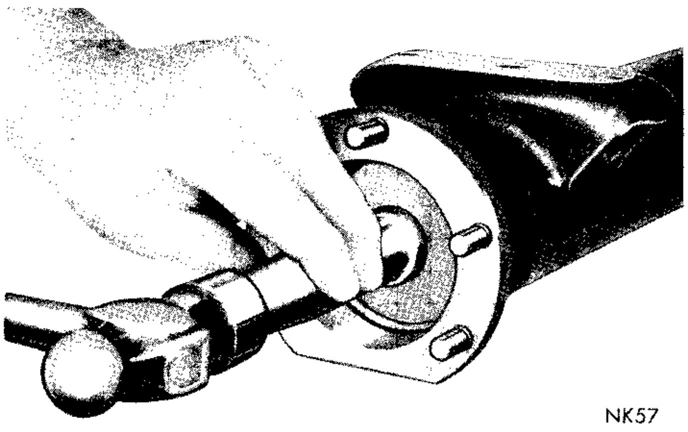


Fig. 5—Installing Axle Shaft Oil Seal

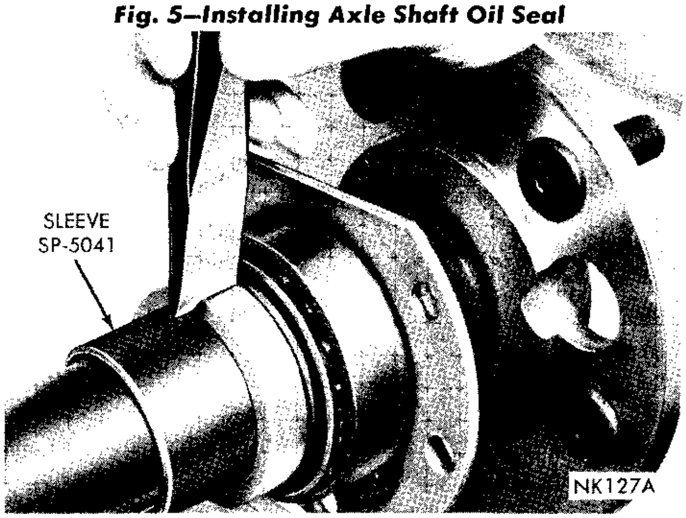


Fig. 6—Notching Bearing Retainer Collar

sible and cut with a pair of side cutters and remove (Fig. 10).

(5) Remove roller bearing cup and protective sleeve SP-5041 from axle shaft.

CAUTION: Sleeve SP-5041 should not be used as a protector for the seal journal when pressing off the bearing cone, as it was not designed for this purpose.

(6) To avoid scuffing seal journal when bearing

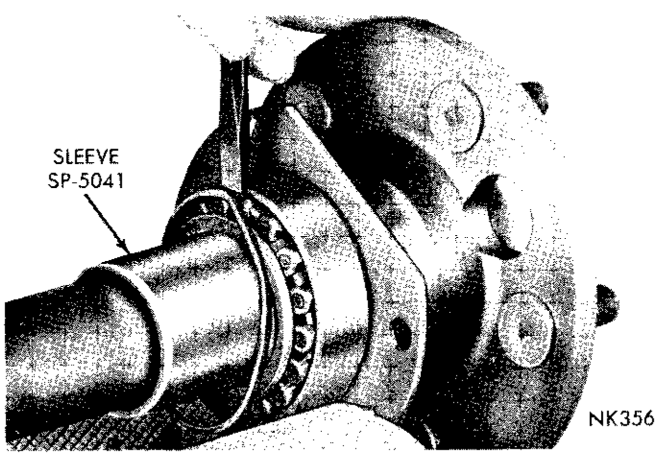


Fig. 7—Removing Roller Retainer

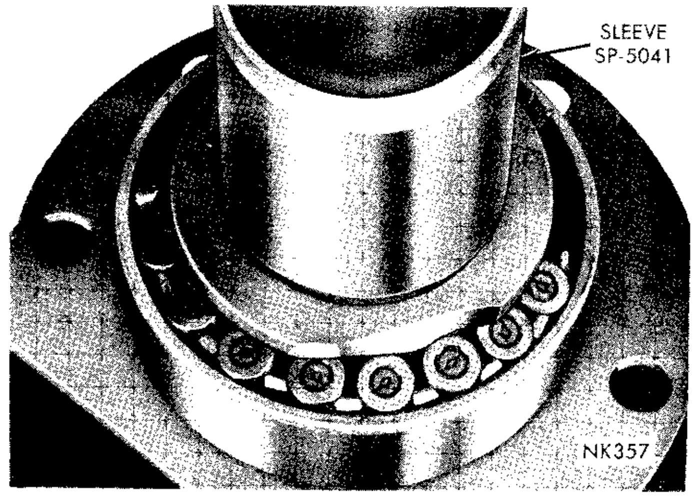


Fig. 8—Flange Ground Off Inner Cone

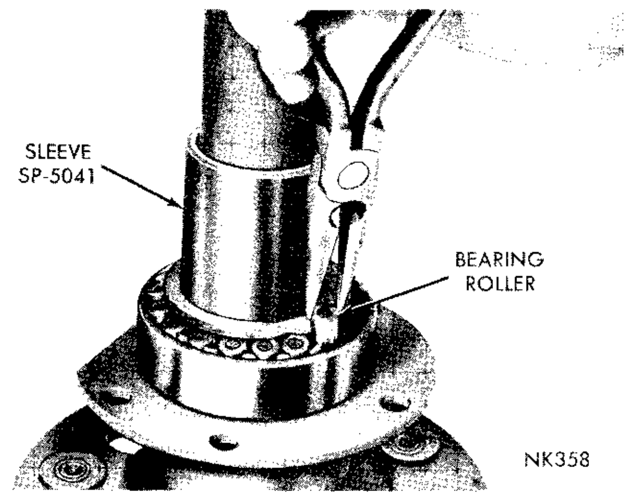


Fig. 9—Removing Bearing Rollers

cone is being removed, it should be protected by single wrap of .002 thickness shimstock held in place by a rubber band (Fig. 11).

(7) Remove the bearing cone using Tool C-3971 (Fig. 3). Tighten bolts of tool alternately until cone is removed (Fig. 12).

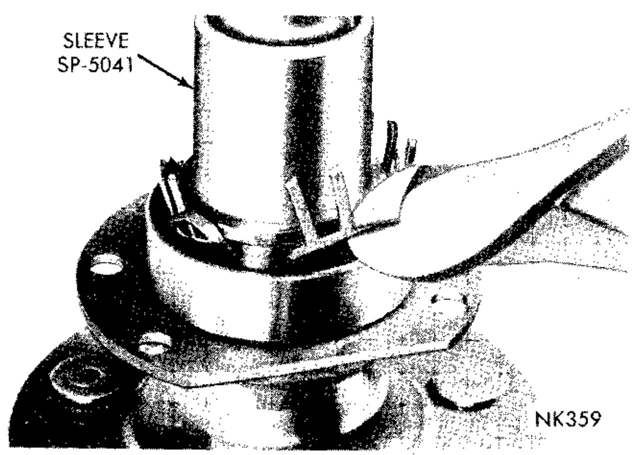


Fig. 10—Cutting Out Roller Bearing Retainer

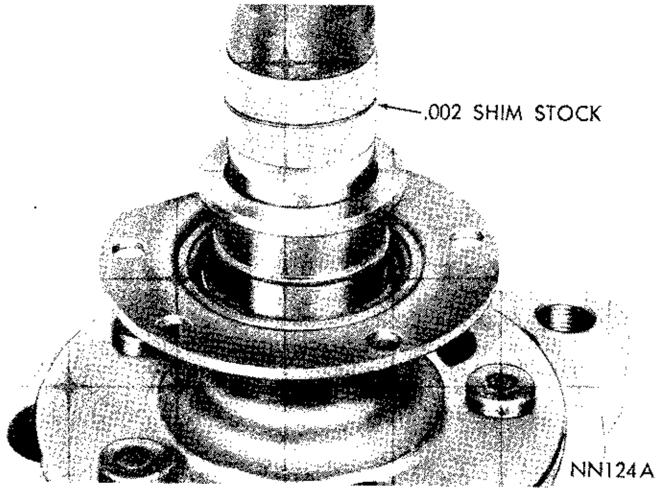


Fig. 11—Seal Journal Protection

(8) Remove seal in bearing retainer plate and replace with new seal.

Assembly

(1) Install retainer plate and seal assembly on axle shaft.

(2) Lubricate wheel bearings with Multi-Purpose Grease NLGI Grade 2 EP.

(3) Install a new axle shaft bearing cup, cone and collar on shaft using Tool C-3971 (Fig. 13) and tighten bolts of tool alternately until bearing and collar are seated properly.

(4) Inspect axle shaft seal journal for scratches and polish with #600 crocus cloth if necessary.

Disassembly (Imperial)

CAUTION: Under no circumstances should axle shaft collars or bearings be removed using a torch. The use of a torch in the removal of the axle shaft collars or bearings is an unsafe practice, because heat is fed into the axle shaft bearing journal and, thereby weakens this area.

(1) Slide protective sleeve SP-5041 over the seal surface next to bearing collar and tape in place. This will prevent the possibility of seal surface being damaged during the cutting of roller retainer, grinding of collar and inner bearing race and splitting of collar.

(2) Remove bearing roller retainer flange by cutting off lower edge with a chisel (Fig. 7).

(3) Grind axle shaft collar in one position to approximate thickness of protective sleeve SP-5041. At same time grind a portion of inner bearing race so bearing rollers can be removed (Fig. 14).

(4) Position axle shaft bearing retaining collar on a heavy vise or anvil and using a chisel, cut a groove into collar at position that you previously ground. Collar should split and, which in turn will enlarge bore and permit collar to be driven off of axle shaft.

(5) Remove bearing rollers at ground section of inner bearing race (Fig. 9).

(6) Pull bearing roller retainer down as far as possible and cut with a pair of side cutters and remove (Fig. 10).

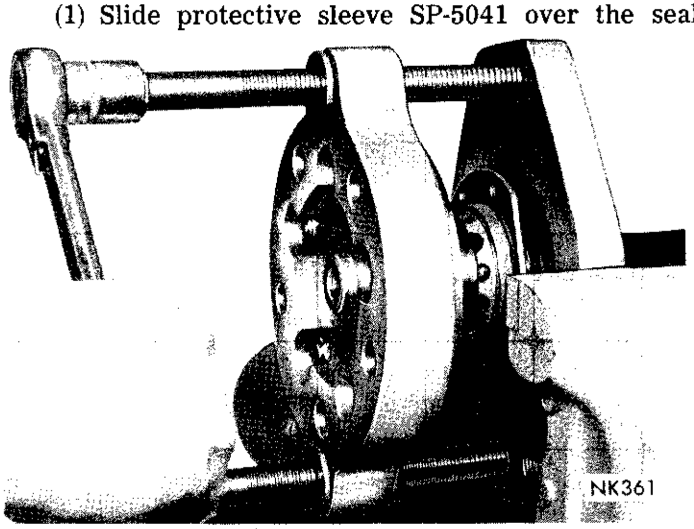


Fig. 12—Removing Bearing Cone with Tool C-3971

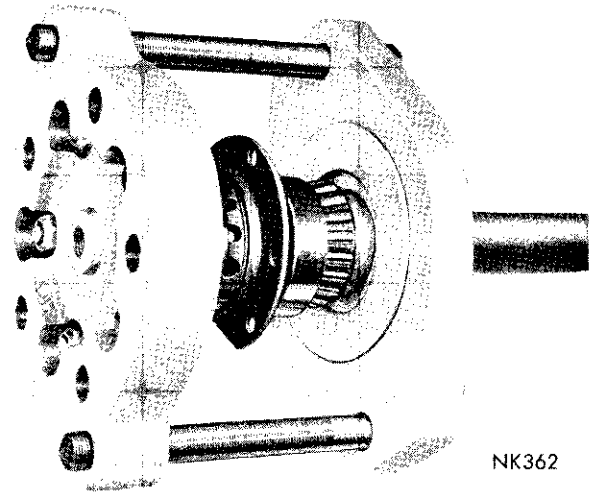


Fig. 13—Installing New Bearing and Collar

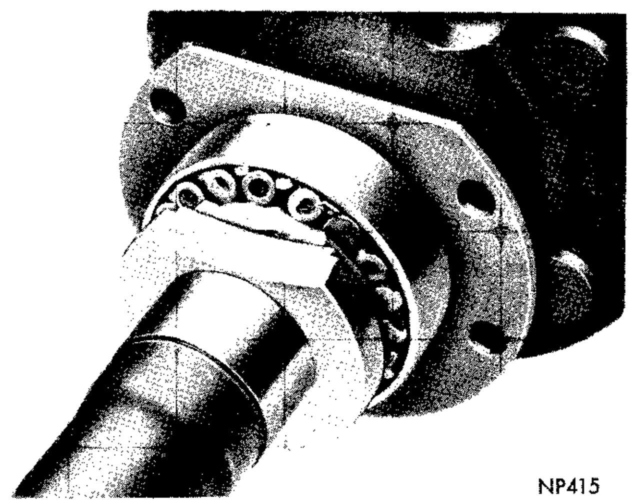


Fig. 14—Collar and Inner Race Ground Prior to Removal (Imperial)

(7) Remove roller bearing cup and protective sleeve SP-5041 from axle shaft.

CAUTION: Sleeve SP-5041 should not be used as a protector for the seal journal when pressing off the bearing cone, as it was not designed for this purpose.

(8) To avoid scuffing seal journal when bearing cone is being removed, it should be protected by a single wrap of .002 thickness shimstock held in place by a rubber band (Fig. 11).

(9) Remove bearing cone using Tool C-3971 and adapter SP-5168. Tighten bolts of tool alternately until cone is removed (Fig. 12).

(10) Remove seal in bearing retainer plate and replace with new seal.

Assembly (Imperial)

(1) Install retainer plate and seal assembly on axle shaft.

(2) Lubricate wheel bearings with Multi-Purpose Grease NLGI Grade 2 E.P. or equivalent.

(3) Install a new axle shaft bearing cup, cone on axle shaft using Tool C-3971 and adapter SP-5168 (Fig. 13) and tighten bolts of tool alternately until bearing is seated properly. Repeat same step for installing the collar.

(4) Inspect axle shaft seal journal for scratches and polish with #600 crocus cloth if necessary.

Installation

(1) Clean axle housing flange face and brake support plate thoroughly. Install a new rubber asbestos gasket on axle housing studs, followed by brake support plate assembly on left side of axle housing.

(2) Apply a thin coating of Multi-Purpose Grease, NLGI Grade 2 E.P. or equivalent to the outside diameter of the bearing cup prior to installing in the bearing bore. This operation is necessary as a corrosion preventative.

(3) Install foam gasket on the studs of axle housing and carefully slide axle shaft assembly through oil seal and engage splines in differential side gear.

(4) Tap end of axle shaft lightly with a nonmetallic mallet to position axle shaft bearing in housing bearing bore. Position retainer plate over axle housing studs. Install retainer nuts and tighten 30-35 foot-pounds. Start by tightening bottom nut.

(5) Repeat step (1) for right side of axle housing.

(6) Back off threaded adjuster of right axle shaft assembly until inner face of adjuster is flush with inner face of retainer plate. Carefully slide axle shaft assembly through oil seal and engage splines in differential side gears.

(7) Repeat step (4).

AXLE SHAFT END PLAY

CAUTION: When setting axle shaft end play, both rear wheels must be off the ground, otherwise a false end play setting will occur.

(1) Using a dial indicator mounted on the left brake support (Fig. 15), TURN THE ADJUSTER CLOCKWISE UNTIL BOTH WHEEL BEARINGS ARE SEATED AND THERE IS ZERO END PLAY IN THE AXLE SHAFTS. BACK OFF THE ADJUSTER COUNTERCLOCKWISE APPROXIMATELY FOUR NOTCHES TO ESTABLISH AN AXLE SHAFT END PLAY OF .008-.018 INCH.

(2) Tap end of left axle shaft lightly with a nonmetallic mallet to seat right wheel bearing cup against adjuster, and rotate axle shaft several revolutions so that a true end play reading is indicated.

(3) Remove one retainer plate nut, install adjuster lock. If tab on lock does not mate with notch in adjuster, turn adjuster slightly until it does. Install nut and tighten 30-35 foot-pounds.

(4) Recheck axle shaft end play. If it is not within the tolerance of .008-.018 inch, then repeat adjustment procedure.

(5) Remove dial indicator and install brake drum, drum retaining clips and wheel.

REAR AXLE HOUSING

Removal

(1) Raise vehicle and support body at front of rear springs.

(2) Block brake pedal in the up position using a wooden block.

(3) Remove rear wheels.

(4) Disconnect hydraulic brake hose at connection on left side of underbody.

(5) Disconnect parking brake cable.

To maintain proper drive line balance when reassembling, make scribe marks on the propeller shaft universal joint and the pinion flange before removal.

(6) Disconnect propeller shaft at differential yoke

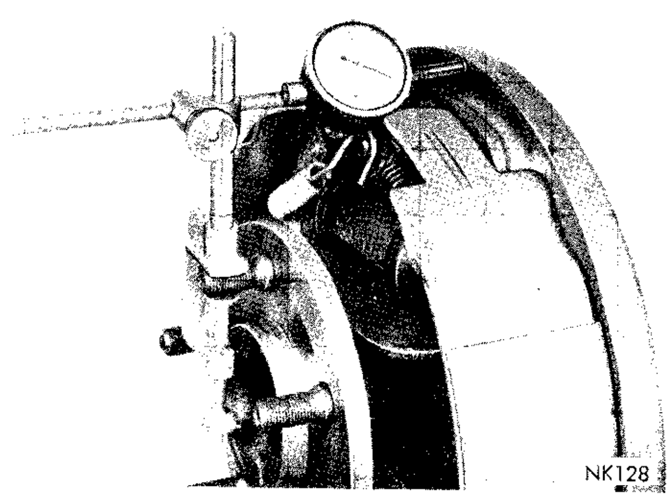


Fig. 15—Measuring Axle Shaft End Play

and secure in an upright position to prevent damage to front universal joint.

(7) Remove shock absorber from spring plate studs and loosen rear spring "U" bolt nuts and remove "U" bolts.

(8) Remove the assembly from vehicle.

Installation

(1) With body of vehicle supported at front of rear springs, position the rear axle assembly spring seats over the spring center bolts.

(2) Install spring "U" bolts and tighten nuts to 45 foot-pounds and install shock absorbers on spring plate studs. (DO NOT OVER TIGHTEN "U" BOLT NUTS.)

(3) Install propeller shaft (match scribe marks on propeller shaft universal joint and pinion flange). Tighten clamp screws to 15 foot-pounds.

(4) Connect parking brake cable.

(5) Connect hydraulic brake hose, bleed and adjust brakes.

(6) Install rear wheels.

(7) If carrier was removed from axle housing during the removal operation, fill axle with proper amount and type of lubricant; see "Specifications" in Lubrication section Group "0".

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

DIFFERENTIAL AND CARRIER

Removal

(1) Remove flanged axle drive shafts.

(2) Disconnect rear universal joint and support propeller shaft up and out of the way to prevent damage to the front universal joint.

(3) Remove the rear axle lubricant.

(4) Loosen and remove the carrier-to-housing attaching nuts and lift the carrier assembly from axle housing.

Disassembly

Side play and runout check taken during disassembly will be very useful in reassembly.

(1) Mount carrier in Stand DD-1014 and attach dial indicator Tool C-3339 to differential carrier flange in a position so pointer of indicator squarely contacts back face of ring gear (Fig. 16). With a screw driver positioned between bearing cap and differential case flange, then using a prying motion determine if side play is present. If side play is evident, remove adjuster lock and loosen adjuster slightly and retighten adjuster sufficiently to eliminate side play.

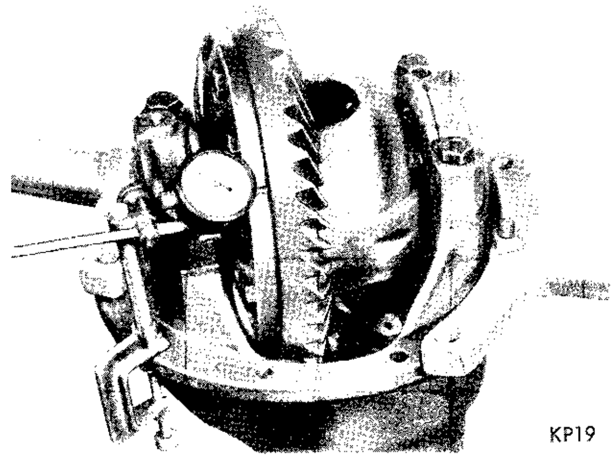


Fig. 16—Checking for Runout and Zero End Play

(2) Rotate drive gear several complete revolutions while noting total indicator reading. Mark drive gear and differential case at point of maximum runout. The marking of differential case will be very useful later in checking differential case runout. Total indicator reading should be no more than .005 inch. If runout exceeds .005 inch the differential case may be damaged, and a second reading will be required after drive gear has been removed. This operation is covered during "Differential Disassembly". Remove dial indicator.

(3) With Tool C-3281 hold companion flange and remove drive pinion nut and Belleville washer.

(4) Install companion flange remover Tool C-452 and remove flange (Fig. 17).

(5) Using a screwdriver and hammer, remove the drive pinion oil seal from the carrier.

(6) While holding one hand over nose end of carrier, invert carrier in stand. The front pinion bearing cone, shim pack and bearing spacer (where used) will drop from carrier.

(7) Apply identifying punch marks on differential bearing pedestals of carrier, differential bearing caps and bearing adjusters for reassembly purposes (Fig. 18).

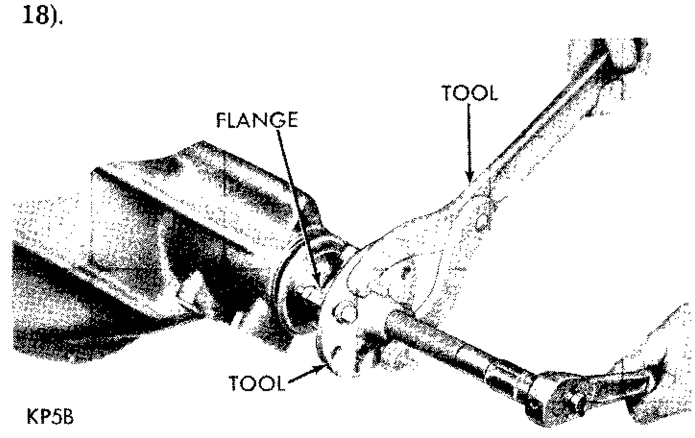


Fig. 17—Removing Companion Flange

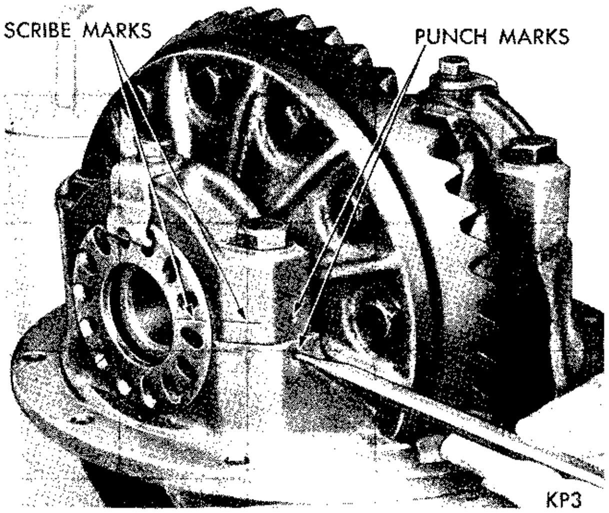


Fig. 18—Marking Bearing Caps and Adjusters

(8) Remove both differential bearing adjuster lock screws and locks.

(9) With a 3/4 inch socket, loosen bearing cap bolts (one on each side) and back off bearing adjusters slightly using spanner wrench Tool C-406A; to remove differential bearing preload. Remove bearing cap bolts, caps and bearing adjusters.

(10) Remove differential and ring gear assembly with bearing cups. Differential bearing cups must be kept with respective bearing cones.

(11) Remove drive pinion and rear bearing assembly from carrier.

Rear Pinion Bearing Removal

(1) Remove drive pinion rear bearing from large stem pinion with Tool C-293 and four (4) No. 37 plates (Fig. 19).

(2) Using a flat end brass drift, remove front and rear pinion bearing cups.

DIFFERENTIAL CASE

Disassembly

(1) Mount differential case and ring gear assembly in a vise equipped with soft jaws (brass).

(2) Remove drive gear bolts. BOLTS ARE LEFT HAND THREAD. With a non-metallic hammer, tap drive gear loose from differential case pilot and remove.

(3) If drive gear runout exceeded .005 inch in step 2 (under "Carrier Disassembly"), recheck the case as follows: Install differential case and respective bearing cups in carrier.

(4) Install bearing caps, cap bolts and bearing adjusters. Tighten bearing cap bolts down lightly and screw in both adjusters with spanner wrench Tool C-406A.

(5) Tighten cap bolts and adjusters sufficiently to prevent any side play in bearings.

(6) Attach a dial indicator Tool C-3339 to carrier flange so pointer of indicator squarely contacts drive gear surface of differential case flange between outer edge flange and drive gear bolt holes (Fig. 20).

(7) Rotate differential case several complete revolutions while noting total indicator reading. This reading must not exceed .003 inch runout. If runout is in excess of .003 inch, differential case must be replaced. **In a case where the runout does not exceed .003 inch it is often possible to reduce the runout by positioning the drive gear 180° from point of maximum runout when reassembling drive gear on differential case.**

(8) With a flat nose drift and hammer, remove differential pinion shaft lock pin from back side of drive gear flange. (The hole is reamed only part way through, making it necessary to remove lock pin from one direction.)

(9) With a brass drift and hammer, remove differential pinion shaft and axle drive shaft thrust block.

(10) Rotate differential side gears until each differential pinion appears at large opening of case.

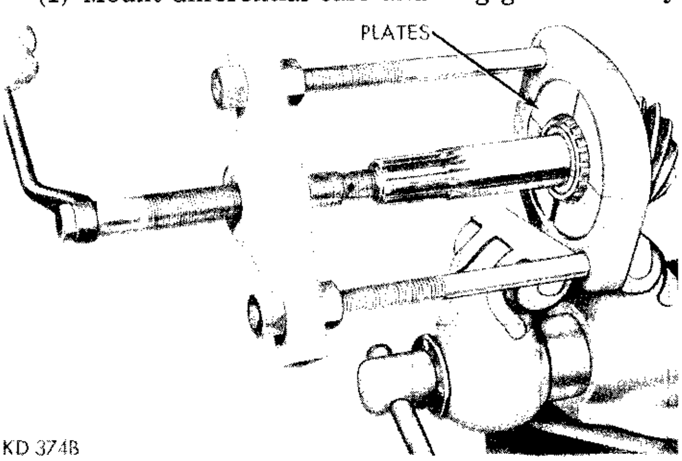


Fig. 19—Removing Drive Pinion Rear Bearing

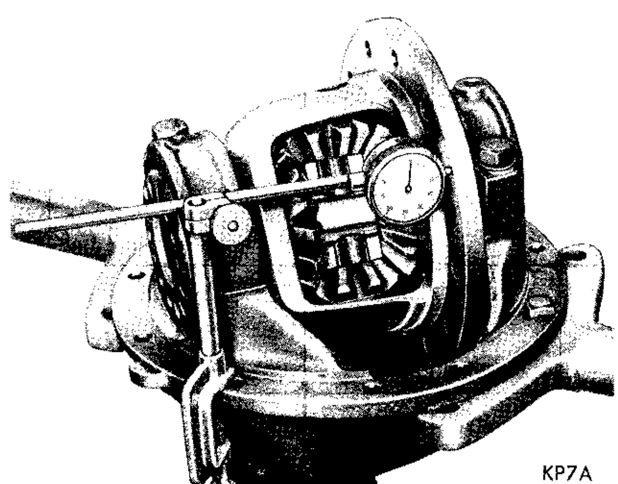


Fig. 20—Checking Drive Gear Mounting Flange Face Runout

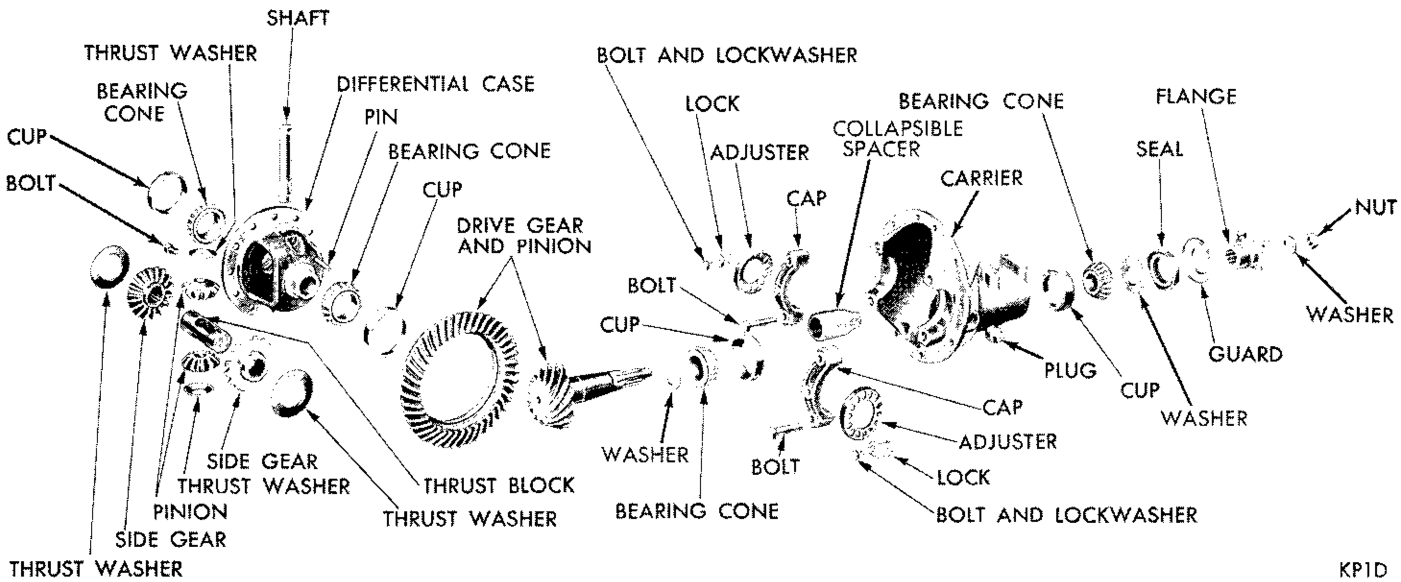


Fig. 21—Differential Carrier Assembly (Large Stem Tapered Pinion)

Remove each pinion and thrust washer at that time.

(11) Remove both differential side gears and thrust washers.

Cleaning and Inspection (Fig. 21)

(1) Clean all parts in a fast evaporating mineral spirits or a dry cleaning solvent and with the exception of bearings, dry with compressed air.

(2) Inspect differential bearing cones, cups and rollers for pitting, spalling or other visible damage. If replacement is necessary, remove bearing cones from differential case with Tool C-293 and adapter plates No. 43 (Fig. 22).

(3) Inspect differential case for elongated or enlarged pinion shaft hole. The machined thrust washer surface areas and counterbores must be smooth and without metal deposits or surface imperfections. If any of the above conditions exist, satisfactory correction must be made or the case replaced. Inspect case for cracks or other visible damage which might render it unfit for further service.

(4) Inspect differential pinion shaft for excessive wear in contact area of differential pinions. Shaft should be smooth and round with no scoring or metal pickup.

(5) Inspect differential side gears and pinions, they should have smooth teeth with a uniform contact pattern without excessive wear or broken surfaces. The differential side gear and pinion thrust washers should be smooth and free from any scoring or metal pickup.

(6) Inspect axle shaft thrust block for excessive wear or visible damage. The wear surface on the opposite ends of the blocks, must be smooth.

(7) Inspect differential pinion shaft lock pin for damage or looseness in case. Replace pin or case as necessary.

(8) Inspect drive gear and pinion for worn or chipped teeth or damaged attaching bolt threads. If replacement is necessary, replace both the drive gear and drive pinion as they are available in matched sets only.

(9) Inspect drive pinion bearing cones, cups and rollers for pitting, spalling, excessive wear, or other

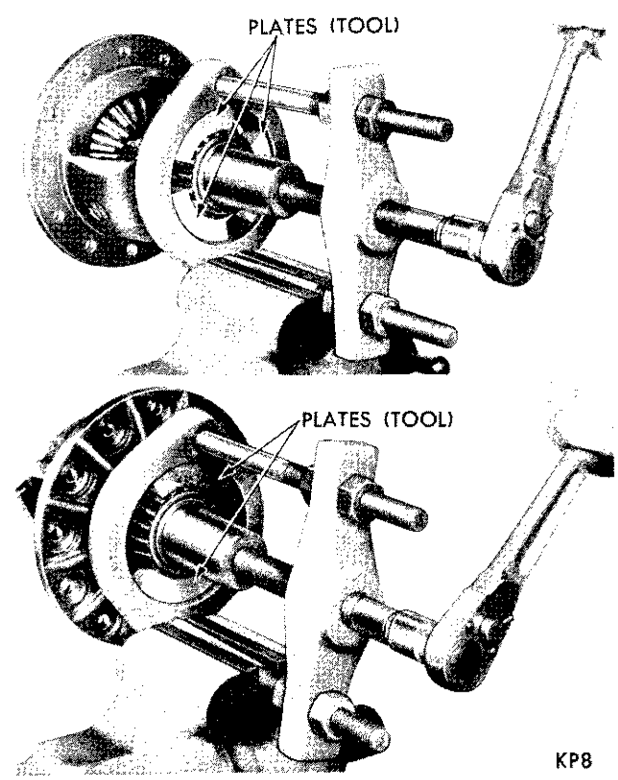


Fig. 22—Removing Differential Bearings

visible damage. If inspection reveals that either are unfit for further service, replace both cup and cone.

(10) Inspect differential carrier for cracks or other visible damage which would render it unfit for further service. Raised metal on the shoulder of bearing cup bores incurred in removing pinion cups should be flattened by use of a flat nose punch.

(11) Inspect drive pinion for damaged bearing journals and mounting shim surface or excessively worn splines. If replacement is necessary, replace both the drive pinion and drive gear as they are available in matched sets only.

(12) Inspect companion flange for cracks, worn splines, pitted, rough or corroded oil seal contacting surface. Repair or replace companion flange as necessary.

ASSEMBLY

LUBRICATE ALL PARTS BEFORE ASSEMBLY WITH LUBRICANT AS SPECIFIED IN (LUBRICATION GROUP "0")

(1) Install thrust washers on differential side gears and position gears in case.

(2) Place thrust washers on both differential pinions and through large window of differential case, mesh the pinion gears with the side gears, having pinions exactly 180 degrees opposite each other.

(3) Rotate side gears 90 degrees to align pinions and thrust washers with differential pinion shaft holes in case.

(4) From pinion shaft lock pin hole side of case, insert slotted end of pinion shaft through case, and the conical thrust washer, and just through one of the pinion gears.

(5) Install thrust block through side gear hub, so that slot is centered between the side gears.

(6) While keeping all of these parts in proper alignment, push pinion shaft into case until locking pin hole in pinion shaft is in exact alignment with its respective hole in case. Install pinion shaft lock pin through hole in case from pinion shaft side of drive gear flange. **The contacting surfaces of the drive gear and differential case flange must be clean and free of all burrs.**

(7) Using an Arkansas stone, relieve the sharp edge of the chamfer on the inside diameter of the ring gear (Fig. 23). **This is very important otherwise during the installation of ring gear on differential case, the sharp edge will remove metal from the pilot diameter of case and can get imbedded between differential case flange and gear; causing gear not to seat properly.**

(8) Position drive gear on differential case pilot, aligning threaded holes of drive gear with those in differential case flange.

(9) Insert drive gear screws (LEFT HAND THREADS) through case flange and into drive gear.

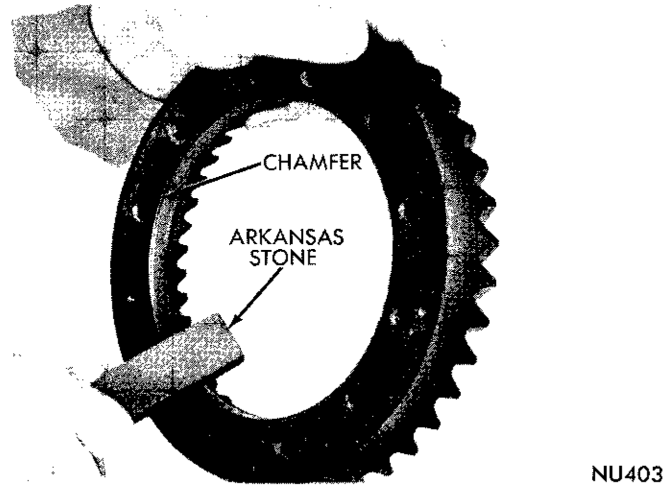


Fig. 23—Stoning Chamfer on Ring Gear

After all cap screws are properly started, tap drive gear against differential case flange with a non-metallic mallet.

(10) Position unit between brass jaws of a vise and alternately tighten each cap screw to 55 foot-pounds.

(11) Position each differential bearing cone on hub of differential case (taper away from drive gear) and with installing Tool C-4086 install bearing cones. An arbor press may be used in conjunction with installing tool.

CAUTION: Never exert pressure against the bearing cage, since this would damage the bearing.

PINION BEARING CUP INSTALLATION

(1) Position pinion bearing cups squarely in bores of carrier. Assemble Tool C-758-D4 (Fig. 24) by placing spacer SP-5387 followed by rear pinion bearing cone over main screw of tool and inserting it into carrier from gear side.

(2) Place front pinion bearing cone over main

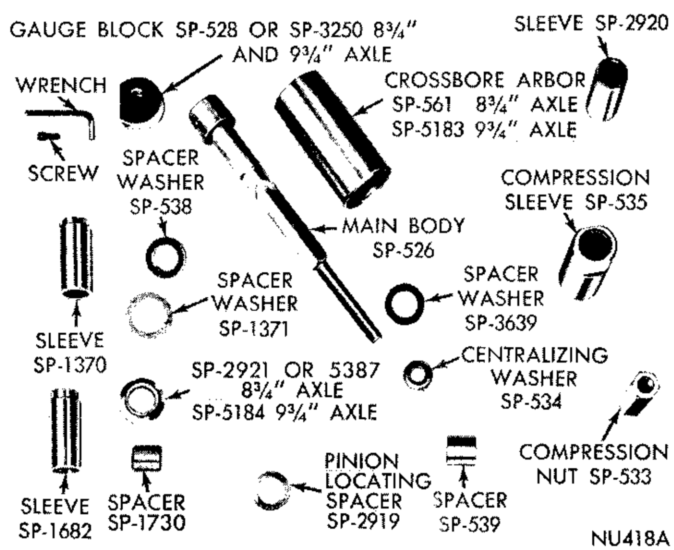


Fig. 24—Rear Axle Setting Gauge Tool C-758-D4

screw of tool followed by compression sleeve SP-535, centralizing washer SP-534, and main screw nut SP-533. Hold compression sleeve with the companion flange holding Tool C-3281 and tighten nut (Fig. 25) allowing tool to rotate as nut is being tightened in order not to brinnel bearing cone or cups. **Do not remove tool after installing cups.**

PINION BEARING PRELOAD AND DEPTH OF MESH SETTING USING TOOL C-758-D4

The 8-3/4″ large stem differential and carrier assembly has incorporated a collapsible spacer which bears against the inner races of the front and rear bearings. This collapsible spacer is used to establish pinion bearing preload. The large stem pinion requires the depth of mesh adjustment first while pinion bearing preload is the last operation performed.

The position of the drive pinion with respect to the drive gear (depth of mesh) is determined by the location of the bearing cup shoulders in the carrier and by the portion of the pinion in back of the rear bearing. The thickness of the rear pinion bearing mounting shim suitable for the carrier can be determined by using Tool C-758-D4.

DEPTH OF MESH (Large Stem Pinion)

Inspect differential bearing cups and cones, carrier for grit and dirt or other foreign material. Clean all parts in fast evaporating mineral spirits or a dry cleaning solvent and with the exception of bearing cones, dry with compressed air. **Front Pinion Bearing Cone and Cup Must Never Be Reused Under Any Circumstances.**

(1) Assemble spacer SP-5387 to main section of tool followed by spacer SP-1730. Install rear pinion bearing cone over spacer SP-1730 and against spacer SP-5387 (Fig. 26).

(2) Insert assembly into carrier and install front pinion bearing cone over tool shaft and in its proper position in bearing cup. Install tool spacer, tool thrust washer and tool nut on shaft.

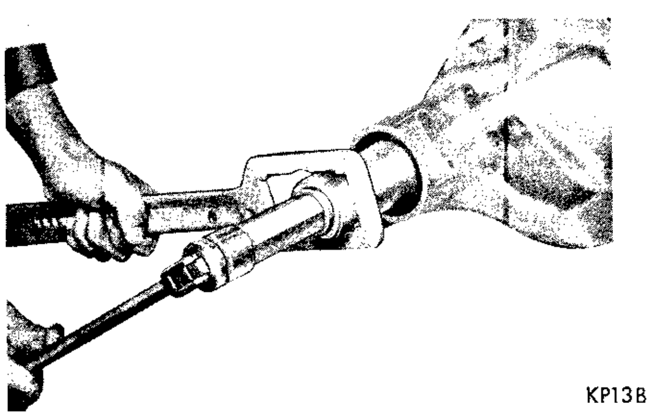


Fig. 25—Seating Bearing Cup in Carrier Housing

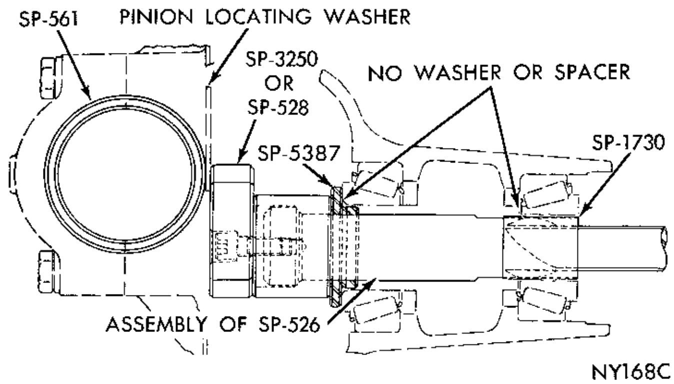


Fig. 26—Tool C-758-D4 Installed in Housing (8-3/4 Large Stem Pinion)

(3) With nose of carrier up, place flange holding Tool C-3281 on compression sleeve. Allow assembly to rotate while tightening nut to not more than 25-50 foot-pounds. **Always make sure bearing cones are lubricated with hypoid gear lubricant.**

(4) Turn tool several complete revolutions in both directions to permit bearing rollers to seat. After bearing rollers are properly seated, check bearing preload by rotating tool with an inch-pound torque wrench. The correct bearing preload should be from 20-30 inch-pounds for new bearings.

(5) With proper bearing preload set, invert carrier in stand and install gauge block SP-528 or SP-3250 to the main screw attaching it with Allen screw securely (Fig. 27). The flat portion of gauge block should be facing differential bearing pedestals.

(6) Position tool arbor SP-561 in differential bearing pedestals of carrier (Fig. 28). Center the arbor so that an approximate equal distance is maintained at both ends. Position differential bearing caps and attaching bolts on carrier pedestals, and insert a piece

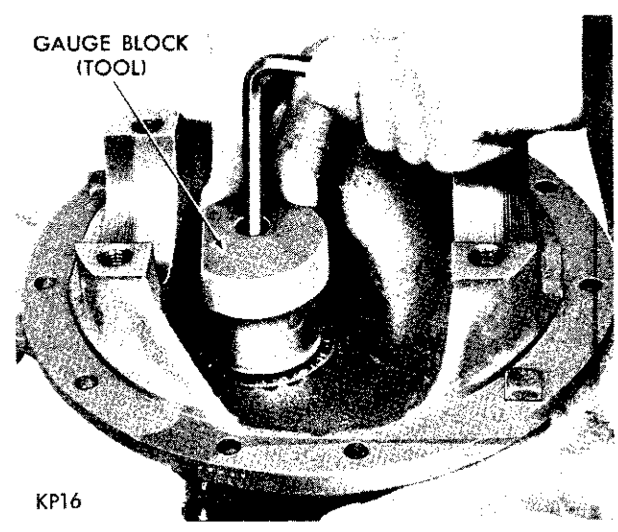


Fig. 27—Installing Gauge Block on Tool

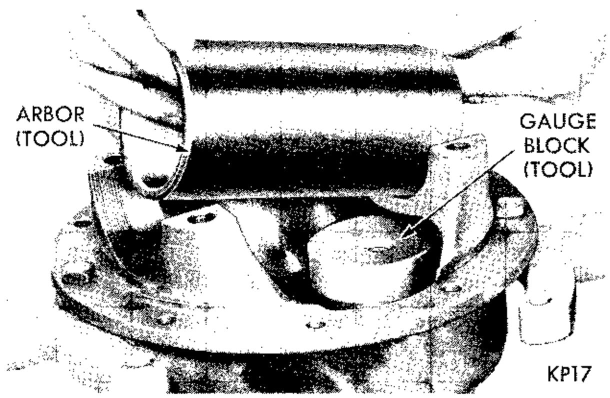


Fig. 28—Installing Arbor in Carrier

of .002 inch shim stock between arbor and each cap. Tighten cap bolts to 10 foot-pounds.

(7) Select a rear pinion bearing mounting shim which will fit between cross arbor and gauge block. This fit must be snug but not too tight (similar to the pull of a feeler gauge. (Fig. 29). This shim is then used in determining the correct thickness shim for installation.

(8) To select a shim for installation, read the marking on end of pinion head (—0, —1, —2, +1, +2, etc). When marking is —, (minus) add that amount to the thickness of shim selected in step (7). When the marking is + (plus), subtract that amount. Example: With a shim .036 inch thick and a pinion marked —2, install a shim .038 inch thick (.036 + .002 = .038). Example: With a shim .036 inch thick and a pinion marked +2, install a washer .034 inch thick, (.036 — .002 = .034) or when a shim .036 inch thick is too loose and .038 inch too thick, use .036 inch shim. Treat other pinion markings in a similar manner. Shims are available in one thousands of an inch increments.

(9) Remove differential bearing caps and remove tool arbor from carrier.

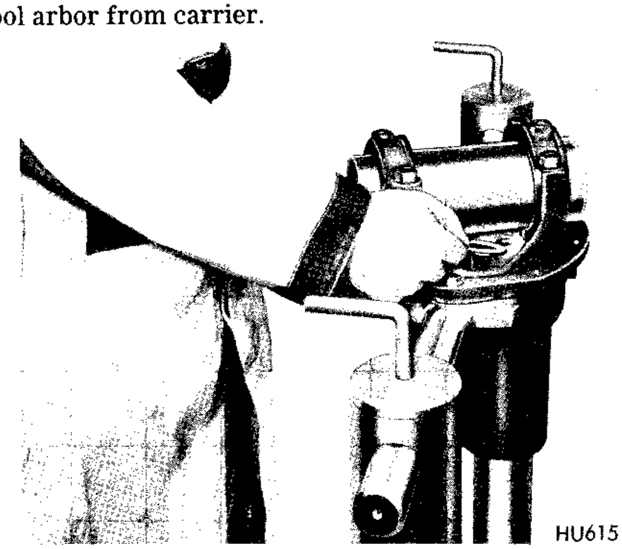


Fig. 29—Determining Spacer Thickness

(10) Reverse carrier in stand so nut of tool is in upright position. Loosen compression nut, and support lower portion of tool in carrier with one hand, remove tool nut, centering washer and compression sleeve. Lower tool down and out of carrier.

(11) Remove front pinion bearing cone from carrier housing.

(12) With stem of drive pinion facing up, add rear pinion bearing mounting shim you selected on pinion stem.

PINION BEARING PRELOAD (Large Stem Pinion)

(1) Position rear pinion bearing cone on pinion stem (small side away from pinion head). Make certain that the contacting surfaces of selected shim, rear bearing cone and pinion head are perfectly clean and free of any foreign particles.

(2) Lubricate front and rear pinion bearing cones with hypoid gear lubricant. Install rear pinion bearing cone onto pinion stem, using Tool C-3095, press bearing cone into place. An arbor press may be used in conjunction with tool.

(3) Insert drive pinion and bearing assembly up through carrier and install collapsible spacer followed by front pinion bearing cone on pinion stem. Install companion flange using Tool C-496 or DD-999 and holding Tool C-3281. This is necessary in order to properly install front pinion bearing cone on stem due to interference fit. Remove tool from pinion stem. **CAUTION:** During the installation of the front pinion bearing be careful not to collapse the spacer.

(4) Apply a light coat of sealer in seal bore of carrier casting and install drive pinion oil seal into carrier using Tool C-4109 or C-3980 (double lip synthetic rubber oil seal) or Tool C-3656 (single lip leather oil seal). The proper tool must be used in order to position the seal the proper depth into the carrier casting.

(5) With pinion supported in carrier, install anticlang washer on pinion stem. Install companion flange with installing Tool C-496 or DD-999 and holding Tool C-3281.

(6) Remove tools and install Belleville washer (convex side of washer up) and pinion nut.

(7) Hold universal joint flange with holding Tool C-3281 and tighten pinion nut to remove end play in pinion, while rotating the pinion to insure proper bearing seating.

(8) Remove holding tool and rotate pinion several complete revolutions in both directions to permit bearing rollers to seat.

(9) Tighten pinion nut to 170 foot-pounds and measure pinion bearing preload by rotating pinion using an inch-pound torque wrench. The correct preload specifications are 20-35 inch-pounds for new bear-

ings or 10 inch-pounds over the original if the old rear pinion bearing is being reused. Correct bearing preload readings can only be obtained with nose of carrier in upright position. Continue tightening of pinion nut in small increments and checking pinion bearing preload until proper preload is obtained. Bearing preload should be uniform during **complete** revolution. A preload reading that varies during rotation indicates a binding condition which has to be corrected. The assembly is unacceptable if final pinion nut torque is below 170 foot-pounds or pinion bearing preload is not within the correct specifications.

NOTE: UNDER NO CIRCUMSTANCES SHOULD THE PINION NUT BE BACKED OFF TO LESSEN PRELOAD. IF THIS IS DONE A NEW COLLAPSIBLE SPACER MUST BE INSTALLED AND NUT RETIGHTENED UNTIL PROPER PRELOAD IS OBTAINED.

DEPTH OF MESH (Without Using Tool C-758-D4)

If the differential assembly was satisfactorily quiet before being disassembled, the drive pinion must be assembled with new pinion bearings. If replacement parts are installed, a complete readjustment is necessary; the proper thickness shim must be selected and installed. The drive gear and pinion are manufactured and lapped in matching sets and are available in matched sets only. The adjustment position in which the best tooth contact is obtained is marked on the end of the pinion head.

To obtain the proper pinion setting in relation to the drive gear, the correct thickness mounting shim must be selected before the drive pinion is installed in the carrier. The pinion bearing mounting shims are available in one thousands increments from .020-.038 inch. To select the proper thickness shim, proceed as follows: It will be noted that the head of the drive pinion is marked with a plus (+) or minus (—) sign followed by a number ranging from 1 to 4, or zero (0) marking.

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

Pinion Bearing Preload (Large Stem)

After selecting the correct pinion bearing mounting shim and installing it behind the rear pinion bearing cone proceed as follows: Install the pinion assembly into the carrier. Install the new collapsible spacer followed by new front pinion bearing cone on pinion stem. Press front pinion bearing cone on pinion stem, being careful not to collapse the spacer.

Apply a light coat of sealer to drive pinion oil seal and carrier casting bore and install drive pinion oil seal with Tool C-4109 or C-3980 (synthetic rubber seal or Tool C-3656 (leather seal). Install anti-clang washer and universal joint flange, Belleville washer (convex side of washer up) and nut. Tighten the pinion nut to 170 foot-pounds and using an inch-pounds torque wrench rotate the pinion to determine preload. The correct preload specifications are 20-30 inch-pounds for new bearings or 10 inch-pounds over the original if the old rear pinion bearing is being reused. If preload is not correct, continue to tighten pinion nut in small increments and checking preload until preload on pinion bearings is correct. A minimum of 170 foot-pounds of torque is required on pinion nut. **Under no circumstances should the pinion nut be backed off to lessen preload. If this is done a new pinion bearing collapsible spacer must be installed and nut retightened until proper preload is obtained.**

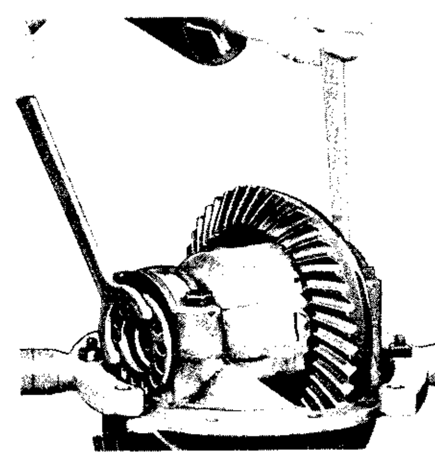
Installation of Differential and Ring Gear in Carrier

(1) Holding differential and ring gear assembly with bearing cups on respective bearing cones, carefully install the assembly into carrier.

(2) Install differential bearing caps, on respective sides, making certain that identification marks on caps correspond with those on carrier. Install cap bolts and tighten bolts of each cap by hand.

(3) Install differential bearing adjusters, on respective sides, making certain that identification marks correspond. Screw adjuster in by hand. No attempt should be made to apply any excessive pressure at this time.

(4) Using spanner wrenches Tool C-406A to square bearing cups with bearing cone, turn adjusters "IN" until cups are properly square with bearings and end play is eliminated with some backlash existing between the drive gear and pinion (Fig. 30).



KP20A

Fig. 30—Adjusting Differential Bearings

(5) Tighten one differential bearing cap bolt on each side to 85-90 foot-pounds.

DRIVE GEAR AND PINION BACKLASH

Correct drive gear and pinion backlash when properly set is .006 to .008 inch at point of minimum backlash. Rotate drive pinion and ring gear several revolutions in both directions in order to seat the bearing rollers. This is necessary before setting backlash.

(1) Attach a dial indicator Tool C-3339 to carrier flange so pointer of indicator is squarely contacting one drive gear tooth (drive side) (Fig. 31).

(2) Measure backlash between drive gear and pinion at four positions, approximately 90 degrees apart. After point of least backlash has been determined, mark drive gear. **Do not rotate drive gear from point of least backlash until all adjustments have been completed.**

(3) Using Tool C-406A (spanner wrench) turn both bearing adjusters equally (in same direction) until backlash between drive gear and pinion is .0005 to .0015 inch. **This backlash variation is given to permit alignment and installation of the bearing adjuster lock, lockwasher and attaching screw. The adjuster must only be turned in a clockwise direction and under no circumstances should be backed off.**

(4) Install adjuster lock on bearing cap, back-face side of drive gear. Tighten lock screw to 15 to 20 foot-pounds.

Differential Bearing Preload

(1) Turn bearing adjuster (tooth side of drive gear) (Fig. 32) in a notch at a time (notch referred to is the adjuster lock holes) until backlash between drive gear and pinion is a minimum of .006 to .008 inch. This will preload differential bearings and establish correct backlash.

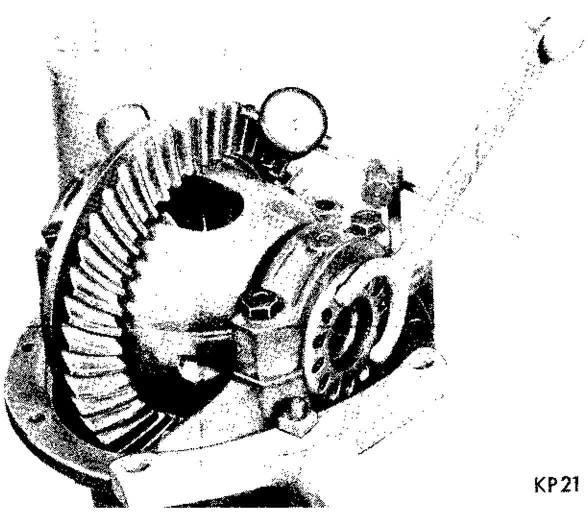


Fig. 31—Measuring Backlash between Drive Gear and Pinion

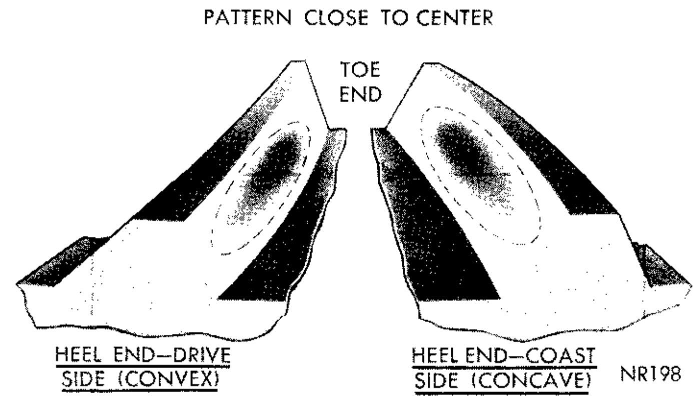


Fig. 32—Desired Tooth Contact Under Light Load

(2) Tighten the remaining two differential bearing cap bolts to 85-90 foot-pounds.

(3) Install remaining adjuster lock, lockwasher and attaching screw. Tighten to 15-20 foot-pounds.

GEAR TOOTH CONTACT PATTERN

The gear tooth contact pattern will disclose whether the correct rear pinion bearing mounting shim has been installed and the drive gear backlash set properly. Backlash between the drive gear and pinion must be maintained within the specified limits until correct tooth contact pattern is obtained.

(1) Apply a thin film of red or white lead on both the drive and coast side of the drive gear teeth. Rotate drive gear one complete revolution in both directions while load is being applied with a round bar or screwdriver between the carrier casting and differential case flange. This action will leave a distinct contact pattern on both the drive and coast side of the drive gear teeth.

(2) Observe the contact pattern on the drive gear teeth and compare with those in figures 32, 33 and 35 to determine if pattern is properly located. With pinion depth of mesh and gear backlash set properly, your contact pattern should resemble that in (Fig. 32). Notice that the correct contact pattern is well centered on both drive and coast sides of the teeth. When tooth contact patterns are obtained by hand, they are apt to be rather small. Under the actual operating load, however, the contact area increases.

(3) If after observing the contact pattern you find it resembles that in (Fig. 33), the drive pinion is too far away from centerline of the ring gear, the contact pattern will appear high on the heel on drive side and high on toe on coast side. To correct this type tooth contact pattern, increase the thickness of the rear pinion bearing mounting spacer (Fig. 34), which will cause the high heel contact on drive side to lower and move toward the toe; the high toe contact on coast side will lower and move toward the heel.

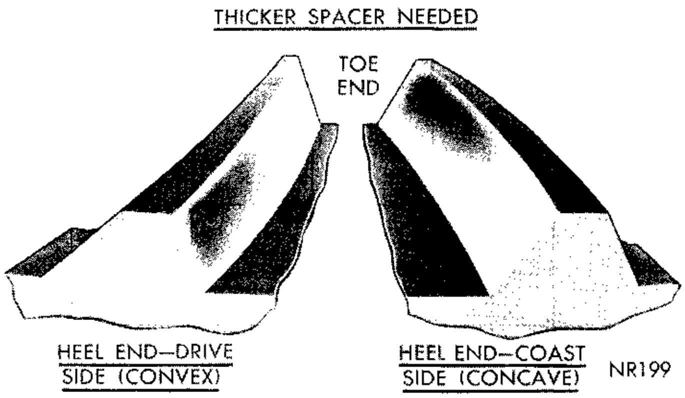


Fig. 33—Incorrect Tooth Contact Pattern (Increase Spacer Thickness)

(4) If after observing the contact pattern you find it resembles that in (Fig. 35), the drive pinion is too close to the ring gear, the pattern will appear low on the toe on drive side and low heel contact on coast side. To correct this type tooth contact pattern, decrease the thickness of the rear pinion bearing mounting spacer (Fig. 36), which will cause the low toe contact on drive side to raise and move toward the heel; low heel contact on coast side will raise and move toward the toe.

DIFFERENTIAL AND CARRIER

Installation

(1) Thoroughly clean the gasket surfaces of the carrier and rear axle housing.

(2) Using a new gasket, install the carrier assembly into the axle housing. Tighten the carrier to axle housing nuts to 45 foot-pounds.

(3) Refer to "Installation of Rear Axle Shaft," when installing and setting axle shaft end play.

(4) Install propeller shaft (match scribe marks on propeller shaft universal joint and pinion flange). Tighten clamp screws to 15 foot-pounds.

(5) Remove wooden block from under brake pedal and bleed and adjust brakes.

(6) Install rear wheels and tighten to 65 foot-pounds.

LUBRICATION

Refill axle assembly with Multipurpose Gear Lubricant, as defined by MIL-L-2105B (API GL-5) should be used in all rear axles with conventional differentials; Chrysler Hypoid Lubricant part number 2933565 is an oil of this type and is recommended or an equivalent be used.

In Sure-Grip axles on all 1970 Vehicles it is recommended that only Chrysler Hypoid Lubricant part number 2933565 or an equivalent be used. This lubricant, recommended for conventional differentials too, contains special additives to provide proper differential durability and performance.

Anticipated Temperature Range	Viscosity Grade
Above — 10°F.	SAE 90
As low as — 30°F.	SAE 80
Bleow — 30°F.	SAE 75

REMOVAL AND REPLACEMENT OF DRIVE PINION FLANGE AND OIL SEAL IN VEHICLE

On large stem carriers which use the collapsible spacer to obtain pinion bearing preload, the following procedure for the removal and replacement of the drive pinion flange and pinion oil seal must be followed to assure that the proper bearing preload is maintained in the axle assembly. If this procedure is not followed it could result in a premature failure of the axle.

(1) Raise vehicle on hoist and make scribe marks on propeller shaft universal joint, drive pinion flange and end of pinion stem.

(2) Disconnect propeller shaft at pinion flange and secure in an upright position to prevent damage to front universal joint.

(3) Remove the rear wheels and brake drums to prevent any drag or a possible false preload reading could occur.

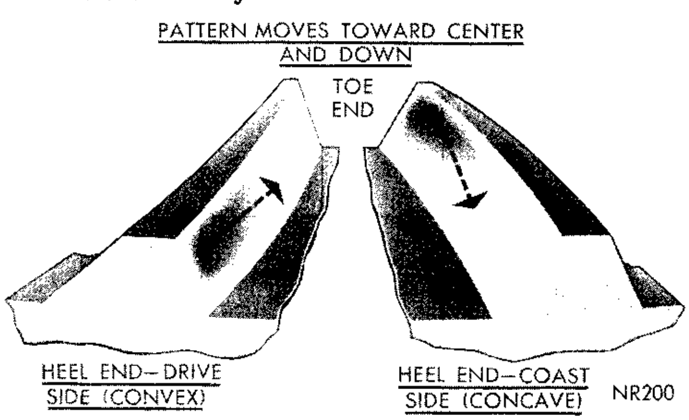


Fig. 34—Effect on Tooth Contact Pattern as Spacer Thickness is Increased

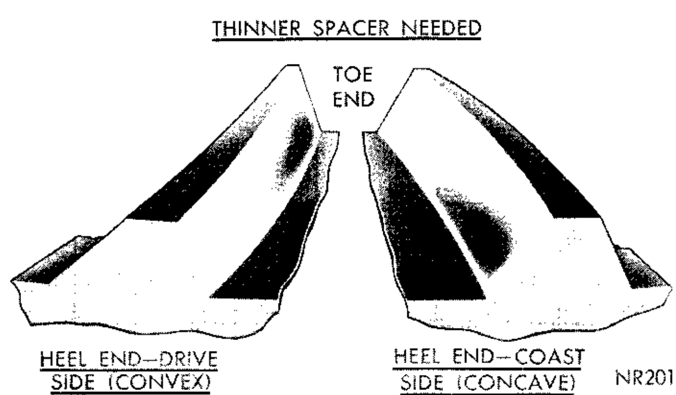


Fig. 35—Incorrect Tooth Contact Pattern (Decrease Spacer Thickness)

(4) Using inch-pound torque wrench C-685 measure pinion bearing preload by rotating pinion with handle of wrench floating, read the torque while wrench is moving through several complete revolutions and record. **This operation is very important because preload must be carefully reset when reassembling.**

(5) With Tool C-3281 hold companion flange and remove drive pinion nut and Belleville washer.

(6) Install companion flange remover Tool C-452 and remove flange. Lower rear of vehicle to prevent lubricant leakage.

(7) Using a screwdriver and hammer, remove the pinion oil seal from the carrier and clean the oil seal seat.

(8) Check splines on pinion shaft stem to be sure they are free of burrs or are not worn badly. If burrs are evident remove them using crocus cloth by working in a rotational motion. Wipe the pinion shaft clean.

(9) Inspect companion flange for cracks, worn splines, pitted, rough or corroded oil seal contacting surface. Repair or replace companion flange as necessary.

(10) Apply a light coat of sealer in seal bore of carrier and install drive pinion oil seal into carrier using Tool C-4109 or C-3980 (Double lip synthetic rubber oil seal) or Tool C-3656 (single lip leather oil seal). The proper tool must be used in order to properly position the seal the correct depth into the carrier casting.

(11) Position companion flange on pinion stem being careful to match scribe marks made previously before removal.

(12) Install companion flange with installing Tool C-496 or DD-999 and holding Tool C-3281.

(13) Remove tool and install Belleville washer (convex side of washer up) and pinion nut.

(14) Hold universal joint flange with holding Tool C-3281 and tighten pinion nut to 170 foot-pounds. Rotate pinion several complete revolutions to assure that bearing rollers are properly seated. Using an inch-pound torque wrench C-685 measure pinion bearing preload. Continue tightening pinion nut and

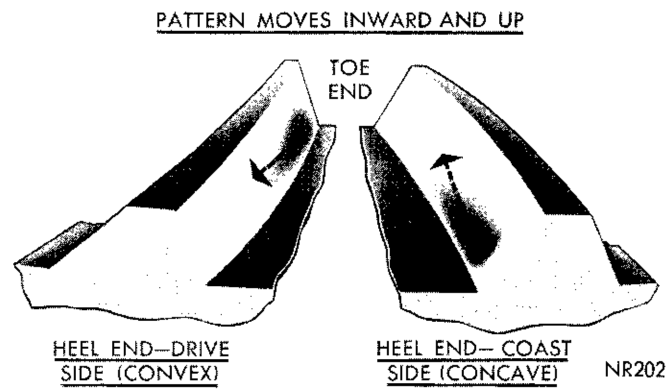


Fig. 36—Effect on Tooth Contact Pattern as Spacer Thickness is Decreased

checking preload until preload is at the original established setting you found in step 4. Under no circumstances should the preload be more than 5 inch-pounds over the established setting found at time of checking in step 4 of procedure.

Bearing preload should be uniform during a complete revolution. A preload reading that varies during rotation indicates a binding condition which has to be corrected. The assembly is unacceptable if final pinion nut torque is below 170 foot-pounds or pinion bearing preload is not within the correct specifications.

CAUTION: Never back off the pinion nut to lessen pinion bearing preload. If the desired preload is exceeded a new collapsible spacer must be installed and nut retightened until proper preload is obtained. In addition, the universal joint flange must never be hammered on, or power tools used.

(15) Install propeller shaft (match scribe marks on propeller shaft universal point and pinion flange). Tighten clamp screws to 15 foot-pounds.

(16) Install the rear brake drums and wheels and tighten nuts 65 foot-pounds.

(17) Raise the vehicle to a level position so axle assembly is at correct running position and check lubricant level. Add the correct type of lubricant required to bring lubricant to proper level.

SURE-GRIP DIFFERENTIAL

INDEX

GENERAL INFORMATION

A new Sure-Grip differential being offered as a special equipment option in the 8-3/4″ rear axles (Fig. 1).

The Sure-Grip differential design is basic and simple and consists of a two piece case construction and is completely interchangeable with the conventional

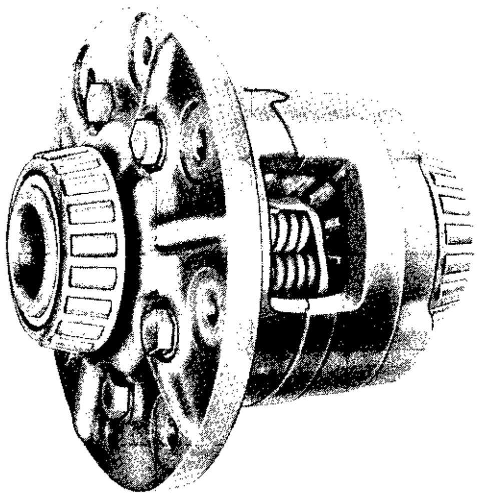

NU404

Fig. 1—Sure-Grip Differential

differential and also the previous type Sure-Grip differential (Fig. 2).

A conventional differential allows the driving wheels to rotate at different speeds while dividing the driving torque equally between them. This function is ordinarily desirable and satisfactory. However, the total driving torque can be no more than double the torque at the lower-traction wheel. When traction conditions are not the same for both driving wheels, a portion of the available traction cannot be used.

The SURE-GRIP differential allows the driving wheel with the better traction condition to develop more driving torque than the other wheel, so that the total driving torque can be significantly greater than with a conventional differential.

SURE-GRIP is not a locking differential. In normal driving conditions the controlled internal friction is easily overcome during cornering and turning so that the driving wheels can turn at different speeds. Extreme differences in traction conditions at the driving wheels may permit one wheel to spin.

SURE-GRIP has been engineered to perform its specialized functions with minimum effect on normal vehicle operations.

The cone clutch SURE-GRIP differentials are similar to corresponding 8-3/4 conventional differentials except for the incorporation of the helix-grooved cones that clutch the side gears to the differential case. The grooves assure maximum lubrication of the clutch surface during operation. The cone brakes and side gears are statically spring preloaded to provide an internal resistance to the differential action within the differential case itself. This internal resistance assures an adequate amount of pull while under extremely low tractive conditions such as mud, snow or ice when encountered at one of the rear wheels.

During torque application to the axle, the initial spring loading of the cone brakes is supplemented by the gear separating forces between the side gears and differential pinions which progressively increases the friction in the differential. It should be remembered that the Sure-Grip differential is not a positive locking type and will release before excessive driving force can be applied to one wheel.

SURE-GRIP DIFFERENTIAL IDENTIFICATION

Identification of sure-grip differential assembly can easily be made by lifting both rear wheels off the ground and turning them. If both rear wheels turn in the same direction simultaneously, the vehicle is equipped with a Sure-Grip Differential. Another means of identification is by removing the filler plug and using a flashlight to look through the filler plug hole to identify the type of differential case.

SERVICE PROCEDURES

SURE-GRIP DIFFERENTIAL NOISE (Chatter—Moan)

Noise complaints related to rear axles equipped with cone-clutch SURE-GRIP should be checked to determine the source of the noise. If a vehicle ride check produces the noise in turns but not straight ahead, the probable cause is incorrect or dissipated rear axle lubricant. The following draining and flushing procedure has been established for the Sure-Grip Differential before it is removed from the vehicle and replaced.

CAUTION: When servicing vehicles equipped with Sure-Grip differentials do not use the engine to rotate axle components unless both rear wheels are clear off the ground. Sure-Grip equipped axles can exert a significant driving force if one wheel is in contact with floor and could cause the vehicle to move.

(1) With lubricant of rear axle assembly at operating temperature raise car on hoist so rear wheels are free to turn.

(2) Loosen and remove fill plug and using a suction gun remove as much of the old lubricant as possible.

(3) Fill axle to proper level with multi-Purpose Hypoid Gear Lubricant Part Number 2933565 or equivalent. Reinstall fill plug and tighten.

(4) Start engine of vehicle and engage in gear and run on hoist with rear wheels free to turn at approximately 40 MPH for ten (10) minutes. This thoroughly circulates the lubricant and brings it to operating temperature.

(5) Stop vehicle and remove the fill plug and using a suction gun remove as much of the lubricant as possible.

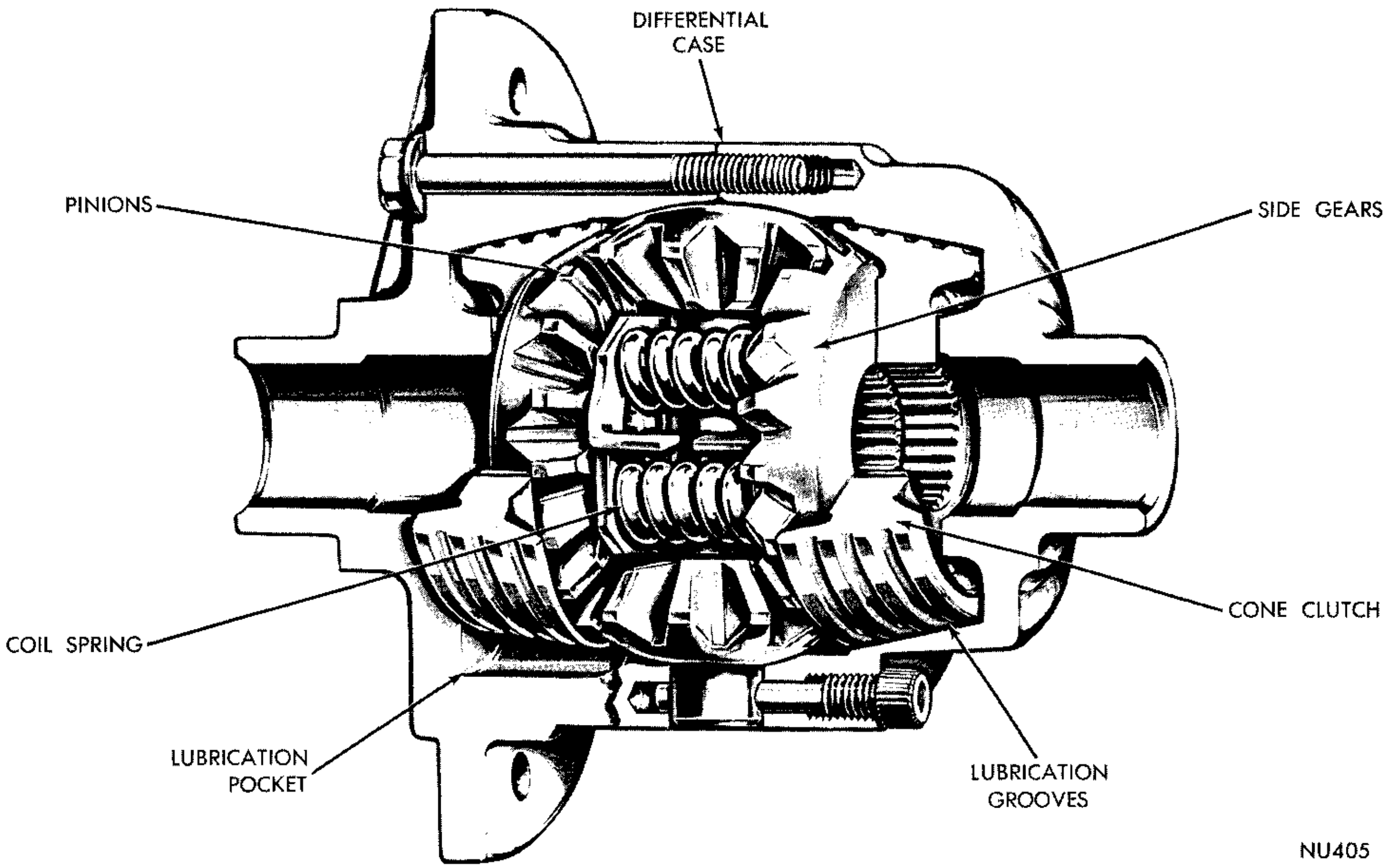


Fig. 2—Sure-Grip Differential (Schematic)

(6) Refill axle to proper level with multi-Purpose Hypoid Gear Lubricant Part Number 2933565 or equivalent. Reinstall fill plug and tighten.

(7) Lower vehicle on hoist and return to customer to drive and evaluate for approximately 100 miles to determine if lubricant corrects the noise complaint.

If after the vehicle is driven approximately 100 miles and the noise condition is still evident, remove the differential and carrier assembly and replace the Sure-Grip Differential. **The Sure-Grip Differential and the internal parts are serviced as an assembly only.**

TESTING SURE-GRIP DIFFERENTIAL

The Sure-Grip differential can be checked to determine if its performance is satisfactory without removing the differential and carrier assembly from the vehicle.

(1) Position vehicle on hoist with engine off and the transmission selector lever in park if automatic or in low gear if manual.

(2) Attempt to rotate wheel by applying turning force with hands gripping tire tread area (Fig. 3).

(3) If you find it extremely difficult, if not impossible to manually turn either wheel, you can consider the sure-grip differential to be performing satisfactorily. If you find it relatively easy to continuously turn either wheel smoothly then the differential is not performing properly and should be removed and replaced. The Sure-Grip Differential and internal parts are serviced as a complete assembly only. **Under no circumstances should the differential be removed and disassembled and reinstalled.**

SURE-GRIP DIFFERENTIAL

CAUTION: During removal and installation of axle shafts, DO NOT rotate one axle shaft unless both are

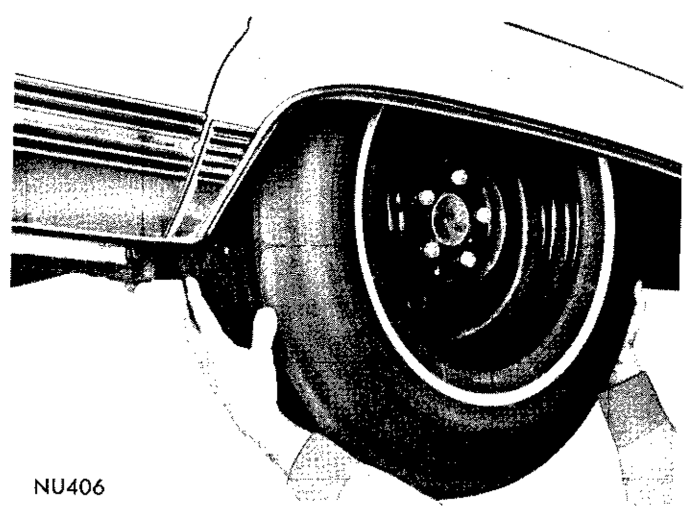


Fig. 3—Testing Sure-Grip Differential Effectiveness

in position. Rotation of one axle shaft without the other in place may result in misalignment of the two spline segments with which the axle shaft spline engages, and will necessitate difficult realignment procedures when shaft is installed.

Removal

Follow the same procedure outlined under conventional differential removal.

Cleaning and Inspection

(1) Clean the Sure-Grip differential assembly in a fast evaporating mineral spirits or a dry cleaning solvent and with exception of bearings, dry with compressed air.

(2) Inspect differential bearing cones, cups and rollers for pitting, spalling or other visible damage. If replacement is necessary, remove bearing cones from differential case using Tool C-293 and adapter plates No. 43.

(3) Visually inspect differential case for cracks or other visible damage which might render it unfit for further service.

Assembly

If during cleaning and inspection the differential bearings were found to be unfit for further use and were removed follow this procedure for installation of new bearings.

(1) Position each differential bearing cone on hub of differential case (taper away from drive gear) and with installing Tool C-4086, install bearing cones. An arbor press may be used in conjunction with installing tool. **CAUTION: Never exert pressure against the bearing cage, since this would damage the bearing.**

(2) If the ring gear was removed from the sure-grip differential case or is being replaced with a new ring gear for any reason, new nylok drive gear screws must be installed.

IMPORTANT: The procedure for installing the ring gear on differential case must be followed so the ring gear seats on the differential case properly.

(3) Using an Arkansas stone, relieve the sharp edge of the chamfer on the inside diameter of the ring gear (Fig. 23 in 8-3/4" Axle section of this group). This is very important, otherwise during the installation of ring gear on differential case, the sharp edge will remove metal from the pilot diameter of case and can get imbedded between differential case flange and gear; causing gear not to seat properly.

(4) Position ring gear on differential case pilot aligning threaded holes of ring gear with those in differential case flange.

(5) Insert drive gear screws (left hand threads) through case flange and into ring gear. After all cap screws are properly started, tap ring gear against differential case flange with a non-metallic mallet.

(6) Position differential case unit between brass jaws of a vise and alternately tighten each cap screw to 55 foot-pounds.

NOTE: Before installation of differential case into carrier lubricate the inside of differential assembly with Multi-Purpose Hypoid Gear Lubricant Part Number 2933565 or equivalent. Do not use any other lubricant other than this special lubricant.

(7) Follow procedure outlined in conventional axle assembly for setting drive pinion depth of mesh, drive gear backlash adjustment and bearing preload adjustment.

INSTALLING SURE-GRIP DIFFERENTIAL AND CARRIER ASSEMBLY

(1) Using a new gasket install carrier assembly in axle housing. Tighten mounting nuts to 45 foot-pounds.

(2) Refer to "Installation of Rear Axle Shaft", when installing axle shafts.

(3) Connect the rear universal joint.

(4) Before lowering the rear wheels of the vehicle to the floor, adjust rear brakes. **CAUTION: Both rear wheels must be raised off the floor when adjusting brakes.**

LUBRICATION

Every six months check the fluid level in the axle through the filler plug hole. When checking the level, be sure the vehicle is in a level position on an axle or drive on type hoist. "See Lubrication Section" for proper level of specific axle assembly.

In Sure-Grip Differentials, use only the Multi-Purpose Hypoid Gear Lubricant Part Number 2933565 or equivalent. Do not use any other lubricant other than this special lubricant.

SPECIFICATIONS

	8-3/4" Axle
TYPE	Semi-Floating Hypoid
Ring Gear Diameter	8.750
PINION BEARINGS	
Type	Tapered Roller
Number Used	2
Adjustment	
(Large Stem)	Collapsible Spacer
Pre-Load Torque (Seal Removed)	20 to 30 inch-pounds
DIFFERENTIAL BEARINGS	
Type	Tapered Roller
Number Used	2
Adjustment	Adjusting Nut
RING GEAR AND PINION	
Serviced in	Matched Sets
Ring Gear Runout	.005" Max.
Back Lash	.006 to .008"
DIFFERENTIAL SIDE GEAR CLEARANCE	
With Gauge	.001 to .012"
WHEEL BEARINGS	
Type	Tapered Roller
Adjustment	Adjusting Nut
End Play	.008-.018
Lubrication	Automotive Multi Purpose Grease NLGI grade 2
LUBRICATION	
Capacity	4.4 Pints (3-1/2 Pints Imp. Meas.)

Type ...... Multi-Purpose Gear Lubricant, as defined by MIL-L-2105B (API GL-5) should be used on all rear axles; such a lubricant is available under Part No. 2933565 Chrysler Hypoid Gear Lubricant or an equivalent be used.

TIGHTENING REFERENCE

	8-3/4" Axle Pounds Foot	Inch
Differential Bearing Cap Bolts	90	
Ring Gear to Differential Case Bolts (Left Hand Thread)	55	
Drive Pinion Flange Nut		
(Large Stem)	170 (Min)	
Carrier to Axle Housing Bolt Nuts	45	
Axle Shaft Retainer Nuts	35	
Propeller Shaft Bolts (Rear)	15	
Spring Clip (U Bolt) Nuts	45	
Wheel Stud Nuts	65	
Shock Absorber Stud Nuts (Lower)	50	

BRAKES

CONTENTS

GENERAL INFORMATION

The new Models are equipped with servo contact, two shoe, internal expanding brakes with application adjusters. The lower ends of the brake shoes are connected by a tubular star wheel adjusting screw, (Fig. 1). Cars with heavy duty brakes are not self-adjusting.

SERVICE BRAKES

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
PEDAL GOES TO FLOOR	(a) Fluid low in reservoir.	(a) Fill and bleed master cylinder.
	(b) Air in hydraulic brake system.	(b) Fill and bleed hydraulic brake system.
	(c) Improperly adjusted brake.	(c) Repair or replace self-adjuster as required.
	(d) Leaking wheel cylinders.	(d) Recondition or replace wheel cylinder and replace both brake shoes.
	(e) Loose or broken brake lines.	(e) Tighten all brake fittings or replace brake line.
	(f) Leaking or worn master cylinder.	(f) Recondition or replace master cylinder and bleed hydraulic system.
	(g) Excessively worn brake lining.	(g) Reline and adjust brakes.
SPONGY BRAKE PEDAL	(a) Air in hydraulic system.	(a) Fill master cylinder and bleed hydraulic system.
	(b) Improper brake fluid (low boiling point).	(b) Drain, flush and refill with brake fluid.
	(c) Excessively worn or cracked brake drums.	(c) Replace all faulty brake drums.
	(d) Broken pedal pivot bushing.	(d) Replace nylon pivot bushing.
BRAKES PULLING	(a) Contaminated lining.	(a) Replace contaminated brake lining.
	(b) Front end out of alignment.	(b) Align front end.
	(c) Incorrect brake adjustment.	(c) Adjust brakes and check fluid.
	(d) Unmatched brake lining.	(d) Match primary, secondary with same type of lining on all wheels.
	(e) Brake drums out of round.	(e) Grind or replace brake drums.
	(f) Brake shoes distorted.	(f) Replace faulty brake shoes.
	(g) Restricted brake hose or line.	(g) Replace plugged hose or brake line.
	(h) Broken rear spring.	(h) Replace broken spring.
SQUEALING BRAKES	(a) Glazed brake lining.	(a) Cam grind or replace brake lining.
	(b) Saturated brake lining.	(b) Replace saturated lining.
	(c) Weak or broken brake shoe retaining spring.	(c) Replace retaining spring.
	(d) Broken or weak brake shoe return spring.	(d) Replace return spring.
	(e) Incorrect brake lining.	(e) Install matched brake lining.
	(f) Distorted brake shoes.	(f) Replace brake shoes.
	(g) Bent support plate.	(g) Replace support plate.
	(h) Dust in brakes or scored brake drums.	(h) Blow out brake assembly with compressed air and grind brake drums.

Condition	Possible Cause	Correction
CHIRPING BRAKES	(a) Out of round drum or eccentric axle flange pilot.	(a) Repair as necessary, and lubricate support plate contact areas (6 places).
DRAGGING BRAKES	(a) Incorrect wheel or parking brake adjustment.	(a) Adjust brakes and check fluid.
	(b) Parking brakes engaged.	(b) Release parking brakes.
	(c) Weak or broken brake shoe return spring.	(c) Replace brake shoe return spring.
	(d) Brake pedal binding.	(d) Free up and lubricate brake pedal and linkage.
	(e) Master cylinder cup sticking.	(e) Recondition master cylinder.
	(f) Obstructed master cylinder relief port.	(f) Use compressed air and blow out relief port.
	(g) Saturated brake lining.	(g) Replace brake lining.
	(h) Bent or out of round brake drum.	(h) Grind or replace faulty brake drum.
HARD PEDAL	(a) Brake booster inoperative.	(a) Replace brake booster.
	(b) Incorrect brake lining.	(b) Install matched brake lining.
	(c) Restricted brake line or hose.	(c) Clean out or replace brake line or hose.
	(d) Frozen brake pedal linkage.	(d) Free up and lubricate brake linkage.
WHEEL LOCKS	(a) Contaminated brake lining.	(a) Reline both front or rear of all four brakes.
	(b) Loose or torn brake lining.	(b) Replace brake lining.
	(c) Wheel cylinder cups sticking.	(c) Recondition or replace wheel cylinder.
	(d) Incorrect wheel bearing adjustment.	(d) Clean, pack and adjust wheel bearings.
BRAKES FADE (HIGH SPEED)	(a) Incorrect lining.	(a) Replace lining.
	(b) Overheated brake drums.	(b) Inspect for dragging brakes.
	(c) Incorrect brake fluid (low boiling temperature).	(c) Drain, flush, refill and bleed hydraulic brake system.
	(d) Saturated brake lining.	(d) Reline both front or rear of all four brakes.
PEDAL PULSATES	(a) Bent or out of round brake drum.	(a) Grind or replace brake drums.
BRAKE CHATTER AND SHOE KNOCK	(a) Out of round brake drum.	(a) Grind or replace brake drum.
	(b) Loose support plate.	(b) Tighten support plate bolts to proper specifications.
	(c) Bent support plate.	(c) Replace support plate.
	(d) Distorted brake shoes.	(d) Replace brake shoes.
	(e) Machine grooves in contact face of brake drum. (Shoe Knock)	(e) Grind or replace brake drum.
	(f) Contaminated brake lining.	(f) Replace either front or rear or all four linings.
BRAKES DO NOT SELF ADJUST	(a) Adjuster screw frozen in thread.	(a) Clean and free-up all thread areas.
	(b) Adjuster screw corroded at thrust washer.	(b) Clean threads and replace thrust washer if necessary.
	(c) Adjuster lever does not engage star wheel.	(c) Repair, free up or replace adjuster as required.
	(d) Adjuster installed on wrong wheel.	(d) Install correct adjuster parts.

SERVICE PROCEDURES

ADJUSTING SERVICE BRAKES

Normally self adjusting brakes will not require manual adjustment but in the event of a brake reline it may be advisable to make the initial adjustment manually to speed up the adjusting time.

(1) Jack up vehicle so all wheels are free to turn.

(2) Remove rear adjusting hole cover from all brake supports of vehicle.

(3) **Be sure parking brake lever is fully released, then back off parking brake cable adjustment so there is slack in cable.**

(4) Insert adjusting Tool C-3784, into star wheel or adjusting screw. Move handle of tool upward until a slight drag is felt when road wheel is rotated.

(5) Insert a thin screwdriver into brake adjusting hole and push adjusting lever out of engagement with star wheel. **(Care should be taken not to bend**

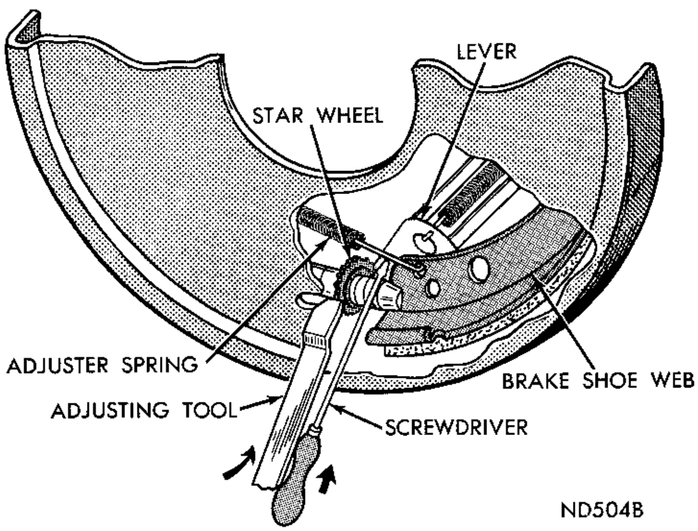


Fig. 1—Adjusting Brakes

adjusting lever (Fig. 1). While holding adjusting lever out of engagement, back off star wheel to insure a free wheel with no brake shoe drag.

(6) Repeat above adjustment at each wheel. The adjustment must be equal at all wheels. Install adjusting hole covers in brake supports.

(7) Adjust parking brake **after** wheel brake adjustment.

It is important to follow the above sequence to avoid the possibility of the parking brake system causing brake drag as may occur if the parking brakes are adjusted before the service brakes.

TESTING APPLICATION ADJUSTER OPERATION

Place the vehicle on a hoist, with a helper in the driver's seat to apply the brakes. Remove the plug from the rear adjustment slot in each brake support plate to observe the adjuster star wheel. Then, to exclude the possibility of maximum adjustment, that is, the adjuster refuses to operate because the closest possible adjustment has been reached, the star wheel should be backed off approximately 30 notches. It will be necessary to hold the adjuster lever away from the star wheel to allow backing off of the adjustment.

Spin the wheel and brake drum in the reverse direction and apply the brakes vigorously. This will provide the necessary inertia to cause the secondary brake shoe to leave the anchor. The wrap up effect will move the secondary shoe, and the cable will pull the adjuster lever up. Upon application of the brake pedal, the lever should move upward, turning the star wheel. Thus, a definite rotation of the adjuster star wheel can be observed if the automatic adjuster is working properly. If by the described procedure one or more adjusters do not function properly, the respective drum must be removed for adjuster servicing.

BLEEDING BRAKE SYSTEM

Clean all dirt and foreign material from the cover of the master cylinder to prevent any dirt from falling into the master cylinder reservoir when the cover is removed.

Using the one man bleeder tank C-3496B (with adaptor) provides a convenient means of keeping the master cylinder full while pressurizing the hydraulic system for bleeding. (Complete bleeding of the dual master cylinder is important! See Bleeding the Master Cylinder of this section.) **Manual bleeding is not recommended, because of reduced fluid flow.**

Tighten the brakes of each wheel until the brakes are locked. (This reduces the movement of the wheel cylinder cups and assists in bleeding.)

Starting with the right rear wheel clean all dirt from the bleeder valve. Place bleeder hose C-650 on the bleeder valve and insert the other end of the bleeder hose into a clean jar half filled with clean brake fluid. (This will permit the observation of air bubbles as they are being expelled from the hydraulic system and also prevent air from being drawn back in to the system. (Follow the manufacturers instructions in the use of the bleeder tools.)

Continue this bleeding operation on the other wheels, starting with the left rear wheel, then the right front and finishing with the left front wheel.

If necessary, repeat this bleeding operation if there is any indication (a low, soft or spongy brake pedal) of air remaining in the hydraulic system. Readjust the brakes as described previously.

TEST FOR FLUID CONTAMINATION

To determine if contamination exists in the brake fluid (as indicated by swollen or deteriorated rubber cups), the following test can be made.

Place a small amount of the drained brake fluid into a small clear glass bottle. Separation of the fluid into distinct layers will indicate mineral oil content. **If there is any question of mineral oil content, as indicated by swollen or deteriorated rubber parts, drain and flush thoroughly and replace all rubber parts.**

WHEEL STUD NUT TIGHTENING

The tightening sequence and tightening of the wheel stud nuts is of great importance to insure efficient brake operation. The use of an impact or long handled wrench may distort the drum.

A criss-cross tightening sequence should be used (Fig. 2). Tighten all the stud nuts to one-half the specified tightening first (30 ft. lbs.) and then repeat the sequence tightening to the specified 65 foot pounds.

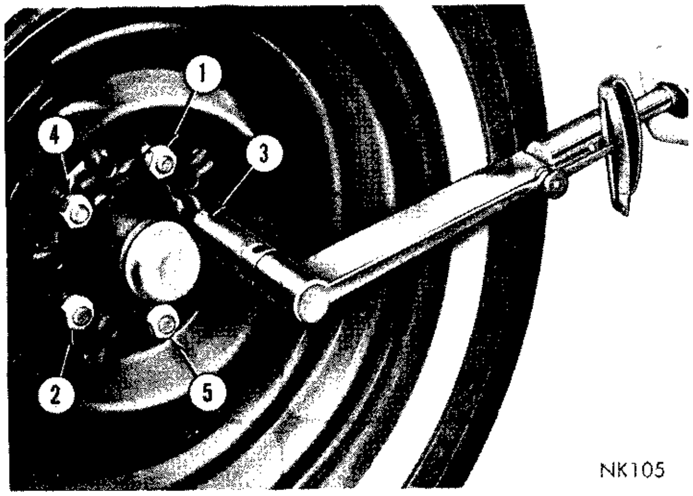


Fig. 2—Wheel Stud Nut Tightening Sequence

BRAKE HOSE AND TUBING

The flexible hydraulic brake hose should always be installed in the vehicle by first tightening the male end of the hose in the wheel cylinder or rear axle housing tee. The hose is then clipped to the hose bracket in a manner to give minimum twist. **Excessive twist can result in hose interference problems with possible hydraulic system failure.**

Inspection of brake hose and tubing should be included in all brake service operations. The hoses should be checked for:

(1) Correct length, severe surface cracking, pulling, scuffing or worn spots. (**Should the cotton fabric casing of the hose be exposed by cracks or abrasions in the rubber hose cover, the hose should be replaced.** Eventual deterioration of the hose can take place with possible burst failure).

(2) Faulty installation to cause twisting, wheel, tire or chassis interference.

Always use factory recommended hose to insure quality, correct length and superior fatigue life. Care should be taken to make sure that the tube and hose mating surfaces are clean and free from nicks and burrs. New copper seal washers should be used and the tube nuts and connections should be properly made and tightened. Double wall steel tubing should always be used to insure superior fatigue life. Care should be taken when replacing brake tubing, to use the proper bending and flaring tools and to avoid routing the tubes against sharp edges, moving components or in hot areas. All tubes should be properly attached with recommended retaining clips.

Steel tubing is used to conduct hydraulic pressure to the front and rear brakes. Flexible rubber hose is used at both front brakes and at a rear axle junction block. Steel tubing is used from the junction block to both rear wheel cylinders. All fittings, tubing and hoses should be inspected for rusted, damaged or

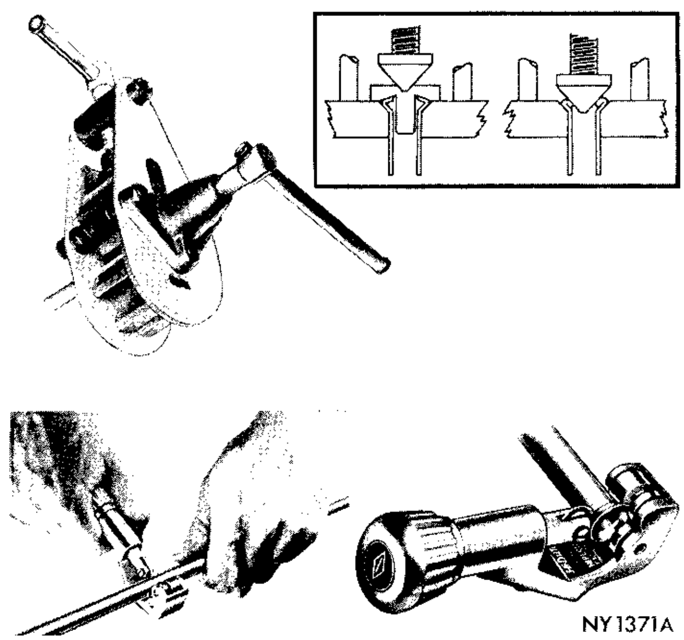


Fig. 3—Cutting and Flaring Steel Tubing

faulty flaring seats. The steel tubing is equipped with a double flare or inverted seat to insure more positive seating in the fitting. To repair or reflare tubing proceed as follows:

(1) Using Tool C-3478, cut off damaged seat or damaged tubing (Fig. 3).

(2) Ream out any burred or rough edges showing on inside edges of tubing. This will make ends of tubing square and insure better seating of flared end of tubing. **Place compression nut on tubing prior to flaring tubing.**

(3) To flare tubing, open handles of flaring Tool C-3838 and rotate jaws of tool until mating jaws of tubing size are centered in area between vertical posts.

(4) Slowly close handles with tubing inserted in jaws but do not apply heavy pressure to handle as this will lock tubing in place.

(5) Place gauge "Form A" on edge over end of tubing and push tubing through jaws until end of tubing contacts recessed notch of gauge matching size of tubing (Fig. 3).

(6) Squeeze handles of flaring tool and lock tubing in place.

(7) Place proper sized plug of gauge "A" down in end of tubing. Swing compression disc over gauge and center tapered flaring screw in recess of disc.

(8) Lubricate taper of flaring screw and screw in until plug gauge has seated on jaws of flaring tool. This action has started to invert extended end of tubing.

(9) Remove gauge and apply lubricant to tapered end of flaring screw and continue to screw down until

tool is firmly seated in tubing.

(10) Remove tubing from flaring tool and inspect seat.

(11) Clean seat and tube of any lubricant before connecting to hydraulic system.

SERVICE BRAKES

INDEX

SERVICE PROCEDURES

Illustrations of the various service procedures will not always show any one specific brake.

BRAKE DRUM REMOVAL

Removing Front Brake Drums

To aid in brake drum removal loosen brake star adjusting wheel.

(1) Remove rear plug from brake adjusting access hole.

(2) Insert a thin screw driver into brake adjusting hole and push adjusting lever away from star adjusting wheel. **Care should be taken not to bend adjusting lever.**

(3) Insert Tool C-3784 into brake adjusting hole and engage notches of brake adjusting star wheel. Release brake adjustment by prying down with adjusting tool.

(4) Remove wheel cover, grease cap, cotter pin, lock, adjusting nut, outer wheel bearing and remove wheel and drum assembly from spindle to expose brake linings (Fig. 1).

(5) Inspect brake lining for wear, shoe alignment, or contamination from grease or brake fluid.

Removing Rear Brake Drums

(1) Remove rear plug from brake adjusting access hole.

(2) Insert a thin screw driver into brake adjusting hole and hold adjusting lever away from notches of adjusting screw.

(3) Insert Tool C-3784 into brake adjusting hole and engage notches of brake adjusting screw. Release

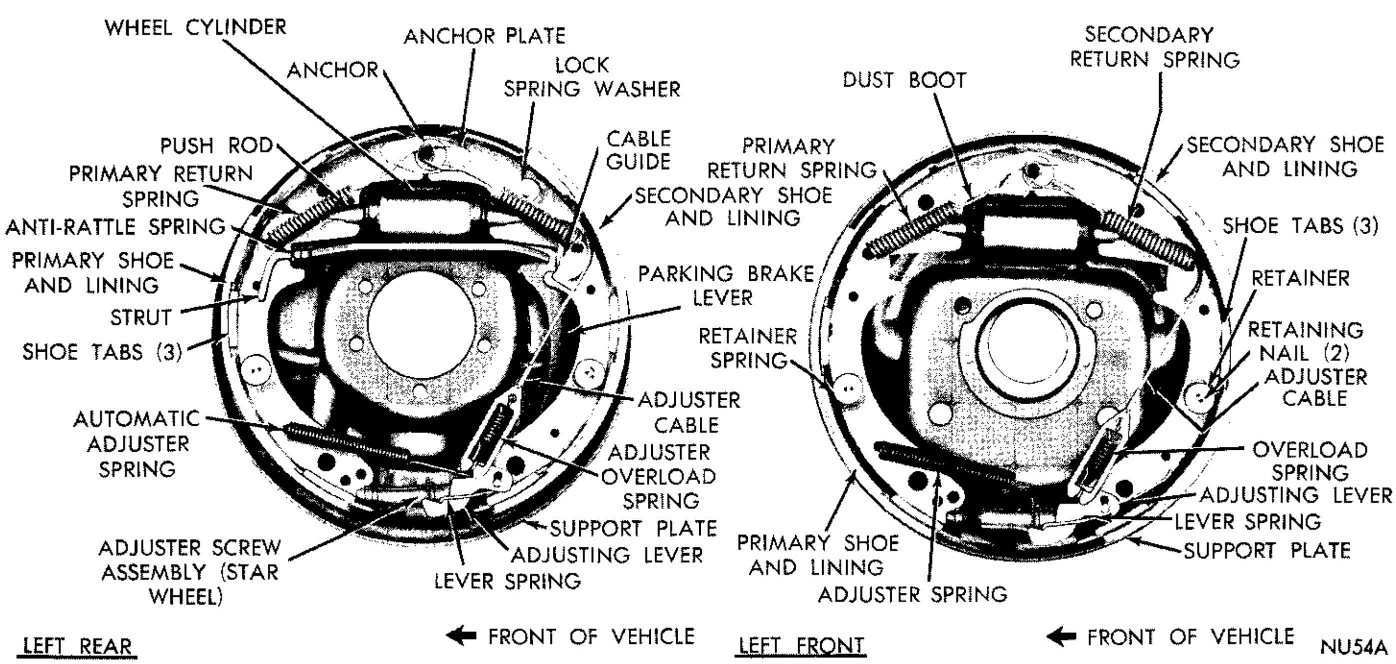


Fig. 1—Brake Assemblies

brake by prying down with adjusting tool.

(4) Remove rear wheel and clips from wheel studs that hold drum on axle. Discard clips. Remove drum.

(5) Inspect brake lining for wear, shoe alignment or contamination from grease or brake fluid. (Fig. 1).

BRAKE SHOE REMOVAL

Removing Front Brake Shoes

(1) Using Tool C-3785 remove brake shoe return springs (Fig. 2). (Note how secondary spring overlaps primary spring). (Fig. 1).

(2) Slide eye of automatic adjuster cable off anchor and unhook from adjusting lever. Remove cable, overload spring, cable guide and anchor plate.

(3) Disengage adjusting lever from spring by sliding forward to clear pivot, then working out from under spring. Remove spring from pivot. Remove automatic adjuster spring from secondary shoe web and disengage from primary shoe web. Remove spring.

(4) Remove brake shoe retainers, springs and nails, using Tool C-4070, (Fig. 3).

(5) Disengage primary and secondary shoes from push rods and remove from support. Remove adjusting star wheel assembly from shoes.

Removing Rear Brake Shoes

(1) Using Tool C-3785, remove brake shoe return springs (Fig. 4). (Note how secondary spring overlaps primary spring). (Fig. 1).

(2) Slide eye of automatic adjuster cable off anchor and then unhook from adjusting lever. Remove cable, overload spring, cable guide and anchor plate.

(3) Disengage adjusting lever from spring by sliding forward to clear pivot, then working out from under spring. Remove spring from pivot. Remove automatic adjuster spring from secondary shoe web and disengage from primary shoe web. Remove spring.

(4) Remove brake shoe retainers, springs and nails

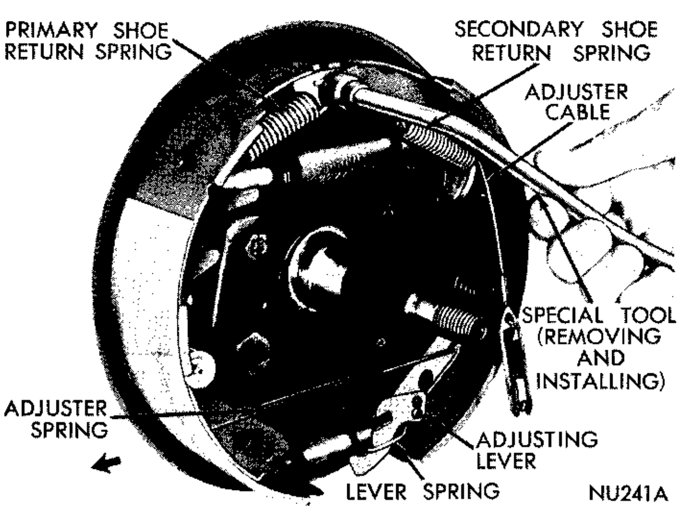


Fig. 2—Removing or Installing Shoe Return Springs (Left Front)

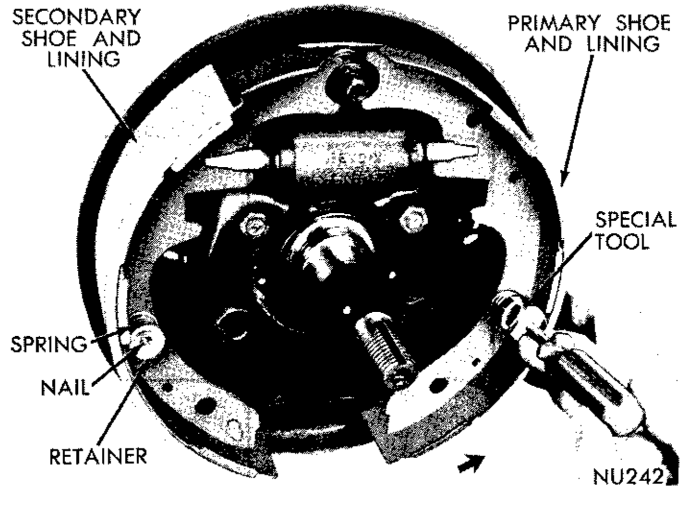


Fig. 3—Removing or Installing Shoe Retainers, Springs and Nails (Right Front)

using Tool C-4070, (Fig. 5).

(5) Spread anchor ends of primary and secondary shoes and remove parking brake lever strut and anti-rattle spring (Fig. 6).

(6) Disengage parking brake cable from parking brake lever.

(7) Disengage primary and secondary shoes from push rods and remove from support. Remove adjusting star wheel assembly from shoes.

CLEANING AND INSPECTION

Wipe or brush clean (dry) the metal portions of the brake shoes. Examine the lining contact pattern to determine if the shoes are bent. The lining should show contact across the entire width, extending from heel to toe. Shoes showing contact only on one side should be replaced. Shoes having sufficient lining but lack of contact at toe and heel should be measured for proper grind.

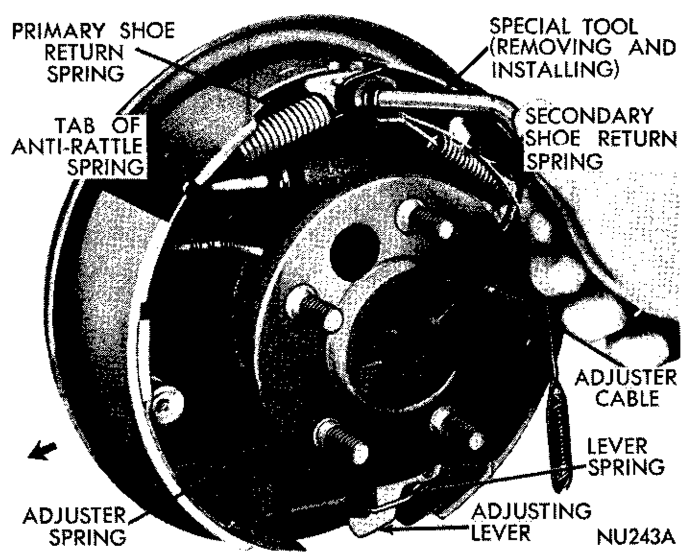


Fig. 4—Removing or Installing Shoe Return Springs (Left Rear)

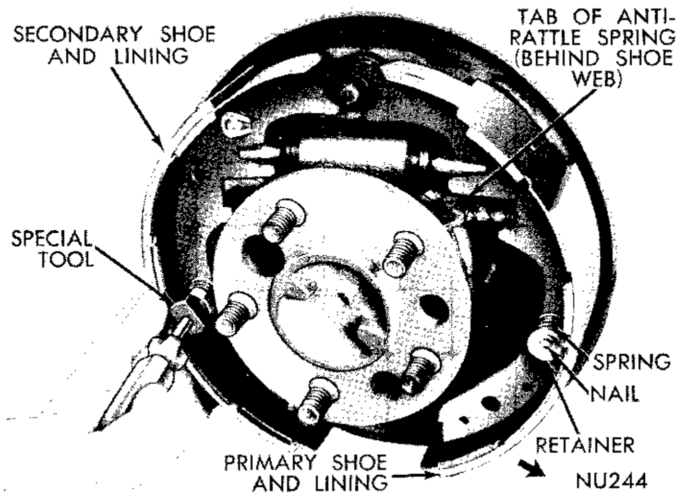


Fig. 5—Removing or Installing Shoe Retainers, Springs and Nails (Right Rear)

Clean the support, using a suitable solvent, then inspect for burrs. Remove if necessary. Clean and inspect the adjusting screws for pulled or stripped threads, then apply a thin film of lubricant to the threads.

New brake shoe return springs and hold down springs should be installed where the old springs have been subjected to overheating or if their strength is questionable. Spring paint discoloration or distorted end coils would indicate an overheated spring.

GRINDING RECOMMENDATIONS

Brake Shoe Lining—New lining should be measured and ground .060" to .080" (maximum under the drum diameter). When replacing brake shoe and lining assemblies, always check them in the drum they are to be used with to insure that they have the recommended radius grind. This grind, which should provide at least .004 inch heel and toe clearance, is necessary for proper lining to drum contact during brake application.

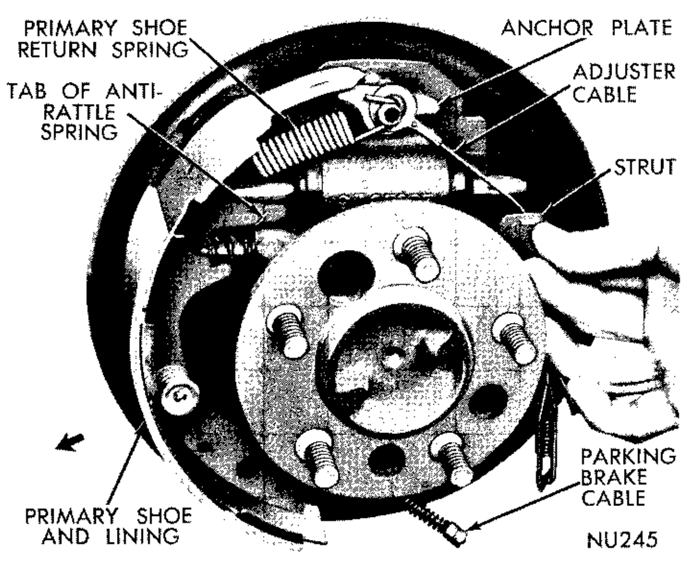


Fig. 6—Removing or Installing Parking Brake Strut and Spring (Left Rear)

Drum Refacing—Measure the drum runout with an accurate gauge. Drum runout should not exceed .006 inch out of round. If the drum runout is in excess of .006 inch, (total indicator run-out) the drum should be refaced. Remove only as much material as is necessary to clean up the drum. It is recommended the front drums be refaced with the wheel and tire mounted. **Do not reface more than .060 inch over the standard drum diameter.**

BRAKE SHOE INSTALLATION

Installing Front Brake Shoes

Lubricate with a thin film the shoe tab contact area (6 places) on support plate with Chrysler support plate lubricant, Part number 2932524 or equivalent (Fig. 9).

(1) Match a primary with a secondary brake shoe and place them in their relative position on a work bench.

(2) Install adjusting star wheel assembly between primary and secondary shoes, with a star wheel next to secondary shoe (Fig. 1). (The left star wheel adjusting stud end is stamped "L" which indicates its position on vehicle). The left side star wheel is cadmium plated. The right is black, and the adjusting stud end is **not** stamped.

(3) Install adjuster spring in primary shoe and hook other end in web of secondary. Install adjusting lever spring over pivot pin on shoe web. Install adjusting lever under spring and over pivot pin. Slide lever slightly rearward to lock in position (Fig. 1).

(4) Spread anchor ends of brake shoes to hold star adjusting wheel assembly in position.

(5) Holding brake shoes firmly, place assembly on support plate, and at the same time engage shoe webs with push rods. (Fig. 7).

(6) Using Tool C-4070, install shoe retaining nails, springs and retainers.

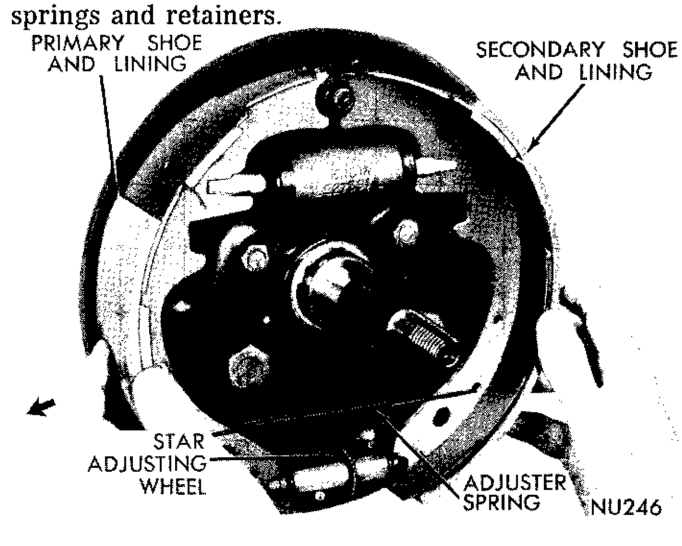


Fig. 7—Installing Brake Shoes (Left Front)

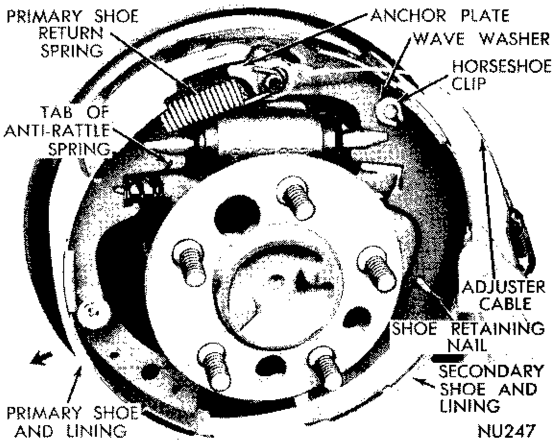


Fig. 8—Installing Brake Shoes (Left Rear)

(7) Install anchor plate over anchor.

(8) Slide "eye" of adjusting cable over anchor and against anchor plate. Engage end of primary shoe return spring in shoe web and install other end over anchor, using Tool C-3785.

(9) Install cable guide in secondary shoe web. Holding in position, engage secondary shoe return spring through guide and into web. Install other end over anchor, using Tool C-3785. (Be sure cable guide remains flat against shoe web, and that secondary spring overlaps primary). (Fig. 1). Using pliers, squeeze ends of spring loops (around anchor) until parallel.

(10) Thread adjuster cable over guide and hook end of overload spring in lever (Fig. 1). (Be sure "eye" of cable is pulled tight against anchor and in a straight line with guide).

Installing Rear Brake Shoes

Lubricate with a thin film the shoe tab contact area (6 places) on support plate with Chrysler support plate lubricant, Part number 2932524 or equivalent (Fig. 9).

(1) Install parking brake lever on inner side of secondary shoe web after lubricating pivot with support plate lubricant. Secure with wave washer and horseshoe clip.

(2) Engage parking brake lever with cable, then slide secondary shoe against support plate, and at the same time engage shoe web with push rod, and against anchor.

(3) Slide parking brake strut behind hub and into slot in parking brake lever. Slide anti-rattle spring over free end of strut. On eleven inch brakes, be sure spring tab is pointing forward and down on outside of shoe web (Left Brake), and pointing frontward and down behind shoe web (Right Brake) (Fig. 1).

(4) Slide primary shoe into position and engage with push rod and free end of strut. Install anchor plate over anchor, then install eye of adjuster cable over anchor.

(5) Engage primary shoe return spring in web of shoe and install free end over anchor, using Tool C-3785.

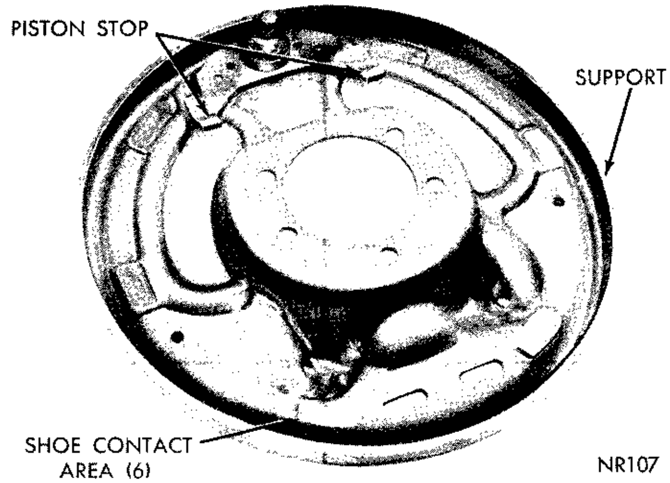


Fig. 9—Shoe Contact Area on Support

(6) Install cable guide in secondary shoe web. Holding in position, engage secondary shoe return spring through guide and into web. Install other end over anchor, using Tool C-3785. (Be sure cable guide remains flat against shoe web and that secondary spring overlaps primary). (Fig. 1). Using pliers, squeeze ends of spring loops (around anchor) until parallel.

(7) Install adjusting star wheel assembly between primary and secondary shoes, with star wheel next to secondary shoe. (Fig. 1). The left star wheel adjusting stud end is stamped "L" which indicates its position on vehicle. The left side star wheel is cadmium plated. The right is black, and the adjusting stud end is **not** stamped. Install adjuster spring between shoes (Fig. 1). (Engage primary shoe first).

(8) Install adjusting lever spring over pivot pin on shoe web. Install adjusting lever under spring and over pivot pin. Slide lever slightly rearward to lock in position.

(9) Using Tool C-4070, install shoe retaining nails retainers and springs.

(10) Thread adjuster cable over guide and hook end of overload spring in lever. (Fig. 1). (Be sure eye of cable is pulled tight against anchor and in a straight line with guide).

Installing Front Brake Drums

(1) Lubricate wheel bearings and install brake drum and adjust wheel bearing to proper preload.

(2) Adjust brakes as described under "Service Procedures" at front of this Section.

Installing Rear Brake Drums

(1) Install brake drum, reinstallation of retaining clips is not necessary. Install wheel and tire assembly.

(2) Adjust brakes as described under "Service Procedures" at front of this Section.

MASTER CYLINDER

(Drum Brakes)

INDEX

GENERAL INFORMATION

The tandem master cylinder (Fig. 1) is of the compensating type with the reservoirs cast integrally. The master cylinder consists of a front and rear piston (in tandem) two outlets, each contain a residual pressure valve and spring (Fig. 4).

The **front** outlet tube from the master cylinder is connected to the hydraulic system safety switch (Figs. 8 and 9) and thence to the **rear** brakes. The **rear** outlet tube from the master cylinder is also connected to the safety switch and the **front** brakes.

The master cylinder used on vehicles not equipped with power brake unit is serviced in the same manner as the master cylinder with power brakes, with one exception, the master cylinder for power brakes does not include the push rod.

The disc brake master cylinder is different than the standard drum brake master cylinder and is covered in the disc brake section of the brake group.

SERVICE PROCEDURES

MASTER CYLINDER REMOVAL

(1) Disconnect the front and rear brake tubes from master cylinder (the residual pressure valves will keep cylinder from draining).

(2) Remove nuts that attach master cylinder to cowl panel and/or power brake unit (if so equipped).

(3) Disconnect pedal push rod (manual brakes) from brake pedal.

(4) Slide master cylinder straight out from cowl panel and/or power brake unit (if so equipped).

DISASSEMBLING MASTER CYLINDER

To disassemble the master cylinder, (Figs. 1 and 4) clean outside of master cylinder thoroughly.

(1) Remove cover retaining bolt, and clamp, then remove cover and gasket. Empty brake fluid from reservoirs.

(2) Loosen piston retainer screw then press in on rear piston and flip retainer down to release rear piston assembly. Slide rear piston assembly out of cylinder bore.

(3) Remove screw and gasket that retains front piston; then, upending master cylinder, tamp (open end down) on bench to remove front piston. **If front piston sticks in bore of cylinder, use air pressure to force piston out of cylinder. New cups must be installed at reassembly if air pressure is used.**

(4) Remove front piston compression spring from bore.

(5) Remove rubber cups from pistons, after noting position of cup lips.

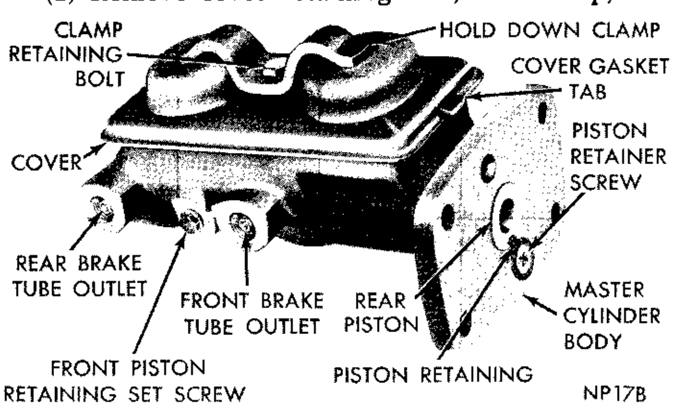


Fig. 1—Tandem Master Cylinder Assembly

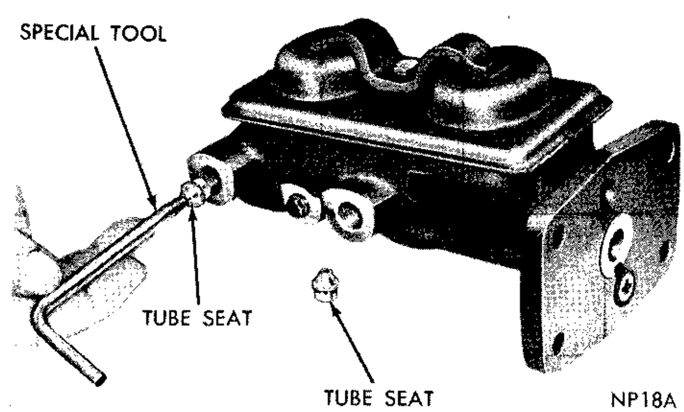


Fig. 2—Removing Tube Seats

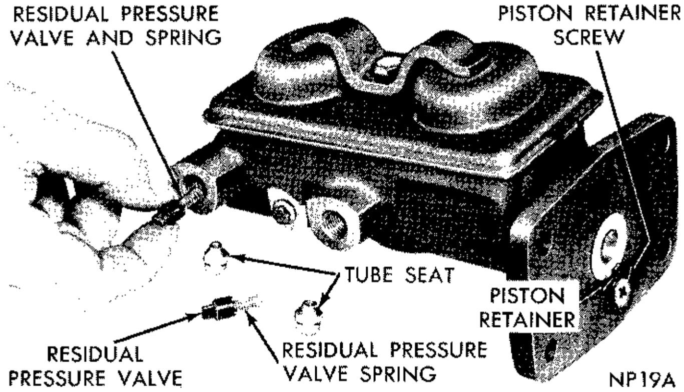


Fig. 3—Removing or Installing Residual Pressure Valves and Springs

Do not remove the primary cup of the rear piston. If cup is damaged or worn, install a new rear piston assembly.

(6) Using Tool T-109-178 (or an easy out) remove tube seats by threading tool firmly into seat, tap tool and seat out of cylinder body, (Fig. 2). Discard seats.

(7) Remove two residual pressure valves and springs (Fig. 3).

CLEANING AND INSPECTION

Clean master cylinder thoroughly, using a suitable solvent and dry with compressed air. Wash the cylinder bore with clean brake fluid and inspect for scoring or pitting. Master cylinder bore walls that have light scratches or show signs of corrosion, can usually be cleaned with crocus cloth. However, cylinder bores that have deep scratches or scoring may be honed, providing the diameter of the bore is not increased more than .002 inch. If master cylinder bore does not clean up at .002 inch when honed, the master cylinder should be discarded and a new master cylinder installed.

If master cylinder pistons are badly scored or corroded, replace them with new ones. The piston cups and seals should be replaced when reconditioning a master cylinder.

When overhauling a master cylinder, use all parts furnished in repair kit. **Discard all used rubber parts.**

REASSEMBLING MASTER CYLINDER

Front Piston

Before assembling the master cylinder, dip all component parts in clean brake fluid and place on a clean shop towel or paper (assembling seals dry can ruin them).

(1) Install thin washer on piston front end then, carefully work primary cup on front end of front piston with the lip away from piston (Fig. 4).

(2) Slide "O" ring over the rear end of front piston and into correct land.

(3) Carefully work front piston secondary cup (Fig. 4) into rear land, with the cup lip away from piston.

(4) Slide cup retainer over front end of piston, followed by piston spring (Fig. 4).

(5) Install piston spring, piston cup retainer, piston and cups into bore of master cylinder (Fig. 5).

Be sure the lip of cups enter bore evenly in order not to damage sealing qualities of cups. (Keep well lubricated with brake fluid.)

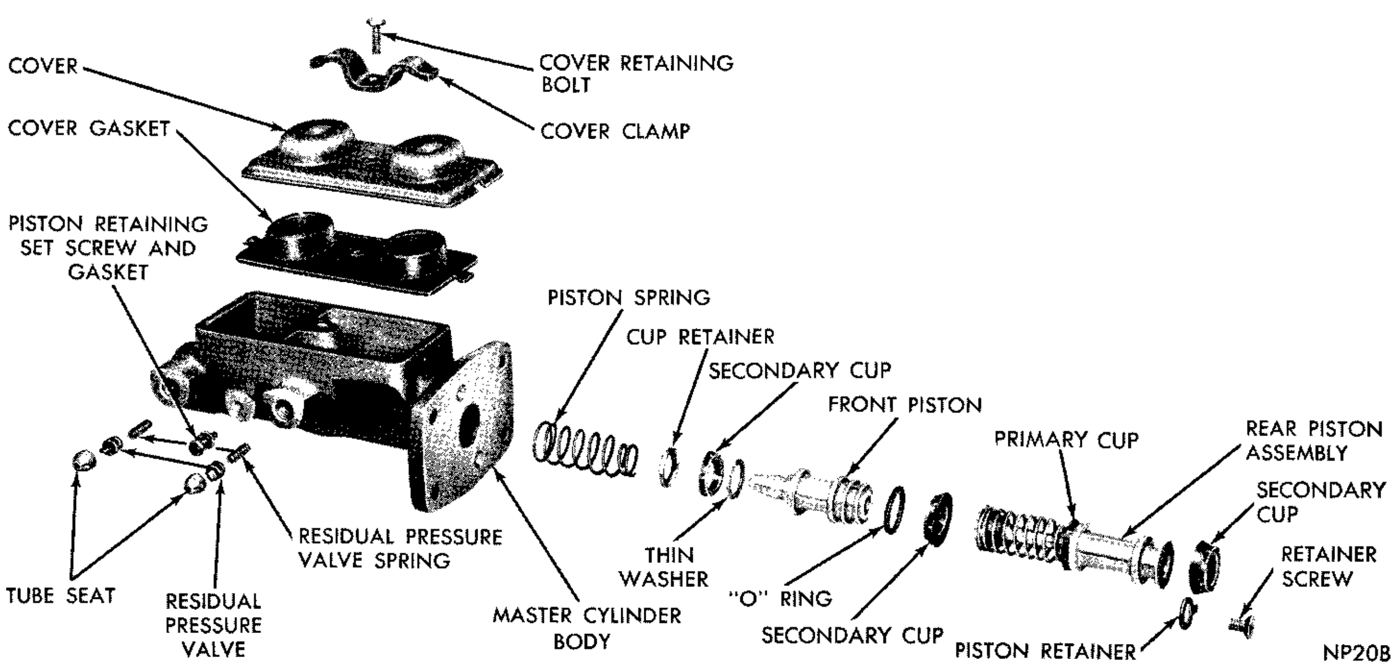


Fig. 4—Tandem Master Cylinder (Exploded View)

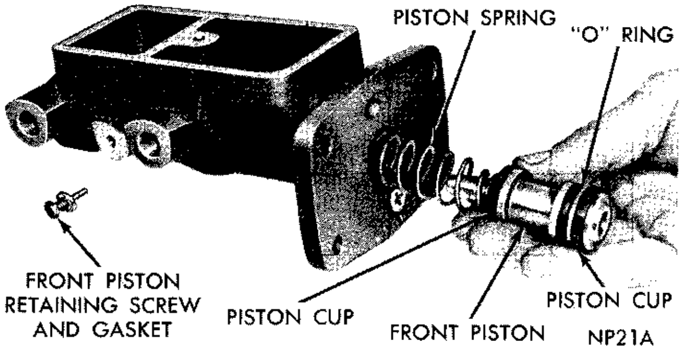


Fig. 5—Installing Front Piston and Spring

Rear Piston

(1) Carefully work secondary cup over rear end of rear piston with lip of cup toward piston (Fig. 4).

(2) Center spring retainer of rear piston assembly over shoulder of front piston. Push piston assemblies into bore up to center piston cup. Carefully work cup into bore then push piston **in** up to rear cup. Carefully work lip of rear cup into bore, then push in on piston until seated (Fig. 6).

(3) Holding piston in seated position, move piston retainer over piston and tighten screw securely.

(4) Install front piston retaining set screw and gasket in cylinder body and tighten securely (Fig. 1).

(5) Install residual pressure valves and springs in outlet ports and install tube seats, firmly. (When the bleeding tubes are attached, the tube seats will be positioned correctly.)

BLEEDING MASTER CYLINDER

Before installing the master cylinder on vehicle, it must be bled on the bench as follows:

(1) Clamp master cylinder in a vise and attach bleeding tubes Tool C-4029 (Fig. 7).

(2) Fill both reservoirs with approved brake fluid.

(3) Using a wooden stick or dowel (power brake equipped vehicles) depress push rod slowly and allow the pistons to return under pressure of springs. Do this several times until all air bubbles are expelled. (Fig. 7).

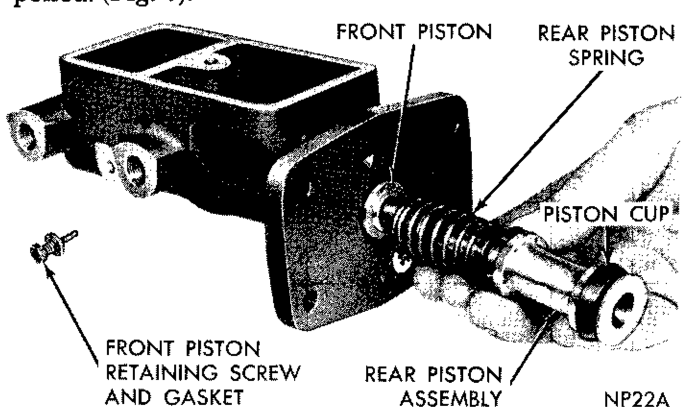


Fig. 6—Installing Rear Piston Assembly

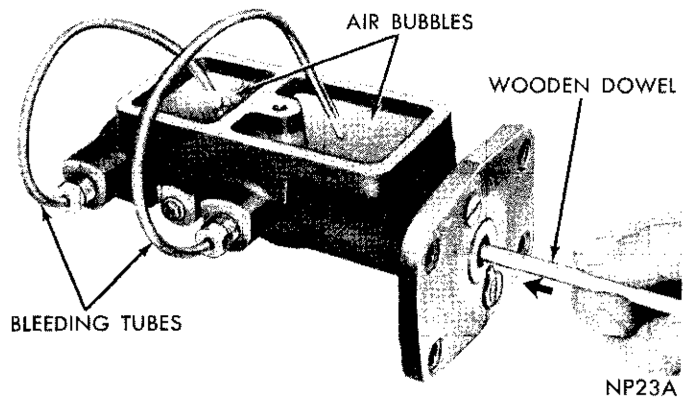


Fig. 7—Bleeding Master Cylinder

(4) Remove bleeding tubes from cylinder and install cover and gasket. (As tubes are removed, fluid remaining in tubes will syphon out.)

(5) Install cover retaining clamp and clamp screw.

(6) Remove from vise and install master cylinder on vehicle as follows:

INSTALLING MASTER CYLINDER

(1) Install master cylinder on vehicle, aligning push rod with cowl panel opening (manual brakes) or power brake push rod with cylinder piston.

(2) Slide over mounting studs. Install attaching nuts and tighten to 9 foot-pounds. Connect push rod to brake pedal.

(3) Connect front and rear brake tubes and tighten to 150 inch-pounds.

(4) Bleed brakes at wheel cylinders using regular procedure, being sure fluid level is maintained. (See Bleeding the Brake System.)

TESTING MASTER CYLINDER

Be sure that the master cylinder compensates at both ports. This can be done by applying the pedal lightly with the engine running (power brakes) and observing for a gyser of fluid squirting up in the reservoirs. This may only occur in the front chamber and so to determine if the rear compensating port is open, it will be necessary to pump up the brakes rapidly and, then, hold the pedal down. Have an observer watch the fluid in the rear reservoir while the pedal is raised. A disturbance in the fluid indicates that the compensating port is open.

HYDRAULIC SYSTEM SAFETY SWITCH

The hydraulic system safety switch (Figs. 8 and 9) is used to warn the vehicle operator that one of the hydraulic systems has failed. A failure in one part of the brake system does not result in failure of the entire hydraulic brake system. As an example, failure

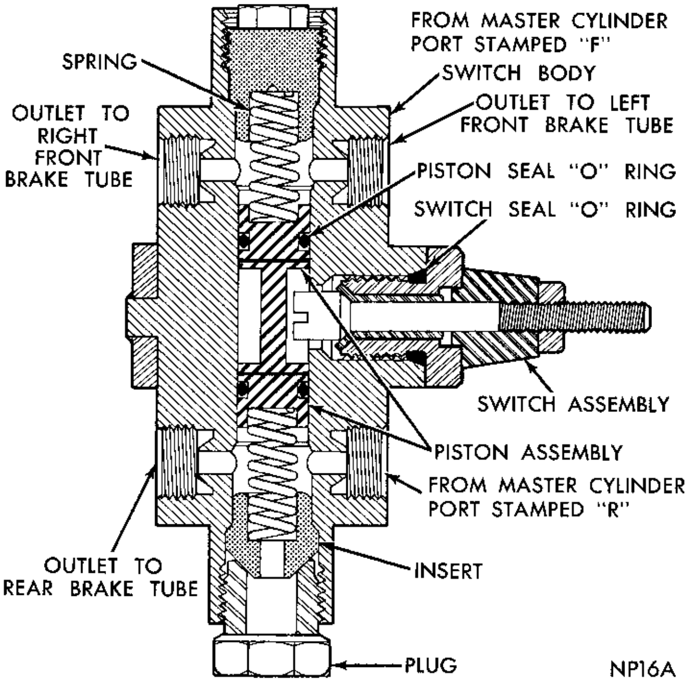


Fig. 8—Hydraulic System Safety Switch (Sectional)

of the rear brake system will leave the front brake system still operative.

As pressure falls in one system, the other system's normal pressure forces the piston to the inoperative side contacting the switch terminal, causing a red warning light to come on in the instrument panel, thus, warning the operator of the vehicle that one of the systems has failed and should be repaired.

The safety switch is mounted on the frame in a vertical position, with the brake tubes connected. (Fig. 8).

If a malfunction occurs within the switch, disconnect tubes from body assembly and install a new assembly. **The component parts of the switch body are not serviced.** However, the terminal unit can be removed if a malfunction occurs and a new terminal

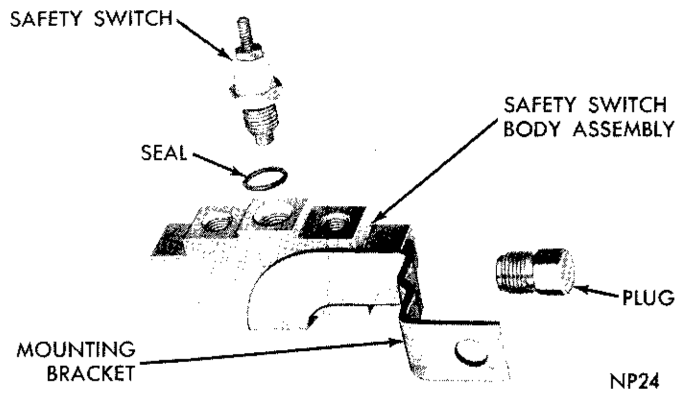


Fig. 9—Hydraulic System Safety Switch (Exploded View)

unit installed.

If a new body is installed, bleed the brake system.

TESTING HYDRAULIC SYSTEM SAFETY SWITCH

The brake warning light flashes only when the parking brake is applied with the ignition key turned "ON". The same light will also illuminate should one of the two service brake systems fail when the brake pedal is applied. To test the system turn the ignition key "ON", and apply the parking brake. If the light fails to light, inspect for a burned out bulb, disconnected socket, a broken or disconnected wire at the switch.

To test the service brake warning system, raise the car on a hoist and open a wheel cylinder bleeder while a helper depresses the brake pedal and observes the warning light. If the light fails to light, inspect for a burned out bulb, disconnected socket, a broken or disconnected wire at the switch. If the bulb is not burned out and the wire continuity is proven, replace the brake warning switch in the brake line Tee fitting mounted on the frame rail in the engine compartment below the master cylinder.

WHEEL CYLINDERS

INDEX

GENERAL INFORMATION

A piston stop (Fig. 3) is welded to the support plates to prevent the pistons from moving out far enough to lose brake fluid. The piston boots are of the press-on type and prevents moisture from entering the wheel cylinder.

To perform service operations or inspections of the wheel cylinders, it will be necessary to remove the cylinders from the support plate and disassemble on the bench.

REMOVING WHEEL CYLINDERS

Front or Rear

With all the brake drums removed, inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears, or heat cracks, and if any of these conditions exist, the wheel cylinders should be completely cleaned, inspected and new parts installed. (A slight amount of fluid on the boot may not be a leak, but may be preservative fluid used at assembly.

(1) In case of a leak, remove brake shoes, (replace if soaked with grease or brake fluid.)

(2) Disconnect brake hose from brake tube at frame bracket (front wheels) or disconnect brake tube from wheel cylinder (rear wheels).

(3) Disconnect brake hose from wheel cylinder (front). Remove wheel cylinder attaching bolts (front or rear), then slide wheel cylinder assembly out of support.

DISASSEMBLING WHEEL CYLINDERS

Front or Rear (Fig. 1)

(1) Using a suitable tool, pry boots away from cylinders and remove. Remove push rods.

(2) Press **in** on one piston and force out piston, cup, spring cup and piston.

(3) Wash wheel cylinder, pistons, and spring in clean brake fluid or alcohol; clean thoroughly and blow dry with compressed air. Inspect cylinder bore and piston for scoring and pitting. (Do not use a rag as lint from the rag will adhere to bore surfaces.)

Wheel cylinder bores and pistons that are badly scored or pitted should be replaced. Cylinder walls that have light scratches, or show signs of corrosion, can usually be cleaned with crocus cloth, using a circular motion. Black stains on the cylinder walls are caused by piston cups and will not impair operation of cylinder.

ASSEMBLING WHEEL CYLINDERS

Front or Rear (Fig. 1)

Before assembling the pistons and new cups in the wheel cylinders, dip them in clean brake fluid. If the boots are deteriorated, cracked or do not fit tightly on the push rods or the cylinder casting, new boots must be installed.

(1) Wash wheel cylinder with alcohol and blow dry with compressed air. Coat cylinder bore with clean brake fluid.

(2) Install expansion spring in cylinder. Install cups in each end of cylinder with open end of cups facing each other.

(3) Install pistons in each end of cylinder with recessed end of pistons facing open ends of cylinder.

(4) Install boots with push rods over ends of cylinder and press over ends until boot is seated against cylinder shoulder. **Use care not to damage boot.**

INSTALLING WHEEL CYLINDERS

Front or Rear

(1) Slide wheel cylinder into position on support (front or rear). Install mounting screws and torque to 220 inch-pounds.

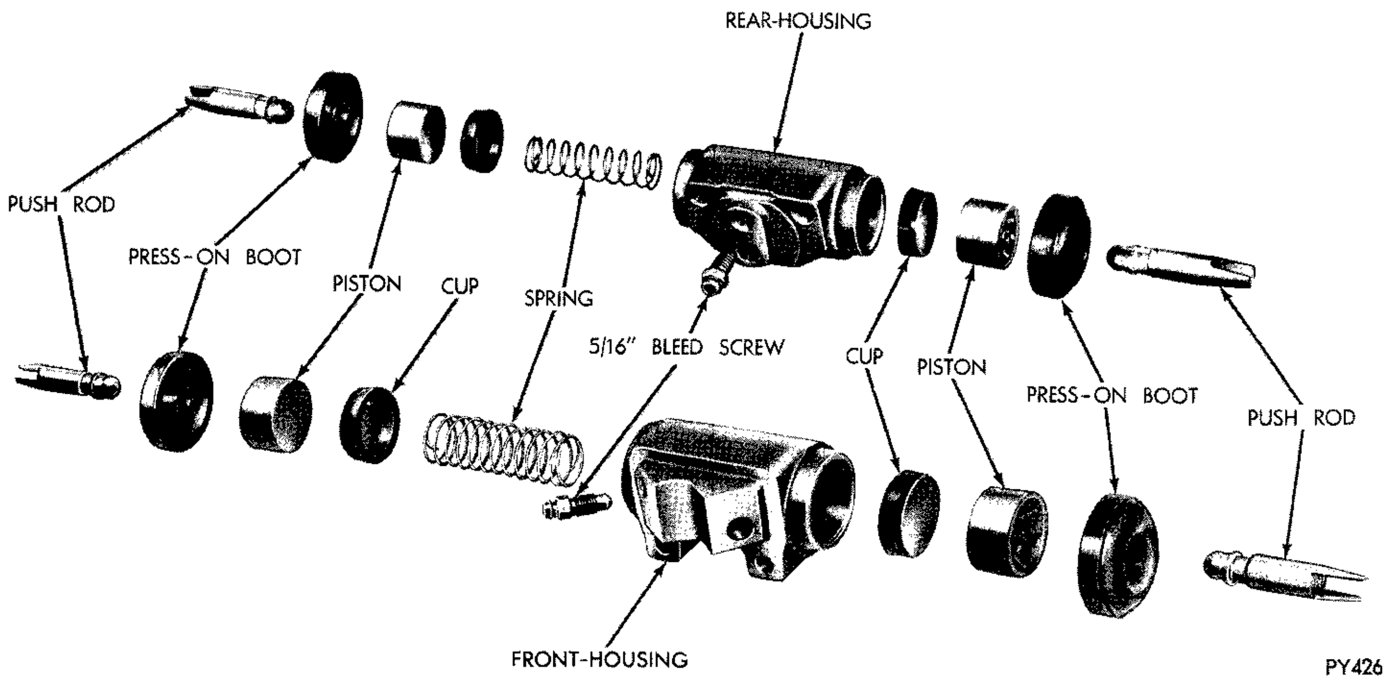


Fig. 1—Wheel Cylinders (Front and Rear)

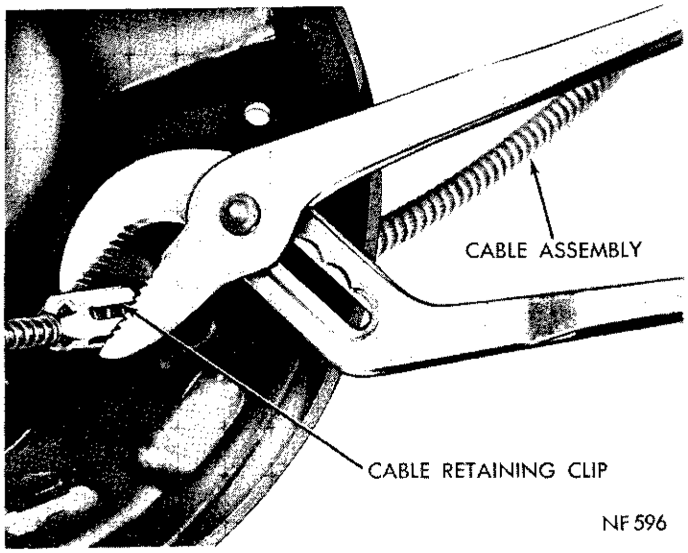


Fig. 2—Removing Brake Cable from Support

(2) Connect brake tube to rear wheel cylinder and torque to 115 inch pounds. Connect brake hose to front wheel cylinder, using a new gasket. Torque to 25 foot pounds, before attaching brake hose to frame bracket. **Should hose be connected to wheel cylinder last, tightening of the hose into wheel cylinder will twist hose, and can result in suspension or tire interference.**

(3) Connect brake line to brake hose and torque to 115 inch-pounds.

REMOVING BRAKE SUPPORT

(Front)

(1) Disconnect brake line from brake hose at frame bracket.

(2) With wheel and brake drum removed, remove four support attaching nuts and washers.

(3) Remove support and brake assembly from spindle.

(Rear)

(1) With wheel and brake drum removed, remove support attaching nuts and washers.

(2) Remove rear axle shaft and retainer.

(3) Disconnect hydraulic brake line from wheel cylinder.

(4) Disengage brake cable from parking brake lever.

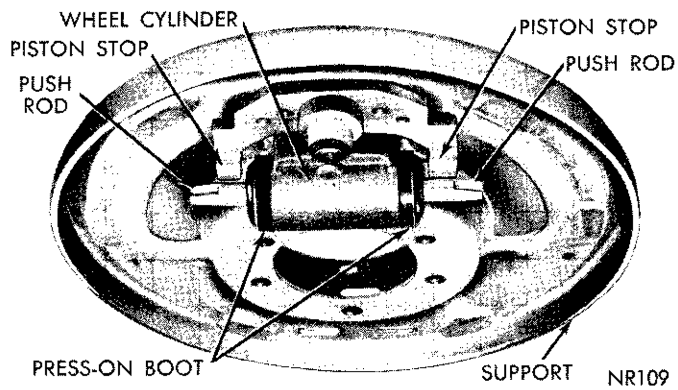


Fig. 3—Wheel Cylinder Piston Stops

(5) Using a suitable tool compress three flared legs of cable retainer and pull brake cable out of support (Fig. 2).

(6) Remove brake support from rear axle housing.

INSTALLING BRAKE SUPPORT

(Front)

(1) Place support plate on spindle and install attaching bolts, nuts, and washers. Tighten bolts that mount through support plate knuckle to 55 foot-pounds. The bolts that go through the support plate, knuckle, and steering arm must be torqued to 120 foot-pounds.

(2) Connect brake hose to wheel cylinder, tighten to 25 foot-pounds, before connecting brake hose to frame bracket. **Should hose be connected to wheel cylinder last, tightening of hose into wheel cylinder will twist the hose, which can result in suspension or tire interference problems.**

(3) Connect brake line to brake hose and torque to 115 inch-pounds.

(Rear)

(1) Install support onto rear axle housing.

(2) Insert rear axle shaft and retainer into housing and install axle retainer nuts and washers. Torque retainer nuts to 35 foot-pounds.

(3) Attach brake line to wheel cylinder and torque to 115 inch-pounds.

(4) Insert parking brake cable into support plate and attach cable to parking brake lever.

PARKING BRAKES

INDEX

GENERAL INFORMATION

The rear wheel service brakes also act as parking brakes. The brake shoes are mechanically operated by a lever and strut connected to a flexible steel cable. The wheel brake cables are joined together by a forward brake cable and equalizer extending to the parking brake pedal or release handle (Figs. 1 and 2).

The parking brake pedal assembly used (Fig. 4) on Imperial models is pedal applied but is released by a vacuum valve. When the engine is started and vacuum is developed, energy is then available to release the parking brake. This is controlled by the transmission shift lever. When the transmission is in neutral or "Park" position, the lever attached to the gearshift tube slide, closes the valve which is mounted on the steering column, (passenger compartment). This stops the vacuum to the vacuum release cannister and allows the parking brake to be applied.

When the shift lever is moved (forward or reverse) the valve is opened to actuate the vacuum release. In the event of engine failure and no vacuum, the brake may be released by a manual release lever mounted on the left side of the parking brake pedal assembly. This system prevents the vehicle from being driven with the parking brake in the applied position (Fig. 4).

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
DRAGGING BRAKE	(a) Improper cable or brake shoe adjustment.	(a) Properly adjust service brakes then adjust parking brake cable.
	(b) Broken brake shoe return spring.	(b) Replace any broken return spring.
	(c) Broken brake shoe retainer spring.	(c) Replace broken retainer spring.
	(d) Grease or brake fluid soaked lining.	(d) Replace grease seal or recondition wheel cylinders and replace both brake shoes.
	(e) Sticking or frozen brake cable.	(e) Replace cables.
	(f) Broken rear spring.	(f) Replace broken rear spring.
	(g) Bent or rusted cable equalizer.	(g) Straighten, or replace and lubricate equalizer.
	(h) Improper vacuum release valve adjustment (Imperial).	(h) Adjust vacuum release valve.
	(i) Heat Set, parking brake cable springs.	(i) Replace parking brake cable.
BRAKE WILL NOT HOLD	(a) Broken or rusted brake cable.	(a) Replace or clean and lubricate brake cable.
	(b) Improperly adjusted brake or cable.	(b) Adjust brakes and cable as necessary.
	(c) Soaked brake lining.	(c) Replace brake lining.
	(d) Ratchet or pedal mechanism worn.	(d) Replace pedal assembly.

SERVICE PROCEDURES

ADJUSTING PARKING BRAKES

The service brakes must be properly adjusted before adjusting the parking brake.

(1) Release parking brake lever and loosen cable adjusting nut to insure cable is slack, (Fig. 1). Before loosening cable adjusting nut, clean threads with wire brush and lubricate with grease.

(2) Tighten cable adjusting nut until a slight drag is felt while rotating wheel, loosen cable adjusting nut until both rear wheels can be rotated freely, then back off cable adjusting nut two full turns.

(3) Apply parking brake several times, then release and test to see that rear wheels rotate freely without dragging.

The independent rear brake cables are attached to an equalizer (Fig. 1). The front cable is adjusted at equalizer.

REMOVING REAR PARKING BRAKE CABLE

Should it become necessary to remove the parking brake cable (rear) for installation of a new cable, (Fig. 2), under "Wheel Cylinders."

(1) With vehicle jacked up or on a suitable hoist, remove rear wheels.

(2) Disconnect brake cable from equalizer.

(3) Remove retaining clip from brake cable bracket.

(4) Remove brake drum from rear axle.

(5) Remove brake shoe return springs.

(6) Remove brake shoe retaining springs.

(7) Remove brake shoe strut and spring from brake support plate and disconnect brake cable from operating arm.

(8) Compress retainers on end of brake cable

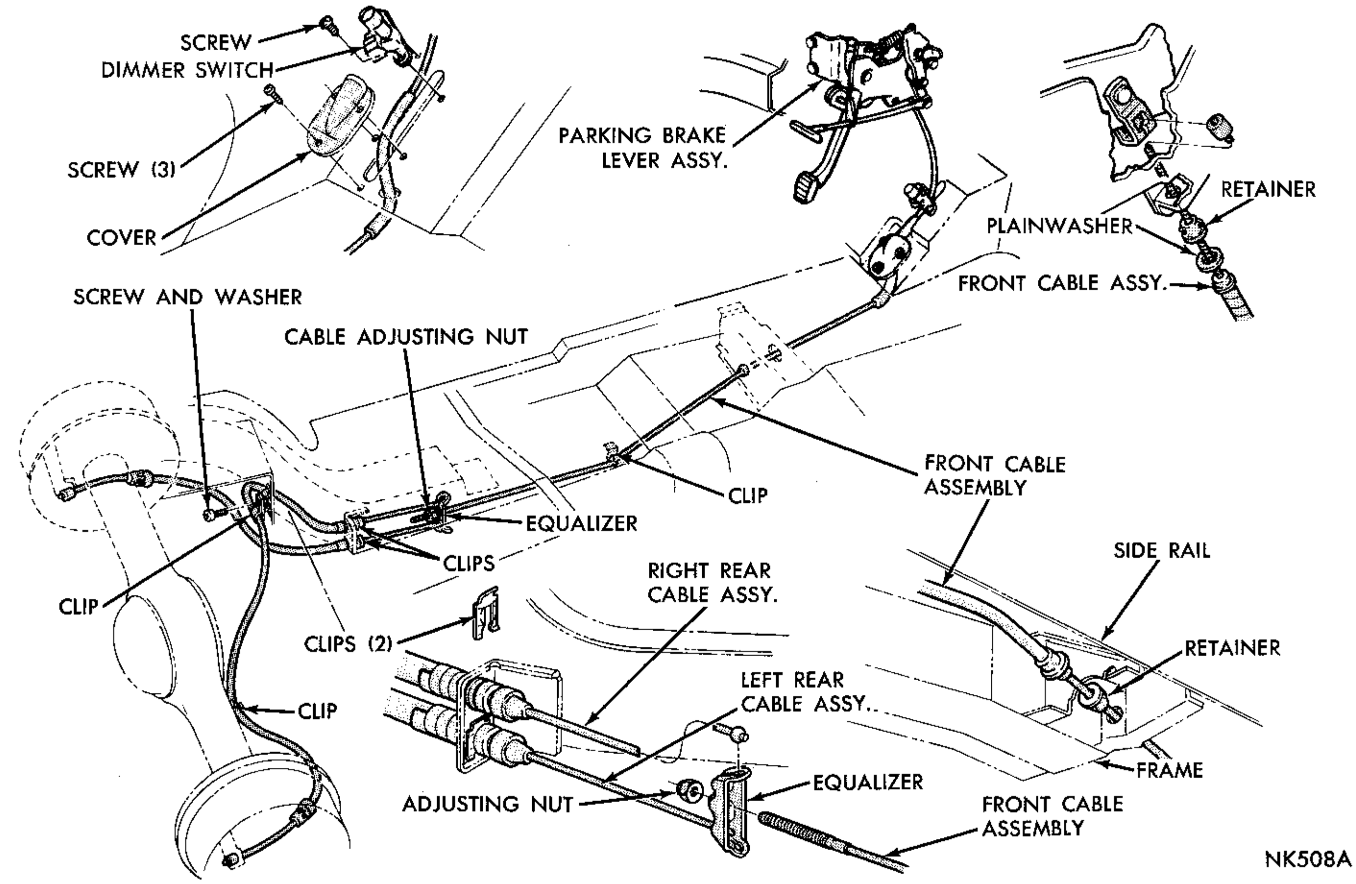


Fig. 1—Parking Brake Cable Routing

housing and remove cable from brake support. (Fig. 2), under "Wheel Cylinders."

INSTALLING REAR PARKING BRAKE CABLE

When installing a new brake cable, lubricate the cable with short fibre grease at the contact points.

(1) Insert brake cable and housing into brake support plate making certain that housing retainers lock housing firmly into place.

(2) Holding brake shoes in place on support plate, engage brake cable into brake shoe operating lever.

(3) Install brake shoe retaining springs, and brake shoe return springs.

(4) Install brake drum and wheel.

(5) Insert brake cable and housing into cable bracket and install retaining clip.

(6) Insert brake cable into equalizer. Note different size slot for corresponding cable end fitting.

REMOVING FRONT PARKING BRAKE CABLE

(1) Disengage front cable from equalizer and using a screwdriver force cable housing and retaining clip out of frame crossmember.

(2) Disengage cable housing from underbody mounting bracket.

(3) Raise floor mat or carpet and remove rubber grommet holding cable housing into floor pan.

(4) Depress parking brake pedal, pulling cable through housing so that when pedal is released, cable may be disengaged from clevis.

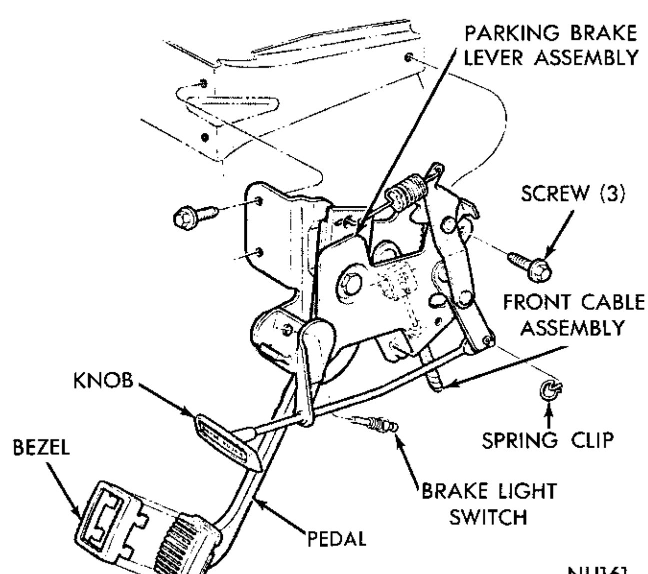


Fig. 2—Parking Brake Pedal

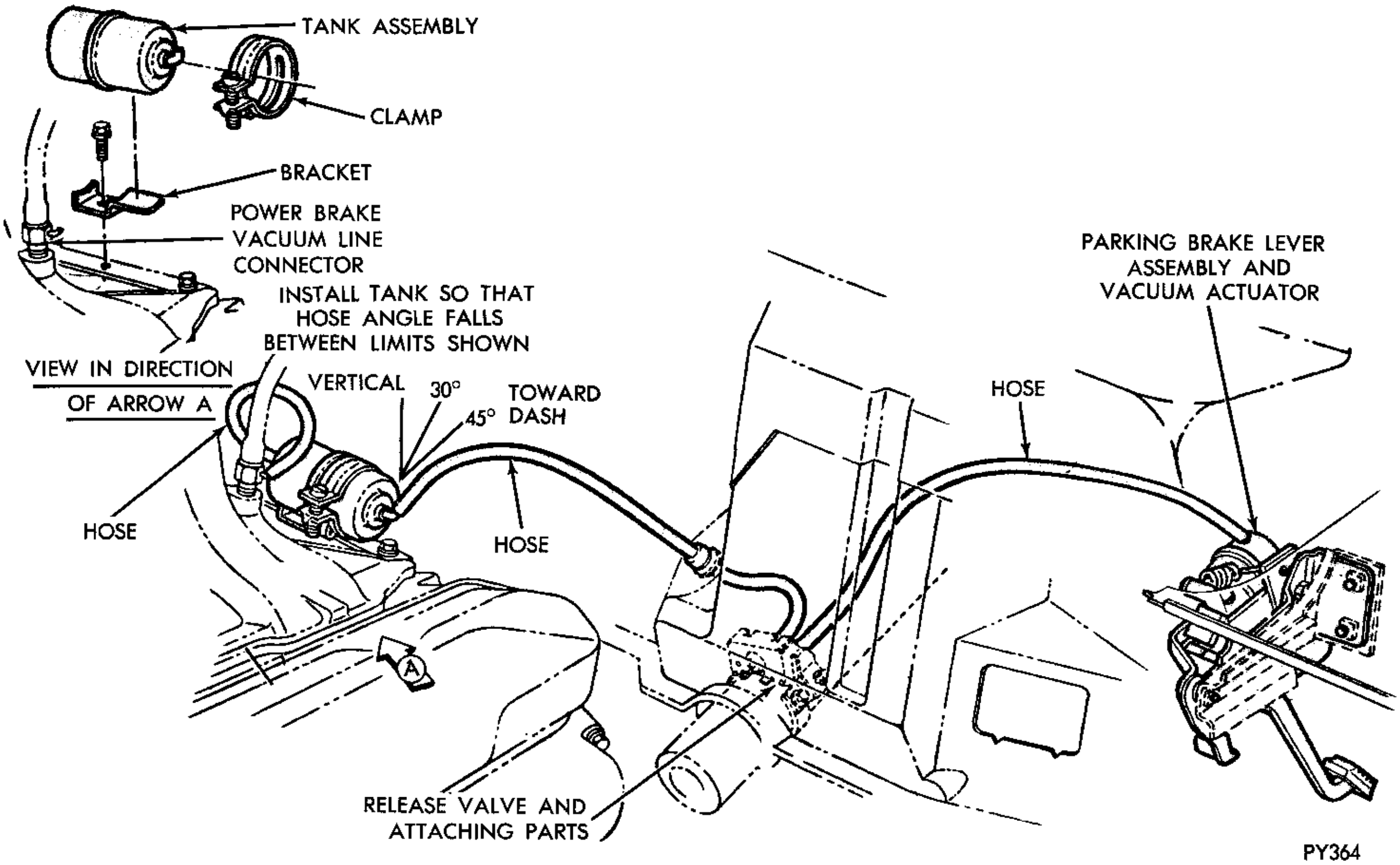


Fig. 3—Parking Brake Vacuum Valve, Actuator and Tank (Imperial)

(5) Using a screwdriver pry housing out of mounting bracket and retaining clip.

(6) Pull parking brake cable and housing up out of floor pan.

INSTALLING FRONT PARKING BRAKE CABLE

(1) Insert parking brake cable down through floor pan.

(2) Install cable housing into underbody mounting bracket.

(3) Insert end fitting of cable into parking brake clevis and force housing and retaining clip into pedal bracket assembly (Fig. 2).

(4) Insert cable through crossmember and force housing and retaining clip into crossmember.

(5) Attach cable to equalizer and adjust parking brake cable.

(6) Apply brakes several times and test for free wheel rotation.

(7) Test operation of vacuum release valve (Imperial only).

PARKING BRAKE VACUUM VALVE (IMPERIAL)

(1) Place transmission shift selector lever in "Drive" (engine off).

(2) Remove vacuum hoses from unit (Fig. 4).

(3) Remove screws that attach vacuum unit to steering column jacket, then remove vacuum valve.

To install vacuum valve unit, (Fig. 4), proceed as follows:

(1) Move actuating arm on valve against spring to extreme position, or until locating holes line up. Install a number 42 drill in hole to properly position valve for installation (Fig. 4).

(2) Move transmission shift selector lever into "Park" position.

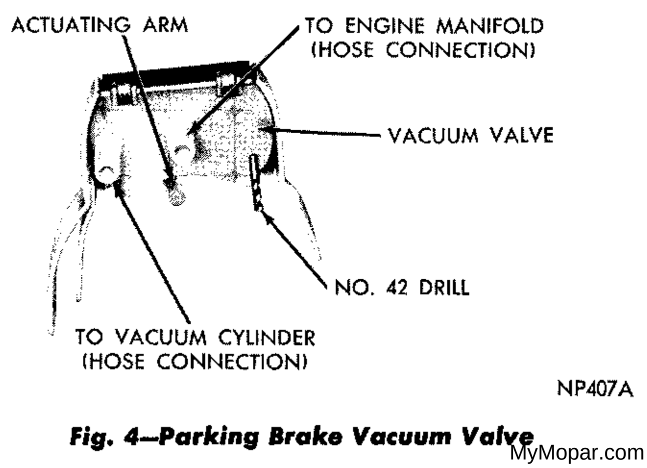


Fig. 4—Parking Brake Vacuum Valve

(3) Place valve in position on steering column jacket and install attaching screws. (Do not tighten.) Rotate valve clockwise (viewed from drivers position) until actuating arm contacts tab inside steering column jacket. Tighten screws securely.

(4) Remove drill from locating hole.

(5) Install vacuum hoses. (Be sure hose from engine manifold is attached to center fitting on valve (Fig. 4).

(6) Start engine and check to see that parking brake can be set in neutral and park position, and will release in reverse and drive positions.

MIDLAND ROSS POWER BRAKE
(Single Diaphragm)

GENERAL INFORMATION

The Midland Ross power brake, (Fig. 1) is located on the engine side of the dash panel. The front cover of the Power Brake Unit supports the master cylinder. The power brake derives its power from the intake manifold vacuum and atmospheric pressure. It does not require a vacuum reservoir.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
DRAGGING BRAKES (ALL WHEELS)	(a) Brake shoes improperly adjusted. (b) Brake pedal linkage binding. (c) Excessive hydraulic seal friction. (d) Compensator port plugged. (e) Fluid cannot return to master cylinder. (f) Parking brake not returning. (g) Metering valve mal-function.	(a) Adjust brakes. (b) Free up linkage. (c) Lubricate seal. (d) Clean out master cylinder. (e) Inspect pedal return and push rod adjustment. (f) Free up as required. (g) Replace metering valve.
GRABBING BRAKES	(a) Grease or brake fluid on linings.	(a) Inspect for a leak and replace lining as required.
PEDAL GOES TO FLOOR (OR ALMOST TO FLOOR)	(a) Self-adjusters not operating. (b) Air in hydraulic system. (c) Hydraulic leak. (d) Fluid low in master cylinder. (e) Shoe hanging up on rough platform.	(a) Inspect self-adjuster operations. (b) Bleed brakes. (c) Locate and correct leak. (d) Add brake fluid. (e) Smooth and lubricate platforms.

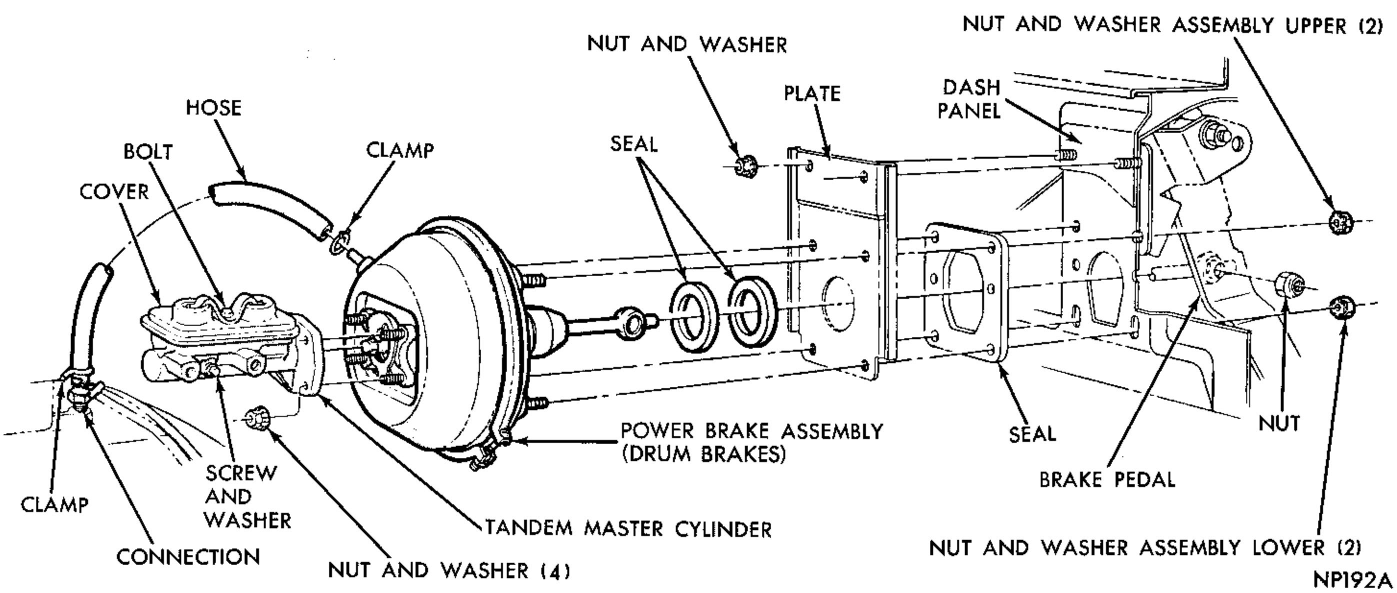


Fig. 1—Power Brake and Master Cylinder

Condition	Possible Cause	Correction
HARD PEDAL (POWER UNIT TROUBLE)	(a) Faulty vacuum check valve.	(a) Replace check valve.
	(b) Collapsed or leaking vacuum hose.	(b) Replace hose.
	(c) Plugged vacuum fittings.	(c) Clean out fittings.
	(d) Leaking vacuum chamber.	(d) Replace unit.
	(e) Diaphragm assembly out of place in housing.	(e) Replace unit.
	(f) Vacuum leak in forward vacuum housing.	(f) Replace unit.

SERVICE PROCEDURES

REMOVING POWER BRAKE (Fig. 1)

(1) Remove nuts attaching master cylinder to brake unit. Remove master cylinder from unit.

(2) Disconnect vacuum hose of power brake.

(3) From under instrument panel, remove nut and attaching bolt from power brake input push rod and brake pedal blade.

(4) Remove four power brake attaching nuts and washers.

(5) Remove power brake from vehicle.

INSTALLING POWER BRAKE

(1) Install power brake assembly into dash and tighten attaching nuts 150 inch-pounds.

(2) Connect brake line and vacuum hose.

(3) Using lubriplate, coat bearing surface of bolt that connects power brake pedal link with brake pedal linkage. Install bolt and nut. Tighten to 30 foot pounds.

CAUTION: Do not attempt to disassemble brake booster as this unit will be serviced by Manufacturer's Service Station.

(4) Install master cylinder on power brake. Tighten mounting nuts to 100 inch-pounds.

With power brake attached to dash panel and vacuum supplied to the unit, the master cylinder should compensate (force jet of fluid up through compensation ports).

(5) Check stop light operation.

POWER BRAKE—BENDIX

(Single Diaphragm)

GENERAL INFORMATION

The single diaphragm type power brake (Fig. 1) is a self contained vacuum hydraulic power braking unit. It is of the vacuum suspended type which utilizes engine intake manifold vacuum and atmospheric pressure for its power. This type of units does not require a vacuum reservoir.

The Bendix Power Brake Unit can be identified by the twist lock method of attaching the housing and cover together.

The basic elements of the vacuum unit are as follows:

A mechanically actuated control valve integral with the vacuum power diaphragms, controls the degree of power brake application or release in accordance with the foot pressure applied to the valve operating rod through the brake pedal linkage.

The control valve is of a single poppet type valve with the atmospheric port and a vacuum port. The vacuum port seat is a part of the valve body attached to the diaphragm assembly. The atmospheric port is a part of the valve plunger which moves within the valve housing and vacuum power diaphragm assembly.

A hydraulic master cylinder which contains all of the elements of the standard brake master cylinder except for the special hydraulic push rod which is a part of the power brake.

SERVICE PROCEDURE

REMOVING POWER BRAKE

(1) Remove four master cylinder attaching nuts and washers and remove master cylinder from power brake.

(2) Disconnect vacuum line from check valve.

(3) From under instrument panel, remove nut and bolt from power brake link and brake pedal.

(4) From under instrument panel remove four brake unit attaching nuts and washers.

(5) Withdraw brake unit assembly from brake support bracket.

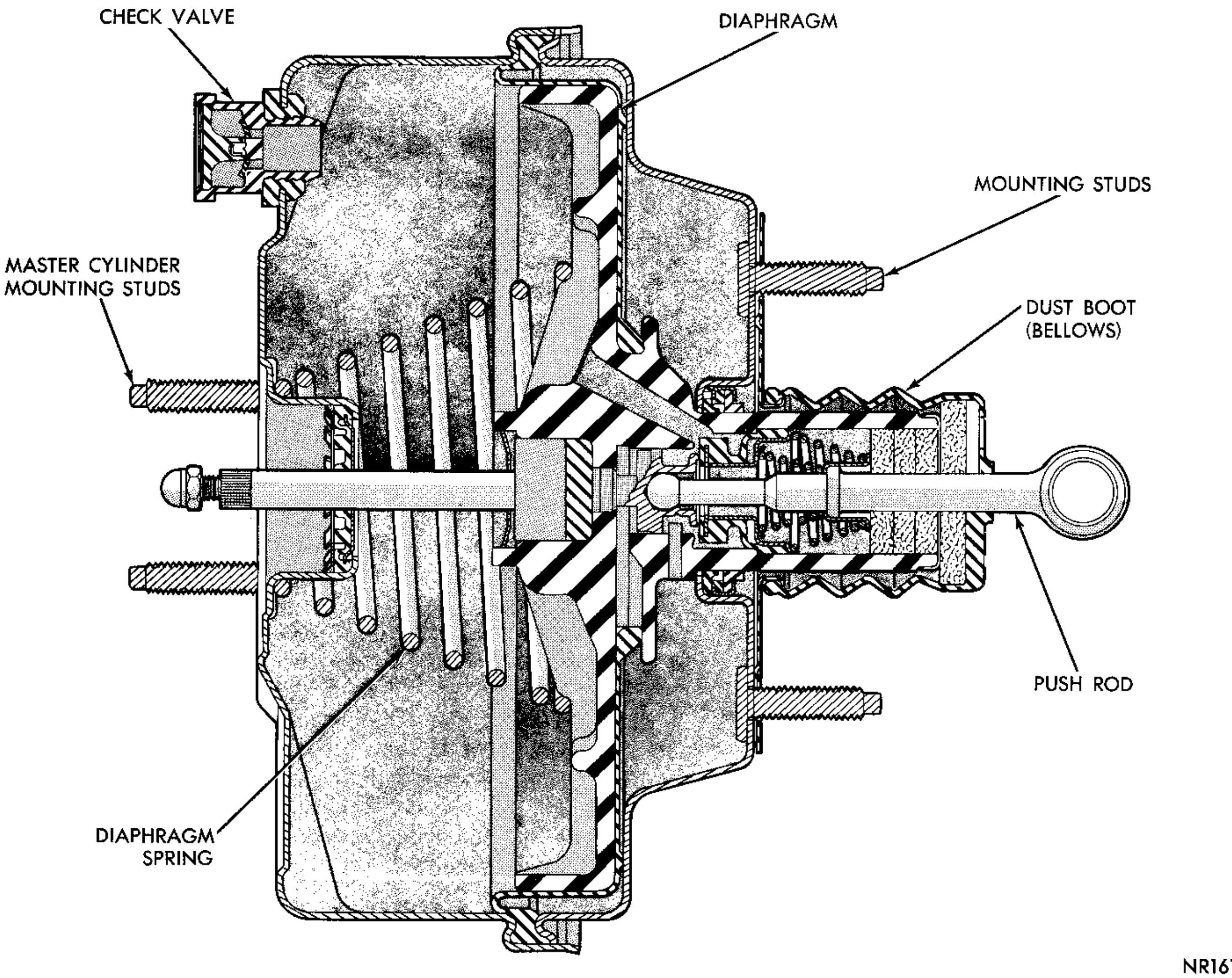


Fig. 1—Power Brake Assembly (Bendix) Drum Brakes

INSTALLING POWER BRAKE

(1) Insert brake link through brake support and install four attaching washers and nuts. Tighten to 150 inch-pounds.

(2) Using lubriplate, coat bearing surface of bolt that connects power brake pedal link with brake pedal. Install bolt and nut. Tighten to 30 foot-pounds.

(3) Attach vacuum hose to check valve.

(4) Install master cylinder on power brake. Tighten mounting nuts to 100 inch-pounds. Be sure power brake output push rod is set to correct length. With power brake attached to dash panel and vacuum supplied to unit, the master cylinder should compensate (force jet of fluid up through front chamber compensation port).

(5) Inspect adjustment of stop light switch.

CAUTION: Do not attempt to disassemble brake booster as this unit will be serviced by Manufacturer's Service Station.

POWER BRAKE—BENDIX

(Tandem Diaphragm)

GENERAL INFORMATION

The tandem diaphragm type power brake (Fig. 1) is a self contained vacuum hydraulic power braking unit. It is of the vacuum suspended type which utilizes engine intake manifold vacuum and atmospheric pressure for its power. This type of unit does not require a vacuum reservoir.

The Bendix Power Brake Unit can be identified by the crimped edge method of attaching the housing and cover together.

The basic elements of the vacuum unit are as follows:

(a) The vacuum power chamber consists of a front

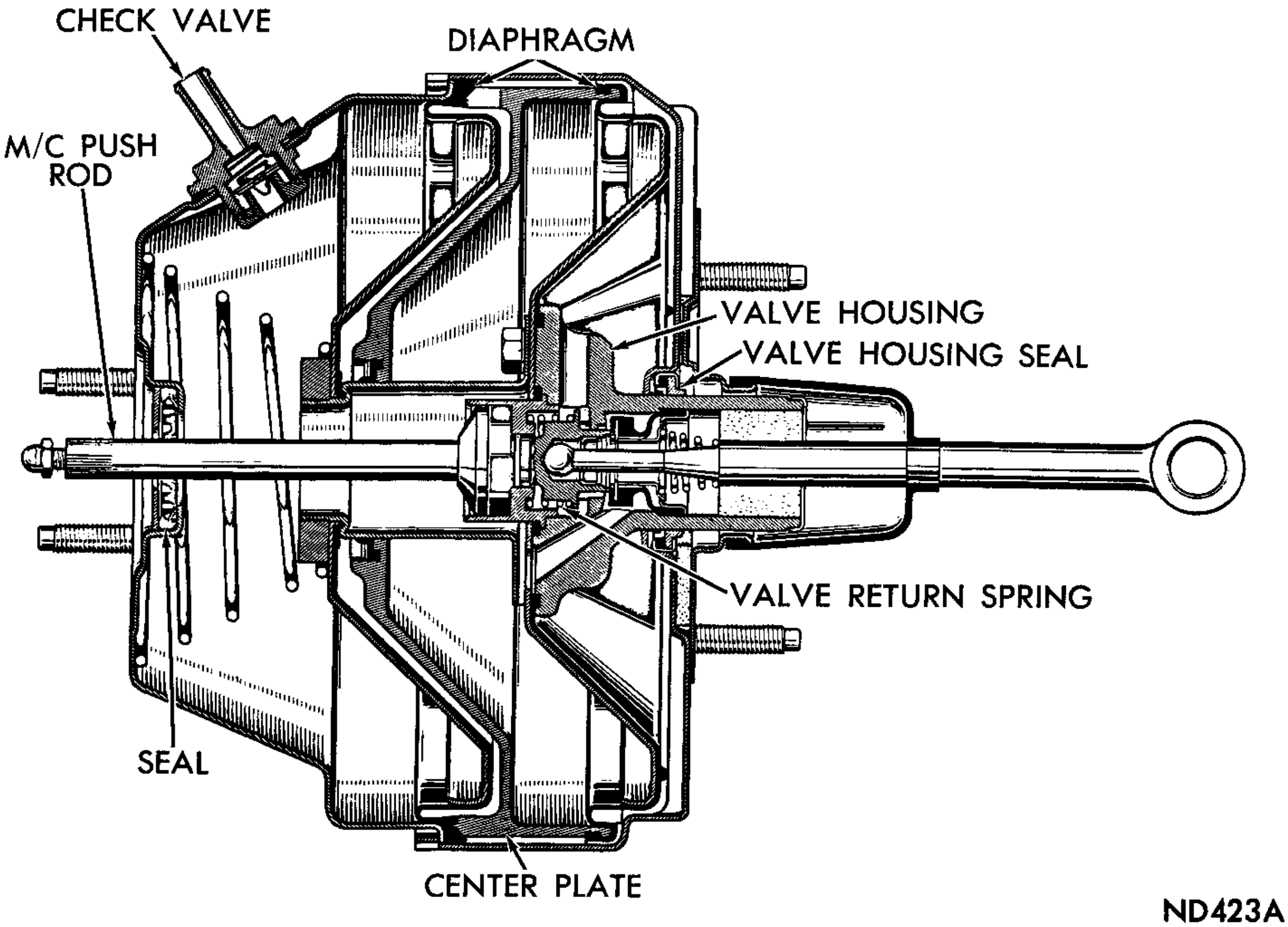


Fig. 1—Power Brake Assembly (Bendix) Disc Brakes

and rear shell, a center plate, front and rear diaphragm, hydraulic push-rod and a vacuum diaphragm return spring (Fig. 1).

(b) A mechanically actuated control valve integral with the vacuum power diaphragms, controls the degree of power brake application or release in accordance with the foot pressure applied to the valve operating rod through the brake pedal linkage.

The control valve is of a single poppet type valve with the atmospheric port and a vacuum port. The vacuum port seat is a part of the valve body attached to the diaphragm assembly. The atmospheric port is a part of the valve plunger which moves within the valve housing and vacuum power diaphragm assembly.

(c) A hydraulic master cylinder which contains all of the elements of the standard brake master cylinder except for the special hydraulic push rod which is a part of the power brake.

SERVICE PROCEDURES

REMOVING POWER BRAKE

(1) Remove four master cylinder attaching nuts and washers and remove master cylinder from power brake.

(2) Disconnect vacuum line from check valve.

(3) From under instrument panel, remove push rod nut and bolt from power brake and brake pedal.

(4) From under instrument panel remove four brake unit attaching nuts and washers.

(5) Withdraw brake unit assembly from brake support bracket.

INSTALLING POWER BRAKE

(1) Insert brake push rod through brake support and install four attaching washers and nuts. Tighten to 150 inch-pounds.

(2) Using lubriplate, coat bearing surface of bolt that connects power brake pedal link with brake

pedal linkage. Install bolt and nut. Tighten to 30 foot pounds.

(3) Attach vacuum hose to check valve.

(4) Install master cylinder on power brake. Tighten mounting nuts to 100 inch-pounds. With power brake attached to dash panel and vacuum supplied to unit, with the brake applied, the master cylinder should compensate (force jet of fluid up through front chamber compensation port).

(5) Inspect adjustment of stop light switch.

CAUTION: Do not attempt to disassemble brake booster as this unit will be serviced by Manufacturer's Service Station.

KELSEY-HAYES DISC BRAKE (FLOATING CALIPER)

INDEX

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXCESSIVE PEDAL TRAVEL	(a) Air, leak, or insufficient fluid in system or caliper.	(a) Check system for leaks and bleed.
	(b) Warped or excessively tapered shoe and lining assembly.	(b) Install new shoe and linings.
	(c) Excessive disc runout.	(c) Check disc for runout with dial indicator. Install new disc.
	(d) Rear brake adjustment required.	(d) Check and adjust rear brakes.
	(e) Loose wheel bearing adjustment.	(e) Readjust wheel bearing to specified torque.
	(f) Damaged caliper piston seal.	(f) Install new piston seal.
	(g) Improper brake fluid (boil).	(g) Drain and install correct fluid.
	(h) Power brake malfunction.	(h) Check and correct power unit.
BRAKE ROUGHNESS OR CHATTER (PEDAL PUMPING)	(a) Excessive thickness variation of braking disc.	(a) Check disc for thickness variation using a micrometer.
	(b) Excessive lateral runout of braking disc.	(b) Check disc for lateral runout with dial indicator. Install new disc.
	(c) Rear brake drums out-of-round.	(c) Regrind rear drums and check for out-of-round.
	(d) Excessive front bearing clearance.	(d) Readjust wheel bearings to specified torque.
EXCESSIVE PEDAL EFFORT	(a) Brake fluid, oil or grease on linings.	(a) Install new shoe linings as required.
	(b) Incorrect lining.	(b) Remove lining and install correct lining.
	(c) Frozen or seized pistons.	(c) Disassemble caliper and free up pistons.
	(d) Power brake malfunction.	(d) Check and correct power unit.
PULL	(a) Brake fluid, oil or grease on linings.	(a) Install new shoe and linings.
	(b) Unmatched linings.	(b) Install correct lining.
	(c) Distorted brake shoes.	(c) Install new brake shoes.
	(d) Frozen or seized pistons.	(d) Disassemble caliper and free up pistons.
	(e) Incorrect tire pressure.	(e) Inflate tires to recommended pressures.
	(f) Front end out of alignment.	(f) Align front end and check.
	(g) Broken rear spring.	(g) Install new rear spring.
	(h) Rear brake pistons sticking.	(h) Free up rear brake pistons.

Condition	Possible Cause	Correction
	(i) Restricted hose or line.	(i) Check hoses and lines and correct as necessary.
	(j) Caliper not in the proper alignment to braking disc.	(j) Remove caliper and reinstall. Check alignment.
NOISE	**Groan**—Brake noise emanating when slowly releasing brakes (creep—groan) (a) Not detrimental to function of disc brakes—no corrective action required. (Indicate to operator this noise may be eliminated by slightly increasing or decreasing brake pedal efforts.)	
	Rattle—Brake noise or rattle emanating at low speeds on rough roads, (front wheels only).	
	(a) Shoe anti-rattle spring missing or not properly positioned.	(a) Install new anti-rattle spring or position properly.
	(b) Excessive clearance between shoe and caliper.	(b) Install new shoe and lining assemblies.
	Scraping—(a) Mounting bolts too long.	(a) Install mounting bolts of correct length.
	(b) Loose wheel bearings.	(b) Readjust wheel bearings to correct specifications.
FRONT BRAKES HEAT UP DURING DRIVING AND FAIL TO RELEASE	(a) Operator riding brake pedal.	(a) Instruct owner how to drive with disc brakes.
	(b) Stop light switch improperly adjusted.	(b) Adjust stop light switch to allow full return of pedal.
	(c) Sticking pedal linkage.	(c) Free up sticking pedal linkage.
	(d) Frozen or seized piston.	(d) Disassemble caliper and free up piston.
	(e) Residual pressure valve in master cylinder.	(e) Remove valve. (See Fig. 15).
	(f) Power brake malfunction.	(f) Check and correct power unit.
LEAKY WHEEL CYLINDER	(a) Damaged or worn caliper piston seal.	(a) Disassemble caliper and install new seal.
	(b) Scores or corrision on surface of cylinder bore.	(b) Disassemble caliper and hone cylinder bore. Install new seal.
GRABBING OR UNEVEN BRAKING ACTION	(a) Causes listed under "Pull."	(a) Corrections listed under "Pull."
	(b) Power brake malfunction.	(b) Check and correct power unit.
BRAKE PEDAL CAN BE DEPRESSED WITHOUT BRAKING EFFECT	(a) Air in hydraulic system or improper bleeding procedure.	(a) Bleed system.
	(b) Leak past primary cup in master cylinder.	(b) Recondition master cylinder.
	(c) Leak in system or caliper.	(c) Check for leak and repair as required.
	(d) Rear brakes out of adjustment.	(d) Adjust rear brakes.
	(e) Bleeder screw open.	(e) Close bleeder screw and bleed entire system.

GENERAL INFORMATION

The Kelsey-Hayes single piston, floating caliper disc brake assembly (Fig. 1), consists of the hub and disc assembly, the caliper, shoes and linings, splash shield and adaptor.

The cast iron braking disc has 40 (forty) cooling fins (or louvres) that are cast integrally between the two machined braking surfaces (Fig. 2). When the wheel is in motion, the rotation of the disc cooling fins supplies air circulation between the braking surfaces for efficient cooling of the disc and prolonged lining life. The braking disc is protected from road splash (inboard side) by a shield bolted to the steering knuckle and by the wheel and tire on the outboard side.

The single piston caliper assembly floats through four rubber bushings on two steel guide pins threaded into the adaptor. Two of the bushings are inserted in the outboard portion of the caliper and two on the inboard side (Fig. 3). Four machined abutments on the adaptor, position and align the caliper, fore and aft. Two positioners installed over the guide pins, control the movement of the caliper along with the piston seal, and assists in maintaining proper shoe clearance and are also required to hold the inner bushing in place.

The guide pins are also used to radially locate and restrain both shoes, while all of the braking force is taken by the caliper on the outboard shoe and ma-

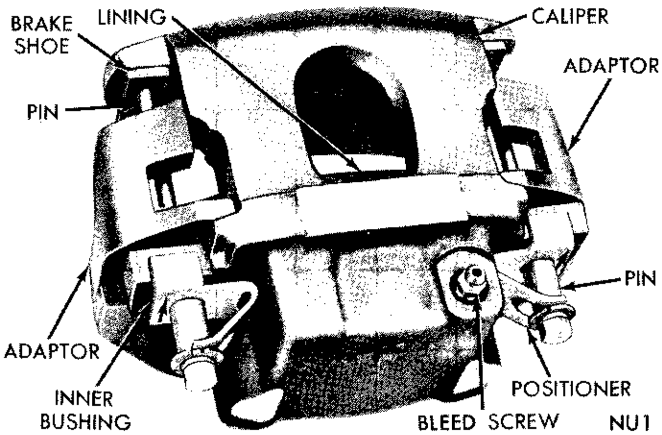


Fig. 1—Floating Caliper Assembly (Single Piston)

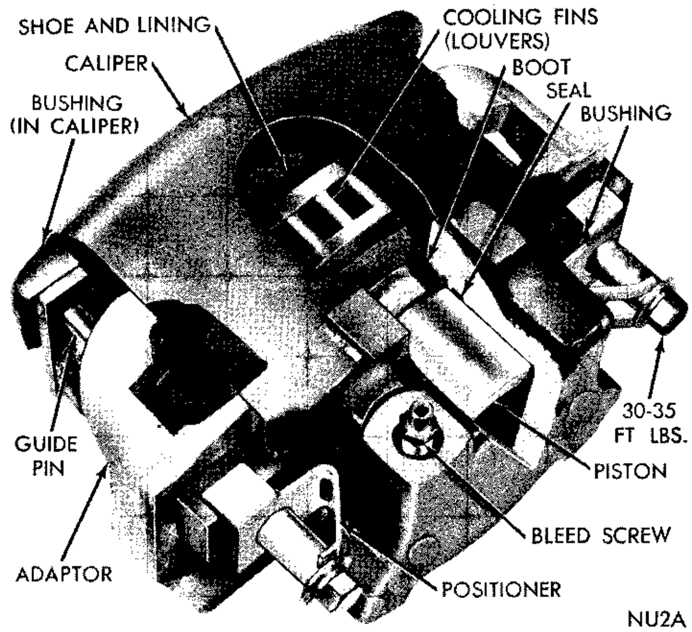


Fig. 2—Floating Caliper Assembly (Sectional)

chined lug (Fig. 9) on the adapter for the inboard shoe.

The caliper is a one piece casting with the inboard side containing the single piston cylinder bore. The steel piston is 2-3/4 inches in diameter and is nickle and chrome plated for anti-corrosion and long wear. The square cut rubber piston seal is located in a machined groove in the cylinder bore and provides a hydraulic seal between the piston and the cylinder wall (Fig. 4). The adaptor is mounted to the steering knuckle by two special nylock bolts (Fig. 5).

A moulded rubber dust boot installed in a groove in the cylinder bore and piston, keeps contamination from the cylinder wall and piston. The boot has a wiping lip (Fig. 6) that prevents contamination in the bore area.

As the brake pedal is depressed, hydraulic pressure is applied against the piston. This force is transmitted to the inboard brake shoe and lining and the inboard

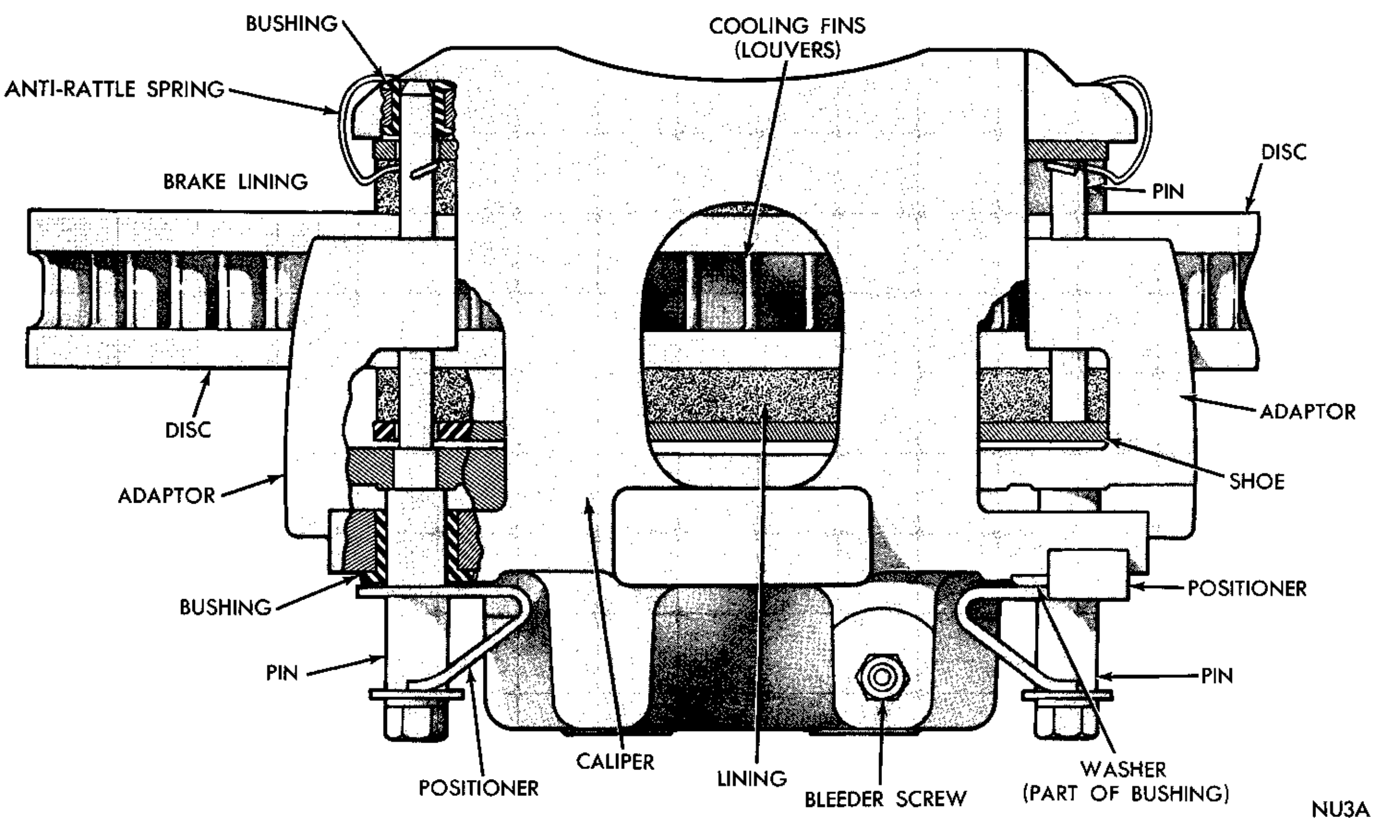


Fig. 3—Floating Caliper Assembly (Sectional) Shoe Mounting

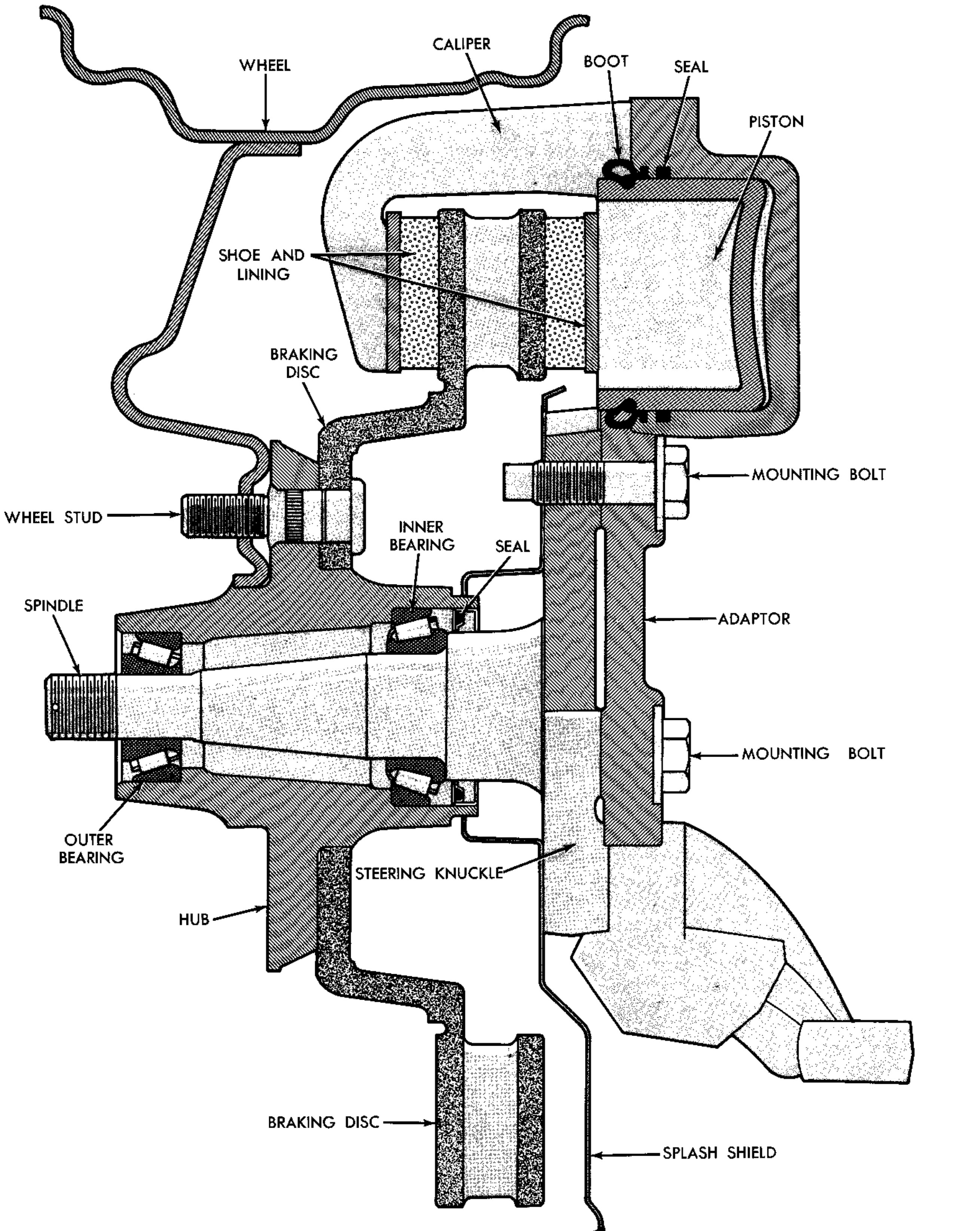


Fig. 4—Disc Brake Assembly (Sectional)

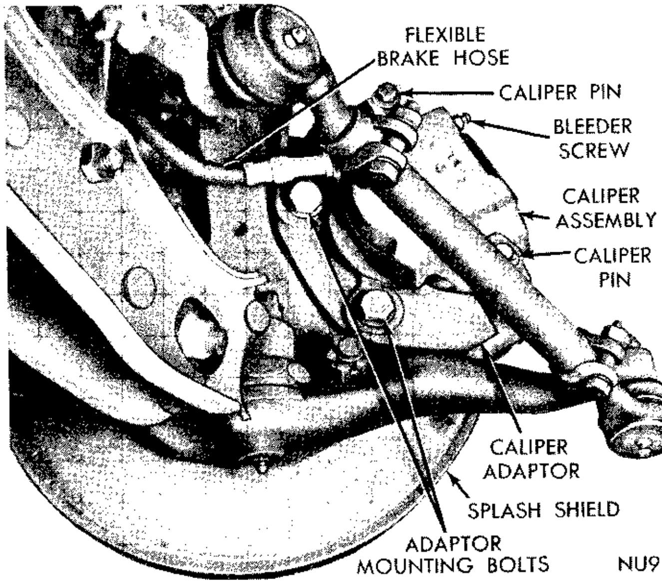


Fig. 5—Disc Brake Caliper Mounting

braking surface of the disc. As force increases against the disc from the inner lining, the caliper assembly moves inboard, sliding on the guide pins, thus providing a clamping force on the disc.

When the brake pressure is released, the piston seal (distorted by applied pressure) returns to its normal position, pulling the piston back to released position, while the two positioners force the caliper outboard to create a slight running clearance between outer shoe and the disc.

Automatic adjustment is obtained by outward relocation of the piston as the inboard lining wears and the inward movement of the caliper as the outboard lining wears, thus maintaining correct adjustment at all times.

METERING VALVE

All Kelsey-Hayes Floating Caliper disc brake equipped vehicles are equipped with a pressure metering valve. The valve is located on the left frame rail, directly under the battery tray. The use of the metering valve is to better match the front disc brakes with

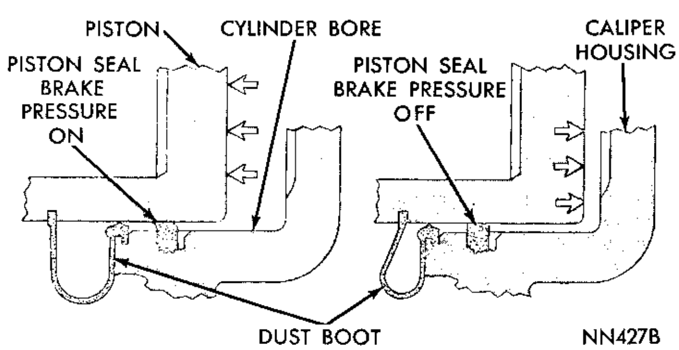


Fig. 6—Piston Seal Function for Automatic Adjustment

the rear drum brakes on the vehicle. This results in improved braking and steering control on icy surfaces.

ROUTINE MAINTENANCE—30,000 Miles

Check Brake Lines, Hoses and Linings

Raise all four wheels. Remove one of the front wheel and tire assemblies and inspect the braking disc, linings and caliper. Inspect front brake flexible hose for signs of cracking or deterioration. **Replace brake hose if rubber cover is penetrated.** (The wheel bearings should be inspected at this time and repacked if necessary). **The caliper assembly must be removed in order to inspect the inner wheel bearing.** (Refer to "Brake Shoe Removal" paragraph.)

Do not get oil or grease on the braking disc or linings. If the linings (pads) are worn to within .030 inch of the shoe, replace both sets of shoe and lining assemblies, (inboard and outboard) on the front wheels. It is necessary that both front wheel sets be replaced whenever a respective shoe and lining is worn beyond specifications or damaged.

Check all brake tube connections for possible leaks. Install new flexible hoses as required.

Check adapter plate to knuckle bolts for specified torque (75 to 100 foot-pounds).

Shoe and Lining Wear

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the wheel and tire assemblies, and the calipers. Remove the shoe and lining assemblies. (See "Brake Shoe Removal" paragraph). Three (3) thickness measurements with a micrometer should be taken across the center of the shoe and lining; One reading at each end and one reading in the center. When an assembly has been worn to a thickness of .180 inch, it should be replaced. If a shoe and lining does not require replacement, reinstall, making sure each shoe and positioner is returned to their original positions. (See "Brake Shoe Installation" paragraph). It is normal for the inboard lining to show slightly more wear than the outboard.

Brake Roughness

The most common cause of brake roughness (or chatter with disc brakes are excessive variation in disc thickness and/or excessive disc face runout. These can be easily checked with a dial indicator and a 2″ micrometer (vernier type preferred). If either of the measurements are out of specification, the disc must be refinished or replaced. Refer to "Refinishing (Refacing) Braking Disc paragraph.

Other less prevalent causes of roughness can be the use of some types of non-standard lining and extreme abrasion of the disc faces. Also, vehicles which stand unused for periods of time in areas of high humidity or salt air may incur rust on the disc which could cause a temporary brake surge and roughness. Normally however, this condition should correct itself after a short period of usage. If rust is severe enough roughness will not clear up and disc must be resurfaced or replaced.

DISC BRAKE SERVICE PRECAUTIONS

(1) Grease or any other foreign material must be kept off the caliper assembly, surfaces of the braking disc and external surfaces of the hub, during service procedures. Handling the braking disc and caliper should be done in such a way as to avoid deformation of the disc and scratching or nicking the brake linings (pads).

(2) If inspection reveals that the square sectioned caliper piston seal is worn or damaged, it should be replaced.

(3) During removal and installation of a wheel and tire assembly, use care not to strike the caliper.

(4) The front wheel bearing end play is important and must be within specifications.

(5) Be sure vehicle is centered on the hoist before servicing any of the front end components to avoid bending or damaging disc splash shield on full right or left hand turns.

(6) Before vehicle is moved after any brake service work, **be sure and obtain a firm brake pedal.**

(7) Dragging the brakes (common result of left foot application) should be avoided during vehicle operation.

(8) The wheel, tire, hub and disc assembly **cannot** be removed as an assembly. The caliper assembly must be removed before removal of the hub and disc assembly.

(9) As lining wears, reservoir level will go down. If fluid has been added between relines, then reservoir overflow may occur when the piston is pushed back into the new lining position. Overflowing can be avoided in this case by removal of a small amount of fluid before overflow occurs.

SERVICE PROCEDURES

BRAKE SHOE REMOVAL

(1) Raise vehicle on a hoist or jackstands.

(2) Remove front wheel covers, and wheel and tire assemblies.

(3) Remove caliper guide pins positioners that attach caliper to adaptor and anti-rattle spring.

(4) Remove caliper from disc by slowly sliding caliper assembly out and away from braking disc (Fig. 7). Support caliper firmly so as not to damage flexible brake hose.

(5) Slide outboard shoe and lining assembly out of caliper. Slide inboard shoe and lining assembly out of adaptor (Fig. 8).

(6) Remove outer bushings from caliper by pressing out of bore (Fig. 13), using a suitable tool. Discard bushings.

(7) Slide inner bushings (flanged) off guide pins and discard. Remove positioners from guide pins and discard.

CLEANING AND INSPECTION

Check for piston and seal leaks (evident by brake fluid in and around boot area and inboard lining) and for any ruptures of piston dust boot. If boot is damaged, or fluid is evident, it will be necessary to disassemble caliper assembly and install a new seal, boot, (and piston if damaged or corroded.) (Refer to "Disassembling Caliper Assembly" paragraph). Check the mating surfaces of the abutments on the caliper and adaptor. If corroded or rusty, clean surfaces with wire brush. Inspect braking surfaces of disc.

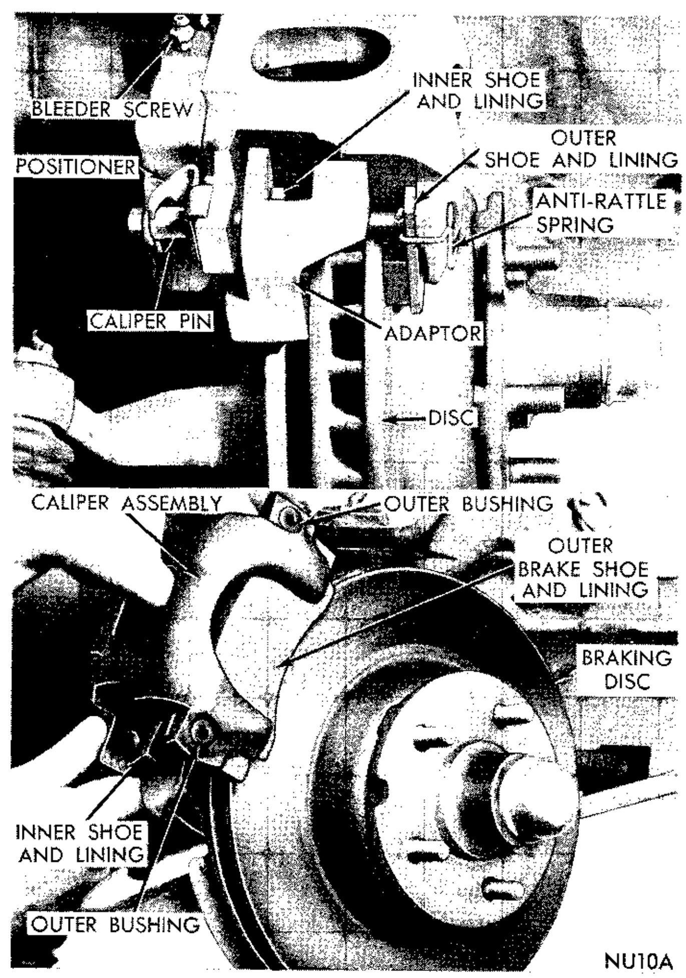


Fig. 7—Removing or Installing Caliper

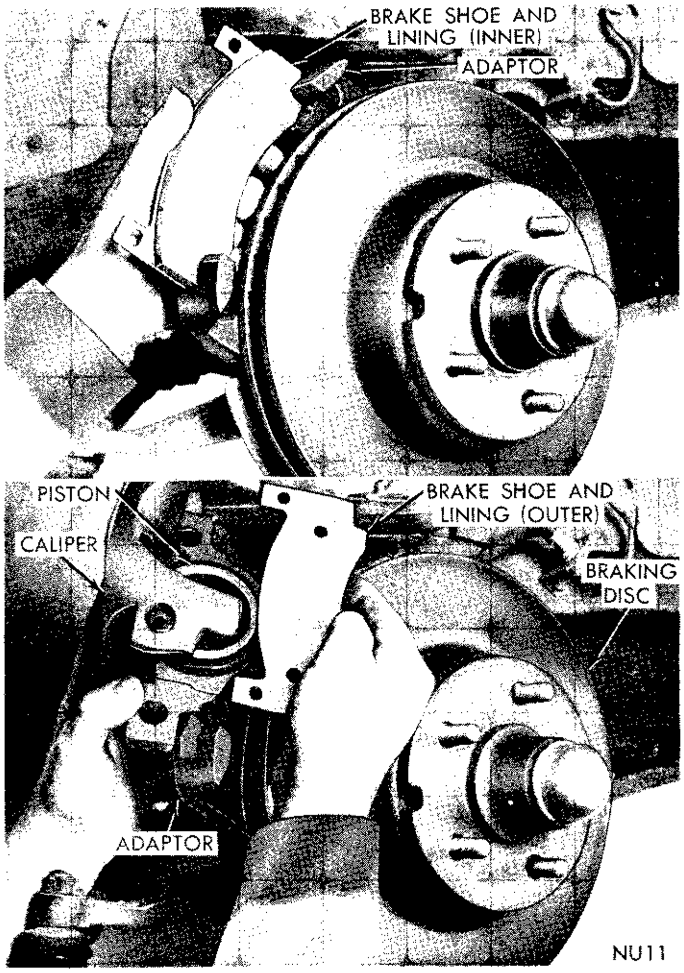


Fig. 8—Removing or Installing Brakes Shoes and Lining

BRAKE SHOE INSTALLATION

When installing new shoe and lining assemblies, it will be necessary to also install new positioners, inner bushings and outer bushings.

(1) Slowly and carefully push piston back into bore until it is bottomed. Watch for possible reservoir overflow. See Step 9 of "Disc Brake Service Precautions".

(2) Install new inner guide pin bushings in caliper with flanged end on inboard side (Fig. 3). Compress flanges of outboard bushing in fingers and work into position in hole from the outboard side of caliper (Fig. 18).

(3) Slide new shoe and lining assemblies into position in adaptor and caliper (Fig. 8), being sure that metal portion of shoe is fully in recess of caliper and adaptor.

(4) Holding outboard lining in position, carefully slide caliper down into position in adaptor and over disc. Align guide pin holes of adapter, inboard and outboard shoes. (Fig. 3).

(5) Install new positioners over guide pins with open ends toward outside, **and with stamped arrows pointing upwards** (Fig. 1). Install assembled guide pins through bushing, caliper, adaptor, inboard outboard shoes and into outer bushings in caliper and anti-rattle spring.

(6) Press **IN** on end of guide pins and thread pin into adaptor, **USING EXTREME CARE SO AS NOT TO CROSS THREADS.** Tighten from 30 to 35 foot-pounds. Be sure tabs of positioners are over machined surfaces of caliper (Fig. 1).

(7) Pump brake pedal several times until a firm pedal has been obtained.

(8) Check and refill master cylinder reservoirs (if necessary) with approved brake fluid as required. (It should not be necessary to bleed the system after shoe and lining removal and installation). However, if a firm pedal cannot be obtained bleed the brake system as described in "Bleeding Brake System" paragraph. **It may have been necessary to remove fluid to put in new linings as fluid is pushed back into master cylinder.**

(9) Install wheel and tire assemblies and wheel covers.

(10) Remove jackstands or lower hoist.

REMOVING CALIPER FROM VEHICLE

It will be necessary to remove the caliper to install a new piston seal and boot.

(1) Raise vehicle on a hoist or jackstands.

(2) Remove front wheel covers and wheel and tire assemblies.

(3) Disconnect front brake flexible hose from tube at frame mounting bracket. Plug brake tube to prevent loss of fluid or prop brake pedal to any position **below** the first inch of travel. Disconnect hose from caliper.

(4) Remove guide pins and positioners that attach caliper to adaptor. Carefully slide caliper out and away from disc and adaptor, while holding outboard shoe and lining assembly. Remove inboard shoe and lining from adaptor.

DISASSEMBLING CALIPER

(1) Mount caliper assembly in a vise equipped with protector jaws (Fig. 10). (Caution: **Excessive vise pressure will cause bore distortion and binding of piston.)**

(2) Remove dust boot. (Fig. 11).

(3) Using Tool C-4087, remove piston from caliper (Fig. 10). Care must be used so as not to scratch, burr or otherwise damage piston on outside diameter. To do so effects sealing qualities of piston. Draw piston straight out of its bore. If a piston becomes cocked removal is more difficult and piston or bore may be damaged. **CAUTION: UNDER NO CONDITION SHOULD AIR PRESSURE BE USED TO REMOVE PISTON FROM BORE. PERSONAL INJURY COULD RESULT FROM SUCH PRACTICE.**

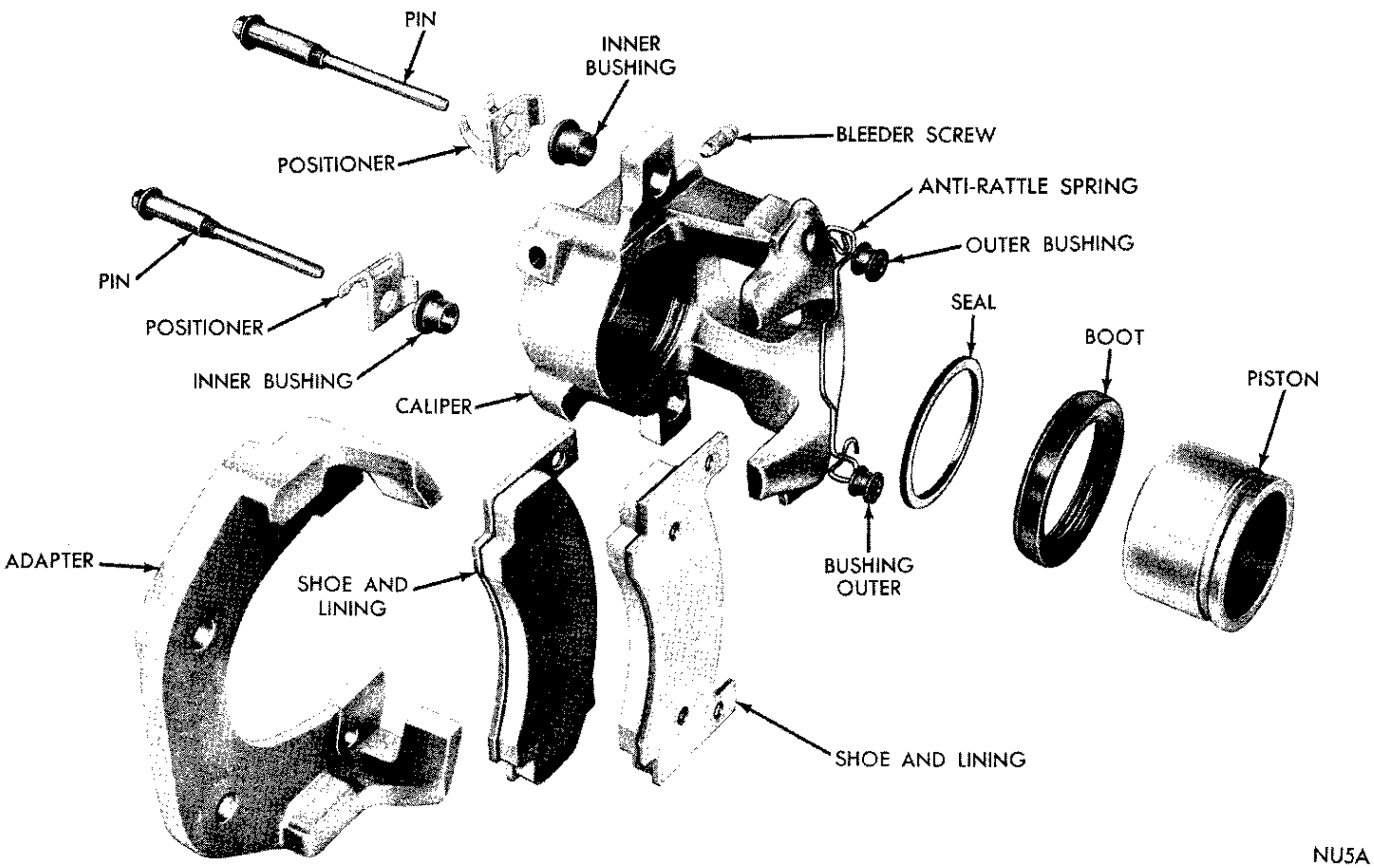


Fig. 9—Caliper Assembly (Exploded View)

(4) Using a small, pointed, wooden or plastic stick, work piston seal out of its groove in piston bore (Fig. 12). Discard old seal. **Do not use a screwdriver or other metal tool for this operation, because of possibility of scratching piston bore or burring edges of seal groove.**

(5) Remove outer bushings from caliper by pressing out of bore, (Fig. 13) using a suitable tool. Discard bushings.

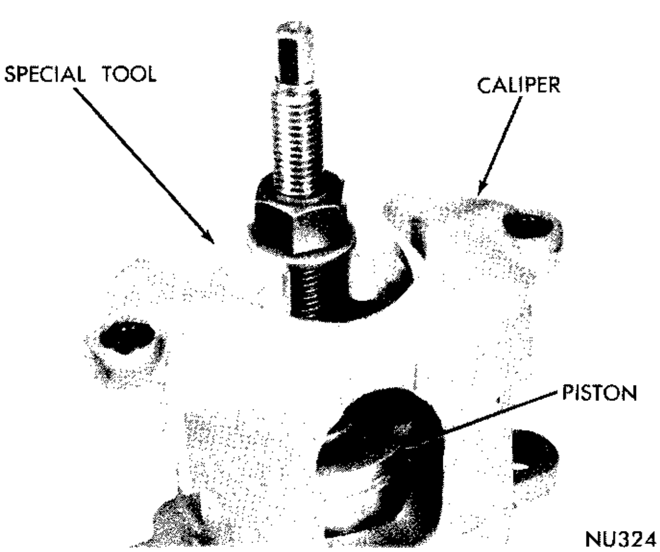


Fig. 10—Removing Piston from Caliper

(6) Remove inner bushing and discard. Remove bleeder screw.

CLEANING AND INSPECTION

Clean all parts using alcohol or a suitable solvent and blow dry, using compressed air. Blow out all drilled passages and bores. (Whenever a caliper has been disassembled, and a new boot and seal must be installed at reassembly). Inspect the piston bore for scoring or pitting. Install a new piston if it is pitted, scored or the plating is severely worn. Bores that show light scratches or corrosion, can usually be cleared with crocus cloth. However, bores that have deep scratches or scoring should be honed, using Tool C-

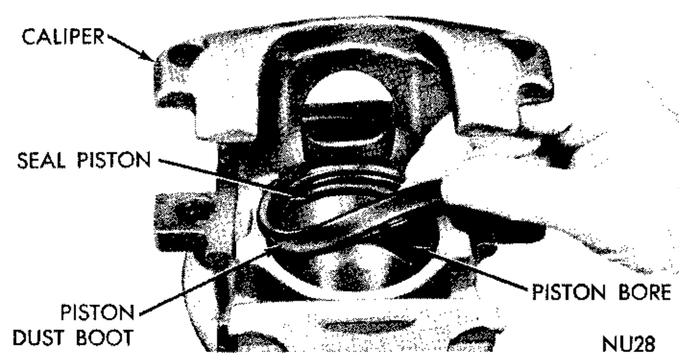


Fig. 11—Removing or Installing Piston Dust Boot

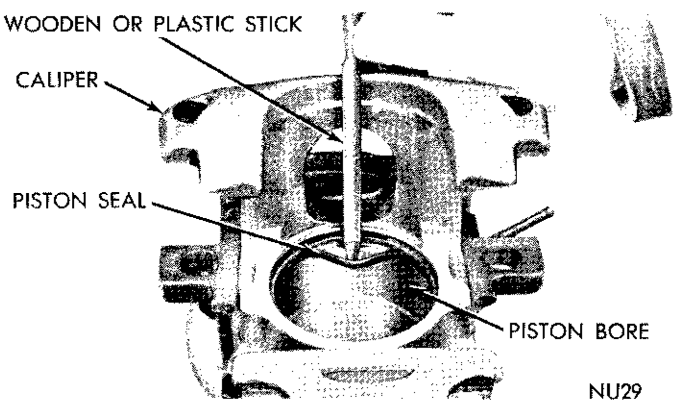


Fig. 12—Removing Piston Seal

4095, providing the diameter of the bore is not increased more than .002 inch. If the bore does not clean up within this specification, a new caliper housing should be installed. Black stains on the piston are caused by the piston seal and will do no harm.

When using Hone C-4095, coat the stones and bore with brake fluid. After honing the bore, carefully clean the seal and boot grooves with a stiff non-metalic rotary brush (Fig. 14).

Use extreme care in cleaning the caliper after honing. Remove all dirt and grit by flushing the caliper with brake fluid; wipe dry with a clean, lintless cloth and then clean a second time in the same manner or until clean cloth shows no signs of discoloration.

ASSEMBLING CALIPER

(1) Clamp caliper in vise (with protector jaws), (Fig. 10). Caution: Excessive vise pressure will cause bore distortion and binding of piston.

(2) Dip new piston seal in lubricant (supplied with kit) Ucon #LB1145Y24 (or equivalent) and install in groove in bore. Seal should be positioned at one area in groove and gently worked around the groove, using **clean** fingers, until properly seated. **NEVER USE AN OLD PISTON SEAL.** (Be sure seal is not twisted or rolled). (Fig. 15).

(3) Coat new piston boot with lubricant (as specified above) leaving a generous amount of lubricant inside of boot. Install in caliper by working into outer groove, using fingers only. (Boot will seem larger than diameter of groove, but will snap into place when properly positioned in groove. (Fig. 16). Using a forefinger, slide around inside of boot to be sure it is seated, or correctly installed.

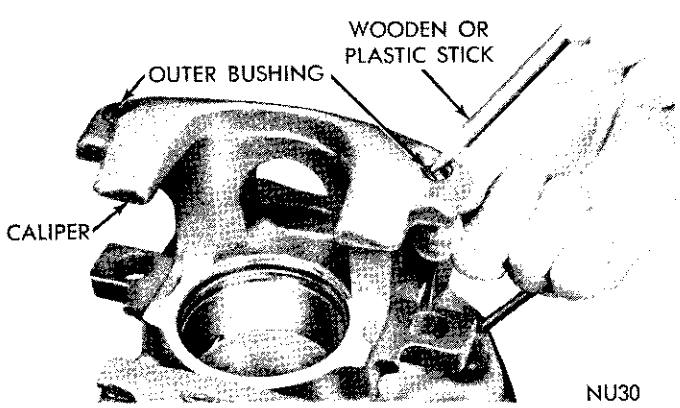


Fig. 13—Removing Outer Bushings

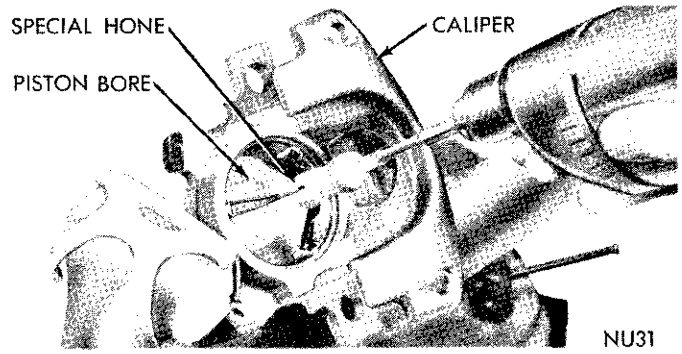


Fig. 14—Honing Piston Bore

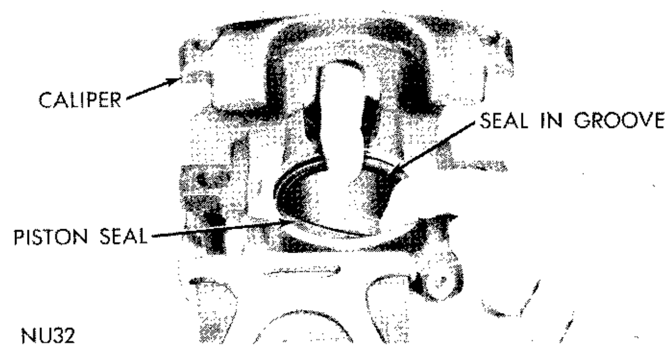


Fig. 15—Installing Piston Seal

(4) Plug high pressure inlet to caliper and bleeder screw hole, then coat piston with a generous amount of lubricant (as specified above). With fingers spreading boot, work piston into boot and press down on piston. (The entrapped air below piston will force boot around piston and into its groove as piston is depressed.) (Fig. 17). Remove plug, then carefully push piston down the bore until bottomed. Caution: **Force must be applied uniformly to avoid cocking.**

(5) Install new inner guide pin bushings in caliper with flanged end on inboard side (Fig. 3). Compress flanges of outboard bushing in with fingers and work

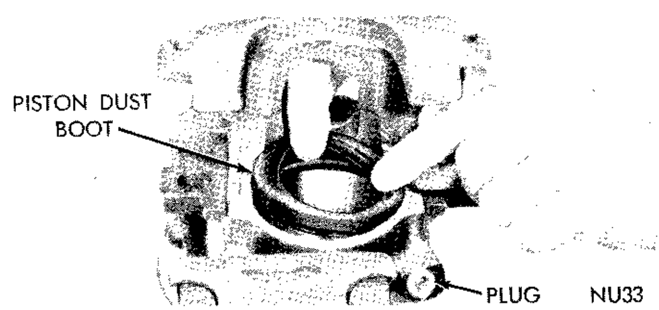


Fig. 16—Installing Piston Dust Boot

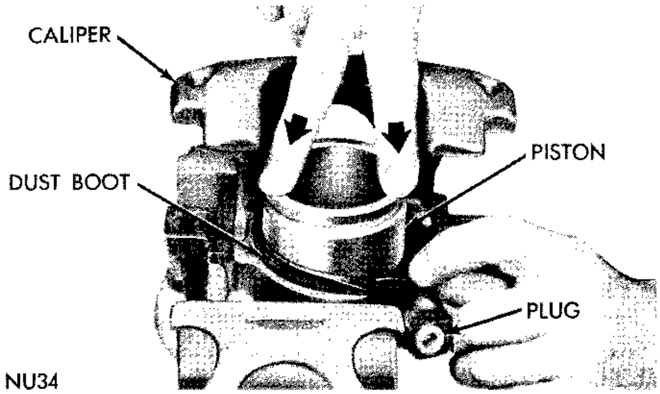


Fig. 17—Installing Piston (through Boot)

into position in hole from the outboard side of the caliper (Fig. 18). Press **IN** on bushing, using finger tips or small plastic stick (Fig. 18) until seated. Be sure flanges extend over caliper casting evenly on both sides. Install bleeder screw.

Before installing caliper assembly on vehicle, inspect braking disc. Conditions as described in "Checking Braking Disc for Runout and Thickness" paragraph.

INSTALLING CALIPER

(1) Examine lining for wear damage, or fluid contamination if its condition is found satisfactory it may be reused. If not usable both front brakes must be relined with new. If old lining is to be reused, be sure linings and positioners are installed in their original position.

(2) Connect flexible brake hose to caliper and tighten securely.

(3) Install new inboard shoe and lining adaptor (Fig. 8). Holding outboard shoe and lining in position in caliper, carefully slide caliper down into position in adaptor and over disc. Align pin holes of caliper, adaptor and inboard and outboard shoes.

(4) Install positioners over guide pins with open ends toward outside and arrows pointing upwards. (Fig. 1). Install assembled guide pins through bushing, caliper, adaptor, inboard and outboard shoes and into outer bushings in caliper.

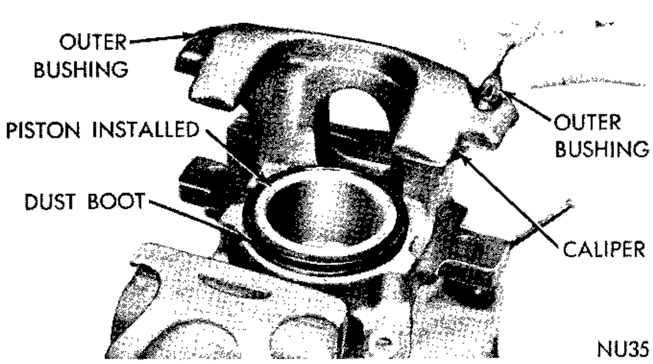


Fig. 18—Installing Outer Bushings

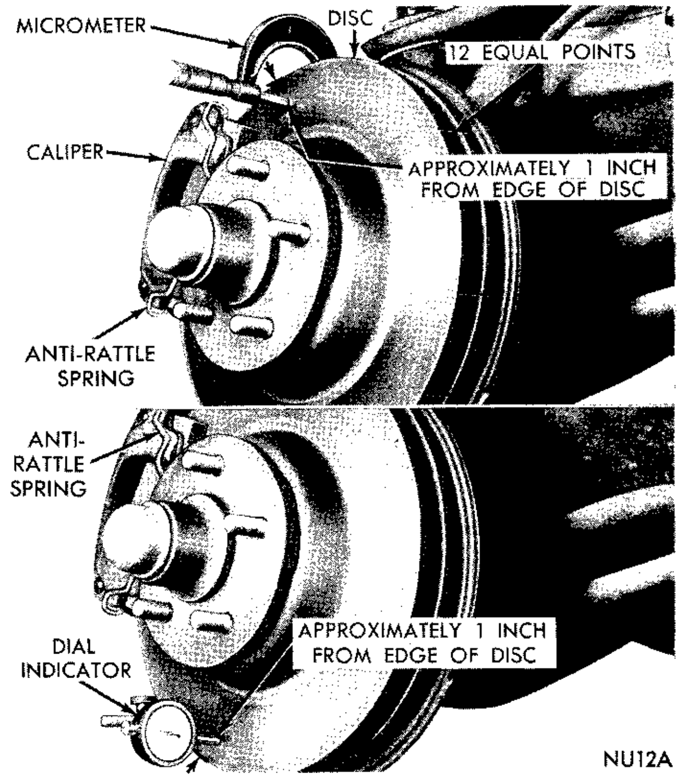


Fig. 19—Checking Braking Disc Run-out and Thickness

(5) Press **IN ON END GUIDE PINS AND THREAD PINS INTO ADAPTOR. USING EXTREME CARE SO AS NOT TO CROSS THREADS.** Tighten from 30 to 35 foot-pounds. (Be sure tabs of positioners are over machined surfaces of caliper (Fig. 1).

(6) Remove plug from brake tube and install flexible brake hose. Tighten securely. Avoid twisting hose.

(7) With bleeder screw open, allow caliper to "gravity" fill with brake fluid, then close bleeder screw. (Be sure all air bubbles have escaped; replenish brake fluid in master cylinder. Bleed brakes as described under "Bleeding Brakes" paragraph.

(8) **Pump brake pedal several times until a firm pedal has been obtained.**

(9) After bleeding caliper, check for fluid tightness under maximum pedal pressures. (Recheck master cylinder reservoir level).

(10) Install wheel and tire assembly and tighten wheel stud nuts to 65 foot pounds. **This is important.** Install wheel cover.

(11) Remove jackstands or lower hoist.

(12) **Road test vehicle and make several stops to wear off any foreign material on the brakes and to seat the linings. The vehicle may pull to one side or the other if this is not done.**

CHECKING BRAKING DISC FOR RUNOUT AND THICKNESS

(1) Mount dial indicator C-3339 on steering arm

with plunger contacting disc approximately one (1) inch from edge of disc. (Fig. 19).

(2) With wheel bearings adjusted to zero end play, check lateral runout. (Both sides of disc). Runout should not exceed .0025 inch. If runout is in excess of specification, install a new disc and hub assembly or reface disc, being careful not to remove more than .015 inch from each side of disc. Be sure and readjust wheel bearings after check.

(3) Thickness variation of disc should be made in conjunction with runout. Measure thickness of disc at twelve (12) equal points with a micrometer at a radius approximately one (1) inch from edge of disc. If thickness measurements vary by more than .0005 inch, disc should be removed and resurfaced or a new disc and hub assembly installed. (Fig. 19).

(4) Light scoring and/or wear is acceptable, if heavy scoring or warping is evident, the disc must be refinished or replaced (See Refinishing (Refacing) Braking Disc). If cracks are evident the hub and disc assembly must be replaced.

REMOVING BRAKING DISC AND HUB

(1) Raise vehicle on hoist or jackstands. Remove wheel cover and wheel and tire assembly.

(2) Remove caliper assembly, as described under "Removing Caliper" paragraph, (but do not disconnect brake line). Suspend caliper from wire hook or loop to avoid strain on flexible hose.

(3) Remove grease cap, cotter pin, nut lock, nut, thrust washer and outer wheel bearing.

(4) Pull disc and hub off wheel spindle.

INSTALLING BRAKING DISC AND HUB

(1) Slide brake disc and hub assembly on spindle.

(2) Install outer bearing, thrust washer and nut.

(3) Tighten wheel bearing adjusting nut to 90 inch pounds while rotating disc and hub. Recheck disc run out as described previously.

(4) Position lock nut on nut with one pair of slots in line with cotter pin hole.

(5) Back off adjusting nut and lock assembly one slot.

(6) Clean grease cap, coating inside with wheel grease (do not fill cap) and install cap. Clean both sides of braking disc with alcohol or suitable solvent.

(7) Install caliper assembly, as described in "Installing Caliper" paragraph.

REFINISHING (REFACING) BRAKING DISC

Before refinishing or refacing a braking disc, the disc should be checked and inspected for the following conditions:

(1) Scoring, rust, impregnation of lining material and worn ridges.

(2) Runout or wobble.

(3) Thickness variation (Parallelism).

(4) Dishing or distortion (Flatness).

If a vehicle has not been driven for a period of time, the discs will rust in the area not covered by the lining and cause noise and chatter, excessive wear and scoring of the discs and lining. Wear ridges on the discs can cause temporary improper lining contact if ridges are not removed before installation of new lining (pads).

Lining deposit on the disc, may cause erratic friction characteristics if new lining is installed without resurfacing or cleaning the disc.

Excessive runout or wobble in a disc can increase pedal travel due to piston knockback and increase seal bushing wear due to necessity of caliper to follow the disc wobble.

Thickness variation in a disc can also result in pedal pulsation, chatter and surge due to variation in brake output when disc section is uneven.

Dishing or distortion can be caused by extreme heat and abuse of the brakes.

Resurfacing Braking Disc

This operation can be used when the disc surface is rusty or has lining deposits. A sanding disc attachment will remove surface contamination without removing much material. It will generally follow variations in thickness which are in the disc.

Refacing Braking Disc

If scoring is deep, runout or thickness variation is beyond limits, or other distortion is apparent, the disc should be refaced on a brake lathe equipped for disc machining. (Fig. 21). After machining a disc, a grinder may be used to remove tool marks.

A new disc and hub assembly should be installed if the old one cannot be refaced to bring it within specifications without removing an excessive amount of material. Do not remove more than .050 inch per disc. Brake operation may be affected if an excess of material is removed.

Both sides of the braking surface should be machined or ground when servicing since small variations in resurfacing machines may cause the newly finished surface to be out of parallel with the opposite unfinished side resulting in a thickness variation beyond acceptable limits. Disc brakes are very sensitive to thickness variation.

The following chart and (Fig. 20) shows the location and tolerances of required specifications when servicing the braking disc:

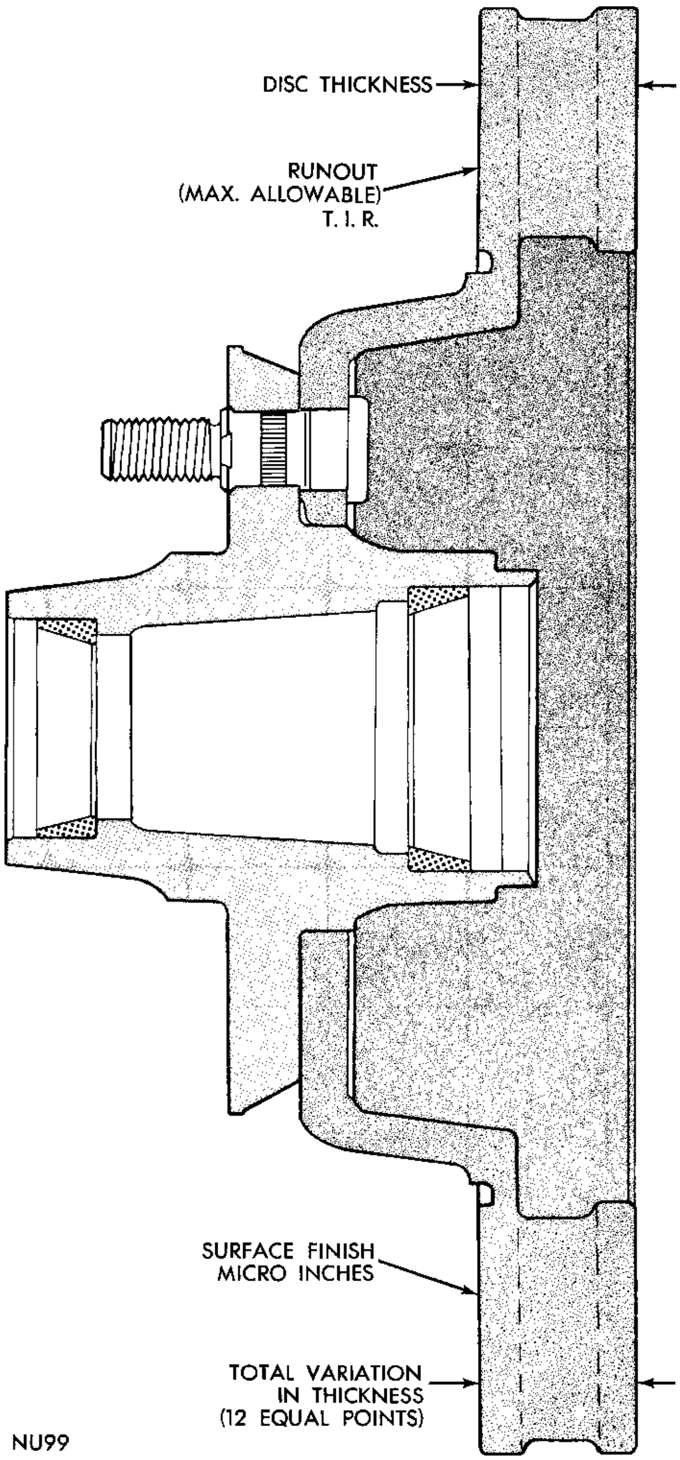


Fig. 20—Disc Specifications

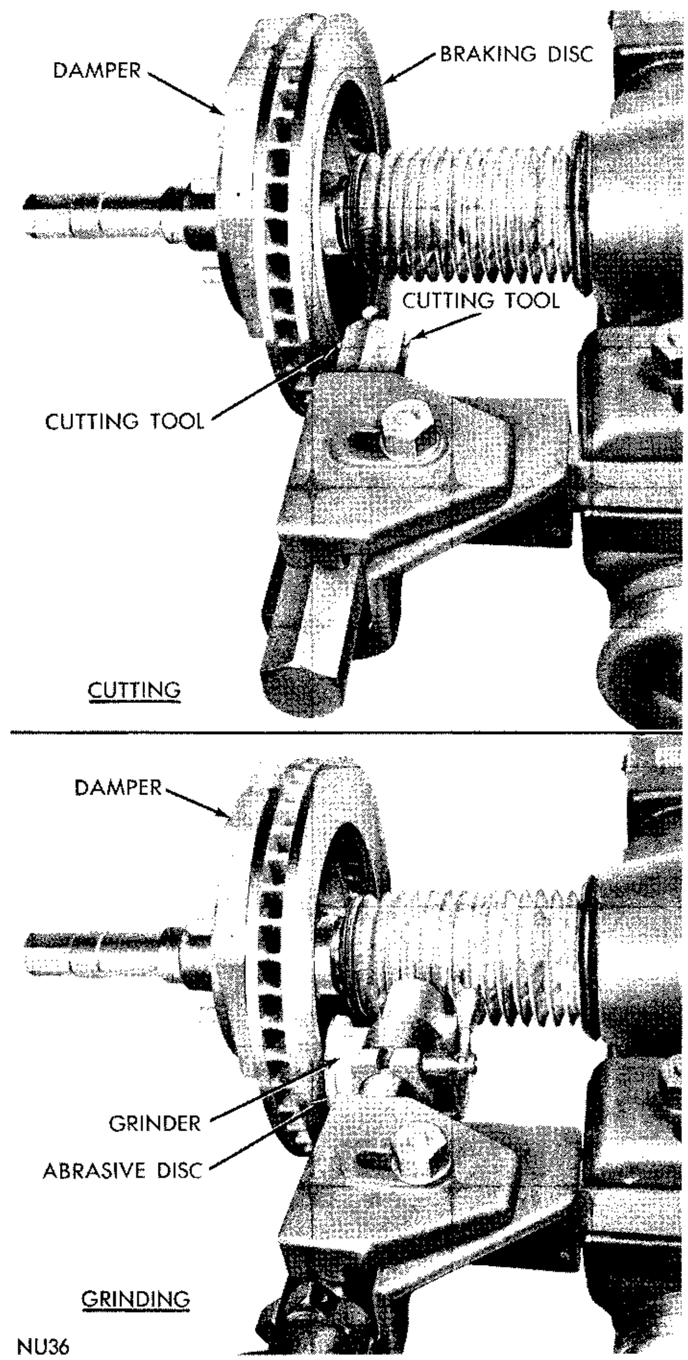


Fig. 21—Refacing Braking Disc

Brake Design	Thickness	Minimum Thickness	Thickness Variation	Runout	Micro Finish
Kelstar Kelsey-Hayes	1.250-1.240	1.20	.0005	.0025″	15-80

CAUTION:

When refacing a braking disc (Fig. 21), the manufacturers of the refacing equipment instructions should be followed closely, and the correct brake disc mounting adaptors must be used to obtain the required specifications.

MASTER CYLINDER

(Disc Brakes)

INDEX

GENERAL INFORMATION

The tandem master cylinder (Fig. 1) (1 and 1/8 inch bore) is of the compensating type with the reservoirs cast integrally. The master cylinder consists of a front and rear piston (in tandem) two outlets, with 1 containing a residual pressure valve and spring (rear brake line outlet only) (Fig. 3).

The **front** outlet tube from the master cylinder is connected to the hydraulic system safety switch (Figs. 8 or 9) and thence to the rear brakes. The **rear** outlet tube from the master cylinder is also connected to the safety switch and the **front** brakes.

The master cylinder used on vehicles not equipped with power brake units is serviced in the same manner as the master cylinder with power brakes with one exception, the master cylinder **for** power brakes does not include the push rod.

The **drum** brake master cylinder is different than the disc brake master cylinder and is covered in the service brake section of this group.

SERVICE PROCEDURES

MASTER CYLINDER REMOVAL

(1) Disconnect front and rear brake tubes from master cylinder and install a plug in **rear** outlet. (The residual pressure valve in **front** outlet will keep cylinder from draining).

(2) Disconnect pedal push rod (drum type brakes) from brake pedal.

(3) Remove nuts that attach master cylinder to cowl panel and/or power brake unit (if so equipped).

(4) Slide master cylinder straight out from cowl panel and/or power brake unit (if so equipped).

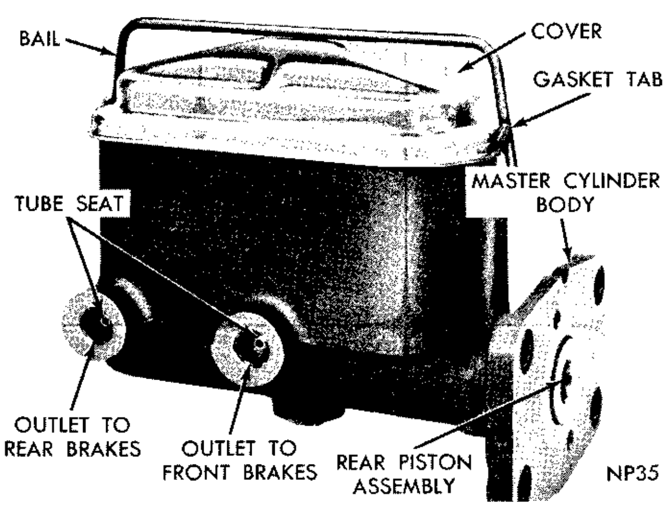


Fig. 1—Tandem Master Cylinder

DISASSEMBLING MASTER CYLINDER

To disassemble the master cylinder, (Figs. 1 and 4), clean the outside of the master cylinder thoroughly.

(1) Press bail to one side and remove cover and gasket. Empty brake fluid from reservoirs.

(2) Remove piston retaining screw and gasket (Fig. 2), then slide rear piston assembly out of cylinder bore.

(3) Upend master cylinder and tamp (open end

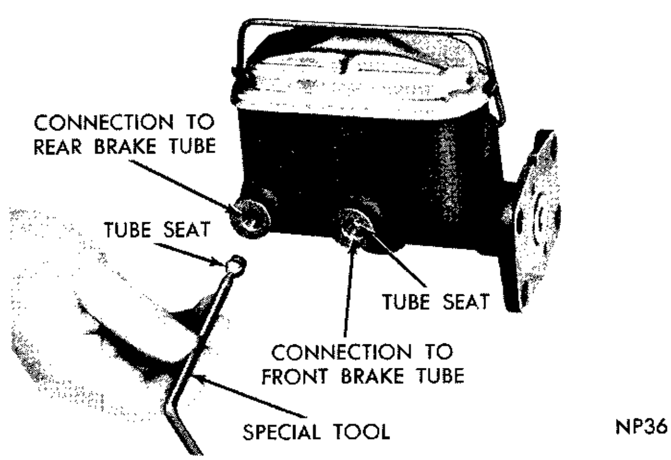


Fig. 2—Removing Tube Seats

down) on bench to remove front piston and spring. If front piston sticks in bore of cylinder, use air pressure to force piston out of cylinder. **New cups must be installed at reassembly if air pressure is used.**

(4) Remove front piston compression spring from bore.

(5) Using Tool T-109-178 (or an easy out) remove tube seats by threading tool firmly into seat, **tap tool** and seat out of cylinder body. (Fig. 2). Discard seats.

(6) Remove residual pressure valve and spring from front outlet (Fig. 3).

(7) Remove rubber cups from pistons after noting position of cup lips. Do not remove center cup of rear piston. If cup is damaged or worn, install a new rear piston assembly.

CLEANING AND INSPECTION

Clean master cylinder thoroughly, using a suitable solvent and dry with compressed air. Wash the cylinder bore with clean brake fluid and inspect for scoring or pitting. Master cylinder bore walls that have light scratches or show signs of corrosion, can usually be cleaned with crocus cloth. However, cylinder bores that have deep scratches or scoring may be honed, providing the diameter of the bore is not increased more than .002 inch. If master cylinder bore does not clean up at .002 inch when honed, the master cylinder should be discarded and a new master cylinder installed.

If master cylinder pistons are badly scored or corroded, replace them with new ones. The piston cups and seals should be replaced when reconditioning a master cylinder.

When overhauling a master cylinder, use all parts furnished in repair kit. **Discard all used rubber parts.**

REASSEMBLING MASTER CYLINDER

Front Piston

Before assembling the master cylinder, dip all

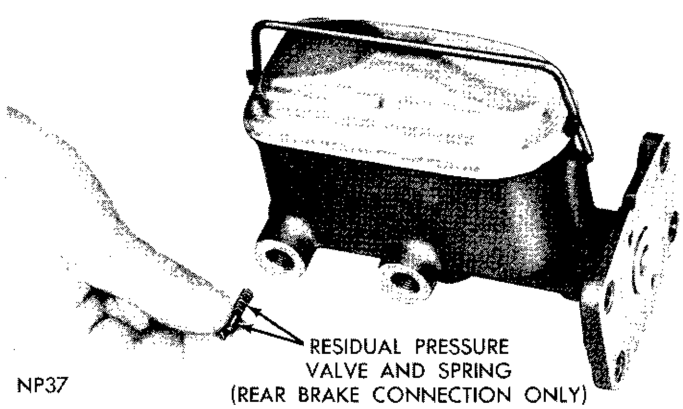


Fig. 3—Removing or Installing Residual Pressure Valve and Spring

component parts in clean brake fluid and place on a clean shop towel or paper (assembling seals dry, can ruin them).

(1) Slide thin washer over stem of front piston, followed by primary cup. (Be sure lip is away from piston.) (Fig. 4).

(2) Carefully work seal piston cup over rear end of piston and into second land. (Be sure lip of cup is facing front of piston.) (Fig. 4).

(3) Carefully work secondary piston cup over piston and into rear land. The lip must be facing toward rear (Fig. 4).

(4) Position small end of pressure spring into retainer, then slide assembly into bore of cylinder (Fig. 5). **Be sure cups enter bore evenly in order not to damage sealing quality of cups. (Keep well lubricated with brake fluid.)**

Rear Piston

(1) Carefully work secondary cup over rear end of rear piston with lip of cup toward front (Fig. 4).

(2) Center spring retainer of rear piston assembly over shoulder of front piston. Push piston assemblies into bore. Carefully work lips of cups into bore, then seat piston assemblies (Fig. 6).

(3) Holding pistons in seated position, install piston retaining screw and gasket. Tighten securely (Fig. 6).

(4) Install residual pressure valve and spring (Fig. 3) in **front** brake outlet, then install tube seats firmly. (When the bleeding tubes are attached, the tube seats will be positioned correctly.)

BLEEDING MASTER CYLINDER

Before installing master cylinder on vehicle, it must be bled on the bench as follows:

(1) Clamp master cylinder in a vise and attach bleeding tubes Tool C-4029 (Fig. 7).

(2) Fill both reservoirs with approved brake fluid.

(3) Using a wooden stick or dowel (power brake equipped vehicles) depress push rod slowly. (Note air bubbles.) Allow pistons to return under pressure of springs. Do this several times or until bubbles cease to appear (Fig. 7).

(4) Remove bleeding tubes from cylinder and install plug in rear outlet. (As tubes are removed, fluid remaining in tubes will syphon out.)

(5) Place cover and gasket over reservoirs and secure with bail.

(6) Remove master cylinder from vise and install on vehicle as follows:

INSTALLING MASTER CYLINDER

(1) Install master cylinder on vehicle, aligning push rod with cowl panel opening (manual) or power

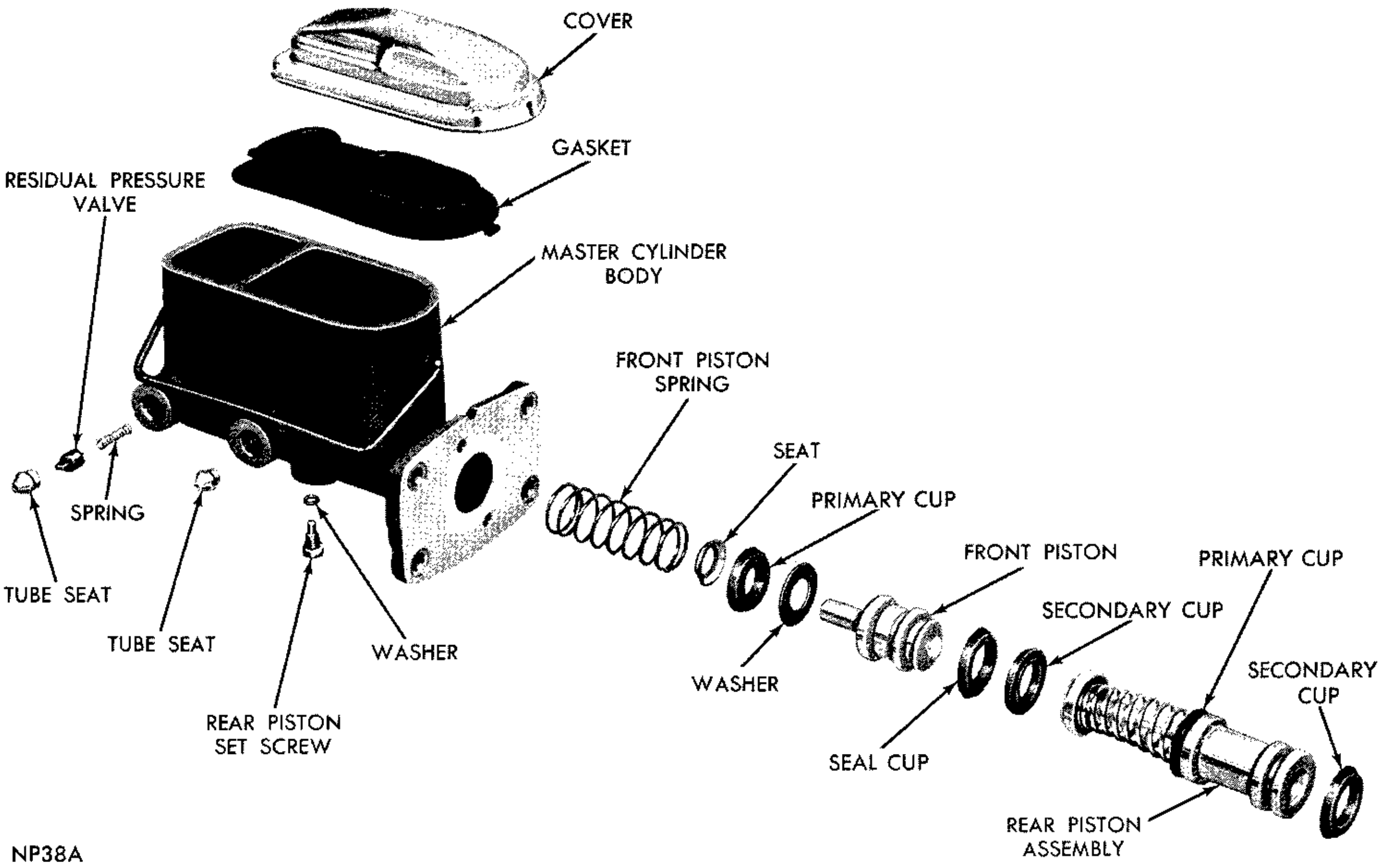


Fig. 4—Tandem Master Cylinder (Exploded View)

brake push rod with master cylinder piston.

(2) Slide over mounting studs. Install attaching nuts and tighten to 9 foot-pounds.

(3) Connect front and rear brake tubes and tighten to 150 inch pounds.

(4) Bleed brakes at wheel cylinders, using regular procedure, being sure fluid level is maintained. (See "Bleeding Brake System".)

TESTING MASTER CYLINDER

Be sure that the master cylinder compensates at both ports. This can be done by applying the pedal lightly with the engine running (power brakes) and observing for a gyser of fluid squirting up in the reservoirs. This may only occur in the front chamber and so to determine if the rear compensating port is

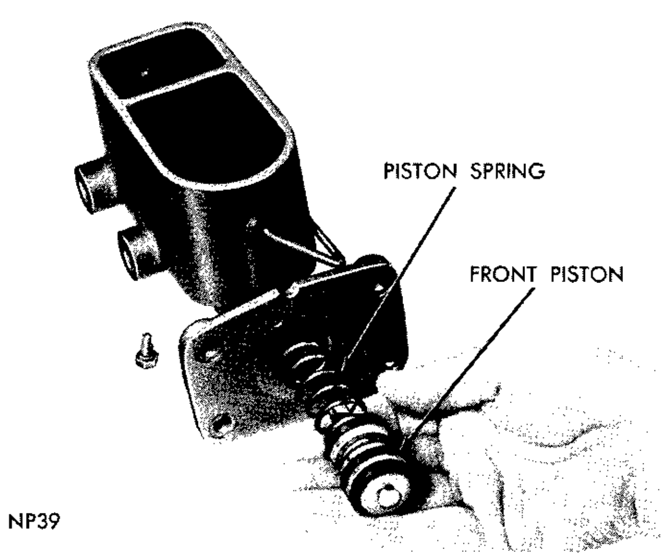


Fig. 5—Installing Front Piston and Spring

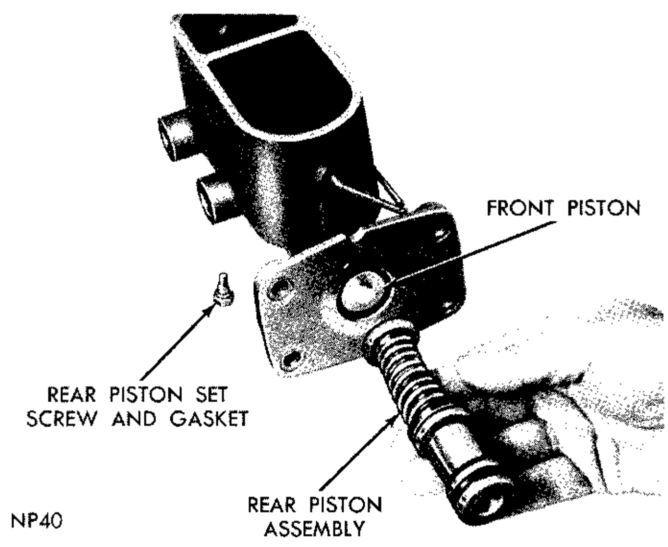


Fig. 6—Installing Rear Piston Assembly

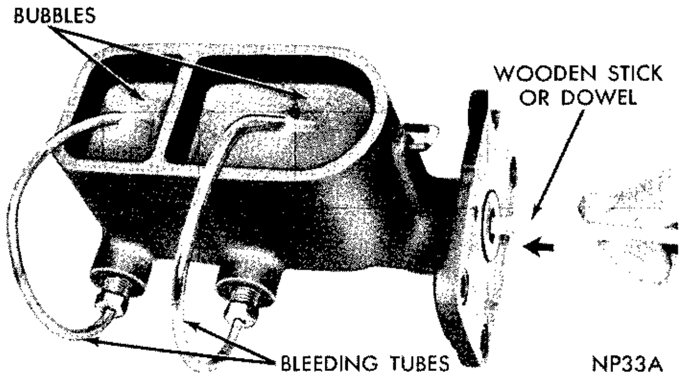


Fig. 7—Bleeding Master Cylinder

open, it will be necessary to pump up the brakes rapidly and then hold the pedal down. Have an observer watch the fluid in the rear reservoir while the pedal is raised. A disturbance in the fluid indicates that the compensating port is open.

HYDRAULIC SYSTEM SAFETY SWITCH

The hydraulic system safety switch (Fig. 8 and 9) is used to warn the vehicle operator that one of the hydraulic systems has failed. A failure in one part of the brake system does not result in failure of the entire hydraulic brake system. As an example, failure of the rear brake system will leave the front brake system still operative.

As pressure falls in one system, the other system's normal pressure forces the piston to the inoperative side; contacting the switch terminal, causing a red

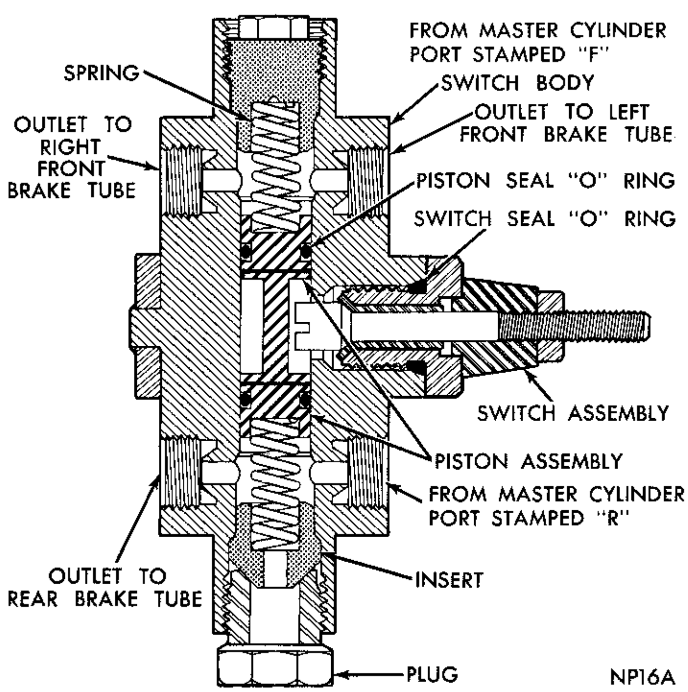


Fig. 8—Hydraulic System Safety Switch (Sectional)

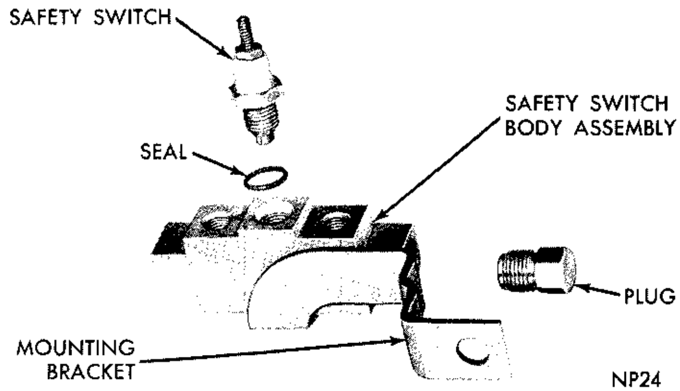


Fig. 9—Hydraulic System Safety Switch (Exploded View)

warning light to come on in the instrument panel, thus warning the operator of the vehicle, that one of the systems has failed and should be repaired.

The safety switch is mounted on the frame in a vertical position, with the brake tubes connected, as shown in (Fig. 8).

If a malfunction occurs within the switch, disconnect tubes from body assembly and install a new assembly. **The component parts of the switch body are not serviced.** However, the terminal unit can be removed if a malfunction occurs, and a new terminal unit installed.

If a new safety switch body assembly is installed, bleed the brake system.

TESTING HYDRAULIC SYSTEM SAFETY SWITCH

The brake warning light flashes only when the parking brake is applied with the ignition key turned "ON". The same light will also illuminate should one of the two service brake systems fail when the brake pedal is applied. To test the system turn the ignition key "ON", and apply the parking brake. If the light fails to light, inspect for a burned out bulb, disconnected socket, a broken or disconnected wire at the switch.

To test the service brake warning system, raise the car on a hoist and open a wheel cylinder bleeder while a helper depresses the brake pedal and observes the warning light. If the light fails to light, inspect for a burned out bulb, disconnected socket, a broken or disconnected wire at the switch. If the bulb is not burned out and the wire continuity is proven, replace the brake warning switch in the brake line Tee fitting mounted on the frame rail in the engine compartment below the master cylinder.

PRESSURE METERING VALVE

All disc brake vehicles are equipped with a pres-

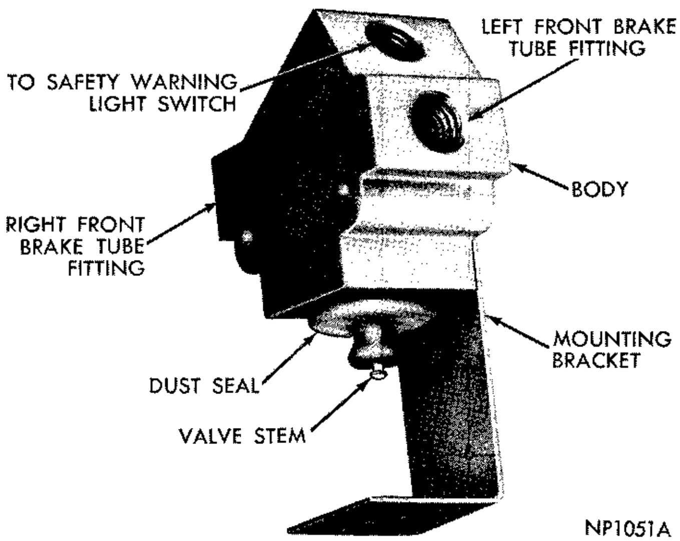


Fig. 1—Metering Valve Assembly

sure metering valve (Figs. 1 and 2). The valve is located on the left frame rail, directly under the battery (Fig. 3). The use of the metering valve is to better match front disc brakes with the rear drum brakes, resulting in improved braking and steering control on icy surfaces.

Due to operating characteristics of the valve, which causes complete shut-off of the flow of brake fluid between approximately 3 and 135 psi, front brake bleeding procedures should be done as follows:

(1) **Gravity Bleed:** This method of bleeding is not effected by the metering valve, as fluid pressures are always below 3 psi. Remove master cylinder reservoir cover and gasket, then fill reservoirs with approved brake fluid. Open disc brake bleeder screws, and allow fluid and air to drain until stream of fluid is free of air.

(2) **Pedal Bleed:** This method of bleeding is not effected by the metering valve, as fluid pressures are in excess of 135 psi. Follow normal procedure of pumping pedal and opening bleeder screws. **Do not pump master cylinder dry!**

(3) **Pressure Bleed:** This method of bleeding is influenced by the metering valve. Bleed pressure, which is normally about 35 psi, is high enough to cause the metering valve to close, stopping the flow of fluid to the front brakes. However, the valve can be held open manually by using Tool C-4121, to pull the valve stem down.

CAUTION: Under no condition should a rigid clamp, wedge or block be used to depress the valve stem as this can cause an internal failure in the valve, resulting in complete loss of front brakes.

It should be noted that the pressure release valve stem is in its uppermost position when there is no

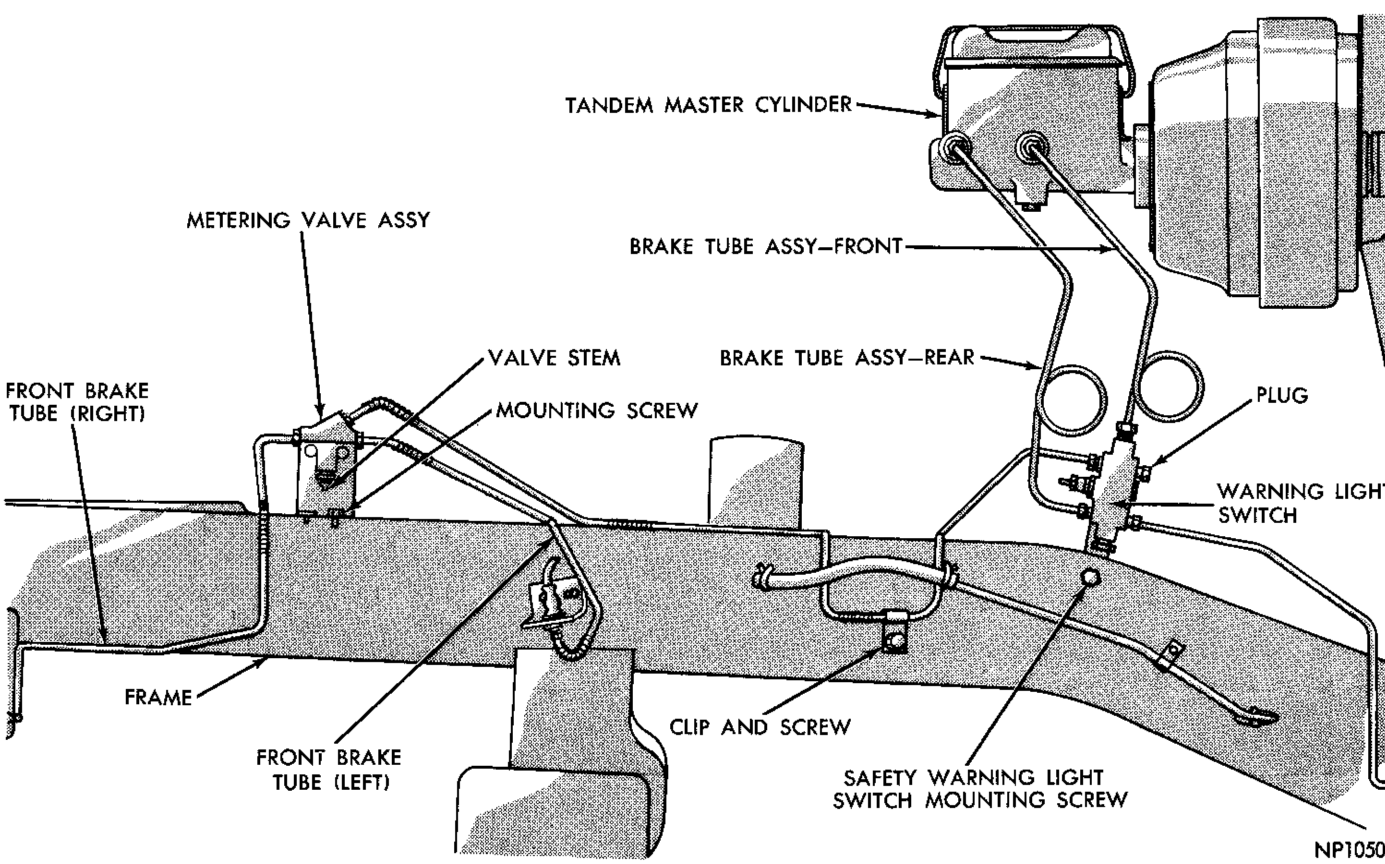


Fig. 2—Metering Valve Mounting

pressure present. No attempt should be made to further depress the valve stem.

Checking Metering Valve

(1) A slight "bump" may be felt by the foot as the brake pedal is stroked. This bump will occur after the pedal has been stroked about 1 inch.

(2) A visual check will show that the valve stem extends slightly when the brakes are applied and retracts when the brakes are released.

(3) In case of a metering valve malfunction, remove valve and install a new one.

SPECIFICATIONS

BRAKES

Model Application	Newport	300 and New Yorker	Imperial
TYPE		Duo-Servo Single Anchor	Rear
DRUM DIAMETER	11 in.	11 in.	11 in.
(Heavy Duty)	11 in.		
NUMBER OF BRAKE SHOES	8	8	4
WIDTH			
Front	2-3/4 in.	3 in.	Disc
Rear	2-1/2 in.	2-1/2 in.	3 in.
(Heavy Duty Including Station Wagon)			
Front	3 in.		
Rear	2-1/2 in.		
BRAKE LINING	Extruded and Moulded Asbestos-Bonded		
LENGTH			
Front Primary	9-1/4"		
Front Secondary	12-1/8"		
Rear Primary	9-1/4"		
Rear Secondary	12-1/8"		

KELSEY-HAYES DISC BRAKE

(Floating Caliper)

Type of Brake	Floating Caliper
Location	Front Wheels Only
Master Cylinder	Horizontal Tandem (Dual)
Metering Valve Location	Left Front Frame Rail
Brake Adjustment	None Required
Residual Valve Location (Rear Brakes Only)	In Master Cylinder Outlet
CALIPER ASSEMBLY	
Shoe and Lining Removal	Bottom, Caliper Removed
Number of Pistons	1 Each Unit
Piston Diameter	2-3/4" (2.751"-2.753")
Piston Bore Diameter	
Maximum Allowable (After Honing)	2.757"
Piston Seal	Moulded Rubber (Square Section) .126" Wide—120" Radial Thickness
Dust Boot	Moulded Rubber (External) 1 Per Unit
Bleeder Screw Location	Inner Housing 3/8"
BRAKING DISC	
Type	Ventilated Cast Iron
Diameter (Outside)	11.75"
(Inside)	7.725"
Disc Run-out (Maximum Allowable) T.I.R.	.0025"
Disc Surface Finish	15 to 80 Micro Inches

Disc Thickness	1.250-1.240
Disc Parallelism (Total Variation in Thickness)	.0005″
BRAKE SHOE AND LINING	
Type	Bonded
Lining Thickness	.460″ (Nominal)
Wide	1.80″ (At Center)
Long	6.02″
Braking Area	10.0″
Maximum Wear (Minimum Thickness Allowed)	Not less than .030″ Lining at any point or a minimum shoe and lining thickness of .180″
MASTER CYLINDER	
Piston Bore Diameter	1-1/8″
Maximum Bore Diameter Allowable (After Honing)	.002″ O.S.
Residual Valve	Rear Brakes Only
DISC SPLASH SHIELD	
Type	Vented-Stamped Steel
Mounting	3 Bolts to Knuckle
WHEELS	
Type	Drop Center
Diameter	15 x 5.50 15 x 6.00 15 x 6.50

POWER BRAKE TIGHTENING REFERENCE

Power Brake Pedal Link to Brake Pedal Linkage Bolt Nut	30 Foot Pounds
Master Cylinder Mounting Nuts	100 Inch Pounds
Power Brake Unit to Dash Nuts	150 Inch Pounds

CLUTCH

CONTENTS

GENERAL INFORMATION

The Semi-Centrifugal, single, dry disc clutch (Fig. 1), combines the feature of low pedal effort with that of a clutch capable of transmitting the full torque of the engine.

Six centrifugal rollers are assembled between the pressure plate and cover. These rollers are provided to increase the normal load on the disc assembly at higher engine speeds. As the engine speed increases, the centrifugal force of the rollers causes them to act as wedges between the cover and pressure plate and exert greater force against the disc.

No adjustment for wear is provided in the clutch itself. The clutch pedal linkage, however, is provided with an adjustable rod to maintain specified pedal free play.

The three pressure plate release levers are preset during manufacture and no attempt should be made to adjust them in service.

Clutch Pedal and Bracket

The clutch pedal is connected to the torque shaft through a vertically positioned rod (Fig. 2). A non-adjustable over-center spring is provided between the pedal and the pedal bracket to allow easy clutch pedal operation.

The upper end of the clutch pedal pivots in the pedal bracket on two needle bearings. These bearings do not require periodic lubrication.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
CLUTCH CHATTER	(a) Worn or damaged disc assembly.	(a) Replace disc assembly.
	(b) Grease or oil on disc facings.	(b) Replace disc assembly and correct cause of contamination.
	(c) Improperly adjusted cover assembly.	(c) Replace cover assembly.
CLUTCH SLIPPING	(a) Burned, worn, or oil soaked facings.	(a) Replace disc assembly and correct cause of contamination.
	(b) Insufficient pedal free play.	(b) Adjust release fork rod.
	(c) Weak or broken pressure springs.	(c) Replace cover assembly.
DIFFICULT GEAR SHIFTING	(a) Excessive pedal free play.	(a) Adjust release fork rod.
	(b) Worn or damaged disc assembly.	(b) Replace disc assembly.
	(c) Improperly adjusted cover assembly.	(c) Replace cover assembly.
	(d) Clutch disc splines sticking.	(d) Remove disc assembly and free up splines or replace disc.
CLUTCH NOISY	(a) Dry clutch linkage.	(a) Lubricate where necessary.
	(b) Worn release bearing.	(b) Replace release bearing.
	(c) Worn disc assembly.	(c) Replace disc assembly.
	(d) Worn release levers.	(d) Replace clutch assembly.
	(e) Worn or dry pilot bushing.	(e) Lubricate or replace bushing.
	(f) Dry contact-pressure plate lugs in cover.	(f) Lubricate very lightly.

SERVICE PROCEDURES

CLUTCH PEDAL FREE PLAY

The only adjustment required for the clutch is the clutch pedal linkage adjustment to provide the prescribed clutch pedal free play. The adjustment is

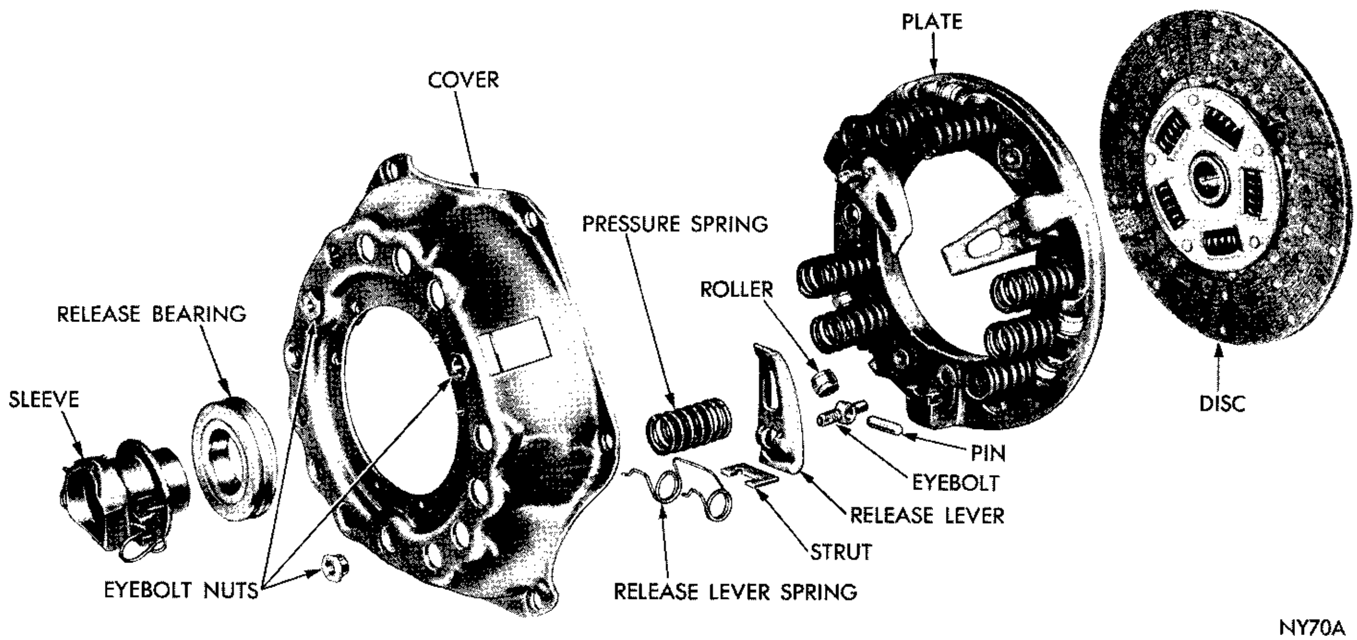


Fig. 1—Clutch Disassembled (Semi Centrifugal)

necessary to restore pedal free play reduced by normal clutch wear.

Adjusting Clutch Pedal Free Play

(1) Inspect condition of clutch pedal rubber stop (Fig. 2). If stop is damaged, install a new one.

(2) Adjust fork rod by turning self-locking adjusting nut (Fig. 3) to provide 5/32 inch free movement at end of fork. This movement will provide prescribed one-inch free play at pedal.

CLUTCH—SERVICING

Improper operation or excessive wear may impair the clutch function to a point where it may be necessary to remove and replace the disc and/or clutch assembly. Should this become necessary, proceed as follows:

Removal

(1) Remove transmission. See "Manual Transmission," Group 21, for detailed procedure.

(2) Remove clutch housing pan.

(3) Disconnect return spring from clutch release fork and torque shaft lever pin.

(4) Remove fork rod assembly from pin and release fork (Fig. 3).

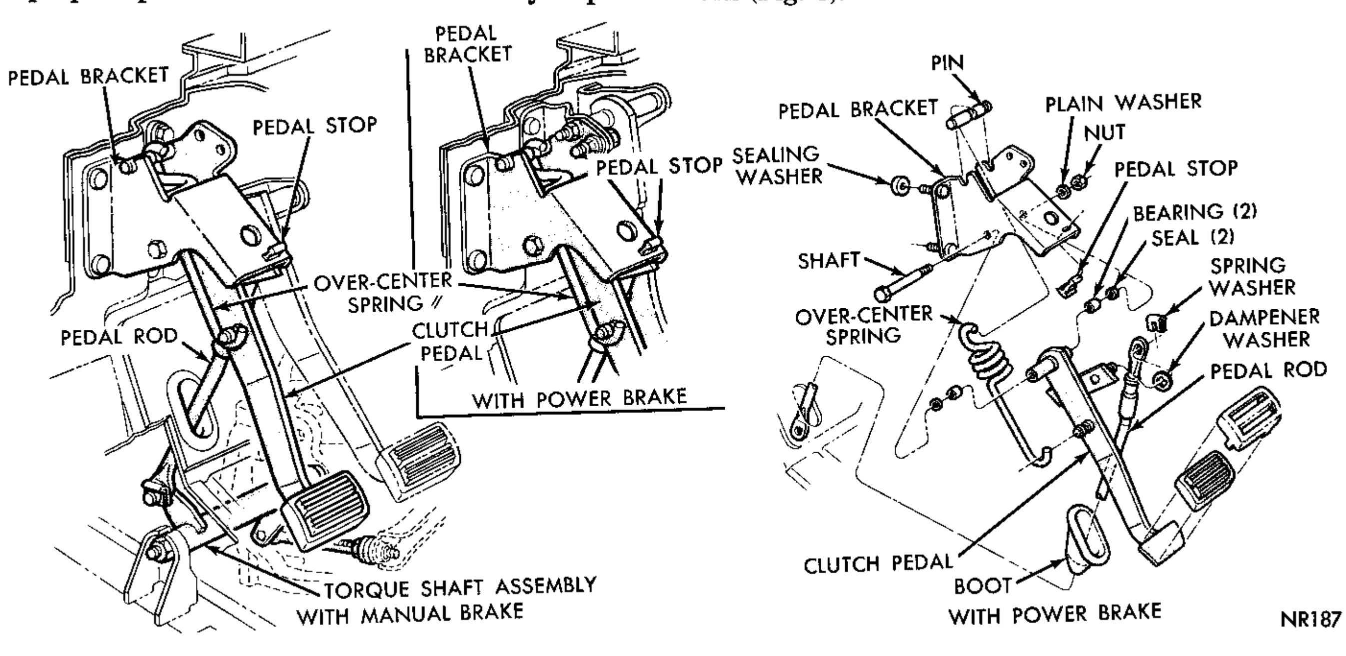


Fig. 2—Clutch Pedal and Linkage

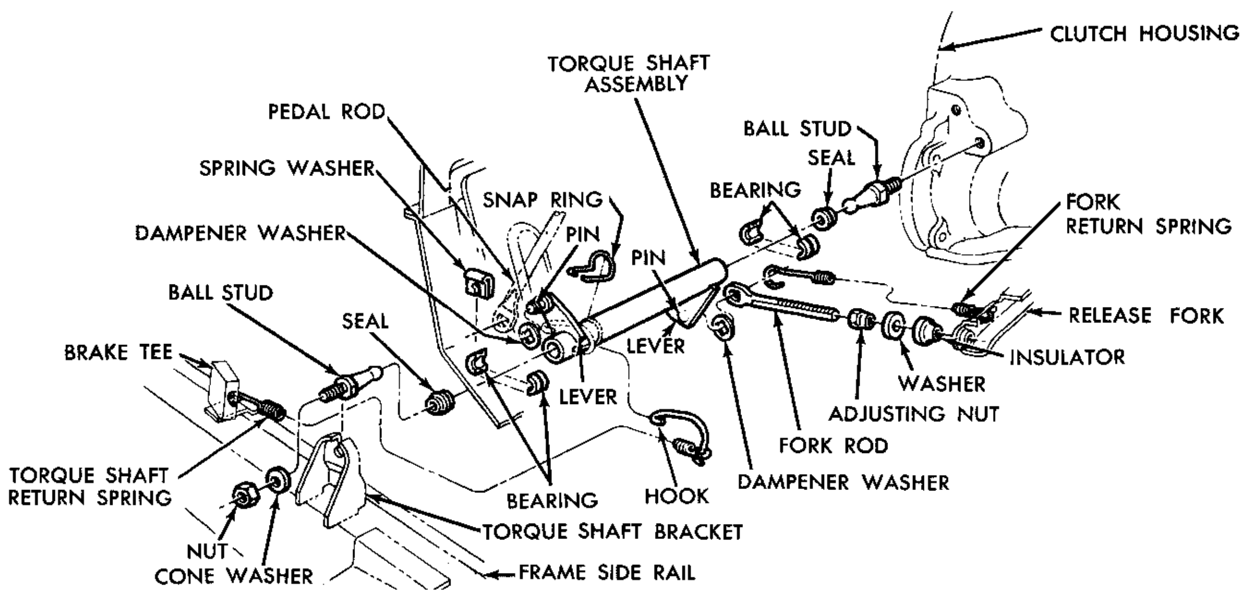


Fig. 3—Torque Shaft and Linkage

(5) Remove clutch release bearing and sleeve assembly from clutch release fork (Fig. 4) then remove release fork and boot from clutch housing.

(6) Mark clutch cover and flywheel (Fig. 5) to maintain their same relative positions when reinstalling clutch assembly.

(7) Loosen and back off clutch cover attaching bolts, one or two turns at a time, in succession, to avoid bending cover flange.

(8) Remove clutch assembly and disc from clutch housing.

CAUTION: Handle clutch and disc carefully to avoid contaminating the friction surfaces.

Cleaning and Inspection

(1) Use compressed air to clean dust out of clutch housing. Inspect for oil leakage through engine rear main bearing oil seal and transmission drive pinion seal. If leakage is noted, it should be corrected at this time.

(2) Friction face of flywheel should have a uniform appearance throughout entire clutch contact area. If there is evidence of heavy contact on one portion of wear circle and a very light contact 180° from that portion, flywheel may be improperly mounted or sprung. In either case, a dial indicator mounted on clutch housing with plunger in contact with wear circle, should show **no more** than .003 inch runout throughout complete rotation of flywheel.

(3) Friction face of flywheel should also be free from discoloration, burned areas, small cracks, grooves or ridges.

(4) The drive pinion pilot bushing pressed in rear end of crankshaft should be smooth and show no excessive wear. A new transmission main drive pinion can be used to gauge size of bushing.

If necessary to replace bushing, proceed as detailed under "Crankshaft to Transmission Drive Pinion Pilot Bushing."

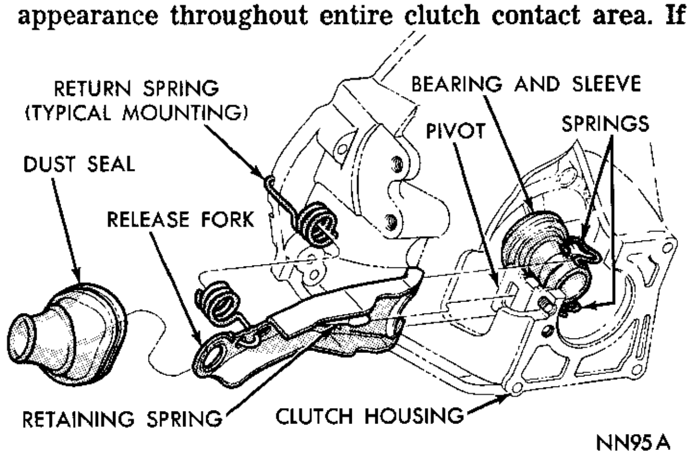


Fig. 4—Clutch Release Fork, Bearing and Sleeve

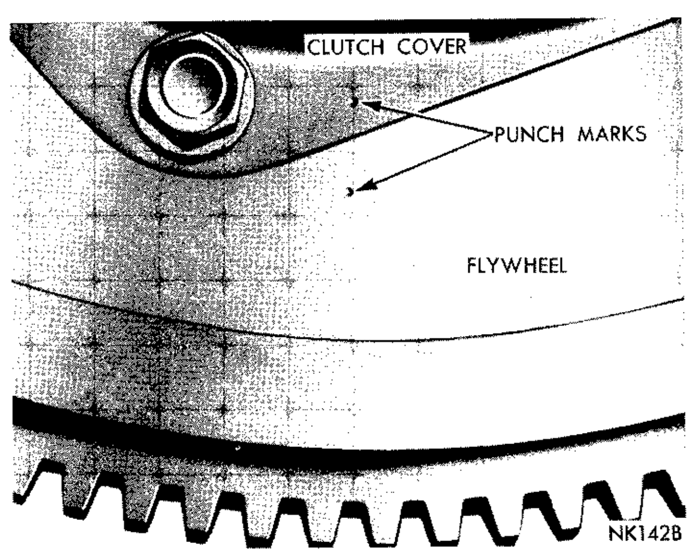


Fig. 5—Marking Clutch and Flywheel

(5) End of transmission main drive pinion should be smooth and bright, without grooves and ridges.

(6) The disc assembly should be handled without touching facings. Replace disc if facings show evidence of grease or oil soakage, or wear to within less than .015 inch of rivet heads. The hub splines and splines on transmission main drive pinion should be a snug fit without signs of excessive wear. Metallic portions of disc assembly should be dry and clean and show no evidence of having been hot. Each of the arched springs between facings should be unbroken and all rivets should be tight.

(7) Wipe friction surface of pressure plate with kerosene, mineral spirits or other suitable solvent.

(8) Using a straight edge, check pressure plate for flatness. The pressure plate friction area should be flat within .015 inch and free from discoloration, burned areas, cracks, grooves or ridges.

(9) Inner ends of release levers should have a uniform wear pattern.

(10) Using a surface plate, test cover for flatness. All sections around attaching bolt holes should be in contact with surface plate within .015 inch.

(11) The cover should be a snug fit on pressure plate lugs.

If clutch assembly does not meet these requirements, it should be replaced.

(12) Examine condition of clutch release bearing.

CAUTION: The clutch release bearing is a prelubricated, sealed thrust bearing and should not be immersed in solvent.

The bearing should turn freely when held in the hands under light thrust load, with no evidence of roughness.

(13) If bearing is noisy, rough or dry, install a new one on sleeve as detailed under "Clutch Release Bearing."

Installation

The grease recommended for use during reassembly procedures is Automotive Multi-Purpose Grease NLGI Grade 2 E.P. or Multi-Mileage Lubricant, Part Number 2525035.

(1) Lubricate transmission drive pinion pilot bushing in end of crankshaft with about one-half teaspoon of grease. Place lubricant in radius back of bushing.

(2) Clean the surfaces of flywheel and pressure plate thoroughly with fine sandpaper or crocus cloth, and make certain that all oil or grease has been removed.

(3) Hold clutch disc, pressure plate and cover in mounting position, with springs on disc damper facing away from flywheel. **Do not touch disc facing, as contamination may result in clutch chatter.** Insert a Clutch Disc Aligning Arbor through hub of disc and into bushing (Fig. 6). If an Arbor is not available,

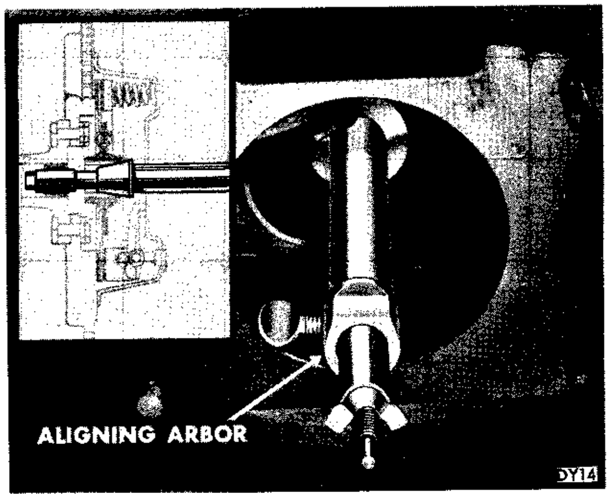


Fig. 6—Clutch Disc Aligning Arbor

use a spare transmission drive pinion.

(4) Install clutch cover attaching bolts (after aligning balance punch marks) but do not draw down (Fig. 5). The special 12 point bolts used on 11 inch clutches for 383 cu. in. and larger engines, require no lock washers. The use of lock washers would create interference problems.

(5) **To avoid distortion of the clutch cover, bolts should be tightened a few turns at a time (alternately) until they are all snug.** Tighten bolts to 30 foot-pounds. Remove Arbor (or drive pinion if used).

(6) Fill cavity of bearing sleeve with Lubricant. Also, apply a film to release fork pads of sleeve (Fig. 7).

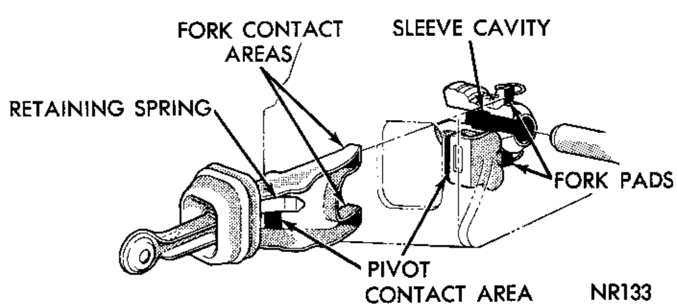
(7) Lubricate fork fingers and retaining spring at pivot contact area (Fig. 7), with a film of grease.

(8) Engage fork fingers under clutch sleeve retaining springs while engaging fork spring into fork pivot (Fig. 4).

(9) Be sure groove in dust seal is engaged on seal opening flange in clutch housing.

(10) Assemble clutch release rod in end of release fork (Fig. 3). Install torque shaft return spring in end of release fork. Assembly front end of rod on torque shaft lever pin and secure with front end of return spring (Fig. 3).

CAUTION: Do not lubricate splines or pilot end of



transmission drive pinion, when installing transmission. These areas must be kept dry.

(11) Install transmission as detailed in "Transmission Installation," Group 21.

(12) Adjust clutch linkage as detailed under "Adjusting Clutch Pedal Free Play."

PILOT BUSHING—CRANKSHAFT TO TRANSMISSION DRIVE PINION

Tools called out are part of Bushing Service Tool Kit C-3887-A.

Removal

(1) Thread bushing puller SP-3631 into bushing firmly and squarely, about 3 or 4 turns.

(2) Place receiving cup SP-3633 over threaded shaft of puller and install nut SP-1191 down against cup.

(3) Hold puller and turn nut to draw bushing out of crankshaft.

Installation

(1) Soak new bushing in oil before installing.

(2) Place handle SP-3549 on head SP-3551 and use this tool to drive new bushing into crankshaft flush to end.

(3) Place one-half teaspoon of grease in crankshaft cavity behind bushing.

CLUTCH RELEASE FORK

Removal

(1) Unhook return spring from torque shaft lever pin and release fork (Fig. 3).

(2) Remove fork rod assembly from torque shaft and release fork.

(3) Pry dust seal out of clutch housing and remove from clutch fork (Fig. 4).

(4) Grasp outer end of clutch fork and pull fork out and free of retaining springs and off knife edge pivot (Fig. 3). **The clutch fork has a riveted flat retaining spring that is engaged in a hole in the pivot. The clutch release fork pivot is an "L" shaped bracket bolted inside the clutch housing.**

(5) Remove clutch housing pan.

Installation

(1) **The grease recommended for use during reassembly procedures is Automotive Multi-Purpose Grease NLGI Grade 2 E.P. or Multi-Mileage Lubricant, Part Number 2525035.**

(2) Before installing release fork, lubricate both sides of fork contact areas, pivot contact area, edge of pivot, also the clutch sleeve fork pads (Fig. 7).

(3) Install clutch release fork in housing, being careful to engage flat retaining spring in hole in pivot and under retaining springs of bearing sleeve.

(4) Install dust seal over release fork and engage groove of seal in clutch housing. Install housing pan.

(5) Insert threaded end of fork rod assembly in hole of release fork (Fig. 3). Install eye end of fork rod on torque shaft lever pin.

(6) Hook torque shaft return spring in release fork and on torque shaft lever pin (Fig. 3).

(7) Adjust clutch linkage as described under "Adjusting Clutch Pedal Free Play".

CLUTCH RELEASE BEARING (Removed From Clutch)

Removal

(1) Examine condition of bearing. If bearing is noisy, rough or dry when rotated by hand under light thrust load, remove bearing from sleeve.

(2) Support bearing in a vise or press and carefully press out sleeve.

(3) Clean sleeve in solvent and remove all old lubricant.

Assembly

CAUTION: Exercise care when installing a new clutch release bearing to avoid damaging bearing race. Never drive bearing on sleeve with a hammer. Use either of following two methods.

Vise Method

(1) Position new bearing on sleeve and place old bearing against face of new bearing.

(2) Support parts in a vise and carefully press new bearing on sleeve (Fig. 8). **Make certain bearing is seated on shoulder of bearing sleeve. Rotate bearings as they are pressed together.**

Press Method

(1) Support sleeve on press bed.

(2) Position new bearing on sleeve and place old bearing on new one.

(3) Bring press ram into contact with old bearing and apply sufficient pressure to **seat new bearing on shoulder of sleeve. Rotate bearings as they are pressed together.**

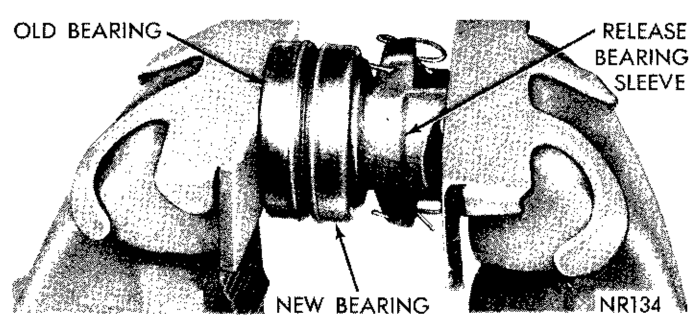


Fig. 8—Replacing Clutch Release Bearing

Lubrication

Before installing bearing and sleeve assembly, lubricate parts as follows:

(1) Fill cavity of bearing sleeve with the previously recommended Automotive Multi-Purpose Grease, NLGI grade 2 EP (Fig. 7).

(2) Also, apply a film of lubricant to release fork pads of sleeve.

(3) A film of lubricant should be applied to the pivot contact area of fork retaining spring and contact areas of fork fingers.

Installation

(1) Install bearing and sleeve assembly in clutch housing, engaging fork under the sleeve springs (Fig. 4). **Be sure springs have lateral freedom.**

CAUTION: Do not lubricate splines or pilot end of transmission drive pinion, when installing transmission. These areas must be kept dry.

(2) Install transmission as detailed in "Transmission Installation," Group 21.

(3) Adjust clutch linkage as detailed in "Adjusting Clutch Pedal Free Play."

TORQUE SHAFT AND BEARINGS

Removal

(1) Remove spring washer securing pedal rod to torque shaft lever pin and remove rod from pin (Fig. 3).

(2) Unhook torque shaft return spring from torque shaft lever pin and release fork. Remove fork rod assembly. Remove outer torque shaft return spring from hook on torque shaft lever and brake tee (Fig. 3).

(3) Remove nut and cone washer from outer ball stud.

(4) Unscrew ball stud from clutch housing (Fig. 3).

(5) Lift frame end of torque shaft from torque shaft bracket and remove torque shaft assembly from vehicle.

(6) Disassemble torque shaft assembly by removing snap ring, ball studs, seals and bearings.

Cleaning and Inspection

(1) Clean all parts in kerosene, mineral spirits or other suitable solvent. Remove all grease from inside torque shaft.

(2) The two ball studs should be bright and free from scratches, ridges, or other surface imperfections.

(3) The inner surfaces of bearings should also be smooth and free from surface scratches or embedded foreign material. The wear pattern should be uniform over entire surface.

(4) Replace worn or cracked rubber seals.

Installation

(1) Install new seals on ball studs (Fig. 3).

(2) Coat counterbored ends of torque shaft, torque shaft bearings and ball studs with Multi-Mileage Lubricant, Part Number 2525035, or Automotive Multi-Purpose Grease, NLGI grade 2 EP.

(3) Install bearings on ball studs and push studs and bearings into torque shaft. Install snap ring on frame end of shaft.

(4) Place torque shaft in approximate position and thread inner ball stud into clutch housing. Tighten stud to 40 foot-pounds (Fig. 3).

(5) Position frame end of torque shaft in slotted frame bracket. Install cone washer and nut on stud and tighten to 40 foot-pounds.

(6) Install pedal rod on torque shaft lever pin and secure with spring washer.

(7) Insert threaded end of fork rod assembly in end of release fork (Fig. 3). Install eye end of rod assembly on torque shaft lever pin.

(8) Hook one end of torque shaft return spring in release fork (Fig. 3) and opposite end over torque shaft lever pin to secure fork rod on pin. Install outer torque shaft return spring between hook on torque shaft lever and brake tee.

(9) Adjust clutch linkage.

CLUTCH HOUSING ALIGNMENT

When performing adjustments or repairs that involve removing the clutch housing, it will be necessary to check transmission mounting bore runout and squareness to the crankshaft when reassembling.

Bore Runout

(1) Replace one flywheel to crankshaft bolt with a bolt about 3 inches long. Mount Dial Indicator C-3339 on this bolt with a "C" clamp (Fig. 9).

(2) With C-771 Turning Tool turn flywheel while noting dial indicator needle deflection. Bore out-of-round must not exceed .008 inch maximum total indicator reading, or .004 inch, one-half total indicator reading.

(3) Excess bore runout can be corrected by install-

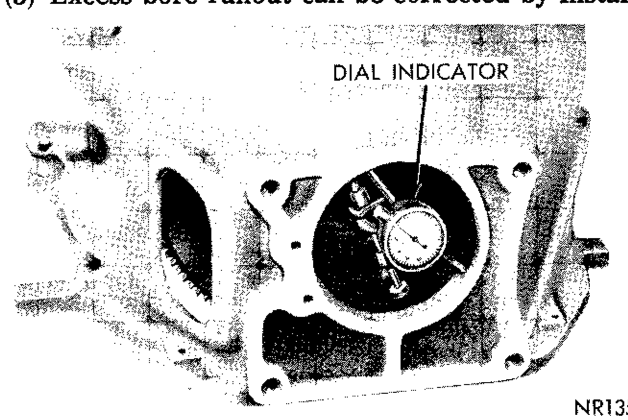


Fig. 9—Measuring Clutch Housing Bore Runout

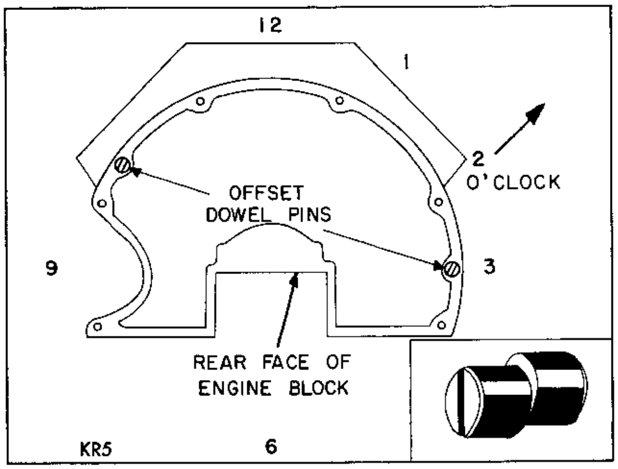


Fig. 10—Offset Dowel Diagram

ing correct size offset dowels (Fig. 10). These dowels are available in three offset sizes and they **must be** installed in pairs of the same size: .007 inch, Part Number 1736347; .014 inch, Part Number 1736348 and .021 inch, Part Number 1736353.

(4) To illustrate recommended correction procedure, assume total indicator reading is .020 inch, in a direction which approximates 2 o'clock on engine block (Fig. 10).

(5) In this case, housing is off crankshaft centerline .010 inch (one-half total indicator reading) which is .006 inch greater than allowable limit of .004 inch (one-half total indicator reading).

(6) In the case under consideration, installation of two .007 inch dowels will bring runout within the allowable limits of .004 inch or .010 inch minus .007 inch (dowels) which equals .003 inch runout.

(7) The amount of eccentricity of the dowel will produce a total indicator reading change of double the dowel eccentricity, therefore, select a pair of dowels with the nearest to one-half of total indicator runout of bore. For runout (total indicator reading) of .009″ through .020″, use a .007″ dowel (No. 1736347); .022″ through .034", use .014 dowel (No. 1736348) and .036″ through .050″, use .021″ dowel (No. 1736353).

(8) To install dowels, remove clutch housing and old dowels from rear face of engine block.

(9) Install both dowels with slots parallel and aligned in direction to correct bore runout. (Slot indicates direction of maximum dowel eccentricity.) Both dowels must be inserted into engine block, up to off-set shoulder.

(10) Install clutch housing to engine block bolts. Tighten 7/16 inch bolts to 50 foot-pounds and 3/8

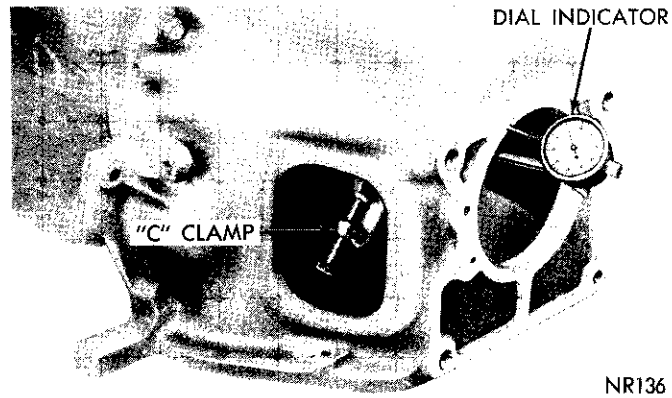


Fig. 11—Measuring Clutch Housing Face Squareness

inch bolts to 30 foot-pounds.

(11) Remount dial indicator and remeasure bore runout. Small corrections can be made by removing clutch housing (if necessary) and turning dowels with a screwdriver to shift housing and bring bore within limits.

Face Squareness

(1) Relocate dial indicator (Fig. 11) and rotate flywheel, using Tool C-771. If total indicator reading is greater than .006 inch, note amount of total indicator reading and location of lowest indicator reading (i.e., point where indicator arm or follower is extended farthest).

(2) To correct squareness, place proper thickness shim stock between clutch housing and engine block or between transmission and clutch housing. After remeasuring face squareness, tighten 7/16 inch housing bolts to 50 foot-pounds and 3/8 inch bolts to 30 foot-pounds.

(3) Install clutch release bearing, fork, linkage and transmission. Adjust clutch linkage.

STEAM CLEANING PRECAUTIONS

Since the clutch housing has provisions for ventilation, condensation from steam vapors tend to accumulate on the internal clutch mechanism when the vehicle is steam cleaned. The facings of the disc will absorb moisture, and the force exerted by the pressure plate will bond the facings to flywheel and/or, pressure plate, if the car is allowed to stand for some time before use. If this condition occurs, it will necessitate replacement of disc assembly, flywheel and/or clutch assembly. **Immediately after cleaning operation, start engine and "slip clutch" in order to dry off disc assembly, pressure plate and flywheel.**

SPECIFICATIONS

COVER AND PRESSURE PLATE ASSY. IDENTIFICATION CHART

Size	Part Number*	Springs No. & Color	Mounting Bolt Circle Dia.	Centrifugal Assist Rollers
11″	3410157	6 White—6 Tan	11-5/8″	6

CLUTCH DISC ASSY. IDENTIFICATION CHART

Size	Part Number*	Facing Dia. Outside x Inside	Springs No. & Color	Spline Inside Dia.
11″	3410160	11″ x 6-1/2″	5 Tan—5 Green	15/16″

*Part Numbers subject to change during model year.

TIGHTENING REFERENCE

	Pounds Foot	Pounds Inch
Clutch Cover to Flywheel Bolts	30	
Clutch Fork Pivot Bolts		200
Clutch Housing to Engine Bolts 3/8″	30	
Clutch Housing to Engine Bolts 7/16″	50	
Clutch Housing Pan Bolts		200
Flywheel Bolts	55	
Torque Shaft Ball Stud	40	
Torque Shaft Ball Stud Nut	40	
Transmission to Clutch Housing Bolts	50	

COOLING

CONTENTS

GENERAL INFORMATION

In order to provide satisfactory protection for the wide variety of corporation models the cooling system of each must be tailored to specific needs. To do this effectively the Corporation offers five basic systems:

(1) Standard
(2) Air Conditioning
(3) High Capacity Fan
(4) Maximum Cooling
(5) Trailer Towing

The standard system consists of a tube and spacer type radiator, 16 psi radiator pressure cap, centrifugal water pump, 195°F. thermostat,* and a seven blade fan. See specifications for application.

The cooling system for air conditioned equipped vehicles generally requires a greater capacity radiator along with a fan shroud, special centrifugal water pump and drive ratio, larger fan, and thermostatically controlled fan drive (in some installations). See specifications for applications.

An optional high capacity fan to protect against overheating for unusual operating conditions is available.

The maximum cooling system consisting of a larger radiator and on some models radiator shrouds and/or hood-to-yoke seals and bumper to yoke are used to provide protection against overheating for unusually severe operation requirements.

The trailer towing package is a combination of the maximum cooling package and the high capacity fan, as necessary to provide protection against overheating when towing trailers.

For internal cooling system protection each cooling system is factory equipped with sufficient permanent type anti-freeze for —20°F. protection. It is recommended that the coolant be changed annually to insure adequate anti-freeze and corrosion protection. Air conditioned cars require year round protection with permanent type anti-freeze with a minimum of +15°F. protection for summer operation and additional antifreeze in the winter according to the prevailing temperatures.

*440 H.P. Engines have a 190° thermostat.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXTERNAL LEAKAGE	(a) Loose hose clamp.	(a) Replace the hose clamp.
	(b) Hose leaking.	(b) Replace the hose.
	(c) Leaking radiator.	(c) Repair or replace the radiator as necessary.
	(d) Water pump leaking through vent hole.	(d) Replace the water pump.
	(e) Loose core hole plug.	(e) Install new core hole plug.
	(f) Damaged gasket, or dry gasket, if engine has been stored.	(f) Replace gaskets as necessary.
	(g) Cylinder head bolts loose, or tightened unevenly.	(g) Replace the cylinder head gasket and torque head in correct sequence.
	(h) Leak at heater connection.	(h) Clean the heater connections and replace the hoses and clamps if necessary.
	(i) Leak at water temperature sending unit.	(i) Tighten the water temperature sending unit.

Condition	Possible Cause	Correction
	(j) Leak at water pump attaching bolt.	(j) Tighten the water pump attaching bolts to 30 foot-pounds.
	(k) Leak at exhaust manifold stud.	(k) Seal and re-drive the stud.
	(l) Cracked thermostat housing.	(l) Replace the thermostat housing.
	(m) Dented radiator inlet or outlet tube.	(m) Straighten the radiator inlet or outlet tube as necessary.
	(n) Leaking heater core.	(n) Repair or replace the heater core.
	(o) Cracked or porous water pump housing.	(o) Replace the water pump assembly.
	(p) Warped or cracked cylinder head.	(p) Replace the cylinder head.
	(q) Cracked cylinder block.	(q) Replace the cylinder block.
	(r) Sand holes or porous condition in block or head.	(r) Replace the cylinder block or cylinder head as necessary.
	(s) Faulty pressure cap.	(s) Replace pressure cap.
	(t) Loose or stripped oil cooler fittings.	(t) Tighten or replace as necessary.
INTERNAL LEAKAGE	(a) Faulty head gasket.	(a) Install a new head gasket.
	(b) Refer to causes (f), (g), (p), (q), (r) and (t) listed under External Leakage.	(b) Refer to corrections (f), (g), (p), (q), (r) and (t) listed under External Leakage.
	(c) Crack in head into valve compartment.	(c) Pressure test cooling system, replace the cylinder head.
	(d) Cracked valve port.	(d) Pressure test cooling system, replace the cylinder head.
	(e) Crack in block into push rod compartment.	(e) Pressure test cooling system, replace the cylinder block.
	(f) Cracked cylinder wall.	(f) Pressure test cooling system, replace the cylinder block.
	(g) Leaking oil cooler.	(g) Repair or replace the oil cooler.
POOR CIRCULATION	(a) Low coolant level.	(a) Fill radiator to correct level.
	(b) Collapsed radiator hose. (A bottom hose with faulty spring may collapse only at medium or high engine speeds.)	(b) Replace the hose and spring.
	(c) Fan belt loose, glazed, or oil soaked.	(c) Tighten or replace the fan belt as necessary.
	(d) Air leak through bottom hose.	(d) Reposition hose clamps or replace the hose. Check radiator outlets for dents or out-of-rounds.
	(e) Faulty thermostat.	(e) Replace the thermostat.
	(f) Water pump impeller broken or loose on shaft.	(f) Replace the water pump.
	(g) Restricted radiator core water passages.	(g) Flush the radiator thoroughly or rod out if necessary.
	(h) Restricted engine water jacket.	(h) Flush the engine cooling system thoroughly.
OVERHEATING (refer to Causes and Corrections listed under "Poor Circulation")	(a) Blocked radiator air passages.	(a) Clean out the radiator air passages.
	(b) Incorrect ignition timing.	(b) Time the engine ignition system.
	(c) Low engine oil level.	(c) Add engine oil to the correct level.
	(d) Incorrect valve timing.	(d) Correct the engine valve timing.
	(e) Inaccurate temperature gauge.	(e) Replace the temperature gauge.
	(f) Restricted overflow tube.	(f) Remove restriction from overflow tube.
	(g) Faulty radiator pressure cap or seat.	(g) Replace the radiator cap. Clean or replace seat.
	(h) Frozen heat control valve.	(h) Free up manifold heat control valve.
	(i) Dragging brakes.	(i) Adjust the brakes.
	(j) Excessive engine idling.	(j) Increase idle R.P.M. or stop engine.
	(k) Frozen coolant.	(k) Thaw out cooling system, add antifreeze as required.
	(l) Faulty fan drive unit.	(l) Replace the fan drive unit.
	(m) Faulty temperature sending unit.	(m) Replace the sending unit.
OVERFLOW LOSS (Also refer to Causes and Corrections listed under	(a) Overfilling.	(a) Adjust coolant to the correct level.
	(b) Coolant foaming due to insufficient corrosion inhibitor.	(b) Flush the radiator and add antifreeze as required.

Condition	Possible Cause	Correction
"Poor Circulation and Overheating")	(c) Blown head gasket. (d) Broken or shifted lower hose spring.	(c) Replace the head gasket. (d) Replace lower hose.
CORROSION	(a) Use of water containing large concentration of lime and minerals. (b) Insufficient corrosion inhibitor. (c) Use of antifreeze for extended length of time.	(a) Use only clean soft water with antifreeze. (b) Use antifreeze or rust inhibitor as required. (c) Drain cooling system and replace with new antifreeze.
TEMPERATURE TOO LOW—SLOW ENGINE WARM-UP	(a) Faulty thermostat. (b) Inaccurate temperature gauge. (c) Faulty temperature sending unit.	(a) Replace the thermostat. (b) Replace the temperature gauge. (c) Replace the sending unit.
WATER PUMP NOISY	(a) Seal noisy. (b) Bearing corroded.	(a) Add Water Pump Lube. (b) Replace water pump.

ACCESSORY DRIVE BELTS

Condition	Possible Cause	Correction
INSUFFICIENT ACCESSORY OUTPUT	(a) Belt too loose. (b) Belt excessively glazed or worn.	(a) Adjust belt tension. (b) Replace and tighten as specified.
BELT SQUEAL WHEN ACCELERATING ENGINE	(a) Belts too loose. (b) Belts glazed.	(a) Adjust belt tension. (b) Replace belts.
BELT SQUEAK AT IDLE	(a) Belt too loose. (b) Dirt and paint imbedded in belt. (c) Non-uniform belt. (d) Non-uniform groove or eccentric pulley.	(a) Adjust belt tension. (b) Replace belt. (c) Replace belt. (d) Replace pulley.
BELT ROLLED OVER IN GROOVE OR JUMPS OFF	(a) Broken cord in belt. (b) Belts not matched (A/C). (c) Belt is not Chrysler approved part. (d) Belt too loose. (e) Severely misaligned pulleys.	(a) Replace belt. (b) Install matched belts. (c) Install Chrysler belt. (d) Adjust belt tension. (e) Align accessories.

SERVICE PROCEDURES

FAN

There are no repairs to be made to the fan. If the fan is bent or damaged it should be replaced.

Removal

(1) Remove shroud attaching screws, separate shroud from radiator, position shroud rearward on engine. Fan attaching screws can now be removed.

(2) On models equipped with fluid fan drive, remove fan drive attaching screws. The fan and fluid fan drive are removed as a unit.

Installation

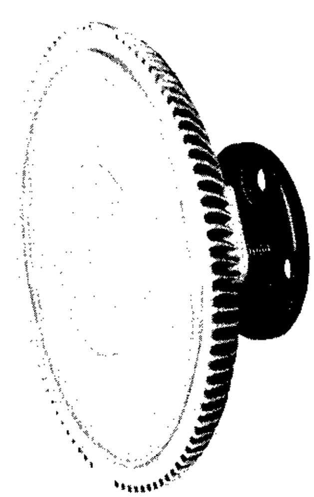
Use correct fan spacer, if required, so clearance between fan blades and radiator is 3/4 to 1-1/4 inches. No fan spacer permitted with fluid fan drive regardless of fan blades to radiator clearance. Install one piece shroud on vehicles so equipped. Tighten fan belt as outlined in "Accessory Belt Drives".

FLUID FAN DRIVE

CAUTION: To prevent silicone fluid from draining into fan drive bearing and ruining the grease, do not place drive unit with shaft pointing downward.

Torque Control Drive

The Torque Control Drive (Fig. 1) is a silicone



NK480A

Fig. 1—Torque Control Fan Drive

fluid filled coupling connecting the fan to the fan pulley. The unit allows fan to be driven in normal manner at low engine speeds while limiting the top speed of the fan to a pre-determined level at higher engine speeds.

Thermal Control Drive

Air conditioned vehicles only the Thermal Control Drive (Fig. 2) is essentially the same as the Torque unit except for a thermostatic spring on the drive face. This thermostat senses temperature from the radiator and engages the drive for higher fan speed if temperature from the radiator rises above a certain point.

In case of engine overheating during slow car speed or idle operation, increase engine speed to approximately 1000 rpm in neutral gear. If condition is not corrected by increasing engine speed, replace fan drive unit with a unit known to be operating properly and test by operating vehicle under same conditions. Replace original drive unit assembly if trouble was corrected with test unit.

WATER PUMP

Note: The water pump is serviced only as an assembly. When replacing the water pump do not install a standard water pump on any air conditioned vehicle or vice versa. See specifications for proper pump.

Removal

(1) Drain the cooling system. (Remove fan shroud if so equipped and set back on engine).

(2) Loosen power steering pump, idler pulley and alternator. Remove all belts.

(3) Remove fan, spacer (or fluid drive) and pulley. **CAUTION: To prevent silicone fluid from draining into fan drive bearing and ruining the grease, do not place drive unit with shaft pointing downward.**

(4) Remove the bolts attaching the water pump body to the housing. Remove the water pump and discard gasket.

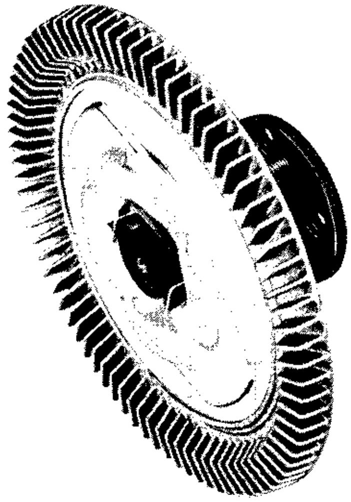


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Fig. 2—Thermal Control Fan Drive

Installation

(1) Install water pump body on housing, using a new gasket.

(2) Tighten bolts to 30 foot-pounds. Rotate pump shaft by hand to be sure it rotates freely. Install pulley, spacer (or fluid drive) and fan.

(3) Tighten nuts to 15 foot-pounds. Install one piece shroud if so equipped. Fill the cooling system and test for leaks. Tighten belts as outlined in "Accessory Belt Drives".

RADIATOR

Removal

(1) Drain cooling system.

(2) On vehicles with automatic transmission, disconnect oil cooler lines at radiator bottom tank.

(3) Remove upper and lower radiator hoses (using pliers C-3250).

(4) Remove shroud attaching screws, separate shroud from radiator, position shroud rearward on engine for maximum clearance.

(5) Remove radiator attaching screws.

(6) Radiator can now be lifted free from engine compartment. **Care should be taken not to damage radiator cooling fins or water tubes during removal. Fan damage should always be avoided.**

Installation

(1) Slide radiator down into position behind radiator support and install attaching screws.

(2) Install fan shroud (if so equipped), connect hoses, and connect transmission oil cooler lines, if so equipped.

(3) Fill cooling system to 1-1/4" below filler neck seat with water and anti-freeze, as required. After warm-up, re-check coolant level.

(4) On vehicles with automatic transmission, measure transmission oil level after warm-up and add oil as required.

Cleaning

(1) Drain cooling system and refill with clean **soft** water and a reliable cooling system cleaner.

(2) Operate engine according to directions on Cleaner label.

(3) After cleaning operation, flush entire cooling system until water runs clean.

(4) Regardless of climate, the cooling system should be refilled with sufficient permanent type anti-freeze for —20°F protection. To insure adequate corrosion protection.

(5) If vehicle is equipped with **air conditioning** the cooling system must contain anti-freeze all year

round. This is necessary because in the reheat-cycle system used on all vehicles, cold refrigerated air passes through the heater core. Anti-freeze is necessary to prevent the heater core from freezing in hot weather when the air conditioner is being used.

TRANSMISSION OIL COOLER

The transmission oil cooler is located in the bottom radiator tank (water cooled), which is an integral part of the radiator.

Some models are equipped with an auxiliary oil cooler (air cooled) mounted ahead of the radiator and is connected in series with the standard transmission oil cooler (Fig. 3).

In case of a leak, engine coolant may become mixed with transmission fluid, also, transmission fluid may enter cooling system. Both cooling system and transmission should be inspected in event cooler is leaking.

Testing Oil Cooler for Leaks

(1) Disconnect both oil cooler lines at radiator.

(2) Connect a pressure gauge to one cooler connection and a shut off valve to the other. Close the valve.

(3) Connect a source of air pressure to the valve.

(4) Coat all fittings with oil.

(5) Open the test valve and apply (up to 100 psi) air pressure. Oil bubbles will identify any fitting joint leaks. Repair all joint leaks.

(6) Close the valve. Gauge reading will then drop if cooler is leaking.

Repairing Oil Cooler

(1) Remove radiator from vehicle.

(2) Remove radiator bottom tank.

(3) Melt the soft solder holding the cooler to the tank.

(4) Remove the stamped retainer nuts holding the cooler fittings to the bottom tank and remove the cooler.

(5) Install a new cooler or repair the old cooler with **silver solder** and reinstall as follows:

(6) Position oil cooler in bottom tank and install the stamped retainer nuts on oil cooler fittings.

(7) Use soft solder to secure the cooler in the tank.

(8) Attach bottom tank to radiator using soft solder.

(9) Install radiator as described in Paragraph "Radiator".

(10) Fill cooling system and test for leaks.

If the transmission operates properly after repairing the leak, drain the transmission and torque converter while hot, remove the transmission oil pan and inspect for sludge, rust, dirty or plugged inlet

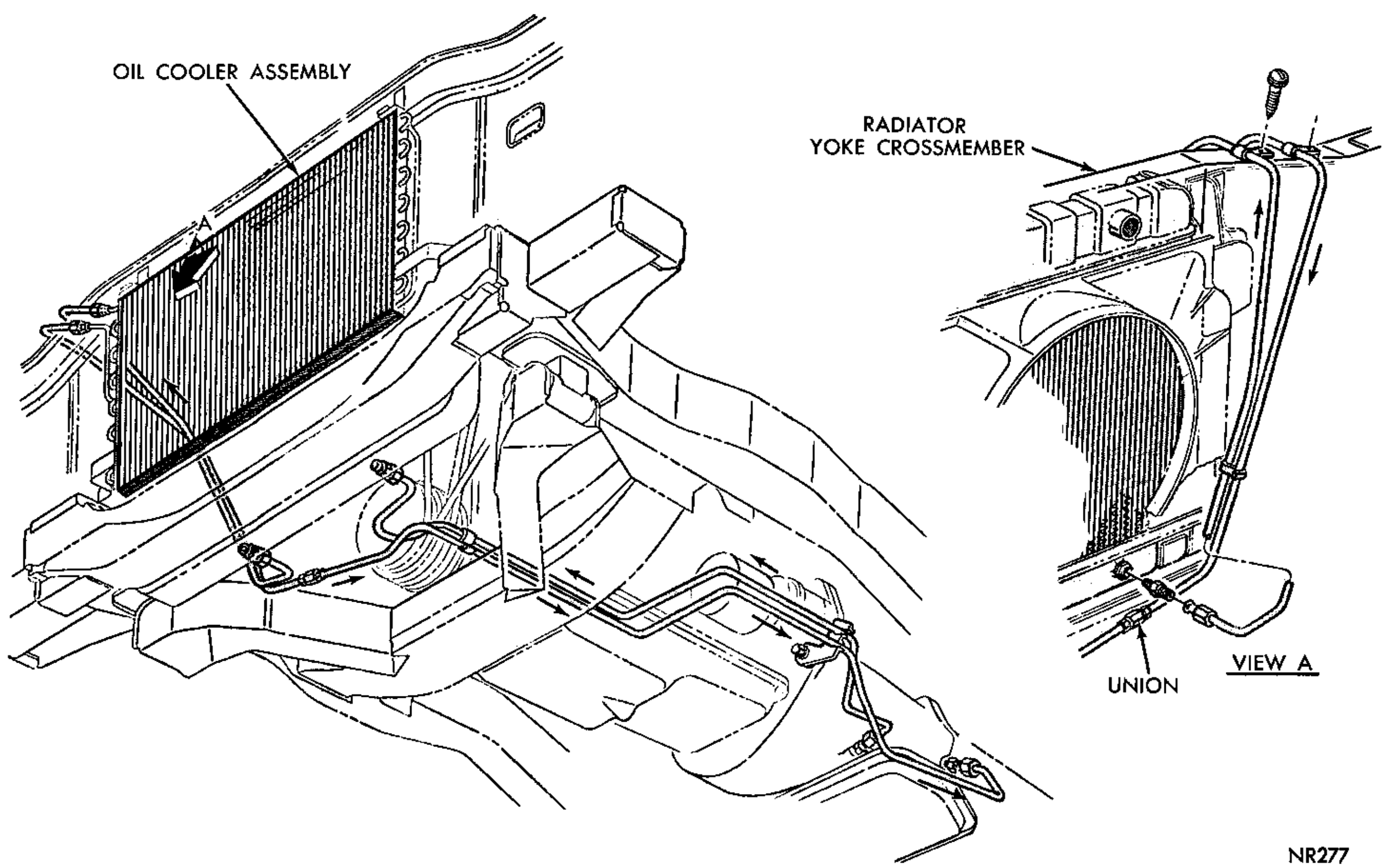

Fig. 3—Oil Flow—Transmission Coolers with Trailer Tow—Imperial and Chrysler 383—4 BBL.

filter. If none of these conditions are found, reconditioning may not be necessary. Reassemble, using Dexron "Automatic Transmission Fluid or Chrysler Automatic Transmission Fluid AQ-ATF-2848A available under Part Number 1843314.

The transmission auxiliary oil cooler being all aluminum can be repaired by a local reliable radiator service having the equipment for alumibrazing or heliarc.

REVERSE FLUSHING THE COOLING SYSTEM

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.

Flushing Cylinder Block

(1) Drain radiator and remove hoses at radiator.

(2) Remove thermostat and reinstall thermostat housing.

(3) Install Tool C-3514, or other suitable flushing gun to inlet hose.

(4) Connect water hose of gun to a pressure water source and air hose of gun to a pressure air source.

(5) Turn on water, and when cylinder block is filled, turn on air (up to 20 psi) in short blasts.

(6) Allow cylinder block to fill between blasts of air.

(7) Continue this procedure until water runs clean. Test thermostat and if satisfactory, reinstall: otherwise, replace using a new housing gasket.

(8) Fill cooling system to 1-1/4 inches below filler neck, using **soft** water and anti-freeze, depending on season or if equipped with air conditioning.

(9) Engine should be operated until temperature gauge indicates normal operating temperature, then, continue an additional five minutes to release any air trapped in system.

(10) Check for leaks and coolant level; correct as necessary.

Reverse Flushing Radiator

(1) Drain cooling system and remove hoses from engine.

(2) Install Tool C-3514, or other suitable flushing gun in radiator lower outlet.

(3) Fill radiator and turn on air in short blasts.

CAUTION: Internal radiator pressure must not exceed 20 psi, as damage to radiator may result.

(4) Continue this procedure until water runs clean. **It is a good policy to reverse flush heater cores any time the radiator is reverse flushed.**

(5) Fill cooling system to 1-1/4 inches below filler neck, using **soft** water and anti-freeze, depending on season or if equipped with air conditioning.

(6) Engine should be operated until temperature gauge indicates normal operating temperature, then, continue an additional five minutes to release any air trapped in system.

(7) Check for leaks and coolant level; correct as necessary.

THERMOSTAT

The thermostat is actuated by a pellet containing a copper-impregnated wax, as shown in (Fig. 4). As the temperature of the pellet increases, the wax expands and opens the valve. A 195° thermostat is standard equipment.* **The use of a 160° thermostat or alcohol type anti-freeze is not recommended.**

If the thermostat does not close completely when cold, the engine will warm up slowly or not at all, and heater performance will also be impaired. Poor heater performance may also be due to valve opening at too low a temperature. Too high a valve opening temperature or a valve that will not open can cause overheating.

*440 H.P. Engines have a 190° thermostat.

Removal

(1) Drain cooling system down to thermostat level or below.

(2) Remove upper radiator hose from thermostat housing.

(3) Remove thermostat housing bolts and remove thermostat and housing.

Testing Thermostat

(1) Visually inspect thermostat to make sure valve closes tightly. If valve does not close completely due to dirt, sand or other foreign material, carefully clean the sealing edge making sure the sealing edge is not damaged. If valve does not close tightly when clean, install a new thermostat.

(2) Immerse thermostat in a container of warm water so that pellet of thermostat is completely covered. The pellet must not touch bottom or sides of container.

(3) Heat the water and stir it continuously (to insure uniform temperature) and check water temperature with a thermometer at the point when a .001"

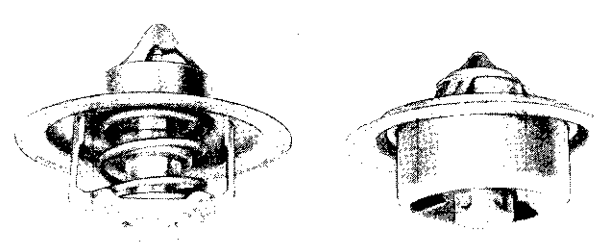

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Fig. 4—Thermostats

feeler gauge can be inserted into valve opening. The feeler gauge should pass freely into the valve opening at a water temperature of 187° to 194°F for a 190° thermostat and a water temperature of 192° to 199° for a 195° thermostat. If outside of this range, replace thermostat.

(4) Continue heating water to approximately 210°F for a 190° thermostat and 215° temperature for a 195° thermostat. The thermostat valve should be fully open at this temperature. If it is not, replace thermostat.

Installation

(1) Using a new gasket, position thermostat so pellet end is toward engine and attach with bolts through thermostat housing.

(2) If removed, reinstall or replace the upper hose.

(3) Fill cooling system to 1-1/4 inches below filler neck with water and rust resistor or water and anti-freeze.

RADIATOR HOSES

The hoses are removed and installed using hose clamp pliers C-3250.

A hardened, cracked, swollen or restricted hose should be replaced.

The reinforcement spring inside the lower hose is necessary to prevent collapsing of the hose due to suction at medium or high engine speeds. If this spring is misplaced in hose, it should be repositioned. If this spring is deformed hose must be replaced.

RADIATOR PRESSURE CAP

Radiators are equipped with a 16 psi cap, as standard equipment (Fig. 5).

WARNING: When removing pressure cap, turn counterclockwise to stop, without downward pressure on cap, permitting built-up pressure to escape through overflow tube. This will prevent hot water from spraying out of radiator filler opening. To complete removal apply downward pressure and turn counterclockwise.

PRESSURE TESTING RADIATOR CAP

Select the short neoprene seal and metal adapter from the kit, Tool C-4080. Slip the seal on the tube at

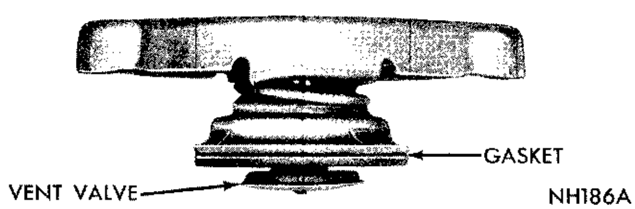


Fig. 5—Radiator Pressure Cap

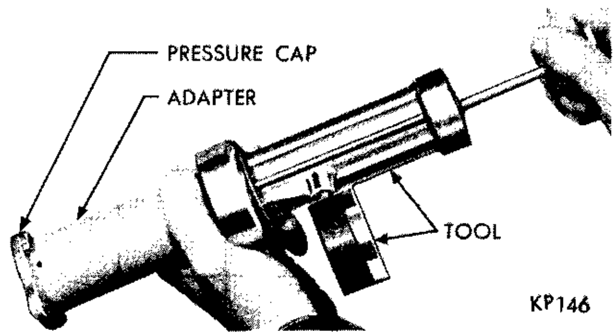


Fig. 6—Testing Pressure Cap

the bottom of the instrument. Then attach either end of the short adapter to the instrument. Dip the pressure cap in water and apply cap to end of adapter. Working the plunger, as shown in (Fig. 6) bring the pressure to 16 pounds on the gauge. If the pressure cap fails to hold the pressure within a range of 14-17 pounds, replace the cap with a **new tested** cap.

The brass vent valve at the bottom of the cap should hang freely. If the rubber gasket has swollen and prevents the valve from hanging loosely, replace the cap. **Do not use a replacement cap without this vent valve.**

PRESSURE TESTING COOLING SYSTEM

(1) With engine not running, wipe the radiator filler neck sealing seat clean. The water level should be 1/2 inch below neck of radiator.

(2) Attach the Tester Tool C-4080 to the radiator, as shown in (Fig. 7) and apply 15 pounds pressure. If the pressure drops inspect all points for external leaks.

(3) If there are no external leaks, after the gauge dial shows a drop in pressure, detach the tester, start engine and run the engine to operating temperature in order to open the thermostat and allow the coolant

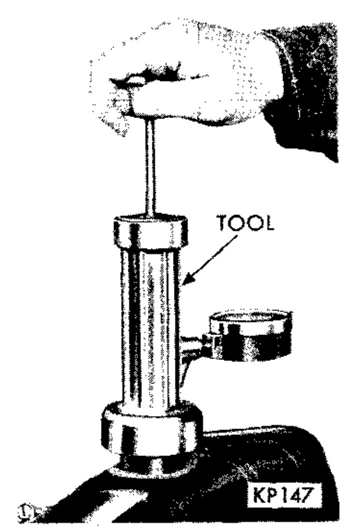


Fig. 7—Pressure Testing Cooling System

to expand. Reattach the tester and pump to 7 lbs. pressure while the engine is running. Race the engine, and if the needle on the dial fluctuates it indicates a combustion leak, usually a head gasket.

WARNING: Pressure builds up fast. Any excessive amount of pressure built up by continuous engine operation must be released to a safe pressure point. NEVER PERMIT PRESSURE TO EXCEED 20 lbs.

(4) Remove the wires from the spark plugs on one bank and operate the engine on the opposite bank. If the needle continues to fluctuate, it indicates a leak on the bank still in operation. If the needle ceases to fluctuate, the leak is in the bank, from which combustion has been released.

(5) If the needle on the dial does not fluctuate, race the engine a few times and if an abnormal amount of water emits from the exhaust system at the tail pipe, it may indicate a leak that can be a faulty head gasket, cracked engine block, or the cylinder head near the exhaust ports.

(6) If the above pressure test of the cooling system holds without fluctuation, then there is no leak, however, there may be internal leaks which can be determined by removing the oil dip-stick and if water globules appear intermixed with the oil it will indicate a serious internal leak in the engine. If there is an internal leak, the engine must be disassembled, the leak located and necessary new parts installed.

ENGINE WATER TEMPERATURE GAUGE

For Removal, Installation and Testing procedures of the water temperature sending and receiving units, refer to "Electrical" Group 8 "Gauges".

ACCESSORY BELT DRIVES

PROPER BELT TENSION

Satisfactory performance of belt driven accessories (Fig. 8) depends on the maintenance of proper belt tension. There are two methods by which belt tensions can be properly established. "The Torque Method" and "The Belt Deflection Method". If the specified tensions are not maintained, belt slippage may cause engine overheating, lack of power steering assist, loss in air conditioning capacity, reduced belt life. To avoid any such adverse effects, the following service procedure should be followed:

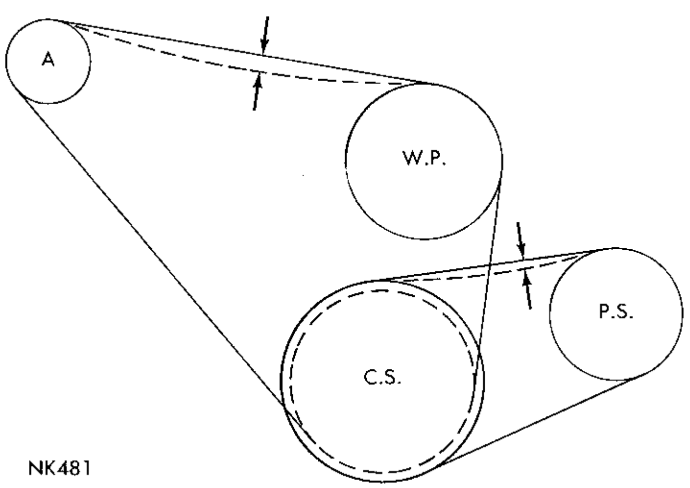
Adjust all belts to the specified "used belt" tension at new vehicle preparation. Any belt that has operated for a minimum for a half-hour is considered to be used. The new belt tension specification apply for all new belt replacements.

On **Chrysler Models** with 383 or 440 cubic inch engine with air conditioning, it may be necessary to remove the A/C clutch to install a new A/C belt set. With belts engaged in the crankshaft, alternator and the A/C clutch grooves, install A/C clutch on compressor. Adjust belts to proper tension. See Group 24 of this manual for A/C clutch Removal and Installation.

Torque Method

All belts can be adjusted to the specified tension by use of a torque wrench. The alternator belts are adjusted by using a special Tool C-3841 and torque wrench Tool C-3005.

The special tool should be hooked at the heavily-ribbed section of the alternator rectifier end shield. Other belts can also be tightened by torque wrench 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. (See Specifications.) Tighten all mounting bolts



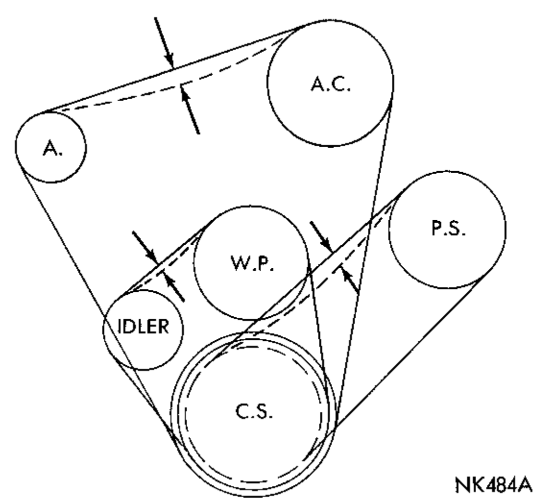


Fig. 8—Belt Deflection Location

while the torque is applied to the accessory. If it is not possible to use the torque wrench because of clearance, use an extension.

Belt Deflection Method

All belts can also be adjusted 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 can be used to establish the five-pound load. See Figure 8 for correct location at which to measure deflection.

This method should be used only when it is not possible to use the torque method. To adjust belts by the deflection method, loosen all mounting bolts and use a bar to apply tensions to the belts being careful not to damage the accessory. A 1/2 inch square drive hinge handle can be used if the accessory has a square hole. Tighten the mounting bolts and test the deflection. (See Specifications.) It may be necessary to repeat this procedure several times to establish the correct tension.

SPECIFICATIONS

CHRYSLER AND IMPERIAL

ENGINE	383-2BBL	383-4BBL	440	IMPERIAL
CAPACITY (With Heater) Quarts—	14.5—22″	14.5—22″	15.5—22″	17.5—28″
Radiator Width	15-26″ A/C 16-26″ M/C	16—26″	17—26″ A/C 18-26″ M/C	
RADIATOR—Identification Number—Width				
Transmission Manual 230	2998963—22″	N/A	N/A	N/A
Automatic 727	2998963—22″	2998964—22″	2998969—22″	2998980—28″
A/C	2998965—26″	2998967—26″	2998970—26″	2998980—28″
Max. Cooling	2998968—26″	2998968—26″	2998968—26″	2998980—28″
Oil Cooler Size Standard	12″	12″	12″	12″
A/C	12″	12″	12″	12″
Max. Cooling	12″	12″**	12″	12″**
Shroud—Transmission Manual	None			
Automatic	None	None	Yes***	Yes
A/C & Max. Cooling	Yes	Yes	Yes	Yes
Seal				
Hood to Yoke	Yes	Yes	Yes	Yes
Bumper to Yoke Air Conditioning and Maximum Cooling	Yes	Yes	Yes	All
FAN				
Diameter—Number Blades—Width				
Standard	18—7—2	N/A	N/A	N/A
Automatic	18—7—2	18—7—2	18—7—2	18-1/2—7—2-1/2
A/C	18-1/2—7—2-1/2	18-1/2—7—2-1/2	18-1/2—7—2-1/2	18-1/2—7—2-1/2
High Capacity	18—7—2-1/8	18—7—2-1/8	18—7—2-1/8	N/A
Spacer				
Standard	1.60″	1.60″	1.60″	Thermal
A/C	Thermal	Thermal	Thermal	Thermal
High Capacity	1.60″	1.60″	1.60″	N/A
Ratio (Fan to Crankshaft)				
Standard	.95:1	.95:1	.95:1	.95:1
A/C	1.4:1	1.4:1	1.4:1	1.4:1
High Capacity	.95:1	.95:1	.95:1	N/A
WATER PUMP IMPELLER				
Diameter—Number Blades				
Standard	4.38″-8	4.38″-8	4.38″-8	4.38″-8
A/C	3.50″-6	3.50″-6	3.50″-6	3.50″-6

*Add 1-1/2 quarts for rear seat heater.

**Auxiliary 11″ x 26″ oil cooler (air cooled) in series with standard oil cooler with trailer tow.

***High Performance only.

A/C With air conditioning.

M/C With maximum cooling.

BELT TENSION SPECIFICATIONS

TORQUE METHOD

Torque (Ft. Lbs.) to be applied to components

ENGINE CUBIC INCH	USED BELT* 383 440	NEW BELT 383 440
Power Steering Bracket	70	120
Alternator		
With Air Conditioning	45	70
Imperial only	25	40
Without Air Conditioning	40	60
Imperial only	30	40
Fan Idler	40	65

BELT DEFLECTION METHOD

Deflection (Inches) to be Applied at Midpoint of Belt

Segment Under a 5 Pound Load (See Figure 8)

	ALL MODELS USED BELT*	ALL MODELS NEW BELT
Power Steering	5/32″	3/32″
Fan Belt—Idler	3/32″	1/16″
Alternator		
Without Air Conditioning	3/16″	3/32″
With Air Conditioning	9/32″	3/16″

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

CONVERSION TABLE

U. S. Quart	14.5	15.5	16	17	17.5	18.5	19
Imperial Quart	12	13	13.25	14.25	14.50	15.5	15.75

TIGHTENING REFERENCE

	Inch Pounds	Foot Pounds	Thread Size
Water Pump Bolts	—	30	—
Fan Attaching Bolts	—	15-18	—
Thermostat Housing Bolts	—	30	—
Shroud Mounting Bolts	12	—	8-32
	75	—	1/4-20
Radiator Mounting Bolts	95	—	1/4-20
Drain Cock	150	—	—
Oil Cooler Fittings—To Radiator	110	—	—
Lines to Fittings	85	—	—
Lines to Auxiliary Cooler	85	—	—
Lines to Connector	50	—	—

ELECTRICAL

CONTENTS

BATTERY

INDEX

SERVICE PROCEDURES

BATTERY VISUAL INSPECTION

(1) Protect paint finish with fender covers.

(2) Disconnect battery cables at battery.

(3) Remove battery hold-down clamp and remove battery from vehicle.

(4) Inspect battery carrier and fender side panel for damage caused by loss of acid from battery.

(5) Clean top of battery with a solution of clean warm water and baking soda. Scrub areas with a stiff bristle brush being careful not to scatter corrosion residue. Finally wipe off with a cloth moistened with ammonia or baking soda in water.

CAUTION: Keep cleaning solution out of battery cells to eliminate weakening the electrolyte.

(6) Replace damaged or frayed cables.

(7) Clean battery terminals and inside surfaces of clamp terminals with Cleaning Tool MX-75.

(8) Examine battery case and cover for cracks.

(9) Install battery.

(10) Tighten battery hold-down screw nuts to 3 foot-pounds. **Observe polarity of battery terminals to be sure the battery is not reversed.**

(11) Connect cable clamps to battery posts and tighten securely. Coat all connections with light mineral grease or petrolatum after tightening.

(12) If electrolyte level is low, fill to recommended level with mineral-free water.

SPECIFIC GRAVITY TEST

A hydrometer Tool 40-B is used to measure specific gravity of electrolyte in battery cells. This gives an indication of how much unused sulphuric acid remains in the solution.

A hydrometer should be graduated to read from 1.160 to 1.320, in graduations of .005 specific gravity. Graduated markings should be not less than 1/16 inch apart and accurate to within .002 specific gravity. Graduated portion of stem should be about two inches long. Clearance between float and glass barrel, at smallest diameter, should be a minimum of 1/8″ around all sides and barrel must be clean.

Liquid level of battery cell should be at normal height and electrolyte should be thoroughly mixed with any battery water which may have just been added by charging battery before taking hydrometer readings. See "Adjustment of Acid Gravity."

In reading a hydrometer, the gauge barrel must be held vertically and just right amount of fluid be drawn up into gauge barrel with pressure bulb fully expanded to lift float freely so it does not touch the sides, top or bottom of the barrel. Take a reading with eye on level with liquid level in the gauge barrel. **DO NOT TILT** hydrometer.

Hydrometer floats are calibrated to indicate correctly only at one fixed temperature.

Specific gravity of battery electrolyte strength or density varies not only with the quantity of the acid in solution but also with temperature. As temperature increases, the density of the electrolyte decreases, and specific gravity is reduced. As temperature drops, the density of the electrolyte increases and the specific gravity increases.

Specific gravity variations caused by temperatures must be considered and corrected to 80°F. in the analysis of the battery, otherwise specific gravity readings will not give a true indication of state of charge.

Use a battery immersion type thermometer of the mercury-in-glass type, having a scale reading as high as 125° F. and designed for not over a 1-inch bulb immersion. A suitable dairy type thermometer may prove satisfactory for the purpose.

Draw electrolyte in and out of the hydrometer barrel several times to bring the temperature of the hydrometer float to that of the acid in the cell and then measure the electrolyte temperature in the cell.

The temperature correction in specific gravity reading at 80° Fahrenheit is zero. Add .004 specific gravity points for every 10° degrees over 80° F. and subtract .004 specific gravity points for every 10 degrees under 80° F. All readings must be corrected to 80 degrees Fahrenheit. Refer to Figure 1 and examples one and two as follows:

Example 1—

Hydrometer Reading 1.260
Acid Temperature .... 20 degrees Fahrenheit
Subtract Specific Gravity .... .024
Correct Specific Gravity is 1.236

Example 2—

Hydrometer Reading 1.255
Acid Temperature .... 100 degrees Fahrenheit
Add Specific Gravity .... .008

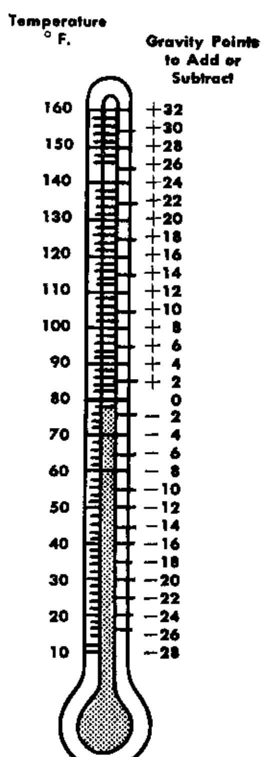


Fig. 1—Hydrometer Reading Correction Chart

Corrected Specific Gravity is 1.263

A fully charged relatively new battery has a specific gravity reading of 1.260 plus .015 minus .005.

Test Conclusions

(a) Battery specific gravity is less than 1.220 battery should be recharged. Make a high rate discharge test for capacity. If battery cells test O.K., recharge and adjust gravity of all cells uniformly. Test voltage regulator setting. Thoroughly test the electrical system for short circuits, loose connections and corroded terminals.

(b) **Cells show more than 25 points (.025 Specific Gravity) Variation**—Short circuit in low cell. Loss of electrolyte by leakage or excessive overcharge; try to recharge battery. See "Charging the Battery". See "Adjustment of Acid Gravity."

(c) Battery specific gravity is above 1.220 and all cells are even. Battery state of charge may be satisfactory. Test by making "High Rate Discharge Test of Battery Capacity". Test voltage regulator setting, and that all electrical connections are clean and tight.

TEST BATTERY CONDITION AND STATE OF CHARGE WITH CAD-TIP ANALYZER Part Number 1-369 (Fig. 2).

(1) Check electrolyte level in all cells and add mineral-free water to proper level. **When a car is running, the battery is receiving a charge from the alternator. This charge builds up a "surface charge" in the battery that must be removed before an accurate test can be made.**

(2) Remove the surface charge by turning the headlights "on" for one minute before testing battery. **If the battery has not been operating in a car for at least 8 hours prior to testing, Step 2 is not necessary. IMPORTANT: Be sure that headlights, ignition and all accessories are "off" during test.**

(3) Remove battery filler plugs and place the RED probe in the POSITIVE (+) CELL and the BLACK probe in the SECOND CELL. NOTE READING. (There will be no meter reading if the probes are

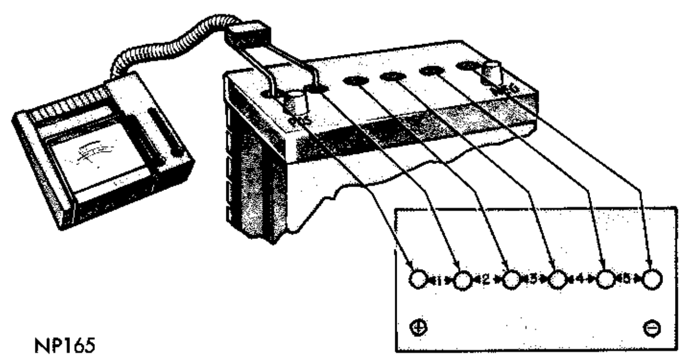


Fig. 2—Testing Battery Cells with Cad-Tip Battery Cell Analyzer

reversed.) **A manual set index pointer is provided to assist in making cell comparisons. Set the manual index pointer for reference.**

(4) Move RED probe to SECOND CELL and BLACK probe to THIRD CELL; then move RED probe to THIRD CELL and BLACK probe to FOURTH CELL, etc., until all cells have been tested. Note each cell reading so that CELL COMPARISONS CAN BE MADE. **Always store probe assembly in the space provided in the meter case.**

TEST READING INTERPRETATIONS (Fig. 3)

(A) If the readings of any two cells vary FIVE scale divisions or more on the TOP scale—regardless of the colored sections in which they may fall on the bottom scale—**The battery is at or near the point of failure and should be replaced.**

(B) If all cells vary LESS than five scale divisions on the TOP scale and all are in the GREEN section of the Bottom Scale—**The battery is in good condition and a safe state of charge.**

(C) If all cells vary LESS than five scale divisions on the TOP scale but if any of the cells test in the RED section of the BOTTOM scale—the battery is in good condition but is in a low state of charge—**Recharge at once to avoid a starting failure.**

(D) If ANY cell readings are in the "RECHARGE AND RETEST" section of the TOP SCALE and the balance of the readings are within the first four scale divisions—the battery is too low to make an accurate condition test—Recharge battery and retest.

CAUTION: Be certain to remove "surface charge" after recharge and before retesting. See "Step 2."

ADJUSTMENT OF ACID GRAVITY

Hydrometer floats usually are not calibrated below 1.160 specific gravity and cannot indicate the condition of a battery in a very low state of charge. Therefore, it may be necessary to give the battery several hours charge before a hydrometer reading will indicate that the battery is taking a charge.

If the specific gravity of all cells are not within .015 points of specified value, corrected to 80°F, at the end of a full charge, remove some of the electrolyte with a hydrometer and add a like amount of distilled water to reduce the gravity if too high, or add 1.400 Specific Gravity acid to raise specific gravity, if too low. Continue the charge so as to give the electrolyte a chance to mix and then read the gravity after another hour of charge to note the effect of the additions. Continue this adjusting procedure until gravity is brought to the desired value by charging for one hour after each adjustment.

Never adjust the specific gravity of any battery cell which does not gas freely on charge. Unless electrolyte has been lost through spilling or leaking, it

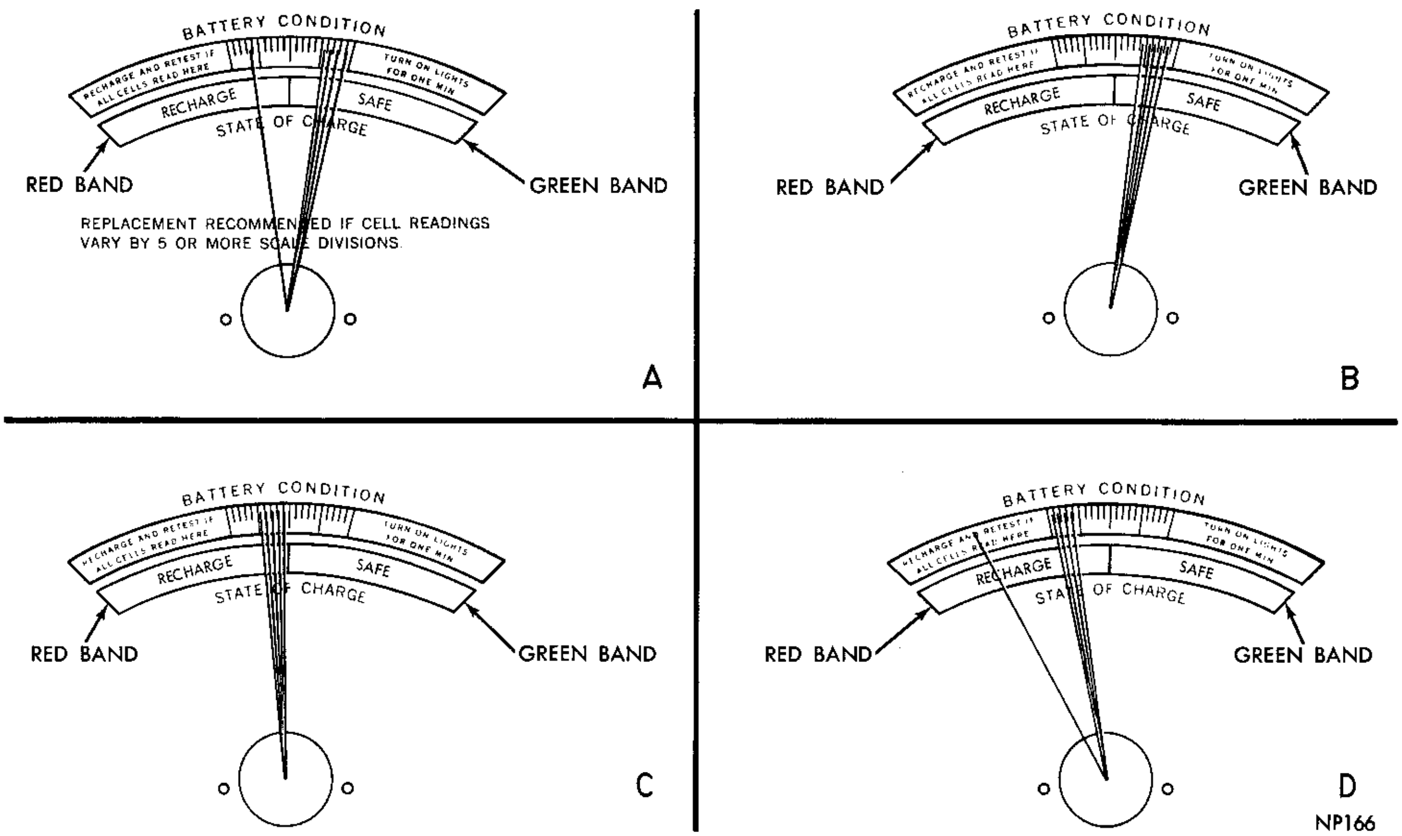


Fig. 3—Battery State of Charge

should not be necessary to add acid to a battery during its life. Acid should never be added unless one is certain that the cell will not come up to normal gravity by continued charging. Always make the temperature correction for hydrometer readings, as warm electrolyte will read low and this might be mistaken for failure of the battery to rise normally in gravity. It could also be falsely concluded that the battery would not take a full charge.

HIGH RATE DISCHARGE TEST OF BATTERY CAPACITY

Satisfactory capacity tests can be made only when battery equals or exceeds 1.220 specific gravity at 80 degrees Fahrenheit. If the reading is below 1.220 the battery should be slow charged until fully charged in order to secure proper test results.

Test Procedure

(1) Turn control knob of Battery-Starter-Tester to **OFF** position.

(2) Turn Voltmeter Selector Switch to the 16 volt position on test units so equipped.

(3) Connect test ammeter and voltmeter positive leads to battery positive terminal. Connect ammeter and voltmeter negative leads to battery negative terminal (Fig. 4). **Voltmeter clips must contact battery posts or cable clamps and not ammeter lead clips.**

(4) Turn control knob clockwise until ammeter reading is equal to three times ampere hour rating of battery.

(5) Maintain this load for 15 seconds; voltmeter should read 9.5 volts or more, which will indicate that the battery has good output capacity.

(6) After the 15 second test, turn Battery-Starter-Tester control knob to the **OFF** position.

If the voltage in the "High Rate Discharge Test" was under 9.5 volt, the battery should be test charged to determine whether the battery can be satisfactorily charged.

Charging the Battery
Three Minute Charge Test (Fig. 5)

This test should not be used if battery temperature is below 60 degree F.

(1) Connect Battery Charger positive (+) lead to battery positive terminal and negative (—) lead to battery negative terminal.

IMPORTANT: Be sure of correct polarity when charging batteries.

(2) Trip Battery Charger Power Switch to **ON** position. Turn timer switch past three minute mark then back to the three minute mark.

(3) Adjust Battery Charger Switch to highest possible rate not exceeding 40 amperes.

(4) When timer switch cuts off at the end of 3 minutes, turn timer switch back to fast charge.

(5) Use the 16 volt scale of the Battery Starter Tester and measure total voltage of battery posts while battery is being fast charged. If total voltage during charge exceeds 15.5 volts, battery is sulphated and should be cycled and slow-charged until specific gravity reaches 1.260 (See "Slow Charging"). **A slow charge is preferable to bring the battery up to a full charge.**

If specific gravity remains constant after testing battery at one hour intervals for three hours, battery is at its highest state of charge.

(6) Make another capacity test. If capacity test does not meet specifications, replace battery.

Fast Charging the Battery (Fig. 6)

If adequate time for a slow charge is not available, a high rate (FAST) charge is permissible and will give a sufficient charge in one hour enabling the battery and alternator to continue to carry the electrical load.

Connect Battery Charger positive (+) lead to battery positive terminal and negative (—) lead to battery negative terminal. If battery is not removed from

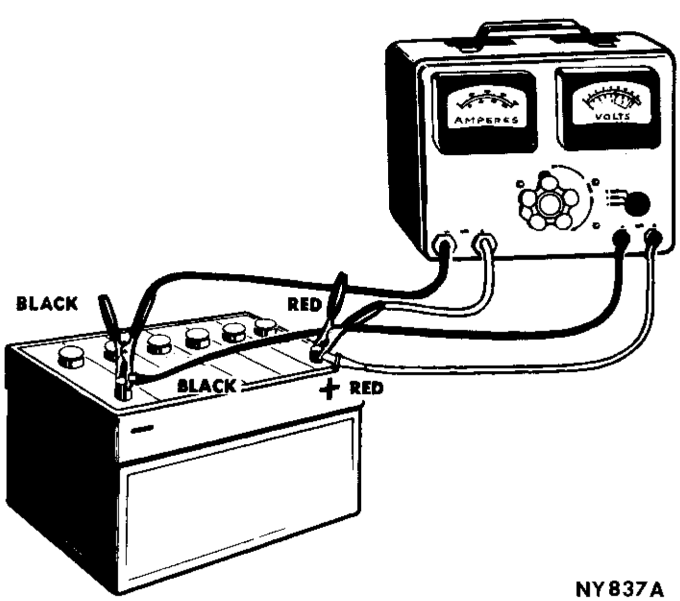


Fig. 4—High Rate Discharge Test

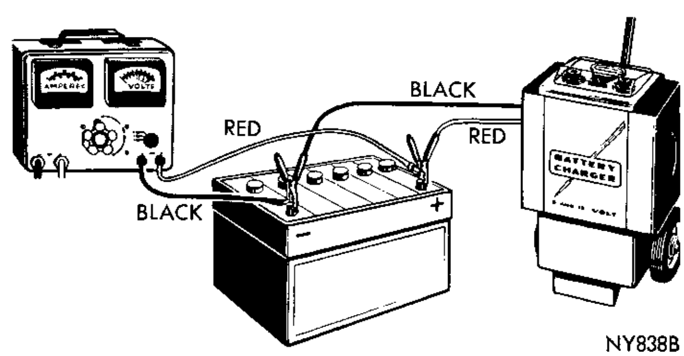


Fig. 5—Three Minute Charge Test

vehicle, **BE SURE** ignition switch is turned off and all electrical accessories are turned off during charging.

CAUTION: The battery can be damaged beyond repair unless the following precautions are taken:

(1) Battery electrolyte temperature must **NEVER** exceed 125 degrees Fahrenheit.

If this temperature is reached, battery should be cooled by reducing charging rate or remove battery from the circuit.

(2) As batteries approach full charge electrolyte in each cell will begin to gas or bubble. Excessive gassing must not be allowed.

(3) Do not fast charge longer than one hour.

If battery does not show a significant change in specific gravity after one hour of "FAST" charge, the slow charge method should be used.

Remember to use temperature correction when checking specific gravity. **The manufacturers of high rate charging equipment generally outline the necessary precautions and some models have thermostatic temperature limiting and time limiting controls.**

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

Slow Charging Batteries

Many discharged batteries can be brought back to good condition by slow charging; especially batteries that are sulphated.

Battery should be tested with a hydrometer and a record kept of the readings taken at regular intervals throughout the charge. When a cell has a specific gravity reading that is 25 points (.025) or more below other cells, that cell is faulty and battery should be replaced.

Safe slow charging rates are determined by allowing one ampere per positive plate per cell. Proper slow charging rate would be 5 amperes for a 59 ampere hour battery; and 6 amperes for a 70 ampere hour battery.

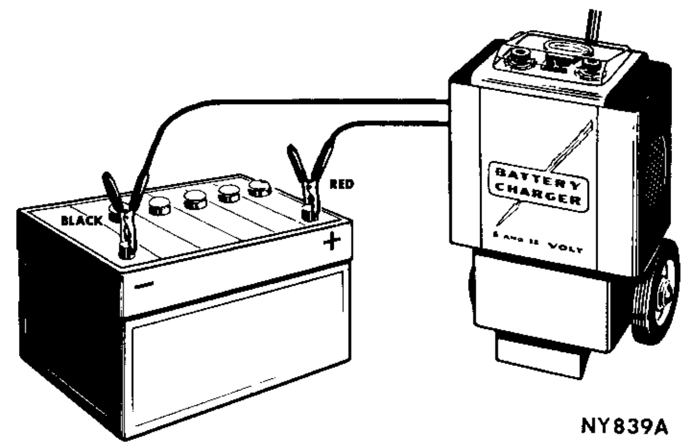


Fig. 6—Fast Charging the Battery

The average length of time necessary to charge a battery by the slow charge method at normal rates is from 12 to 16 hours, however, when a battery continues to show an increase in specific gravity, battery charge should be continued even if it takes 24 hours or more. **Watch the temperature of batteries carefully and if the temperature of any one of them reaches 110°F., lower the charging rate.**

Battery will be fully charged when it is gassing freely and when there is no further rise in specific gravity after three successive readings taken at hourly intervals. Make sure hydrometer readings are corrected for temperature.

The rate of charge for a sulphated battery should be no more than 1/2 the normal slow charge rate. Many sulphated batteries can be brought back to a useful condition by slow charging at half the normal charging rate from 60 to 100 hours. This long charging cycle is necessary to reconvert crystalline lead sulphate into active materials. **When a battery takes a full charge, but is returned several times in need of a recharge, check for a cracked cell partition with a syringe to provide air pressure; bubbles will appear in an adjacent cell if a crack is present.**

REDUCTION GEAR STARTER

INDEX

GENERAL INFORMATION

The starter has a 3.5 to 1 reduction gear set built into the starter assembly, which is housed in an aluminum die casting, Fig. 1. The starter utilizes a solenoid shift device, the housing of the solenoid is integral with the starter drive end housing.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
STARTER FAILS TO OPERATE	(a) Weak battery or dead cell in battery.	(a) Test specific gravity. Recharge or replace battery as required.
	(b) Ignition switch faulty.	(b) Test and replace switch if necessary.
	(c) Loose or corroded battery cable terminals.	(c) Clean terminals and clamps, replace if necessary. Apply a light film of petrolatum to terminals after tightening.
	(d) Open circuit, wire between the ignition—starter switch and ignition terminal on starter relay.	(d) Inspect and test all the wiring.
	(e) Starter relay defective.	(e) Test relay and replace if necessary.
	(f) Faulty starter.	(f) Test and repair as necessary.
	(g) Armature shaft sheared.	(g) Test and repair.
	(h) Open solenoid pull-in wire.	(h) Test and replace solenoid if necessary.
STARTER FAILS AND LIGHTS DIM	(a) Weak battery or dead cell in battery.	(a) Test for specified gravity. Recharge or replace battery as required.
	(b) Loose or corroded battery cable terminals.	(b) Clean terminals and clamps, replace if necessary. Apply a light film of petrolatum to terminals after tightening.
	(c) Internal ground in windings.	(c) Test and repair starter.
	(d) Grounded starter fields.	(d) Test and repair starter.
	(e) Armature rubbing on pole shoes.	(e) Test and repair starter.
STARTER TURNS, BUT ENGINE DOES NOT ENGAGE	(a) Starter clutch slipping.	(a) Replace clutch unit.
	(b) Broken clutch housing.	(b) Test and repair starter.
	(c) Pinion shaft rusted, dirty or dry, due to lack of lubrication.	(c) Clean, test and lubricate.
	(d) Engine basic timing wrong.	(d) Check engine basic timing and condition of distributor rotor and cap.
	(e) Broken teeth on engine ring gear.	(e) Replace ring gear. Inspect teeth on starter clutch pinion.
STARTER RELAY DOES NOT CLOSE	(a) Battery discharged.	(a) Recharge or replace battery.
	(b) Faulty wiring.	(b) Test for open circuit, wire between starter relay ground terminal post and neutral starter switch (automatic transmission only). Also test for open circuit; wire between ignition-starter switch and ignition terminal and starter relay.
	(c) Neutral starter switch on automatic transmission faulty.	(c) Test and replace the switch if necessary.
	(d) Starter relay faulty.	(d) Test and replace if necessary.
RELAY OPERATES BUT SOLENOID DOES NOT	(a) Faulty wiring.	(a) Test for open circuit wire between starter-relay solenoid terminal and solenoid terminal post.
	(b) Faulty solenoid switch or connections.	(b) Test for loose terminal connections between solenoid and starter field.
	(c) Solenoid switch contacts corroded.	(c) Test and replace solenoid if necessary.
	(d) Broken lead or a loose connection inside solenoid switch (brush holder plate).	(d) Test and replace solenoid if necessary.

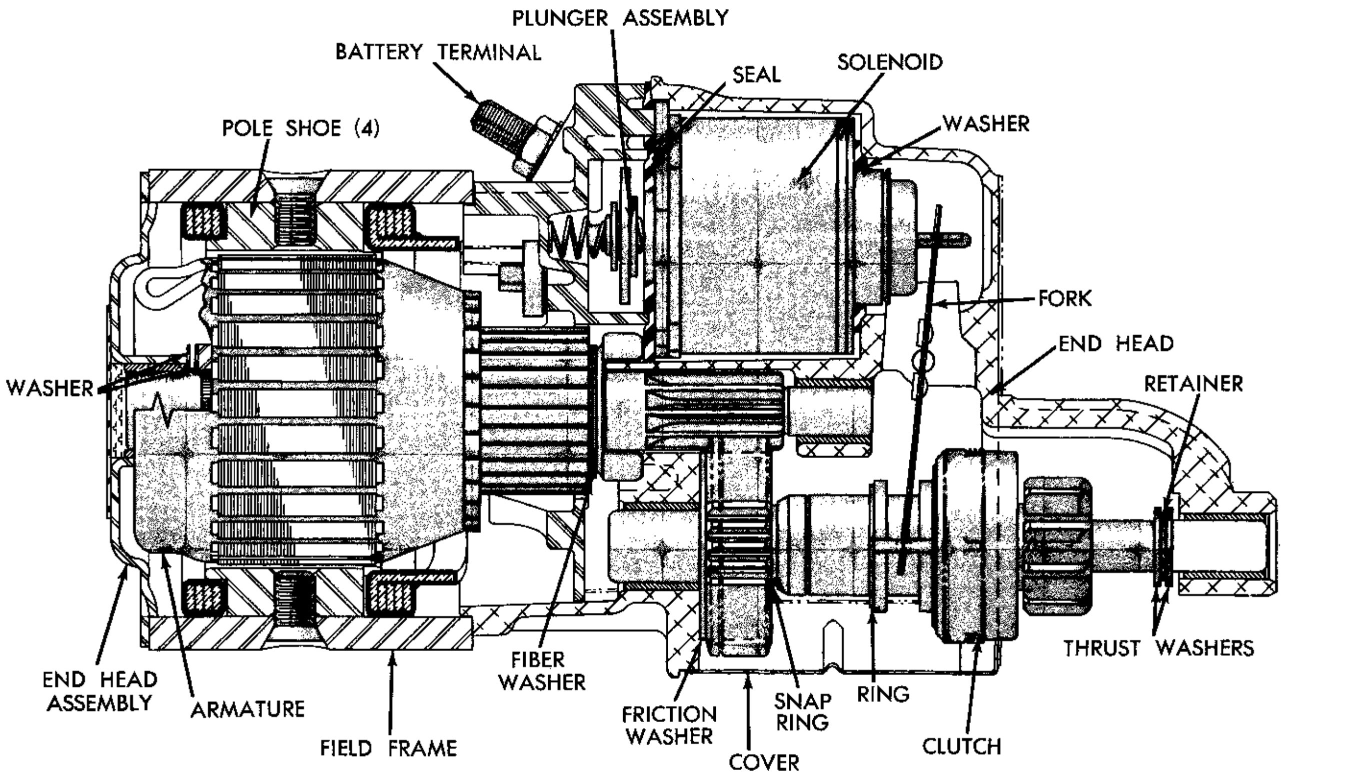


Fig. 1—Starter Cross Section

Condition	Possible Cause	Correction
SOLENOID PLUNGER VIBRATES BACK AND FORTH WHEN SWITCH IS ENGAGED	(a) Battery low.	(a) Test for specific gravity of battery. Replace or recharge battery.
	(b) Faulty wiring.	(b) Test for loose connections at relay, ignition-starter switch and solenoid.
	(c) Lead or connections broken inside solenoid switch cover (brush holder plate) or open hold-in wiring.	(c) Test and replace solenoid if necessary.
	(d) Check for corrosion on solenoid contacts.	(d) Test and clean the contacts.
STARTER OPERATES BUT WILL NOT DISENGAGE WHEN IGNITION STARTER SWITCH IS RELEASED	(a) Broken solenoid plunger spring or spring out of position.	(a) Test and repair.
	(b) Faulty ignition-starter switch.	(b) Test and replace the switch if necessary.
	(c) Solenoid contact switch plunger stuck in solenoid.	(c) Remove contact switch plunger, wipe clean of all dirt, apply a film of SAE-10 oil on plunger, wipe off excess.
	(d) Insufficient clearance between winding leads to solenoid terminal and main contactor in solenoid.	(d) Test and repair.
	(e) Faulty relay.	(e) Test and replace relay if necessary.

SERVICE PROCEDURES

AMPERAGE DRAW TEST (with Starter Tester)

Check battery electrolyte gravity with a reliable hydrometer. Gravity should be not less than 1.220 (temperature corrected). Or see that battery passes the High Rate Discharge Test shown in the "Battery" section of this manual.

Turn Battery—Starter Tester **CONTROL KNOB** to "OFF" position.

Turn voltmeter Selector Switch to 16 Volt position.

Connect heavy **Positive** ammeter lead (Red) to **Positive** battery terminal. Connect heavy **Negative** ammeter lead (Black) to **Negative** battery terminal.

Connect **Positive** voltmeter lead (Red) to **Positive** battery terminal. Connect **Negative** voltmeter lead (Black) to **Negative** battery terminal.

DISCONNECT ignition primary lead from ignition ballast resistor, or primary wire from either side of coil, to prevent engine from starting.

Crank engine with a remote control starter switch and observe **Exact** reading on Voltmeter. Stop cranking engine. Without cranking engine, turn tester **CONTROL KNOB** clockwise until voltmeter reads **Exactly** the same as when engine was being cranked with the remote control starter switch. Ammeter now indicates starter amperage draw. Check specifications. **Engine should be up to operating temperature. Extremely heavy oil or a tight engine will increase starter amperage draw.**

INSULATED CIRCUIT TEST

(1) Test battery electrolyte specific gravity. Specific gravity should be 1.220 or above. If battery specific gravity is below 1.220, recharge battery to full charge before proceeding with test.

(2) Turn voltmeter selector switch to 4 volt position.

(3) Disconnect ignition coil secondary cable.

(4) Connect voltmeter positive lead to battery positive post and voltmeter negative lead to solenoid connector which connects to the starter field coils.

The voltmeter will read off scale to the right until starter is actuated.

(5) Connect remote control switch to battery and solenoid terminal of starter relay.

(6) Crank engine with a remote starter control starter switch and observe voltmeter reading. Voltmeter reading should not exceed .3 volt. A voltmeter reading .3 volt or less indicates voltage drop is normal in cables, starter relay switch solenoid switch and connections between battery and starter motor. See "Starter Ground Circuit Test."

If voltmeter reading is more than .3 volt, it indicates high resistance in starter insulated circuit. Make following tests to isolate point of excessive voltage loss:

(A) Remove voltmeter lead from solenoid connector and connect to the following points, repeating test at each connection. Starter terminal of solenoid, battery terminal of solenoid, battery cable terminal at solenoid, starter relay and cable clamp at the battery.

(B) A small change will occur each time a normal portion of the circuit is removed from test. A definite change in the voltmeter reading indicates that the last part eliminated in test is at fault.

Maximum allowable voltage loss is as follows:

Battery insulated cable	.2 volt
Solenoid switch	.1 volt
Each connection	.0 volt

Replace faulty cables. Clean and tighten all connections.

RESISTANCE TEST

(1) Test battery electrolyte specific gravity. Specific gravity should be 1.220 or above.

(2) Disconnect positive battery lead from battery terminal post. Connect an 0 to 300 scale ammeter between disconnected lead and battery terminal post.

(3) Connect a test voltmeter with 10 volt scale division between battery positive post and starter switch terminal at starter solenoid.

(4) Crank engine and observe reading on voltmeter and ammeter. Voltage should not exceed .3 volt. A voltage reading that exceeds .3 volt indicates there is high resistance caused from loose circuit connections, a faulty cable, burned starter relay or burned solenoid switch contacts. A current that is high and is combined with slow cranking speed, indicates starter should be removed and repaired.

GROUND CIRCUIT TEST

(1) Connect test voltmeter positive lead to starter housing and voltmeter negative lead to battery negative post.

(2) Crank engine with a remote control starter switch and observe voltmeter reading. Voltmeter reading should not exceed .2 volt. A reading of .2 volt or less indicates the resistance of the ground cable and connections is normal. If voltmeter reading is more than .2 volt, it indicates excessive voltage loss in starter ground circuit. Make the following tests to isolate point of excessive voltage loss. Repeating test at each connection.

(a) Starter drive housing.

(b) Cable terminal at engine.

(c) Cable clamp at battery.

A small change will occur each time a normal portion of circuit is removed from the test. A definite change in voltmeter reading indicates that last part eliminated in the test is at fault.

Maximum allowable voltage loss is as follows:

Battery ground cable .2 volt
Engine ground circuit .1 volt
Each connection .0 volt

REMOVING THE STARTER

(1) Disconnect ground cable at battery.

(2) Remove cable at starter.

(3) Disconnect solenoid lead wires at **solenoid terminals.**

(4) Remove one stud nut and one bolt attaching starter to flywheel housing, slide automatic transmission oil cooler tube bracket off the stud (if so equipped) and remove the starter. **Do not damage cylinder block seal.**

TESTING THE STARTER (Bench Test)

Free Running Test

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

(a) Connect a test ammeter (100 amperes scale) and a carbon pile rheostat in series with battery positive post and starter terminal.

(b) Connect a voltmeter (15 volt scale) across starter.

(c) Rotate carbon pile to full resistance position.

(d) Connect battery cable from battery negative post to starter frame.

(e) Adjust the rheostat until battery voltage shown on voltmeter reads 11 volts. Amperage draw should be as shown in specifications.

Locked-Resistance Test

(1) Install starter in a test bench.

(2) Follow instructions of test equipment manufacturers and test starter against following specifications. With applied battery voltage adjusted to 4 volts. Amperage draw should be as shown in specifications.

DISASSEMBLING THE STARTER

(1) Place the starter gear housing in a vise equipped with soft jaws. Use the vise as support fixture only. **DO NOT** clamp.

(2) Remove two through bolts and starter end head assembly.

(3) Carefully pull armature up and out of gear housing and starter frame and field assembly. Remove steel and fiber thrust washer. **The wire of shunt field coil is wrapped on the brush terminal. One set of brushes are connected to this terminal. The other pair of brushes is attached to the series field coils by means of a terminal screw. Carefully pull frame and field assembly up just enough to expose terminal screw and wire wrap connection of shunt field at brush terminal. Place two wood blocks between starter frame and starter gear housing to facilitate removal of terminal screw, Fig. 2.**

(4) Support brush terminal by placing a finger behind the terminal and remove terminal screw.

(5) Unwrap shunt field coil lead from starter brush terminal. **Starter brush holder plate with starter brush terminal, contact and brushes is serviced as an assembly.**

(6) Unwrap solenoid lead wire and unwind wire

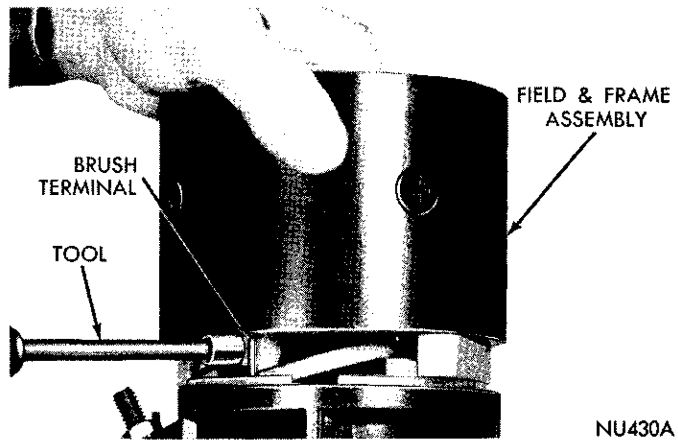


Fig. 2—Removing or Installing Terminal Screw

from starter brush terminal (Fig. 3).

(7) Remove nut (11/32 wrench), steel washer and insulating washer from solenoid terminal.

(8) Straighten solenoid wire and remove brush holder plate with brushes and solenoid as an assembly.

(9) Remove solenoid assembly from gear housing well (Fig. 4).

(10) Remove nut from starter battery terminal.

(11) Remove starter battery terminal from holder plate.

(12) Remove solenoid contact and plunger from solenoid.

(13) Remove solenoid return spring from well of solenoid housing moving core.

(14) Remove dust cover from gear housing (Fig. 5).

(15) Release retainer clip that positions driven gear on pinion shaft (Fig. 6).

CAUTION: Retainer is under tension and a cloth should be placed over the retainer to prevent it from springing away after removal.

(16) Release retainer ring at front of pinion shaft (Fig. 7). **Do not spread retainer ring any greater than outside diameter of pinion shaft otherwise lock ring can be damaged.**

(17) Push pinion shaft towards rear of housing (Fig. 8) and remove retainer ring and thrust washers,

Fig. 3—Unwinding or Winding Solenoid Lead Wire

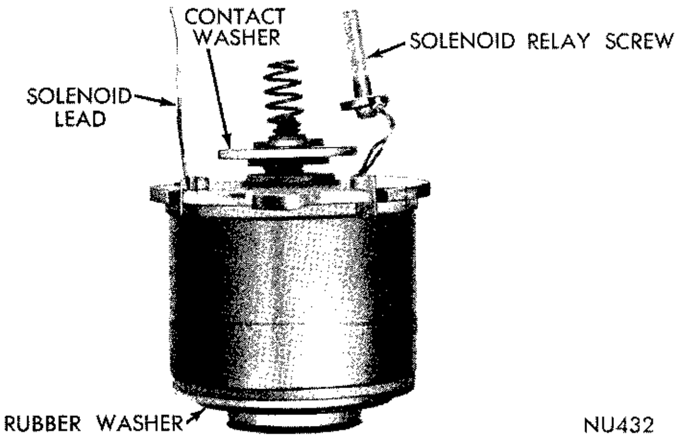


Fig. 4—Solenoid Assembly

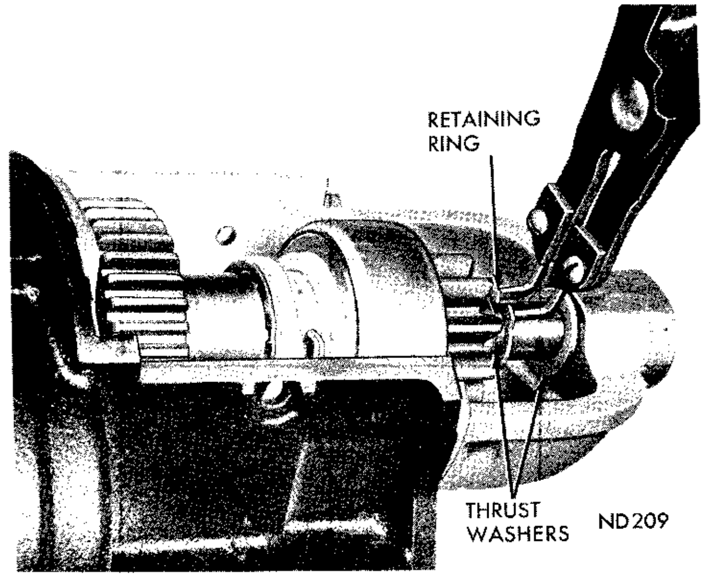


Fig. 7—Removing or Installing Piston Shaft Retainer Ring

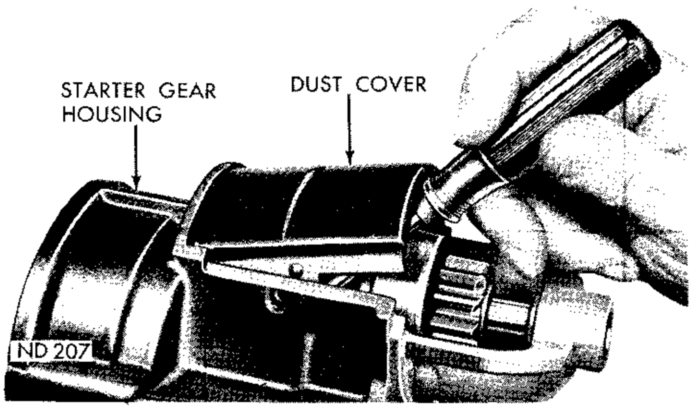


Fig. 5—Removing Dust Cover

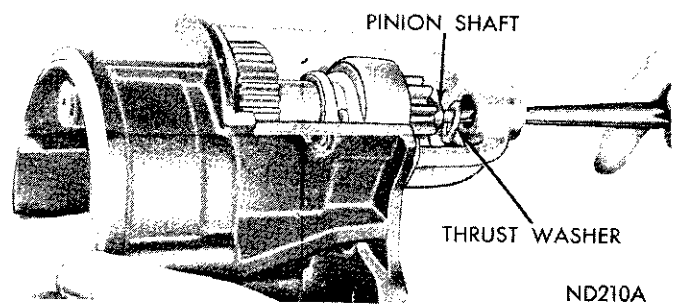


Fig. 8—Removing Pinion Shaft

clutch and pinion assembly, with the two shift fork nylon actuators as an assembly (Fig. 9).

(18) Remove driven gear and friction washer.

(19) Pull shifting fork forward and remove solenoid moving core (Fig. 10).

(20) Remove shifting fork retainer pin (Fig. 11) and remove clutch shifting fork assembly.

CLEANING THE STARTER PARTS

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

(2) Do not immerse clutch unit in cleaning solvent. The clutch is pre-lubricated at the factory and solvent will wash lubricant from the clutch.

(3) The starter-clutch outer housing and pinion gear may be cleaned with a cloth moistened with cleaning solvent and wiped dry with a clean dry cloth.

(4) Clean all corrosion from solenoid assembly and inside of solenoid housing. These metal parts are part of the solenoid hold-in ground circuit and must be clean.

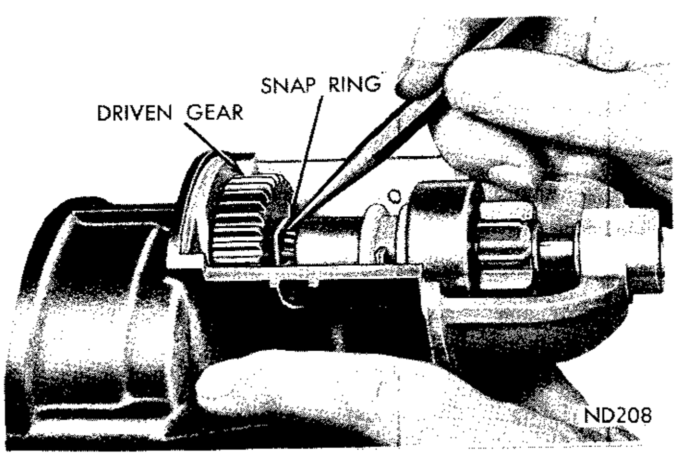


Fig. 6—Removing the Driven Gear Snap Ring

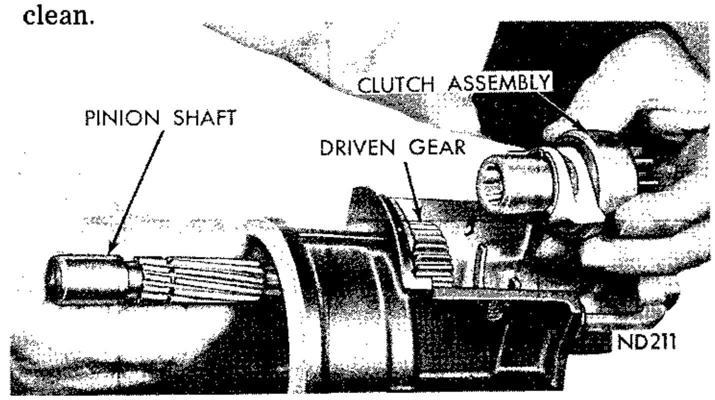


Fig. 9—Removing or Installing Clutch Assembly

(5) Clean terminal contacts and contactor with crocus cloth.

(6) Thoroughly clean outside area of brush plate to remove all oil and dirt.

REPLACEMENT OF BRUSHES AND SPRINGS

(1) Brushes that are worn more than 1/2 the length of new brushes, or are oil-soaked, should be replaced.

(2) When **resoldering** the shunt field and solenoid lead, make a strong low resistance connection using a high temperature solder and resin flux. **Do not use acid** or acid core solder. **Do not** break the shunt field wire units, when removing and installing brushes.

(3) Measure brush spring tension with a spring scale hooked under the spring near the end. Pull scale on a line parallel to the edge of brush and take a reading just as spring end leaves the brush. Spring tensioon should be 32 to 36 ounces. Replace springs that do not meet specifications.

TESTING ARMATURE

Testing Armature for Short Circuit

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

Testing Armature for Ground

Contact armature shaft and each of the commutator riser bars with a pair of test lamp test probes. If

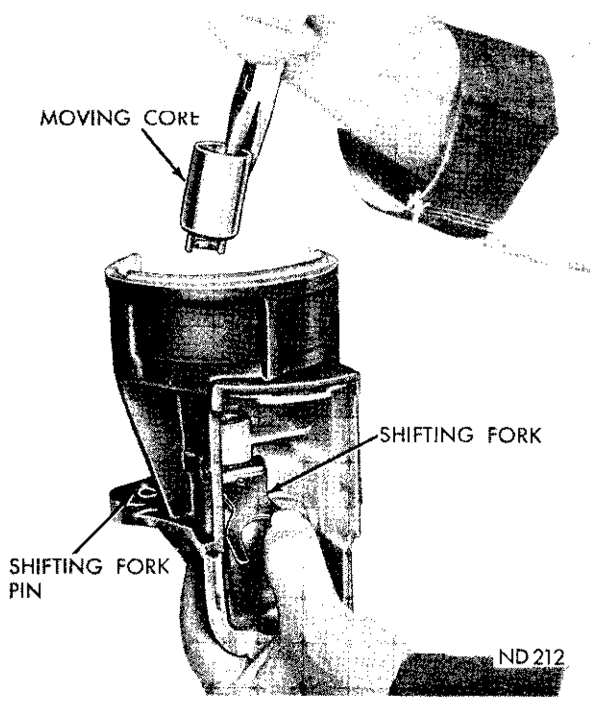


Fig. 10—Removing or Installing Moving Core

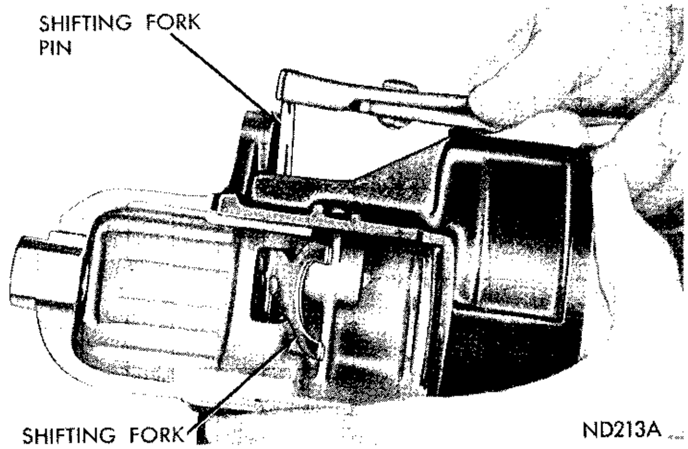


Fig. 11—Removing or Installing Shifting Fork Pin

lamp lights, it indicates a grounded armature. Replace grounded armature.

Testing Commutator Run-Out, and Refacing

Place armature in pair of "V" blocks and measure runout with dial indicator. Measure both shaft and commutator. A bent shaft requires replacement of armature. When commutator runout exceeds .003 inch, commutator should be refaced. Remove only a sufficient amount of metal to provide a smooth, even surface.

Testing Field Coils for Ground

(1) Remove field frame assembly from starter.

(2) Carefully drill out the rivet attaching the series field coil ground lead and shunt field coil lead to field frame.

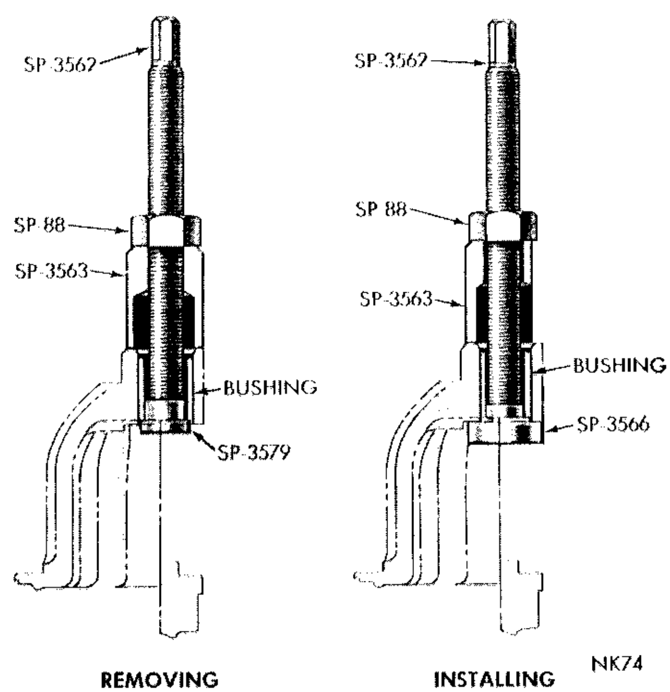


Fig. 12—Removing and Installing Pinion Housing End Bushing

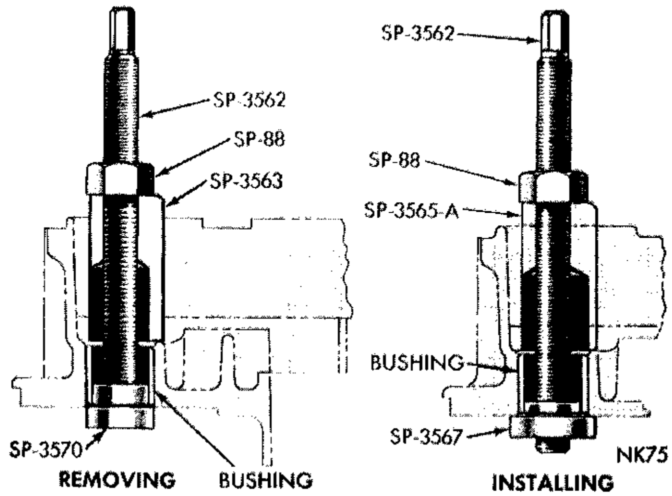


Fig. 13—Removing and Installing Pinion Housing Drive Shaft Bushing

(3) Insulate field coil leads from field frame.

(4) Test for ground using a 110 volt test lamp. Touch one probe of test lamp to series field coil lead and other probe to field frame. Lamp should not light. Repeat the procedure for shunt field coil.

If lamp lights, it indicates that field coils are grounded and require replacement.

REPLACING THE FIELD COILS

A pole shoe impact screwdriver Tool C-3475 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 and not properly seated may cause armature core to rub on pole shoes. **Make sure area between the leads and starter frame is clean. Peen new rivet securely to insure a good electrical contact.**

SERVICING THE STARTER BUSHINGS

Inspect armature shaft bearing, pinion shaft surfaces and bushings for wear. Try the bushings for wear by inserting the shafts and test for side play. **Pre-sized starting motor bushings are available as service bushings. Use Tool C-3944 to remove old bushings and install the new. No burnishing or reaming is required to fit pre-sized bushings.**

The C-3944 Tool and its adaptors are designed to service all of the gear reduction motor bushings with the exception of the end head bushing. End head bushing and end head are serviced as an assembly.

Remove and install bushings, (Figs. 12, 13 and 14).

SERVICING THE STARTER CLUTCH UNIT

Do not immerse starter clutch unit in a cleaning solvent. Starter clutch is pre-lubricated at the factory and a solvent will wash lubricant from the clutch.

The starter clutch outer housing and pinion gear may be cleaned with a cloth moistened with a cleaning solvent and wiped dry with a clean dry cloth.

Rotate the pinion. Pinion gear should rotate smoothly in one direction (not necessarily easily), but should not rotate in opposite direction. If starter clutch unit does not function properly, or pinion is worn, chipped or burred, replace starter clutch unit.

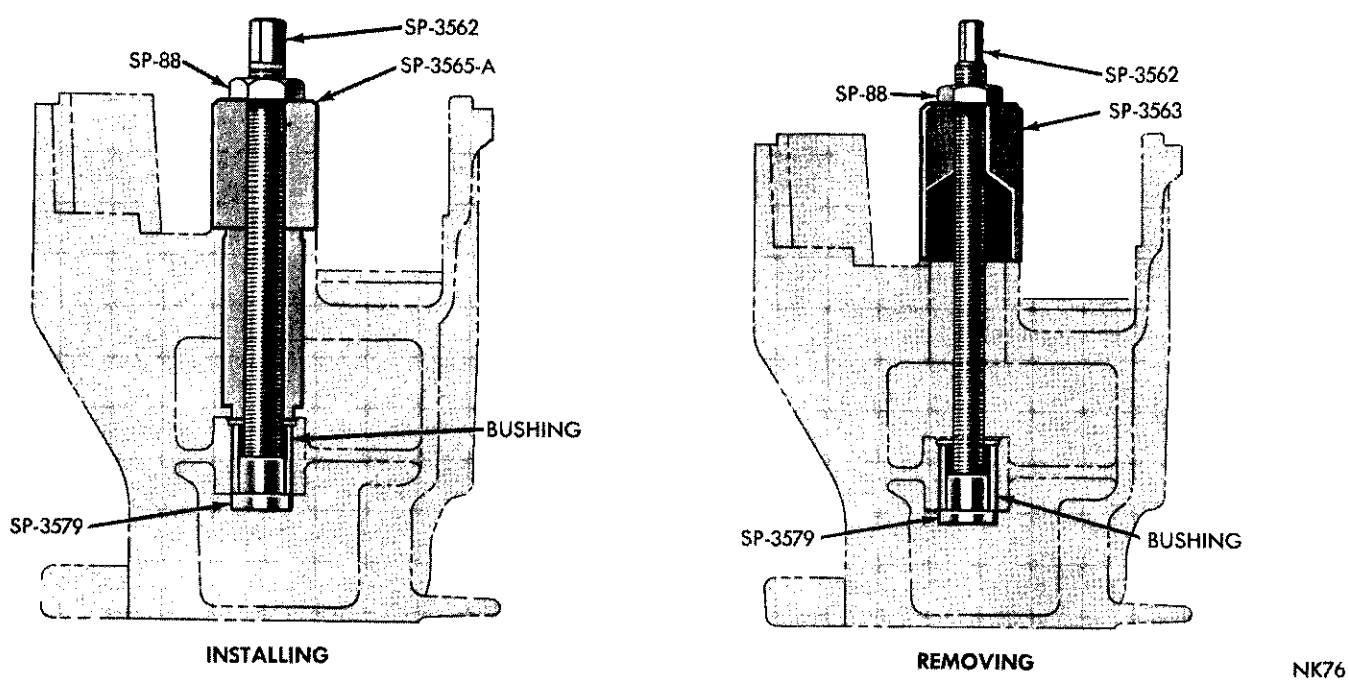


Fig. 14—Removing and Installing Pinion Bushing Armature Shaft Bushing

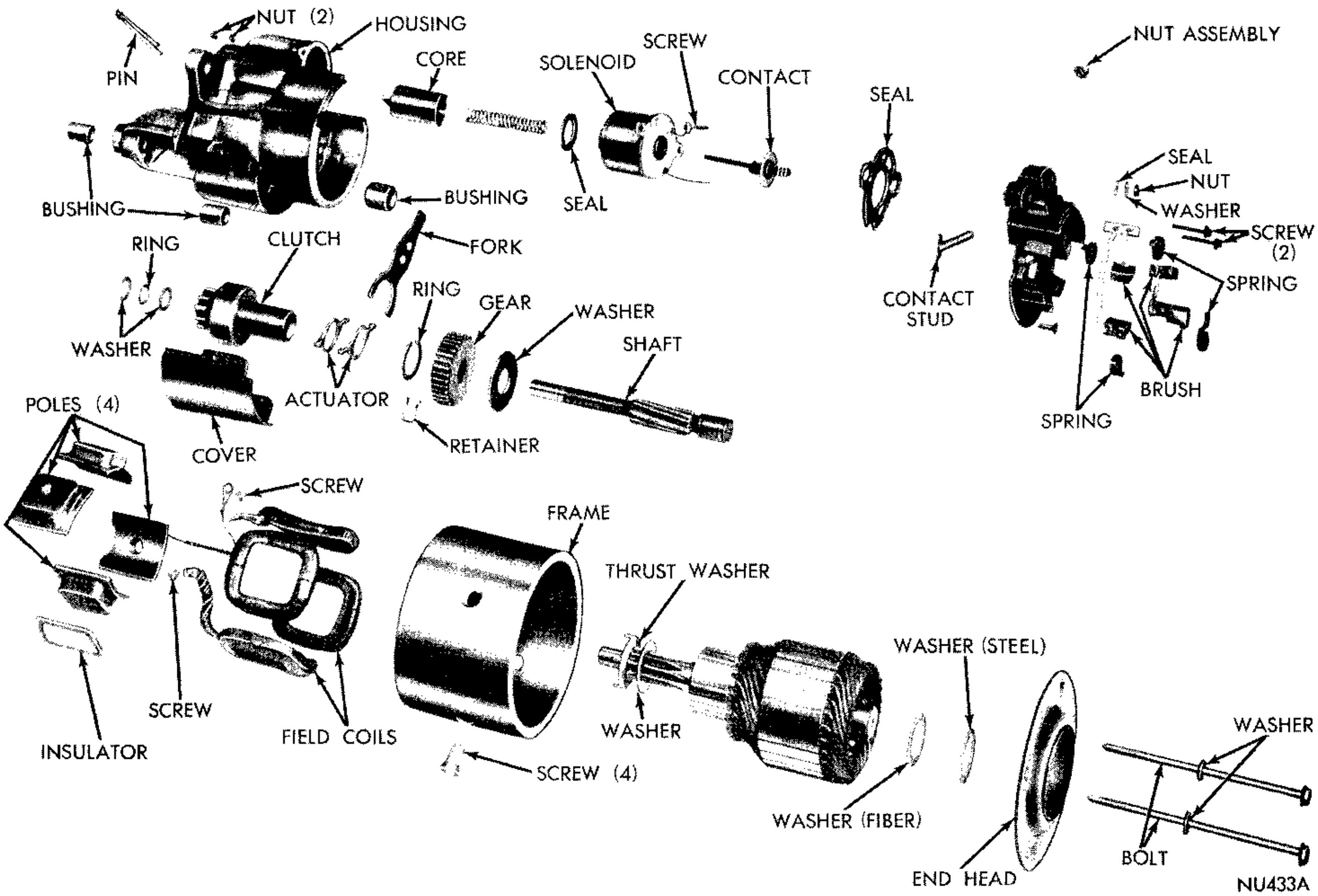


Fig. 15—Starter (Exploded View)

ASSEMBLING THE STARTER (Fig. 15)

The shifter fork consists of two spring steel plates assembled with two rivets. There should be approximately 1/16 inch side movement as shown in Figure 16 to insure proper pinion gear engagement. Lubricate between the plates sparingly with SAE 10 engine oil.

(1) Position shifter fork in drive housing and install shifting fork retainer pin. One tip of pin should be straight, the other tip should be bent at a 15 degree angle away from the housing. The fork and retainer pin should operate freely after bending tip of pin.

(2) Install solenoid moving core and engage shifting fork (Fig. 10).

(3) Enter pinion shaft into drive housing and install friction washer and drive gear.

(4) Install clutch and pinion assembly, thrust washer, retaining and thrust washer (Fig. 9).

(5) Complete installation of pinion shaft, engaging shifting fork with clutch actuators. Figure 17 shows correct relation of parts at assembly. **The friction washer must be positioned on shoulder of splines of the pinion shaft before driven gear is positioned.**

(6) Install driven gear snap ring (Fig. 6).

(7) Install pinion shaft retaining ring (Fig. 7).

(8) Install starter solenoid return spring into bore of movable core.

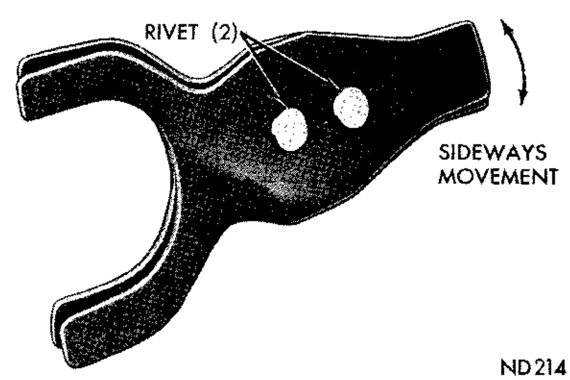


Fig. 16—Shifter Fork Assembly

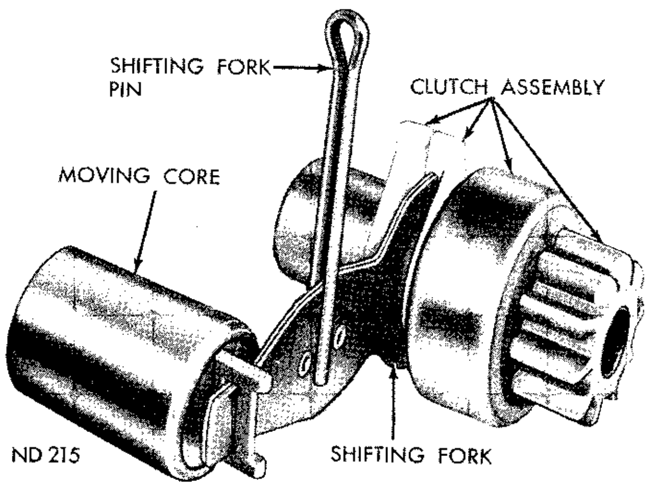


Fig. 17—Shifter Fork and Clutch Arrangement

Inspect condition of starter solenoid switch contacting washer, if top of washer is burned from arcing, disassemble contact switch plunger assembly and reverse the washer.

(9) Install solenoid contact plunger assembly into solenoid and reform double wires to allow for proper entry of terminal stud into brush holder with the double wires curved around the contactor.

CAUTION: The contactor must not touch the double wires when solenoid is energized after assembly is completed (Fig. 4).

Make sure contact spring is positioned on the shaft of the solenoid contact plunger assembly.

(10) Assemble battery terminal stud in brush holder.

Inspect condition of the contacts in brush holder plate. If contacts are badly burned, replace brush holder with brushes and contacts as an assembly.

(11) Position seal on brush holder plate.

(12) Enter solenoid lead wire through hole in brush holder (Fig. 18) and install solenoid stud, insulating washer, flat washer and nut.

(13) Wrap solenoid lead wire tightly around brush terminal post as shown in Figure 19 and solder se-

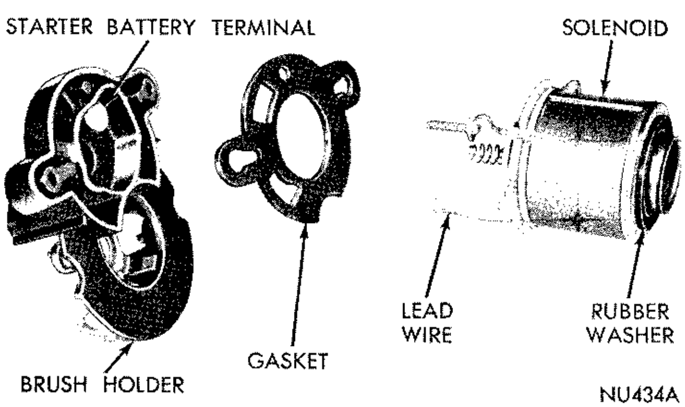


Fig. 18—Assembling Solenoid to Brush Holder Plate

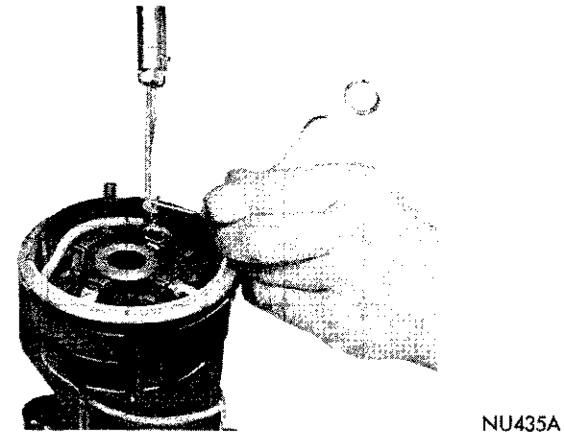


Fig. 19—Soldering Solenoid Winding Lead to Brush Terminal

curely with a high temperature resin core solder and resin flux.

(14) Install brush holder to solenoid attaching screws.

(15) Carefully enter solenoid coil and brush plate assembly into bore of gear housing and position brush plate assembly into starter gear housing (Fig. 20) and install housing attaching nuts. Tighten securely.

(16) Position brushes with armature thrust washer as shown in Figure 19. This will hold brushes out and facilitate proper installation of armature.

(17) Solder shunt coil lead wire to starter brush terminal (Fig. 21).

(18) Install brush terminal screw (Fig. 2).

(19) Position field frame to the exact position on gear housing and enter armature into field frame and starter gear housing (Fig. 22); carefully engaging splines of shaft with reduction gear by rotating armature slightly to engage the splines.

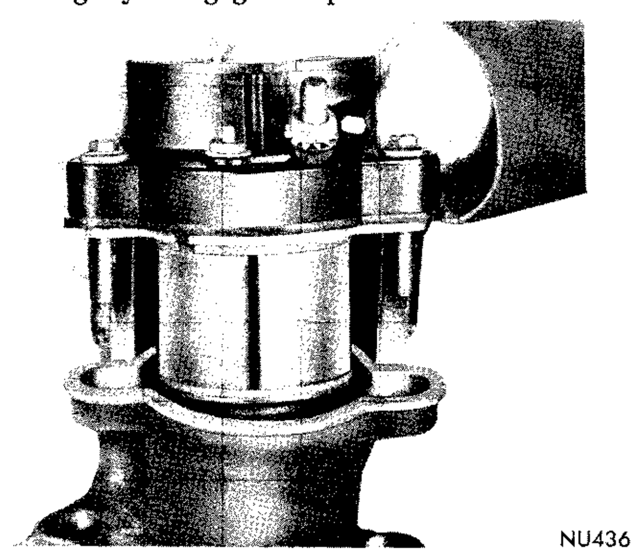


Fig. 20—Installing Solenoid and Brush Holder Into Gear Housing

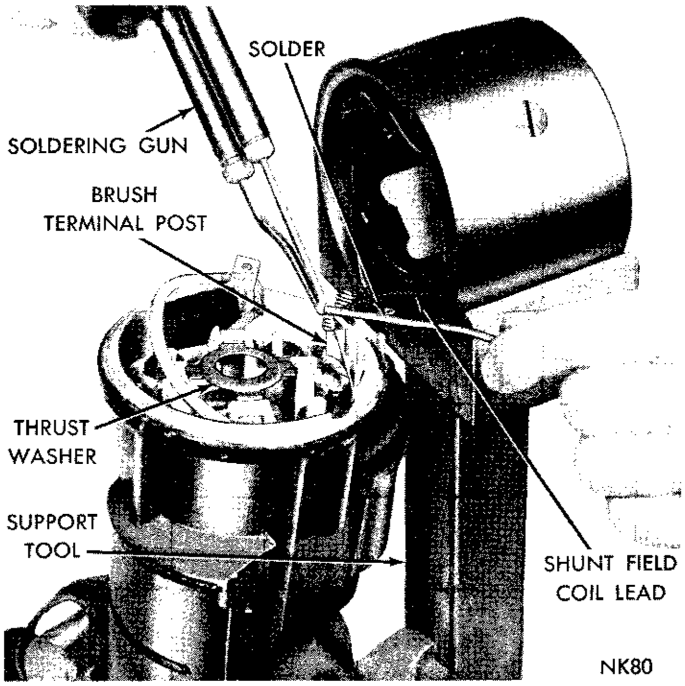


Fig. 21—Soldering Shunt Coil Lead Wire

(20) Install thrust washer (fiber) and washer (steel) on armature shaft.

(21) Position starter end head assembly and install starter frame lockwashers and through bolts. Tighten through bolts securely.

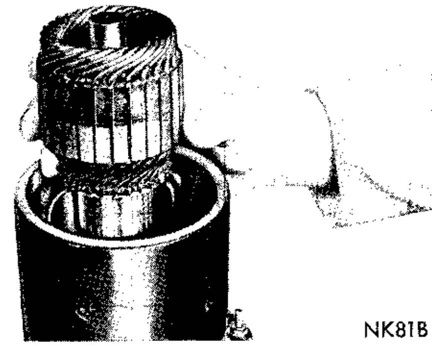


Fig. 22—Installing Starter Armature

INSTALLING THE STARTER

(1) Before installing the starter, make sure starter and flywheel housing mounting surfaces are free of dirt and oil, to insure a good electrical contact.

(2) Position starter to flywheel housing removable seal (if removed).

(3) Install the starter, washer and bolt, the automatic transmission oil cooler tube bracket (if so equipped) and washer and nut. **When tightening attaching bolt and nut be sure to hold the starter pulled away from the engine to insure proper alignment.**

(4) Attach wire at solenoid switch terminal, and cable to starter terminal.

(5) Connect battery ground cable and test operation of the starter for proper engine cranking.

ISOLATED FIELD ALTERNATOR AND ELECTRONIC VOLTAGE REGULATOR

INDEX

GENERAL INFORMATION

The alternator (Figs. 1 and 2) is fundamentally an A.C. current generator, with six (6) built-in silicon rectifiers, that convert A.C. current to D.C. current. D.C. current is available at the "output" "BAT" terminal.

The main components of the alternator are the rotor, stator, rectifiers, the end shields and the drive pulley.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ALTERNATOR FAILS TO CHARGE (No Output or Low Output)	(a) Alternator drive belt loose.	(a) Adjust drive belt to Specifications.
	(b) Worn brushes and/or slip rings.	(b) Install new brushes and/or slip rings.
	(c) Sticking brushes.	(c) Clean slip rings and brush holders. Install new brushes if necessary.
	(d) Open field circuit.	(d) Test all the field circuit connections, and correct as required.

Condition	Correction	Possible Cause
	(e) Open charging circuit.	(e) Inspect all connections in charging circuit, and correct as required.
	(f) Open circuit in stator windings.	(f) Remove alternator and disassemble. Test stator windings. Install new stator if necessary.
	(g) Open rectifiers.	(g) Remove alternator and disassemble. Test the rectifiers. Install new rectifiers if necessary.
LOW, UNSTEADY CHARGING RATE	(a) High resistance in body to engine ground lead.	(a) Tighten ground lead connections. Install new ground lead if necessary.
	(b) Alternator drive belt loose.	(b) Adjust alternator drive belt.
	(c) High resistance at battery terminals.	(c) Clean and tighten battery terminals.
	(d) High resistance in charging circuit.	(d) Test charging circuit resistance. Correct as required.
	(e) Open stator winding.	(e) Remove and disassemble alternator. Test stator windings. Install new stator if necessary.
LOW OUTPUT AND A LOW BATTERY	(a) High resistance in charging circuit.	(a) Test charging circuit resistance and correct as required.
	(b) Shorted rectifier. Open rectifier.	(b) Perform current output test. Test the rectifiers and install new rectifiers as required. Remove and disassemble the alternator.
	(c) Grounded stator windings.	(c) Remove and disassemble alternator. Test stator windings. Install new stator if necessary.
EXCESSIVE CHARGING RATE TO A FULLY CHARGED BATTERY	(a) Faulty ignition switch.	(a) Install new ignition switch.
	(b) Regulator base improperly grounded.	(b) Connect regulator base to a good ground.
	(c) Faulty voltage regulator.	(c) Test voltage regulator. Replace as necessary.
NOISY ALTERNATOR	(a) Alternator mounting loose.	(a) Properly install and tighten alternator mounting.
	(b) Worn or frayed drive belt.	(b) Install a new drive belt and adjust to specifications.
	(c) Worn bearings.	(c) Remove and disassemble alternator. Install new bearing as required.
	(d) Interference between rotor fan and stator leads or rectifiers.	(d) Remove and disassemble alternator. Correct interference as required.
	(e) Rotor or rotor fan damaged.	(e) Remove and disassemble alternator. Install new rotor.
	(f) Open or shorted rectifier.	(f) Remove and disassemble alternator. Test rectifiers. Install new rectifiers as required.
	(g) Open or shorted winding in stator.	(g) Remove and disassemble alternator. Test stator windings. Install new stator if necessary.
EXCESSIVE AMMETER FLUCTUATION	(a) High resistance in the alternator and voltage regulator circuit.	(a) Clean and tighten all connections as necessary.

SERVICE PROCEDURES

DESCRIPTION OF ELECTRONIC VOLTAGE REGULATOR OPERATION

The silicon transistor voltage regulator is a switching voltage regulator which regulates voltage by varying the duty cycle of a series of voltage pulses to the alternator field. The frequency of the voltage pulses is controlled by the ignition frequency of the engine, because the voltage regulator is a peak sensing regulator and the feedback from the ignition system is the highest level ripple on the car electrical system. Once the frequency of operation is established by the ignition system, the voltage regulator controls the voltage by varying the on and off time between the ignition firings. While the voltage across the field and tho current through the output transistor is switching

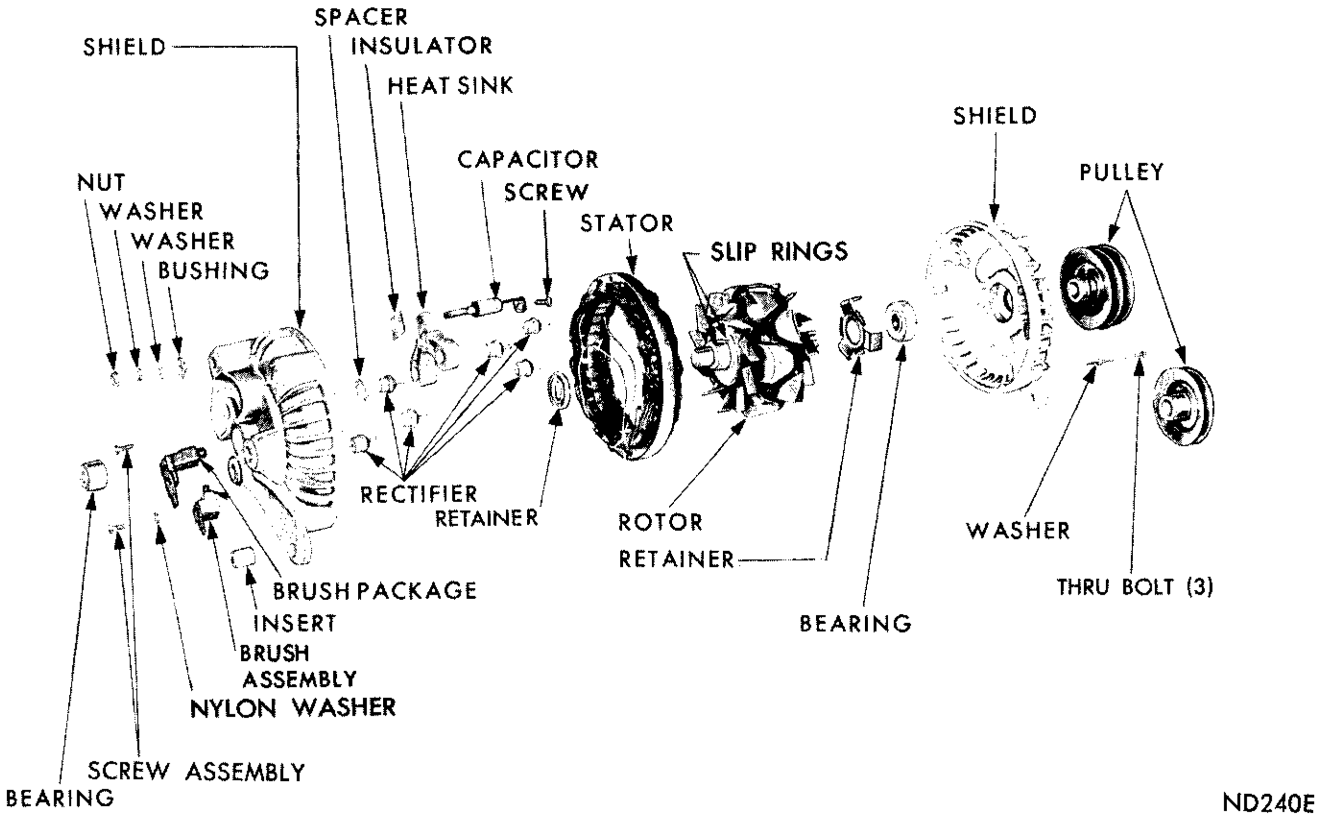


Fig. 1—Isolated Field Alternator (Disassembled View)

completely on and off, the field current of the alternator is only cycling through incremental changes. Since the inductance of the alternator field has a relatively long time constant with respect to the operating frequency of the voltage regulator, there is only enough time allowed for a incremental decrease in field current through the suppression diode during the off time of the transistor.

ISOLATED FIELD ALTERNATOR

CHARGING CIRCUIT RESISTANCE TEST AND CURRENT OUTPUT TEST

(1) Disconnect the battery ground cable.

(2) Disconnect the "Batt" lead at the alternator output terminal.

(3) Connect a 0-75 ampere scale D.C. ammeter in series between the alternator "Batt" terminal and the disconnected "Batt" lead (Fig. 3).

(4) Connect the positive lead of a test voltmeter to the disconnected "Batt" lead. Connect the negative lead of the test voltmeter to battery positive terminal.

(5) Disconnect the field lead from the alternator.

(6) Connect a "jumper" lead from the alternator field terminal to ground.

(7) Connect an engine tachometer. Connect the battery ground cable.

(8) Connect a variable carbon pile to the battery terminals.

(9) Start and operate the engine at idle. **Immediately after starting, reduce engine speed to idle.**

(10) Adjust the engine speed and carbon pile to obtain 20 amperes flowing in the circuit. Observe the voltmeter reading. The voltmeter reading should not exceed .7 volts. If a higher voltage drop is indicated, inspect, clean and tighten all connections in the charging circuit. A voltage drop test may be performed at each connection to locate the connection

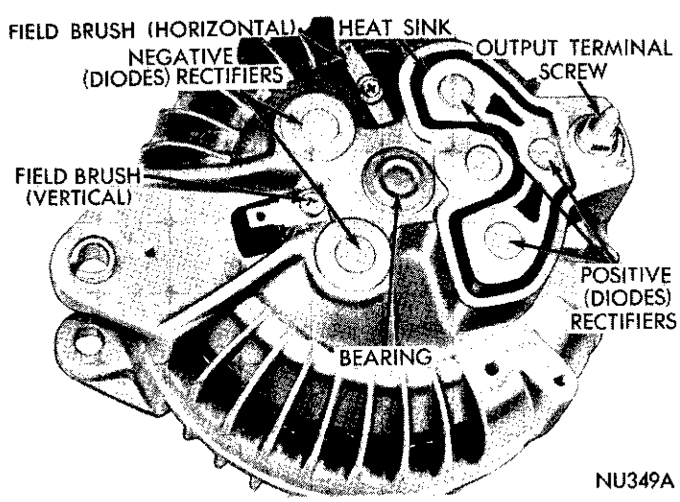


Fig. 2—Alternator Assembly

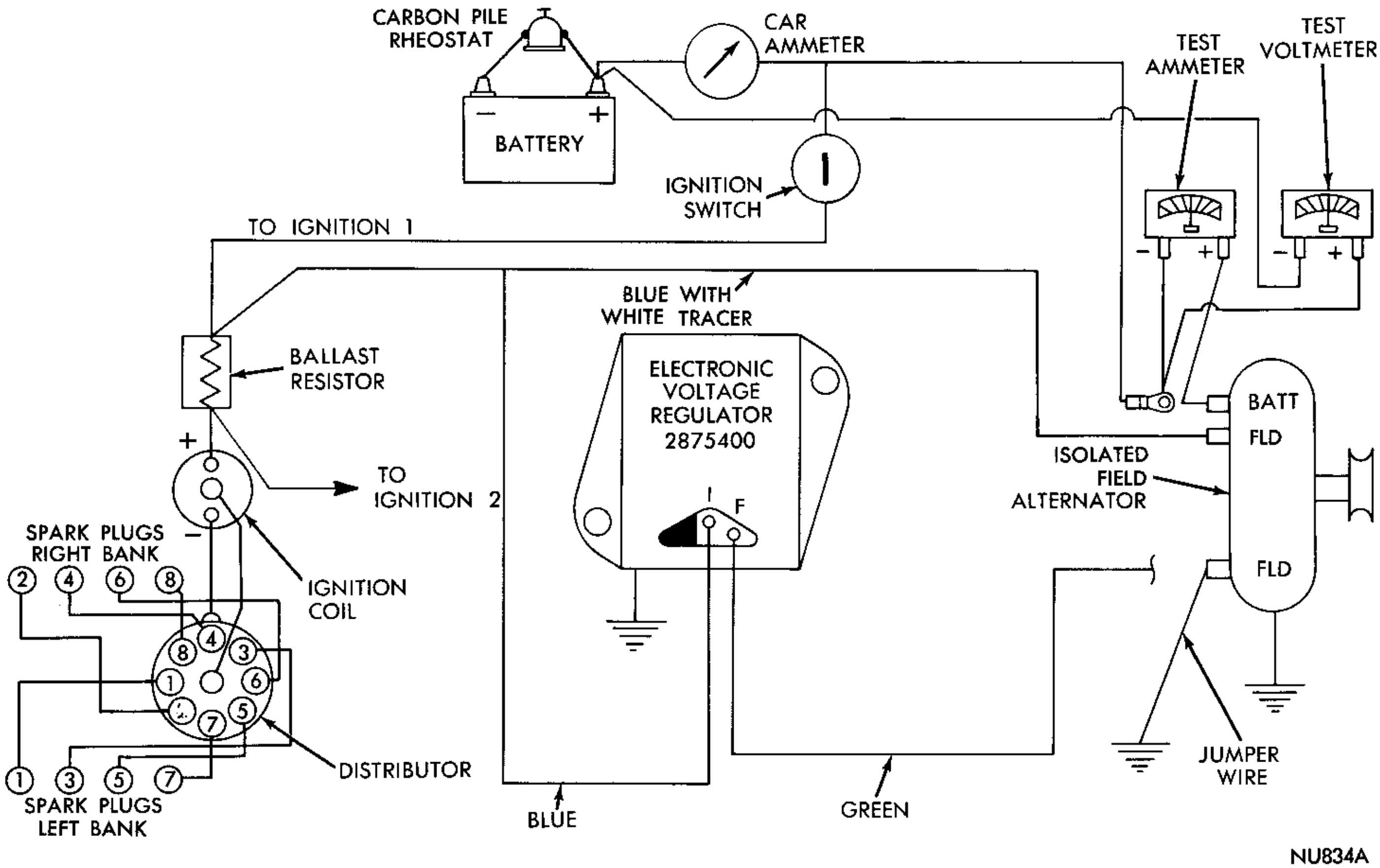


Fig. 3—Charging Circuit Resistance Test

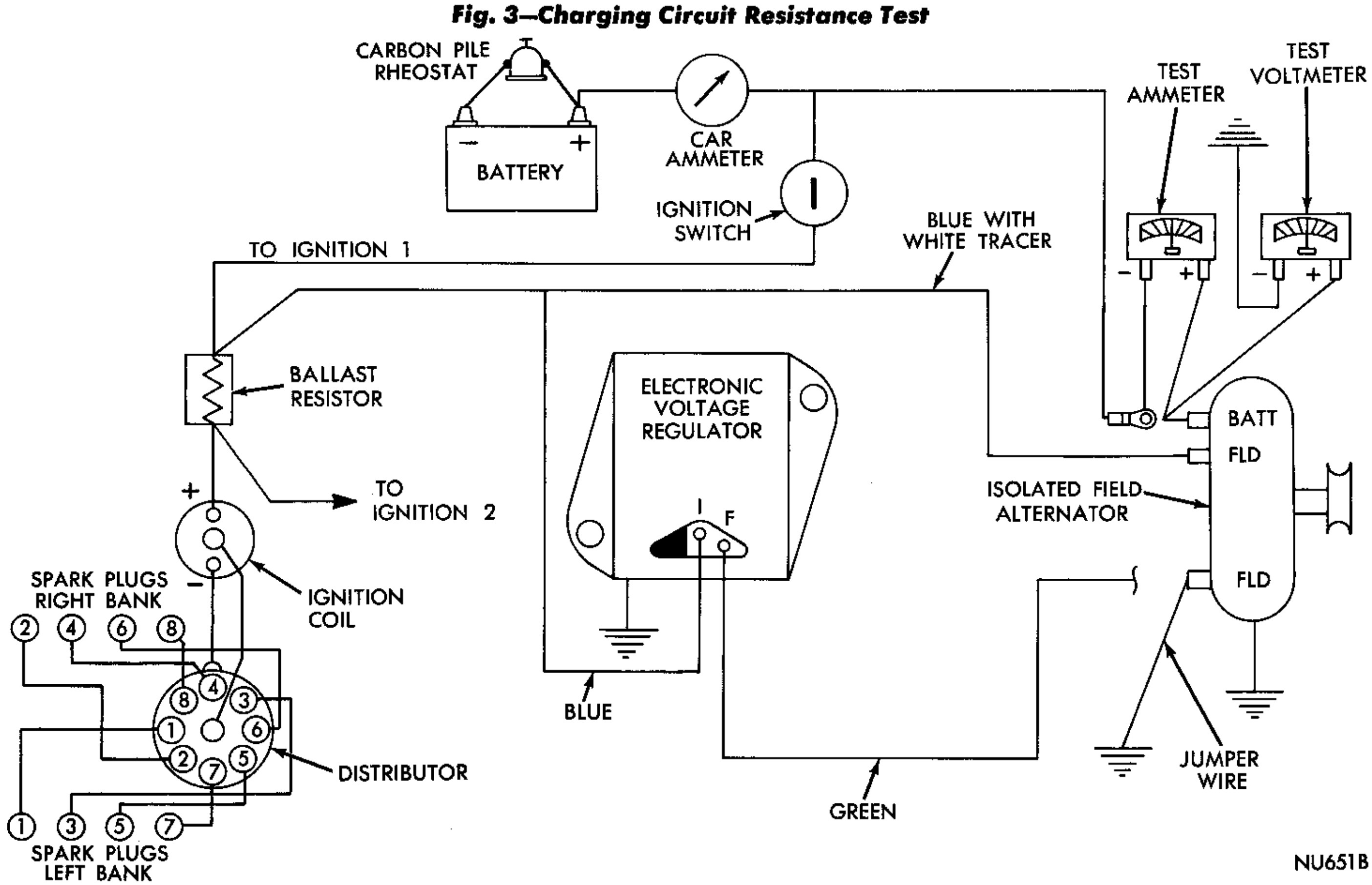


Fig. 4—Current Output Test

with excessive resistance. If the charging circuit resistance tested satisfactorily, reduce engine speed, turn off carbon pile and turn off ignition switch.

(11) Then, to make the current output test, move the negative lead of the voltmeter to a good ground. Move the positive lead of the voltmeter to "Batt" terminal of the alternator (Fig. 4).

(12) Start and operate the engine at idle. **Immediately after starting, reduce engine speed to idle.**

(13) Adjust the carbon pile and engine speed in increments until a speed of 1250 rpm and a voltmeter reading of 15 volts is obtained.

(14) **CAUTION: Incremental increases in engine speed should not be large enough to allow voltage to go above 16 volts.**

(15) Observe the reading on the test ammeter. The output current should be within the limits shown in the "Specifications". If the output is slightly less (5 to 7 amperes) than specified, it may be an indication of possible "open" rectifier or other alternator internal problems. If the output is considerably lower than that specified, it may be an indication of a possible "shorted" rectifier or other internal problems. In either case, the alternator should be removed and tested on the bench before disassembly. If the alternator current output tested satisfactorily, reduce engine speed, turn off carbon pile, and turn off ignition switch.

(16) Disconnect battery ground cable.

(17) Remove test ammeter, voltmeter, tachometer, and carbon pile.

(18) Remove jumper between alternator field and ground. Connect the field wire to the alternator field terminal.

(19) Connect the battery ground cable.

ELECTRONIC VOLTAGE REGULATOR

VOLTAGE REGULATOR TEST (When Tester C-4133 is Not Available)

(1) Clean the battery terminals and check the specific gravity. It should be above 1.200 to allow a prompt regulated voltage check.

If the specific gravity is below 1.200, charge or use another battery and do not leave the uncharged battery in the circuit.

(2) Connect the positive lead from a voltmeter to the ignition Number one (1) terminal of the ballast resistor. (The Ignition Number one (1) terminal of the ballast resistor is the end which has one or two blue wires connected to it.) The other end, Ignition Number two (2), will have a brown and blue wire or just a brown wire connected to it (Fig. 5).

(3) Connect the negative lead from the voltmeter to a good vehicle body ground.

(4) Start and operate engine at 1250 rpm with all lights and accessories turned off. Check voltmeter, the regulator is working properly if the voltage readings are in accordance with the following chart.

AMBIENT TEMPERATURE NEAR VOLTAGE REGULATOR	VOLTAGE RANGE	
—20°F	14.3	15.3
80°F	13.8	14.4
140°F	13.3	14.0
Above 140°F	Less than 13.8	

It is normal for the car ammeter to show an immediate charge and then gradually return to normal position. The duration the ammeter hand remains to the right will be dependent on the length of cranking time.

(5) If the voltage is below limits, proceed as follows:

(a) Check for a good voltage regulator ground. Check for voltage drop between cover of voltage regulator and body on low voltage scale of voltmeter.

(b) Turn off ignition switch and disconnect voltage regulator connector.

(c) Turn on the ignition switch, but do not start car, check for battery voltage at the wiring harness terminal connected to the blue and green leads. **Disconnect wiring harness from voltage regulator when checking the leads.**

Turn off ignition switch. If voltage is not present at either lead, the problem is in the vehicle wiring or alternator field circuit. **DO NOT DISTORT TERMINALS WITH VOLTMETER PROBE.**

(d) If the previous steps, 5(a) through 5(c) tested satisfactorily, change the voltage regulator and repeat step 4.

(6) If the voltage is slightly above the limits shown in chart or is fluctuating, proceed as follows:

(a) Check ground between voltage regulator and vehicle body.

(b) Check ground between vehicle body and engine.

(c) Check ignition switch circuit between battery terminal of ignition switch and voltage regulator.

(7) If the voltage is more than one-half (1/2) a volt above limits shown in chart, change the voltage regulator and repeat step 4.

(8) Remove the test voltmeter.

ELECTRONIC VOLTAGE REGULATOR TEST (With Tester Tool C-4133)

(1) Remove connector from Electronic Voltage Regulator on vehicle.

(2) Plug in power cord of Voltage Regulator Tester to 110 Volt A.C. 60 cycle source.

(3) Connect the ground wire from the voltage regulator tester to a good body ground near the voltage

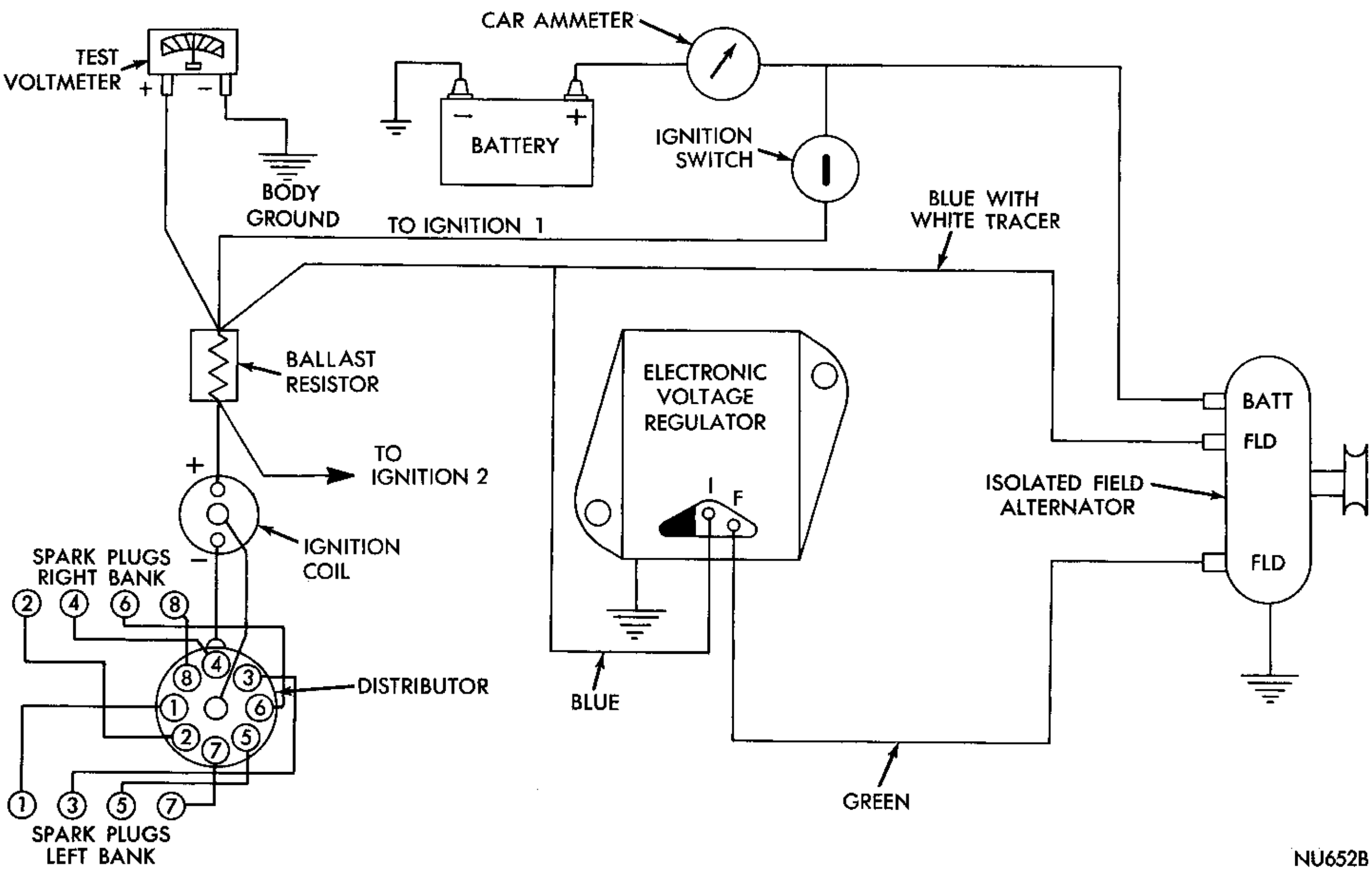


Fig. 5—Voltage Regulator Test (Without Tester Tool C-4133)

regulator (at voltage regulator mounting screws Figs. 6 and 7).

(4) Plug connector of voltage regulator tester on voltage regulator on vehicle.

(5) Place knob on the tester to the regulator test position.

(6) Press the test button on the voltage regulator tester. The voltage reading should be in accordance with the following:

(a) If the voltage regulator temperature is at room temperator (80°F.) or above, the meter reading should be in the green or yellow range.

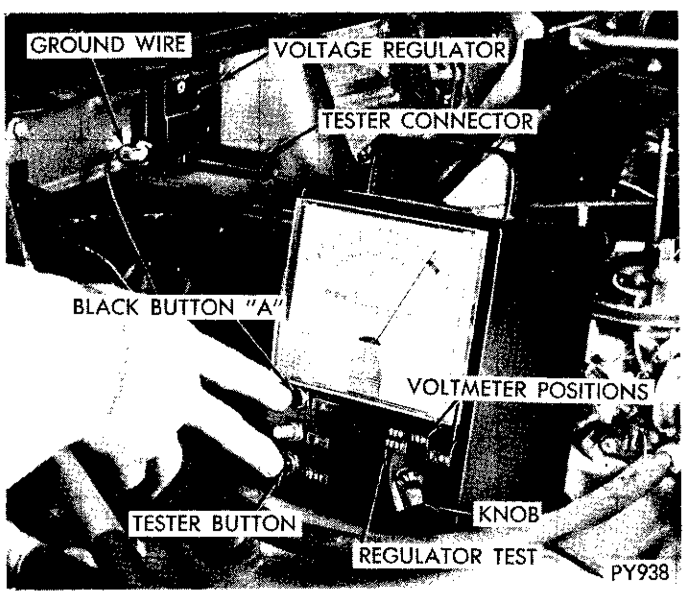


Fig. 6—Voltage Regulator Test (Depressing Test Button and Black Button "A")

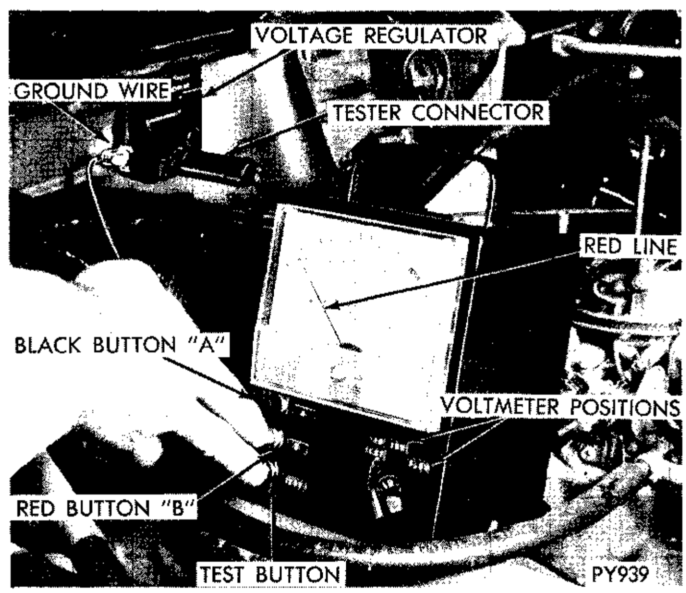


Fig. 7—Voltage Regulator Test (Depressing Test Button "B")

(b) If the voltage regulator is at room temperature (80°F.) or below, the meter reading should be in the green or blue range.

(7) While holding the test button in, depress **Black Button** (A) (Fig. 6), the meter reading should remain within the limits of step 6.

(8) While holding the test button in, depress **Red Button** (B) (Fig. 7), the meter should read above the red line.

(9) If all tests remain within limits the voltage regulator is good.

The tester may be used as a D.C. Voltmeter by placing tester knob in either the 18 volt or 1.8 volt position. Use the red probe and black clip leads for testing.

ALTERNATOR SERVICE PROCEDURES

If alternator performance does not meet current output specifications limits, it will have to be removed and disassembled for further test and servicing.

(1) Disconnect battery ground table at battery negative terminal.

(2) Disconnect alternator output "BATT" and field "FLD" leads and disconnect ground wire.

(3) Remove alternator mounting bolts and remove alternator.

BENCH TESTS

Field Coil Draw

If alternator field coil draw has not been tested on vehicle it may be tested on test bench as follows:

(1) Connect a wire between one field terminal of the alternator and the positive terminal of a fully charged battery. Connect test ammeter positive lead to the other field terminal of the alternator and the negative lead to the battery negative terminal.

(2) Slowly rotate alternator rotor by hand. Observe ammeter reading. Field coil draw should be 2.3 amperes to 2.7 amperes at 12 volts. **A low rotor coil draw is an indication of high resistance in field coil circuit, (brushes, slip rings, or rotor coil). A higher rotor coil draw indicates possible shorted rotor coil or grounded rotor.**

Testing Alternator Internal Field Circuit for Ground

(1) To test internal field circuit for ground, touch one test probe from a 110 volt test lamp to one of the alternator field brush terminals and remaining test probe to the end shield. If rotor assembly or field brush is not grounded, lamp will not light.

(2) If lamp lights, remove field brush assemblies (noting how the parts are assembled) and separate the end shields by removing the three through bolts.

(3) Again test by placing one of the test probes to a slip ring and remaining test probe to the end shield. If lamp lights, rotor assembly is grounded and requires replacement. If lamp does not light after removing the field brush and separating the end shields, the cause of the ground at the first ground test was a grounded brush.

(4) Examine plastic insulator and screw. Screw is a special size and must not be substituted.

(5) Install brush holders, terminals, insulated washers, shake proof washers and screws. If the parts were not assembled in this order; this could be the cause of the ground condition.

DISASSEMBLING THE ALTERNATOR

To prevent possible damage to brush assemblies, they should be removed before proceeding with disassembly of the alternator. The field brushes are mounted in plastic holders that position the brushes against the slip rings of the rotor.

(1) Remove retaining screw lockwasher, insulated washer, and field terminal, and carefully lift plastic holder containing spring and brush assembly from end housing (Fig. 8).

(2) Remove the brush screws, insulating nylon washers and lift brush assemblies from end shield.

CAUTION: Stator is laminated, do not burr stator or end shield.

(3) Remove through bolts and pry between the stator and drive end shield with blade of a screwdriver (Fig. 9). Carefully separate drive end shield, pulley and rotor assembly away from stator and rectifier shield assembly.

Testing the Rectifiers with Tool C-3829

The Rectifier Tester Tool C-3829 provides a quick, simple and accurate test of the alternator rectifiers without the necessity of disconnecting soldered rectifier leads. With alternator rectifier end shield sepa-

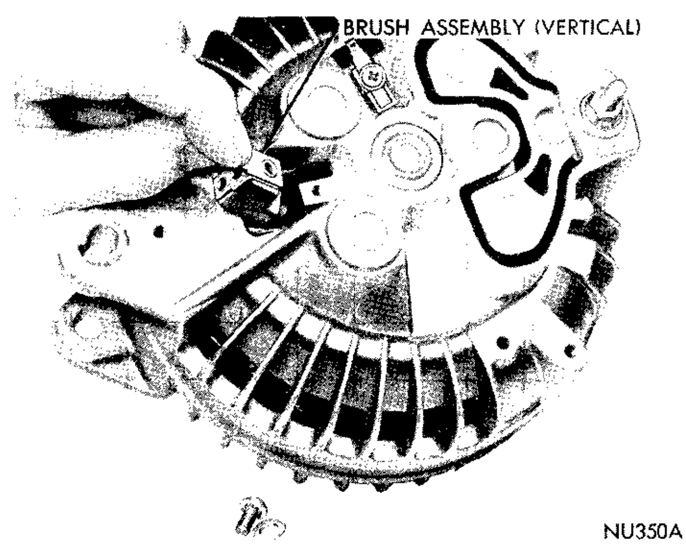


Fig. 8—Removing or Installing Field Brushes

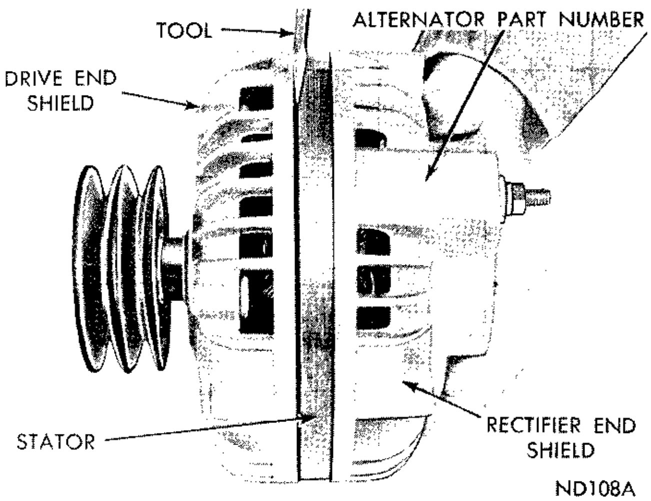


Fig. 9—Separating Drive End Shield From Stator

rated from drive end housing proceed with rectifier test as follows:

Positive Case Rectifier Test (Fig. 10)

(a) Place alternator on an insulated surface. Connect test lead clip to the alternator (BAT) output terminal.

(b) Plug in Tool C-3829 power source lead into a 110 volt A.C. power supply. Touch exposed bare metal connections of each of the positive case rectifiers, with test prod.

The reading for satisfactory rectifiers will be 1-3/4 amperes or more. Reading should be approximately the same for three rectifiers.

When two rectifiers are good and one is shorted, reading taken at the good rectifiers will be low, and reading at shorted rectifier will be zero. Disconnect lead to the rectifier reading zero and retest. The reading of the good rectifiers will now be within satisfactory range.

When one rectifier is open it will read approximately one ampere, and two good rectifiers will read within satisfactory range.

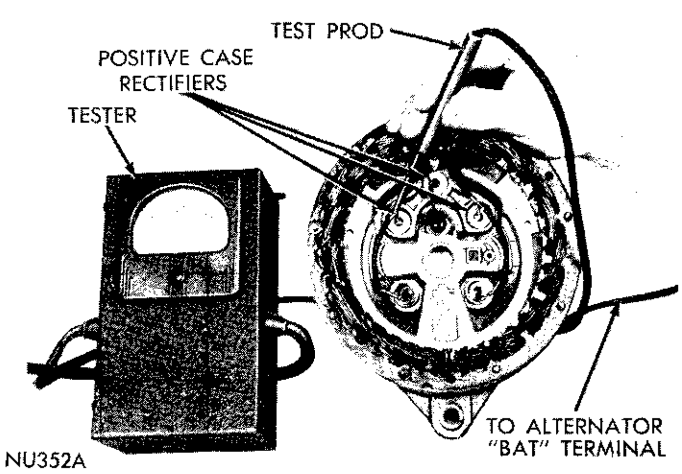


Fig. 10—Testing Positive Rectifiers

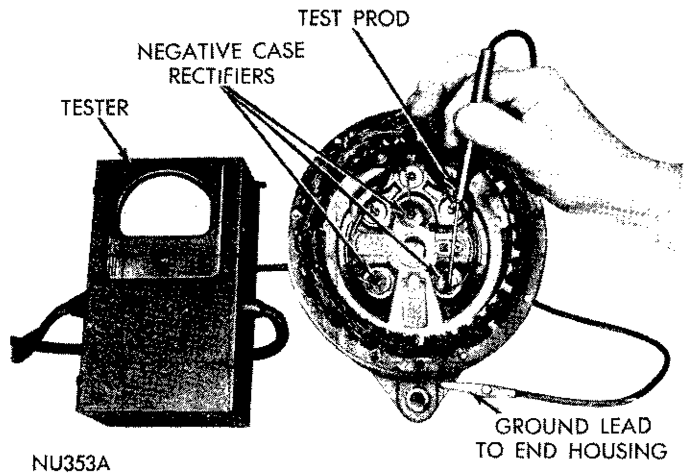


Fig. 11—Testing Negative Rectifiers

Negative Case Rectifier Test (Fig. 11)

(a) Connect test lead clip to rectifier end housing.

(b) Touch exposed connection of each of the negative case rectifiers with test probe.

CAUTION: Do not break the sealing around rectifier lead wire. The sealing material is for protection against corrosion. Always touch test probe to exposed metal connection nearest rectifier.

Test specifications are the same, and test results will be approximately the same as for positive case rectifiers, except meter will read on opposite side of scale.

TESTING RECTIFIERS AND STATOR (When Tool C-3829 is not available)

(a) Separate the three (3) stator leads at "Y" connection (Fig. 12). **Cut stator connection as close to**

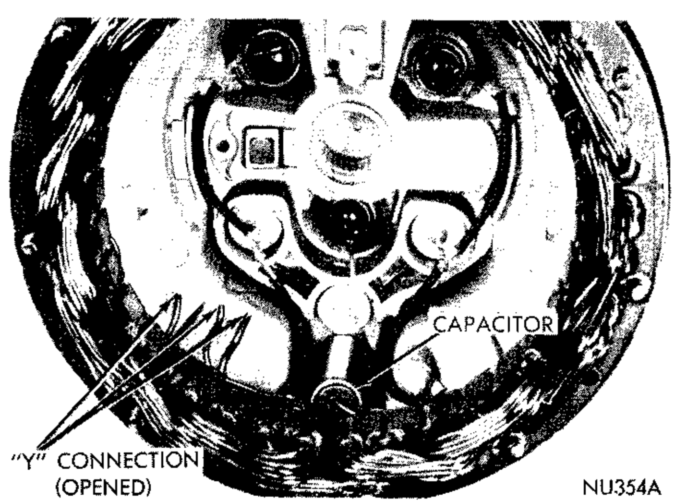


Fig. 12—Separating the Three Stator Leads

connector as possible. If they are cut too short it may be difficult to get them together again for soldering.

(b) Test rectifiers with a 12 volt battery and a test lamp equipped with a number 67 bulb (4 candle power) by connecting one side of test lamp to positive battery post; other side of test lamp to a test probe with other test probe connected to the negative battery post.

(c) Contact outer case of rectifier with one probe and other probe to wire in center of rectifier (Fig. 13).

(d) Reverse the probes, moving probe from rectifier outer case to rectifier wire, and the probe from rectifier wire to rectifier outer case.

If test lamp "lights" in one direction but does "not light" in other direction, rectifier is satisfactory. If lamp lights in "both directions," **rectifier** is "shorted." If test lamp does "not light" in either direction, rectifier is "open." **Possible cause of an open or blown rectifier is a faulty capacitor or a battery that has been installed in reverse polarity. If battery is installed properly and the rectifiers are open, test capacitor capacity—.50 microfarad (plus or minus 20%).**

(e) Unsolder rectifier leads from stator leads. **Do not blow solder off with air—fine particles of solder can short other rectifiers.**

(f) Test stator for grounds using a 110 volt test lamp (Fig. 14). Use wood slats to insulate the stator from rectifier shield. Contact one prod of test lamp to stator pole frame, and contact the other prod to each of the three stator leads. Test lamp should "not light." If test lamp lights, stator windings are "grounded."

(g) Test stator windings for continuity, by contacting one prod of test lamp to **all** three stator leads at "Y" connection. Contact each of the three stator leads (disconnected from rectifiers). Test lamp should "light" when prod contacts each of the three leads. If lamp does not light stator winding is "open" (Fig. 15).

(h) Install a new stator if stator tested is "grounded" or "open." If stator tested satisfactorily, tin the three stator wires and resolder. Tape connector and cement down to stator to make sure the "Y" connector does not short out to end shield. If the rectifiers must be replaced, unsolder the rectifier wire from the stator lead wire at the soldered joint. **When removing rectifiers, it is necessary to support end shield and/or heat sink to prevent damage to these castings.**

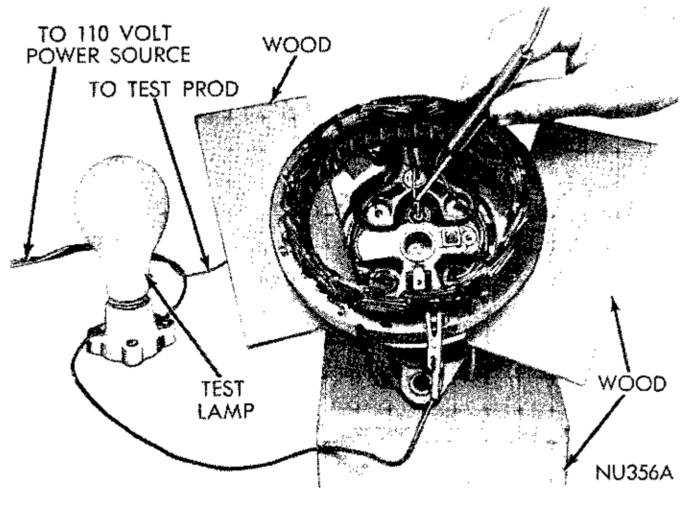


Fig. 14—Testing Stator for Ground

(4) Place Rectifier Removing and Installing Press in a vise and support end shield on clamp anvil under rectifier to be removed (Fig. 16). **Make sure bore of tool completely surrounds rectifier during removal process.**

(5) Carefully apply pressure with tool pressure screw until support tool, rectifier end shield, and remover pin, and remover adapter are in alignment then press the rectifier out of end shield or heat sink.

(6) The pully is an interference fit on rotor shaft. Remove pulley with Puller Tool C-4068, (Fig. 17).

(7) Pry drive end bearing spring retainer from end shield with a screwdriver (Fig. 18).

(8) Support end shield and tap rotor shaft with a plastic hammer to separate rotor from end shield. **The**

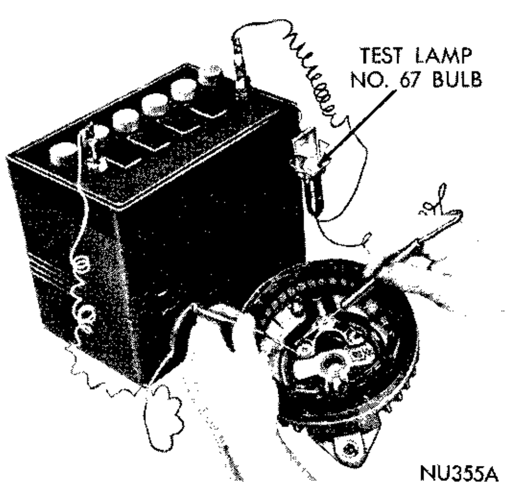


Fig. 13—Testing Rectifiers with Test Lamp

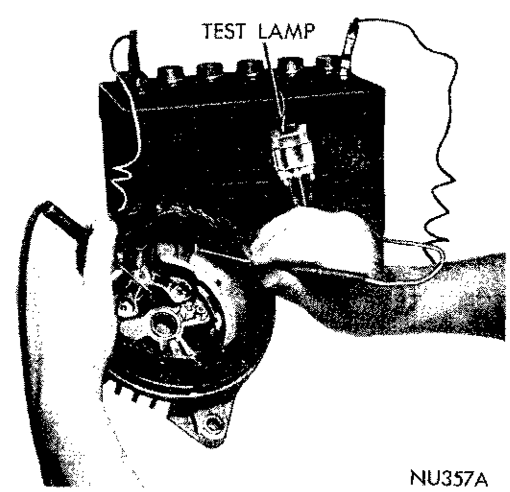


Fig. 15—Testing Stator Windings for Continuity

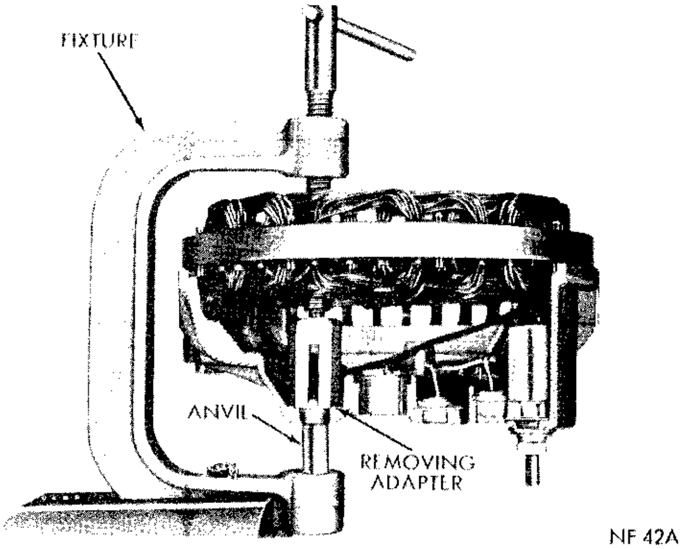


Fig. 16—Removing the Rectifiers

new bearing is lubricated with a predetermined amount of special lubricant and does not require additional lubrication.

(9) The drive end ball bearing is an interference fit with the rotor shaft. Remove bearing with Puller Tool C-4068, (Fig. 19).

(10) Remove output terminal nuts and washers and remove terminal screw and inside capacitor. **The heat sink is also held in place by the terminal screw.**

(11) Remove insulator (Fig. 20).

(12) The needle roller bearing in rectifier end shield is a press fit. If necessary to remove rectifier

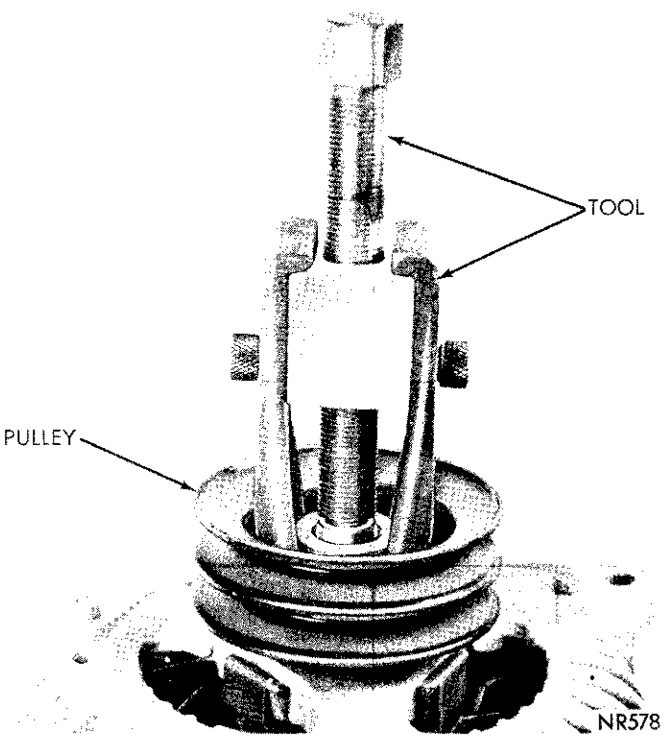


Fig. 17—Removing the Pulley

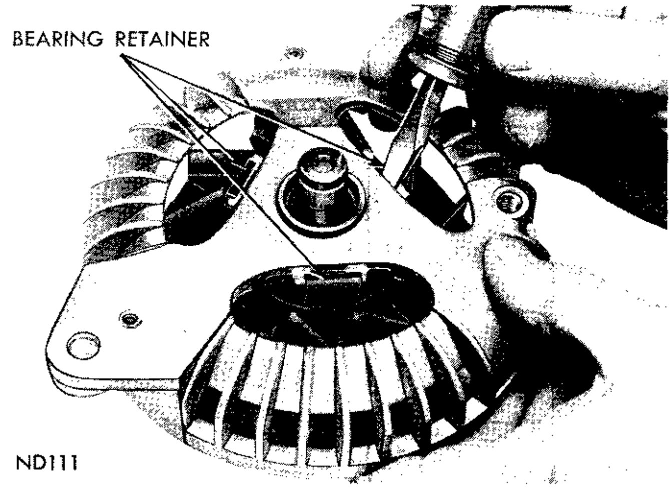


Fig. 18—Disengaging Bearing Retainer from End Shield

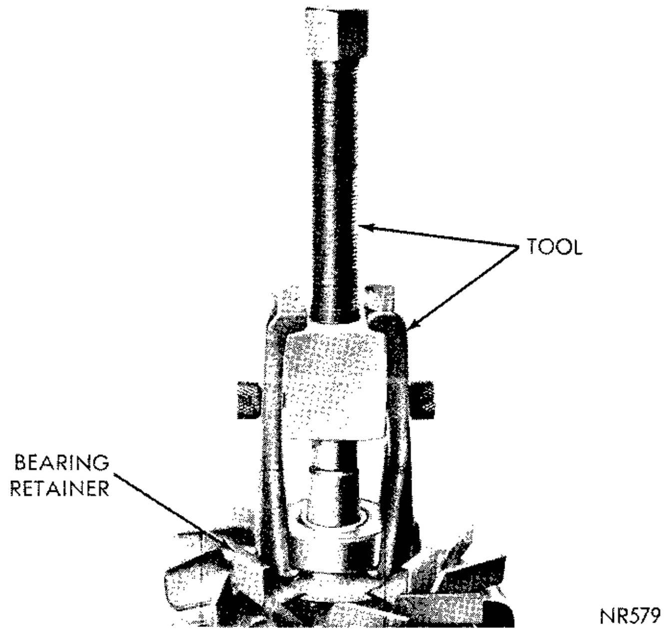


Fig. 19—Removing Bearing from Rotor Shaft

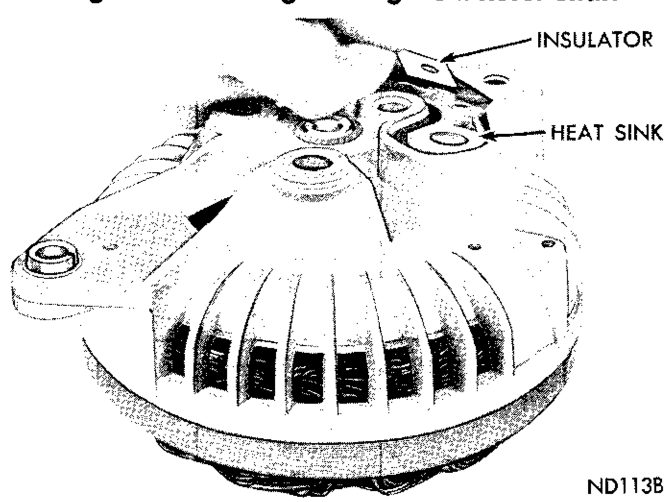


Fig. 20—Removing Heat Sink Insulator

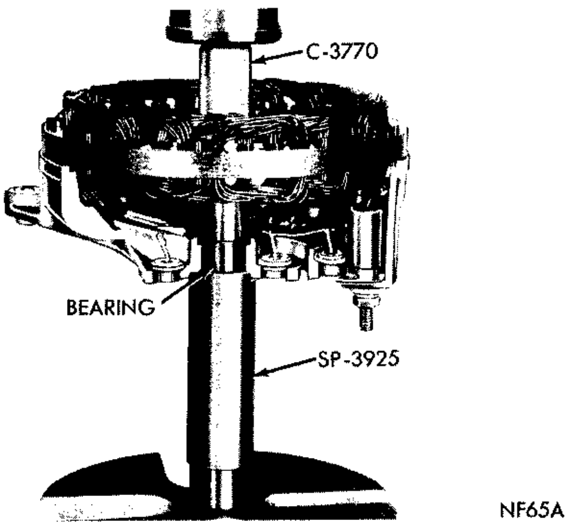


Fig. 21—Removing Rectifier End Shield Bearing

end frame needle bearing, protect end shield by supporting shield with Tool C-3925 when pressing bearing out with Tool C-3770A (Fig. 21). Make sure notches in tool clear raised section of heat sink. **The new bearing is prelubricated and no additional lubricant should be added, as an excessive amount of lubricant will contaminate the slip rings and cause premature brush and rotor failures.**

REPLACING SLIP RINGS

Slip rings that are damaged can be replaced as follows:

(a) Remove rotor plastic grease retainer.

(b) Unwind field coil leads from slip ring lugs (Fig. 22) being careful not to break the wire leads.

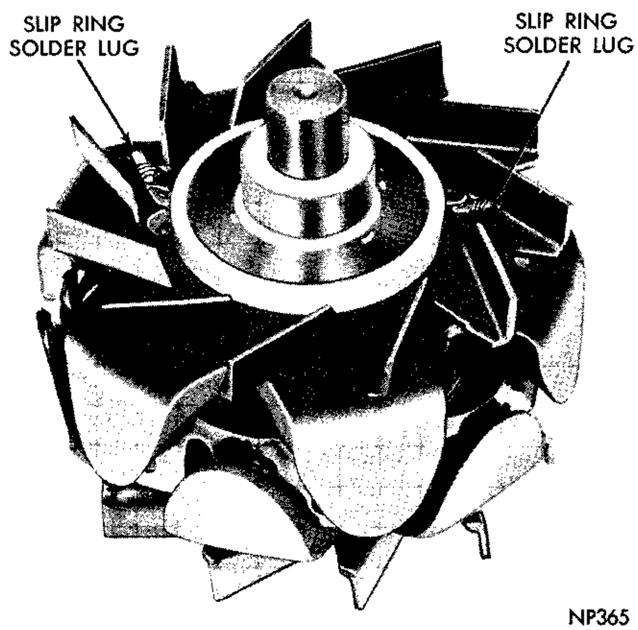


Fig. 22—Solder Points—Slip Ring Installed

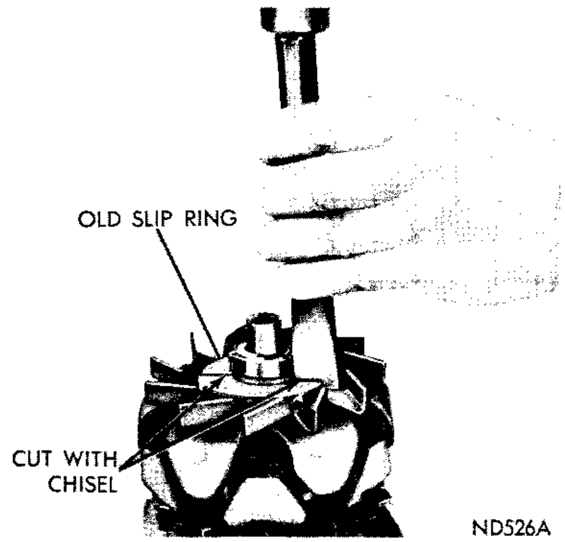


Fig. 23—Cutting Old Slip Rings

(c) Use a chisel to cut through the copper of both slip rings at opposite points (180° apart) (Fig. 23).

(d) Break the plastic insulator and remove the old slip ring.

(e) Clean away dirt and particles of old slip ring from rotor.

(f) Scrape ends of field coil wires clean for good electrical contact.

(g) Position field coil wires so as to clear path for new slip ring.

(h) Position new slip ring carefully on rotor shaft to insure that slip ring lugs will be in proper position for connecting field coil wires (Fig. 24).

(i) Place installing Tool C-3900 over rotor shaft and position rotor, slip ring and tool assembly in arbor press (Fig. 25). Press slip ring on shaft. **When slip ring is bottomed on rotor fan, the field lead wire (insulated brush ring) should clear the access hole through the fan and pole piece.**

(j) Tin field coil lead wires.

(k) Coil each field lead wire around the slip ring lug, starting first wrap against shoulder of lug and winding outward. Solder with resin core solder (Fig. 26).

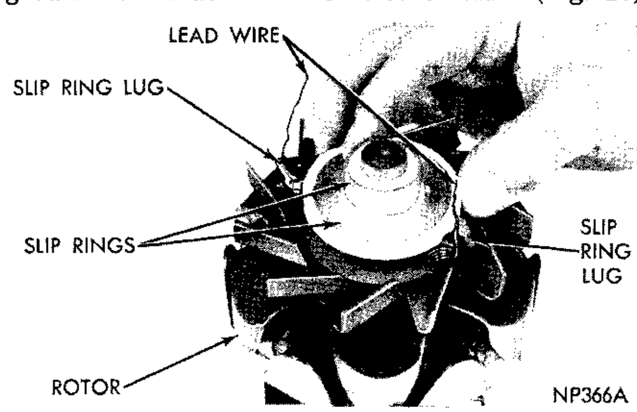


Fig. 24—Aligning Slip Ring with Field Lead Wires

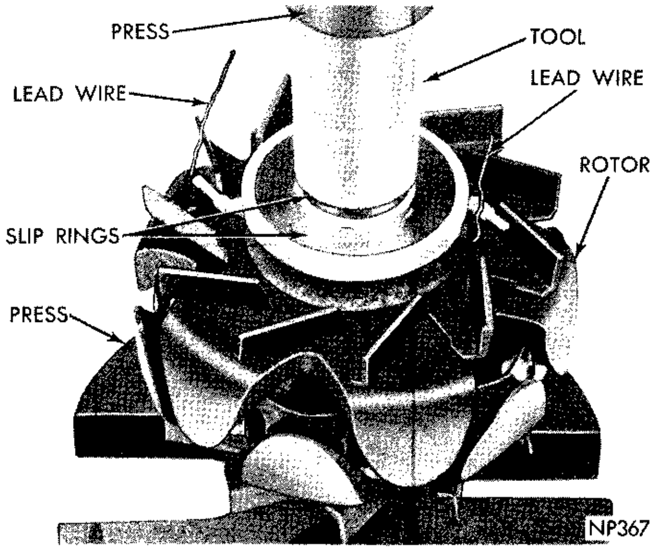


Fig. 25—Installing Slip Rings

(l) Test slip rings for ground with a 110 volt test lamp by touching one test lead prod to rotor pole piece and remaining prod to slip ring. Test lamp should not light. If lamp lights, slip rings are shorted to ground.

(m) Test slip ring for continuity by placing one test prod on the positive and the other test prod on the ground slip ring. Light should go on showing the field circuit is completed.

(n) If rotor is not grounded and field circuit is continuous, lightly clean slip rings surface with 00 sandpaper.

(o) Position grease retainer on rotor shaft and press retainer on shaft with installer Tool C-3921 (Fig. 27). The plastic retainer is properly positioned when the inner bore of the installer tool bottoms on the rotor shaft.

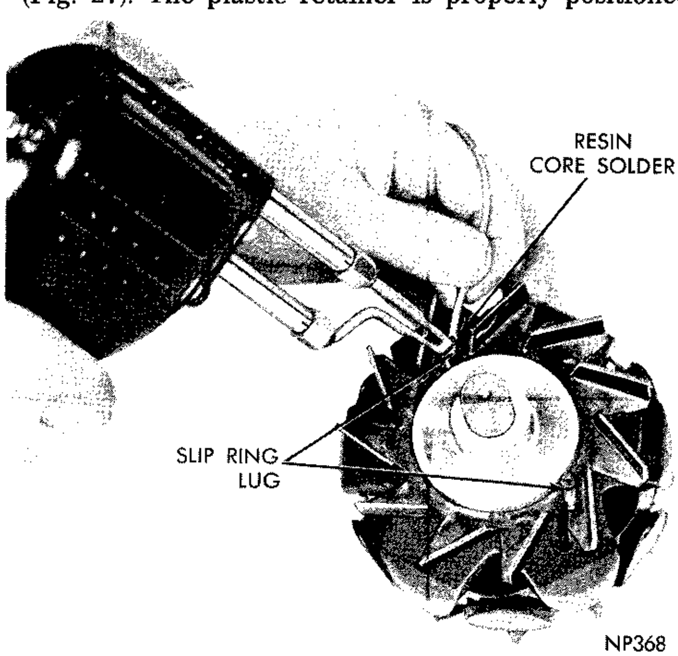


Fig. 26—Solderng Field Coil Leads

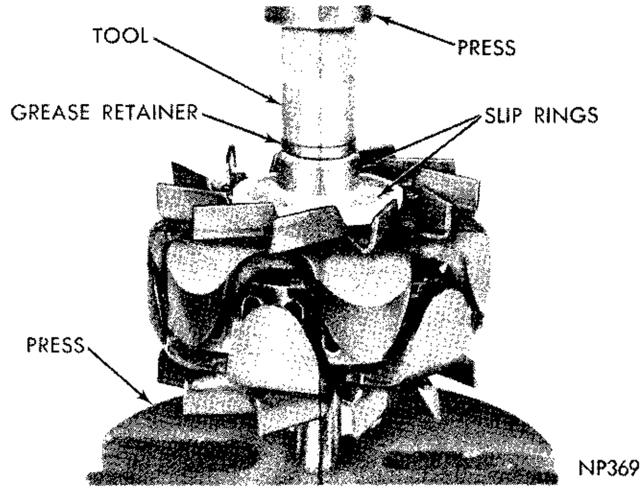


Fig. 27—Installing Grease Retainer

ASSEMBLING THE ALTERNATOR

(1) Check rectifier identification to make sure correct rectifier is being installed. Refer to Parts List for rectifier identification.

(2) Start rectifier squarely into mounting hole.

(3) Support heat sink or rectifier end shield on installer adapter of Tool C-3928. With the installing adapter positioned on the rectifier, carefully apply pressure with tool pressure screw until the installer tool, rectifier, rectifier end shield or heat sink are in alignment and after determining that rectifier is started squarely in the casting, slowly apply pressure with tool pressure screw until you feel the collar of rectifier bottom against casting (Fig. 28). **Make sure installer support adapter fits square around the rectifier inner boss and that pressure is applied on outer rim of rectifier.**

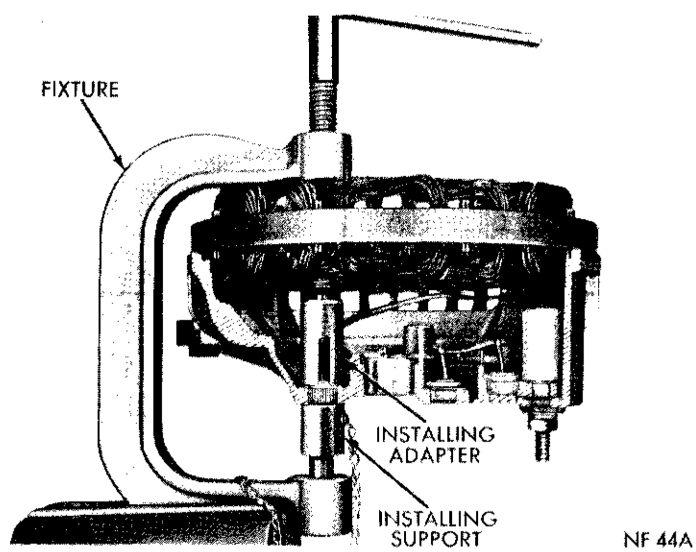


Fig. 28—Installing a Rectifier

CAUTION: DO NOT USE a hammer to start the rectifier into its bore in end shield. DO NOT HAMMER OR SHOCK the rectifier in any manner as this will fracture the thin silicon wafer in the rectifier causing complete rectifier failure.

(4) Clean the leads and mate stator lead with rectifier wire and bend the loop snugly around stator lead to provide a good electrical and mechanical connection. Solder wires with resin core solder. Hold rectifier lead wire with pliers just below the joint while soldering (Fig. 29). Pliers will absorb heat from the soldering operation and protect rectifier. **After soldering, quickly cool soldered connection; touch a dampened cloth against it. This will aid in forming a solid joint.**

(5) After soldering, stator leads must be pushed down into the slots cast into the end shield and cemented with Cement Part Number 2299314 or equivalent to protect the leads against possible interference with the rotor fans. Test each replacement rectifier to make certain rectifier was not damaged by the soldering or pressing operations.

(6) Support end shield on Tool C-3925 so that notches in the support tool will clear the raised section of the heat sink and press the bearing into position with Tool SP-3381 (Fig. 30), until bottomed on support tool. **New bearings are pre-lubricated, additional lubrication is not required.**

(7) Insert drive end bearing in drive end shield and install bearing retainer plate to hold bearing in place.

(8) Position bearing and drive end shield on rotor shaft and, while supporting base of rotor shaft, press bearing and shield into position on rotor shaft with arbor press and Tool C-3858 (Fig. 31).

CAUTION: Make sure bearing is installed squarely at installation; otherwise, damage to bearing will result. Press bearing on rotor shaft until bearing contacts shoulder on rotor shaft fan hub.

(9) Install pulley on rotor shaft. Shaft of rotor must be supported in a manner so all pressing force is on pulley hub and rotor shaft (Fig. 32). **Press pulley on rotor shaft until pulley contacts inner race of drive and bearing. Do not exceed 6800 pounds pressure. Do not hammer.**

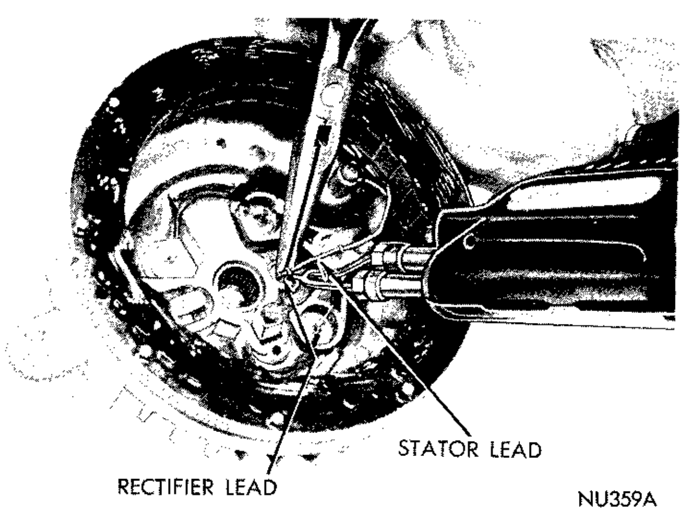


Fig. 29—Soldering Rectifier and Stator Leads

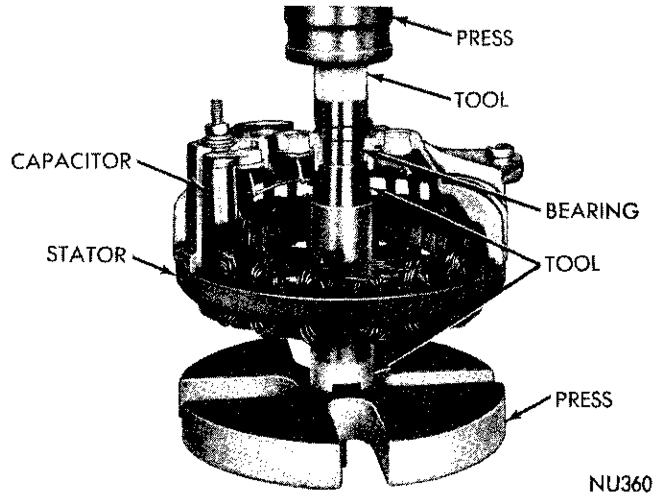


Fig. 30—Installing Rectifier End Shield Bearing

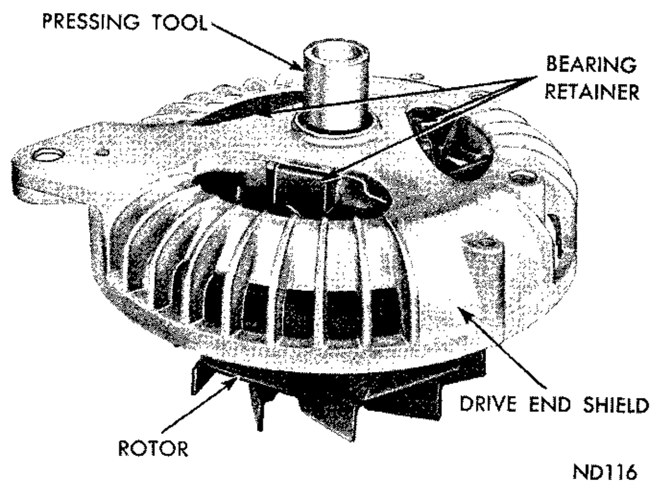


Fig. 31—Installing Drive End Shield Bearing

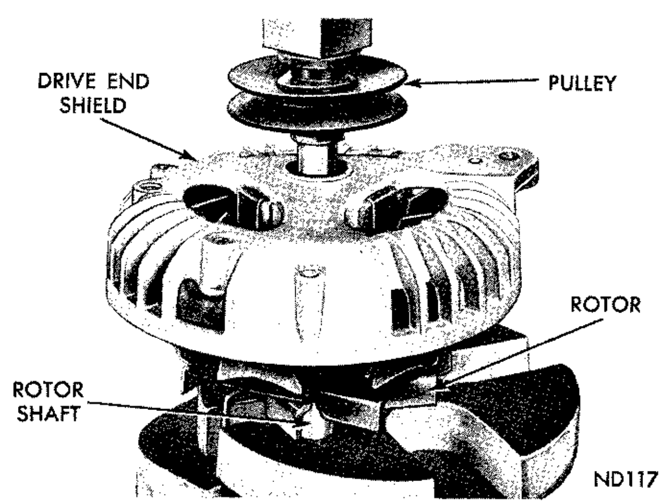


Fig. 32—Installing Alternator Pulley

(10) The alternators have the capacitor mounted internally. Make sure heat sink insulator is in place (Fig. 20).

(11) Install output terminal screw and capacitor through heat sink and end shield.

(12) Install insulating washers, lockwashers and lock nuts.

(13) Make sure heat sink and insulator are in position then tighten lock nut.

(14) Position stator on rectifier end shield.

(15) Position rotor and end shield assembly on stator and rectifier end shield assembly. Align through bolt holes in the stator, rectifier end shield and drive end shield.

(16) Compress stator and both end shields by hand and install through bolts, washers and nuts. Tighten bolts evenly to 20-30 inch-pounds.

(17) Install field brushes in holder. Place one vertical and one horizontal holder in rectifier and shield.

(18) Place nylon washer on each terminal and install lockwashers and attaching screws.

(19) Rotate pulley slowly by hand to be sure rotor fans do not hit rectifiers, capacitor lead, and stator connections.

(20) Install alternator and adjust drive belt to specifications.

(21) Connect (output) "BAT" and (field) "FLD" leads and connect ground wire.

(22) Connect battery ground cable.

(23) Start and operate engine, and observe alternator operation.

(24) Test current output and regulator setting.

IGNITION SYSTEM—8 CYLINDER

INDEX

GENERAL INFORMATION

The ignition system consists of two separate circuits. The battery, ammeter, ignition switch, ballast resistor, primary winding of the ignition coil, distributor contacts and condenser, vehicle frame, and primary wiring make up the low voltage primary circuit. The secondary high voltage circuit includes the coil secondary winding, distributor cap and rotor, spark plug cables, spark plugs and vehicle frame.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
BURNED OR PITTED DISTRIBUTOR CONTACTS	(a) Dirt or oil on contacts.	(a) If oil is on contact face, determine cause and correct condition. Clean distributor cam of dirt and grease, apply a light film of distributor cam lubricant to cam lobes; wipe off excess. See "Distributor Lubrication." Replace contact set and adjust as necessary.
	(b) Alternator voltage regulator setting too high.	(b) Test alternator voltage regulator setting. Replace distributor contact set and adjust as necessary.
	(c) Contacts misaligned or gap too small.	(c) Align and adjust contacts.
	(d) Faulty coil.	(d) Test and replace coil if necessary. Replace and adjust contacts.
	(e) Ballast resistor not in circuit.	(e) Inspect conditions, and correctly connect the coil.

Condition	Possible Cause	Correction
	(f) Wrong condenser or faulty condenser.	(f) Test condenser and replace if necessary. Replace and adjust contacts.
	(g) Faulty ignition switch.	(g) Replace ignition switch.
	(h) Bushings worn.	(h) Replace housing.
	(i) Touching contacts with the hands during installation.	(i) Replace and adjust contacts.
IGNITION COIL FAILURE	(a) Coil damaged by excessive heat from engine.	(a) Replace coil. Inspect condition of the distributor contacts.
	(b) Coil tower carbon-tracked.	(b) Replace the coil.
	(c) Oil leak at tower.	(c) Replace the coil.

SERVICE PROCEDURES

SECONDARY CIRCUIT INSPECTION

Check high tension cable connections for good contact at the coil and distributor cap towers and at the spark plugs. Terminals should be fully seated. The nipples and spark plug covers should be in good condition. Nipples should fit tightly on the coil cap towers and spark plug covers should fit tight around spark plug insulators. Cable connections that are loose will corrode and increase the resistance and permit water to enter the towers causing ignition malfunction. **To maintain proper sealing between the towers and nipples, cable and nipple assemblies should not be removed from the distributor or coil towers unless nipples are damaged or cable testing indicates high resistance or broken insulation.**

Clean high tension cables with a cloth moistened with a non-flammable solvent and wipe dry. Bend cables to check for brittle or cracked insulation.

When testing secondary cables for punctures and cracks with an oscilloscope follow the instructions of the equipment manufactures.

If an oscilloscope is not available, secondary cables can be tested as follows:

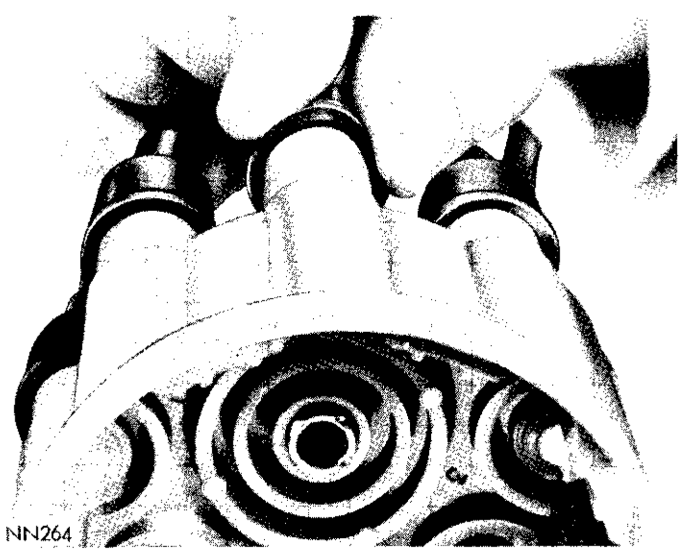


Fig. 1—Installing Secondary Cable and Nipple at Distributor Cap Tower

(a) Engine not running, connect one end of a test probe to a good ground, other end free for probing.

(b) Disconnect cable at spark plug end. Insulate cable end from grounding.

(c) With engine running, move test probe along entire length of wire. If punctures or cracks are present there will be a noticeable spark jump from the faulty area to the probe. Secondary coil wire may be checked in the same manner, be sure one spark plug cable is disconnected from spark plug while running probe along coil wire secondary cable. Cracked, leaking or faulty cables should be replaced.

When installing new cable assemblies, install new high tension cable and nipple assembly over cap or coil tower, entering the terminal into the tower, push lightly, then pinch the large diameter of the nipple (Fig. 1) to release trapped air between nipple and tower. Continue pushing on the cable and nipple until cables are properly seated in the cap towers. Use the same procedure to install cable in coil tower (Fig. 2).

Use the following procedure when removing the high tension cable from the spark plug. First, remove the cable from the retaining bracket. Then grasp the insulator as close as possible to the spark plug and use a straight and steady pull (Fig. 3). **Do not use pliers and do not pull the cable at an angle.** Doing so will damage the insulation, cable terminal or the

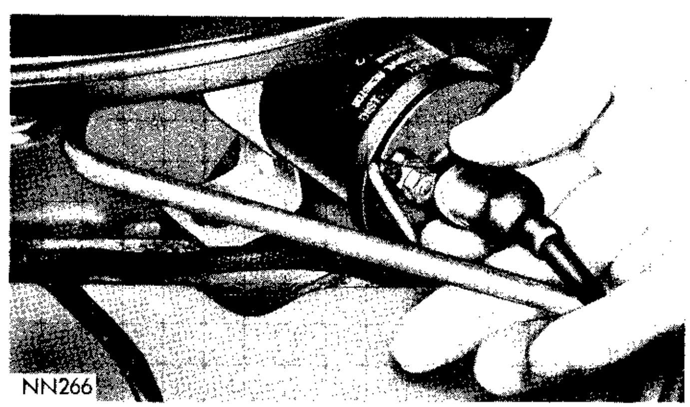


Fig. 2—Installing Secondary Cable and Nipple at Coil Tower

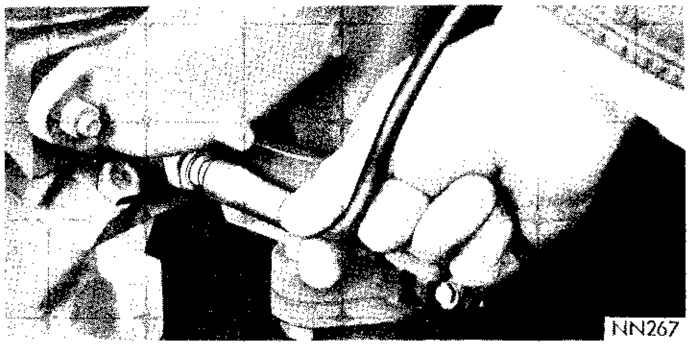


Fig. 3—Removing Secondary Cable and Cover from Spark Plug (Typical)

spark plug insulator. **Wipe spark plug insulator clean before reinstalling cable and cover.**

Resistance type cable is identified by the words "Electronic Suppression" printed on the cable jacket. No additional resistors are necessary.

Use an ohmmeter to check resistance type cable for open circuits, loose terminals or high resistance as follows:

(a) Remove cable from spark plug and install the proper adapter between cable and spark plug.

(b) Lift distributor cap from distributor with cables intact. **Do not remove cables from cap.**

(c) Connect the ohmmeter between spark plug adapter and the corresponding electrode inside the cap, making sure ohmmeter probes are in good contact. If resistance is more than 30,000 ohms, remove cable at cap tower and check the cable resistance. If resistance is more than 30,000 ohms on cables under twenty-five inches long or 50,000 ohms on cables over twenty-five inches long, replace cable assembly. Test all spark plug cables in same manner.

To test coil to distributor cap high tension cable, remove distributor cap with the cable intact. **Do not remove cable from the coil or cap.** Connect the ohmmeter between center contact in the cap and either primary terminal at coil. If the combined resistance of coil and cable is more than 25,000 ohms, remove the cable at coil tower and check cable resistance. If resistance is more than 15,000 ohms, replace the cable. If resistance is less, check for a loose connection at the tower or for a faulty coil.

Inspect coil tower for cracks, carbon tracking or oil leaks.

DISTRIBUTOR RESISTANCE TEST

This test indicates the resistance of the ignition primary circuit from the distributor side of the coil, through the points and the distributor ground. Excessive resistance in this portion of the ignition system will prevent the coil from producing sufficient output for good over-all ignition. To perform test, proceed as follows:

(1) Turn Selector Switch of a Tach-Dwell unit to CALIBRATE position and adjust Dwell Calibrator until Dwell Meter reads on the set line (test leads separated).

(2) Leave Selector Switch in CALIBRATE position. connect Tach-Dwell red lead to distributor terminal of coil and black lead to a good ground.

(3) Turn ignition switch "ON." Observe dwell meter reading. Meter pointer should be well within bar marked "DISTRIBUTOR RESISTANCE." If reading is zero or outside of bar, crank engine with the starter until meter pointer moves as far to right as possible. (This will indicate that contacts are closed.) A reading now within the bar indicates a normal distributor primary circuit.

If reading is outside the bar, high resistance is present in distributor primary circuit.

(4) Remove test lead from distributor terminal of coil and connect to the following points:

(a) Distributor primary terminal (outside).

(b) Distributor primary terminal (inside).

(c) Contact terminal bracket (insulated bracket).

(d) Ground side of the contacts.

(e) Distributor housing.

(5) Repeat test at each connection until a noticeable change occurs in the meter reading. If a poor connection or faulty lead in indicated, clean, tighten or replace as necessary and repeat test (3).

If faulty contacts are indicated remove distributor for complete inspection, service, testing and calibration.

IDLE RPM TEST

Engine idle rpm setting should be tested and recorded as it is when the vehicle is first brought into the shop for testing. This will assist in diagnosing complaints of engine stalling, creeping and hard shifting on vehicles equipped with automatic transmissions.

Test procedures are as follows:

(1) Turn Selector Switch to CALIBRATE position and adjust Dwell Calibrator until Dwell Meter reads on SET line (test leads separated).

(2) Connect red lead of the test unit to distributor primary terminal at coil and black lead to a good ground.

(3) Turn Selector Switch to 8 LOBE position.

(4) Turn the Tach-Dwell RPM Switch to the 1000 rpm position.

(5) With engine at normal operating temperature (off fast idle), momentarily open the throttle and release to make sure there is no bind in the linkage and that idle speed screw is against its stop.

(6) Note engine RPM on 1000 RPM scale and adjust carburetor idle speed to specifications. See "Fuel System" specifications.

DISTRIBUTOR CONTACT DWELL

The degrees of distributor dwell are the degrees of rotation through which the contacts remain closed. This is also commonly referred to as "dwell angle" or "cam angle."

The correct distributor point dwell is essential for good ignition performance and contact point life.

Test procedures are as follows:

(1) Disconnect vacuum line.

(2) Connect Tach-Dwell red lead to distributor terminal of coil and black lead to a good ground.

(3) Turn Selector Switch to 8 LOBE position.

(4) Start engine and operate engine at idle speed.

(5) Observe dwell meter reading. If the dwell reading is within "Specifications" the contact gap, cam rubbing block and contact arm are all in satisfactory condition.

If dwell reading is not within specifications, incorrect contact gap, worn cam, worn rubbing block or distorted contact arm may be indicated.

DWELL VARIATION

This test indicates the mechanical condition of the distributor. Excessive wear in distributor mechanical parts cause dwell variations which will affect ignition timing.

Test procedures are as follows:

(1) With engine at idle speed, **vacuum hose disconnected,** and test leads connected as in "Contact Dwell Test," turn Tach-Dwell RPM Switch to the 5,000 RPM position.

(2) Slowly increase engine speed to 1500 RPM then slowly reduce to idle speed while observing dwell meter reading.

If dwell reading varies more than 2 degrees from initial reading between idle speed and 1500 RPM, probable wear in the distributor shaft, bushings or contact plate bearing and pivot pin is indicated. Remove distributor for complete inspection and testing on a distributor tester. **Dwell variation at speeds above 1500 does not necessarily indicate distributor wear. Dwell and gap of the contacts must both be within their specified limits at the same time. If this cannot be accomplished, it is probable that wrong contacts are installed or the rubbing block or cam lobes are badly worn or movable contact is distorted.**

IGNITION TIMING (383 Cu. In. 440 Cu. In)

(Solenoid Distributor—Fig. 4)

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give proper ignition timing. The ignition timing test will indicate the timing of the spark at No. 1 cylinder at curb idle (Hot only).

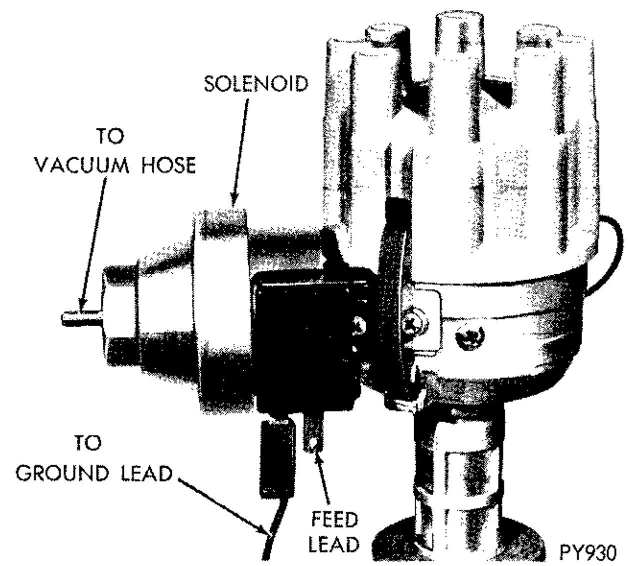


Fig. 4—Solenoid Retard Distributor Connections

Test procedures are as follows:

(1) Disconnect vacuum hose at distributor, and plug hose.

(2) Connect the secondary lead of a power timing light to No. 1 spark plug, red primary lead to positive terminal of the battery and the black primary lead to the negative battery terminal. **Do not puncture cables, boots or nipples with test probes. Always use proper adapters. Puncturing the spark plug cables with a probe will damage the cables. The probe can separate the conductor and cause high resistance. In addition breaking the rubber insulation may permit secondary current to arc to ground.**

(3) Loosen the distributor hold-down mounting screw just enough so distributor housing can be rotated in its mounting.

(4) Start the engine and set the curb idle as shown in "Specifications." (Transmission in Neutral and Engine Hot).

(5) Aim the power timing light at the timing marks on the chain case cover. If the timing light flash occurs when the timing mark on the vibration damper is located ahead of specified degree mark on the timing plate. The timing is advanced. To adjust turn distributor housing **(Not Vacuum Chamber)** Counter clockwise. **Do not use vacuum chamber as a turning handle.** If the timing light flash occurs when the timing mark on the vibration damper is located past the specified degree mark on the timing plate. The timing is retarded. **To adjust turn distributor housing clockwise.** Timing may vary from the specified specifications a plus or minus 2-1/2° and still fall within range, but if the timing is checked it should be adjusted to the specification shown on the distributor charts.

(6) To check the distributor solenoid for proper operation, disconnect the wire at the carburetor. Aim

the power timing light at the timing marks on the chain case. The timing should advance at least 5-1/2° and the engine speed should increase.

(7) Stop the engine and tighten the distributor hold-down screw.

(8) Reconnect the wire at the carburetor throttle stop.

(9) Reconnect the vacuum hose to the distributor.

(10) Remove the timing light.

Ignition Timing (with C-744 Test Lamp)

(1) Connect C-744 test lamp between distributor primary terminal and battery positive post.

(2) Turn engine until number 6 exhaust valve is just closing; continue turning engine slowly until specified degree mark on the crankshaft pulley is at specified degree mark at timing case cover.

(3) Loosen distributor clamp bolt so distributor housing can be rotated with a slight drag, then turn distributor in the normal rotation until test lamp lights.

(4) Turn distributor against normal distributor rotation until test lamp goes out. **If test lamp lights immediately when connected, turn distributor against normal distributor rotation until light goes out.**

(5) Tighten distributor clamp bolt securely and remove test lamp. If the operation is performed properly the engine is timed to specifications. **If engine is turned beyond the timing mark, continue turning engine for two full revolutions of the crankshaft; this will place the distributor rotor in approximately the initial position.**

CAUTION: DO NOT reverse rotation of the crankshaft, if you have passed the timing mark as this would affect valve timing and distributor timing.

DISTRIBUTOR REMOVAL

(1) Disconnect vacuum hose at distributor.

(2) Disconnect primary lead wire at coil.

(3) Unfasten distributor cap retaining clips and lift off distributor cap.

(4) Scribe a mark on the edge of distributor housing to indicate position of the rotor as reference when reinstalling distributor.

(5) Remove distributor hold-down clamp screw and clamp.

(6) Carefully lift distributor from engine.

SHAFT AND BUSHING WEAR TEST

(1) Remove distributor rotor.

(2) Disconnect primary lead wire at distributor terminal. DO NOT LOOSEN inner nut that holds movable contact arm tension spring to terminal post.

(3) Clamp the ribbed section of distributor housing lightly in a vise equipped with soft jaws and attach dial indicator to body of distributor with the indicator plunger arm resting against movable contact arm at the rubbing block and with the rubbing block of contact arm on the highest point of cam lobe (Fig. 5).

(4) Place one end of a wire loop around the top of distributor shaft. Hook a spring scale in the other end of wire loop and pull on a line with the plunger of indicator gauge. Be sure wire loop on shaft end is down on the shaft to insure a straight pull and also that wire loop does not interfere with indicator or holding bracket. Apply a five pound pull and read the movement of plunger on indicator dial. (Be sure rubbing block of contact arm is on highest point of the cam lobe during this test.) If plunger movement exceeds .006 inch, replace bushings and/or distributor shaft, see "Distributor Disassembly."

DISTRIBUTOR DISASSEMBLY (Figs. 4 and 6)

(1) Remove distributor rotor. **The distributor cap clamp springs on Chrysler built distributors are held in place by peened metal around the openings and should not be removed.**

(2) Remove the two screws and lockwashers attaching vacuum advance unit to distributor housing and remove the advance unit.

(3) Remove primary lead wire and rubber grommet as an assembly. Push grommet towards inside of distributor to remove. **Do not pull on the wire.**

(4) Remove two screws, and lockwashers attaching the contact plate to housing and lift out the contact plate, contacts and condenser as an assembly.

(5) If side play exceeded .006 inch in "Shaft and Bushing Wear Test," replace housing and bushings or shaft and cam assembly as necessary.

ASSEMBLING THE DISTRIBUTOR

(1) Test operation of governor weights and inspect weight springs for distortion. Lubricate governor weights.

(2) Inspect all bearing surfaces and pivot pins for roughness, binding or excessive looseness.

(3) Install contact plate assembly. Align condenser lead, contact point spring, primary lead and install attaching screw.

(4) Install vacuum unit attaching screws and washers.

(5) Test contact arm spring tension, and adjust contact gap.

(6) Lubricate felt pad in the top of distributor cam with 1 drop of light engine oil and install rotor.

CONTACT ARM SPRING TENSION

(1) Hook a spring scale Tool MTU-36 on the breaker arm and pull in a straight line at a right angle

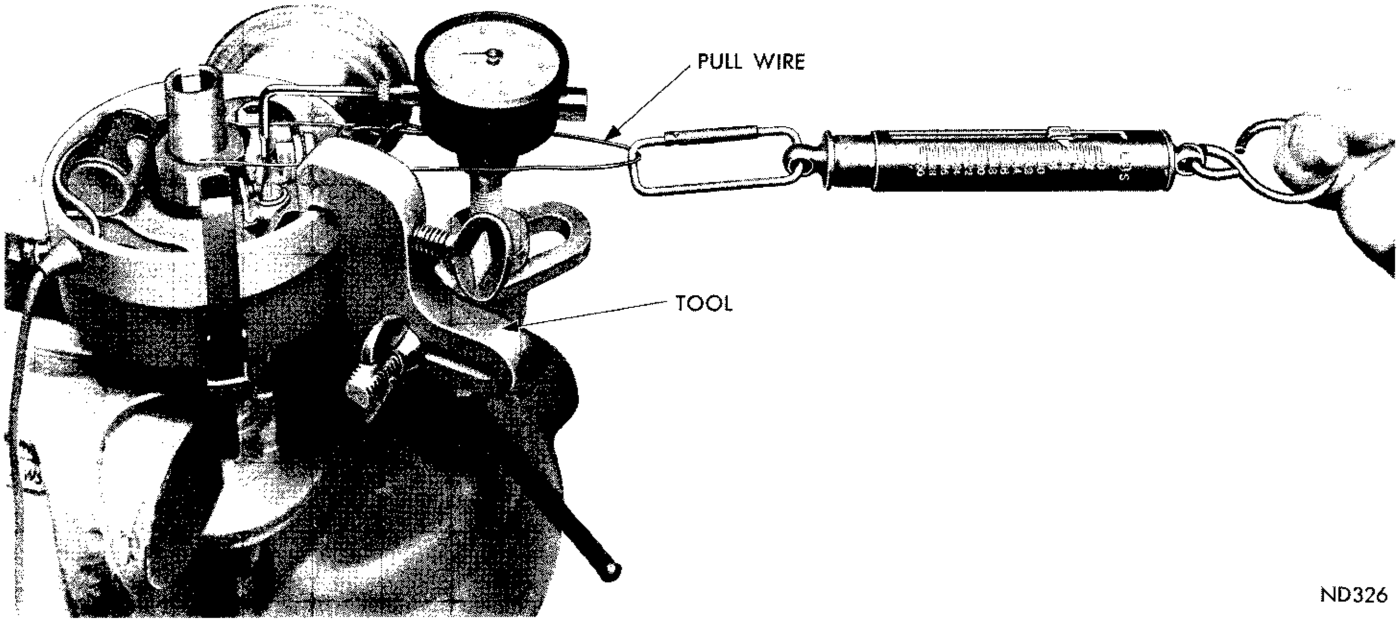


Fig. 5—Shaft and Bushing Wear Test

to the contact surfaces (Fig. 7). Take a reading as the contacts start to separate under the slow and steady pull of the scale. Spring tension should be as shown in specifications. If the reading is outside these limits, loosen the screw which holds the end of the contact arm spring, and slide the end of the spring in or out, as necessary.

(2) Tighten the screw and measure the spring tension. **Just the right amount of contact spring tension is very important for effective ignition and efficient engine performance. Spring tension that is too great, will cause excessive wear on the distributor cam and on the nylon block of the movable contact arm. Spring tension that is too weak, is unable to keep the contacts in contact with each other when they close. This is particularly true as engine speed is increased, causing high-speed misfiring.**

DISTRIBUTOR CONTACTS

Contact Wear

Contacts which have undergone several thousand miles of operation will have a rough surface, but this should not be interpreted as meaning that the contacts are worn out. If the contact area has a gray color and the roughness between the contacts matches so that a large contact area is maintained, the contacts will continue to provide satisfactory service.

However, if the contact area is oily, mottled or dark in color, or is badly pitted, the contacts will soon become unsatisfactory for further operation. Not only must they be replaced, but the ignition system and engine must be checked to determine the cause of the trouble so it can be eliminated. **Unless the condition causing contact burning or excessive pitting is corrected, new contacts will provide no better service than the old contacts.**

Burning of Contacts

Contact burning will result from high primary voltage, presence of oil or other foreign material, defective condenser and improper contacts adjustment. High voltage causes an excessively high current flow through the contacts which burns them rapidly. High voltage can result from an improperly adjusted or inoperative voltage regulator.

Oil or crankcase vapors which work up into the distributor and deposit on the contact surfaces will cause them to burn rapidly. This is easy to detect since the oil produces a smudgy line under the contacts. Clogged engine breather pipes permit crankcase pressure to force oil or vapors up into the distributor. Over-oiling of the distributor will also cause burning of the contacts.

If the contact opening is too small (cam angle too large), arcing will occur between the contacts resulting in low secondary voltage and engine miss.

High series-resistance in the condenser circuit will prevent normal condenser action so the contacts will burn rapidly. This resistance may be caused by a loose condenser mounting or lead connection, or by poor connections inside the condenser.

Pitting of Contacts

Contact pitting results from the transfer of material from one contact to the other so that a tip builds up on one contact while a pit forms in the other.

A small amount of pitting in several thousand miles is normal and does not affect the distributor operation. However, excessive pitting such as long sharp

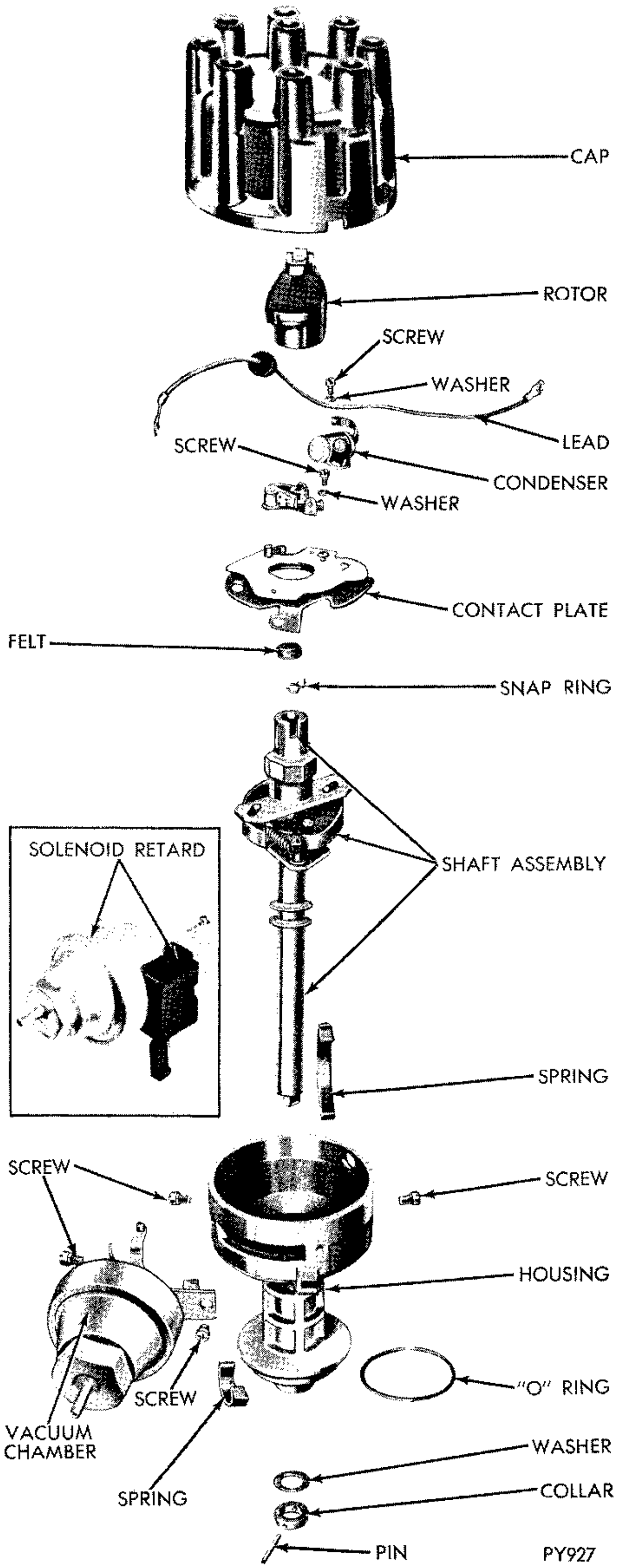


Fig. 6—Distributor (Disassembled View) (Typical)

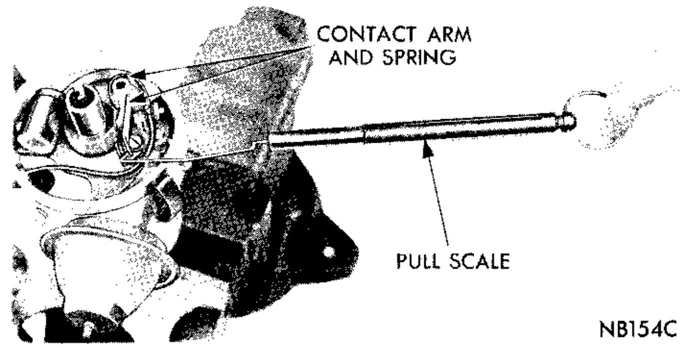


Fig. 7—Testing Contact Arm Spring Tension

spikes is harmful and causes arcing and voltage loss. Contacts with this condition should be replaced.

Excessive pitting can be due to too small a contact opening, high primary voltage or wrong condenser capacity. Inspect to be certain the condenser capacity, contact spring tension and contact gap are within specified ranges. See "Specifications".

INSTALLING AND ALIGNING CONTACTS

(1) Loosen terminal screw nut, and remove primary lead and condenser lead.

(2) Remove stationary contact lock screw and remove old contact set.

(3) Install a new contact set; the sleeve at one end of adjustable bracket fits over and pivots on upper contact plate mounting pin.

(4) Connect condenser and primary leads.

(5) Align contacts, if necessary, by bending stationary contact bracket only. **Never bend** movable contact arm to obtain alignment.

(6) After aligning contacts, adjust contact clearance to "Specifications," using dial indicator (Fig. 8). Recheck contact arm spring tension.

(7) Test dwell angle to show proper degree of closure. See Paragraph, "Distributor Contact Dwell."

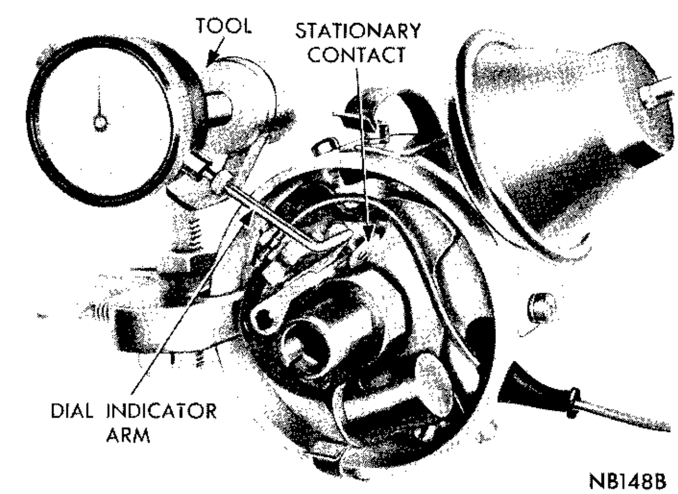


Fig. 8—Adjusting Contact Clearance with Indicator

The lock screw should be loosened just enough so stationary contact bracket can be moved with a slight drag; otherwise, it will be difficult to set contacts accurately. After setting contacts to the correct gap, tighten stationary bracket lock screw.

DISTRIBUTOR LUBRICATION

(1) Lubricate felt wick under the rotor in top of distributor cam with 1 drop of SAE 10W oil.

(2) Wipe the distributor cam free of dirt and old grease with a clean lintless cloth. Apply a light film of new distributor cam lubricant Number 1473595 or equivalent over the entire cam surface. Lubricant must be able to adhere to the cam surface thereby resisting being thrown from the cam by centrifugal force, must not melt at operating temperatures and must not harden or dry out with age, must not chemically react or be affected by ozone or cause corrosion or pitting of the metal, must possess moisture control properties to prevent rust formation on the cam.

CAUTION: A thin film is all that is required. Do not over-lubricate. Excess grease will be thrown from the distributor cam when engine is running. If this grease strikes the contacts, arcing and burning of contacts will result.

TESTING DISTRIBUTOR ADVANCE

Centrifugal Advance Curve

Mount distributor assembly (less cap and rotor) in a reliable stroboscope-type distributor tester and proceed with tests as follows: **Clamp around ribbed section of distributor housing. The bottom section of distributor housing is not a machined surface and concentricity would be affected, causing a wobble.**

(1) Turn Tach-Dwell switch to 8 "LOBE" position and Motor Switch to correct direction of rotation. Refer to "Distributor Specifications" in this manual.

(2) Turn battery switch "ON."

(3) Regulate tester speed control to operate distributor at 200 distributor rpm.

(4) Align the "O" of the distributor tester degree ring with any one of the arrow flashes.

(5) Adjust tester speed control to operate distributor at speeds called for under "Specifications" and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(6) If advance is not according to specifications, replace with a new distributor shaft with correct calibration (shaft, cam, yoke, governor weights and springs as an assembly) or with a new distributor assembly, less cap and rotor.

Do Not attempt calibration of Chrysler Built distributors.

Vacuum Diaphragm Leak Test

With distributor mounted in distributor tester and with vacuum unit attached to distributor, proceed as follows:

(1) Place thumb over end of vacuum pump and hose and adjust regulator control knob to give a reading of 20 inches with hose closed off to be sure tester hose does not leak.

(2) Attach tester vacuum pump hose to the tube on the distributor vacuum unit. The vacuum gauge should hold on maximum vacuum obtainable if no leak exists.

(3) Observe contact plate while performing leak test to test response of contact plate. There should be instant response to the pull of the diaphragm, moving the plate without a drag or bind.

(4) If leakage is indicated, replace vacuum unit assembly.

Vacuum Advance Curve

Connect tester vacuum pump hose to the distributor vacuum advance unit and perform operations 1 through 4 under "Centrifugal Advance Curve." Then proceed as follows:

(1) Turn tester vacuum pump "ON." Adjust vacuum pump regulator to vacuum test specifications. See "Specifications" and observe arrow flashes on tester degree ring to determine degrees of advance.

(2) If vacuum advance is above or below specifications, replace vacuum advance unit. Retest vacuum advance curve.

DISTRIBUTOR INSTALLATION

(1) Position distributor on engine. Align rotor with marks previously scribed on distributor housing. **Clean top of cylinder block to insure a good seal between distributor base and block.**

(2) Engage tongue of distributor shaft with slot in distributor and oil pump drive gear. **If engine has been cranked while distributor is removed, it will be necessary to establish the proper relationship between distributor shaft and NO. 1 piston position as follows:**

(a) Rotate crankshaft until number one piston is at top of compression stroke.

(b) Rotate rotor to the position of number one distributor cap terminal.

(c) Lower distributor into the opening, connect primary lead and install distributor cap. Make sure all high tension wires "snap" firm in cap towers. Install distributor hold-down clamp screw. Tighten screw finger tight.

(d) Connect secondary lead of a Power Timing Light to NO. 1 spark plug (using proper adapter). Connect red primary lead to positive terminal of battery and black primary lead to negative battery terminal.

(e) Start and operate engine at idle speed. Rotate distributor housing so that specified timing mark and pointer are in alignment (Moving the distributor housing against shaft rotation advances timing and with shaft rotation retards timing).

(f) Tighten distributor clamp screw after timing has been set and recheck timing adjustment with a Power Timing Light.

(g) If timing is correct, connect vacuum hose to distributor and remove timing light from engine.

IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor. When testing the coil for output, include resistor in tests.

Inspect coil for external leaks and arcing. Always make two tests when testing the coil. One when the coil is cold, the other after the coil has been warmed up.

Test coil according to coil tester Manufacturer's instructions. Test coil primary resistance. Test ballast resistor resistance. Test coil secondary resistance. Replace any coil and ballast resistor that does not meet specifications.

Every time an ignition coil is replaced because of a burned tower, carbon tracking or any evidence of arcing at the tower, the nipple or boot on the coil end of the secondary cable, replace cable. Any arcing at the tower will carbonize the nipple so that placing it on a new coil will invariably cause another coil failure.

If the secondary cable shows any signs of damage, the cable should be replaced with a new cable with a neoprene nipple since the old cable can cause arcing, and therefore, ruin a new coil.

BALLAST RESISTOR

The ballast resistor is a compensating resistance in the ignition primary circuit. During low speed operation, when the primary circuit current flow is high, ballast resistor temperature rises, increasing resistance. This reduces current flow, thereby prolonging ignition contact life. At high speed operation, when primary current flow is low, the ballast resistance cools off allowing more current flow, which is required for high speed operation. During starter operation, the ballast resistor is bypassed, allowing full battery voltage to the ignition primary circuit.

SPARK PLUGS

Spark plug appearance or conditions can reflect a wide variety of engine conditions as follows:

Normal Conditions

Normal conditions (Fig. 9). This plug has been running at the correct temperature in a "healthy" engine. The few deposits present will probably be light tan or gray in color with most regular grades of commercial gasoline. Electrode burning will not be in evidence; gap growth will average not more than about .001"/1000 miles. Chances are the plug, as pictured, could be cleaned, the gap electrodes filed, regapped and reinstalled with good results.

Cold Fouling

Cold fouling or carbon deposits (Fig. 10). This dry black appearance is fuel carbon and can be due to over rich fuel-air mixture, possibly resulting from a faulty choke, clogged air cleaner, improper carburetor idle adjustment, or dirty carburetor. However, if only one or two plugs in a set are fouled like this it is a good idea to check for sticking valves or faulty ignition cables. This condition also results from prolonged operation at idle. If the vehicle is operated extensively at idle and low speeds, improved plug service will be obtained by using the next step hotter spark plugs.

Wet Fouling

Wet fouling (Fig. 11) tells you that the plug has drowned in excess oil. In an old engine, suspect worn rings or excessive cylinder wear. Use of a hotter plug may relieve such fouling, but plugs can't take the place of needed engine overhaul. **Remember that "break-in" fouling of new engines may occur before normal oil control is achieved. In new or recently overhauled jobs, such fouling plugs can be cleaned and reinstalled.**

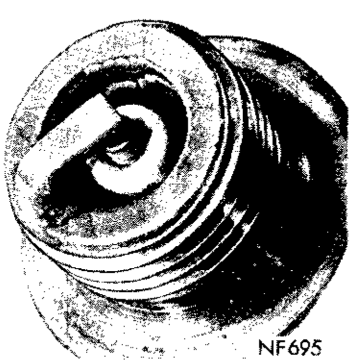


Fig. 9—Normal Conditions

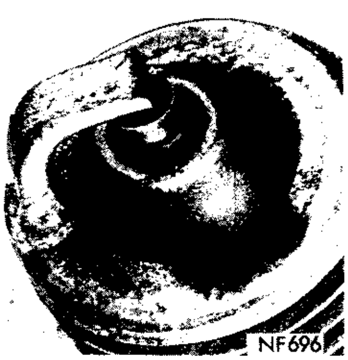


Fig. 10—Cold Fouling

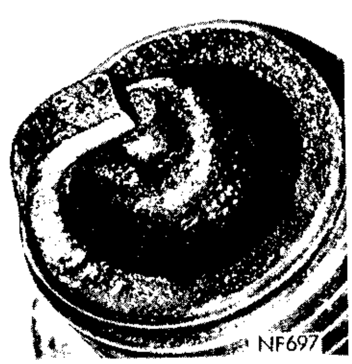


Fig. 11—Wet Fouling

Fig. 12—Overheating

Overheating

Overheating (Fig. 12) is indicated by a white or light gray insulator which appears "blistered." Electrode gap wear rate will be considerable in excess of .001"/1000 miles. This suggests that a cooler heat range should be used . . . however, over-advanced ignition timing detonation and cooling system stoppages can also overheat the correct spark plug heat ranges.

Cleaning and Regapping

Carefully clean the spark plugs in an abrasive type cleaner. Use a pin type feeler gauge to check spark plug gap. Reset gaps to .035 inch. **Before setting spark plug gap, file center electrode flat, make adjustment by bending ground (side) electrode, never bend the center electrode.**

When installing spark plugs, tighten to 30 foot-pounds.

EXTERIOR LIGHTING

HEADLIGHTS

INDEX

GENERAL INFORMATION

The dual headlight system consists of four sealed beam bulbs.

The two outboard bulbs are of the two filament type for low and high beam and are marked by a numeral 2 molded in the lens.

The two inboard bulbs have only one filament and are marked with a numeral 1 molded in the glass.

The bulbs cannot be installed wrong as mounting lugs for number one (1) and number two (2) bulbs are offset at different angles.

On high beam, the number one (1) bulbs provide high intensity "reach" down the highway and an off focus filament in number 2 bulbs provide "body" light which illuminates the side of the road, ditches, etc. On low beam only, number 2 bulbs operate.

Manual on and off operation is controlled by a switch mounted on the far left of the instrument panel, while manual operation of the high-low beam is controlled with a foot operated dimmer switch mounted on the left side of the floor pan.

Two automatic controls are offered as optional equipment on all models to control the on-off, high-low operation of the headlight system. When both units are installed on the vehicle, the operation of the headlights becomes completely automatic. The device to control on-off operation is called "Safeguard Sentinel". See Accessories, Group 1. The automatic control for the high-low beam operation is called "Automatic Headlight Beam Changer". See Accessories, Group 1.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HEADLIGHTS DIM (engine running above idle)	(a) High resistance in lighting circuit. (b) Faulty sealed beam units. (c) Faulty voltage regulator.	(a) Test lighting circuit including ground connection. Make necessary repairs. (b) Replace sealed beam units. (c) Test voltage regulator and alternator. Make necessary repairs.
LIGHTS FLICKER	(a) Loose connections or damaged wires in lighting circuit. (b) Light wiring insulation damaged producing momentary short.	(a) Tighten connections and check for damaged wiring. (b) Test wiring and replace or tape damaged wires.
LIGHTS BURN OUT FREQUENTLY	(a) High voltage regulator setting. (b) Loose connections in lighting circuit.	(a) Adjust or replace voltage regulator. (b) Tighten connections.

Condition	Possible Cause	Correction
LIGHTS WILL NOT LIGHT	(a) Discharged battery.	(a) Recharge battery and correct cause.
	(b) Loose connections in lighting circuit.	(b) Tighten connections.
	(c) Burned out lamps.	(c) Replace bulbs or sealed beam unit.
	(d) Open or corroded contacts in headlight switch.	(d) Replace headlight switch.
	(e) Open or corroded contact in dimmer switch.	(e) Replace dimmer switch.
HEADLIGHTS DIM (engine idling or shut off)	(a) Partly discharged battery.	(a) Charge battery.
	(b) Faulty battery.	(b) Test battery. Replace if necessary.
	(c) High resistance in light circuit.	(c) Test headlight circuit including ground connection. Make necessary repairs.
	(d) Faulty sealed beam units.	(d) Replace sealed beam units.
	(e) Corroded battery terminals.	(e) Clean terminals.

SERVICE PROCEDURES

PRE-AIMING INSTRUCTIONS

(1) Test dimmer switch operation.

(2) Observe operation of high beam indicator light mounted in instrument cluster.

(3) Inspect for badly rusted or faulty headlight assemblies. These conditions must be corrected before satisfactory adjustment can be made.

(4) Place vehicle on level floor.

(5) Adjust front suspension height as necessary.

(6) Inspect tire inflation.

(7) Rock vehicle sideways to allow vehicle to assume its normal position.

(8) If gasoline tank is not full, place a weight in trunk of vehicle to simulate weight of a full tank (6-1/4 pounds per gallon).

(9) There should be no other load in vehicle other than driver or a substituted weight of approximately 150 pounds placed in driver's position.

(10) Remove each headlight trim panel. Do not remove sealed beam retainer rims.

(11) Thoroughly clean headlight lenses.

COMPENSATING THE AIMERS

(1) Place transit on floor in line with vertical centerline of right front wheel (Fig. 1). Place split image target in like position at right rear wheel.

(2) Adjust range screw on transit until target split image coincides or merges into one unbroken line.

Make sure that line of sight is perpendicular from eye to viewing port of transit and that target image is centered in viewing port of transit.

(3) Turn dial on side of transit until bubble in spirit level is centered.

(4) When bubble is centered, note "plus" or "minus" reading on compensator scale. This figure indicates degree of slope of floor and must be transferred to each aimer.

(5) With a screw driver, turn adjusting slot of floor level compensator in each aimer, until correct plus or minus figure (or fractional part) appears in proper window (Fig. 2).

TESTING AIMER CALIBRATION (Fig. 3)

(1) Using carpenter or stone mason level of known accuracy, locate a true vertical plate glass window or smooth surface.

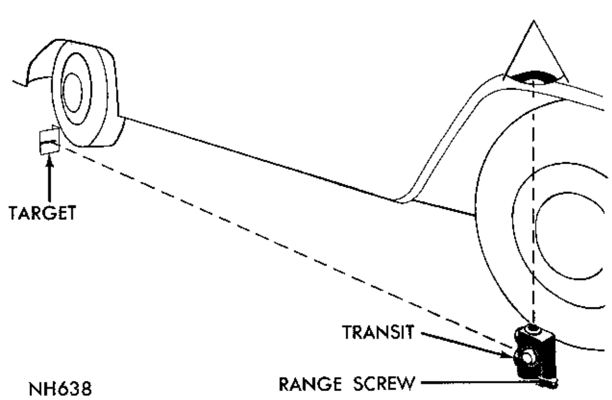


Fig. 1—Determining Slope of Floor

Fig. 2—Adjusting Floor Level Compensators

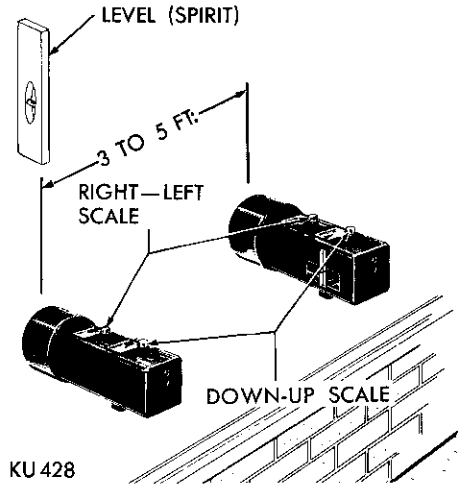


Fig. 3—Checking Aimer Calibration

(2) Set **DOWN-UP** pointer on **DOWN 2.**

(3) Set **RIGHT-LEFT** pointer and floor level compensator at "O."

(4) Secure aimers to glass or smooth surface three to five feet apart so split image targets can be located in viewing ports.

(5) If bubble is centered in glass dial, vertical calibration is correct. If bubble is not centered, make **DOWN-UP** adjustment by rotating level adjusting screw until bubble is centered in spirit level.

(6) The horizontal aim is correct if targets on opposite aimers are aligned in viewing ports. If targets are not aligned in viewing ports, rotate mirror adjusting screw until target split image becomes aligned.

MOUNTING AND ADJUSTING THE AIMERS

(1) While holding an aimer in alignment with lens of one outer headlight, bring aimer up to and against headlight lens.

Make certain that headlight lens pads are making full contact with aimer mounting flange and that aimer target is facing inboard.

(2) Push release lever forward (to expel air from suction cup) and while holding aimer firmly against headlight aiming pads, slowly pull release lever back until spring lock engages in the slot, (Fig. 4).

(3) Mount second aimer on other side of vehicle, in the same manner.

(4) On each aimer, set pointer to numeral 2 on **DOWN** side of **DOWN-UP** scale.

(5) On each aimer position pointer, of **RIGHT-LEFT** scale, at **2-RIGHT.**

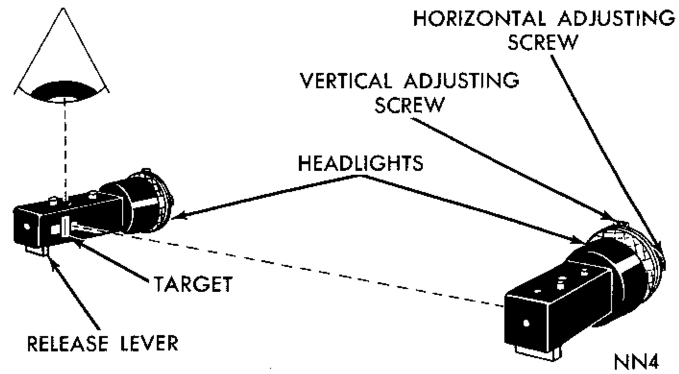


Fig. 4—Mounting and Adjusting Aimers

MEASURING HEADLIGHT AIM

Horizontal Test

Turn the RIGHT-LEFT scale knob until the split image is in alignment. If the **RIGHT** or **LEFT PORTION** of scale exceeds the following values, lights should be aimed.

Values given represent inches at 25 feet.

	Left	Right
No. 1 Unit	4	4
No. 2 Unit	0	4

Vertical Test

Turn **DOWN-UP** scale knob until the spirit level is centered. If **DOWN** or **Up** portion of the scale exceeds the following values, the lights should be aimed.

No. 1 Unit	1/2 down to 3-1/2 down
No. 2 Unit	1/2 down to 3-1/2 down

Horizontal Adjustment

(1) With pointer of **RIGHT-LEFT** scale still set at **2-RIGHT,** sight through aimer viewing port.

Make sure that line of sight is perpendicular from eye to viewing port of aimer and that target image is centered in viewing port of aimer.

(2) While sighting through viewing port of aimer, turn horizontal adjusting screw on headlight until split target image line merges into one unbroken line. To remove backlash, be sure to make a final adjustment by turning headlight horizontal adjusting screw in a clockwise direction (Fig. 5).

(3) Make horizontal adjustment on other side of vehicle in same manner.

Vertical Adjustment

(1) Turn vertical adjusting screw on headlight in a counterclockwise direction to bring bubble of spirit level on aimer to vehicle side of center. Use care to avoid disturbing installed position of aimers. Then turn screw clockwise until bubble is centered for correct aim and elimination of backlash.

(2) Make vertical adjustment on other side of vehicle in same manner.

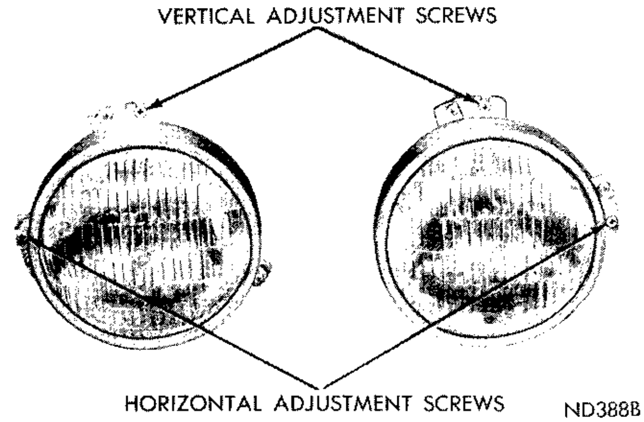


Fig. 5—Headlight Adjusting Points

(3) Inspect target alignment on each side and readjust horizontal aim, if necessary.

Proceed to adjust inboard units by repeating outlined procedure. Install headlight trim panels.

Remove aimers by releasing spring lock at rear (bottom) of aimer and pushing release lever forward. Do not attempt to remove aimers by pulling them away from headlight lens—slide suction cup downward and away from lens.

SEALED BEAM REPLACEMENT (ALL MODELS)

The lens, filament and reflector are sealed into one unit which can be removed as follows:

(1) Remove screws from headlight panel and remove panel.

(2) Remove screws from interior retaining ring, and remove ring. **Do not disturb headlight aimer screws.**

(3) Pull out sealed beam unit and unplug connector, pulling it straight off.

(4) Install new sealed beam unit.

(5) Install unit retaining ring.

(6) Aim the headlight and install headlight panel.

VISUAL HEADLIGHT ADJUSTMENT

Low Beam

Place vehicle on a known level floor 25 feet from aiming screen or light colored wall.

Four lines are required on screen or wall (Fig. 6).

(a) A horizontal line at the level of centers of headlights, line number 3.

(b) A center vertical line which must be lined up with center of hood, line number 5.

(c) A vertical line on left of screen or wall in line with center line of left headlight line number 4.

(d) A vertical line on right of screen or wall in line with center line of right headlight, line number 6.

Remove headlight door. Adjust top adjusting screw for vertical adjustment, adjust side screw for horizontal adjustment. (See Fig. 5).

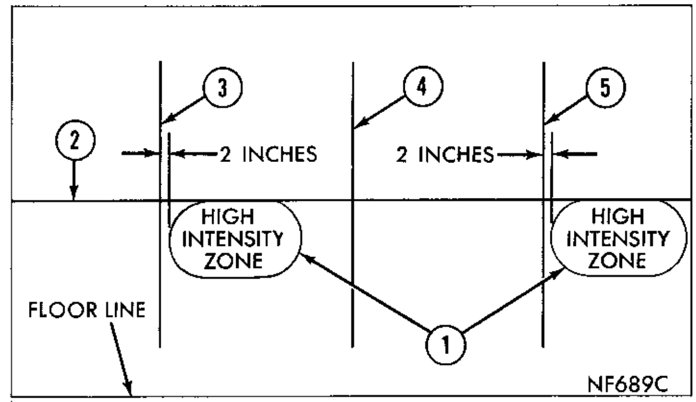


Fig. 6—Low Beam Adjustment Pattern

Adjust low beam of headlights to match the patterns in Figure 6 and the corresponding numbers listed below:

(1) Lower beam pattern of both headlights.

(2) Horizontal line at level of headlight centers.

(3) Vertical line in line with center of left headlight.

(4) Vertical line in line with center of hood.

(5) Vertical line in line with center of right headlight.

High Beam

Adjust high beam of headlights to match the patterns in Figure 7 and the corresponding numbers listed below:

(1) High beam pattern of both headlights.

(2) Horizontal line at level of headlight centers.

(3) Vertical line in line with center of left headlight.

(4) Vertical line in line with center of hood.

(5) Vertical line in line with center of right headlight.

FRONT FENDER TURN SIGNAL INDICATOR LAMPS—CHRYSLER (Fig. 8)

Removal

(1) From under front fender remove one cap nut attaching lamp to fender.

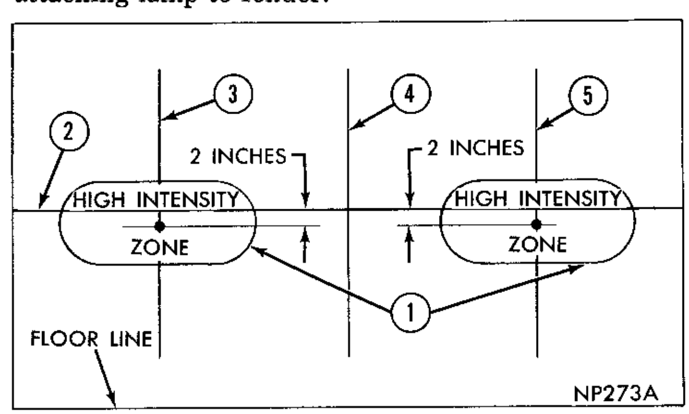


Fig. 7—High Beam Adjustment Pattern

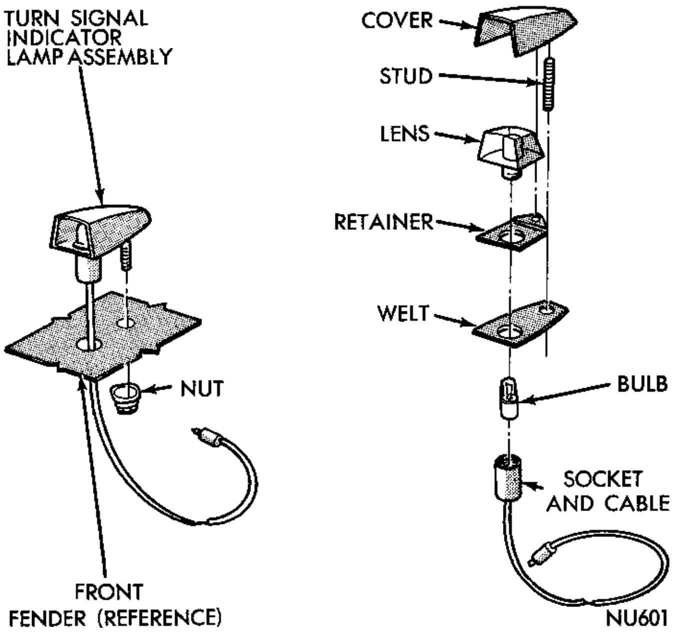


Fig. 8—Front Fender Turn Signal Indicator Lamps—Chrysler

(2) Disconnect lamp socket connector from harness connector and lift lamp up to remove.

To replace bulb, unscrew lamp socket from lens and lift out bulb.

Installation

(1) Enter lamp connector through hole in fender and position lamp and gasket on fender.

(2) Install attaching nut and connect lamp connector to harness.

FRONT FENDER TURN SIGNAL INDICATOR LAMP—Chrysler—Except Station Wagons (Fig. 9)

Removal

(1) Disconnect lamp connector from front end lighting harness.

(2) Remove one screw attaching lamp cover to fender.

(3) Pull lamp and wire assembly up and out of fender.

To replace lamp bulb, remove one screw attaching lamp bracket to lamp cover; snap out lamp lens insert and replace bulb.

Installation

(1) Enter wire and lamp connector through opening in top of fender.

(2) Connect lamp connector to harness connector.

(3) Position lamp on fender and install attaching screw.

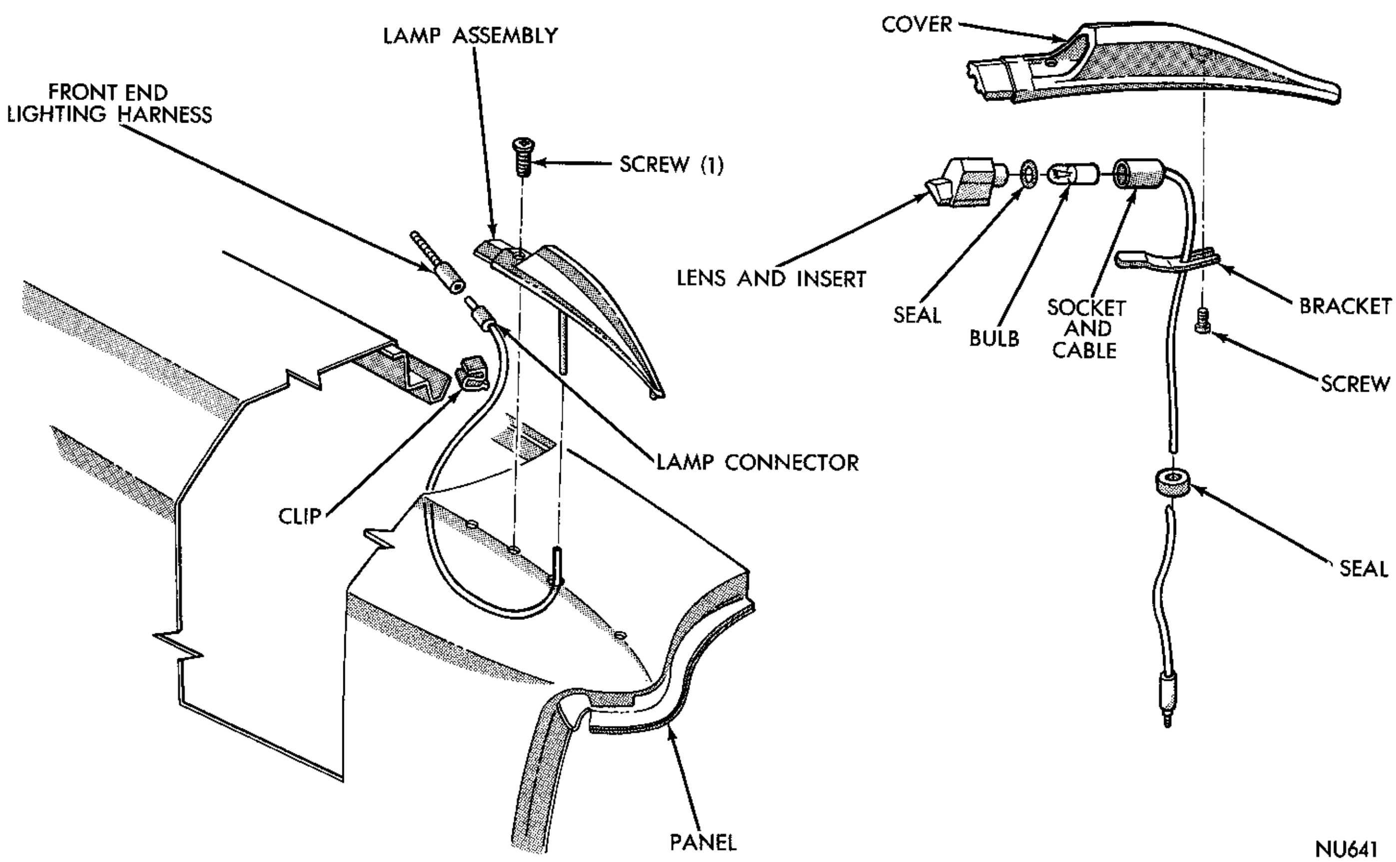


Fig. 9—Front Fender Turn Signal Indicator Lamps—Chrysler—Except Station Wagons

FRONT FENDER TURN SIGNAL INDICATOR LAMPS—Imperial (Fig. 10)

Removal

(1) From under front fender, remove two nuts from indicator lamp cover studs.

(2) Disconnect lamp socket connector from harness connector.

(3) Pull lamp and wiring connector up through top of fender.

To replace lamp bulb, remove two screws attaching lamp lens to housing, unscrew bushing from harness connector and remove bulb.

Installation

(1) Position lamp and wiring connector on fender and install attaching nuts to housing studs.

(2) Connect lamp wiring connector to harness connector.

FRONT BUMPER, PARK AND TURN SIGNAL LAMPS—Chrysler (Fig. 11)

Removal

(1) From under front bumper, disconnect lamp socket connector from harness connector, remove two screws and remove lamp.

To remove lens or bulb, remove two screws from face of lens and remove lens.

Installation

(1) Position lamp on bumper, install attaching screws and connect lamp connector to harness.

FRONT BUMPER, PARK AND TURN SIGNAL LAMPS—Imperial (Fig. 12)

Removal

(1) Remove two screws and lamp bezel.

(2) Remove two screws and pull out lamp assembly, disconnect lamp connector and remove lamp.

To replace lens or bulb, remove bezel and the two screws attaching lens to lamp housing.

Installation

(1) Position lamp on front bumper, connect lamp connector to harness connector.

(2) Install lamp bezel and two attaching screws.

FRONT GRILLE, PARK AND TURN SIGNAL LAMPS—Chrysler (Fig. 13)

Removal

(1) Remove three screws and washers and pull lamp

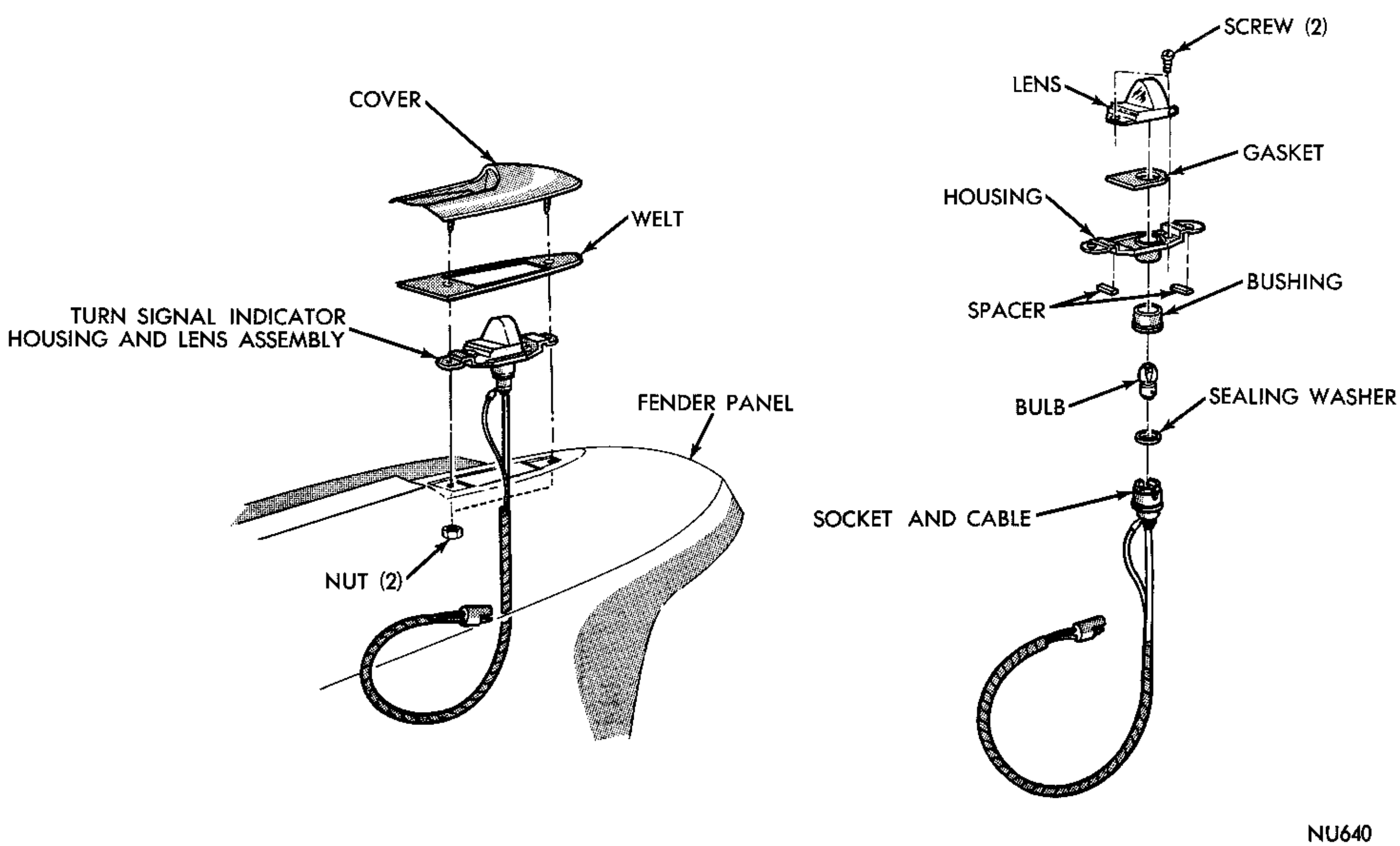


Fig. 10—Front Fender Turn Signal Indicator Lamps—Imperial

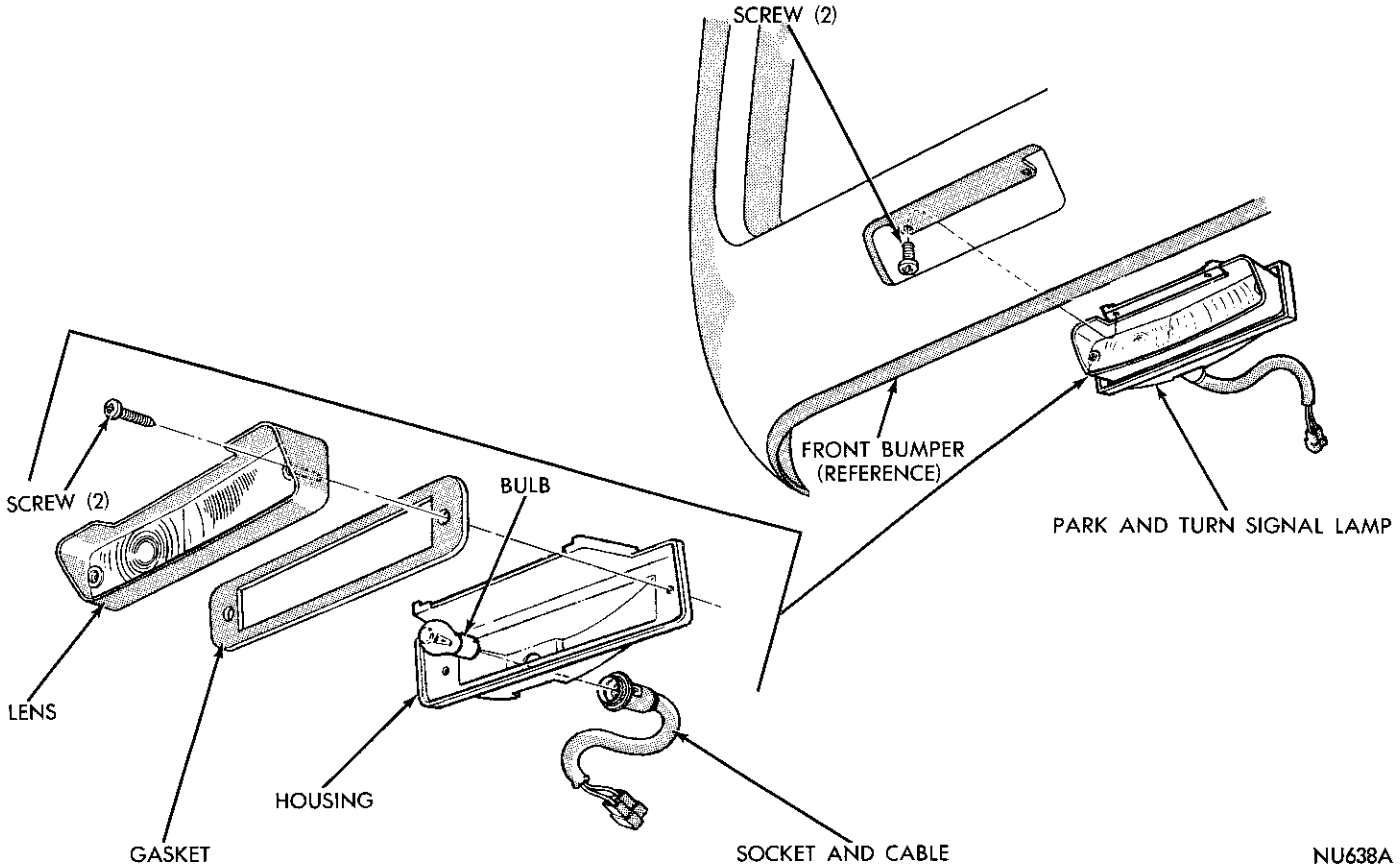


Fig. 11—Front Bumper, Park and Turn Signal Lamps—Chrysler

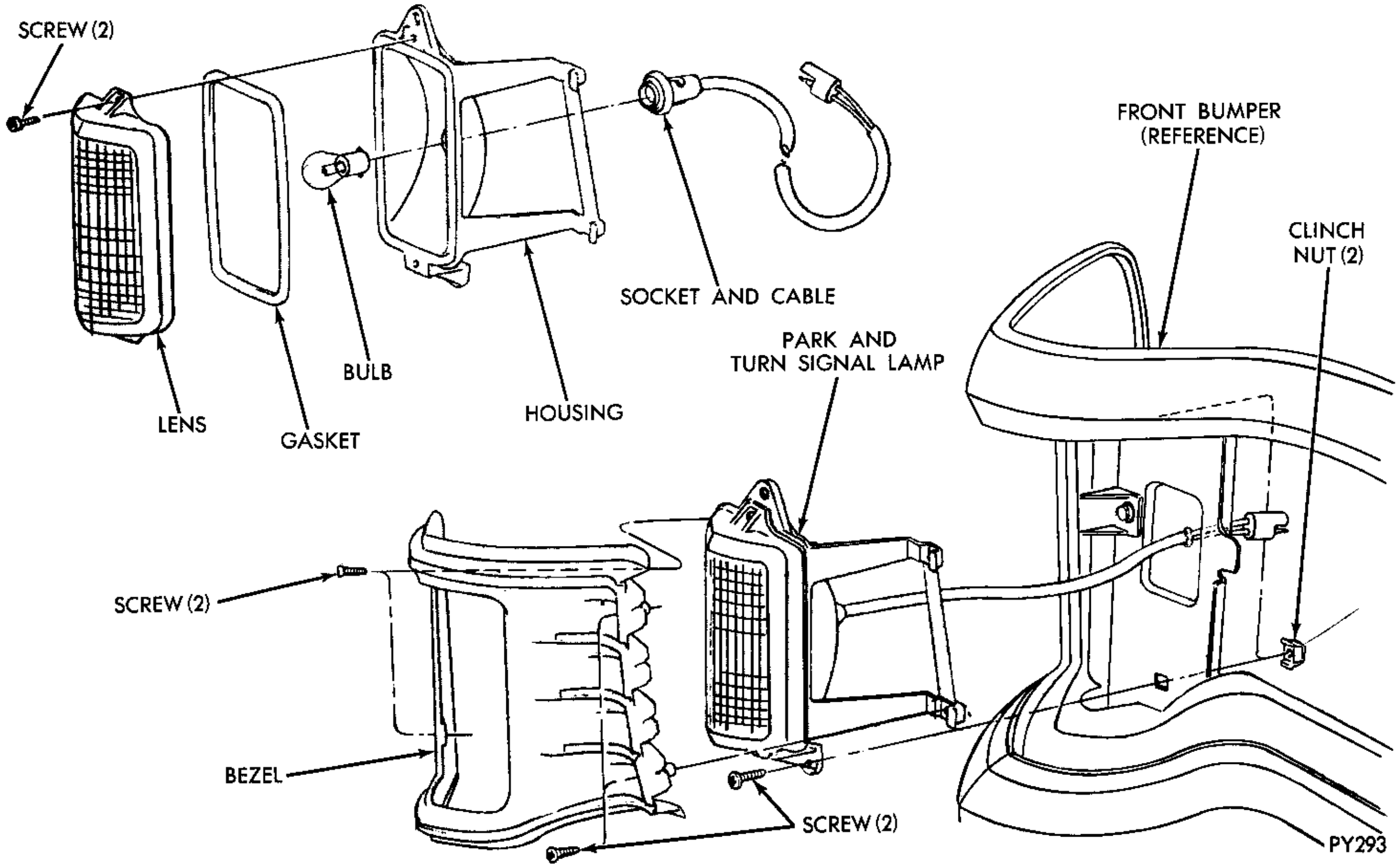


Fig. 12—Front Bumper, Park and Turn Signal Lamps—Imperial

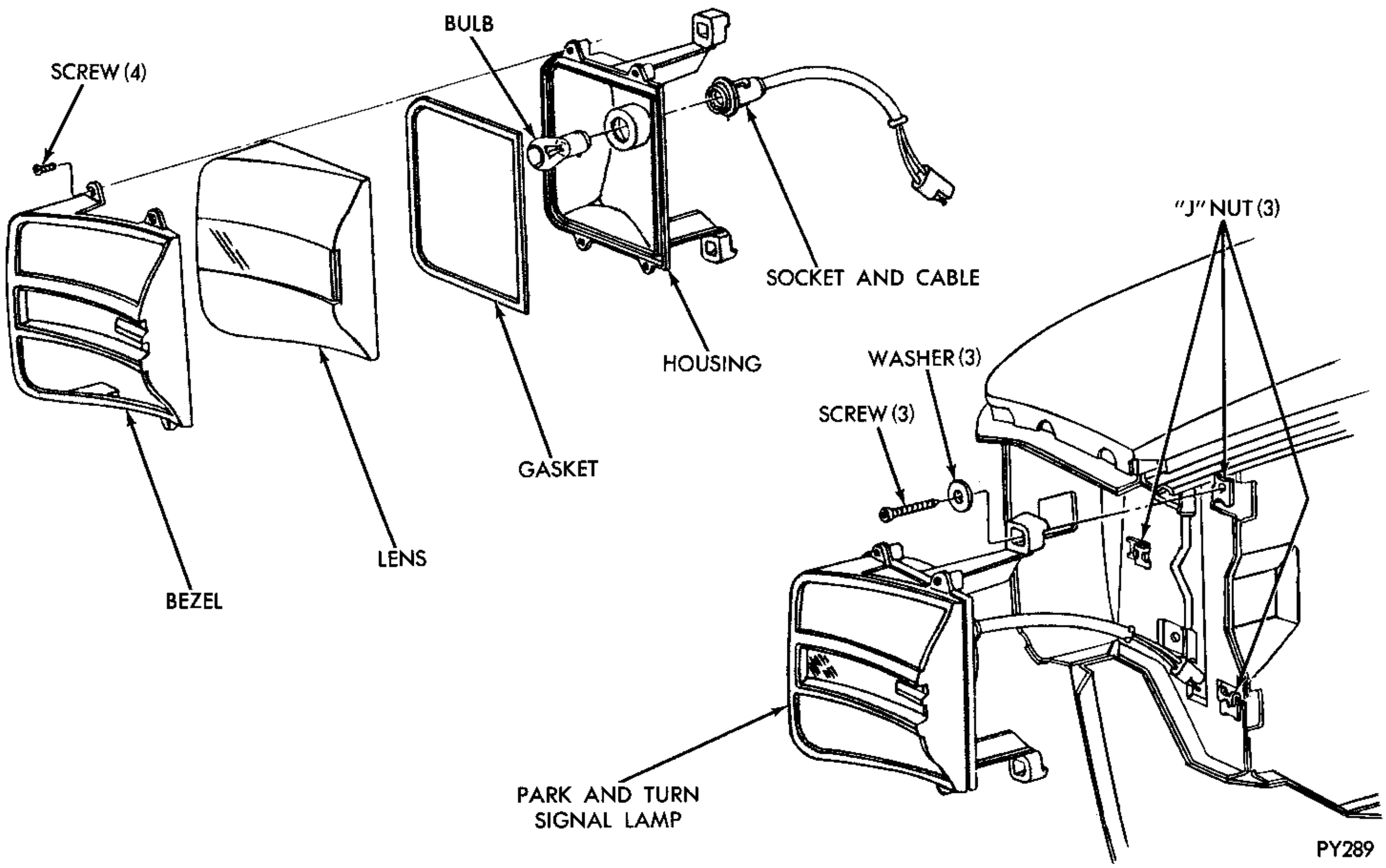


Fig. 13—Front Grille, Park and Turn Signal Lamps—Chrysler

away from grille to disconnect lamp socket connectors from harness connector.

To replace lens or bulb, remove four screws attaching lens and bezel to lamp housing.

Installation

(1) Position lamp on front grille, connect lamp connector to harness connector and install lamp attaching screws.

FRONT FENDER CORNERING AND SIDE MARKER LAMPS—Chrysler (Fig. 14)

Removal

(1) Remove two nut assemblies and remove lamp bracket.

(2) Pull lamp away from fender and disconnect lamp connectors from front end harness and remove lamp.

To replace lens or bulbs, remove two screws from lens face and remove lens.

Installation

(1) Position bracket over lamp studs and install nut assemblies.

(2) Position lamp and connect lamp socket connectors to harness.

FRONT FENDER CORNERING AND SIDE MARKER LAMPS—Imperial (Fig. 15)

Removal

(1) From under front fender remove two nut assemblies and remove lamp bracket.

(2) Pull lamp away from fender, disconnect lamp socket connectors from harness connectors and remove lamp.

To replace lens or bulb, remove two screws attaching bezel and lens to lamp and remove bezel and lens.

Installation

(1) Position lamp on fender and install lamp bracket and two attaching nuts.

(2) Connect lamp connectors to harness connectors.

FRONT FENDER SIDE MARKER LAMP AND REFLECTOR—Chrysler (Fig. 16)

Removal

(1) From under the fender remove two capnuts and remove lamp bracket.

(2) Pull lamp away from fender and disconnect socket connector from harness connector and remove lamp.

To replace lens or bulb, remove two lens attaching screws.

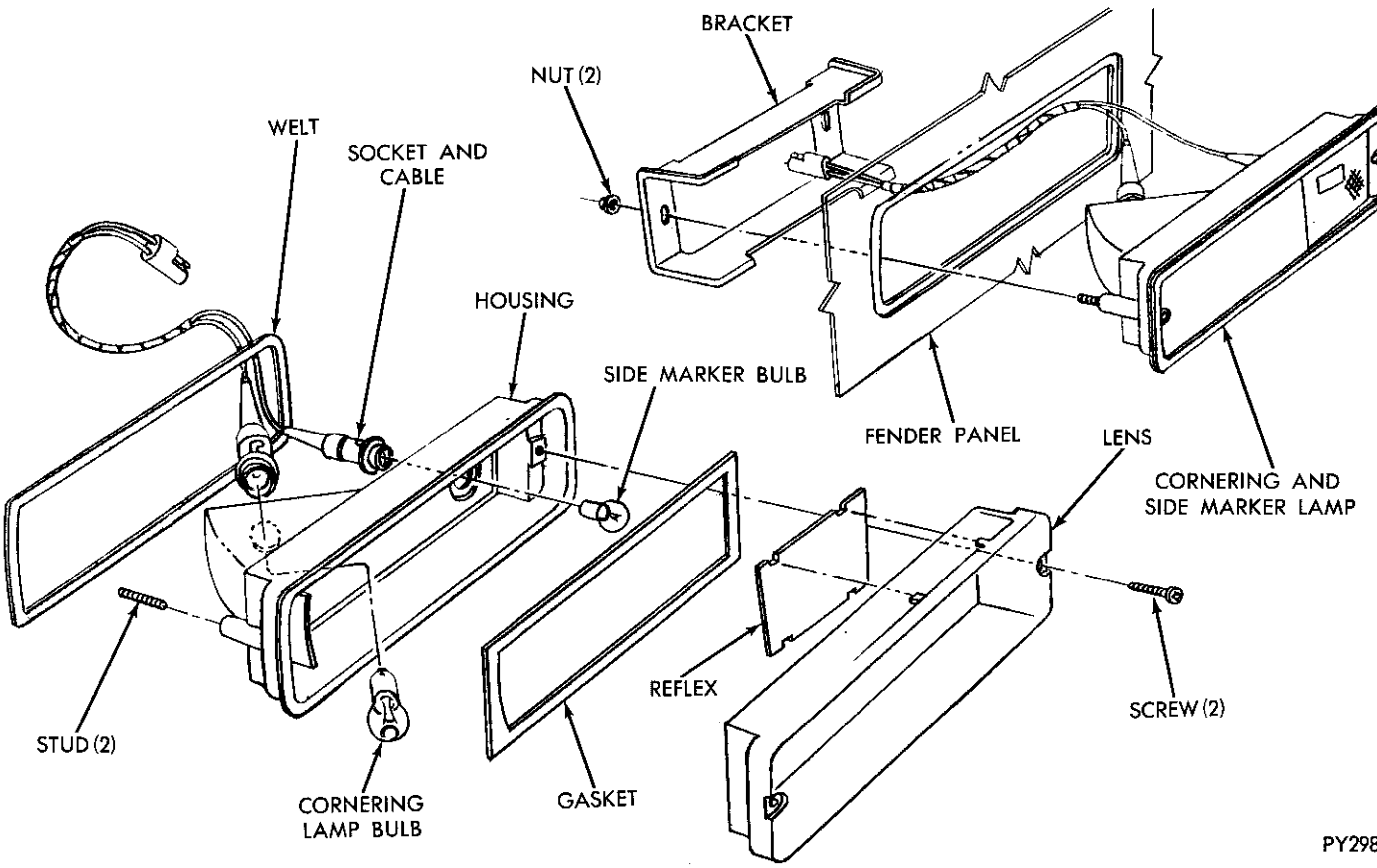


Fig. 14—Front Fender Cornering and Side Marker Lamps—Chrysler

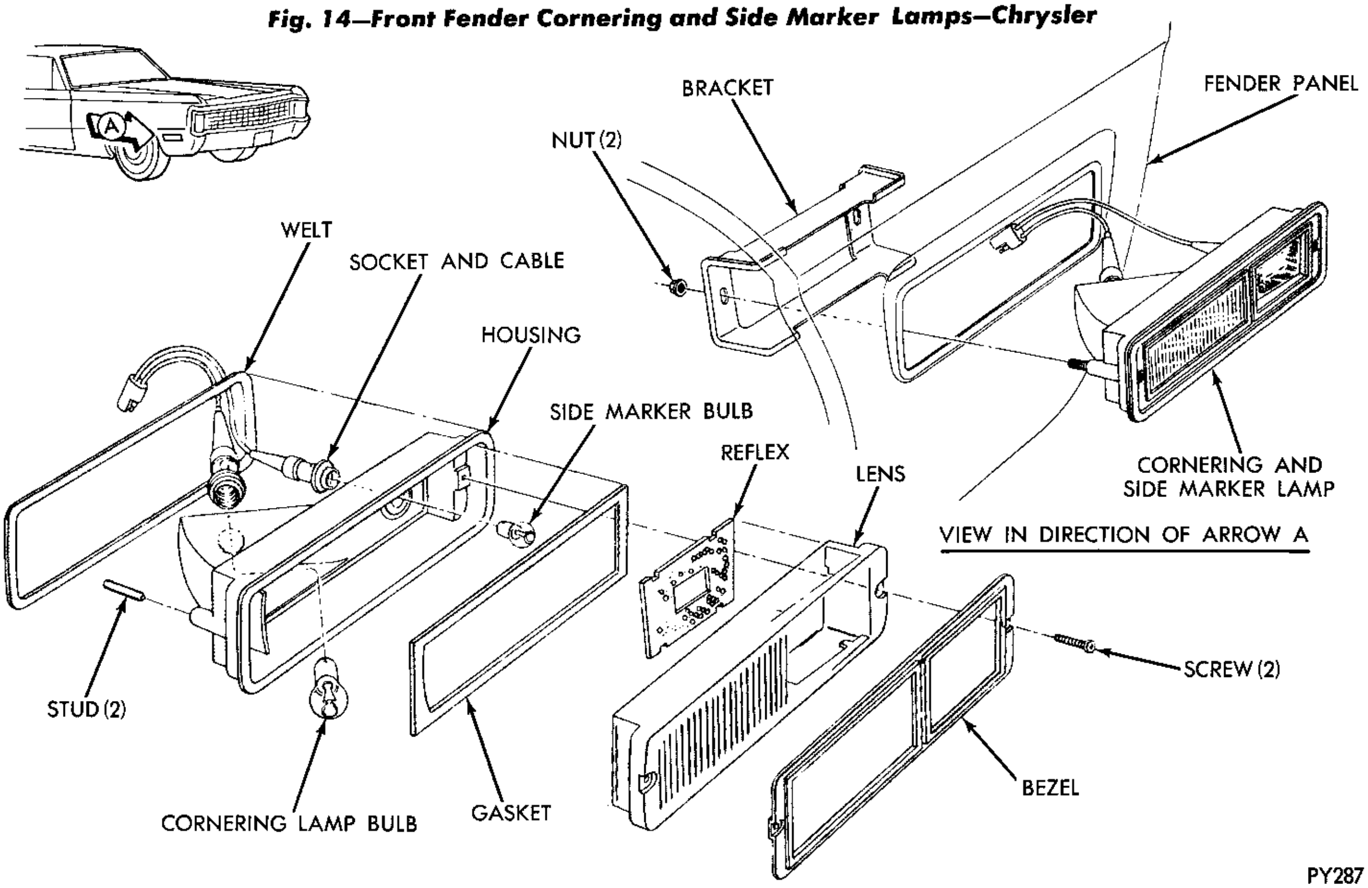


Fig. 15—Front Fender Cornering and Side Marker Lamps—Imperial

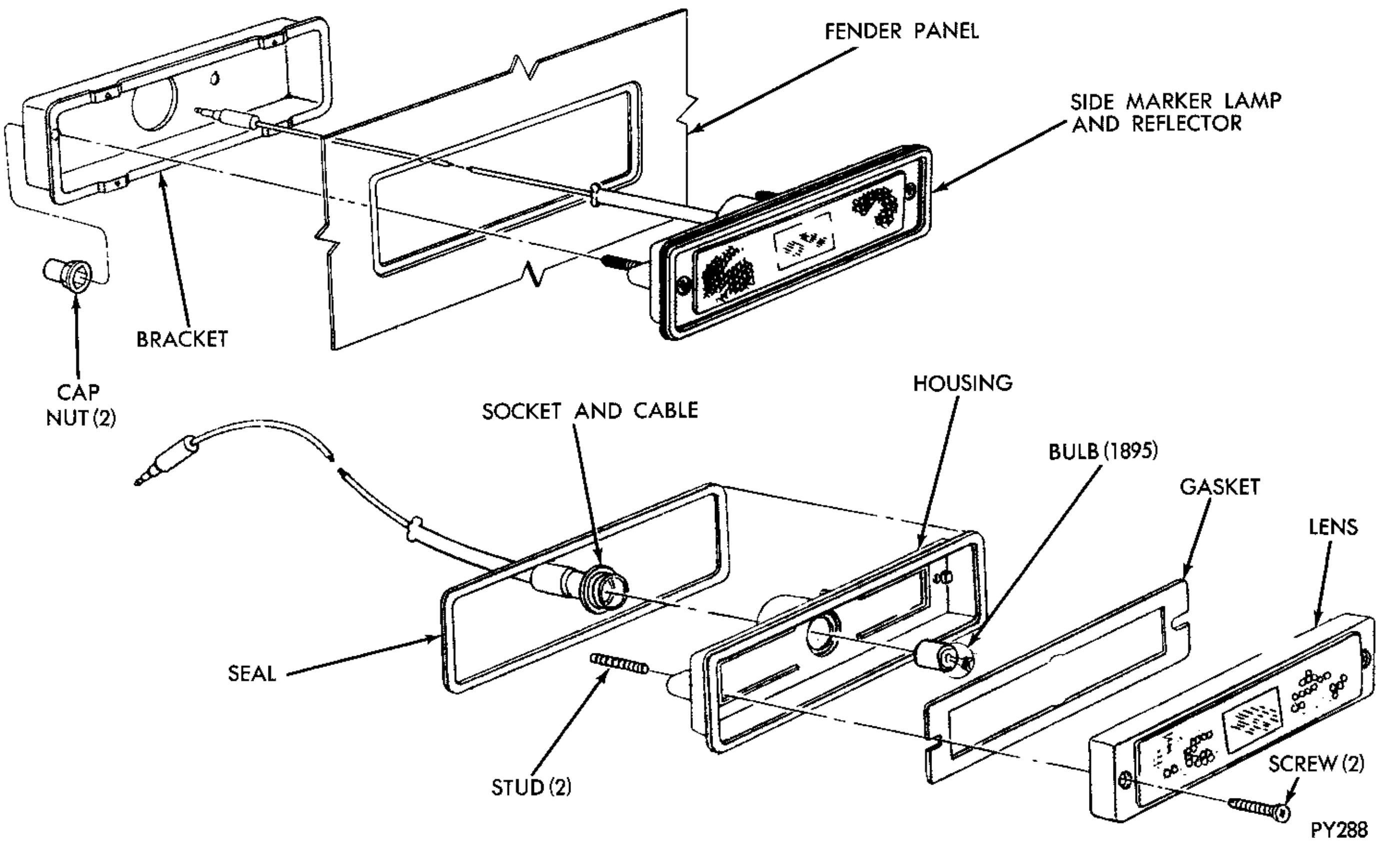


Fig. 16—Front Fender Side Marker Lamp and Reflector—Chrysler

Installation

(1) Position lamp and connector on fender and install lamp bracket and capnuts.

(2) Connect lamp connector to harness connector.

REAR BUMPER, TAIL, STOP, TURN SIGNAL AND BACK-UP LAMPS—Chrysler 300 (Fig. 17)

To remove lamp lens or bulbs, remove eight screws attaching lens to lamp housing.

To remove lamp housing, remove four attaching nuts, disconnect lamp connector from harness connector.

REAR BUMPER, TAIL, STOP, TURN SIGNAL AND BACK-UP LAMPS—Chrysler (Fig. 18)

Removal

(1) From under fender, disconnect lamp connector from harness connector.

(2) Remove four nut assemblies and three capnuts and remove lamp assembly.

To replace lamp lens and bulbs, remove six screws attaching lens to lamp housing.

Installation

(1) Position lamp on rear bumper and install attaching nuts.

(2) Connect lamp connector to harness connector.

REAR BUMPER, TAIL, STOP, TURN SIGNAL AND BACK-UP LAMPS—Chrysler—(Typical) (Fig. 19)

Removal

(1) From under rear bumper, disconnect lamp socket connector from harness connector.

(2) Remove three nut assemblies attaching lamp to bumper and remove lamp assembly.

To replace lamp lens or bulbs, remove four screws from lens and bezel face and remove lens assembly.

Installation

(1) Position lamp assembly on rear bumper and install attaching nuts.

(2) Connect lamp connector to harness connector.

REAR BUMPER, TAIL, STOP AND TURN SIGNAL LAMPS—Imperial (Fig. 20)

Removal

(1) Remove six screws attaching lamp bezel to lamp and remove bezel.

(2) Remove three nuts from lamp studs, disconnect lamp socket and side marker connector and remove lamp.

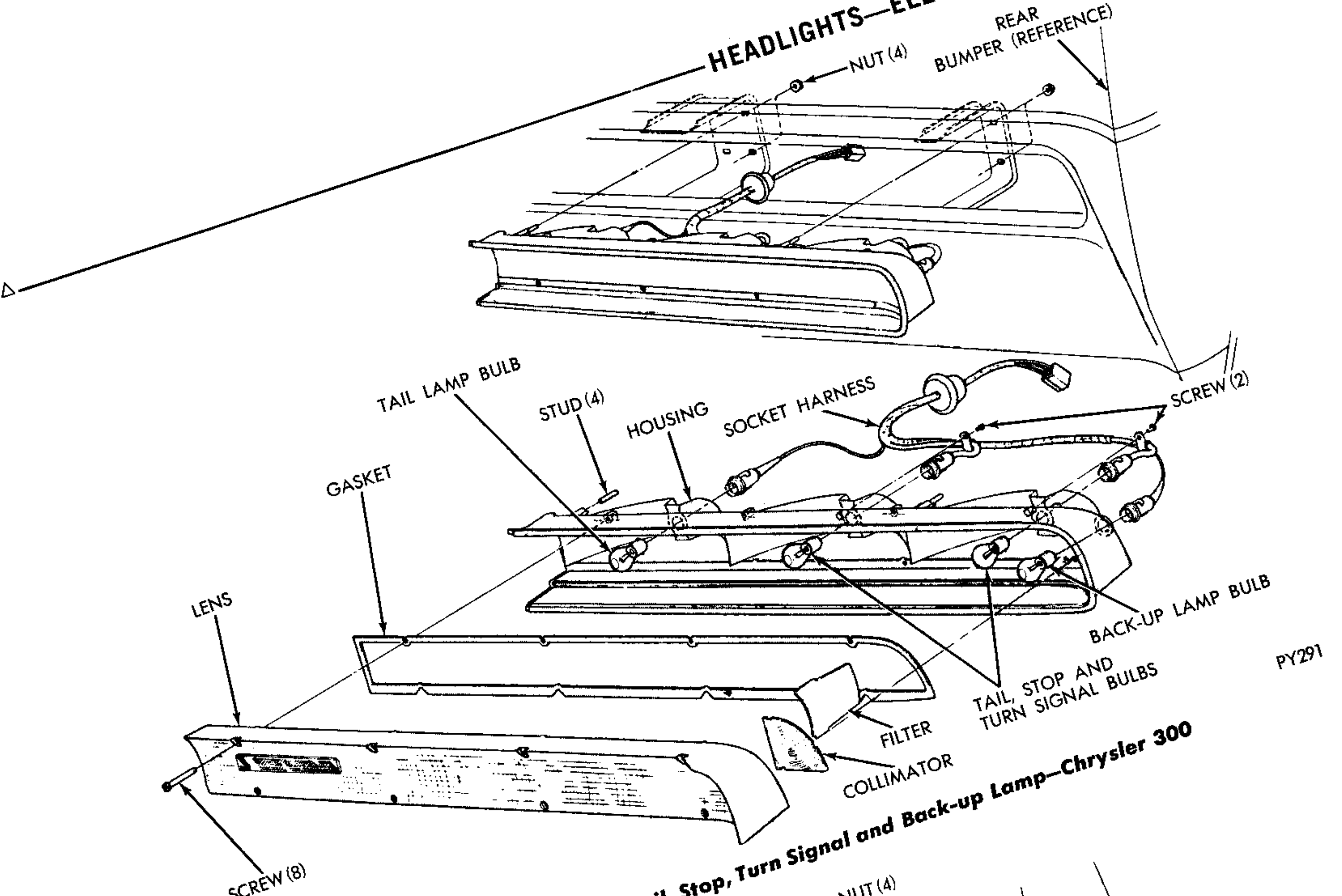
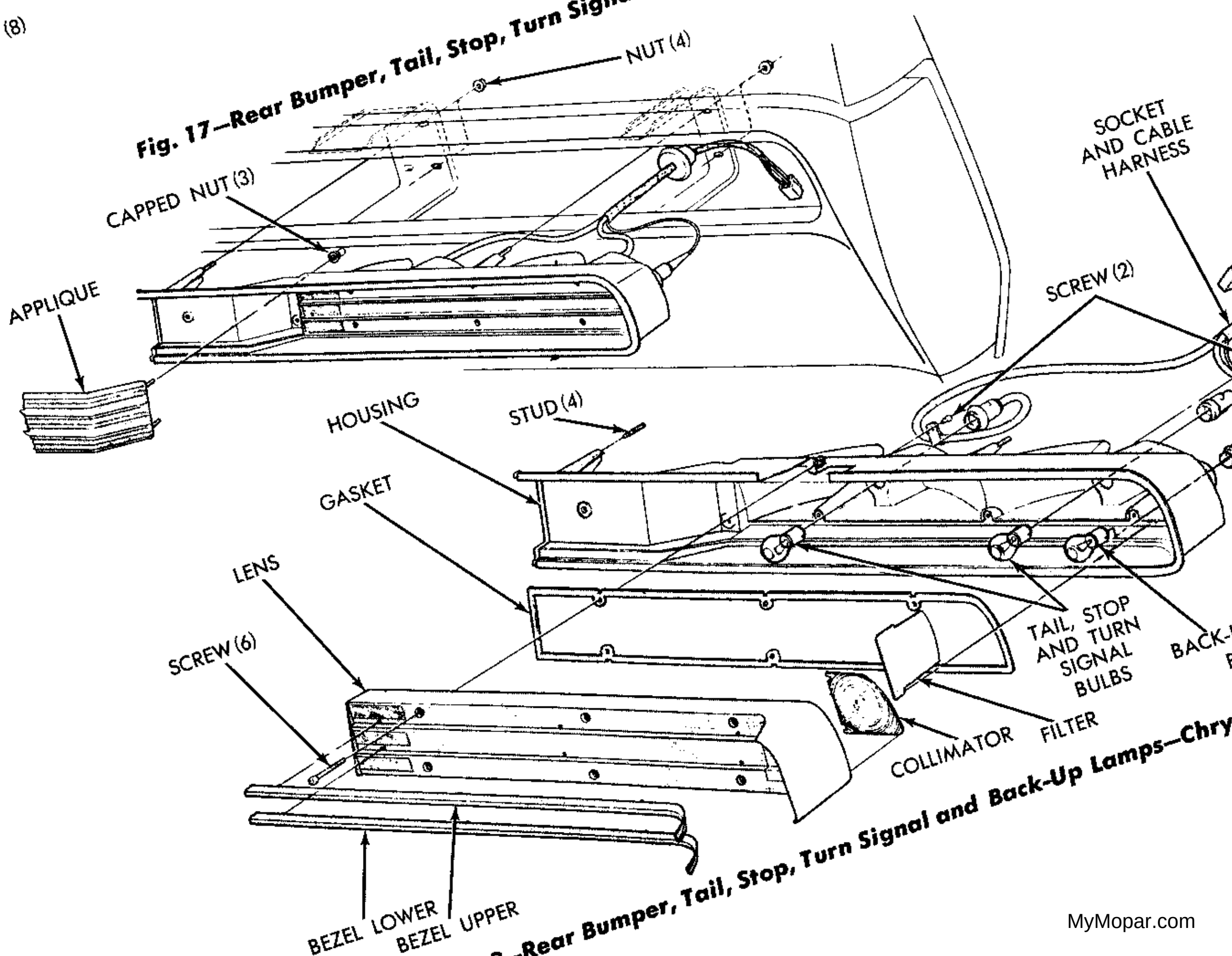


Fig. 17—Rear Bumper, Tail, Stop, Turn Signal and Back-up Lamp—Chrysler 300



18—Rear Bumper, Tail, Stop, Turn Signal and Back-Up Lamps—Chry

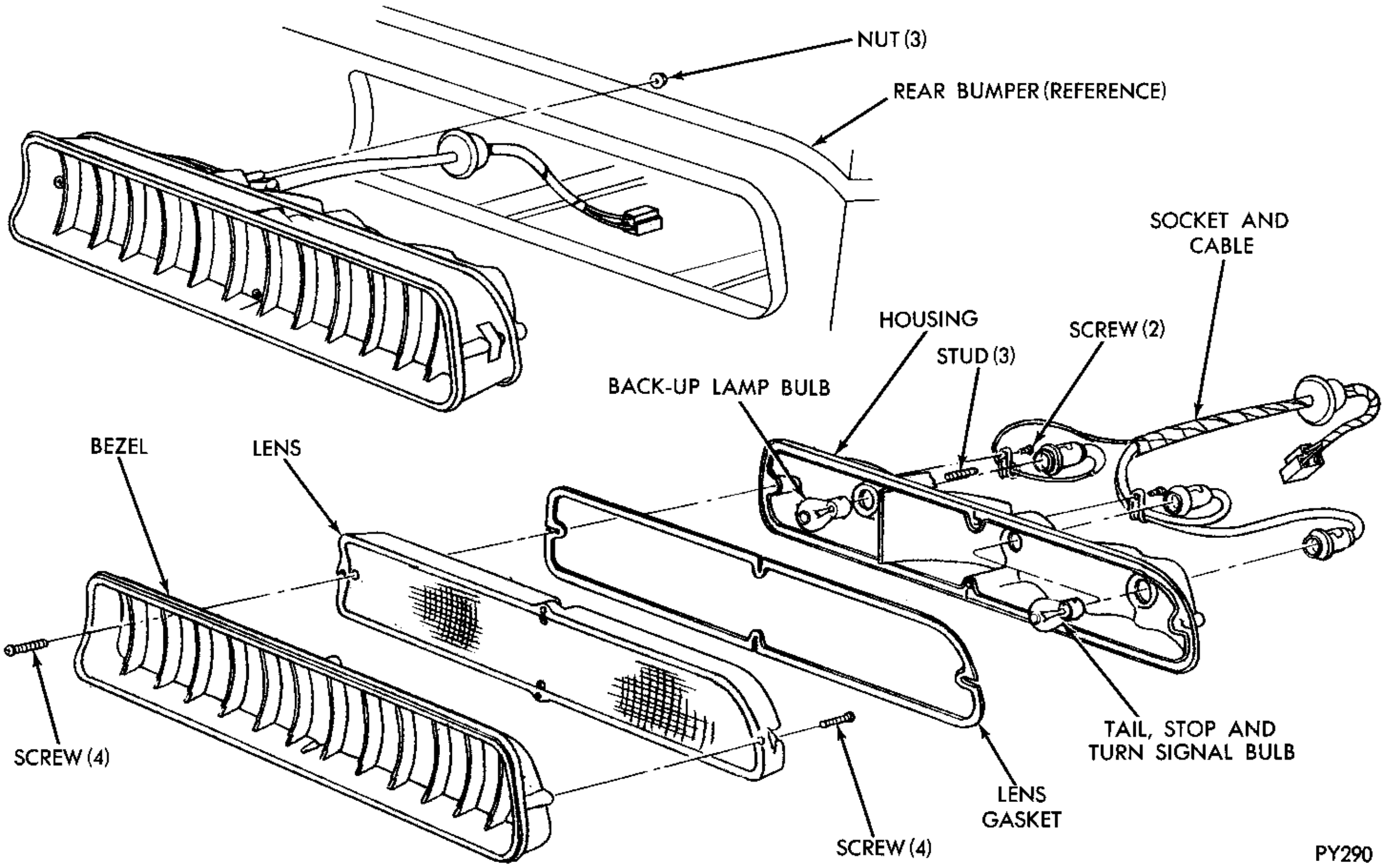


Fig. 19—Rear Bumper, Tail, Stop, Turn Signal and Back-Up Lamps—Chrysler—(Typical)

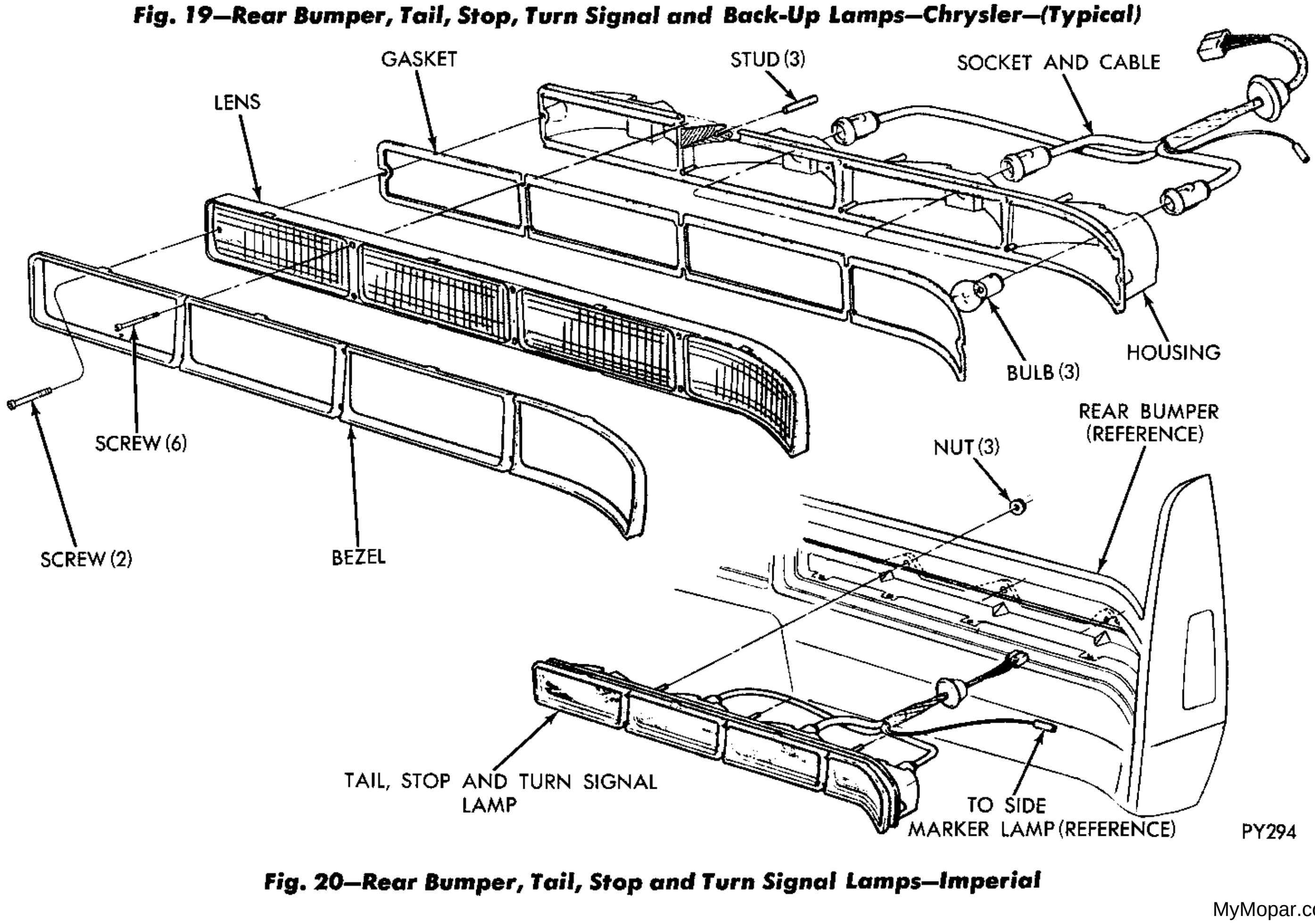


Fig. 20—Rear Bumper, Tail, Stop and Turn Signal Lamps—Imperial

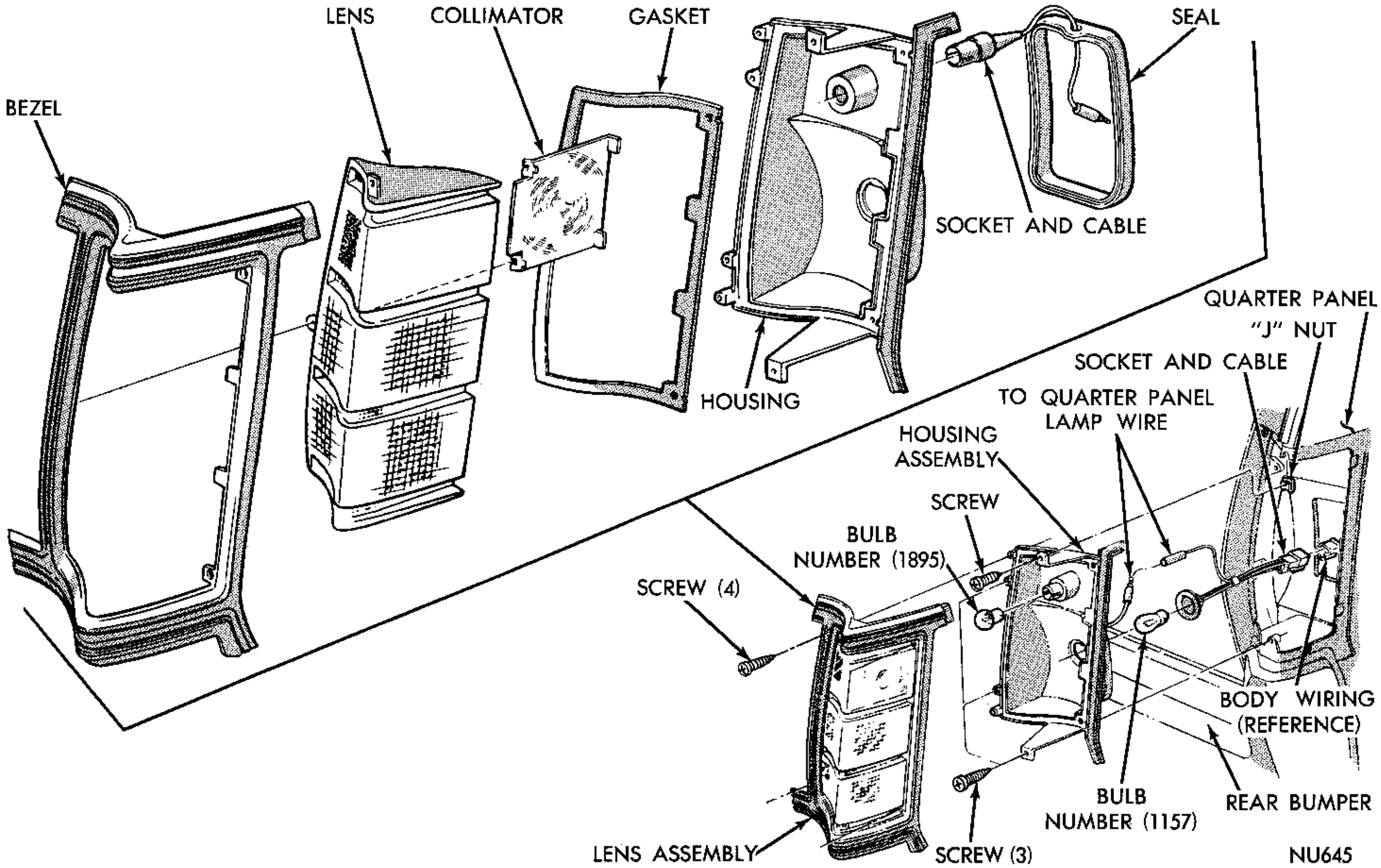


Fig. 21—Quarter Panel, Tail, Stop, Turn Signal and Side Marker Lamps—Chrysler—Station Wagons

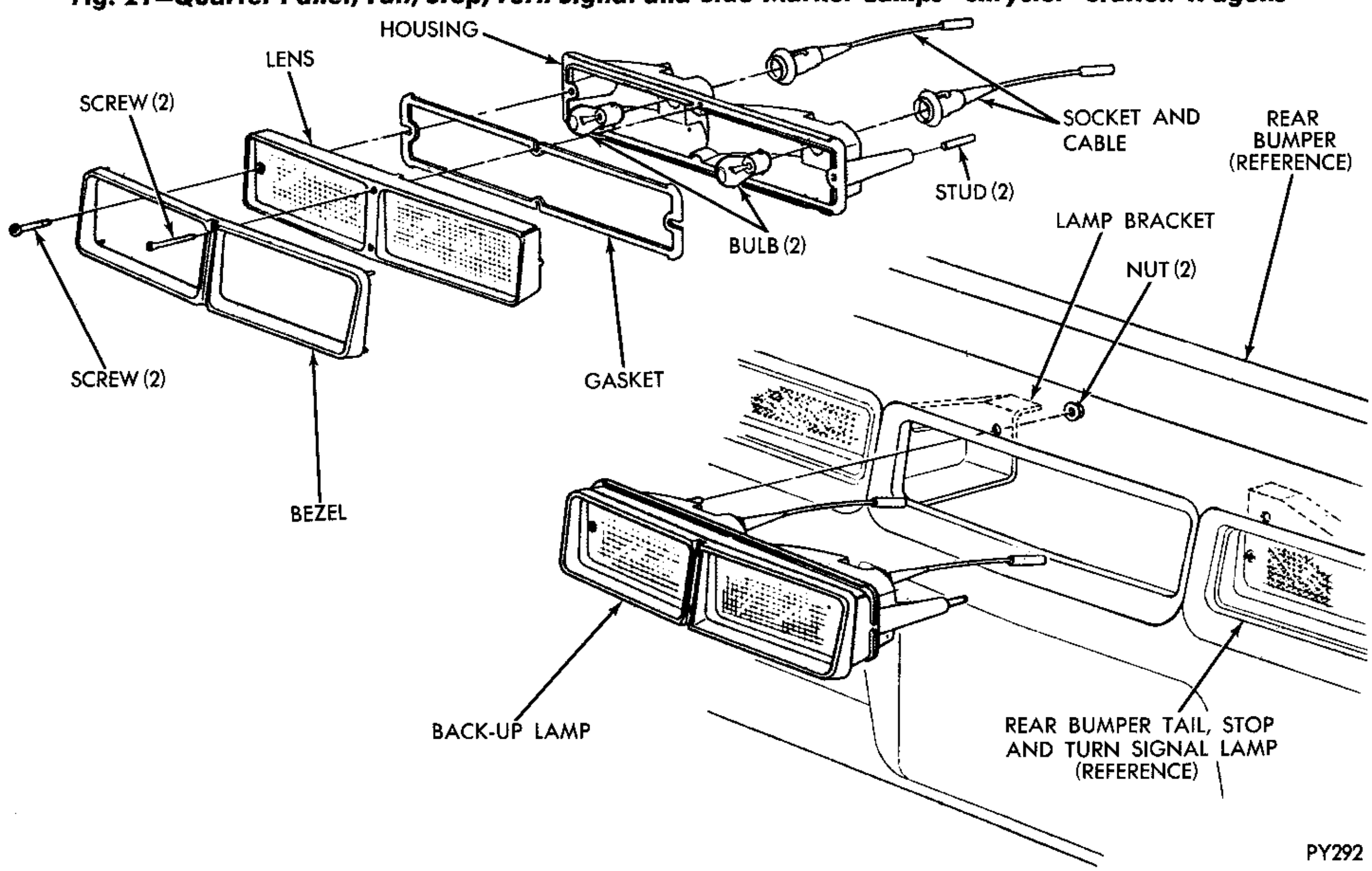


Fig. 22—Rear Bumper Back-Up Lamp—Imperial

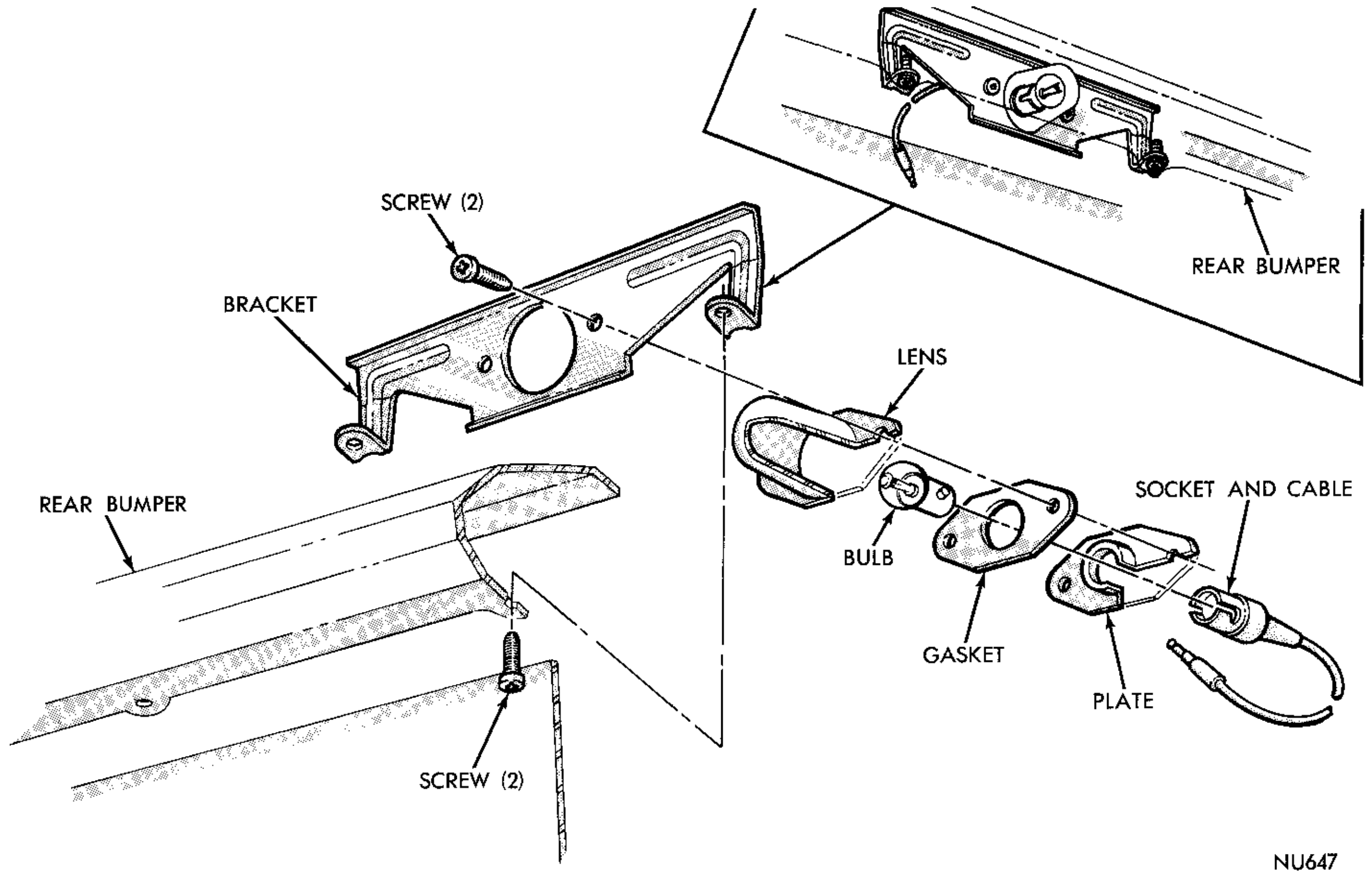


Fig. 23—Rear Bumper License Lamp—All Models

Bezel, lens and bulbs can be removed from lamp without removing lamp.

Installation

(1) Position lamp on bumper and install attaching nuts.

(2) Install lamp bezel and six attaching screws.

(3) Connect lamp connector to harness connector and lead to side marker lamp.

QUARTER PANEL, TAIL, STOP, TURN SIGNAL AND SIDE MARKER LAMP—Chrysler Station Wagons—Typical (Fig. 21)

Removal

(1) Remove four screws attaching lens assembly to lamp housing.

(2) Remove two screws attaching lamp housing to quarter panel.

(3) Disconnect lamp socket and wire and quarter panel lamp wire from body wiring harness.

Installation

(1) Connect lamp socket and panel lamp wire to body harness connectors.

(2) Position lamp housing on quarter panel and install attaching screws.

(3) Install lamp lens, gasket and lens and four attaching screws.

REAR BUMPER BACK-UP LAMP—Imperial (Fig. 22)

Refer to Figure 22, remove two nut assemblies, pull

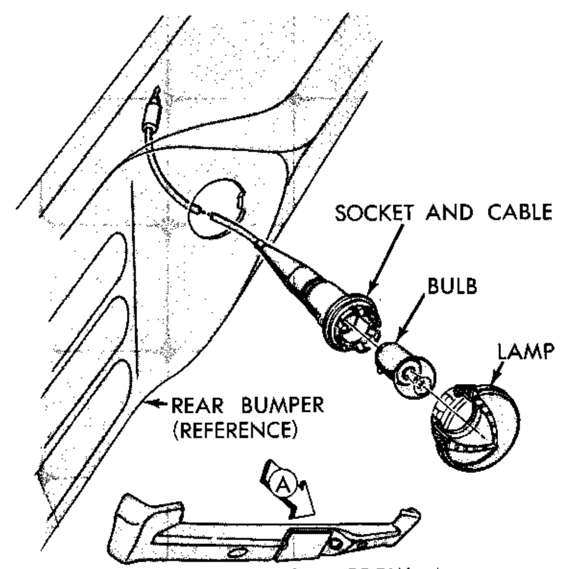


Fig. 24—Rear Bumper License Lamp— Station Wagons—Chrysler

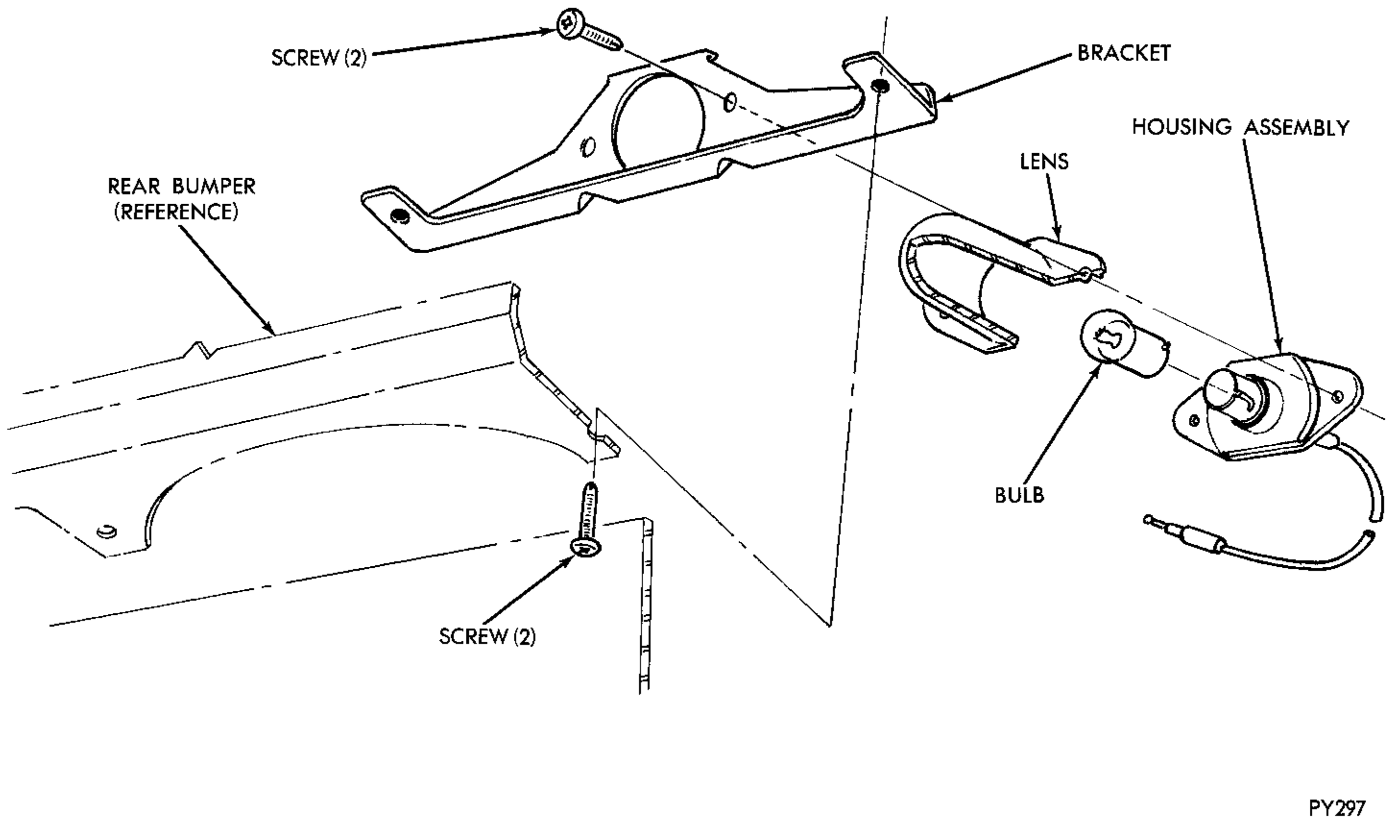


Fig. 25—Rear Bumper License Lamp—Except Station Wagons

lamp away from bumper to disconnect lamp connectors from harness connector and remove lamp.

To remove lens or bulbs, remove four screws attaching lens to lamp housing and remove lens.

REAR BUMPER LICENSE LAMP—All Models (Fig. 23)

(1) From under rear bumper, remove two screws attaching lamp bracket, disconnect lamp socket connector from harness connector and remove lamp.

REAR BUMPER LICENSE LAMP—Station Wagons Chrysler (Fig. 24)

Refer to Figure 24 and snap lamp lens off socket to replace lens or bulb.

REAR BUMPER LICENSE LAMP—Except Station Wagons—Chrysler (Fig. 25)

Removal

(1) Remove two screws attaching lamp to lamp bracket, (Fig. 25).

(2) Disconnect lamp wiring connector to body harness connector and remove lamp and bracket assembly.

To replace lamp bulb, remove two screws attaching lamp lens to lamp bracket and replace lens and bulb as necessary.

Installation

(1) Position lamp and bracket assembly on rear bumper and install attaching screws.

(2) Connect lamp wiring connector to body wiring harness connector.

INSTRUMENT PANELS

INDEX

GENERAL INFORMATION

Imperial models are equipped with a "Sentry Signal Light" which serves as a warning to the driver if the oil pressure is low, the engine coolant temperature is above normal or the fuel level is to low. Separate sending units for the oil pressure and temperature indicating operation of the Sentry Signal are mounted on the engine and are connected to a low fuel warning relay (Fig. 1) located on the right lower instrument panel reinforcement channel near the glove box.

Chrysler instrument clusters are equipped with **two** temperature indicator lights; one green for cold indication and a red one for overheating indication. When the engine temperature is low the green light will remain lighted until engine temperature reaches normal operating range. If the engine should overheat, the red light will illuminate.

In the fuel level indicating system in all models, a hinged float arm in the fuel tank raises or lowers dependent on the fuel level. The float arm contacts a variable resistor in the gauge sending unit that provides a change of resistance in the fuel gauge circuit with any up or down movement of the float. This resistance registers on the instrument panel gauge, metered to the capacity of the tank.

When the fuel level in the tank is low, the resistance of the circuit is increased restricting current flow and consequently positions the instrument panel gauge pointer to low (Fig. 1).

Resistance in the circuit is at a minimum when the tank is full and the float arm is raised. With resistance at a minimum, current flow is high registering full on the instrument panel gauge.

Constant voltage is provided to the gauges through the use of a voltage limiter mounted externally on the back of the instrument cluster on Chrysler and Imperial models. The voltage limiter is connected in parallel to provide regulated voltage to the gauges (Fig. 1).

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ALL GAUGES READ HIGH ("against the peg") AFTER IGNITION SWITCH IS TURNED "ON"	(a) Faulty voltage limiter (stuck points or an open heater coil).	(a) Test voltage limiter.
	(b) Cluster not properly grounded to panel.	(b) Tighten cluster mounting screws.
GAUGE POINTERS DO NOT MOVE WHEN IGNITION SWITCH IS TURNED "ON"	(a) Faulty voltage limiter or an open circuit on battery side (input of limiter).	(a) Test voltage limiter. Test wiring, repair or replace as necessary.
TEMPERATURE AND OIL GAUGES* INDICATE NORMAL OPERATION BUT THE FUEL GAUGE INDICATES A HIGHER OR LOWER FUEL LEVEL THAN ACTUALLY EXISTS	(a) Fuel tank sending unit or instrument panel fuel gauge is faulty.	(a) Test sending unit and gauge.
	(b) Fuel tank is improperly grounded.	(b) Test fuel tank for a good ground. NOTE: Testing the system with the tank sending unit positioned for both "empty" and "full" is usually sufficient to determine the calibration in the range between these positions.
	(c) Low fuel warning relay faulty.	(c) Test relay.
FUEL AND OIL GAUGES* INDICATE CORRECTLY BUT TEMPERATURE GAUGE INDICATES HIGHER OR LOWER TEMPERATURE THAN ACTUAL ENGINE TEMPERATURE	(a) Faulty instrument panel temperature gauge, wiring or faulty temperature sending unit in engine.	(a) Test wiring, repair or replace as necessary. Test gauge and sending unit.
ERRATIC TEMPERATURE GAUGE OPERATION*	(a) Loose or dirty electrical connections.	(a) Clean and tighten all electrical connections and test the gauge operation.

Condition	Possible Cause	Correction
ERRATIC OPERATION OF FUEL GAUGE	(a) Loose or dirty electrical connections or faulty tank sending unit.	(a) Test fuel gauge sending unit, and proceed as follows: (1) Clean and tighten all electrical connections. (2) Make sure that the fuel tank sending unit is grounded to the tank and that the tank is grounded to the frame.
	*(b) Faulty Low Fuel Warning Relay.	(b) Test Relay.
ERRATIC OIL GAUGE OPERATION*	(a) Loose or dirty electrical connections.	(a) Clean and tighten all electrical connections and test the gauge operation.

*Imperial Models Only

SERVICE PROCEDURES

TESTS IN VEHICLE

Voltage Limiter—All Models

The voltage limiter can be tested in the vehicle or with the instrument cluster removed. To quickly test the voltage limiter in the vehicle, connect one lead of a voltmeter or test light to the temperature sending unit and the other lead to a good ground. Leave the sending unit lead wire attached to the sending unit.

Turn the ignition switch to the "ON" position. A fluctuating voltmeter or a flashing light indicates the voltage limiter is operating. The Imperial model has an in-line choke for radio noise suppression.

Fuel Gauge Circuit—Imperial Models

Imperial models incorporate a Low Fuel Warning Sentry Signal on the instrument panel. A relay is used in the circuit to feed the fuel gauge separately. The tank unit is a standard tank unit, connected to the one terminal of the fuel gauge (Fig. 1). The relay has a built in limiter to supply 5 volts to the fuel gauge. A choke is built in the relay for radio noise suppression.

Fuel Gauge and Low Fuel Warning Relay—Imperial

(1) Disconnect wire at the fuel tank unit. Connect one lead of tester C-3826 to wire terminal and other lead to a good ground.

(2) Turn ignition key on, turn tester knob to "H" position and observe instrument panel gauge. Gauge should read full plus 3/32 inch or minus 1/32 inch.

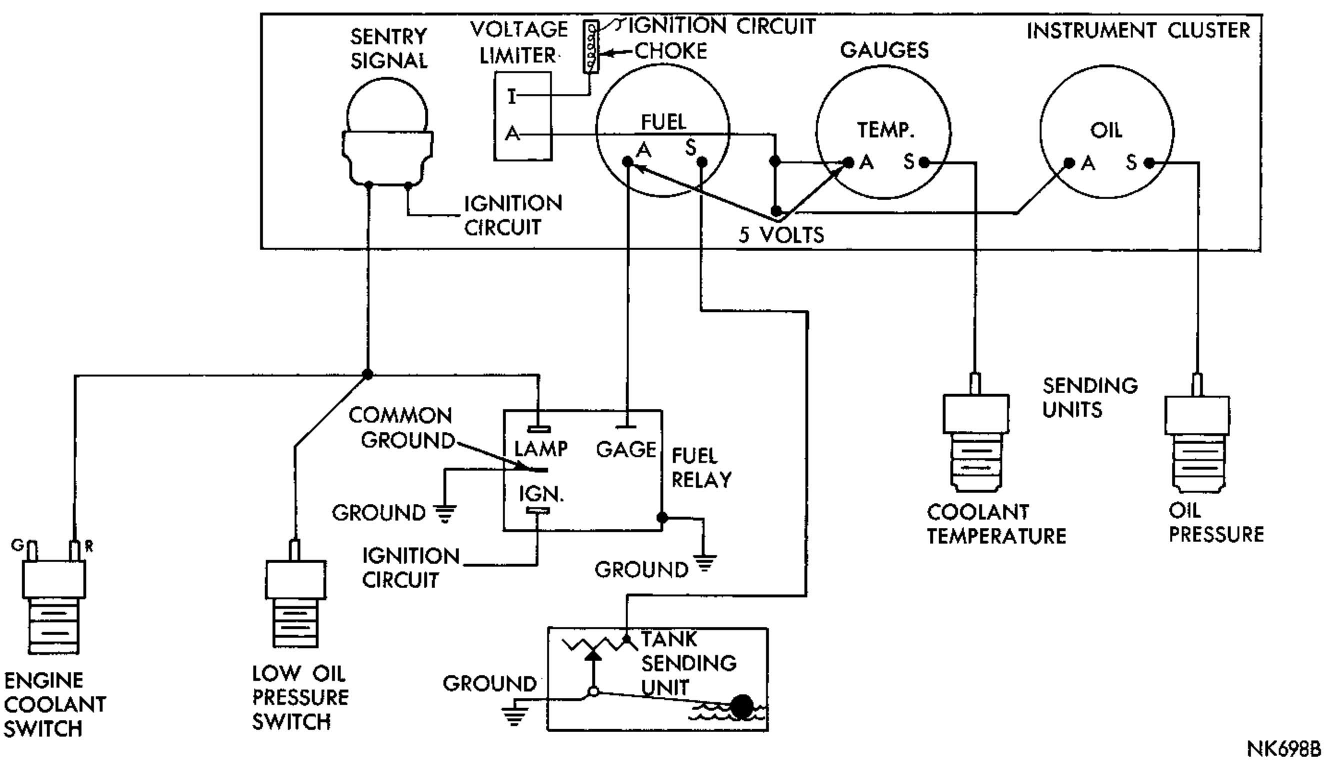


Fig. 1—Sentry Signal Circuit

Turn tester knob to "M", gauge should read 1/2. **Thermal gauges are slow in operation and time should be allowed for gauge to respond.**

(3) Turn tester knob to "L", panel gauge should read empty plus 1/32 inch or minus 3/32 inch.

The low fuel warning relay will trigger the Sentry Signal Lamp when the gauge pointer is moving from the 1/2 position to the "E" position. **Temperature and oil switches must be disconnected for this test or engine must be running.**

(4) If instrument panel gauge does not perform as described, check output of relay (terminal marked gage) use procedure outlined under Voltage Limiter Test.

(5) To check sentry signal position of relay (light will not trigger) use a jumper wire to ground terminal marked lamp. Light should illuminate. If no light, check bulb and wiring. If lamp lights, relay is faulty and should be replaced.

Fuel Gauge Testing—Chrysler Models

(1) Disconnect wire at fuel tank sending unit. Connect one lead of Tester C-3826 to wire terminal and other lead to a good ground. Turn ignition key on.

(2) Turn knob on dial of tester to "H" and observe gauge on panel. It should read "Full," plus 3/32" or minus 1/32".

With dial knob on "M", panel gauge should read 1/2.

(3) With dial knob on "L", panel gauge should read "Empty," plus 1/32" or minus 3/32". On units equipped with Low Fuel Warning lamp, lamp should light when gauge goes from 1/2 to "E".

(4) If lamp does not light when gauge pointer is between 1/2 capacity and empty, use a jumper wire between cavities 2 and 3 of low fuel warning connector, bulb should illuminate. If no light, check bulb and wiring, if bulb and wiring are O.K. and lamp lights, relay is faulty and should be replaced.

(5) If panel gauge does not perform as described, continuity of circuit from tank sending unit to panel unit should be tested, with special attention to printed circuit board. If continuity has been established, the gauge should be replaced.

(6) On units equipped with Low Fuel Warning System, the output of the relay can be checked by using the procedure outlined under "Voltage Limiter Test".

Oil Pressure Gauge—Imperial Models

Disconnect wire from the oil pressure sending unit on the engine. Connect one test lead of Tester Tool C-3826 to the removed wire terminal the other test lead to a good ground. Place the pointer of the gauge tester on the "L" position and turn the ignition switch to "on." Do not start engine. The oil pressure gauge should show "L" plus or minus 1/8 inch. **Thermal gauges are slow in operation. Allow time for gauge to heat up.** When the tester is in the "L" position the "Sentry Signal" on the cluster should be illuminated.

Place the pointer on the tester on the "M" position and the oil pressure gauge should advance to the 1/2 position of the dial. Place the pointer of the tester in the "H" position and the gauge should advance to the "H" position of the dial.

Should the gauge respond to the above tests, but not operate when the wire is attached to the sending unit, it should be replaced. Should the gauge fail to respond to the above tests indications are of possible loose connections, broken wire, or faulty gauge. The instrument cluster should be removed for further tests. See "Instrument Cluster."

Oil Pressure Warning Light—Chrysler Models

To test the oil pressure warning light, remove the terminal from the oil pressure sending unit. Connect one lead of the gauge tester to the terminal and the other test lead to a good ground.

With the ignition switch in the "on" position and the gauge tester in the "L" position, the indicator light should not light. With the gauge tester in the "M" position, the indicator light should show a dull glow. With the gauge tester in the "H" position, the indicator light should show full brilliance.

Should the oil pressure warning light fail to respond to the above tests, indications are of possible loose connections, broken wire, or burned out lamp.

Low Oil Pressure Warning Switch

The operation of the oil pressure warning switch, mounted on the engine, is dependent on variances in the engine oil pressure.

When the engine oil pressure is high (normal operating condition of the engine) the switch is held in the "OFF" or "OPEN" position allowing no current to flow to the oil pressure warning lamp on the instrument panel.

When the engine oil pressure is low, the switch is in the "ON" or "CLOSED" position allowing current to flow to the oil pressure warning lamp on the instrument panel. This causes the warning lamp to be illuminated.

Temperature Indicating System—Imperial Models

Disconnect the terminal from the temperature sending unit on the engine. Connect one test lead of Tester C-3826 to the terminal and the other test lead to a good ground. Place the pointer of the gauge tester on the "L" position and turn the ignition switch to "on." The temperature gauge should show "C" plus or minus 1/8 inch. **Thermal gauges are slow in operation. Allow time for gauge to heat up.**

Place the pointer on the tester on the "M" position and the temperature gauge should advance to the driving range left of 1/2 position of the dial. Place the pointer of the tester in the "H" position and the gauge should advance to the "H" position of the dial.

Should the gauge respond to the above tests, but not operate when the terminal is attached to the sending unit, indications are of a faulty sending unit and it should be replaced. Should the gauge fail to respond to the above tests, indications are of possible loose connections, broken wire, defective printed circuit board or faulty gauge. The instrument cluster should be removed for further tests. See "Instrument Clusters."

Temperature Indicating System—Chrysler Models

To test the temperature indicator turn the ignition key to the "Acc" or left position. Disconnect the wires from the temperature sensing switch on the engine and one at a time touch the wires momentarily to ground. When the wire from the "G" terinal is grounded the "Cold" (green) bulb of the indicator should light. When the wire from the "R" terminal is grounded the "Hot" (red) bulb of the indicator should light. If one of the bulbs fail to light, the bulb that did not light is faulty and should be replaced. If both of the bulbs fail to light indications are of a faulty circuitry in the system or possibly both of the indicator bulbs are faulty. Repair or replace as necessary.

BRAKE SYSTEM WARNING LIGHT

The brake warning light flashes only when the parking brake is applied with the ignition key turned "ON." The same light will also illuminate should one of the two service brake systems fail when the brake pedal is applied. To test the system turn the ignition key "ON", and apply the parking brake. If the light fails to light, inspect for a burned out bulb, disconnected socket, a broken or disconnected wire at the switch.

To test the service brake warning system, raise the car on a hoist and open a wheel cylinder bleeder while a helper depresses the brake pedal and observes the warning light. If the light fails to light, inspect for a burned out bulb, disconnected socket, a broken or disconnected wire at the switch. If the bulb is not burned out and the wire continuity is proven, replace the brake warning switch in the brake line Tee fitting mounted on the frame rail in the engine compartment below the master cylinder.

LEFT ASH RECEIVER—All Models

Removal

(1) Disconnect cigar lighter and ash receiver lamp wiring.

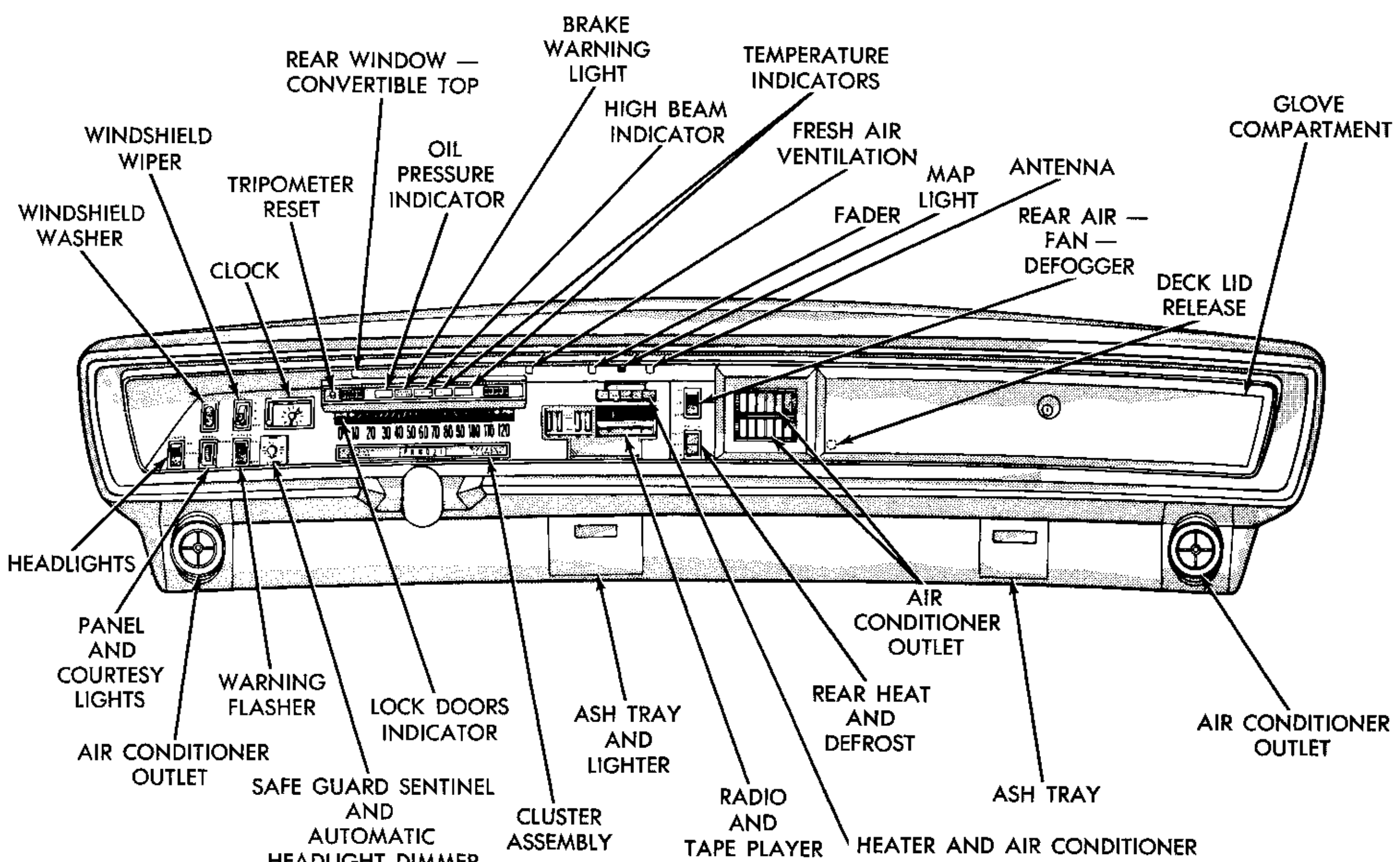


Fig. 2—Instrument Panel—Chrysler

(2) Remove ash receptacle from ash receiver housing.

(3) Remove ash receiver four mounting screws and remove ash receiver housing.

Installation

(1) Position ash receiver housing and install four mounting screws.

(2) Install ash receiver receptacle.

(3) Connect cigar lighter and ash receiver lamp wiring.

HEATER CONTROL—All Models

Removal

(1) Disconnect battery ground cable.

(2) Remove left ash receiver.

(3) Remove the radio. See "Radio Removal", Accessories Group 1.

(4) Remove the two heater control mounting nuts from under instrument panel.

(5) Remove heater control support screw from support bracket.

(6) Disconnect heater switch vacuum hose harness from heater switch.

(7) Disconnect heater control wiring connectors.

(8) Disconnect heater control cable and remove heater control assembly.

Installation

(1) Position heater control and connect control cable.

(2) Connect heater control wiring connectors.

(3) Connect heater switch vacuum hose harness to heater switch.

(4) Install and tighten heater control support bracket attaching screw.

(5) Install and tighten heater control mounting nuts.

(6) Install radio. See "Radio Installation", Accessories Group 1.

(7) Install left ash receiver.

(8) Connect battery ground cable and check operation of radio and heater controls. For adjustments of heater control cable refer to "Heaters" Group 24.

VENT CONTROLS—Chrysler Models

Removal

(1) Remove lower left and right kick pads.

(2) Remove vent control mounting screws.

(3) Disconnect the lower left and right control cables at the fresh air doors and remove vent controls.

Installation

(1) Connect vent control cables at fresh air doors

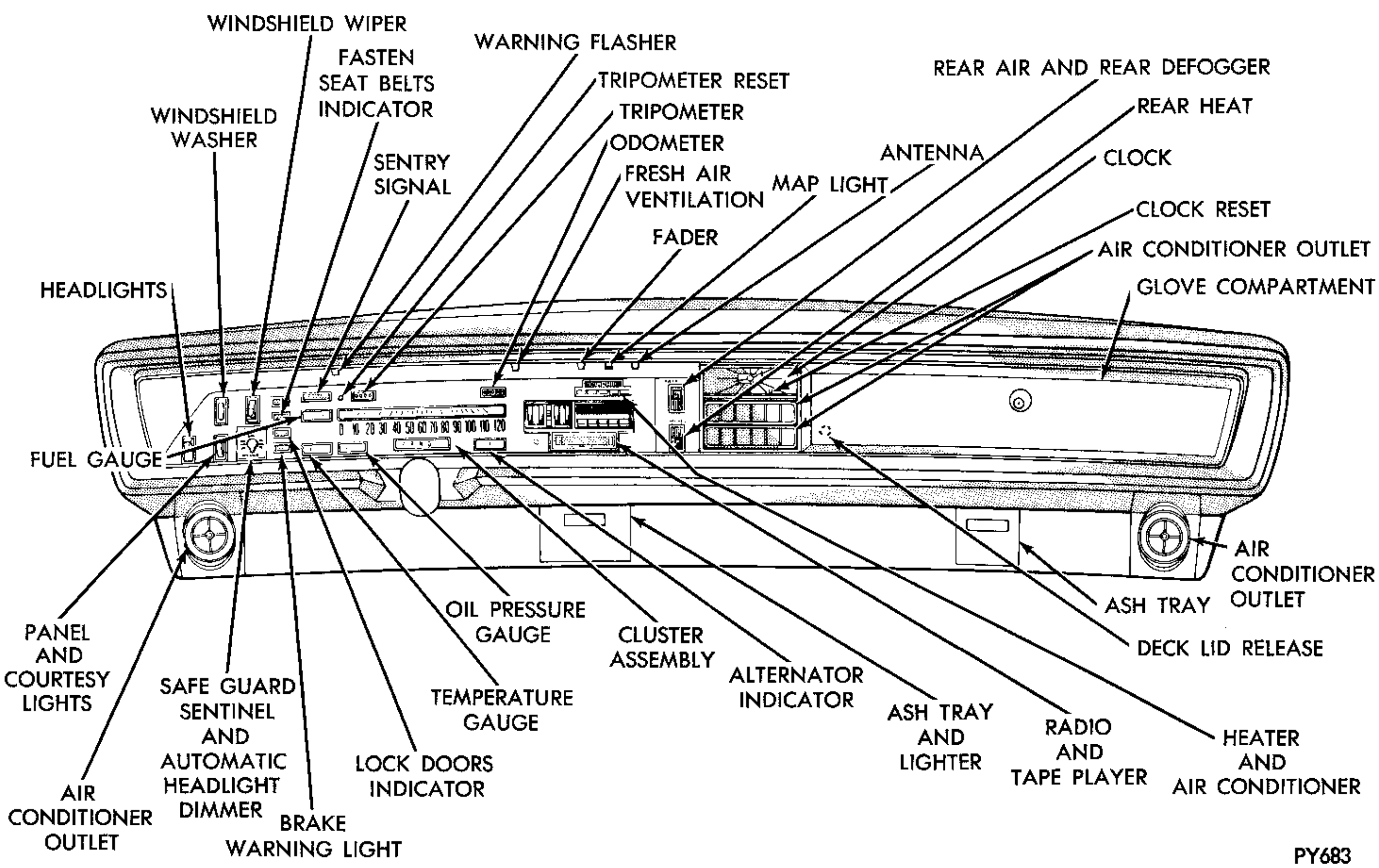


Fig. 3—Instrument Panel—Imperial

install vent controls mounting screws. Adjust cables as necessary. See "Air Conditioning" Group 24.

(2) Install lower left and right kick pads.

VENT CONTROLS—Imperial Models

Removal

(1) Remove two mounting screws.

(2) Disconnect the lower left and right control cables at fresh air doors and remove vent controls.

Installation

(1) Position vent controls, connect control cables and install two mounting screws.

(2) Adjust cables as necessary. See "Air Conditioning", Group 24.

MAP LAMP—All Models

Removal

(1) Remove the two vent control mounting screws and allow assembly to hang free.

(2) Remove the four map lamp mounting screws.

(3) Disconnect fader control wiring connector.

(4) Disconnect map lamp wiring connector and remove map lamp.

Installation

(1) Position map lamp on instrument panel and connect map lamp wiring connector.

(2) Connect fader control wiring connector.

(3) Install map lamp mounting screws.

(4) Install vent control assembly and mounting screws.

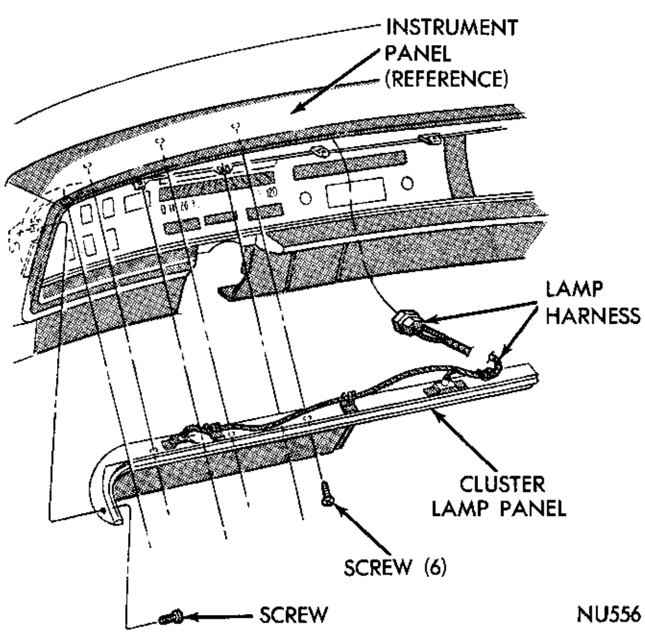


Fig. 4—Lamp Panel—Removing and Installing—Chrysler

LAMP PANEL—Chrysler Models (Fig. 4)

Removal

(1) Disconnect battery ground cable.

(2) Remove two vent control mounting screws and allow assembly to hang free.

(3) Remove map lamp.

(4) Remove the seven lamp panel attaching screws.

(5) Move lamp panel to the right and tilt it down to remove it.

Installation

(1) Move lamp panel up and to the left to position it on the instrument panel.

(2) Install lamp panel attaching screws.

(3) Install map lamp.

(4) Position vent control and install mounting screws.

(5) Connect battery ground cable and check operation of lamp panel.

LAMP PANEL—Imperial Models

Removal

(1) Disconnect battery ground cable.

(2) Remove the two vent control mounting screws and move the control to allow sufficient clearance for lamp panel removal.

(3) Remove the map lamp.

(4) Remove two screws and remove lamp panel end plate.

(5) Remove the seven lamp panel mounting screws.

(6) Move the lamp panel to the right and down disconnecting the hazard warning switch connector and lamp panel wiring connector, then remove lamp panel.

Installation

(1) Position lamp panel on instrument panel and connect hazard warning switch and lamp panel wiring connectors.

(2) Install lamp panel mounting screws.

(3) Install lamp panel end plate.

(4) Install map lamp.

(5) Install vent control assembly.

(6) Connect battery ground cable and check operation of warning lamp system.

RIGHT END CLUSTER ACCESSORY BEZEL—Imperial

Removal

(1) Disconnect battery ground cable.

(2) Disconnect vacuum hose harness from rear heater switch.

(3) Disconnect wiring connector from rear fan switch.

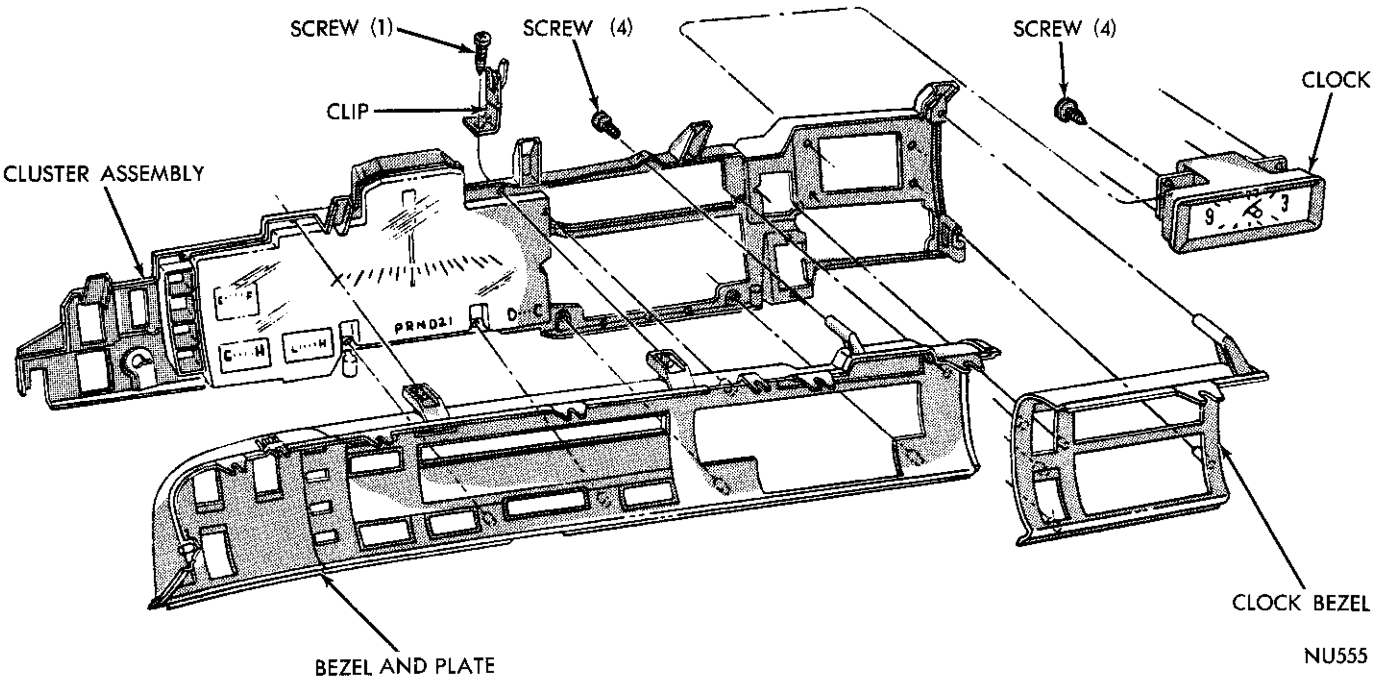


Fig. 5—Cluster Bezels and Cluster—Removing and Installing—Imperial

(4) Remove rear heater switch (two screws).

(5) Remove rear fan switch (two screws).

(6) Remove two bezel mounting screws and remove bezel from front of panel.

Installation

(1) Position bezel on instrument panel and install the bezel mounting screws.

(2) Install rear fan switch and mounting screws.

(3) Install rear heater switch and mounting screws.

(4) Connect rear fan switch wiring connector and rear heater switch vacuum hose harness.

(5) Connect battery ground cable and test operation of switches.

INSTRUMENT CLUSTER—Chrysler Models (Figs. 2, 7 and 8)

Removal

(1) Disconnect battery ground cable.

(2) Remove lower steering column cover (four screws).

(3) Remove the gear shift indicator pointer.

(4) Remove the three outside floor plate mounting bolts.

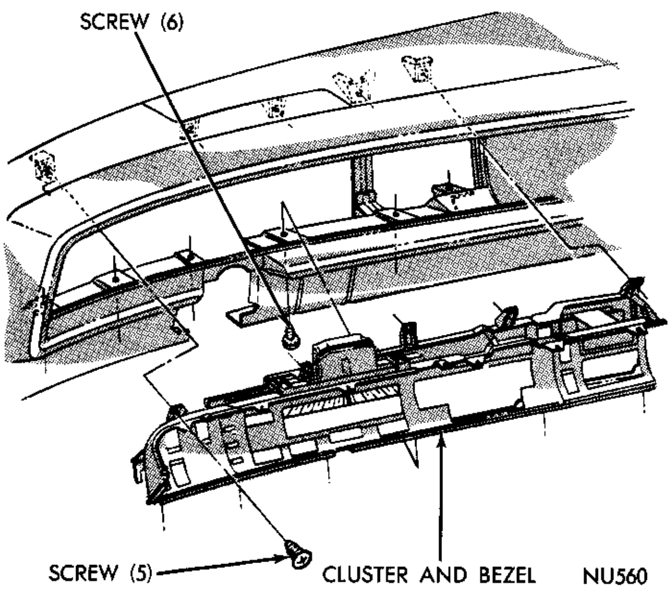


Fig. 6—Cluster and Bezel—Removing and Installing—Imperial

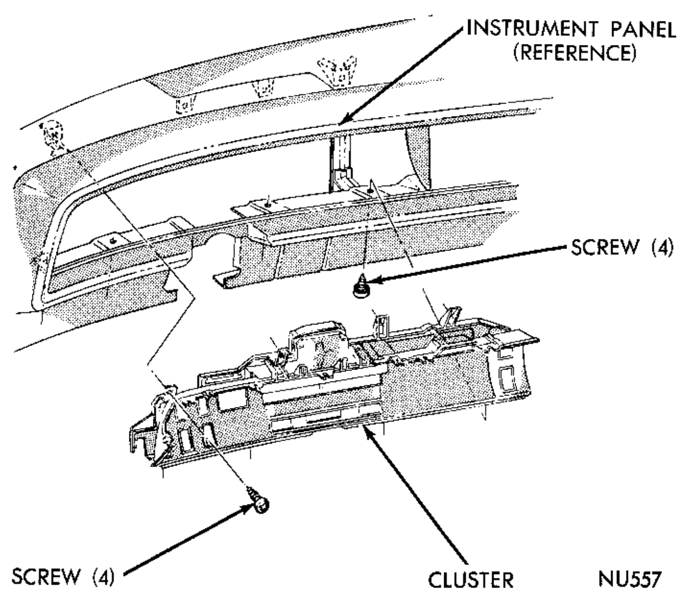


Fig. 7—Cluster Panel—Removing and Installing—Chrysler

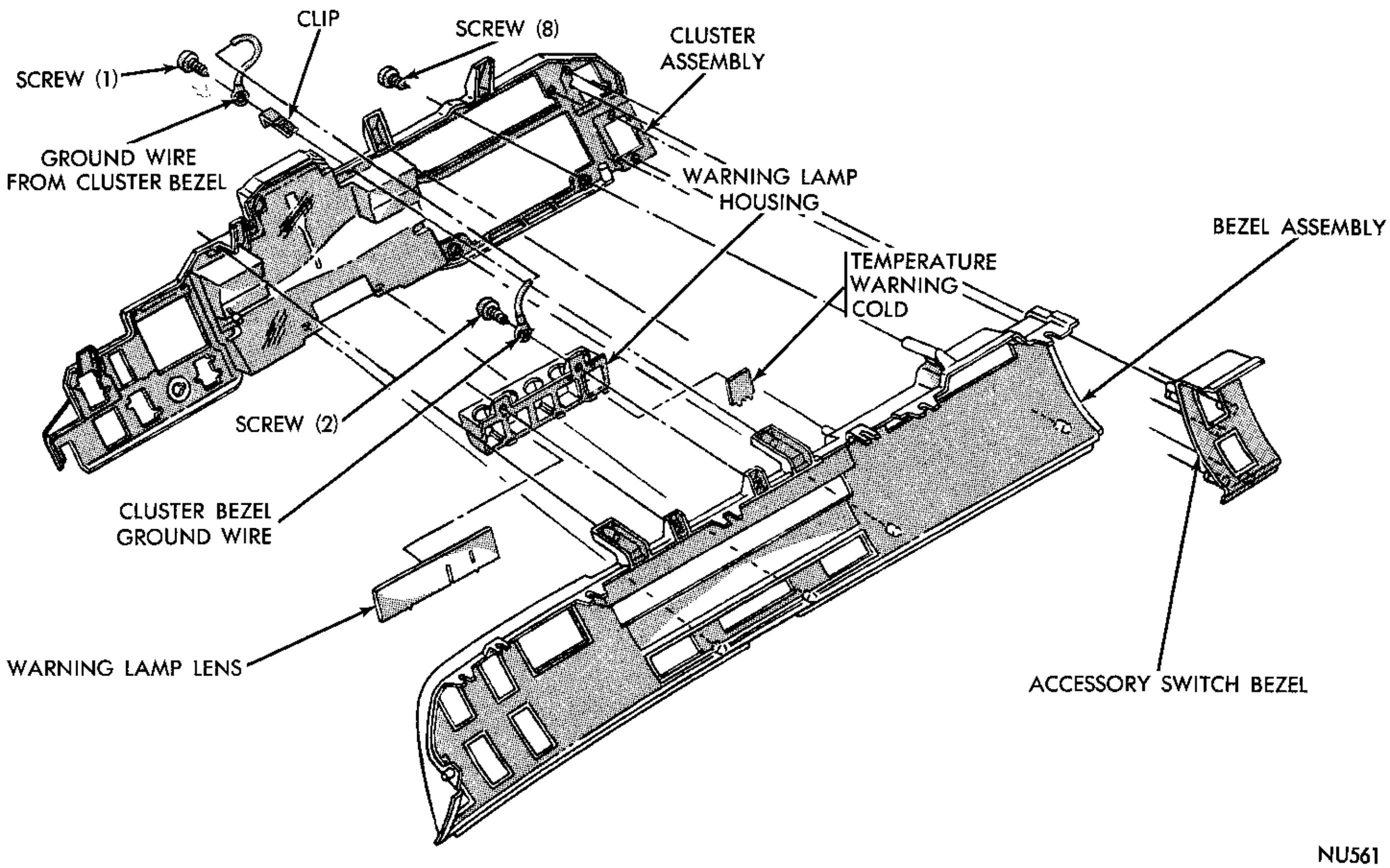


Fig. 8—Installing or Removing Bezel From Cluster—Chrysler

(5) Remove the ground strap nut from the steering column support and remove ground strap.

(6) Remove the three steering column clamp support nuts.

(7) Carefully lower the steering column and allow steering wheel to rest on front seat cushion.

(8) Remove left ash receiver.

(9) Remove radio. See "Accessories", Group 1.

(10) Remove heater controls.

(11) Remove the two vent control mounting screws and allow assembly to hang free.

(12) Remove map lamp.

(13) Remove lamp panel and lay it on top of instrument panel.

(14) From under the instrument panel remove four mounting screws from the right end accessory switch cover.

(15) Disconnect speedometer cable at speedometer.

(16) Remove the wiring harness from the harness clip on the left side of the column support.

(17) Remove four upper cluster mounting screws.

(18) Remove four lower cluster mounting screws (through access holes in the lower panel).

(19) Move the cluster to the right, rotating the right end of cluster towards the front of car and down.

(20) Roll the top of the cluster down and rock panel cluster slightly to the left to gain access to wiring.

(21) Disconnect wiring from the switches and instrument cluster and roll cluster out from instrument panel.

CAUTION: Perform this operation carefully as the connector pins on the printed circuit board may be easily destroyed.

Installation

(1) Carefully enter cluster into instrument panel opening and connect wiring to switches and cluster.

(2) With all wiring connected, tip the cluster up slightly and move cluster to the left and up into position on the panel.

(3) Install the four upper cluster mounting screws but do not tighten.

(4) Install the four lower mounting screws, (through access holes in the lower panel) then tighten all eight mounting screws securely.

(5) Place wiring harness into harness clip and clamp securely.

(6) Connect speedometer cable at speedometer.

(7) From under lower front of instrument panel install the accessory switch cover mounting screws.

(8) Install lamp panel.

(9) Install map lamp.

(10) Install vent control.

(11) Install heater controls.

(12) Install radio.

(13) Install left ash receiver.

(14) Carefully raise steering column into position; install column clamp support nuts (finger tight).

(15) Install floor support plate mounting bolts and tighten securely. Tighten steering column clamp support nuts.

(16) Install ground strap at steering column support.

(17) Install gear shift indicator pointer.

(18) Install steering column cover.

(19) Connect battery ground cable and test operation of all instruments, gauges and controls.

INSTRUMENT CLUSTER—Imperial Models (Figs. 3, 5 and 6)

Removal

(1) Disconnect battery ground cable.

(2) Remove left ash receiver.

(3) Remove the radio. See "Accessories" Group 1.

(4) Remove heater controls from instrument panel and let hang free.

(5) Disconnect the vent control cables at fresh air doors.

(6) Remove vent control mounting screws and move the control to allow for lamp panel removal.

(7) Remove map lamp.

(8) Remove lamp panel assembly.

(9) Remove cluster accessory bezel.

(10) Remove steering column cover.

(11) Remove gear shift indicator pointer.

(12) Remove steering column clamp at instrument panel and cover screws at floor panel.

(13) Lower steering column and rest steering wheel on front seat cushion.

(14) Disconnect speedometer cable from speedometer.

(15) Remove five upper cluster mounting screws.

(16) Remove five lower cluster mounting screws, working through the access holes in the lower instrument panel.

(17) Move the cluster to the right, pushing the right end of the cluster toward the front of the car while turning the top of cluster down, then pull the left end of the cluster out of the panel.

(18) Disconnect all wiring and connectors from back of cluster.

(19) Complete cluster removal.

Installation

(1) Position cluster on instrument panel and connect all wiring and connectors.

(2) Enter left side of cluster and raise top of cluster while moving cluster towards rear of car into position on the instrument panel.

(3) Install the five cluster lower mounting screws but do not tighten.

(4) Install the five upper mounting screws then tighten all screws securely.

(5) Connect speedometer cable to speedometer.

(6) Carefully raise steering column into position and install upper clamp and floor cover screws.

(7) Install gearshift indicator pointer.

(8) Install steering column cover.

(9) Install cluster accessory bezel.

(10) Install lamp panel assembly.

(11) Install map lamp.

(12) Install vent control assembly.

(13) Connect vent control cables at fresh air doors.

(14) Install heater controls.

(15) Install radio.

(16) Install ash receiver assembly.

(17) Connect battery ground cables and test operation of all lights, gauges, controls and radio.

WARNING LAMP BULBS—Chrysler Models

All of the lamp panel warning lights bulbs can be replaced as follows:

(1) Remove two vent control mounting screws and allow assembly to hang free.

(2) Remove map lamp.

(3) Remove lamp panel and place it on top of the instrument panel.

(4) Reaching over the instrument cluster, remove the lamp socket from the housing and the bulb from the socket.

Oil Warning, Brake System, High Beam, Engine Temperature-Hot and Engine Temperature-Cold.

(5) The following cluster indicator bulbs are serviceable from underneath the panel.

Right Turn Signal and Left Turn Signal.

Fasten Belt Indicator.

Locked Door Indicator.

WARNING LAMP BULBS—Imperial Models

(Replaced from under the instrument panel without removing instrument cluster).

Signal Sentry Bulb

Fasten Seat Belt Bulb

Lock Door Bulb

Brake System Bulb

High Beam Bulb can be removed after rocking the instrument cluster out far enough to gain acess to the printed circuit and bulb. (Not necessary to drop steering column).

EMERGENCY FLASHER—Chrysler Models

(1) Remove lower steering column cover for access.

(2) Remove wiring harness from wiring clip on left

side of steering column support.

(3) Remove wiring connectors from cluster printed circuit board, emergency flasher switch, panel lamp dimmer switch and headlamp switch.

(4) Remove two flasher switch mounting screws and remove flasher switch.

With instrument cluster removed, the following Chrysler Model switches replaced by removing the switch mounting screws and replacing the switch.

Panel Lamp Dimmer Switch
Head Lamp Switch
Windshield Wiper Switch
Windshield Washer Switch
Voltage Limiter

SWITCH REPLACEMENT—Imperial Models

Panel Lamp Dimmer Switch

(1) Remove lamp panel.

(2) Remove instrument cluster to gain access to the switch.

(3) Remove two switch mounting screws and remove switch.

Windshield Wiper Switch

(1) Remove instrument cluster to gain access to the switch.

(2) Remove two switch mounting screws and remove the switch.

Windshield Washer Switch

(1) Remove instrument cluster to gain access to the switch.

(2) Remove two switch mounting screws and remove the switch.

Headlamp Switch

(1) Remove instrument cluster to gain access to the switch.

(2) Remove two switch mounting screws and remove the switch.

The following switches and lamps can be removed from underneath the instrument panel by removing the switch attaching screws.

Rear Heater Vacuum Switch.
Rear Blower Switch.
Voltage Limiter.

INSTRUMENT AND GAUGES REPLACEMENT All Models

(Cluster Removed from Instrument Panel) Printed Circuit Boards

(1) Remove gauge mounting nuts.

(2) Remove printed circuit board mounting screws.

(3) Remove printed circuit board.

Alternator (Ammeter)

(1) Remove tripometer reset knob.

(2) Remove switch mounting screws.

(3) Remove cluster bezel mounting screws.

(4) Remove instrument cluster lens (held by snap pins).

(5) Remove two ammeter gauge mounting nuts and remove the gauge.

Oil Pressure Gauge

(1) Remove tripometer reset knob.

(2) Remove switch mounting screws.

(3) Remove cluster bezel mounting screws.

(4) Remove instrument cluster lens (held by snap pins).

(5) Remove two oil pressure gauge mounting nuts and remove the gauge.

Temperature and Fuel Gauge

(1) Remove tripometer reset knob.

(2) Remove switch mounting screws.

(3) Remove instrument cluster lens (held by snap pins).

(4) Remove four gauge assembly mounting nuts and remove the gauge assembly.

Speedometer

(1) Remove tripometer reset knob.

(2) Remove speedometer mounting screws.

(3) Remove instrument cluster lens.

(4) Remove speedometer.

Glove Box Light Replacement—All Models

(1) Remove the glove box light and switch assembly from the instrument panel bezel.

(2) Remove the bulb from the switch assembly.

Left Ash Receiver Light Replacement—All Models

(1) Remove the left ash receiver from the instrument panel.

(2) Remove the lamp socket from the housing and remove the bulb.

GLOVE BOX—All Models

Removal

(1) Remove the four upper glove box to lower glove box attaching screws.

(2) Remove the six glove box to instrument panel attaching screws.

(3) Separate the upper and lower glove box.

(4) Disconnect the stereo crossover wiring connectors (so equipped) and remove the lower glove box.

(5) Remove the upper glove box.

Installation

(1) Carefully install the upper glove box.

(2) Install the lower glove box and connect the stereo crossover wiring connectors (so equipped).

(3) Install the upper and lower glove box screws.

INSTRUMENT PANEL BEZEL—Chrysler Models

Removal

(1) Remove glove box door.

(2) Remove glove box.

(3) Remove vacuum lid switch bezel (so equipped).

(4) Remove glove box lamp and switch assembly.

(5) Remove four lower mounting screws through glove box opening.

(6) Remove four upper mounting screws through glove box opening.

(7) Remove instrument panel bezel.

Installation

(1) Position instrument panel bezel and install the four upper and lower mounting screws.

(2) Install glove box lamp and switch assembly.

(3) Install vacuum deck lid switch bezel.

(4) Install glove box and mounting screws.

(5) Install glove box door.

INSTRUMENT PANEL BEZEL—Imperial Models

Removal

(1) Remove the glove box door.

(2) Remove the glove box.

(3) Disconnect the glove box lamp and switch assembly wiring connector.

(4) Remove the eight bezel attaching screws and remove bezel.

Installation

(1) Position the instrument panel bezel and install the eight attaching screws.

(2) Connect the glove box lamp and switch wiring connector.

(3) Install glove box.

(4) Install glove box door.

INSTRUMENT PANEL TRIM PAD

Removal

(1) Remove steering column covers, upper and lower.

(2) Remove gear shift indicator pointer (one screw).

(3) Remove the three outside floor plate mounting screws.

(4) Remove the three steering column clamp support nuts.

(5) Carefully lower the steering column and allow steering wheel to rest on front seat cushion.

(6) Remove glove box door.

(7) Remove glove box.

(8) Remove instrument panel bezel.

(9) Remove two vent control mounting screws and allow assembly to hang free.

(10) Remove map lamp.

(11) Remove lamp panel.

(12) From under the instrument panel, remove the six lower trim pad mounting nuts.

(13) Through lamp panel and glove box openings, remove four upper trim pad mounting nuts and remove trim pad.

(14) Through the instrument cluster and glovebox openings, remove three upper trim pad mounting screws and remove trim pad.

Installation

(1) Position trim panel on instrument panel and install the ten attaching screws.

(2) Install lamp panel.

(3) Install map lamp.

(4) Position vent control and install attaching screws.

(5) Install instrument panel bezel.

(6) Install glove box and glove box door.

(7) Position steering column and install upper column attaching nuts, **finger tight.**

(8) Install the three outside floor plate mounting screws and tighten securely, then tighten the three upper column nuts securely.

(9) Install gear shift indicator pointer.

(10) Install steering column cover upper and lower.

TESTS OUT OF VEHICLE

Printed Circuit Board—All Models

A visual inspection of the conductors should be

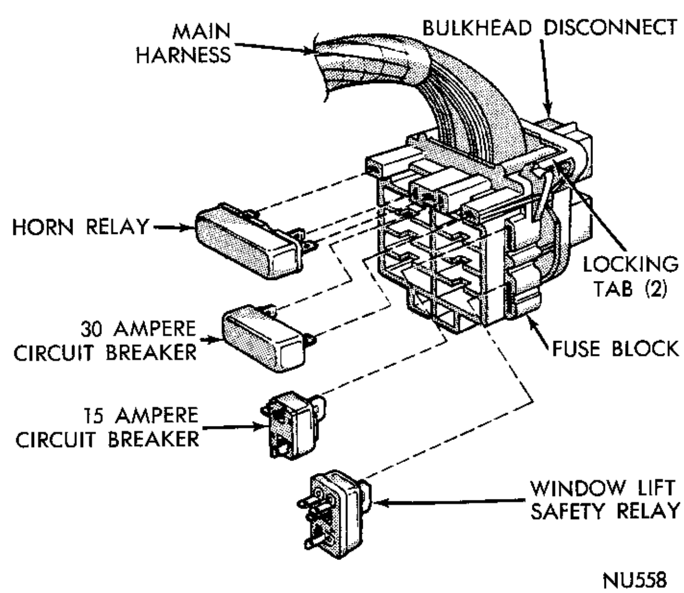


Fig. 9—Removing or Installing Circuit Breakers and Relays to Fuse Block

made for cracks or damaged circuits. If no visual damage is evident, each circuit should be tested for continuity with an ohmmeter or a test light. Should an open circuit be detected, the printed circuit board should be replaced.

Instruments—All Models

(1) Connect a jumper wire to voltage limiter input terminal. Connect other end of the jumper wire to positive post (+) of a 12 volt test battery.

(2) Connect a jumper wire from negative (—) post of battery to instrument cluster base (ground).

(3) Connect one lead from Tester C-3826 to gauge sending terminal being tested.

(4) Connect remaining tester lead to instrument cluster base (ground).

When the gauge tester is in "L" position, the gauge being tested should read on the low side of dial. With gauge tester on "M", the gauge should read in the center of the dial scale and on the high end of the dial when pointer of tester is placed on "H". If gauges do not perform as stated, inspect for an open printed circuit before replacing gauge.

CAUTION: A direct connection from a 12 volt battery will damage the gauges or printed circuit board.

Fuel Tank Sending Unit—All Models

Before removing any unit of the fuel level indicating system, the panel fuel gauge should be tested first. See "Tests in Vehicle". If the panel gauge performs properly **make sure the fuel tank ground strap on the fuel line at the tank is making a good ground.** Should the gauge perform properly and the ground strap be properly installed, remove the fuel tank sending unit as outlined in "Fuel System", Group 14 and test as follows:

(1) Using an ohmmeter with a 0 to 100 ohm scale, connect one lead to body of sending unit and the other lead to terminal in center of unit.

(2) Hold unit so float arm contacts "Empty Stop." The reading on ohmmeter scale should be 73 ohms, plus or minus 12.0 ohms for Chrysler models or 66 ohms plus or minus 11.5 ohms for Imperial models.

(3) Raise arm to "Full Stop." The reading should now be 9.6 ohms, plus or minus 1 ohm for Chrysler models or 2.2 ohms plus or minus .5 ohm for Imperial models.

If the unit does not perform to these specifications, inspect the stops or arm for possible distortion. If the stops or arm cannot be repaired or are not damaged, the unit should be replaced.

FUSE BLOCK

The fuse block is located under the instrument panel to the left of the brake pedal and is retained to the bulkhead disconnect by two locking tabs (Figs. 9 and 10).

Alignment of fuse block to bulkhead disconnect is maintained by two indexing barrels on the fuse block. The fuse name and capacity is printed on the front face of the fuse block. Refer to "Specifications".

CIRCUIT BREAKERS

Use only identical type and value circuit breakers as replacement when servicing. See "Specifications" for locations and values of circuit breakers.

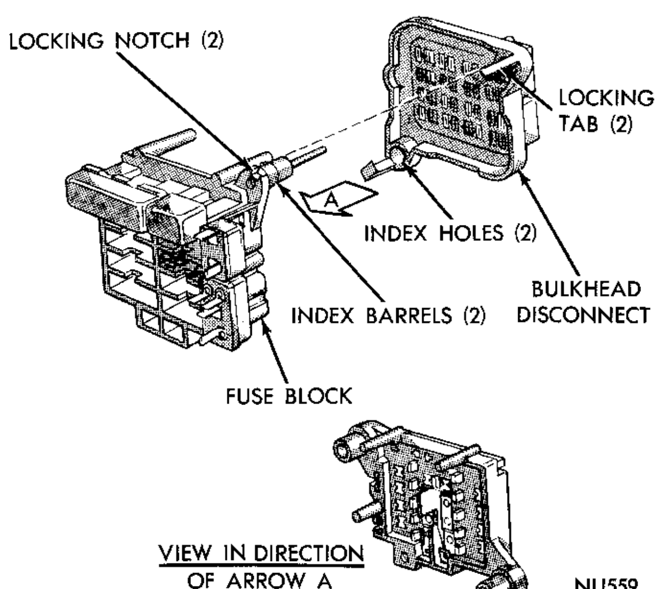


Fig. 10—Removing and Installing Fuse Block

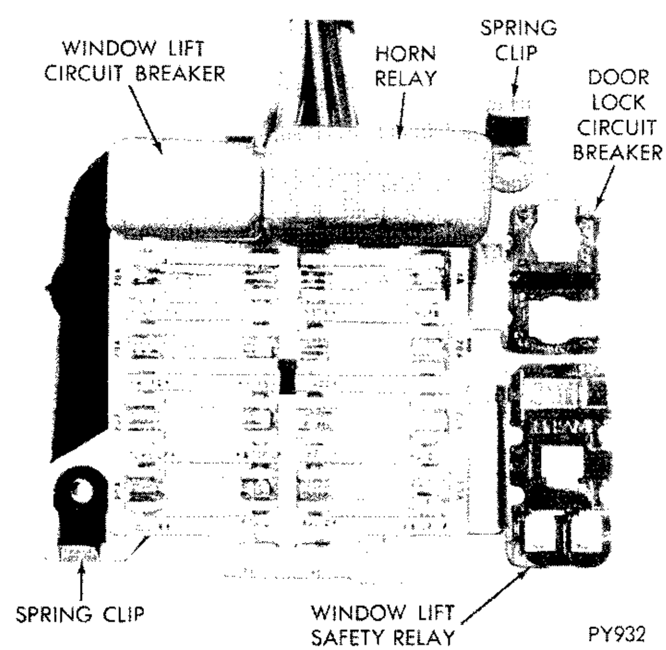


Fig. 11—Bulkhead Disconnect and Fuse Block Assembly

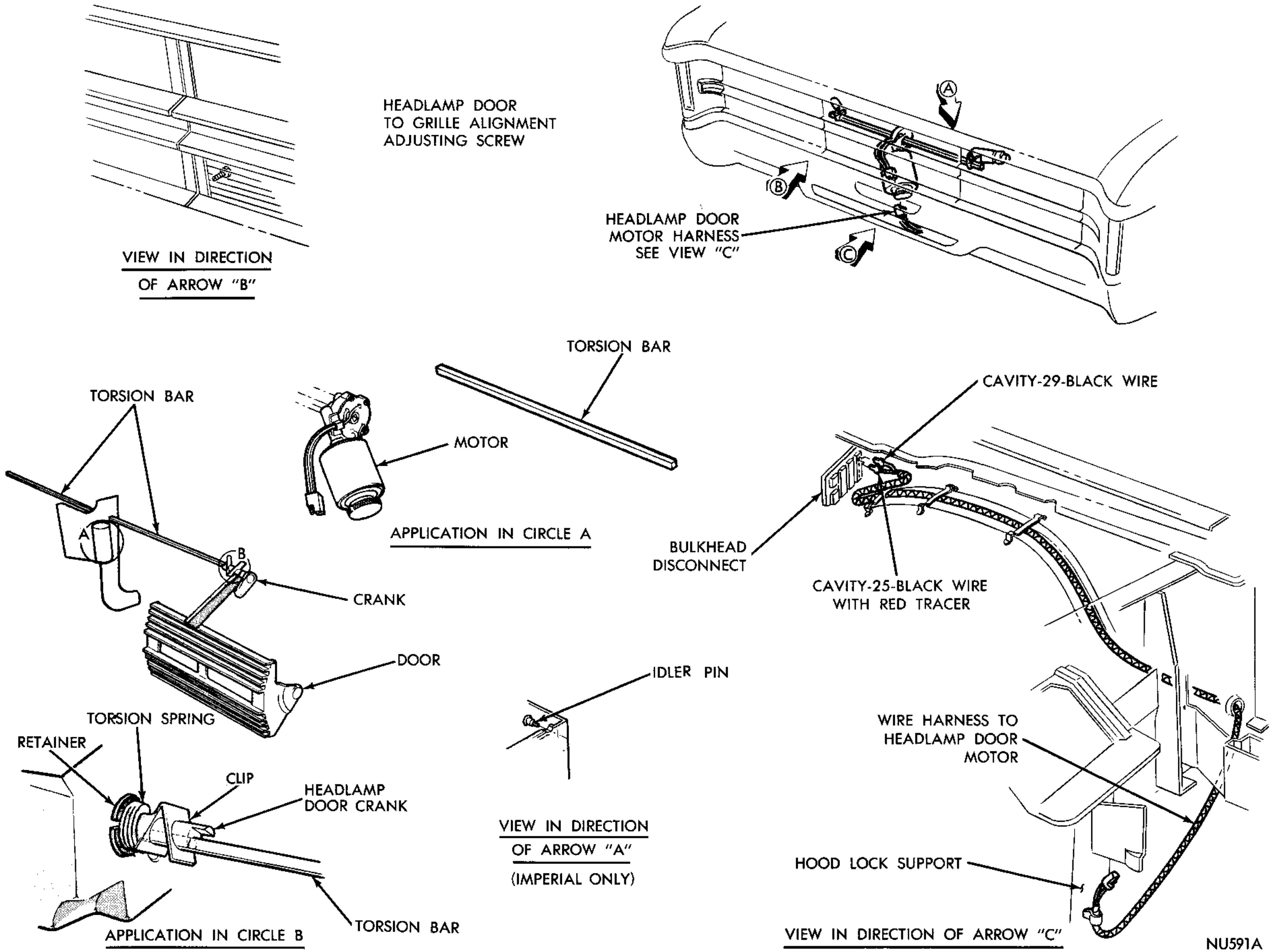


Fig. 1—Concealed Headlamps Adaptation

CONCEALED HEADLAMPS

INDEX

GENERAL INFORMATION

The headlamp doors (Fig. 1) are electrically operated. A single electric motor mounted on the hood lock vertical support is a series-wound type with two field windings. The motor has a worm gear drive and internal limit switches. A relay and circuit breaker assembly is mounted to the instrument panel lower reinforcement left of the steering column.

To open the headlamp doors in the event of an electrical failure, disconnect the motor leads FIRST, then rotate the hand wheel located at the lower end of the motor clockwise until the headlamp doors are fully opened.

CAUTION: Rotating the wheel after the doors reach the end of travel will permanently damage the motor.

SERVICE PROCEDURES

TESTS

(1) If headlamp doors do not operate and headlights and ignition switch are on **not accessory position),** before starting any tests, first check for good ground continuity; terminals fully seated, and connectors free of dirt and corrosion and that the wire from motor terminal is connected to a good body ground.

CAUTION: Do not operate motor with headlamp doors disconnected as operating the motor without load will damage motor.

(2) Using jumper wires, test motor operation. Using the car battery as a direct source of power, apply power to motor leads at terminal. **(Not the ground terminal).** If motor operates, perform Step (3).

(3) Use jumper wires at bulkhead disconnect to see if there is voltage at the terminal for both lights on and off. If there is no voltage for either door position, perform Step (4).

(4) Test for loose wire at the "H" terminal of headlamp switch, loose wires on headlamp motor relay, or faulty circuit breaker or relay; replace, relay and circuit breaker as required.

HEADLAMP DOORS

Removal

(1) Disconnect motor leads at harness connector (Fig. 1).

(2) Rotate the motor hand wheel clockwise if doors are closed; or counterclockwise if doors are open; until headlamp doors are at the halfway open position (indicator lug on motor switch plate and lug on gear near rectangular hole are in alignment Fig. 2). (Imperial only). On Chrysler 300, rotate door to full open position in order to remove door.

(3) Compress torsion bar to headlamp door crank clip and slide clip from crank (Fig. 1).

(4) Force the torsion bar from the crank arm slot by wiggling the door up and down with one hand while pulling the bar out from the slot with your other hand (Fig. 3).

(5) Remove inboard sealed beam units.

(6) Remove torsion spring and retainer clip from crank assembly (Fig. 1).

(7) Remove screw holding the crank assembly to the door arm at the inboard side of door.

(8) Remove crank assembly from headlamp door.

(9) Remove idler pin from outboard side of door, (Imperial only).

(10) Remove door from opening.

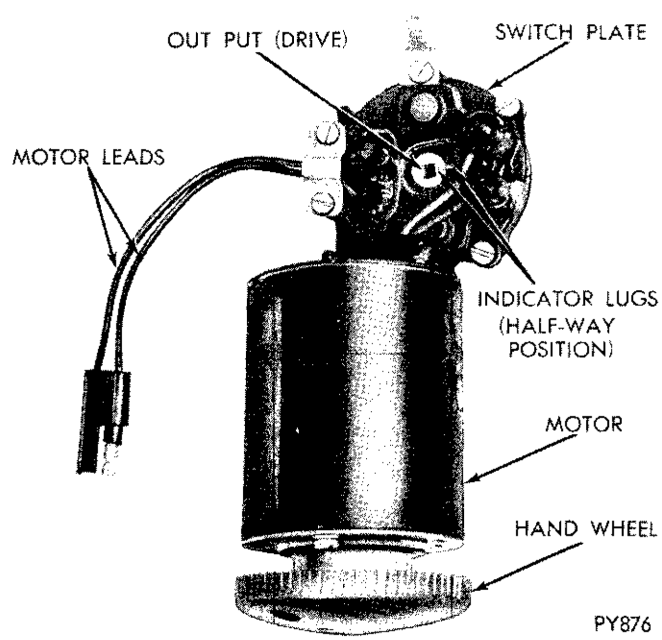


Fig. 2—Manually Aligning Indicator Lugs

Installation

(1) Position door in grille opening, align crank assembly holes and insert crank.

(2) Align idler pins holes and install idler pin, (Imperial only).

(3) Install retainer on crank.

(4) Install screw on side of door, attaching the crank assembly to the door.

(5) While holding door in open position, slide spring into position on crank.

(6) Wind spring up approximately 180° and hook in hole (Chrysler) or on the upper rear corner of the housing (Imperial). Check that spring preloads door in open position.

(7) Position and fully seat torsion bar in slotted area of crank. (Check that the motor is in halfway open position, Fig. 2).

(8) Compress and position clip over crank and torsion bar.

(9) Install headlamp sealed beam units and connect battery ground strap.

(10) Connect motor leads at harness connector (Fig. 1).

TORSION BAR AND MOTOR

The torsion bar and motor is removed as an assembly.

Removal

(1) Disconnect battery ground strap.

(2) Disconnect motor leads including ground wire from harness (Fig. 2).

(3) Rotate the hand wheel on the motor clockwise if doors are closed, or counterclockwise if doors are open until headlamp doors are at the halfway open position, (Fig. 2).

(4) Compress and remove clips from crank assemblies (Fig. 1).

(5) Remove torsion bar from slotted areas in cranks as described in headlamp door removal (Fig. 3).

(6) Remove motor mounting bracket (2 bolts) from vertical lock support (Imperial only).

(7) Remove motor (3 screws) from motor mounting bracket (Imperial) or vertical lock support (Chrysler).

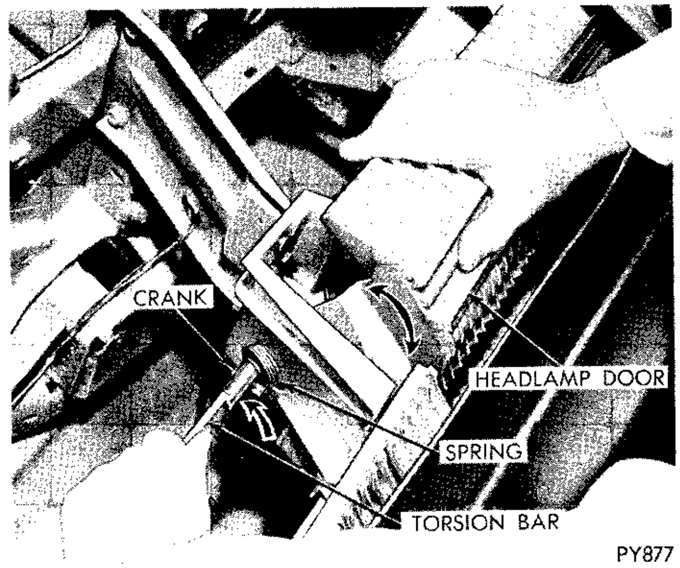


Fig. 3—Removing Torsion Bar from Headlamp Door Crank

(8) Remove torsion bar from motor.

Installation

CAUTION: Do not bench test new motor. Operating motor without load will damage the motor.

(1) Insert torsion bar in motor and position clips on bar. **The torsion bar and the hole in the motor are slightly rectangular and can be assembled only one way.**

(2) Position motor on motor mounting bracket (Imperial) or vertical lock support (Chrysler) and install mounting screws. Verify that the motor is in the halfway open position (Fig. 2), then tighten attaching screws to 95 inch pounds, plus or minus 20 inch pounds.

(3) Position motor mounting bracket on vertical lock support and tighten, attaching bolts to 220 inch pounds (Imperial only).

(4) Position and fully seat torsion bar in slotted areas of cranks. Compress clips and position over cranks and torsion bar.

(5) Connect motor to harness and connect battery ground strap.

(6) Test operation of doors.

WINDSHIELD WIPER SYSTEM

INDEX

GENERAL INFORMATION

The windshield wipers can be operated with the windshield wiper switch only when the ignition switch is in the **Accessory** or **Ignition** position. A circuit breaker, integral with the wiper switch protects the circuitry of the wiper system and the vehicle.

Two speed wipers are standard on Chrysler Newport and 300 models while three speed wipers are standard on Chrysler Town and Country and New Yorker models and on all Imperials. The three speed wipers are available as an option on Chrysler Newport and 300 models.

The three speed motor is controlled by resistors in the field circuit. The high speed resistor is mounted on the switch and the resistance wire is in the harness for medium speed.

Two speed motors have permanent magnet fields and are controlled by feeding power to two different brushes for low and high speed. For low speed operation, the current first flows through the torque limiting resistor and then to the low speed brush (terminal "L", Fig. 3). For high speed operation, the high speed brush (terminal "H") is fed directly.

The depressed parking feature in the three speed system is accomplished by reversing the rotation of the motor and the use of an eccentric motor shaft. When the wiper switch is turned "Off", the motor rotation is reversed, the motor inner shaft stops and the outer rotates 180° degrees, lengthening the linkage slightly to park the blades beneath the rear edge of the hood in the depressed position. The linkage shortens again when the motor is turned "On" by reversing the action.

The depressed parking feature of the two speed system is accomplished by reversing the rotation of the motor and the use of a parking cam on the motor crank pin. When the wiper is turned "Off", the motor direction is reversed and at the same time, the parking cam rotates 180° degrees, lengthening the drive link slightly to park the blades beneath the rear edge of the hood in the depressed position. Motor operation in the wipe direction returns to run position to restore the normal link length and wipe pattern.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
WIPER FAILS TO OPERATE	(a) Binding Linkage. (b) Faulty instrument panel switch. (c) Linkage disconnected. (d) Faulty motor. (e) Open or grounded wiring.	(a) Relieve binding condition. (b) Test switch. See "Panel Switch Tests". (c) Repair as necessary. (d) Test motor. See "Motor Testing". (e) Test wiring for continuity. Repair as necessary.
WIPER BLADES NOT PARKING PROPERLY	(a) Arm set at incorrect position.	(a) Adjust arm. See "Wiper Arm Adjustment."
BLADES SLAP AGAINST WINDSHIELD MOULDINGS ON DRY GLASS	(a) Improperly adjusted wiper arm. (b) Looseness of the motor crank or other drive parts.	(a) See "Wiper Arm Adjustment." (b) Tighten or replace the part.
BLADES CHATTER	(a) Twisted arm holds blade at wrong angle to glass. (b) Bent or damaged blades. (c) Foreign substances such as body polish on glass or blades.	(a) Replace wiper arm. Do not attempt to straighten bent or twisted arm. (b) Replace blades. (c) Clean the glass or blades.
MOTOR WILL NOT STOP WHEN INSTRUMENT PANEL SWITCH IS TURNED "OFF"	(a) Motor park switch failure in the "closed" position.	(a) Replace motor assembly.
MOTOR STOPS IN ANY POSITION WHEN INSTRUMENT PANEL SWITCH IS TURNED	(a) Motor park switch failure in the "open" position. (b) Open parking circuit or open field circuit.	(a) Replace motor assembly. (b) Test continuity of blue, red and green wiring circuit and correct as necessary.
NO SPEED CONTROL	(a) Open circuit in red or green wiring (3-speed). Open circuit in brown or red wiring (2-speed only). (b) Faulty control switch.	(a) Test continuity and correct as necessary. (b) Replace switch.

SERVICE PROCEDURES

WIPER ARM ADJUSTMENT

To determine if an adjustment is required, apply a constant **upward** force of 50 ounces parallel to the windshield glass at the end of the wiper arm (where the blade is attached to the arm). With the force applied, pull the wiper blade away from the windshield glass once or twice to prevent glass friction from affecting upward movement of the wiper arm and blade. With the force applied, the clearance between the side of the wiper blade and the blade stop should be as follows:

Clearance in Inches Between Side of Blade and Blade Stop	
Right	**Left**
.75 to 2.50	.25 to 2.00

If the clearance is not in the specified range lift the wiper arm and insert a .090 inch diameter pin or drill (Fig. 1). With the pin inserted, pull the wiper arm off wiper pivot with a rocking motion and reposition. Remove pin after repositioning. (If necessary to remove left pivot, refer to "Linkage and Pivots" Paragraph.)

CAUTION: The use of a screwdriver or other prying tool to remove an arm may distort it in a manner that will allow it to come off the pivot-shaft in the future, regardless of how carefully it is reinstalled. NEVER under any circumstances push or bend the spring clip in the base of the arm in an attempt to release the arm. This clip is self-releasing.

END PLAY ADJUSTMENT (Three Speed Only)

To adjust the armature shaft end play, turn the adjustment screw in until it bottoms and back-off 1/8 turn (Fig. 2). This adjustment can be made without removing the wiper motor from the vehicle.

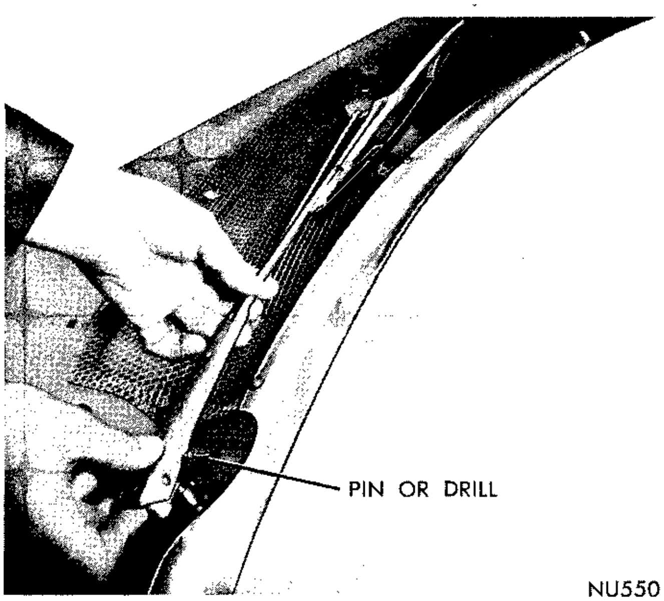


Fig. 1—Removing Wiper Arm and Blade

PANEL SWITCH TESTS (Three Speed Only)

The switch contains the high speed resistor with a medium speed resistor in the wire harness to provide means of controlling the current flow to the motor. In the off position the switch is designed to provide a circuit to the motor to reverse the current to the field winding which reverses the direction of the armature. A circuit breaker, built into the switch, protects the circuitry.

To test the switch, disconnect the wiring to the switch and remove the switch from the instrument panel. For removal and installation of the wiper switch, see "Instrument Panels".

Using a continuity tester or an ohmmeter, test for continuity (no resistance between the contact terminals of the switch as shown in the following chart.

For test purposes, the "Park" position is the "Off" position. The "Low" position is the first detent past the "Off" position. The "High" position is the second detent of the switch. The bench test of the switch does not require the use of a twelve volt battery.

SWITCH CONTINUITY CHART
(3-Speed Wiper Motors)

Off	Low	Medium	High
B to B/U	B to B/U	B to B/U	B to B/U
B/U to P	B/U to A	B/U to A	B/U to A
A to F2	A to F1	F1 to R1	A through the resistor to F1
F1 to Ground	F2 to Ground	F2 to Ground	F2 to Ground
	P-Open	P-Open	P-Open
			F1 to R2

PANEL SWITCH TEST (Two Speed)

This switch contains a circuit breaker between

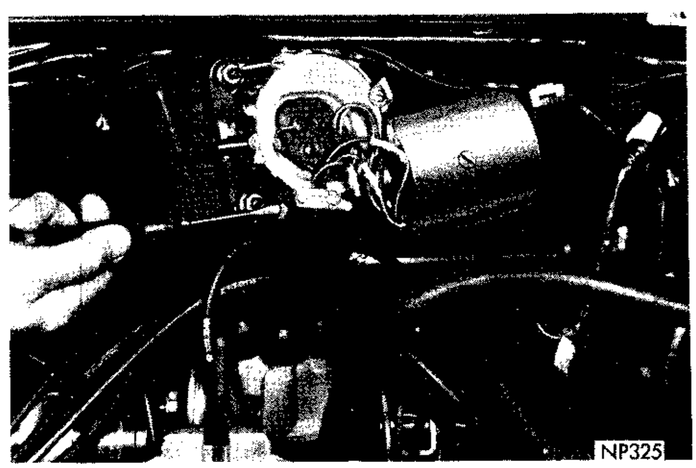


Fig. 2—End Play Adjustment (3 Speed Only)

terminals B and P. To test the switch, disconnect the wiring and remove from the instrument panel.

For removal and installation of the wiper switch, see "Instrument Panels".

Using a continuity tester or an ohmmeter, test for continuity (no resistance) between the contact terminals of the switch as shown in the following chart.

For test purposes, the "Park" position is the "Off" position. The "Low" position is the first detent past the "Off" position. The "High" position is the second detent of the switch. The bench test of the switch does not require the use of a twelve volt battery. **In the test chart the reference "Ground" means to attach one lead of the continuity tester or ohmmeter to the switch case.**

SWITCH CONTINUITY CHART

(Chrysler Manufactured 2-Speed)

Off	Low	High
B to B/U	B to B/U	B to B/U
B to P	B to A	B to F1
A to Ground	P-Open	F2 to Ground
F2-Open	F1-Open	A-Open
F1-Open	F2-Ground	

MOTOR TESTING

(Two Speed) (Fig. 3)

(1) Disconnect motor leads at motor. Connect jumper from battery positive terminal to motor terminal "H". Connect second jumper from terminal "P2" to ground. Motor should run at high speed. Remove jumpers.

(2) Connect jumper from battery positive terminal to resistor terminal. Connect second jumper from terminal "L" to second resistor terminal. Connect a third jumper from terminal "P2" to ground. The motor should run forward at low speed. Remove jumpers.

(3) Connect jumper from battery positive terminal to motor terminal "P1". Connect a second jumper from motor terminal "L" to ground. The motor should run in reverse rotation for at least a half revolution and park. Remove jumpers.

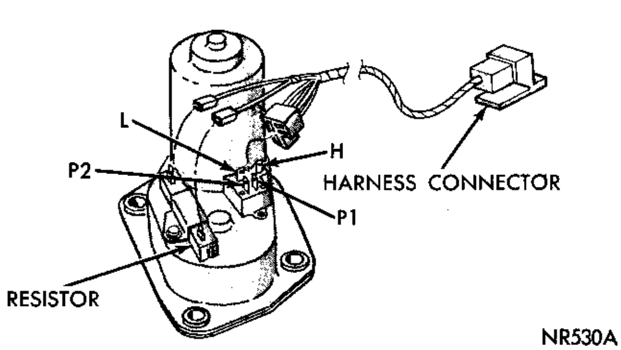


Fig. 3—Wiper Motor—Two Speed

(Three Speed)

Disconnect motor leads at bulkhead disconnect.

(1) Connect a jumper wire from the green lead to ground. Connect a second jumper from battery positive terminal to brown and red leads in bulkhead disconnect. (The ground circuit is completed through the car body.) The motor should run continuously. Disconnect leads.

(2) Connect jumper wire from green lead to brown lead. Connect red lead to ground. Connect third jumper wire from battery positive terminal to blue lead. The wiper should run to the park position. **CAUTION: Motor can be damaged if not wired correctly.**

LINKAGE AND PIVOT REMOVAL

To service drive link, connecting link or either pivot, it is necessary to remove the wiper arms and blade assemblies, and the cowl screen to provide access to the wiper system.

(1) Disconnect battery ground cable.

(2) Remove the crank arm nut and crank arm from motor shaft.

(3) Remove bolts mounting left and right pivots to body (Fig. 5).

(4) Remove links and pivots through cowl top opening. The linkage and pivots can be serviced on bench after removal from the vehicle. (Refer to Figure 4).

LUBRICATION

Should it be necessary to service the wiper system for any reason, the parking spring in the two speed parking mechanism should be lubricated with Mopar Lubricant provided with service package. Apply the lubricant to inside coils of spring first and to the outside of the spring coils after installation of the spring.

The three speed crank arm pin and the pivot pins for all systems should be lubricated with Automotive Multi-Purpose Lubricant NLGI 2.

LINKAGE AND PIVOT INSTALLATION

If servicing of the mechanism on the 2-speed motor crank is required, be certain that during reassembly, the link is positioned between the ears of the cover retainer. Seat the rubber cover fully in the groove provided for it on the cover retainer.

Any retainer clips distorted during removal should be replaced.

When installing connecting link on pivot pin place spring washer on pin and lubricate pin. Install connecting link and retaining clip. Place foam rubber washer and flat metal washer on pin. Lubricate pin and install links and retaining clips.

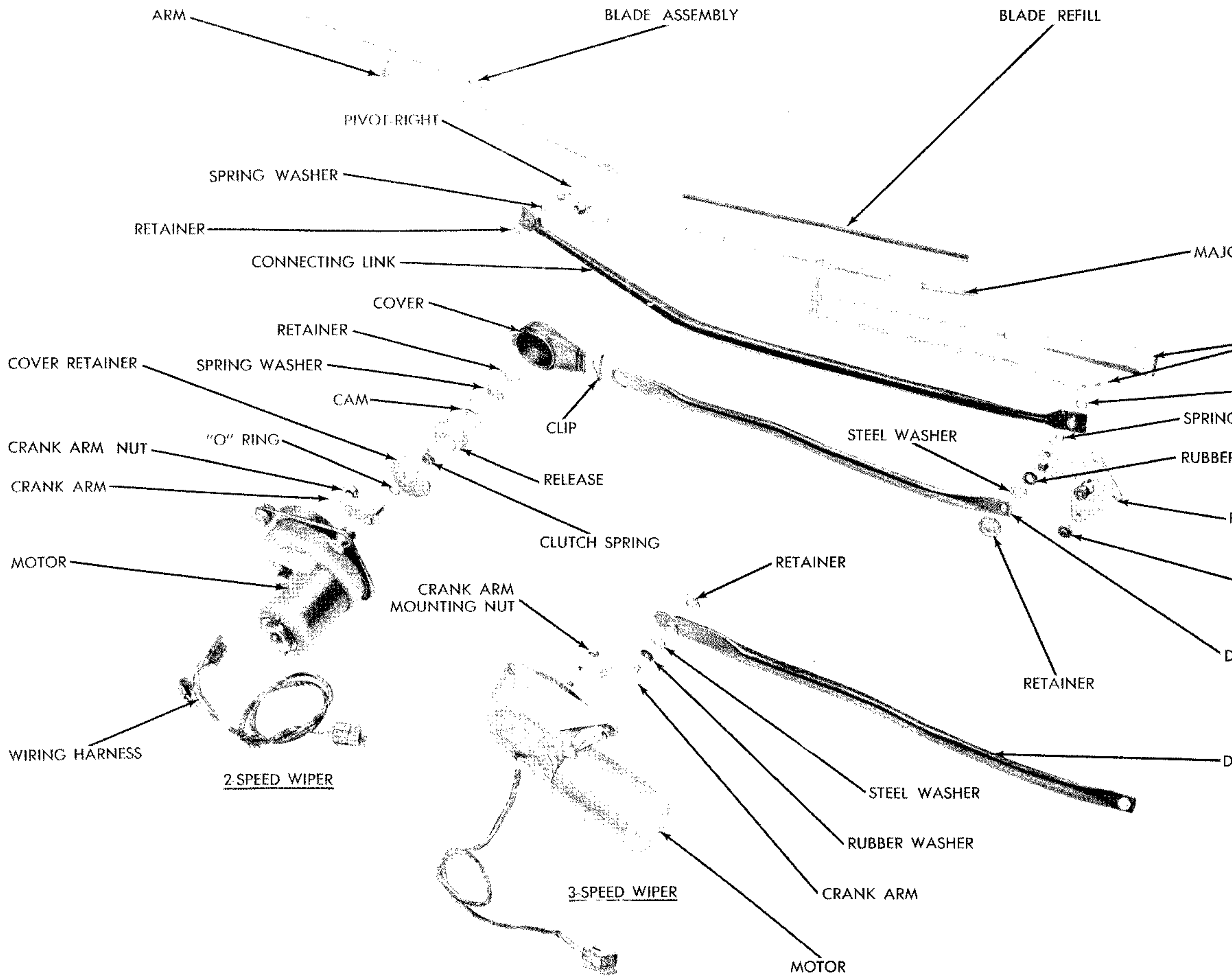


Fig. 4—Wiper System

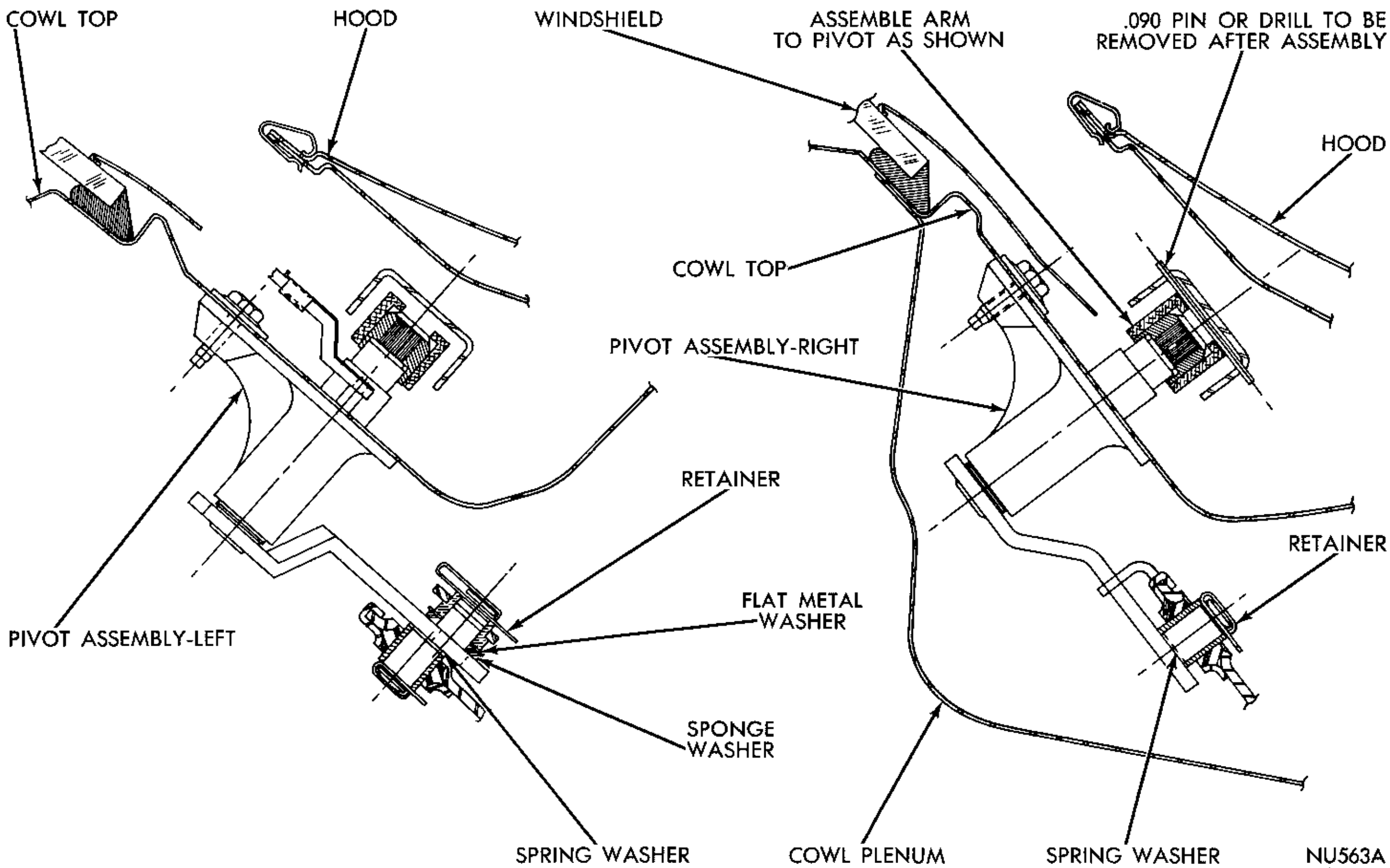


Fig. 5—Pivot, Arm and Link (Sectional)

(1) Insert the linkage and pivots, assembled as a unit, through the cowl panel opening.

(2) Bolt pivots in position.

(3) Position crank arm on motor shaft and tighten mounting nut to 140 inch-pounds.

(4) Connect battery ground cable.

(5) Test wiper system operation.

(6) Install cowl screen.

(7) Using a .090 inch diameter pin or drill (Fig. 1) carefully install wiper arm and blade assemblies. (See Wiper Arm Adjustments).

WINDSHIELD WASHERS

GENERAL INFORMATION

Chrysler and Imperial models are equipped with push button electric washers as standard equipment.

The electric pump assembly is mounted directly to the reservoir. A permanently lubricated sealed motor is coupled to a rotor type pump. Fluid, gravity fed from the reservoir, is forced by the pump through rubber hoses to the nozzles which direct the streams to the windshield.

The pump and reservoir are serviced as separate assemblies.

SERVICE DIAGNOSIS

As an aid to determine if the pump assembly is defective, connect a jumper wire from the blade terminal of the pump (Fig. 2), to the positive terminal of the battery. If pump operates, check wiring and switch. If pump does not operate, it may be defective of frozen. Replace the pump and motor assembly if defective.

Condition	Possible Cause	Correction
INTERMITTENT OPERATION OF SYSTEM	(a) Loose wiring connections. (b) Faulty switch. (c) Faulty motor.	(a) Repair as necessary. (b) Replace switch. (c) Replace motor and pump assembly.

Condition	Possible Cause	Correction
MOTOR RUNS DOES NOT PUMP FLUID	(a) Nozzle jets plugged. (b) Broken or loose hose. (c) Faulty pump.	(a) Clean nozzle jets. (b) Replace hose. (c) Replace motor and pump assembly.
PUMP ASSEMBLY INOPERATIVE	(a) Poor ground. (b) Loose wiring terminals. (c) Corroded terminals. (d) Broken wires. (e) Faulty switch. (f) Faulty motor.	(a) Clean ground wire terminal and tighten mounting screw. (b) Tighten terminals. (c) Clean and tighten terminals. (d) Repair or replace the wires. (e) Replace switch assembly. (f) Replace motor and pump assembly.
LOW OUTPUT	(a) Low aimed nozzles. (b) Poor electrical connections. (c) Pinched or leaky hoses. (d) Defective motor.	(a) Adjust nozzles. (b) Clean and tighten terminals. (c) Correct as necessary. (d) Replace motor and pump assembly.

SERVICE PROCEDURES

Nozzle Adjustment

The nozzles are mounted on the underside of the hood. Vertical and lateral adjustment is obtained by bending the nozzle tube with the fingers. **Caution: To prevent possible injury, do not adjust the nozzles while the wipers are operating.**

Adjust nozzles so that the centers of the streams contact the windshield glass (Fig. 1). The oval pattern formed by the stream striking the windshield glass is not "centered" on the center of the stream. The stream is toward the bottom of the oval pattern.

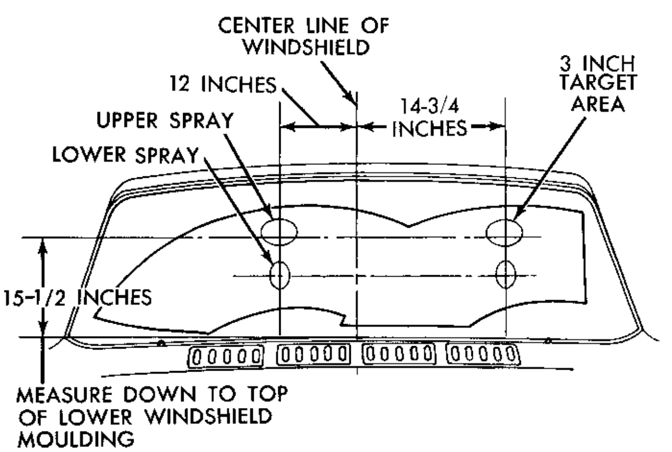


Fig. 1—Washer Aiming Diagram

ELECTRIC PUMP

Removal

(1) Remove reservoir mounting screws, remove reservoir and pump assembly. Empty fluid from reservoir.

(2) Disconnect motor feed wire connector and rubber hose from bottom of pump.

(3) Using a suitable extension and a 7/8 inch deep-well socket through filler neck, remove pump mounting nut inside reservoir. Remove ground wire. **It may be necessary in some older pumps to use a 15/16 in. deep-well socket due to the expansion of the nylon nut through absorption of windshield washer fluid.**

(4) Remove pump from bottom of reservoir and discard rubber gasket.

Installation

Any time the pump is removed from the reservoir, always replace the rubber gasket.

(1) Install new rubber gasket on reservoir.

(2) Install pump assembly through gasket. Place plastic washer under screen and nut assembly and tighten securely (approximately 25 inch pounds). **Do not overtighten.**

(3) Reconnect ground wire. Ground wire may be spliced, soldered or recrimped.

Crimping may be facilitated by making small cuts along the brass barrel, using diagonal cutters and then peening using a center punch and hammer.

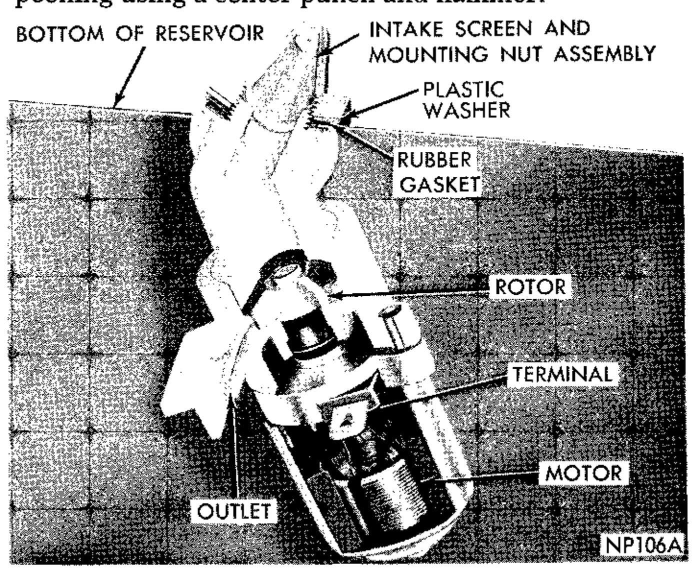


Fig. 2—Reservoir and Pump Assembly

(4) Install pump and reservoir in vehicle with mounting screws **making sure motor ground wire is installed under one of the mounting screws.**

(5) Connect motor feed wire connector and rubber hose to pump. Fill reservoir, inspect for leaks and test operation of washer system making sure the nozzles are adjusted properly.

ELECTRIC WINDOW LIFT, POWER VENTS and ELECTRIC DOOR LOCKS

INDEX

ELECTRIC DOOR LOCK SYSTEM

All doors can be locked or unlocked electrically by operating either of the front door locking buttons. The rear door locking buttons will lock or unlock the rear doors mechanically.

IN THE EVENT OF A POWER FAILURE

The right front door can be locked or unlocked mechanically.

The left front door can be unlocked mechanically by means of the inside remote handle, but cannot be locked from inside the car.

Adjustment

(1) Loosen solenoid to mounting screws (Fig. 1) and slide solenoid to full down position.

(2) Extend solenoid rod until latch is in locked position.

(3) Tighten solenoid to mounting screws and test operation of lock.

Electrical Tests

The battery must be fully charged before testing. Make certain solenoids are correctly adjusted before circuits are tested. The circuit breaker is located behind the left side cowl trim panel. The relay is located behind the right side cowl trim panel.

Connect the positive lead of a voltmeter to the buss bar on the relay assembly and the negative lead of the voltmeter to a good ground (Fig. 2). With no load, voltage should be 12.6 volts and 9.4 volts when locks are activated. If no reading is obtained at relay, the circuit breaker should be tested next. See "Wiring Diagrams" for appropriate schematic wiring diagram.

Connect voltmeter positive lead to light green terminal of circuit breaker and other lead to a good ground. If a reading of 12.4 volts is not obtained, inspect for a broken wire or loose connection at ammeter. Replace circuit breaker only if continuity of input wire has been established.

To determine which solenoid is faulty, check each individual door for electrical lock and unlock, or disconnect the solenoid connectors one at a time, while operating the door lock switch. When faulty solenoid is disconnected, the remaining door locks will operate. If necessary to replace solenoid, refer to Group 23 "Body and Frame".

If the solenoid failure was caused by overheating (sticking switch), the remaining solenoids should be checked for proper operation and replaced if necessary.

VENT WING REGULATORS

Electrical Tests

The battery should be fully charged and the ter-

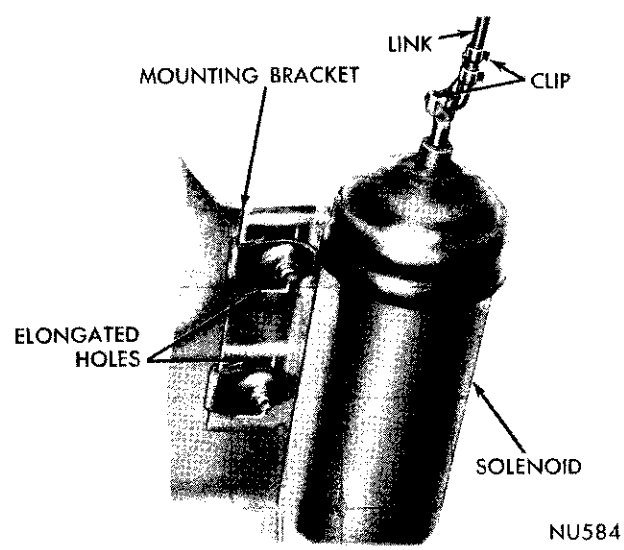


Fig. 1—Solenoid Adjustment

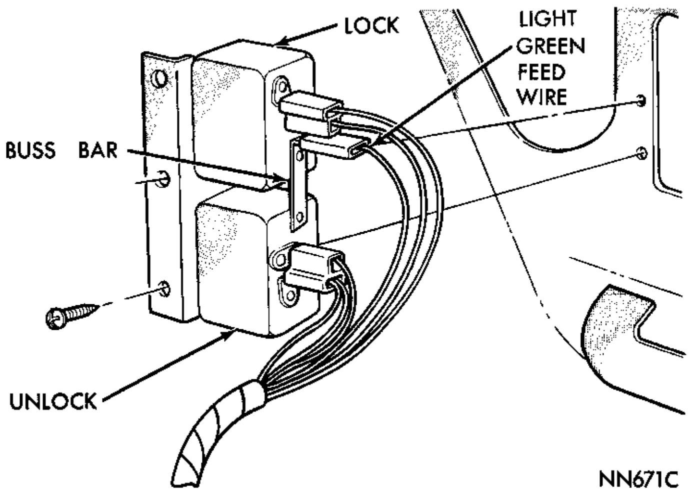


Fig. 2—Door Lock Relay

minal clean and tight before any tests are performed. Wire connections at the ammeter and accessory circuit breaker, mounted on the left cowl panel, should be tight.

Vent wing motors have two separate field windings, known as split series. Direction of rotation is controlled by energizing either field with the switch. The fields are grounded to body through the motor housing with the switch completing the particular circuit back to ground when it is actuated.

Circuit Breaker Test

Connect one lead of a test light to output terminal of circuit breaker and other lead to a good ground. The test bulb should light, if not and wire continuity has been established, replace the circuit breaker.

Vent Wing Switch

Slide a thin blade behind switch housing (front and back) to depress retaining clips and pull switch out from trim panel. Carefully separate multiple terminal block from switch body. Connect lead of a test light to tan feed wire terminal of multiple terminal block and other lead to a good ground. If bulb does not light, inspect for broken or loose wires to circuit breaker.

If bulb does light, remove and connect a jumper wire between tan feed wire in multiple connector and "open" terminal wire (Fig. 1). If vent operates properly, replace switch body. If vent fails to operate inspect for broken, loose or disconnected wires or a faulty motor. See "Bench Test". Repeat above test on "close" terminal if first test opens vent wing. Refer to Group 23 "Body and Frame" for removal and replacement of components.

Vent Wing Motor

Connect a jumper wire from positive post of a test battery to white wire terminal of motor and connect a second jumper from battery negative post to motor housing. The motor should run in one direction unless it is against regulator stop. In that event remove positive jumper wire from white terminal and touch it to dark blue wire terminal. Should motor fail to run in either direction, it should be replaced.

WINDOW REGULATORS

Electrical Tests

Electric window lift motors are the permanent magnet type. The motors are grounded through the master switch by a black wire attached to the left cowl panel (Fig. 1).

Circuit Breaker Test

Connect one lead of a test light to output terminal of circuit breaker and other lead to a good ground. The test bulb should light, if not and wire continuity has been established, replace the circuit breaker.

Window Lift Switch

Remove switch from trim panel for testing purposes. Slide a thin blade behind the switch housing (front and back) to depress retaining clips and pull switch out from panel. Carefully separate multiple terminal block from switch body. Connect one lead of a test light to black wire terminal and touch other lead to tan wire terminal. The test bulb should light, if not, test wires for an open circuit. Use two jumper wires to test continuity of circuits. Connect one jumper to the tan lead and the other end to the **Up** or **Down** terminal (opposite of glass position). Connect the other jumper to a good ground and to the opposite terminal (Fig. 1).

If motor runs, install switch body on multiple connector and activate switch. Should motor fail to run, replace switch body. Each switch is tested in same manner.

The motor should run, if not, test continuity of wiring. Should continuity be established and motor still does not run, replace motor.

Motor Bench Test

Connect a jumper from positive terminal of a test battery to one of the motor leads. Connect another jumper from the test battery negative terminal to the other motor lead and the motor should run. To reverse direction of motor rotation, switch leads of jumper wires at test battery terminals.

Motor Lubrication

With motor removed from regulator. Remove seal (Fig. 2) from the motor gearbox housing. Apply a liberal amount of the lubricant in the gearbox housing to the entire inside diameter of seal marked "A" and the outside diameter of the gear and pinion assembly

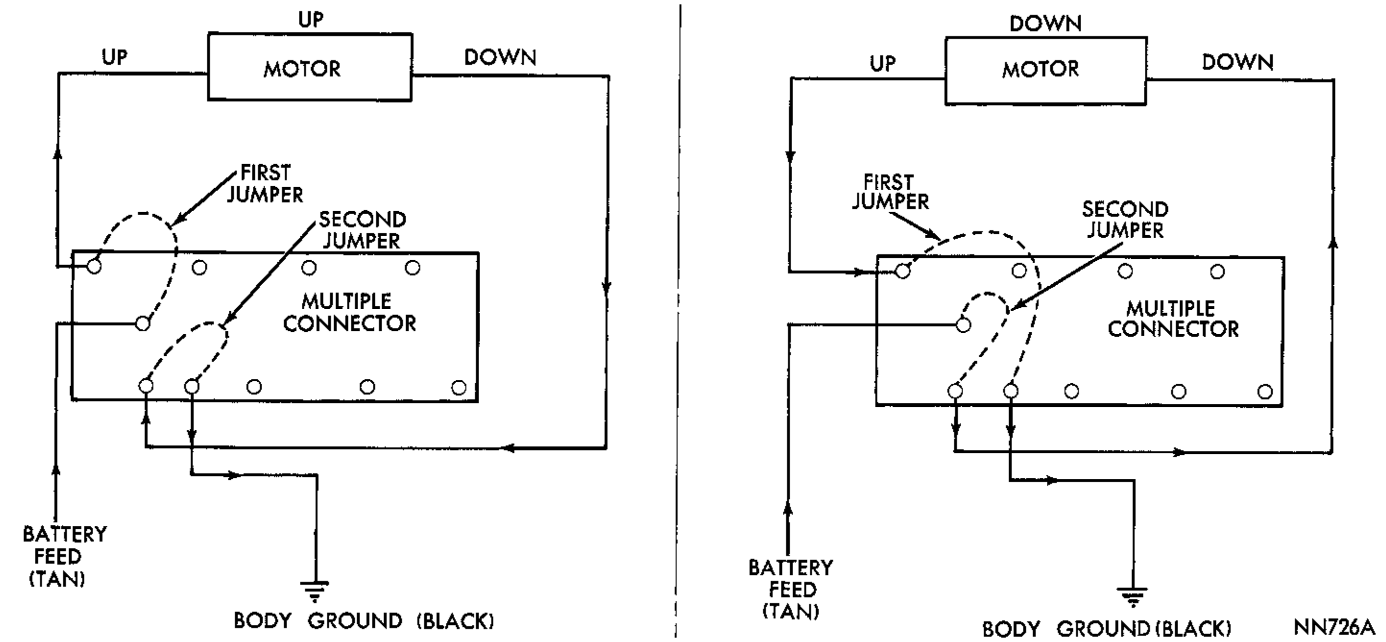


Fig. 1—Testing Electrical Switch

marked "B", and diameter "C" where the seal contacts the rubber coupling.

If there is no lubricant in the gear box, fill to top of gear with Mopar 2525035 Multi-Mileage Lubricant or Mopar 1064768 Lubri-plate.

STATION WAGON—TAIL GATE WINDOW LIFT

Electrical Tests

A tail gate glass may not move due to a binding condition between the glass and run channels. Correct the binding condition before making electrical tests.

CONTROL SWITCH

Disconnect black wire at control switch and hold firmly against yellow wire terminal on control switch. The glass (if raised) should lower. Repeat test with brown wire. The glass (in lowered position) should rise. If glass operates during tests, but fails to operate when the control switch lever is moved, the switch is at fault. If glass fails to move during these tests, perform the wire harness tests.

WIRE HARNESS AND REGULATOR MOTOR

Disconnect wire harness connector at motor. Connect one wire of a test light to brown wire and the other to a good body ground. Position instrument panel switch in the "UP" position. The bulb should light. Repeat test with the yellow wire, but position switch in the "DOWN" position. If bulb fails to light either time, and all wire terminals are tight, replace the circuit breaker. See "Wiring Diagrams" for appropriate schematic wiring diagram.

Should bulb light on one wire but not the other, inspect harness for a broken wire. If bulb lights in both tests, place one wire of test light to black wire terminal on motor and other wire to a good body ground. Position switch in either "UP" or "DOWN" position. If bulb lights, inspect for a bad ground connection or broken black wire. If test bulb does not light and the wire harness continuity has been established, replace the motor. See "Group 23" for replacement and adjustments of tail gate components.

Pump Motor

Should the test bulb light on one wire but not the other, inspect wire harness for a broken wire. If the bulb lights in both tests, place one wire of the test light to the black wire terminal (ground) on the motor and the other wire to a good body ground. Position the switch in either "UP" or "DOWN" position. If bulb should light inspect for a poor ground connection or broken black wire. If the bulb does not light and wire harness continuity has been established,

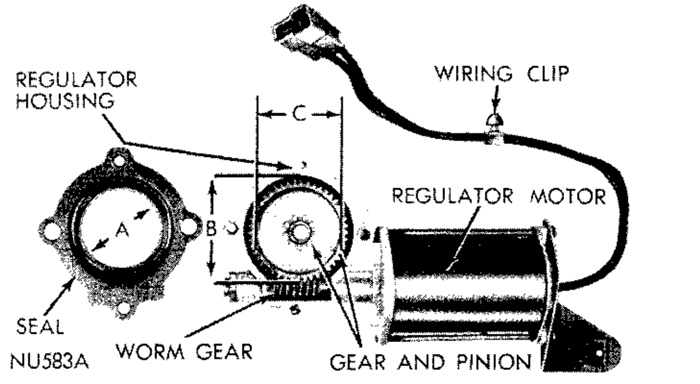


Fig. 2—Window Lift Motor Lubrication

test black wire with a needle type connector as close to motor as possible without touching motor. If bulb fails to light, replace the motor (refer to Group 23, "Body and Frame").

TOP LIFT (CONVERTIBLE)

Electrical Tests

Control Switch

Refer to Figure 1 and appropriate wiring diagram (See "Wiring Diagrams") and disconnect red wire at switch. Hold firmly against yellow wire terminal on switch. The top (if raised) should start to lower. Repeat test with the brown wire. The top (in lowered position) should start to rise. If top operates during these tests, but fails to operate when the control switch lever is moved to "UP" or "DOWN" position, the switch is at fault and should be replaced. If the top fails to operate during these tests, inspect and test wires between switch and motor.

Circuit Breaker

Disconnect the wire harness connector at the motor and connect one wire of test light to brown wire and the other to a good body ground. Position the instrument panel switch in the "UP" position. The bulb should light. Repeat this test with the yellow wire but position the switch in the "DOWN" position. If the bulb fails to light either time and wire continuity has been established, replace the circuit breaker.

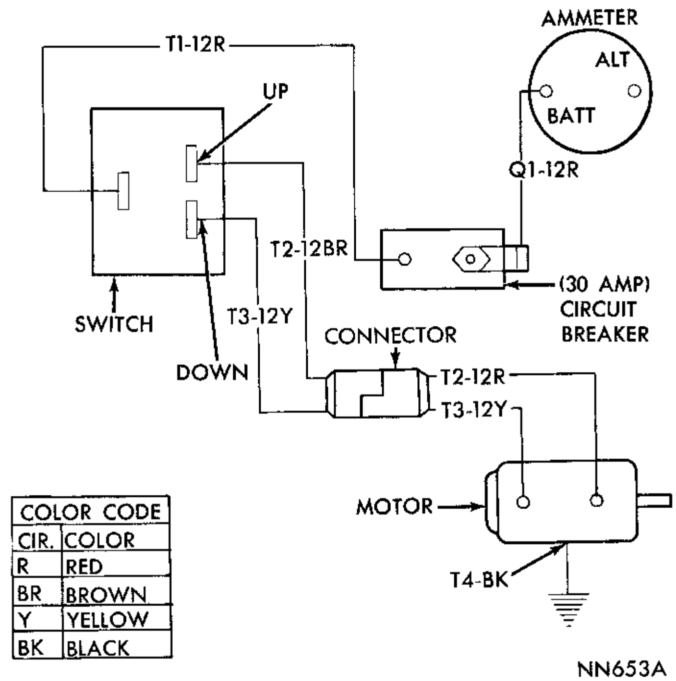


Fig. 1—Wiring Circuit

POWER SEATS

INDEX

GENERAL INFORMATION

This power seat can be adjusted in six different directions—up, down, forward, back, tilt forward, or tilt rearward.

The control switch is located on the lower outboard side of the seat. The front lever on the switch (Fig. 1) raises or lowers (tilts) the front of the seat, the center lever raises or lowers the complete seat, and also moves it forward or backward, the rear lever raises or lowers (tilts) the back of the seat.

A three armature permanent magnet reversible motor is coupled through cables to rack and pinion assemblies located in the seat tracks, providing the various seat movements.

The electrical circuit is protected by a 30 amp circuit breaker located on the fuse block on the inside of the cowl panel to the left of the steering column.

SERVICE PROCEDURES

ELECTRICAL TESTS

Before any testing is attempted the battery should be fully charged and all connections and terminals cleaned and tightened to insure proper continuity and grounds. With everything connected and the dome

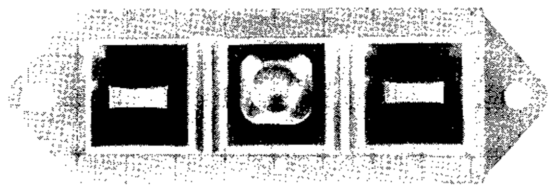


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Fig. 1—Switch Assembly

light on, apply switch in direction of failure, if dome light dims the seat motion is trying to work indicating mechanical jamming. If dome light does not dim then proceed with the following electrical tests.

(1) Disconnect wire from instrument panel feed at fuse block side cowl circuit breaker.

(2) Connect test lamp C-744 in series between instrument panel feed and good ground. If test lamp lights feed in wiring is good.

(3) Remove test lamp and connect feed to circuit breaker.

(4) Disconnect wiring from other side of circuit breaker. Connect test lamp C-744 in series between circuit breaker and good ground, if test lamp lights circuit breaker is good.

(5) Remove test lamp and connect wiring harness.

(6) Disconnect wiring harness at connector under seat. Connect test lamp C-744 between red (R) and black (BK) wire in female connector on harness, if test lamp lights harness to seat is good.

(7) Remove test lamp and connect harness.

(8) Remove switch from seat harness.

(9) To check front motor connect a covered jumper wire between the red (R) terminal in the center section (Fig. 2) either the red with dark green (R-DGN) tracer, or yellow with dark green (Y-DGN) tracer connection in the front section. Connect a second covered jumper wire between the black (BK) terminal in the center section and the open connection in the front section, if motor does not operate, reverse the jumpers in the front section. If motor still does not operate, either the harness or complete three motor assembly should be replaced.

(10) To check center motor connect a covered jumper wire between the red (R) terminal of the center section (Fig. 2) and either the red with white tracer (R-W) tracer, or yellow with white (Y-W) tracer connection in the center section. Connect a second covered jumper wire between the black (BK) terminal in the center section and the open connection in the center section, if motor does not operate, reverse the jumpers (R-W) and (Y-W). If motor still does not operate, either the harness or complete three motor assembly should be replaced.

(11) To check rear motor connect a covered jumper wire between the red (R) terminal in the center section (Fig. 2) and either the red with dark blue (R-DBL) tracer, or yellow with dark blue (Y-DBL) tracer connection in the rear section. Connect a second covered jumper wire between the black (BK) terminal in the center section and the open connection in the rear section, if motor does not operate, reverse the jumpers in the rear section. If motor still does not operate, either the harness or complete three motor assembly should be replaced.

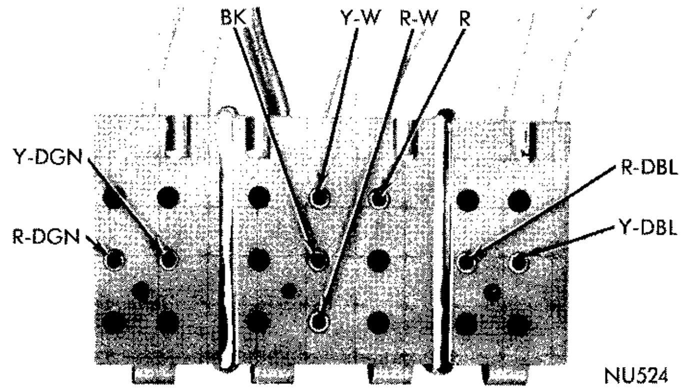

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Fig. 2—Electrical Test Area Location

(12) If all motors and the seat operate properly this indicates that the switch is bad and should be replaced. For additional wiring diagrams see "Wiring Diagram" section at end of this group.

SEAT ASSEMBLY AND ADJUSTER

Removal

(1) Disconnect battery ground cable.

(2) From underneath vehicle remove mounting nuts holding seat assembly to floor pan.

(3) Tilt seat and disconnect wiring harness.

(4) Remove assembly from vehicle.

Installation

(1) Position seat assembly in vehicle.

(2) Connect wiring harness.

(3) From underneath vehicle install and tighten mounting nuts.

(4) Connect battery ground cable and check seat operation.

ADJUSTER

Removal

(1) Remove seat assembly from vehicle following procedure outline under, "Seat Assembly and Adjuster."

(2) Lay seat on its back on some clean object.

(3) Remove bolts attaching adjuster to seat assembly.

Installation

(1) Lay seat on its back on some clean object.

(2) Position adjuster to seat assembly and install attaching bolts.

(3) Install seat assembly following procedure outlined under "Seat Assembly and Adjuster."

MOTOR

Removal

CAUTION: Anytime the motor, cable and housing assemblies or vertical and horizontal transmission assemblies require maintenance, the assemblies must be synchronized to insure easy and proper operation.

(1) Remove seat assembly from vehicle following procedure outlined under "Seat Assembly and Adjuster."

(2) Lay seat assembly on its back on some clean object.

(3) Remove bolt which holds motor to support (Fig. 3). Then remove mounting (Fig. 4) screws.

(4) Carefully disconnect housings and cables from motor assembly.

Installation

(1) Place motor assembly into position.

(2) Carefully connect cables and housings to motor assembly.

(3) Install mounting screws.

(4) Install bolt holding motor assembly to adjuster.

(5) Install seat assembly following procedure outlined under, "Seat Assembly and Adjuster."

CABLE AND HOUSING

Removal

CAUTION: Anytime the motor, cable and housing assemblies or vertical and horizontal transmission assemblies require maintenance, the assemblies must be synchronized to insure easy and proper operation.

It is recommended that anytime a cable is to be re-

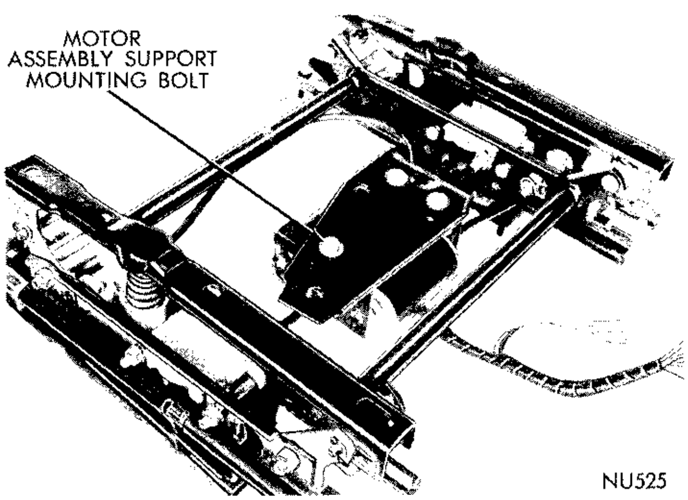

Fig. 3—Mounting Bolt Location

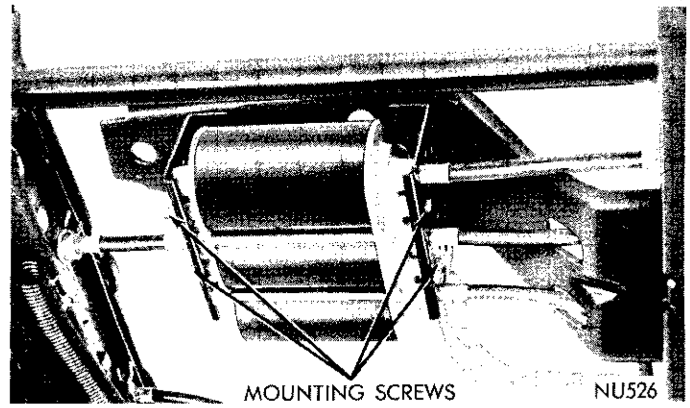

Fig. 4—Motor Mounting Screw Locations

placed that the motor assembly be removed also for ease of replacement.

(1) After motor has been disconnected. Remove corbin clamp from cable housing then slide cable and housing out of connector (Fig. 5).

Installation

(1) Insert cable and housing into connector and install corbin clamp.

(2) Install motor assembly.

HORIZONTAL AND VERTICAL TRANSMISSIONS

Removal

CAUTION: Anytime the motor, cable and housing assemblies or vertical and horizontal transmission assemblies require maintenance, the assemblies must be synchronized to insure easy and proper operation.

(1) Remove seat assembly from vehicle following procedure outlined under, "Seat Assembly and Adjuster."

(2) Remove motor assembly following procedure outlined under, "Motor."

(3) Fasten a 10 inch "C" clamp from the mounting base assembly to the upper channel assembly just

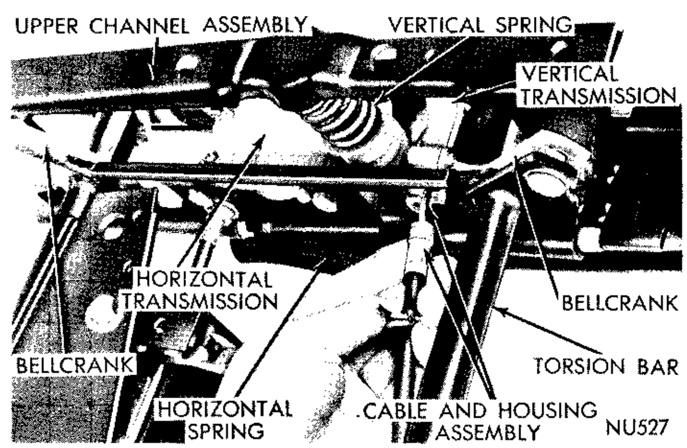

Fig. 5—Removing or Installing Cable and Housing

tight enough to keep it in place while removing cotter key and the front (5/16") clevis pin.

(4) After clevis pin is removed, slowly release the tension on the vertical spring.

(5) Remove cotter key and rear (3/8") clevis pin and upper channel assembly.

(6) Remove horizontal spring.

(7) Remove the through bolts from each end of the side rail assembly.

(8) Remove the through bolts from the transmission assemblies and separate rails and transmission assemblies (Fig. 6).

Installation

During assembly constant care should be exercised to keep both track and rail assemblies synchronized.

(1) Position transmission assemblies between side rails and install through bolts and nuts.

(2) Locate roll pin and install through bolts in each end of assembly.

(3) Install horizontal spring.

(4) Position rail assemblies at end of torsion bars. Line up holes and upper channel and install rear (3/8") clevis pin and cotter key.

(5) Insert vertical spring and apply pressure with "C" clamp just enough to align holes in mounting base and upper channel. Install front (5/16") clevis pin and cotter key.

(6) Install motor assembly following procedure outlined under, "Motor."

(7) Install seat assembly following procedure outlined under, "Seat Assembly and Adjuster."

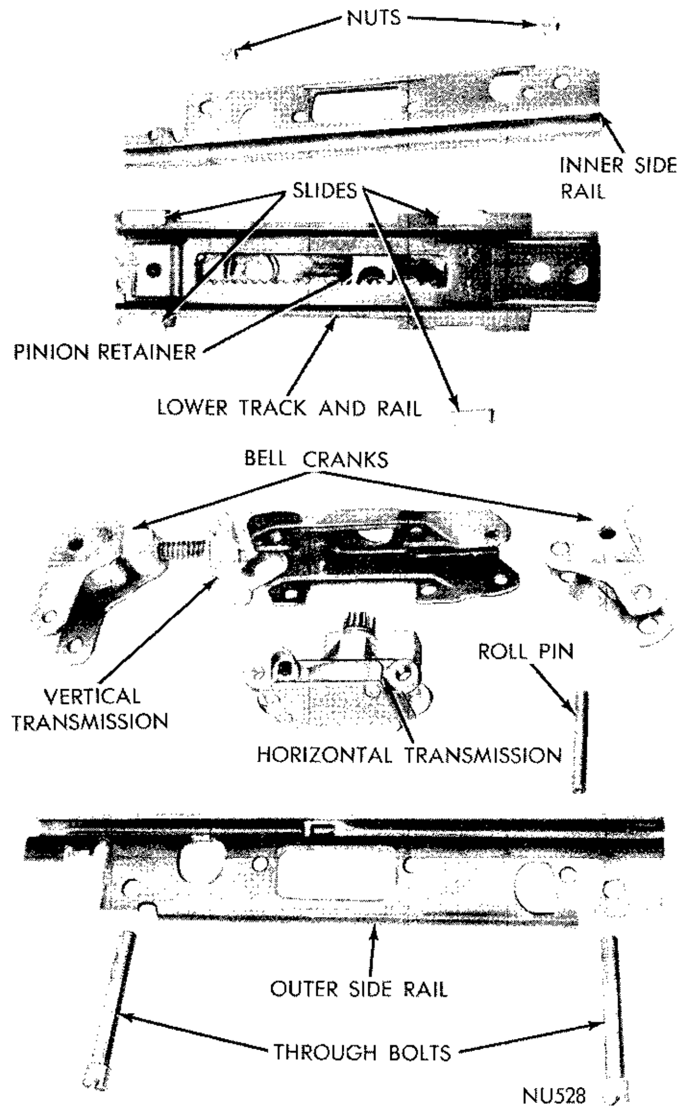

Fig. 6—Side Rail (Disassembled)

TURN SIGNALS AND EMERGENCY FLASHER

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GENERAL INFORMATION

The turn signals are activated with a lever mounted on the left side of the steering column just below the steering wheel. When the driver wishes to signal his intentions to change direction of travel, moving the lever up causes the right turn signals to flash. Moving the lever down causes the left turn signals to flash.

After completion of a turn the system is deactivated automatically. As the steering wheel returns to the straight ahead position, a lobe mounted to the underside of the steering wheel contacts one of two canceling cams in the turn signal switch mounted in the steering column upper housing. Contact of the lobe with the canceling cam returns the switch to the off position.

When the system is activated, one of two indicator lights mounted in the instrument cluster or on the front fender flashes in unison with the turn signal lights indicating to the driver that the system is operating.

The turn signal flasher is a plug in type mounted on the instrument panel lower reinforcement to the left of the steering column.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXTERNAL LAMPS OPERATE NORMALLY, NO INDICATIONS ON INSTRUMENT CLUSTER	(a) Faulty pilot bulb in instrument cluster.	(a) Replace bulb.
SYSTEM DOES NOT FLASH	(a) Faulty flasher unit. (b) Faulty external bulb. (c) Faulty contact in switch.	(a) Replace flasher. (b) Replace faulty bulb. (c) Replace switch.
SYSTEM DOES NOT CANCEL AFTER COMPLETION OF TURN	(a) Broken or loose cancelling finger. (b) Improperly aligned cancelling finger. (c) Broken or faulty switch.	(a) Replace cancelling finger. (b) Align cancelling finger properly. (c) Replace switch.
ENTIRE SYSTEM DOES NOT OPERATE	(a) Open circuit in feed wire to switch. (b) Faulty fuse. (c) Faulty flasher unit.	(a) Check wiring circuits. Refer to "Wiring Diagrams." (b) Replace fuse. (c) Replace flasher.
PILOT LAMP ILLUMINATES BRIGHTLY, EXTERNAL LAMPS GLOW DIMLY WITH NO FLASH	(a) Loose or corroded external lamp ground connection.	(a) Clean and tighten ground connection.

SERVICE PROCEDURES

TURN SIGNAL SWITCH

Removal

(1) Disconnect negative battery terminal at battery.

(2) Remove steering column cover and remove two screws attaching wiring trough (cover) from steering column.

(3) Disconnect wiring connectors at steering column.

(4) Remove horn ring ornament, horn ring or rim blow switch pad and ornament (if so equipped).

(5) Disconnect horn wires at steering wheel hub.

(6) Remove horn ring.

(7) Loosen steering wheel nut several turns and install steering wheel puller Tool C-3428B. Loosen steering wheel first, then remove steering wheel nut and steering wheel.

(8) Remove screw attaching turn signal operating lever and remove lever. **On Tilt Columns, the lever screws out. See "Wiring Adaptations". Page 8-114.**

Attach a piece of string or fine wire to turn signal switch wiring before removing switch from steering column. When switch is removed leave string or wire in steering column jacket tubes as an aid to replacement of wiring.

(9) Remove screws attaching turn signal switch and upper bearing retainer screws and remove retainer and turn signal switch and flasher switch.

Installation

(1) Attach string or wire left in steering column jacket tube during removal, to turn signal switch wiring and carefully pull string on wire down through column jacket tube until directional switch wires can be connected. Position turn signal switch in steering column jacket tube and install switch retainer and attaching screws.

(2) Install turn signal switch actuating lever.

(3) Install steering wheel, on steering shaft with master splines aligned.

(4) Install washer and nut. Tighten nut to 27 foot-pounds.

(5) Install horn switch parts previously removed from steering wheel.

(6) Connect horn switch wires.

(7) Connect wiring connectors at steering column.

(8) Install wiring trough (cover) and steering column cover.

(9) Connect battery ground cable, test operation of turn signals and horns.

EMERGENCY FLASHER

The emergency flasher system is energized by a switch mounted in the steering column and is part of the turn signal switch. When the switch is activated all turn signal lights and the turn signal indicators flash simultaneously.

Before the switch is activated, the turn signal

switch should be in the neutral position to prevent a characteristic feed back through the accessory circuit causing intermittent operation of the accessories.

When the flasher is operating, application of the brake pedal will override the system and interrupt the flasher. All lights will remain on bright until the brake pedal is released.

The system consists of a switch and flasher unit. The flasher is taped to the main wiring harness leading to the bulkhead disconnect.

The flasher is a plug-in type and is not to be confused with the turn signal flasher.

HORNS

GENERAL INFORMATION

The horn circuit consists of a horn switch located in the steering wheel hub and a horn relay is mounted in the passenger compartment under the instrument panel at left kick pad. Battery current from the "B" terminal of the starter relay flows to the "B" terminal of the horn relay. When the horn ring or steering wheel rim horn switch (standard on Imperial models, optional on Chrysler models) is depressed, the horn ring completes a ground circuit to the horn relay closing a set of points in the relay and allowing battery current to flow from the relay to the horns which are grounded to the sheet metal of the vehicle.

The steering wheel rim horn switch is a full circle rubber insert mounted on the inside rim of the steering wheel, (Fig. 1). The insert has two metal contact strips running through the center of the strip with a plastic insulator at each end. When any portion of the insert is depressed the contacts touch, completing the circuit causing the horns to sound.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HORNS WILL NOT SOUND	(a) Improper adjustment.	(a) See "Adjusting."
	(b) Broken or faulty wiring.	(b) See "Testing."
	(c) Faulty horn.	(c) See "Testing." Replace horn if necessary.
	(d) Faulty relay.	(d) See "Testing." Replace relay if necessary.
HORNS SOUND CONTINUOUSLY (Immediately disconnect wires from horns and wire from the "B" terminal of horn relay).	(a) Shorted wiring.	(a) See "Testing."
	(b) Horn switch sticking.	(b) See "Testing"; Replace horn switch if necessary.
	(c) Relay sticking.	(c) See "Testing"; Replace relay if necessary.

SERVICE PROCEDURES

Testing

A. Horns will not sound

Should the horns fail to sound, disconnect wire connector at horn and connect one lead of a test light to the connector terminal and the other lead of test light to a good body ground. Depress the horn ring or button. Should the test light illuminate, the horns are faulty. Replace or adjust horns.

If the test light fails to light, reconnect the connector to the horn terminal and connect one lead of test light to the horn relay "B" terminal and the other test light lead to a good body ground. If the light fails to illuminate, inspect for corroded battery terminals, dead battery or an open circuit in the wire from the starter relay to the "B" terminal of the horn relay.

Should the test light illuminate, touch a jumper wire from relay "S" terminal to good body ground. Sounding of the horns will indicate a poor ground circuit in the horn switch, an open wire from the "S" terminal of the horn relay or a poorly grounded steering column.

To determine if the horn relay is defective, connect a jumper wire from "B" to "H" terminals. If horns operate, the horn relay is faulty and should be replaced.

B. Horns sound continuously

Should the horns sound continuously, disconnect wires from horns and the positive wire from "B" terminal of horn relay. Remove wire from "S" terminal of horn relay and place one lead of a test light (with its own battery) to the wire connector and the other lead to a good ground. If the light illuminates; either the wire is shorted to ground or the horn switch

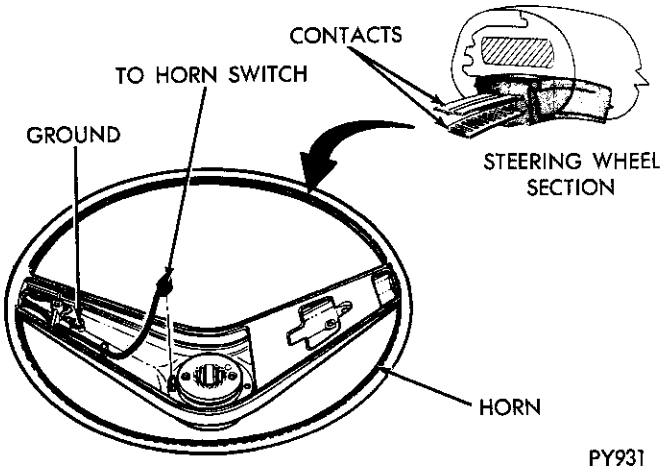

Fig. 1—Steering Wheel-Rim Horn Switch

is faulty. Remove steering wheel and disconnect wire from horn switch. Repeat above test and if light still illuminates; wire is shorted to ground. Repair or replace wire.

If light does not illuminate; horn switch is grounded. Replace horn switch.

If the light does not illuminate on the first test; connect one lead of a test light (without integral battery) to the horn wire connector (green wire) and the other lead to a good body ground. If test light illuminates, there is a short in the horn wiring. Repair or replace wire. If the test light does not illuminate; connect the positive lead back on the "B" terminal of the horn relay and repeat above test. If the light now illuminates, then the relay contacts are sticking. Replace horn relay.

Adjusting

(1) Disconnect connections at each horn to determine which horn is not operating.

(2) Remove horn and bracket assembly.

(3) With a suitable tool (Fig. 2), turn tone adjuster counterclockwise until there is no vibration (sound).

(4) Turn tone adjuster clockwise, approximately 1/4 turn at a time until tone has a clear mellow sound. Do not turn tone adjuster while horn is sounding. **Adjustment will only clear up sound and cannot change horn tone frequency.**

(5) Connect a test ammeter between positive post of a 12 volt battery and horn terminal post. Connect a jumper lead from negative battery post to horn base. Clean paint from horn bracket where connection is made. Turn adjusting screw to obtain a reading of six amperes minimum to eight amperes maximum for Sparton horns, four amperes minimum to six amperes maximum for Prestolite horns.

Amperage must not exceed eight amperes maximum for Sparton horns, six amperes maximum for Prestolite horns.

IGNITION AND STEERING LOCK

The ignition lock is located on the right side of the steering column. See "Wiring Adaptations", Page 8-114.

The ignition switch has five positions. Starting from the first counterclockwise position they are:

Accessory, Lock, Off, On and Start. In "Lock" or "Accessory" positions, the steering and ignition systems are locked to provide anti-theft protection for the car.

The ignition key cannot be turned to the lock position until the gear selector is placed in the Park (P) position for automatic transmissions or reverse gear position for manual transmissions.

The Accessory position permits the operation of the electrical accessories when the engine is not running.

The "Off" position allows the engine to be turned off without locking the steering.

The key can be inserted or withdrawn only on the "Lock" position. Do not attempt to pull the shift lever out of Reverse or Park after the key has been turned to the lock position.

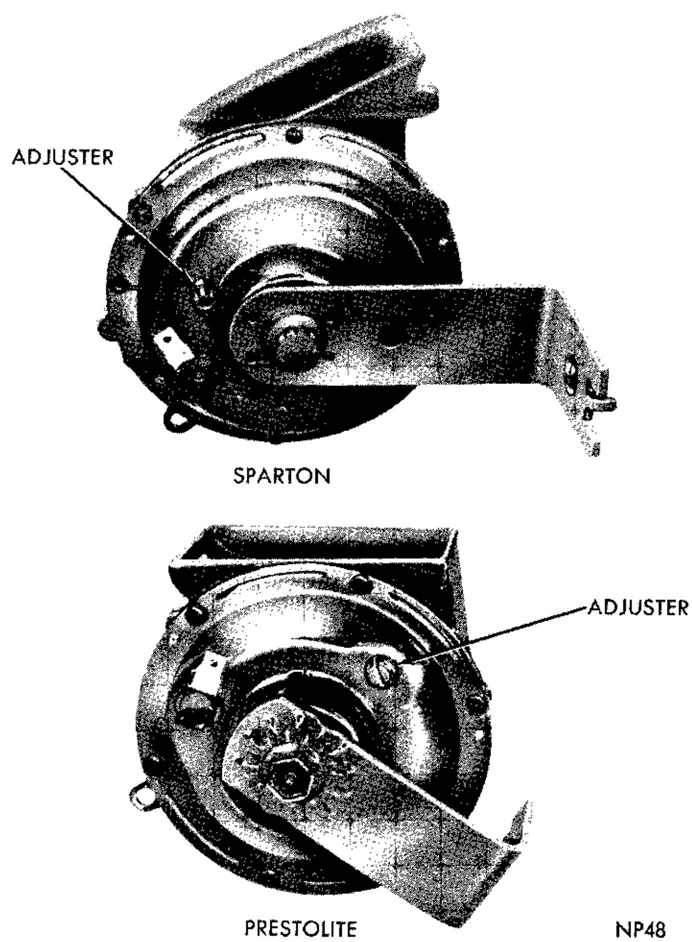

Fig. 2—Horn Adjustments

Removal

(1) Disconnect negative battery terminal at battery.

(2) Remove steering column cover and remove two screws attaching wiring trough (cover) from steering column.

(3) Disconnect wiring connectors at steering column.

(4) Remove horn ring ornament, horn ring or rim blow switch pad and ornament (if so equipped).

(5) Disconnect horn wires at steering wheel hub.

(6) Remove horn ring.

(7) Loosen steering wheel nut several turns and install steering wheel puller Tool C-3428B. Loosen steering wheel first, then remove steering wheel nut and steering wheel.

(8) Remove screw attaching turn signal operating lever and remove lever. **On Tilt Columns, lever screws out.**

Attach a piece of string or fine wire to turn signal switch wiring before removing switch from steering column. When switch is removed leave string or wire in steering column jacket tubes as an aid to replacement of wiring.

(9) Remove screws attaching turn signal switch and upper bearing retainer screws and remove retainer and turn signal switch and flasher switch.

(10) Remove two retaining screws and lift out the ignition key lamp assembly. **DO NOT scuff light tube coating as this will result in some loss of light.**

(11) Remove snap ring from upper end of steering shaft.

(12) Remove three bearing housing attaching screws.

(13) With Tool C-3044 attached to the three threaded holes for the turn signal switch retaining screws, pull bearing and housing from steering shaft.

(14) Remove the lower snap ring from the steering shaft.

(15) Remove the lock plate pin retaining ring from the lock plate hub. Some resistance may be encountered due to the friction of the ring retaining tangs.

(16) Use Tool C-4113 pin removing and installing tool and press the steering shaft lock plate retaining pin out of the shaft and plate and remove the lock plate. **DO NOT attempt removal of the plate by hammering as damage to the collapsible column may result.**

(17) Remove the lock lever guide plate screws and plate.

(18) With a small probe tool inserted in the access hole provided in the housing boss, depress the key cylinder retainer toward the cylinder to disengage it from the slot in the housing bore, then withdraw the key cylinder from the lock housing.

IGNITION AND STEERING LOCK

Installation

Before installing ignition switch and key cylinder make sure the shift housing is in a lockable position (park with automatic, or reverse with manual transmission). When installing the key cylinder it must be turned to "lock" position, key removed. Also make sure ignition switch is turned to the "lock" position to index its cam with the lock cylinder position.

(1) Install ignition switch and screws.

(2) Install ignition switch lock cylinder.

(3) Install lock lever guide plate and two screws.

(4) Install warning buzzer switch if removed.

(5) Install the steering shaft bearing lower snap ring and place the bearing and housing assembly on the steering shaft.

(6) Use Tool C-3879 and a steering wheel nut and flat washer to draw the steering shaft up into the bearing and housing assembly until the lower snap ring contacts the bearing, then install the upper snap ring.

(7) Install the three bearing housing to lock housing attaching screws.

(8) Install lock plate and retaining pin.

(9) Install bearing housing on steering shaft.

(10) Install bearing housing attaching screws.

(11) Install bearing upper snap ring.

(12) Install key lamp assembly, retainer and two screws.

(13) Attach string or wire left in steering column jacket tube during removal, to turn signal switch wiring and carefully pull string on wire down through column jacket tube until directional switch wires can be connected. Position turn signal switch in steering column jacket tube and install switch retainer and attaching screws.

(14) Install turn signal switch actuating lever.

(15) Install steering wheel, on steering shaft with master splines aligned.

(16) Install washer and nut. Tighten nut to 27 foot-pounds.

(17) Install horn switch parts previously removed from steering wheel.

(18) Connect horn switch wires.

(19) Connect wiring connectors at steering column.

(20) Install wiring trough (cover) and steering column cover.

(21) Connect battery ground cable, test operation of turn signals and horns.

SPECIFICATIONS

ELECTRICAL

BATTERY

Engine-Cubic Inch Displacement	Standard Equipment Battery Part Number	Special Equipment Battery Part Number
383	2875320	2642967
440	2642969	2642967

Battery Part Number	Capacity (Amperes)	Number Plates Per Cell
2875320	59	11
2642969	70	13
2444564	70	11
2642967	70	13

All Batteries are 12 Volts with Negative Ground Terminal.

GEAR REDUCTION STARTING MOTOR

Starting Motor Model	2875560
Make	Chrysler
Voltage	12
No. of Fields	4 (3 Series, 1 Shunt)
No. of Poles	4
Brushes	4
Spring Tension	32 to 36 Ounces
Drive	Solenoid Shift Overrunning Clutch
End Play	.010″-.045″
*Cranking Amperage Draw	180 to 200 Amps. 383, 440 Cu. In.
Free-Running Test	
Voltage	11
Amperage Draw Maximum	90
Speed RPM	1925 to 2600
Locked-Resistance Test	
Voltage	4
Amperage Draw	400 to 450
Solenoid Switch	
Pull-In Coil	13.3 to 14.9 Amps. @ 6.0 Volts at 77°F.
Hold-In Coil	8.0 to 9.0 Amps. @ 6.0 Volts at 77°F.

*Engine at normal operating temperature.

ALTERNATOR

Rotation	Clockwise at Drive End
Voltage	12 Volt System
Current Output	Designed Controlled
Voltage Output	Limited by Voltage Regulator
Brushes (Field)	2
Condenser Capacity	.50 Microfarad plus or minus 20%
Field Current Draw—	
Rotating Rotor by Hand @ 12 Volts	2.38 to 2.75 Maximum amperes
Current Output -	
Standard	34.5 plus or minus 3 amperes*
Special Equipment, Heavy Duty and/or Air Conditioning	44.5 plus or minus 3 amperes*
Special Equipment (Fleets)	51 plus or minus 3 amperes*

*Plus or minus three ampere tolerance is provided to allow for temperature variation. Current output is measured at 1250 engine RPM and 15 volts at the alternator. If measured at the battery, current output will be approximately 5 amperes lower than above values.
Voltage is controlled by variable load (carbon pile) across the battery.

ELECTRONIC VOLTAGE REGULATOR

Part Number 3438150

The battery specific gravity should be above 1.200 when checking the regulated voltage.

The Voltage Regulator is working properly if the voltage is in accordance with the following chart:—

Ambient Temperature 1/4" from Voltage Regulator	Voltage Range
—20°F.	14.3 - 15.3
80°F.	13.8 - 14.4
140°F.	13.3 - 14.0
Above 140°F.	Less than 13.8

IGNITION SYSTEM
WITH CLEANER AIR SYSTEM

Engine Application	383 2-Barrel Carburetor Manual Transmission	383 2-Barrel Carburetor Automatic Transmission
Engine Displacement	383 Cu. In.	383 Cu. In.
Distributor Part No.—(Chrysler Built)	3438231	3438231
Advance—Centrifugal (Distributor Degrees at Distributor RPM)	0° to 3.8° @ 550 RPM 7.5° to 9.5° @ 850 RPM 14° to 16° @ 2200 RPM	0° to 3.8° @ 550 RPM 7.5° to 9.5° @ 850 RPM 14° to 16° @ 2200 RPM
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0.5° to 4° @ 7.5" 9.3° to 11.8° @ 12"	0.5° to 4° @ 7.5" 9.3° to 11.8° @ 12"
Contact Gap	.016" to .021"	.016" to .021"
Dwell Angle	28.5° to 32.5°	28.5° to 32.5°
Contact Arm Spring Tension	17 to 20 oz.	17 to 20 oz.
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000" to .003" *	.000" to .003" *
Shaft End Play (After Assembly)	.003" to .017"	.003" to .017"
Rotation	Counterclockwise	Counterclockwise
Timing	TDC**	2.5° BTC**
Spark Plug Type	J-14Y Champion or P-3-6P Mopar	J-14Y Champion or P-3-6P Mopar
Size	14MM 3/8" Reach	14MM 3/8" Reach
Gap	.035"	.035"
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Coil	Chrysler-Essex —or—	Chrysler-Prestolite
Identification Number	2444241	2444242
Primary Resistance @ 70°-80°F	1.41 to 1.55 Ohms	1.65 to 1.79 Ohms
Secondary Resistance @ 70°-80°F	9200 to 10700 Ohms	9400 to 11700 Ohms
Ballast Resistor	2095501	
Resistance @ 70°-80°F	0.5 to 0.6 Ohms	
Current Draw (Coil and ballast resistor in circuit) Engine Stopped	3.0 Amperes	
Engine Idling	1.9 Amperes	

* Service wear tolerance should not exceed .006 inch.

** Plus or minus 2-1/2°. Set at curb idle; See "Fuel System."

IGNITION SYSTEM
WITH CLEANER AIR SYSTEM

Engine Application	383 4-Barrel Carburetor Manual Transmission	383 4-Barrel Carburetor Automatic Transmission
Engine Displacement	383 Cu. In.	383 Cu. In.
Distributor Part No.—(Chrysler Built)	3438233	3438233
Advance—Centrifugal (Distributor Degrees at Distributor RPM)	0° to 4.6° @ 600 RPM 5.6° to 7.6° @ 800 RPM 10° to 12° @ 2300 RPM	0° to 4.6° @ 600 RPM 5.6° to 7.6° @ 800 RPM 10° to 12° @ 2300 RPM
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0.5° to 4.3° @ 10.5″ 9.7° to 12.0° @ 15.5″	0.5° to 4.3° @ 10.5″ 9.7° to 12.0° @ 15.5″
Contact Gap	.016″ to .021″	.016″ to .021″
Dwell Angle	28.5° to 32.5°	28.5° to 32.5°
Contact Arm Spring Tension	17 to 20 oz.	17 to 20 oz.
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000″ to .003″*	.000″ to .003″ *
Shaft End Play (After Assembly)	.003″ to .017″	.003″ to .017″
Rotation	Counterclockwise	Counterclockwise
Timing	TDC**	2.5° BTC**
Spark Plug Type	J-11Y Champion or P-3-4P Mopar***	J-11Y Champion or P-3-4P Mopar***
Size	14MM-3/8″ Reach	14MM-3/8″ Reach
Gap	.035″	.035″
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Coil	Chrysler-Essex —or—	Chrysler-Prestolite
Identification Number	2444241	2444242
Primary Resistance @ 70°-80°F	1.41 to 1.55 Ohms	1.65 to 1.79 Ohms
Secondary Resistance @ 70°-80°F	9200 to 10700 Ohms	9400 to 11700 Ohms
Ballast Resistor	2095501	
Resistance @ 70°-80°F	0.5 to 0.6 Ohms	
Current Draw (Coil and ballast resistor in circuit) Engine Stopped	3.0 amperes	
Engine Idling	1.9 amperes	

* Service wear tolerance should not exceed .006 inch.
** Plus or minus 2-1/2°. Set at curb idle. See "Fuel System."
*** If J-11Y Champion are not available, use Mopar P-3-4P or Champion J-10-Y.

IGNITION SYSTEM
WITH CLEANER AIR SYSTEM

Engine Application	440 Std. Cam 4-Barrel Carburetor Automatic Transmission
Engine Displacement	440 Cu. In.
Distributor Part No.—(Chrysler Built)	3438219
Advance—Centrifugal (Distributor Degrees at Distributor RPM)	0.5° to 3.7° @ 650 RPM 5.7° to 7.7° @ 900 RPM 12° to 14° @ 2300 RPM
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0.5° to 4.3° @ 10.5″ 9.7° to 12° @ 15.5″
Contact Gap	.016″ to .021″
Dwell Angle	28.5° to 32.5°
Contact Arm Spring Tension	17 to 20 oz.
Condenser Capacity	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000″ to .003″ *

Shaft End Play (After Assembly)	.003″ to .017″	
Rotation	Counterclockwise	
Timing	5° BTC**	
Spark Plug Type	J-13Y Champion or Mopar P-3-5P***	
Size	14MM-3/8″ Reach	
Gap	.035″	
Firing Order	1-8-4-3-6-5-7-2	
Coil	Chrysler-Essex	Chrysler-Prestolite
Identification Number	2444241	2444242
Primary Resistance @ 70°-80°F	1.41 to 1.55 Ohms	1.65 to 1.79 Ohms
Secondary Resistance @ 70°-80°F	9200 to 10700 Ohms	9400 to 11700 Ohms
Ballast Resistor	2095501	
Resistance @ 70°-80°F	0.5 to 0.6 Ohms	
Current Draw (Coil and ballast resistor in circuit) Engine Stopped	3.0 amperes	
Engine Idling	1.9 amperes	

* Service wear tolerance should not exceed .006 inch.

** Plus or minus 2-1/2°. Set at curb idle; See "Fuel System".

IGNITION SYSTEM WITH CLEANER AIR SYSTEM

Engine Application	440 Special Cam 4-Barrel Carburetor Manual Transmission	440 Special Cam 4-Barrel Carburetor Automatic Transmission
Engine Displacement	440 Cu. In.	440 Cu. In.
Distributor Part No.—(Chrysler Built)	3438222	3438222
Advance—Centrifugal (Distributor Degrees at Distributor RPM)	0° to 4.6° @ 600 RPM 5.6° to 7.6° @ 800 RPM 10° to 12° @ 2300 RPM	0° to 4.6° @ 600 RPM 5.6° to 7.6° @ 800 RPM 10° to 12° @ 2300 RPM
Advance—Vacuum (Distributor Degrees at Inches of Mercury	0.5° to 4.3° @ 10.5″ 9.7° to 12° @ 15.5″	0.5° to 4.3° @ 10.5″ 9.7° to 12° @ 15.5″
Contact Gap	.016″ to .021″	.016″ to .021″
Dwell Angle	28.5° to 32.5°	28.5° to 32.5°
Contact Arm Spring Tension	17 to 20.0 oz.	17 to 20 oz.
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000″ to .003″ *	.000″ to .003″ *
Shaft End Play (After Assembly)	.003″ to .017″	.003″ to .017″
Rotation	Counterclockwise	Counterclockwise
Timing	TDC **	2.5° BTC**
Spark Plug Type	J-11Y Champion or P-3-4P Mopar***	J-11Y Champion or P-3-4P Mopar***
Size	14MM - 3/8″ Reach	14MM - 3/8″ Reach
Gap	.035″	.035″
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Coil	Chrysler-Essex —or—	Chrysler-Prestolite
Identification Number	2444241	2444242
Primary Resistance @ 70°-80°F	1.41 to 1.55 Ohms	1.65 to 1.79 Ohms
Secondary Resistance @ 70°-80°F	9200 to 10700 Ohms	9400 to 11700 Ohms
Ballast Resistor	2095501	
Resistance @ 70°-80°F	0.5 to 0.6 Ohms	
Current Draw (Coil and ballast resistor in circuit) Engine Stopped	3.0 amperes	
Engine Idling	1.9 amperes	

* Service wear tolerance should not exceed .006 inch.

** Plus or minus 2-1/2°. Set at curb idle; See "Fuel System".

LIGHT BULBS

	Chrysler	Imperial
Arm Rest Lamp		1445
Ash Receiver	1445 (2)	* 1445 (2)
Auto-Temp	* (168)	* (704)
Back-up Lights	1156 (2)	1156 (2)
Brake System Warning Light	57	57
Clock	* (168)	* (704)
Cornering Light	1293	1293
Dome and/or "C" Pillar Light	550	
Door and Pocket Panel and/or Reading Light	90	90
Fasten Belts Indicator	57	57
Fender Mounted Turn Signal Indicator	330 (2)	1813 (2)
Gear Selector Indicator (Column)	* (168)	* (704)
Gear Selector with Console	57	—
Glove Compartment	1891	1891
Heater and/or A/C Control	* 168	* (704)
High Beam Indicator	57	57
Instrument Cluster and Speedometer Illumination	* (168)	* (704) (4)
Ignition Lamp	1445	1445
License Light	67 (1)-67 (2) Station Wagon	67
Lock Doors Indicator	158	
Map Lamp	90	90
Oil Pressure Indicator	57	Gauge
Open Door Indicator		57
Panel Rheostat Valve	24 Ohms	12 Ohms
Park and Turn Signal (Front)	1157 (2)	1157NA
Portable Reading Light		89
Radio	* (168)	* (704)
Sealed Beam—Hi-Beam (No. 1)	4001	4001
Sealed Beam—Hi-Low Beam (No. 2)	4002	4002
Sentry Signal	57	57
Side Marker	1895 (4)	1895 (4)
Stereo Indicator	1445	1445
Switch Lighting	* (168)	* (704)
Tail Light (only)	1095 (2)	
Tail, Stop and Turn Signal	1157 (2)	1157 (6)
Temperature Indicator	57 (2)	—
Trunk and/or Under Hood Light	1004	1004
Turn Signal Indicator (Panel)	**57-168	—

*Included in Instrument Cluster Lighting.
**Optional.

NOTE: All of the above bulbs are brass base. Aluminum base bulbs are not approved and not to be used.

FUSES

Circuit	Car Model and Ampere Rating Chrysler	Imperial
Accessories	20	
Accessory and Turn Signal		20
Cigar Lighter/Console Model 300 Only or Headlamp Sentinal	20	—
Cigar Lighter	—	20
Console (Newport, New Yorker without Headlamp Sentinel)	20	—
Emergency Flasher	20	—
Emergency Flasher and Stop Lamps	—	20
Headlamp Dimmer (In-Line Fuse)	4	4
Heater or Air Conditioning (Blower Motor)	20	20
Instrument Lights	3	5
Low Fuel Warning Relay	—	5
Radio and Back-up Lamps	20	20

	Chrysler	Imperial
Rear Blower (Accessory Fuse)	20	20
Tail Lamps (Model 300 or Headlamp Sentinel)	20	
Tail Lamps and Cigar Lighter (Newport and New Yorker Without Headlamp Sentinel)	20	—
Tail Lamps and Cornering	—	20

CIRCUIT BREAKERS

Circuit	Location	Car Model and Ampere Rating Chrysler	Imperial
Cigar Lighter (Door or Rear)	On fuse block	30	15
Concealed Headlamps	Integral With Relay—Left End of Instrument Panel	5	5
Convertible Top	On fuse block	30	—
Door Locks	On fuse block	15	15
Headlights	Integral with headlight switch	20	20
Power Seats	On fuse block	30	30
Power Tailgate	On fuse block	30	—
Power Windows	On fuse block	30	30
Windshield Wipers	Integral with wiper switch		
	2-Speed Wipers	6.0	—
	3-Speed Wipers	7.5*	7.5

* Optional

WIRING DIAGRAMS

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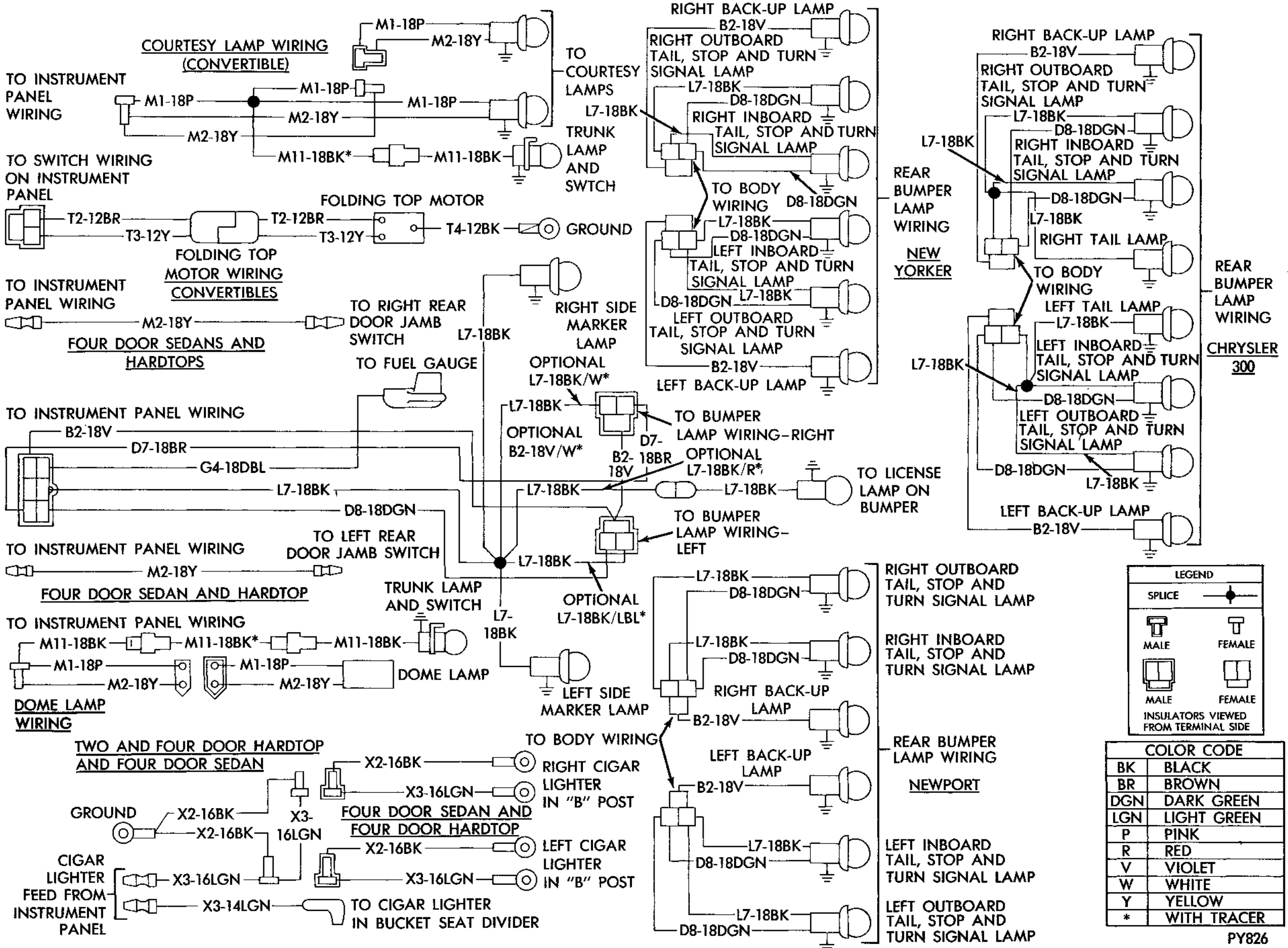
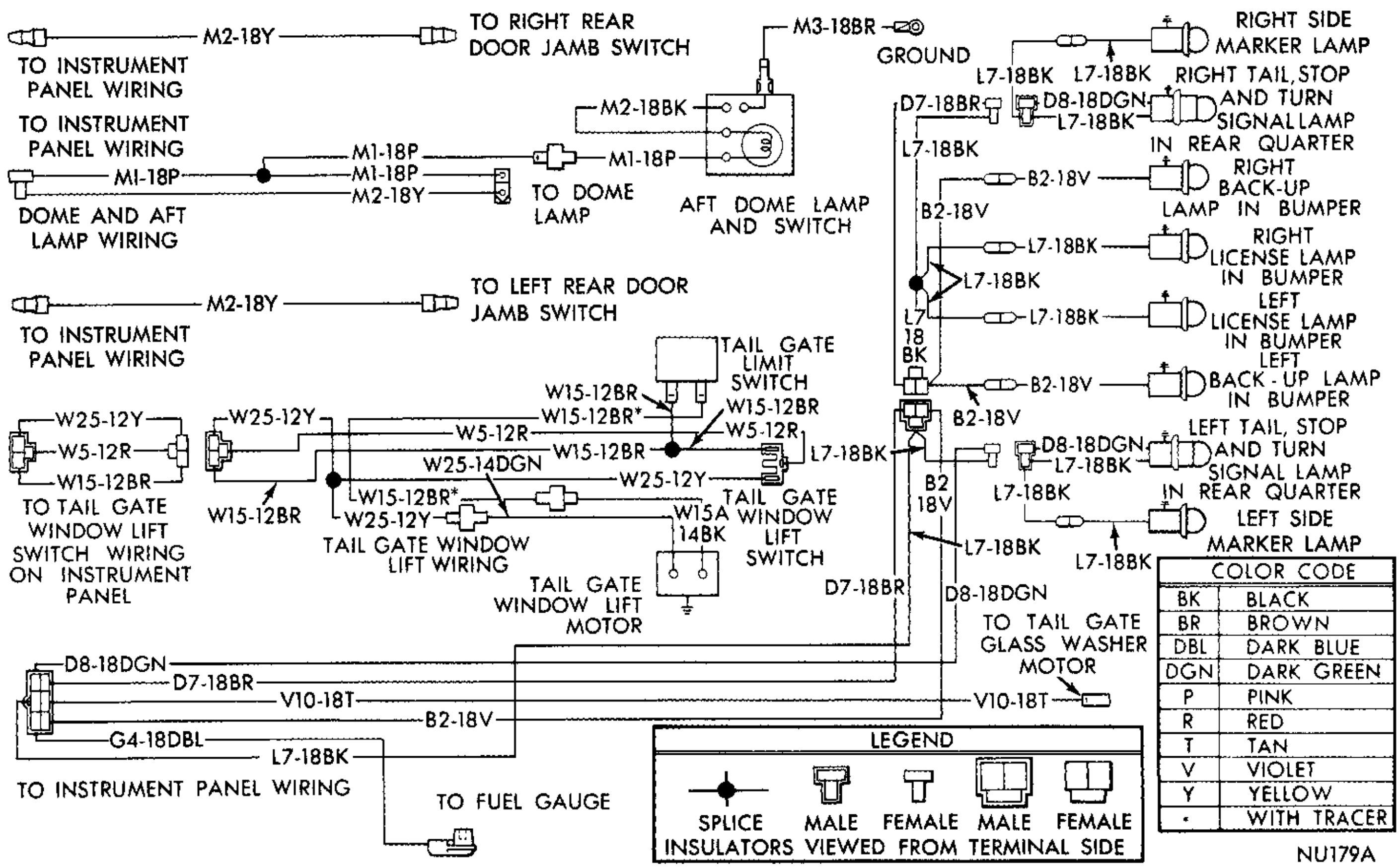
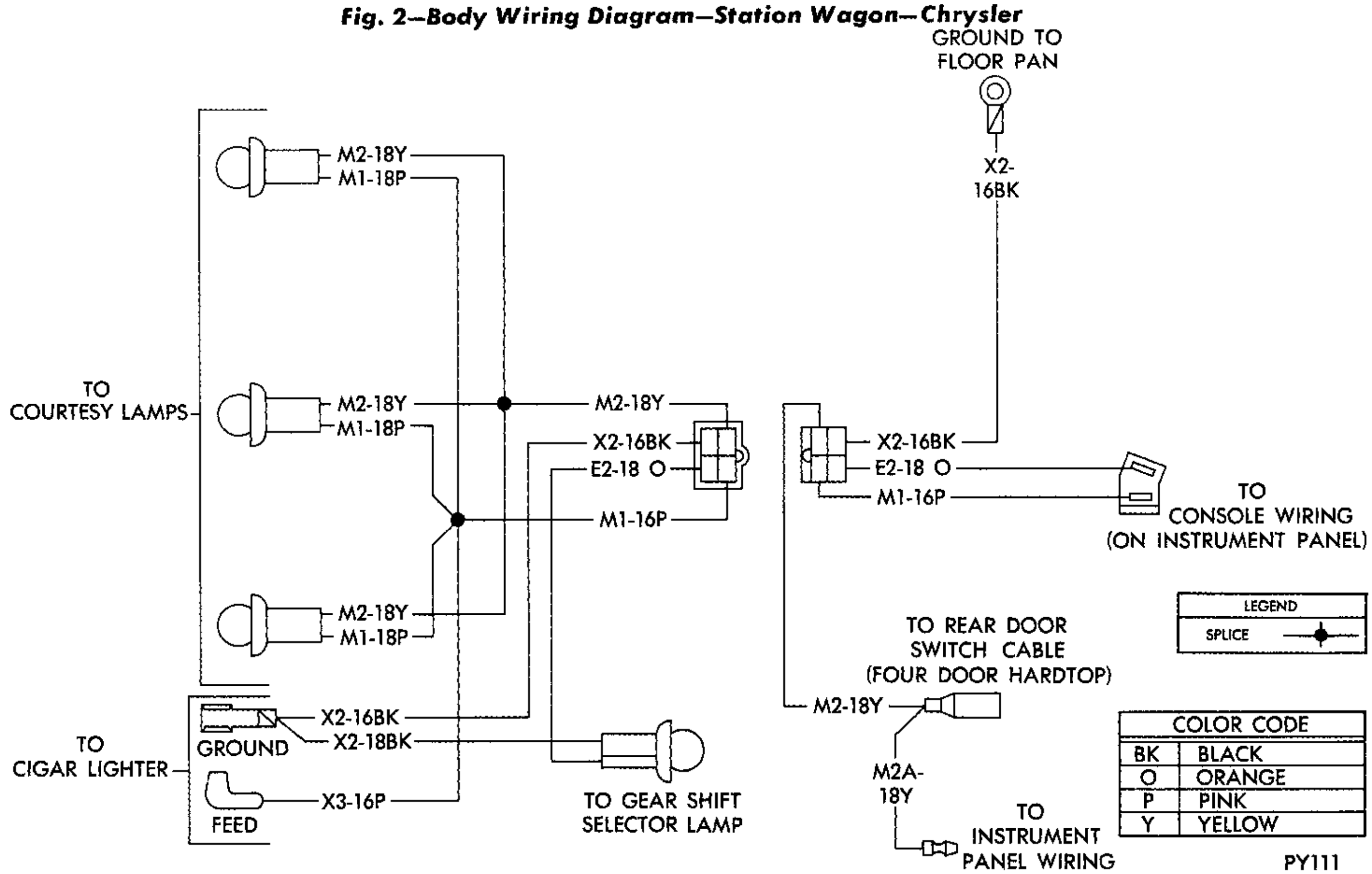


Fig. 1—Body Wiring Diagram—Except Station Wagons—Chrysler



COLOR CODE	
BK	BLACK
BR	BROWN
DBL	DARK BLUE
DGN	DARK GREEN
P	PINK
R	RED
T	TAN
V	VIOLET
Y	YELLOW
*	WITH TRACER

Fig. 2—Body Wiring Diagram—Station Wagon—Chrysler



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P	PINK
Y	YELLOW

Fig. 3—Console Wiring Diagram—Chrysler

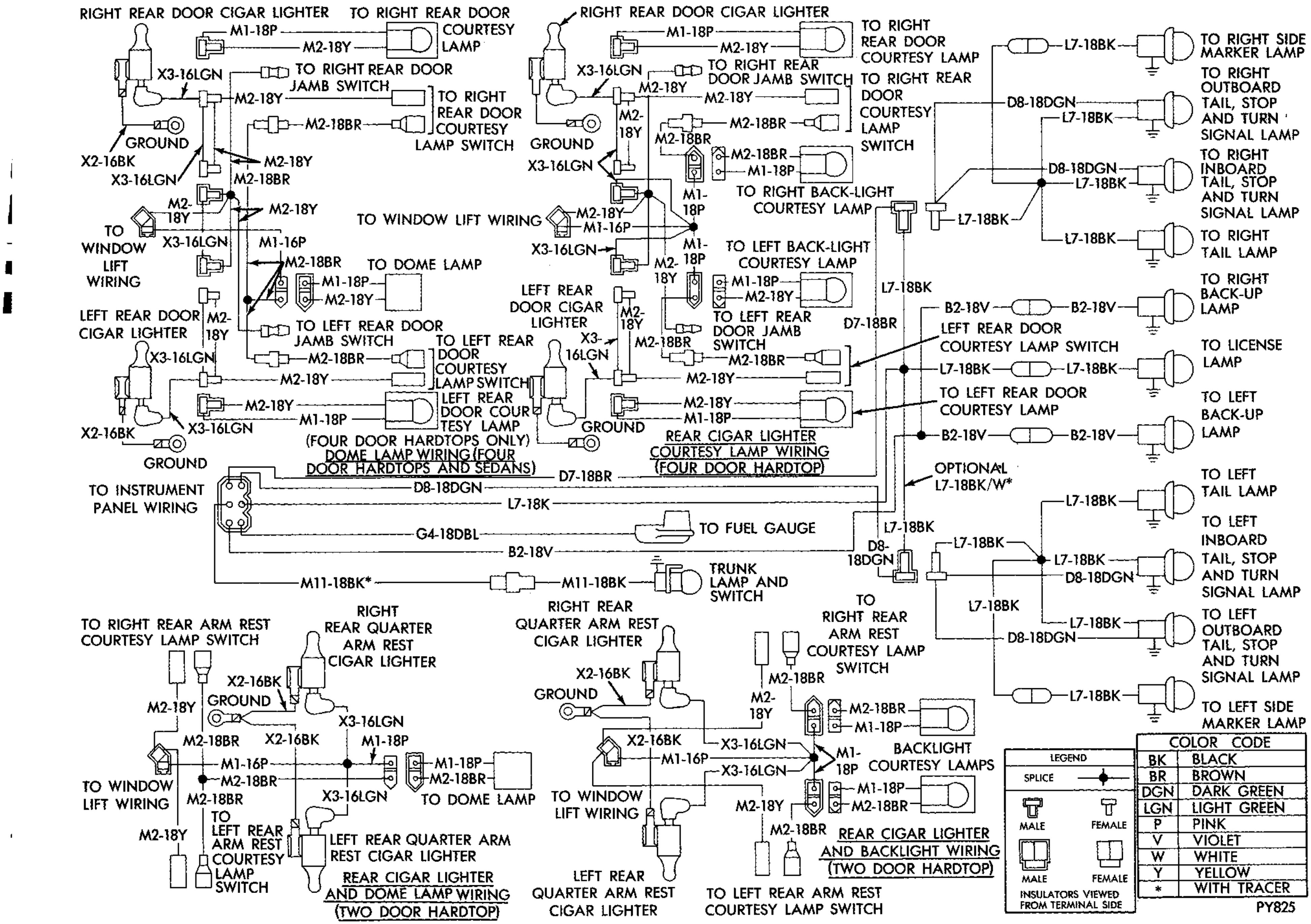


Fig. 4—Body Wiring Diagram—Imperial Console

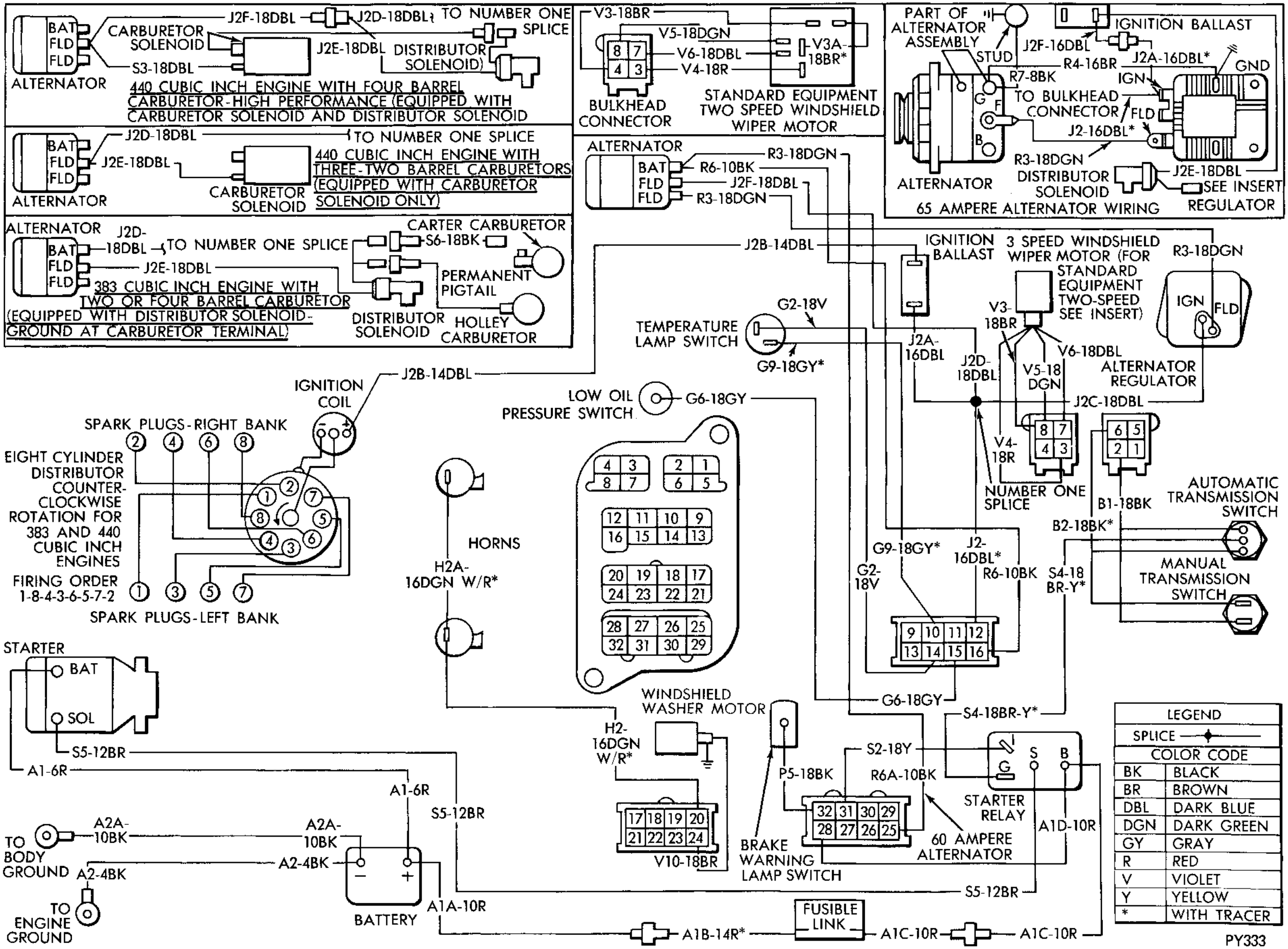
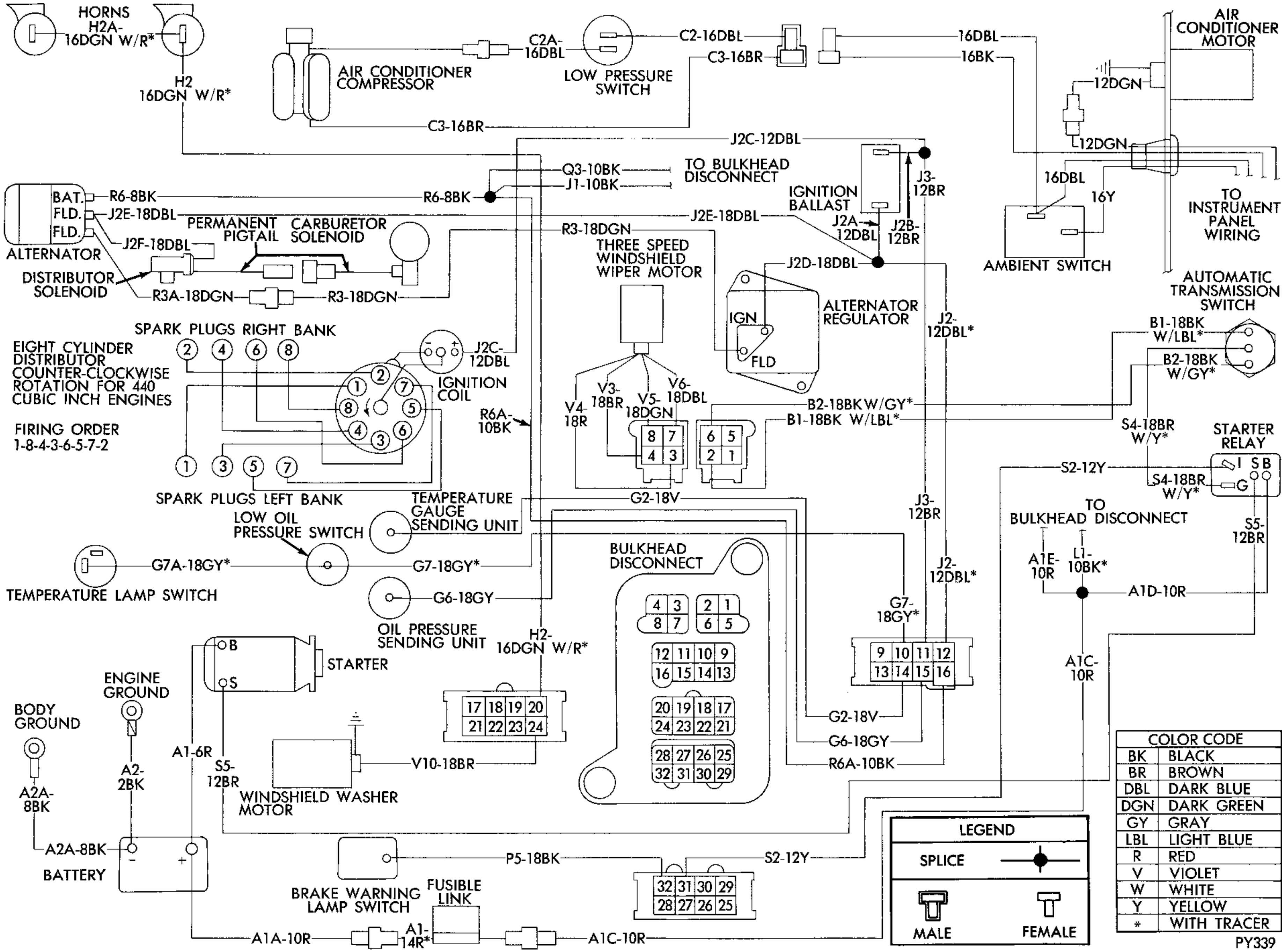


Fig. 5—Engine Compartment—Wiring Diagram—Chrysler



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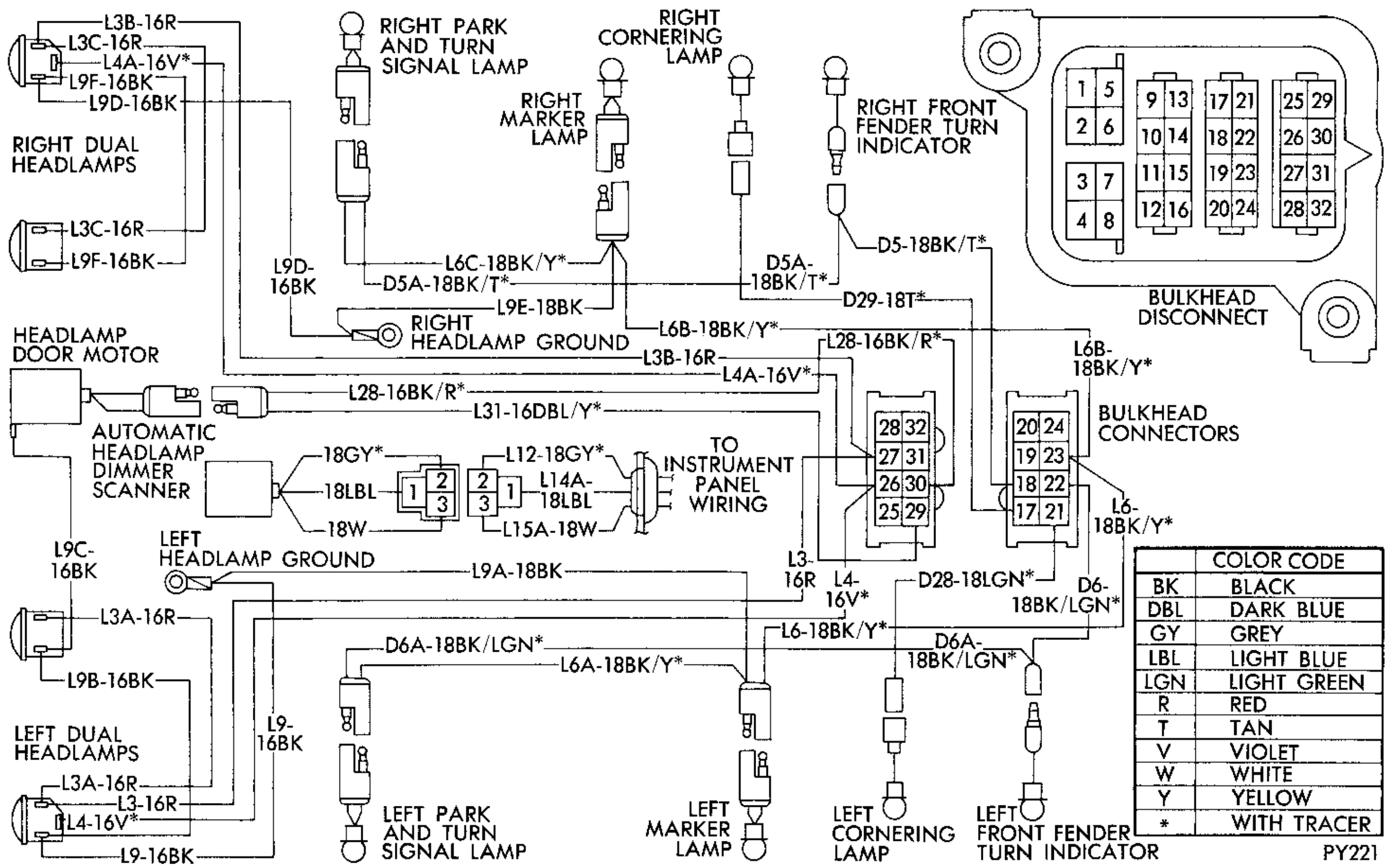
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 6—Engine Compartment—Wiring Diagram—Imperial



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LBL	LIGHT BLUE
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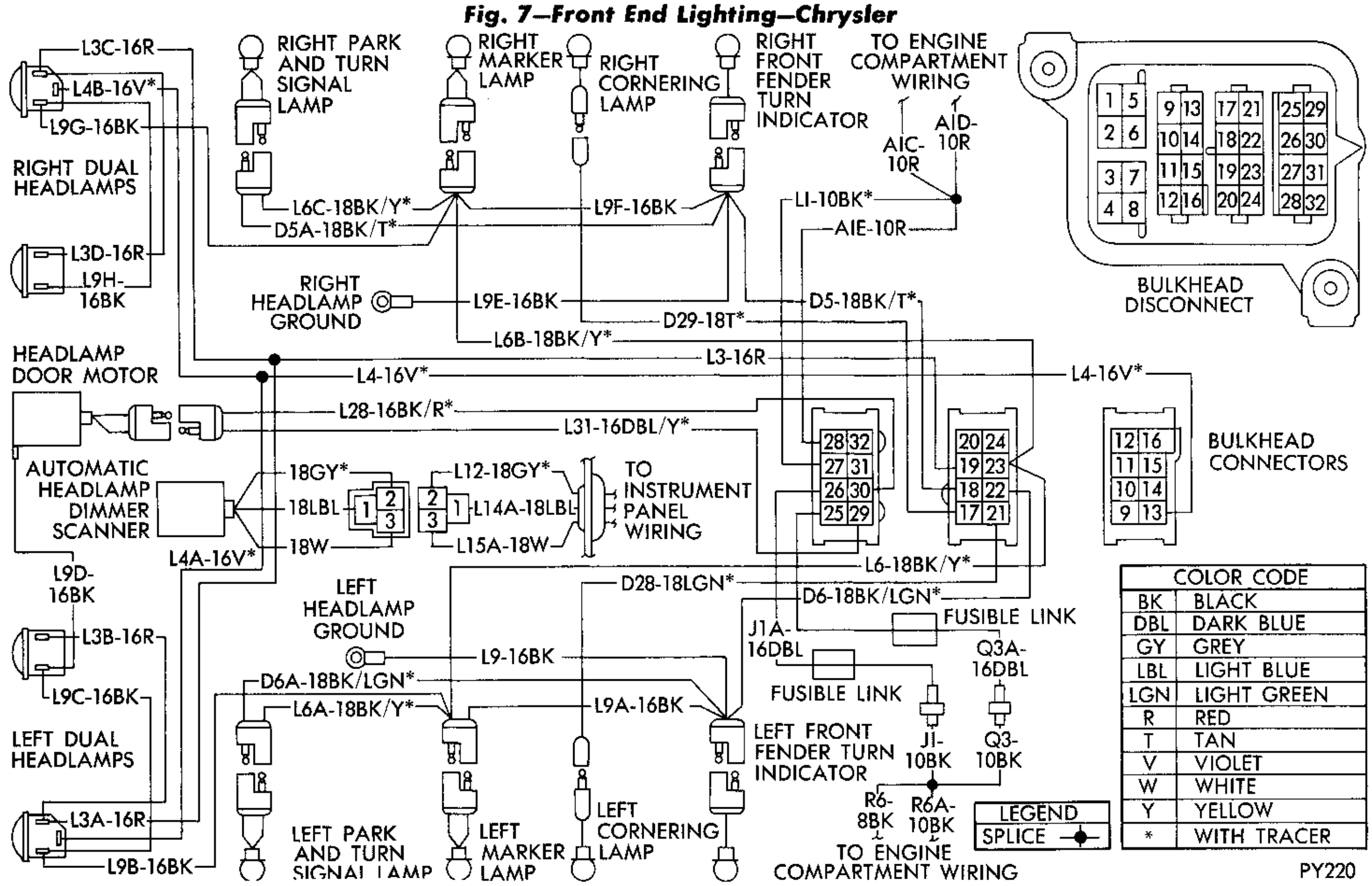
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 7—Front End Lighting—Chrysler



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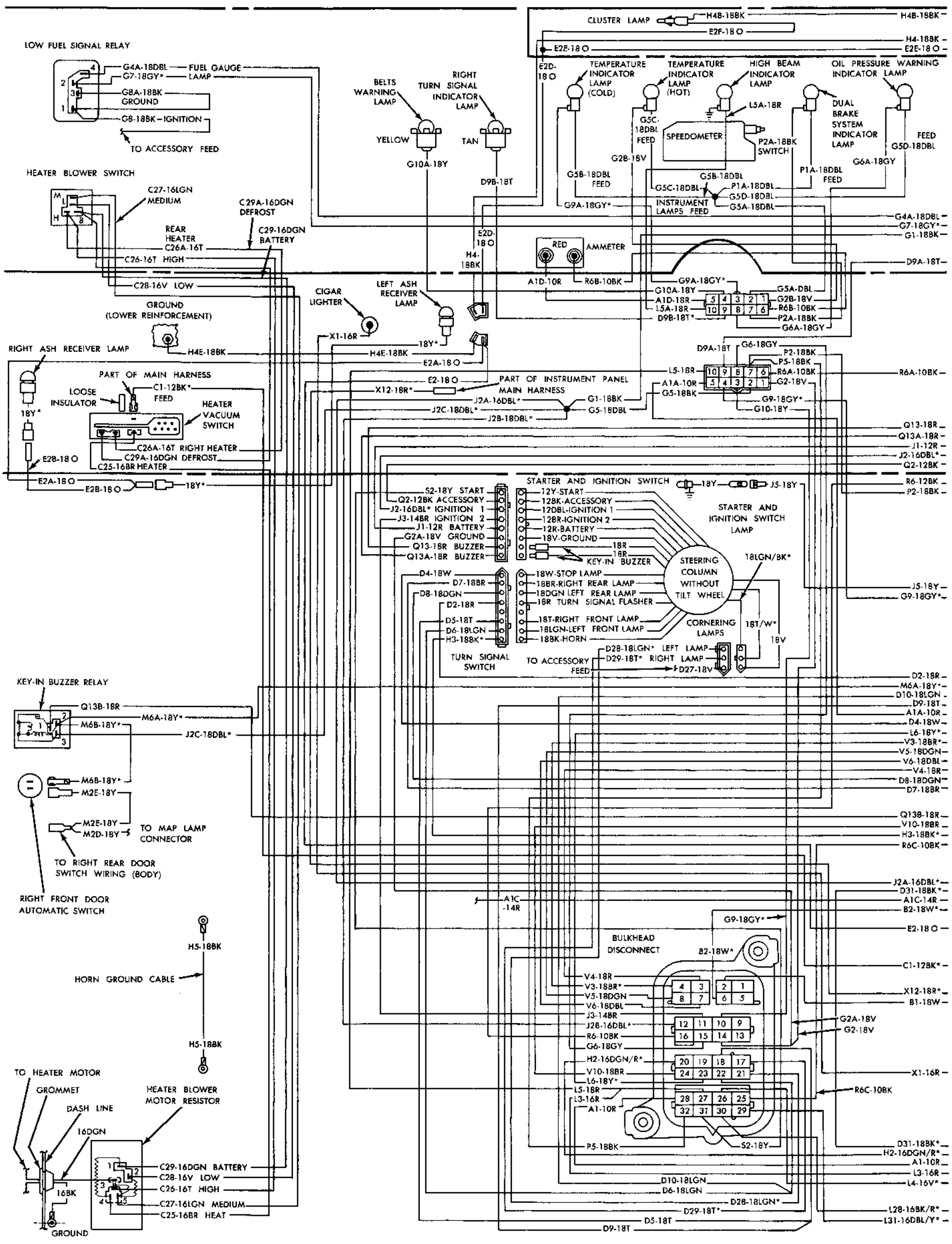
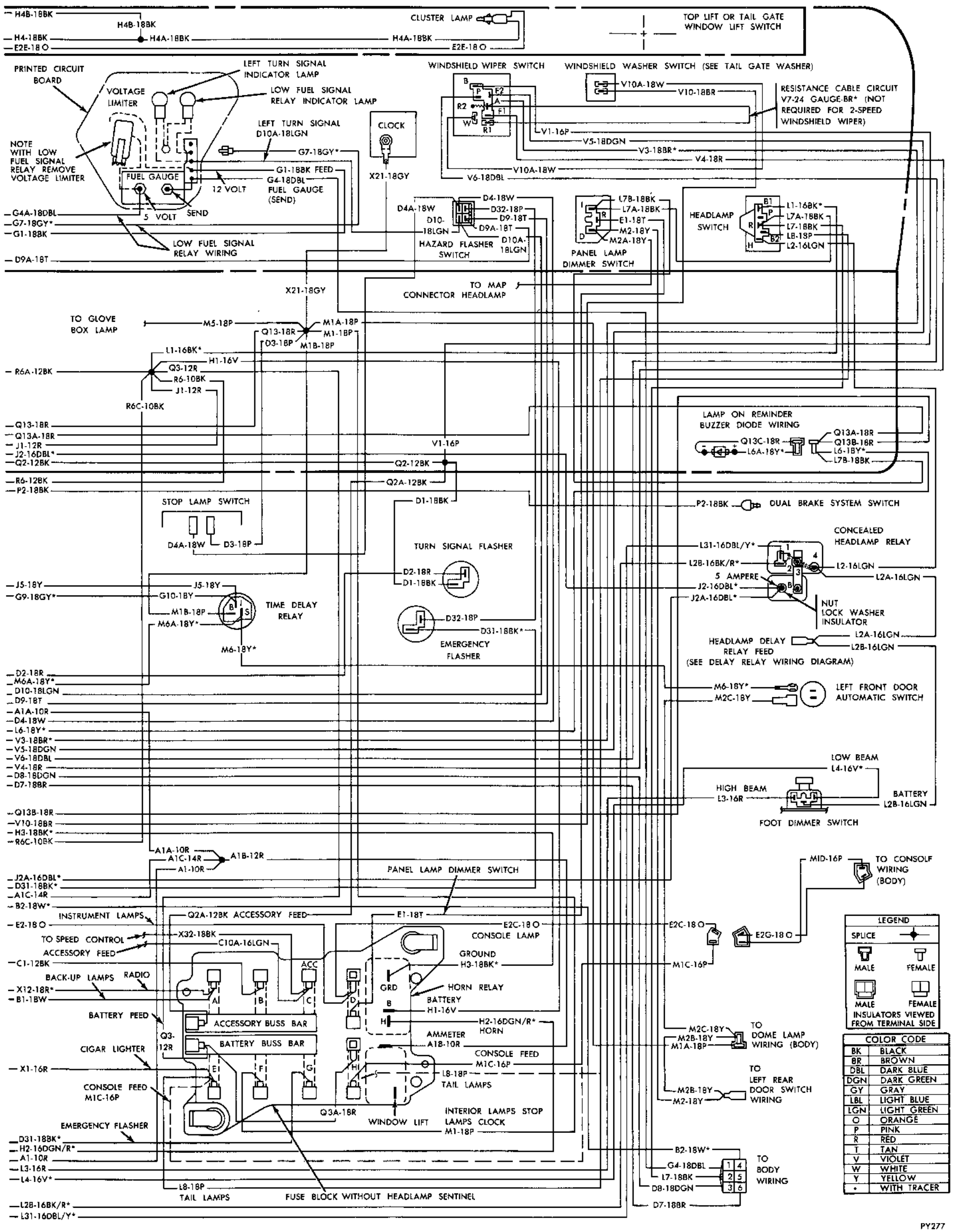
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 8—Front End Lighting—Imperial



LOW FUEL SIGNAL RELAY
G4A-18DBL
FUEL GAUGE LAMP
G7-18GY*
G8A-18BK GROUND
G8-18BK-IGNITION
TO ACCESSORY FEED
CLUSTER LAMP
H4B-18BK
E2F-18 O
E2E-18 O
BELTS WARNING LAMP
RIGHT TURN SIGNAL INDICATOR LAMP
YELLOW
TAN
G10A-18Y
D9B-18T
TEMPERATURE INDICATOR LAMP (COLD)
TEMPERATURE INDICATOR LAMP (HOT)
HIGH BEAM INDICATOR LAMP
OIL PRESSURE WARNING INDICATOR LAMP
DUAL BRAKE SYSTEM INDICATOR LAMP
SPEEDOMETER
L5A-18R
P2A-18BK SWITCH
P1A-18DBL FEED
G5D-18DBL FEED
G6A-18GY
INSTRUMENT LAMPS FEED
G9A-18GY*
HEATER BLOWER SWITCH
C27-16LGN MEDIUM
C29A-16DGN DEFROST
C29-16DGN BATTERY
REAR HEATER C26A-16T
C26-16T HIGH
C28-16V LOW
AMMETER
RED
A1D-10R
R6B-10BK
D9A-18T
CIGAR LIGHTER
LEFT ASH RECEIVER LAMP
X1-16R
GROUND (LOWER REINFORCEMENT)
H4E-18BK
RIGHT ASH RECEIVER LAMP
PART OF MAIN HARNESS
C1-12BK* FEED
LOOSE INSULATOR
HEATER VACUUM SWITCH
C26A-16T RIGHT HEATER
C29A-16DGN DEFROST
C25-16BR HEATER
E2A-18 O
E2B-18 O
PART OF INSTRUMENT PANEL MAIN HARNESS
X12-18R*
J2A-16DBL*
J2C-18DBL*
J2B-18DBL*
G1-18BK
G5-18DBL
STARTER AND IGNITION SWITCH
J5-18Y
STARTER AND IGNITION SWITCH LAMP
S2-18Y START
Q2-12BK ACCESSORY
J2-16DBL* IGNITION 1
J3-14BR IGNITION 2
J1-12R BATTERY
G2A-18V GROUND
Q13-18R BUZZER
Q13A-18R BUZZER
KEY-IN BUZZER
STEERING COLUMN WITHOUT TILT WHEEL
18LGN/BK*
D4-18W
D7-18BR
D8-18DGN
D2-18R
D5-18T
D6-18LGN
H3-18BK*
18W-STOP LAMP
18BR-RIGHT REAR LAMP
18DGN LEFT REAR LAMP
18R TURN SIGNAL FLASHER
18T-RIGHT FRONT LAMP
18LGN-LEFT FRONT LAMP
18BK-HORN
TURN SIGNAL SWITCH
CORNERING LAMPS
D28-18LGN* LEFT LAMP
D29-18T* RIGHT LAMP
TO ACCESSORY FEED
D27-18V
KEY-IN BUZZER RELAY
Q13B-18R
M6A-18Y*
M6B-18Y*
J2C-18DBL*
M2E-18Y
M2D-18Y
TO MAP LAMP CONNECTOR
TO RIGHT REAR DOOR SWITCH WIRING (BODY)
RIGHT FRONT DOOR AUTOMATIC SWITCH
H5-18BK
HORN GROUND CABLE
BULKHEAD DISCONNECT
B2-18W*
G9-18GY*
A1C -14R
TO HEATER MOTOR
GROMMET
DASH LINE
16DGN
16BK
GROUND
HEATER BLOWER MOTOR RESISTOR
C29-16DGN BATTERY
C28-16V LOW
C26-16T HIGH
C27-16LGN MEDIUM
C25-16BR HEAT
V4-18R
V3-18BR*
V5-18DGN
V6-18DBL
J3-14BR
J2B-16DBL*
R6-10BK
G6-18GY
H2-16DGN/R*
V10-18BR
L6-18Y*
L5-18R
L3-16R
A1-10R
P5-18BK
S2-18Y
D10-18LGN
D6-18LGN
D28-18LGN*
D29-18T*
D5-18T
D9-18T
Q13-18R
Q13A-18R
J1-12R
J2-16DBL*
Q2-12BK
R6-12BK
P2-18BK
J5-18Y
G9-18GY*
D2-18R
M6A-18Y*
D10-18LGN
D9-18T
A1A-10R
D4-18W
L6-18Y*
V3-18BR*
V5-18DGN
V6-18DBL
V4-18R
D8-18DGN
D7-18BR
Q13B-18R
V10-18BR
H3-18BK*
R6C-10BK
J2A-16DBL*
D31-18BK*
A1C-14R
B2-18W*
E2-18 O
C1-12BK*
X12-18R*
B1-18W
G2A-18V
G2-18V
X1-16R
R6C-10BK
D31-18BK*
H2-16DGN/R*
A1-10R
L3-16R
L4-16V*
L28-16BK/R*
L31-16DBL/Y*
H4B-18BK
H4-18BK
E2E-18 O
G4A-18DBL
G7-18GY*
G1-18BK
D9A-18T
R6A-10BK



COLOR CODE	
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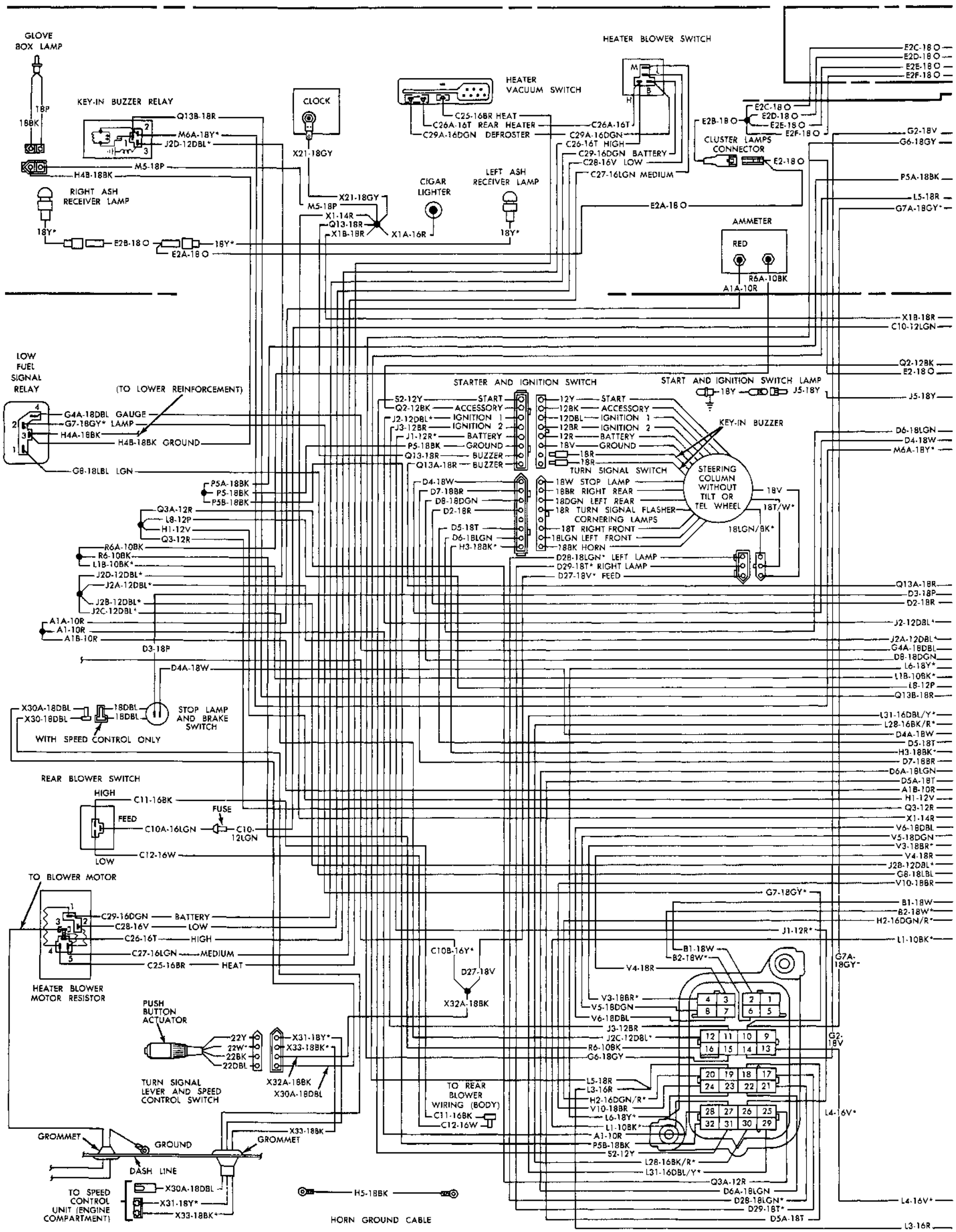
DGN	DARK GREEN
GY	GRAY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

PY277

Fig. 9—Instrument Panel Wiring Diagram—Chrysler


GLOVE BOX LAMP
KEY-IN BUZZER RELAY
CLOCK
HEATER VACUUM SWITCH
HEATER BLOWER SWITCH
CLUSTER LAMPS CONNECTOR
RIGHT ASH RECEIVER LAMP
CIGAR LIGHTER
LEFT ASH RECEIVER LAMP
AMMETER
LOW FUEL SIGNAL RELAY
(TO LOWER REINFORCEMENT)
STARTER AND IGNITION SWITCH
START AND IGNITION SWITCH LAMP
KEY-IN BUZZER
TURN SIGNAL SWITCH
STEERING COLUMN WITHOUT TILT OR TEL WHEEL
STOP LAMP AND BRAKE SWITCH
WITH SPEED CONTROL ONLY
REAR BLOWER SWITCH
TO BLOWER MOTOR
HEATER BLOWER MOTOR RESISTOR
PUSH BUTTON ACTUATOR
TURN SIGNAL LEVER AND SPEED CONTROL SWITCH
TO REAR BLOWER WIRING (BODY)
GROMMET
GROUND
DASH LINE
TO SPEED CONTROL UNIT (ENGINE COMPARTMENT)
HORN GROUND CABLE

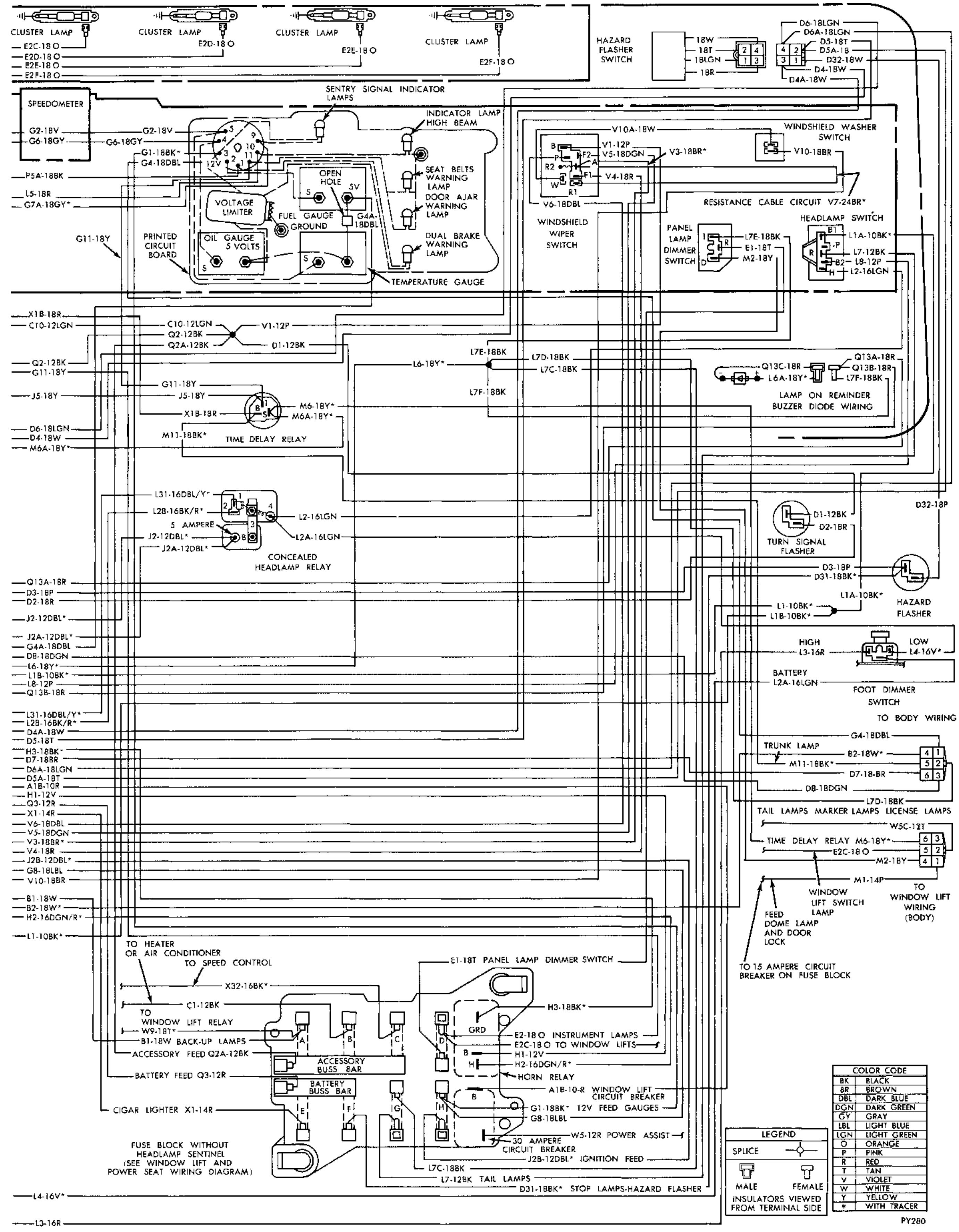


Fig. 10—Instrument Panel Wiring Diagram—Imperial

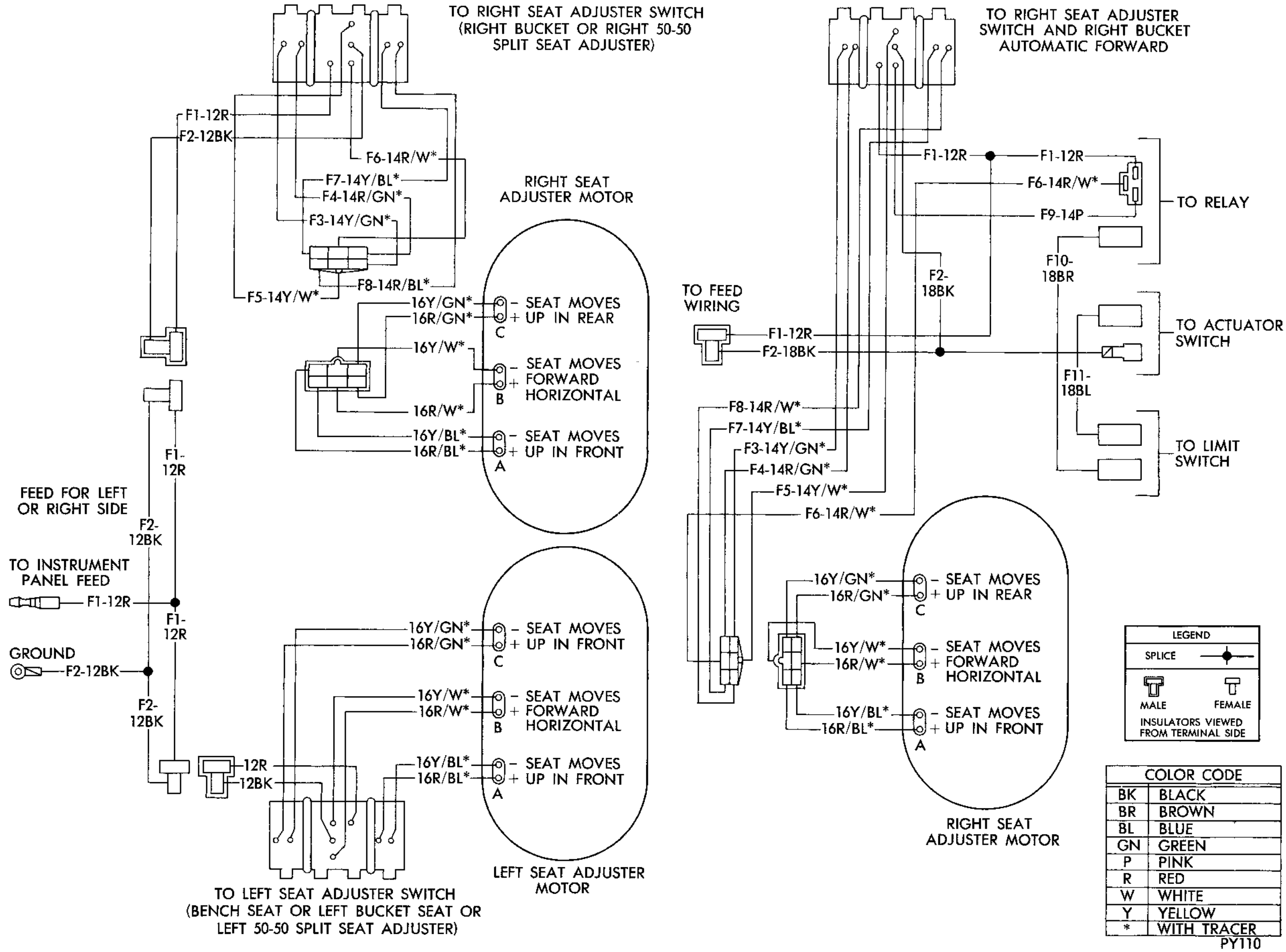
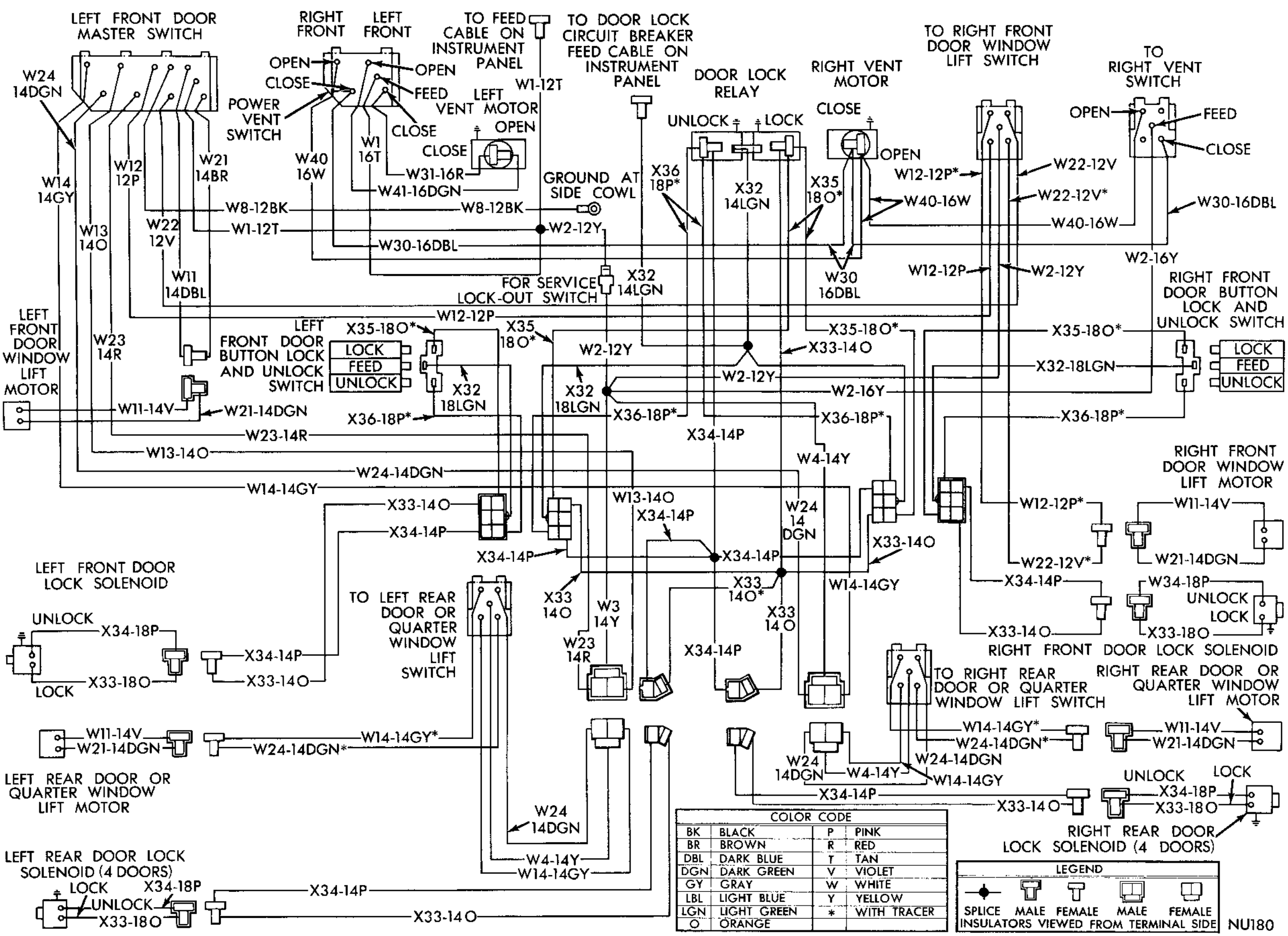


Fig. 11—Electric Seats Wiring Diagram—Imperial



COLOR CODE

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DGN	DARK GREEN	V	VIOLET
GY	GRAY	W	WHITE
LBL	LIGHT BLUE	Y	YELLOW
LGN	LIGHT GREEN	*	WITH TRACER
O	ORANGE		

Fig. 12—Electric Window Lift, Power Vent and Door Locks Wiring Diagram—Chrysler

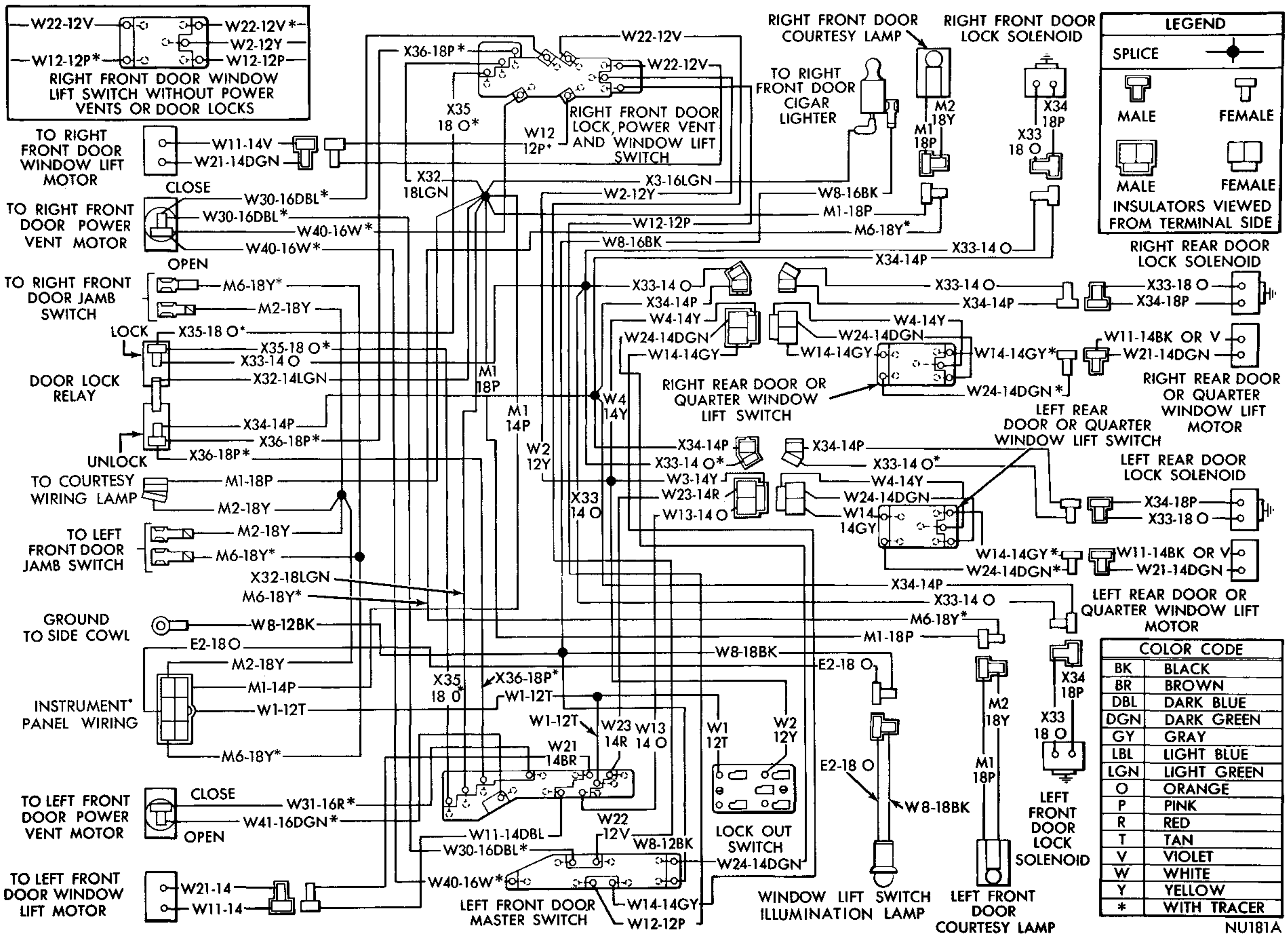
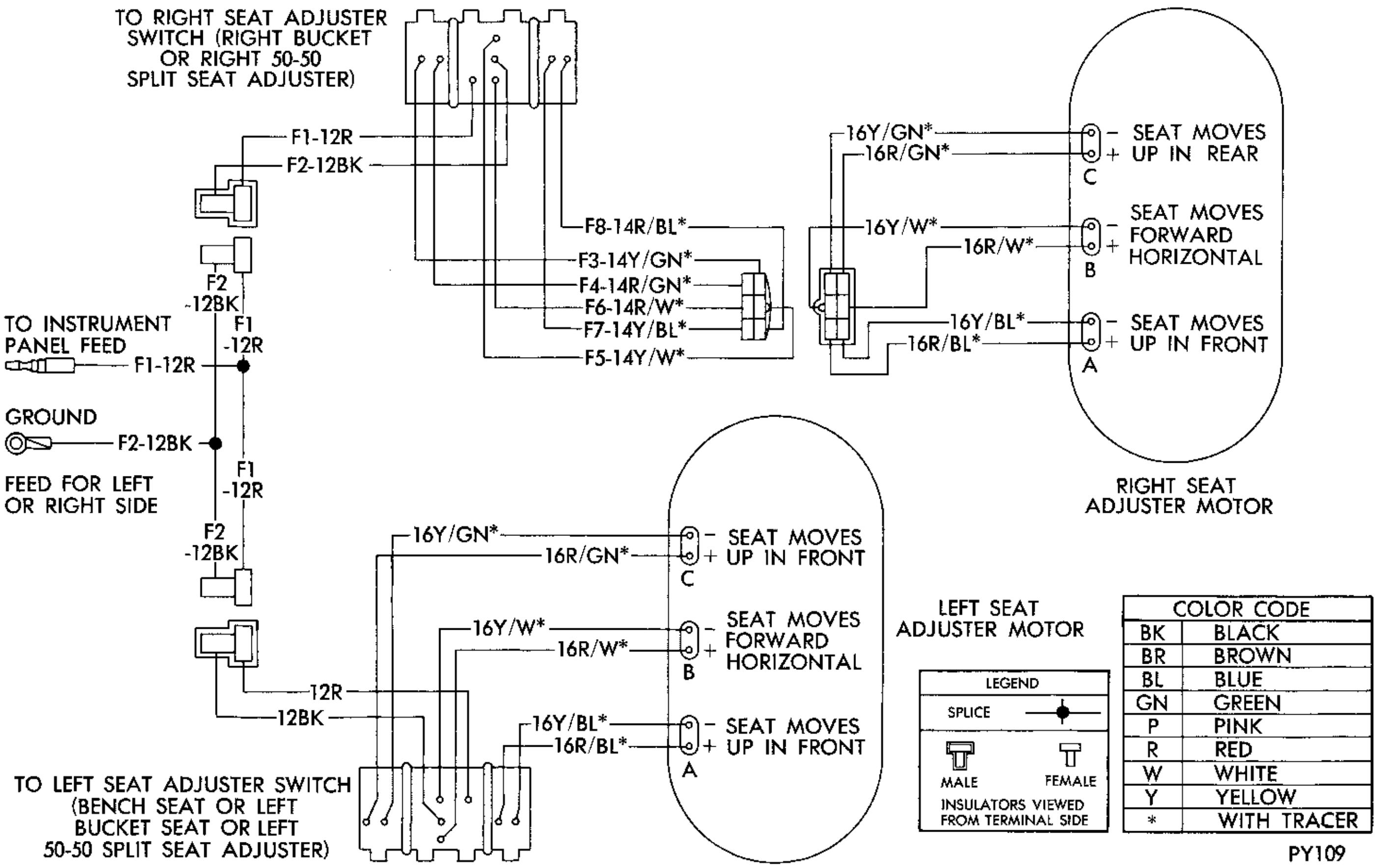


Fig. 13—Electric Window Lift, Power Vent and Door Locks Wiring Diagram—Imperial



COLOR CODE	
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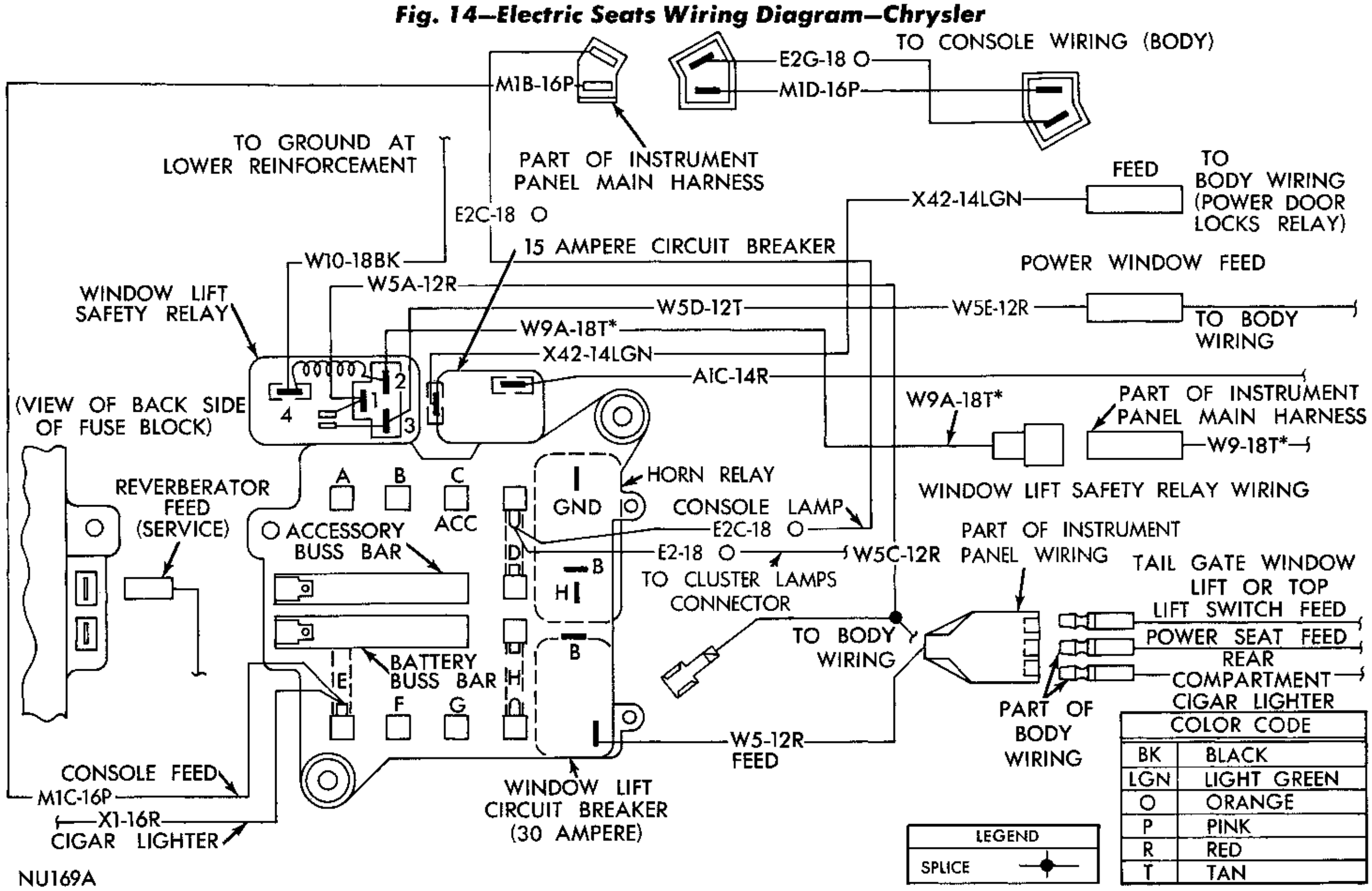
BR	BROWN
BL	BLUE
GN	GREEN
P	PINK
R	RED
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 14—Electric Seats Wiring Diagram—Chrysler



COLOR CODE	
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LGN	LIGHT GREEN
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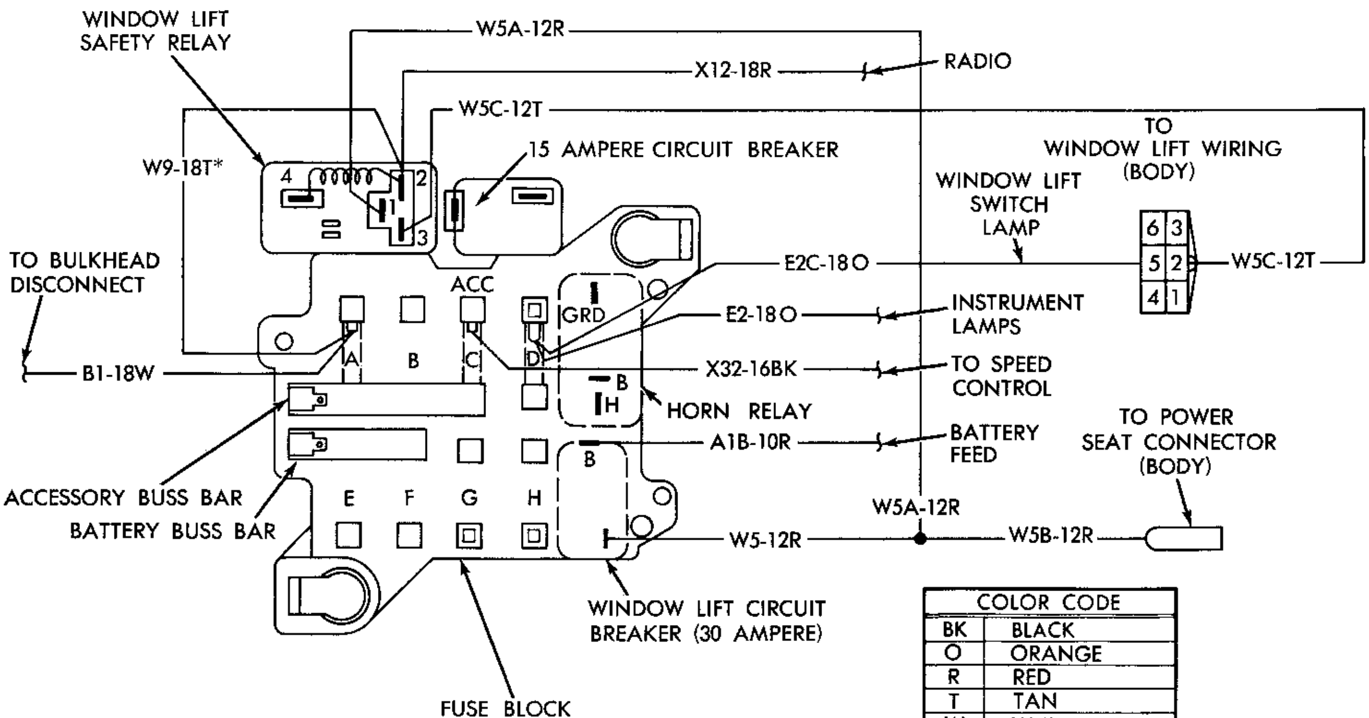
P	PINK
R	RED
T	TAN

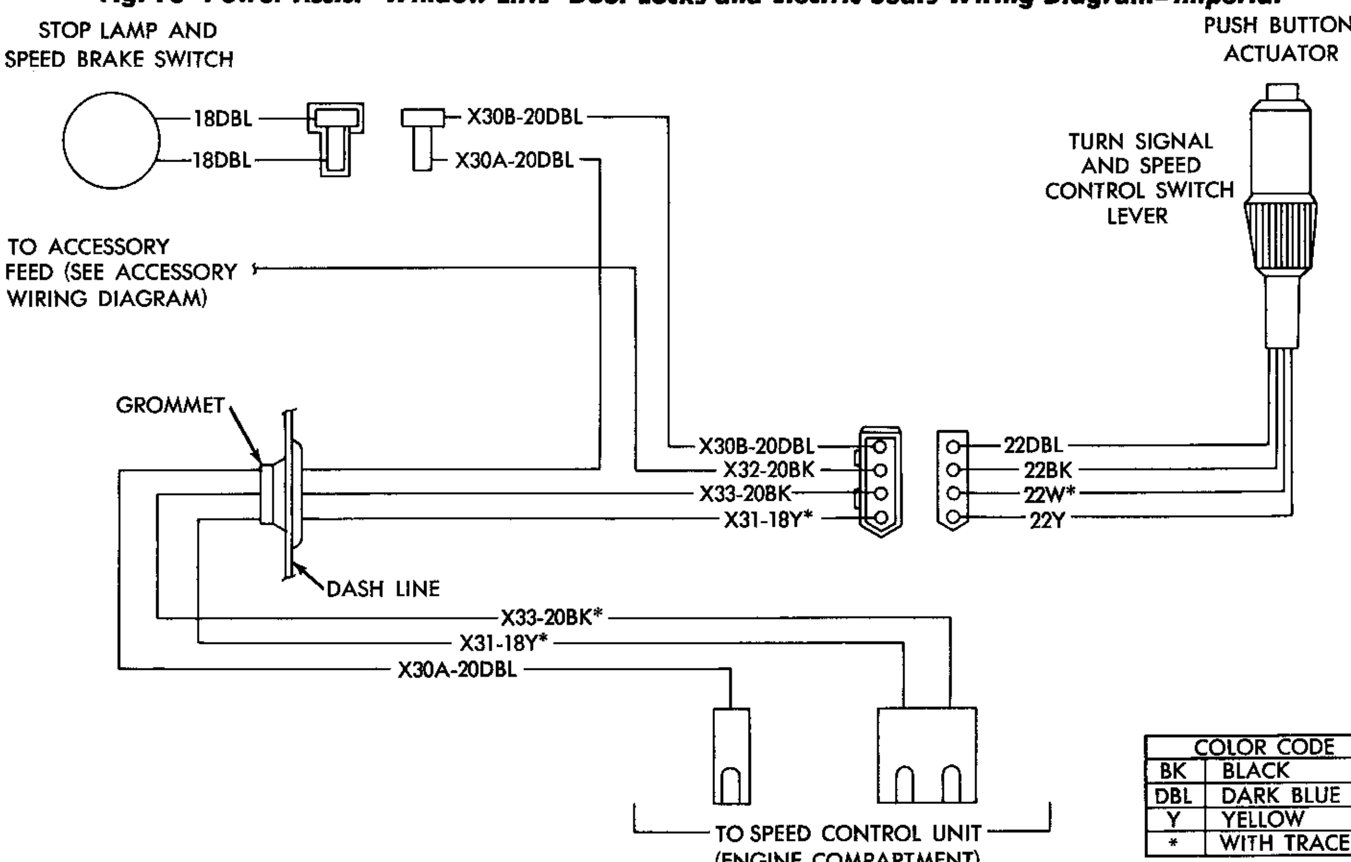
Fig. 15—Power Assist—Window Lifts—Door Locks and Electric Seat Wiring Diagram—Chrysler



COLOR CODE	
BK	BLACK
O	ORANGE
R	RED
T	TAN
W	WHITE
Y	YELLOW
*	WITH TRACER

PY283

Fig. 16—Power Assist—Window Lifts—Door Locks and Electric Seats Wiring Diagram—Imperial



COLOR CODE	
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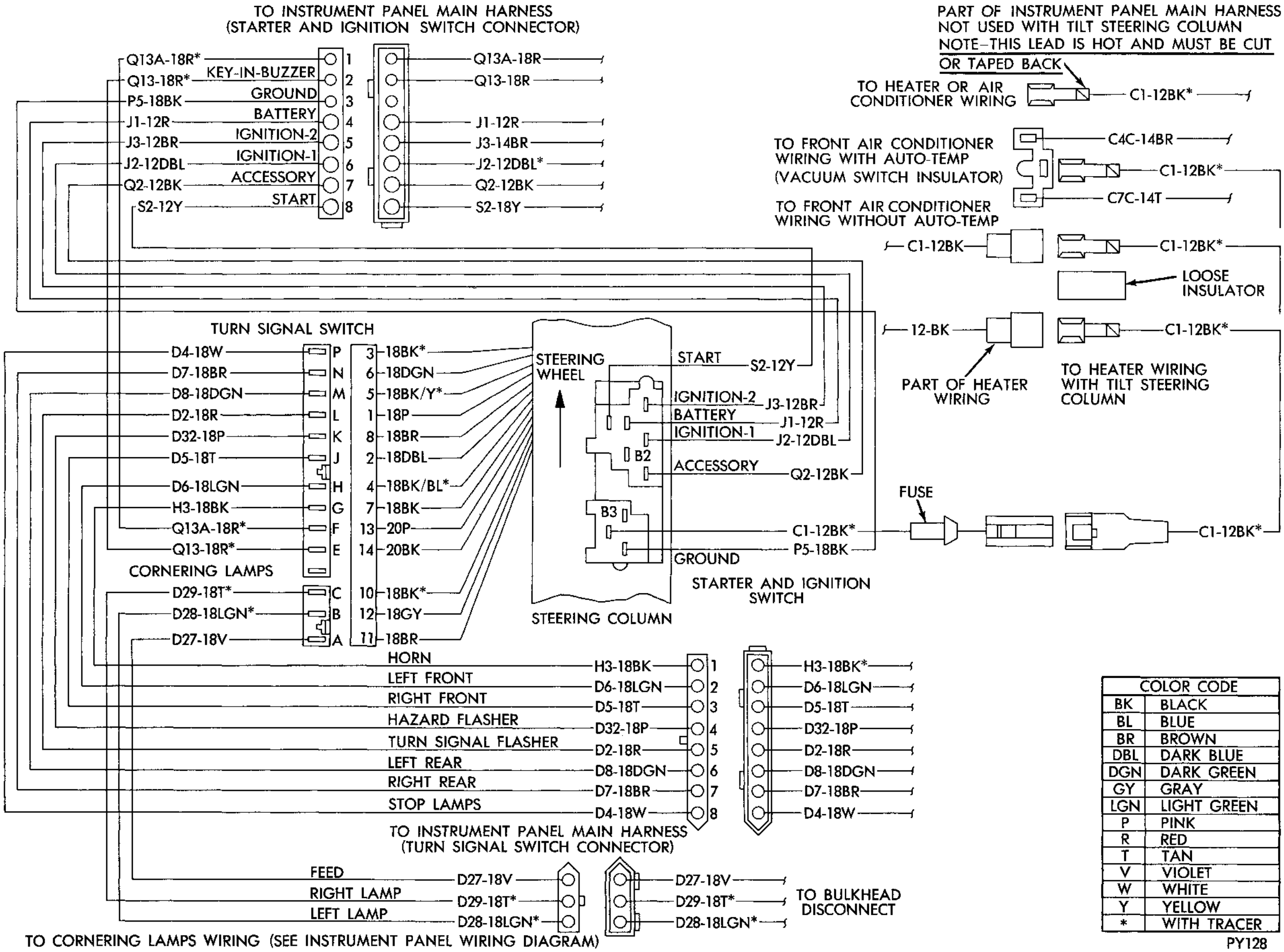
DBL	DARK BLUE
Y	YELLOW
*	WITH TRACER

PY246

Fig. 17—Speed Control Wiring Diagram—Chrysler



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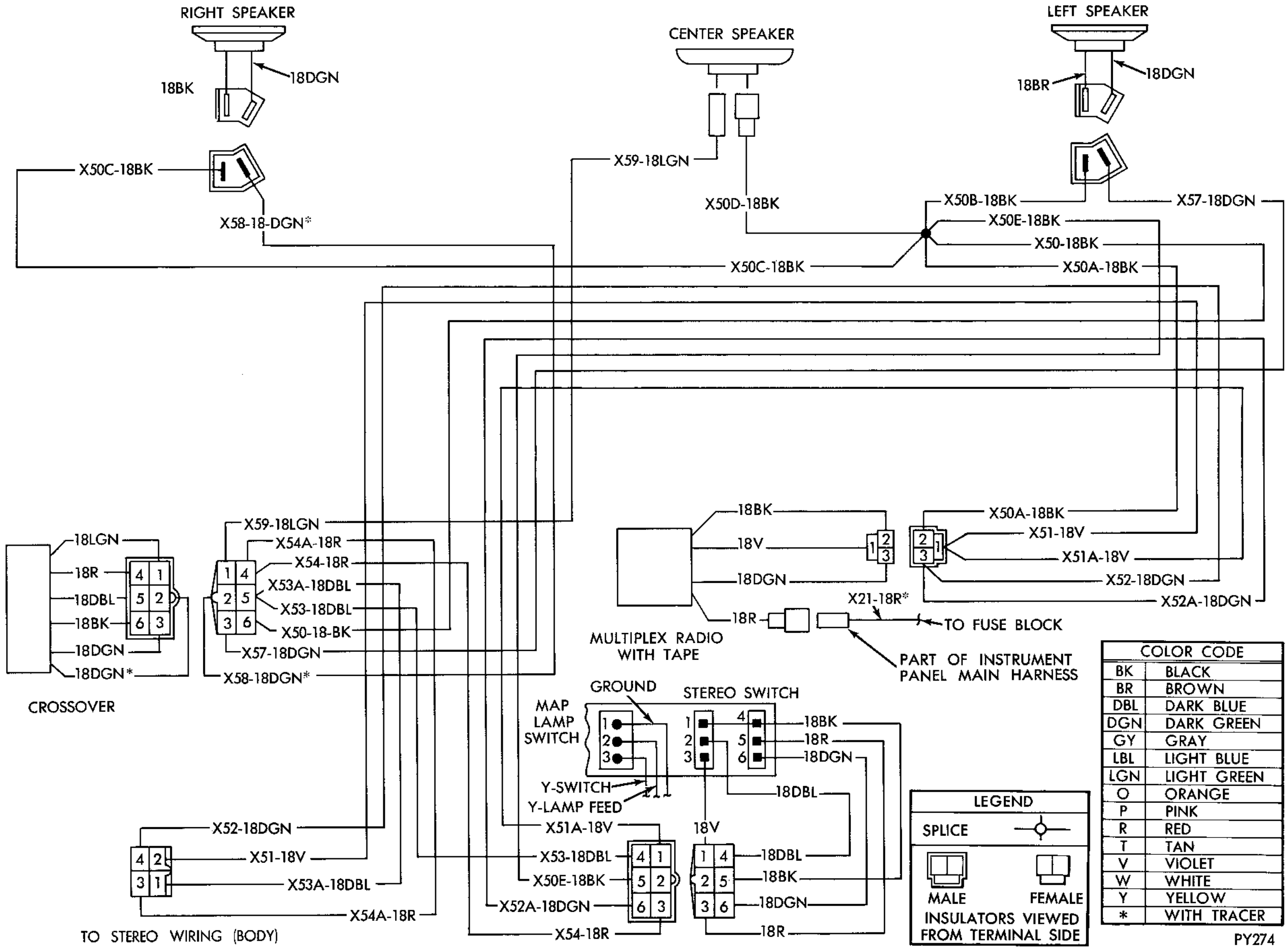
DGN	DARK GREEN
GY	GRAY
LGN	LIGHT GREEN
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 18—Tilt Steering Column Wiring—Chrysler, Imperial



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GY	GRAY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 19—Stereo Wiring Diagram—Chrysler

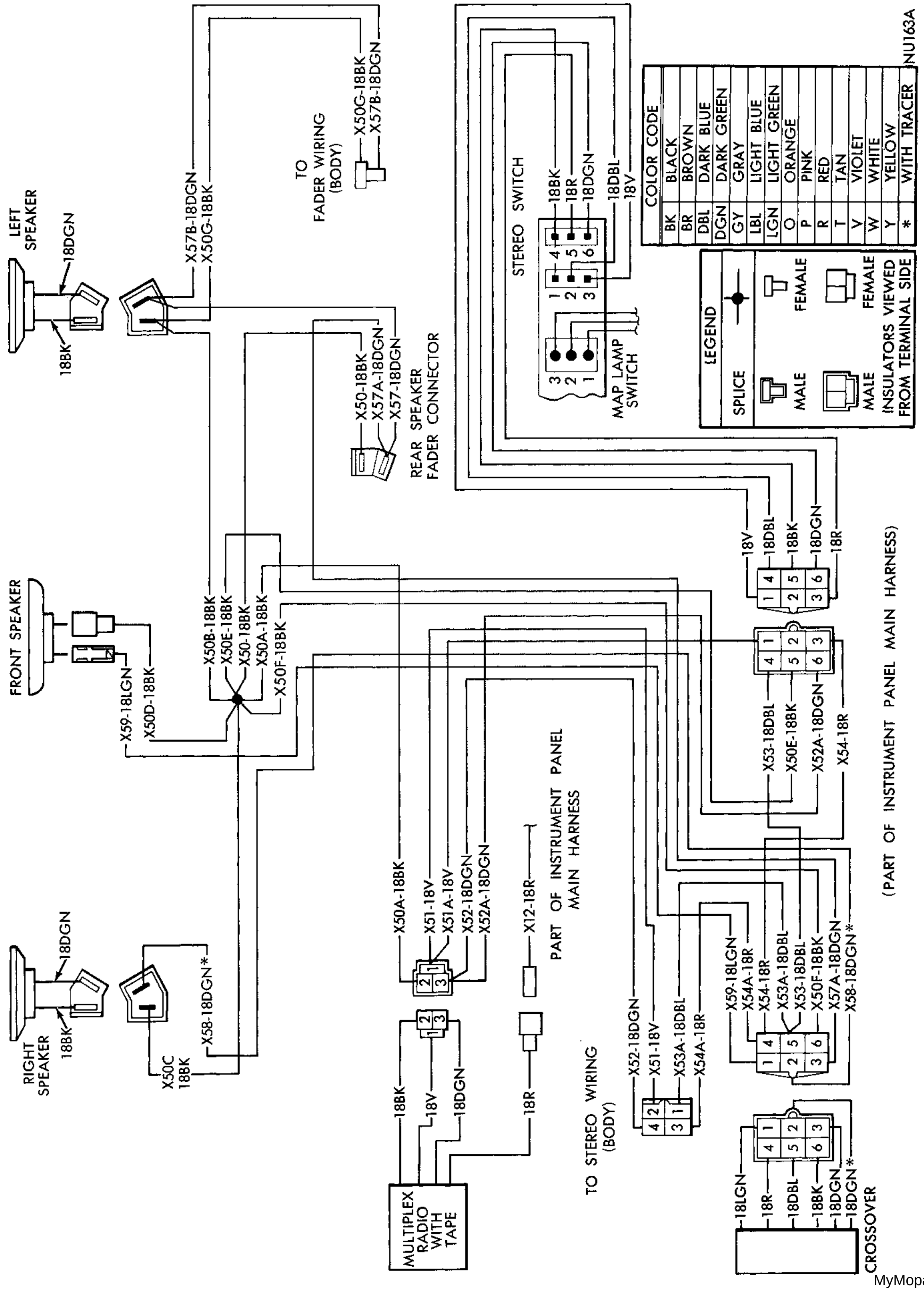


Fig. 20—Stereo Wiring Diagram—Imperial

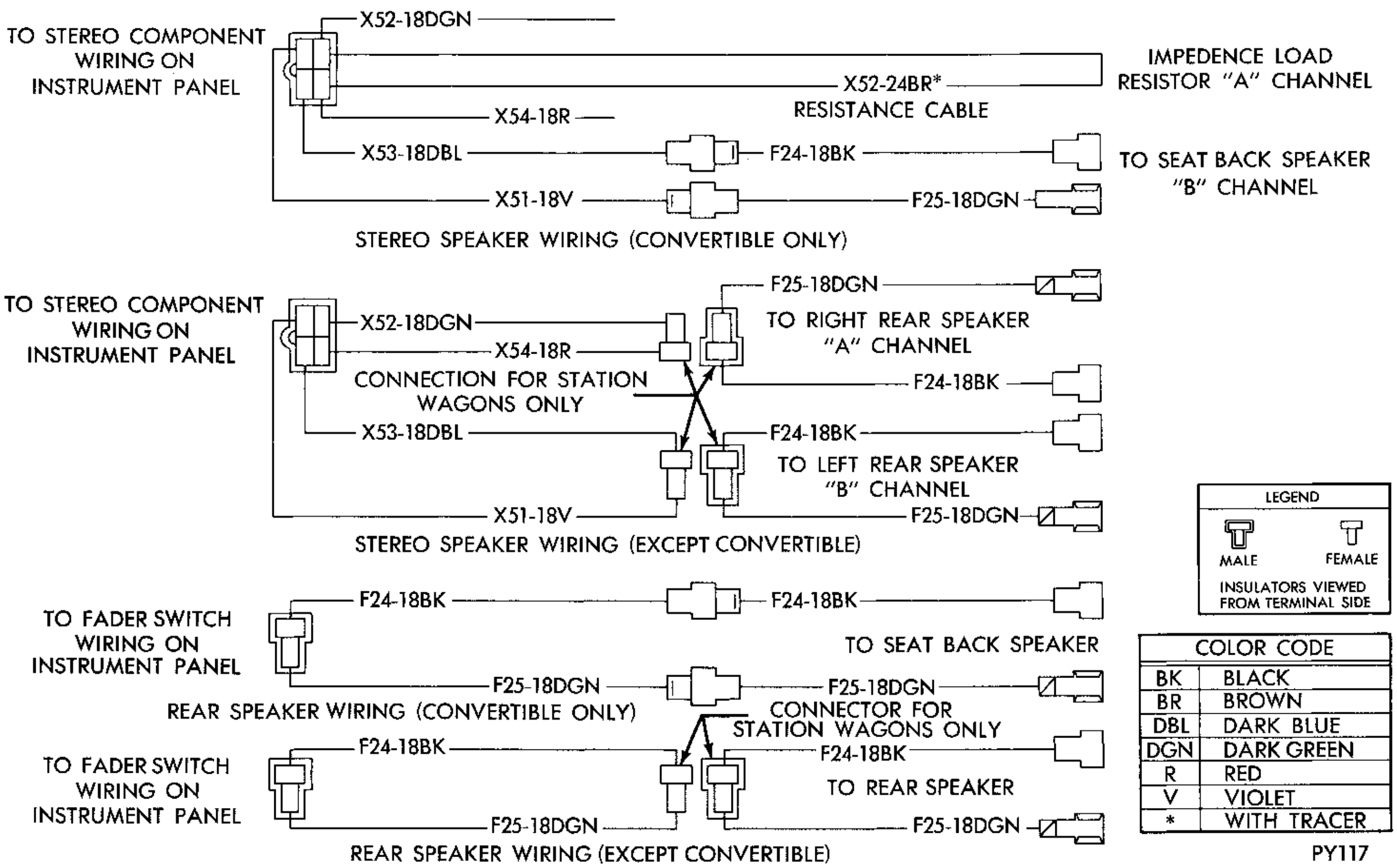


Fig. 21—Radio Rear Speaker Wiring Diagram—Chrysler—Imperial

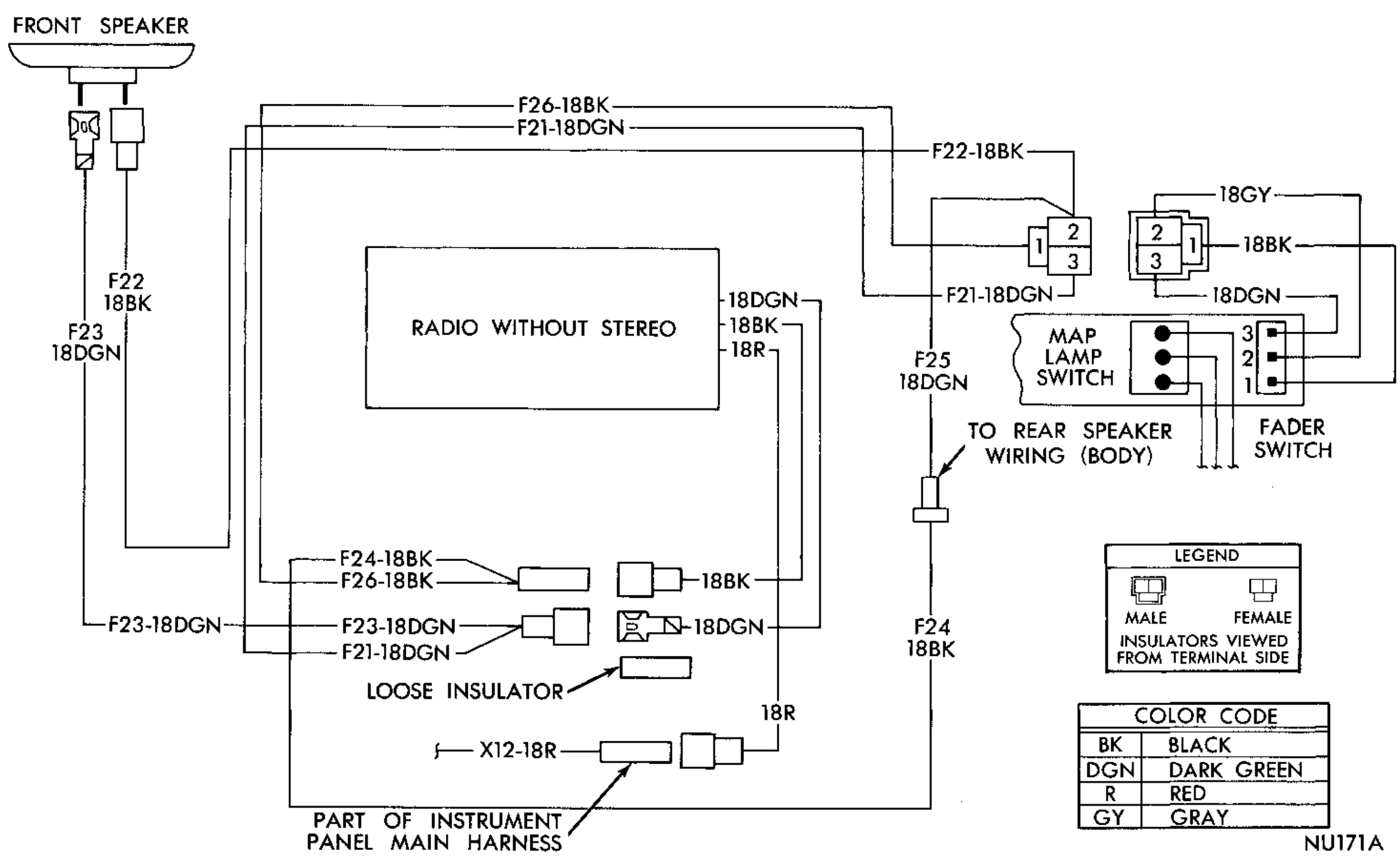


Fig. 22—Rear Speaker Fader Control Switch Wiring Diagram—Chrysler

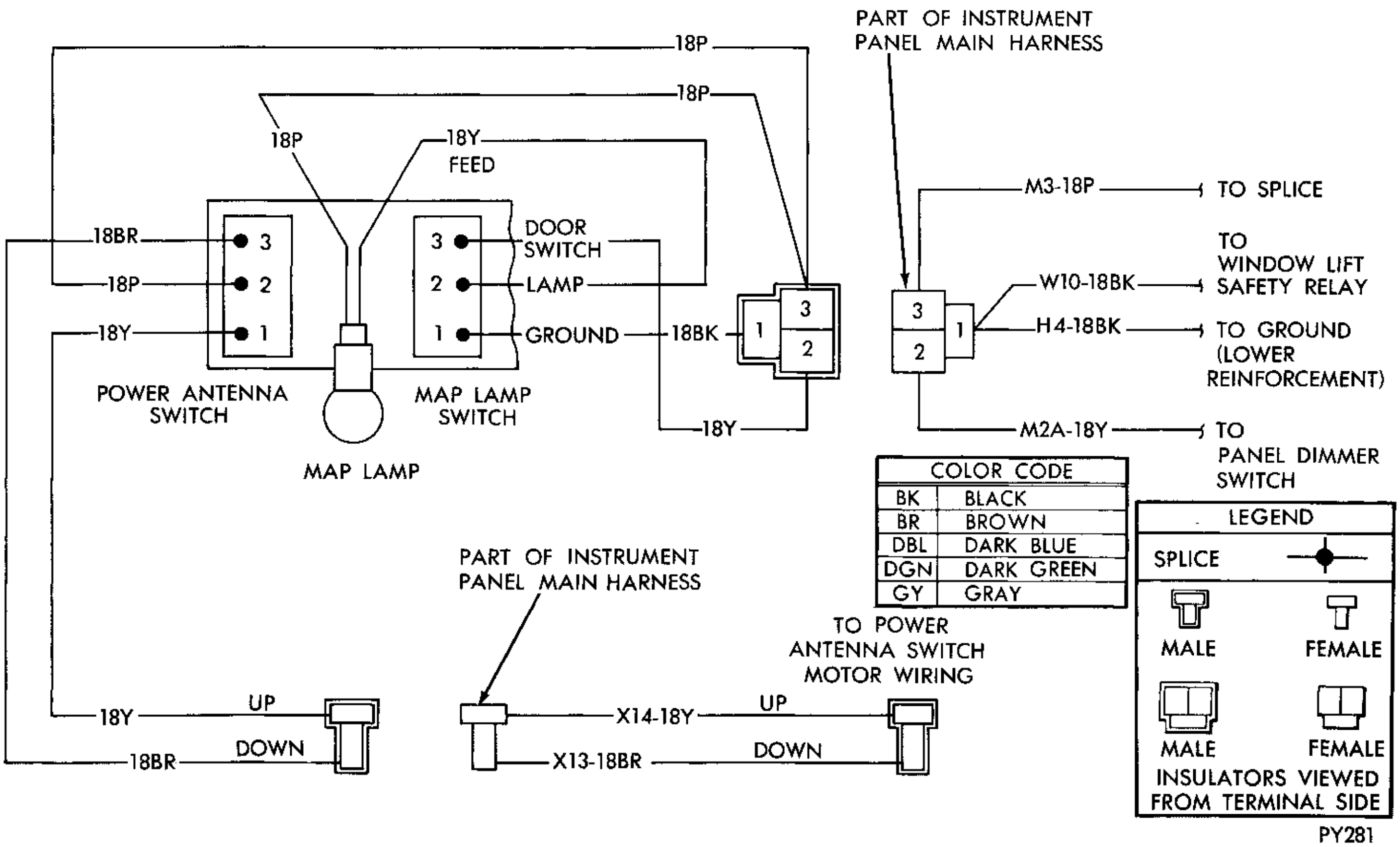


Fig. 23—Map Lamp With Powered Antenna Wiring—Imperial

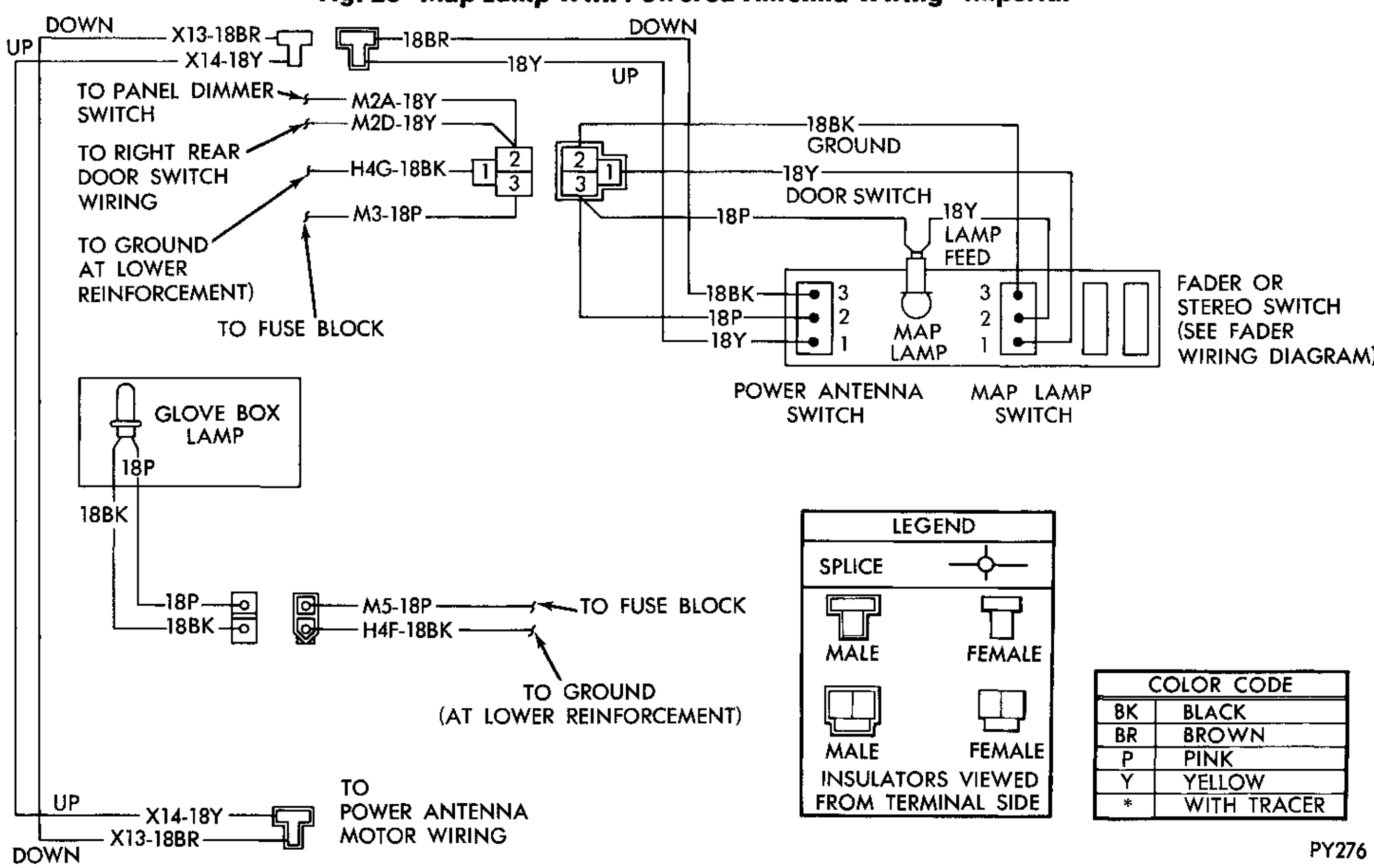


Fig. 24—Map Lamp With Powered Antenna Wiring—Chrysler

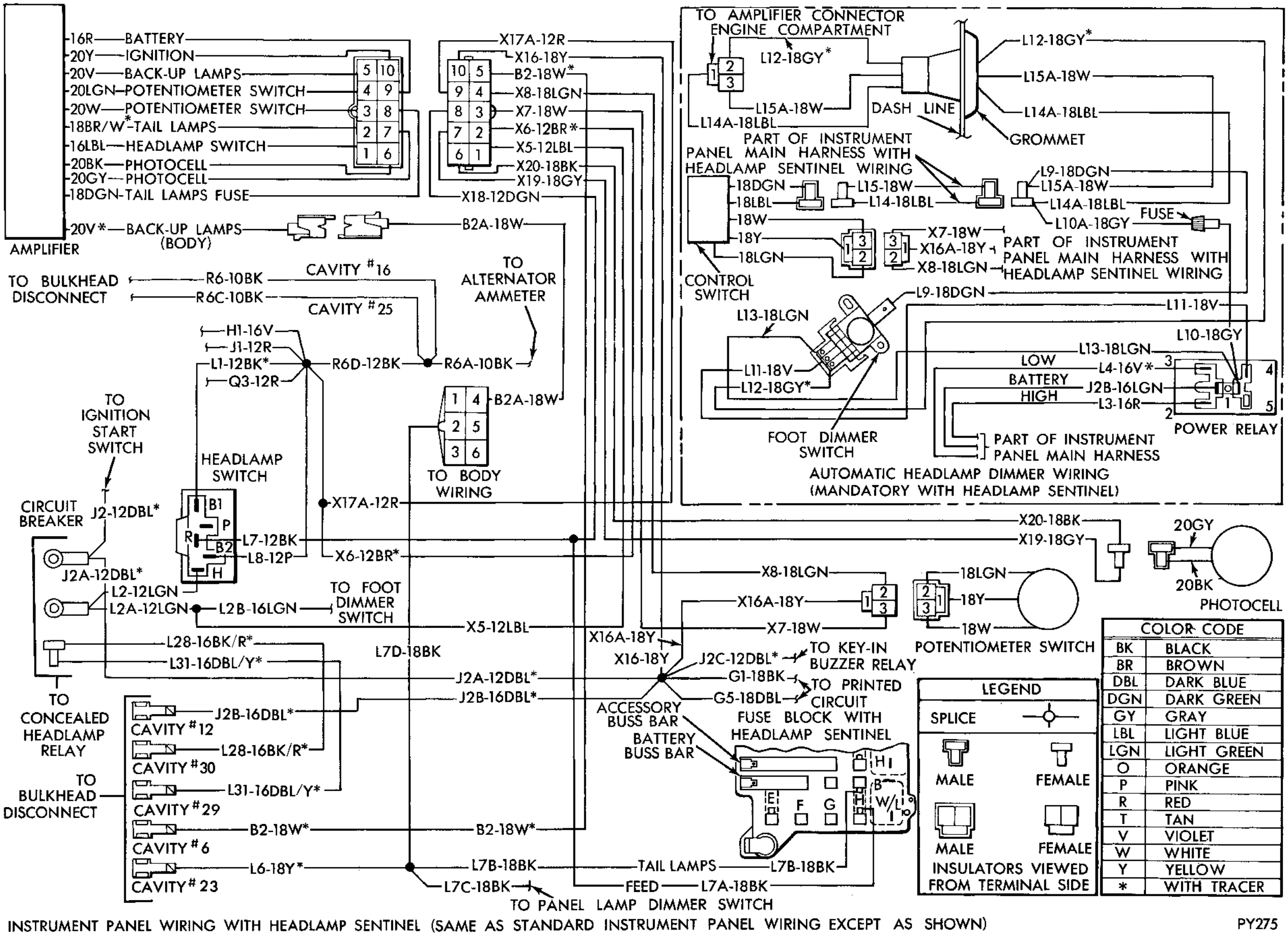
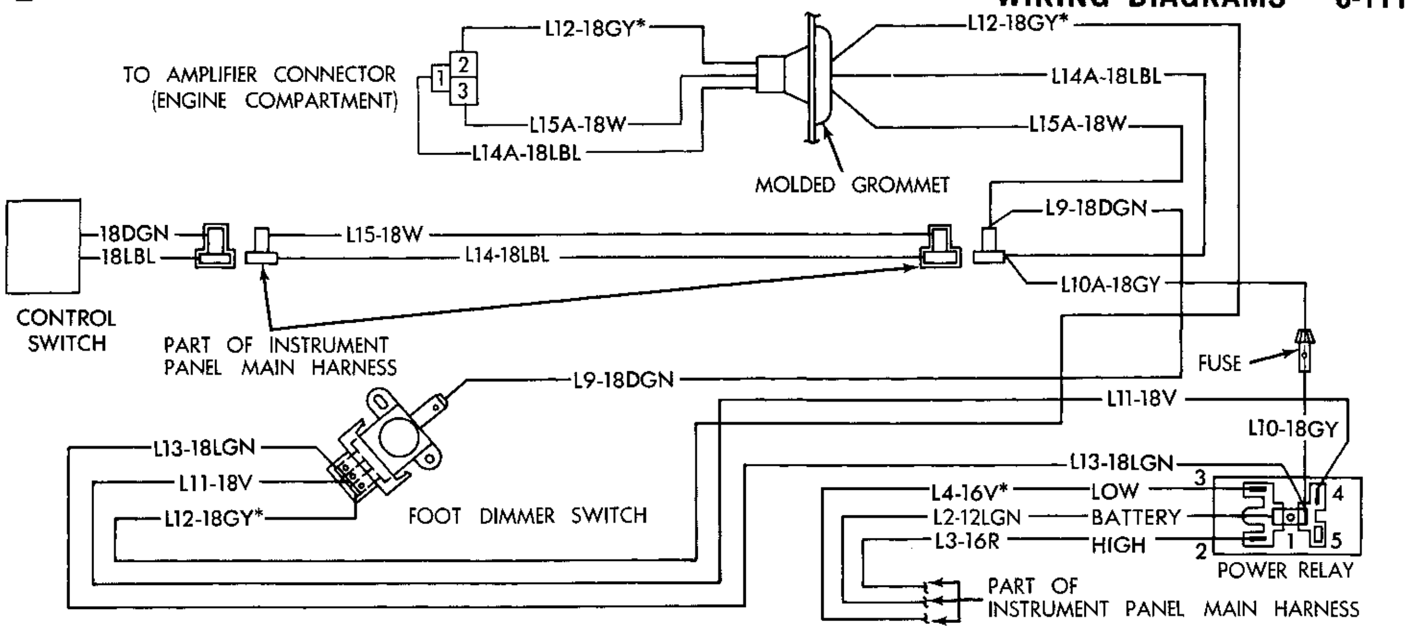
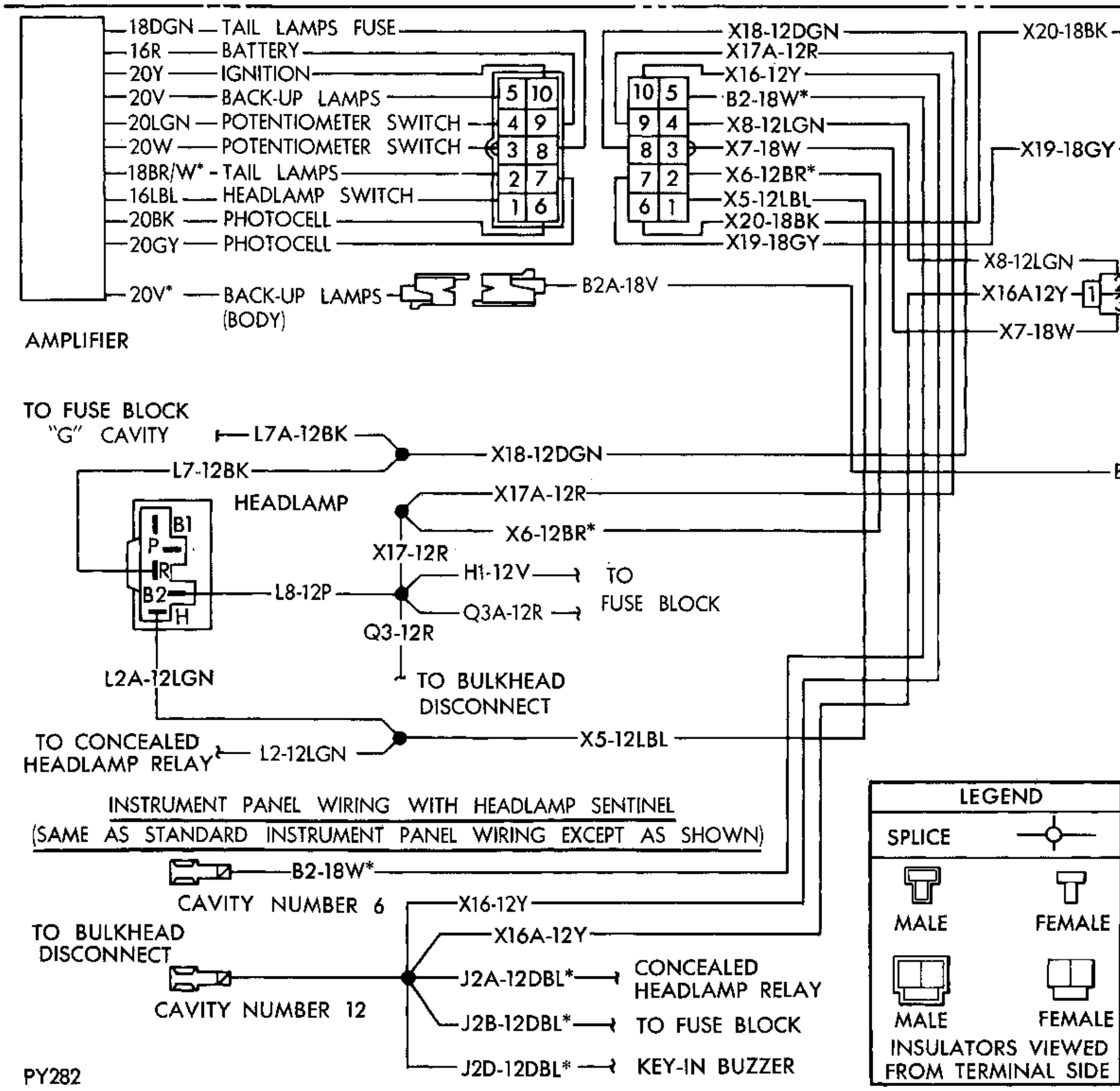


Fig. 25—Automatic Beam Changer and Headlamp Sentinel Wiring Diagram—Chrysler



AUTOMATIC HEADLAMP DIMMER WIRING
(MANDATORY WITH HEADLAMP SENTINEL)



INSTRUMENT PANEL WIRING WITH HEADLAMP SENTINEL
(SAME AS STANDARD INSTRUMENT PANEL WIRING EXCEPT AS SHOWN)

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DBL	DARK BLUE
DGN	DARK GREEN
GY	GRAY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 26—Automatic Beam Changer and Headlamp Sentinel Wiring Diagram—Imperial

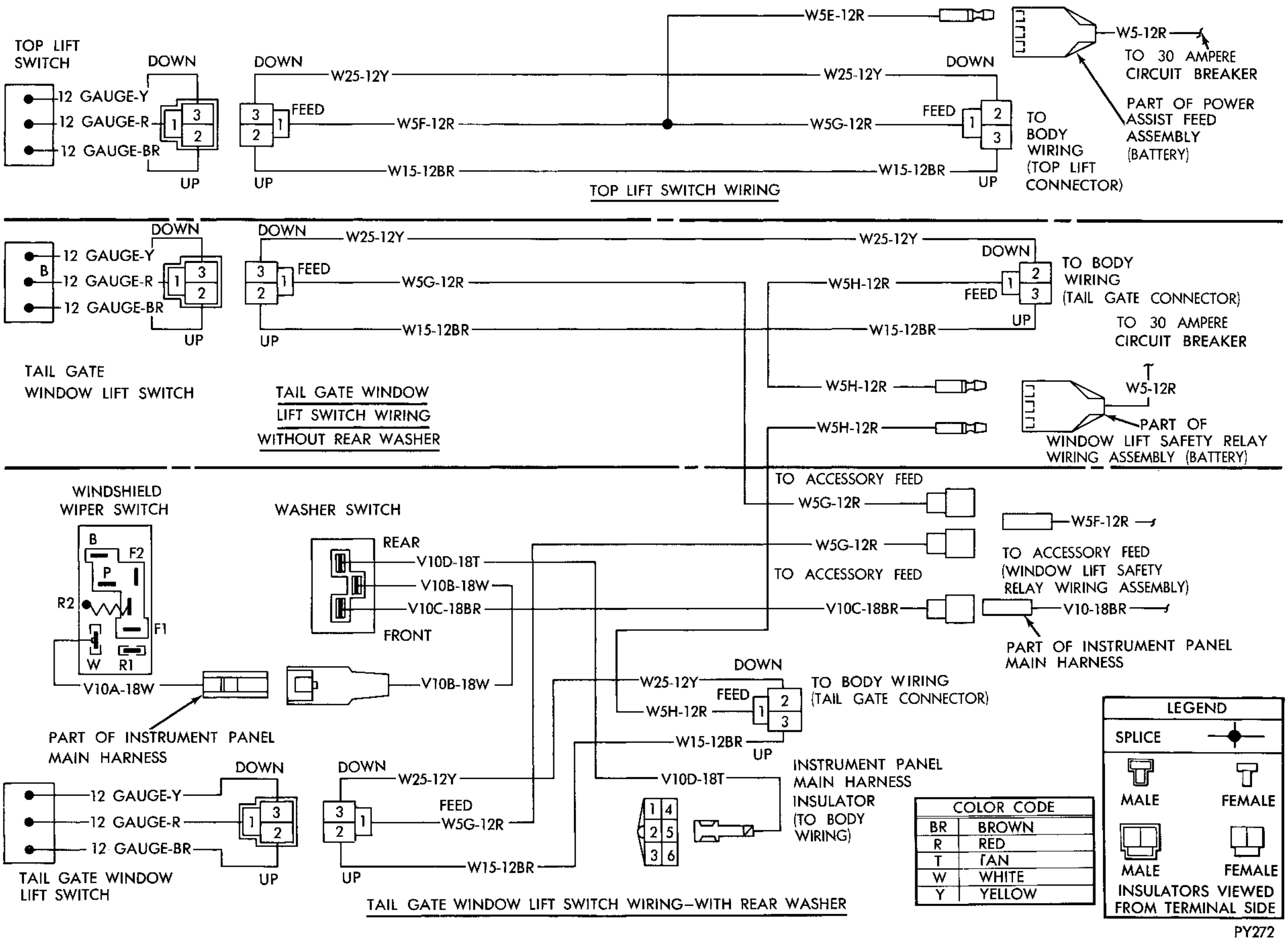

Fig. 27—Top Lift or Tail Gate Window Lift with and Without Rear Window Washer Wiring Diagram—Chrysler

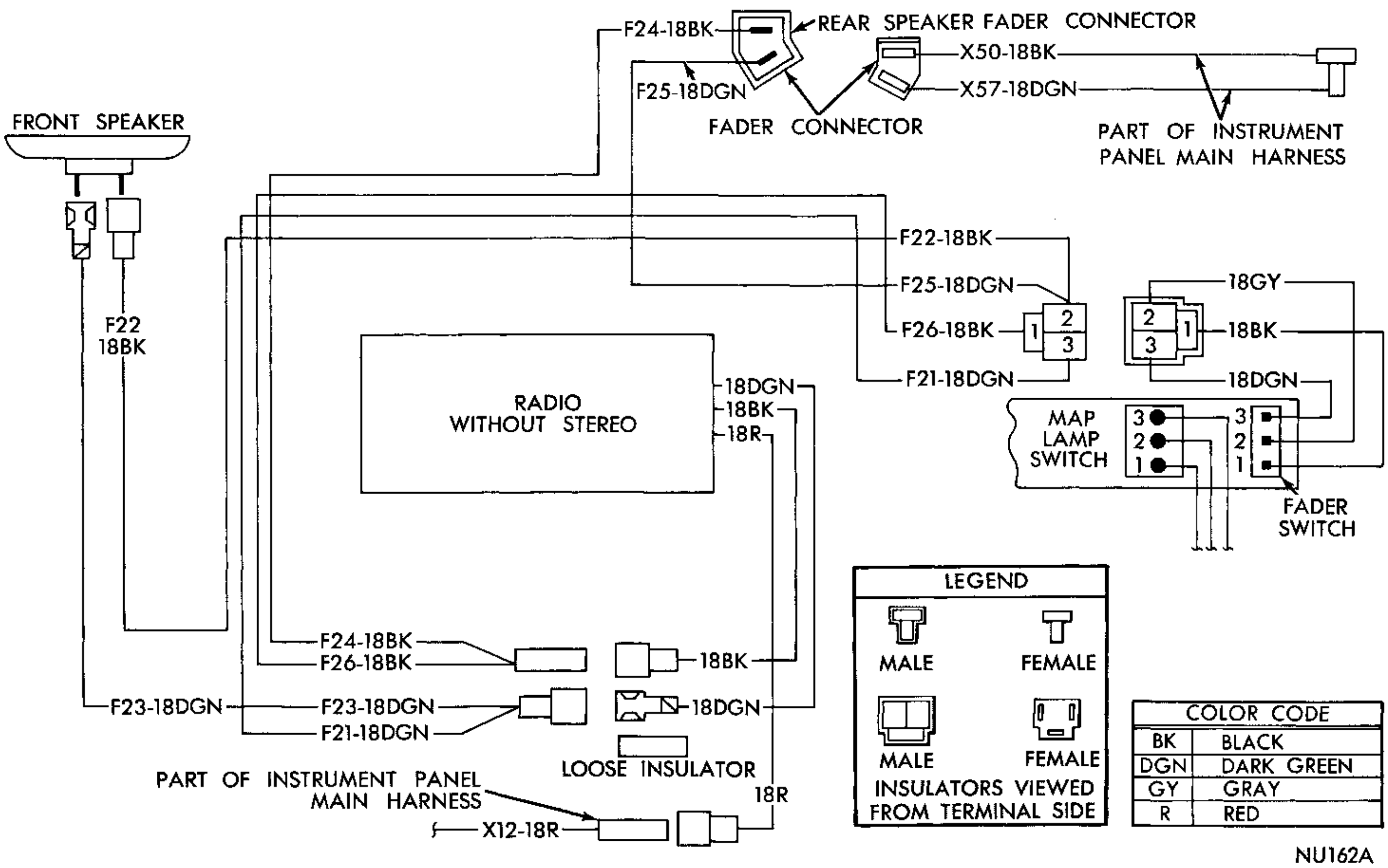

Fig. 28—Rear Speaker Fader Control Switch Wiring Diagram—Imperial

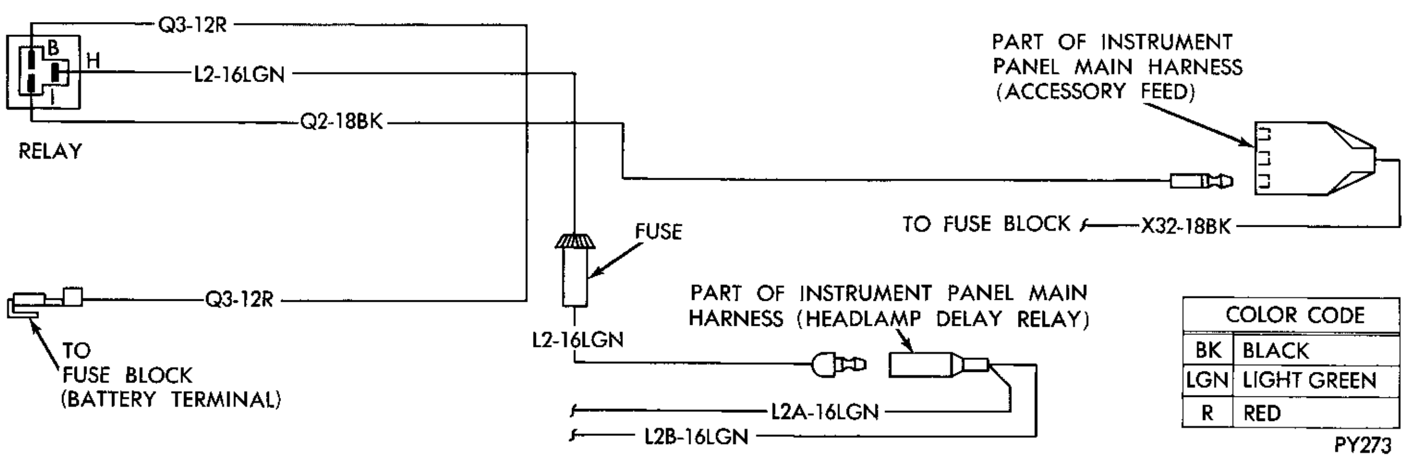

Fig. 29—Headlamp Delay Relay Wiring—Chrysler

WIRING ADAPTATIONS

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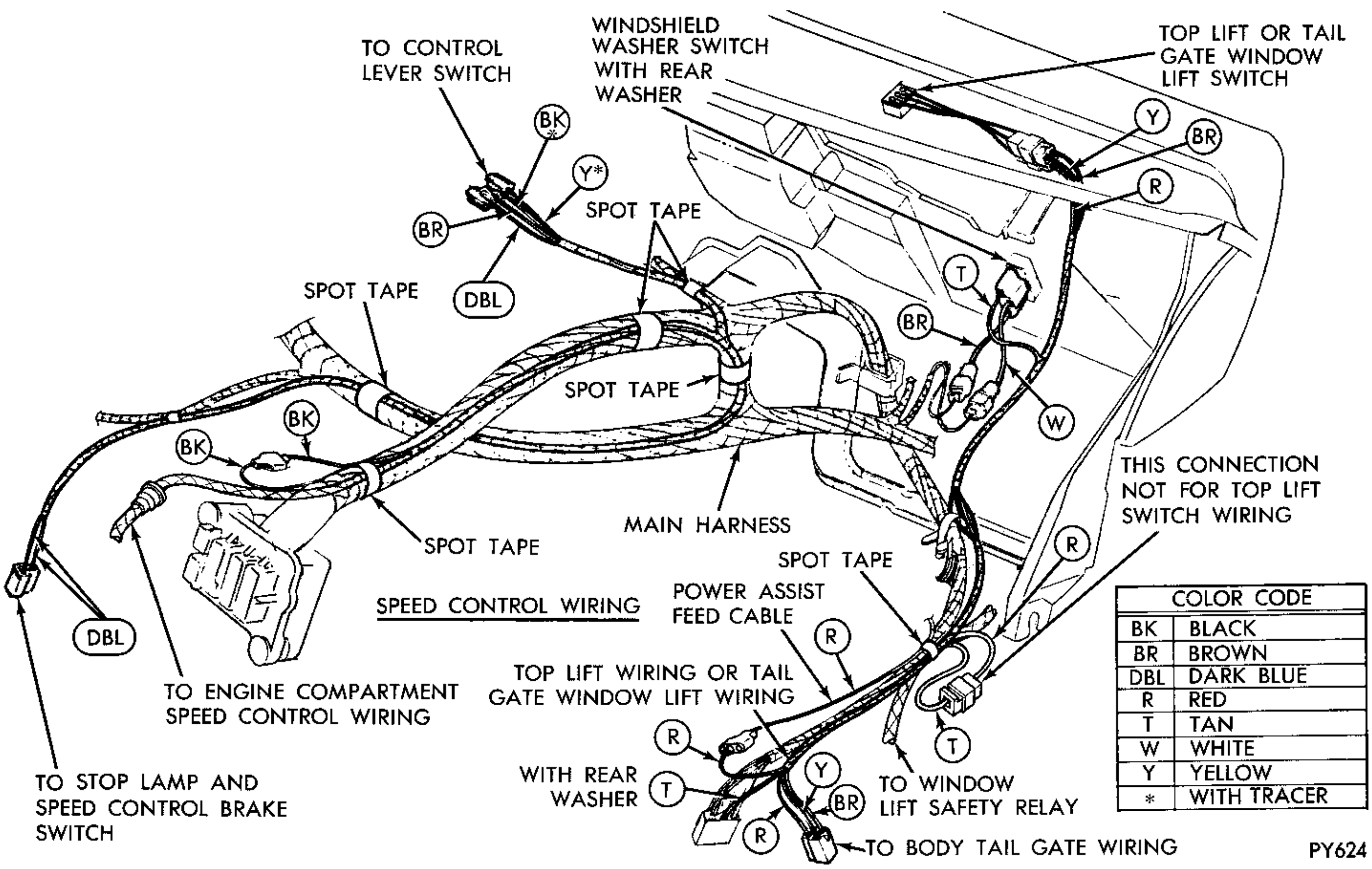
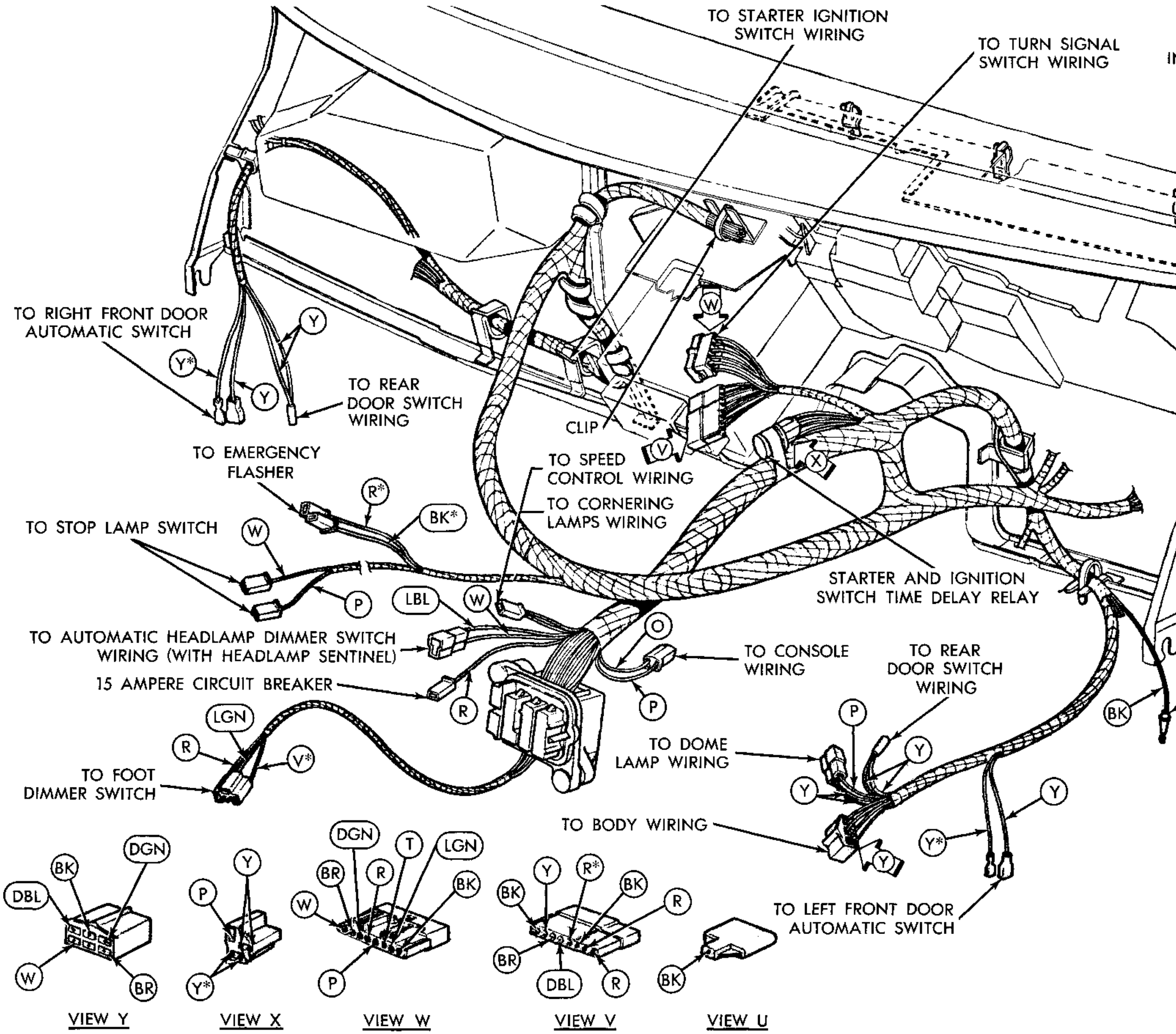


Fig. 1—Top Lift, Tail Gate Window Lift, Speed Control and Power Assist Feed Cable Wiring—Chrysler



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LGN	LIGHT GREEN
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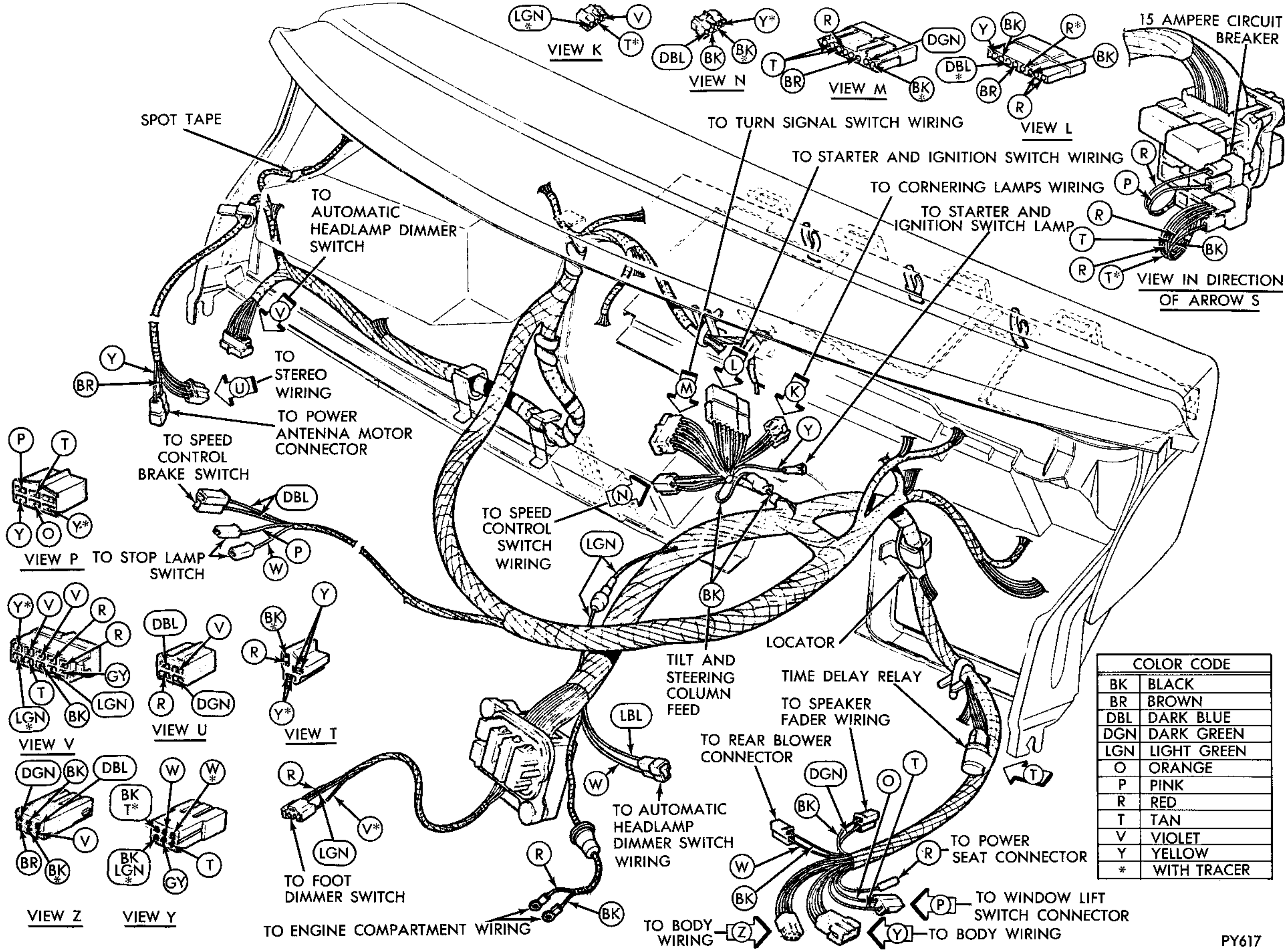
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 2—Instrument Panel Main Harness Hook-up—Chrysler



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DGN	DARK GREEN
LGN	LIGHT GREEN
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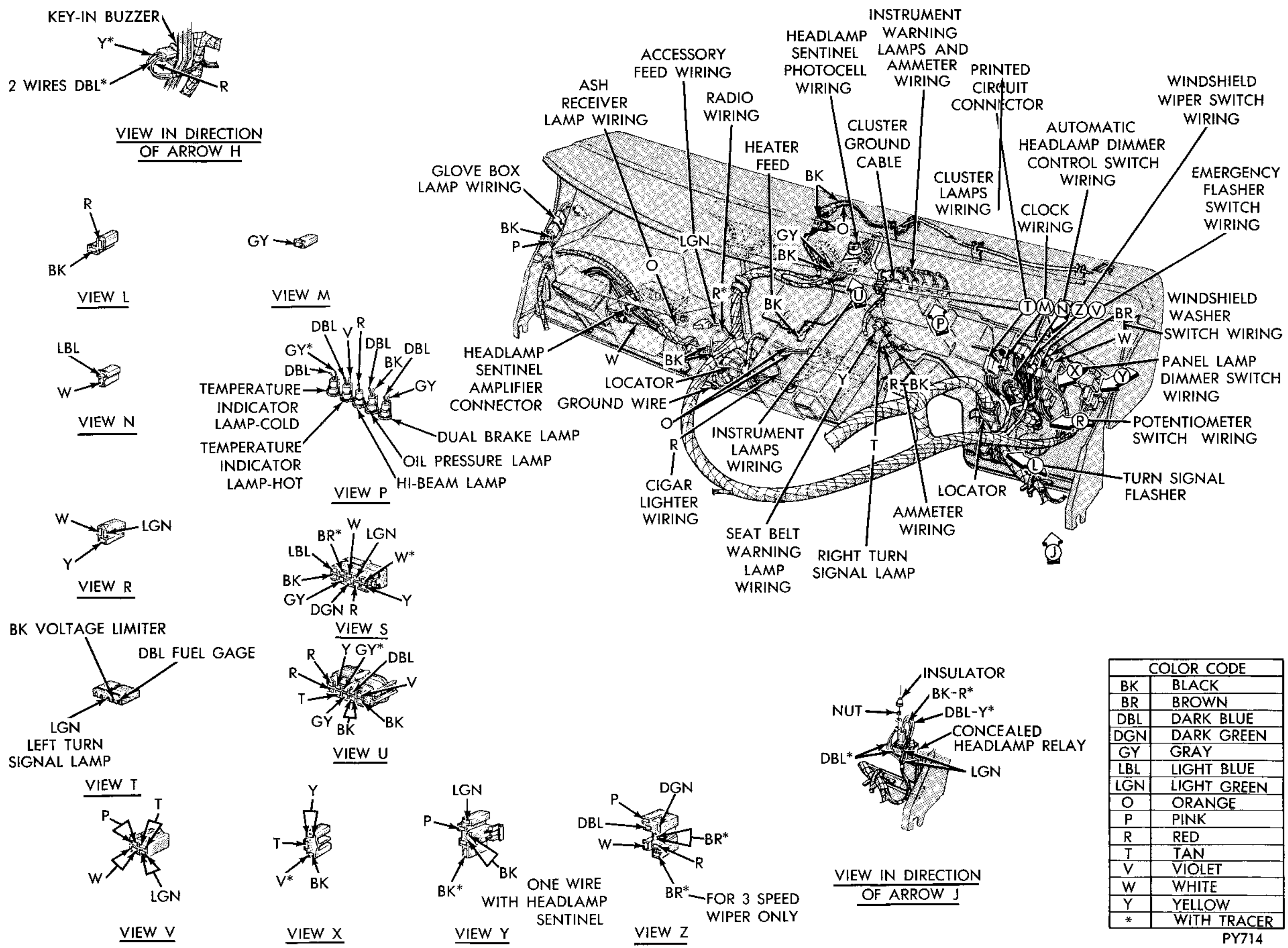
P	PINK
R	RED
T	TAN
V	VIOLET
Y	YELLOW
*	WITH TRACER

Fig. 3—Instrument Panel Main Harness Hook-up—Imperial



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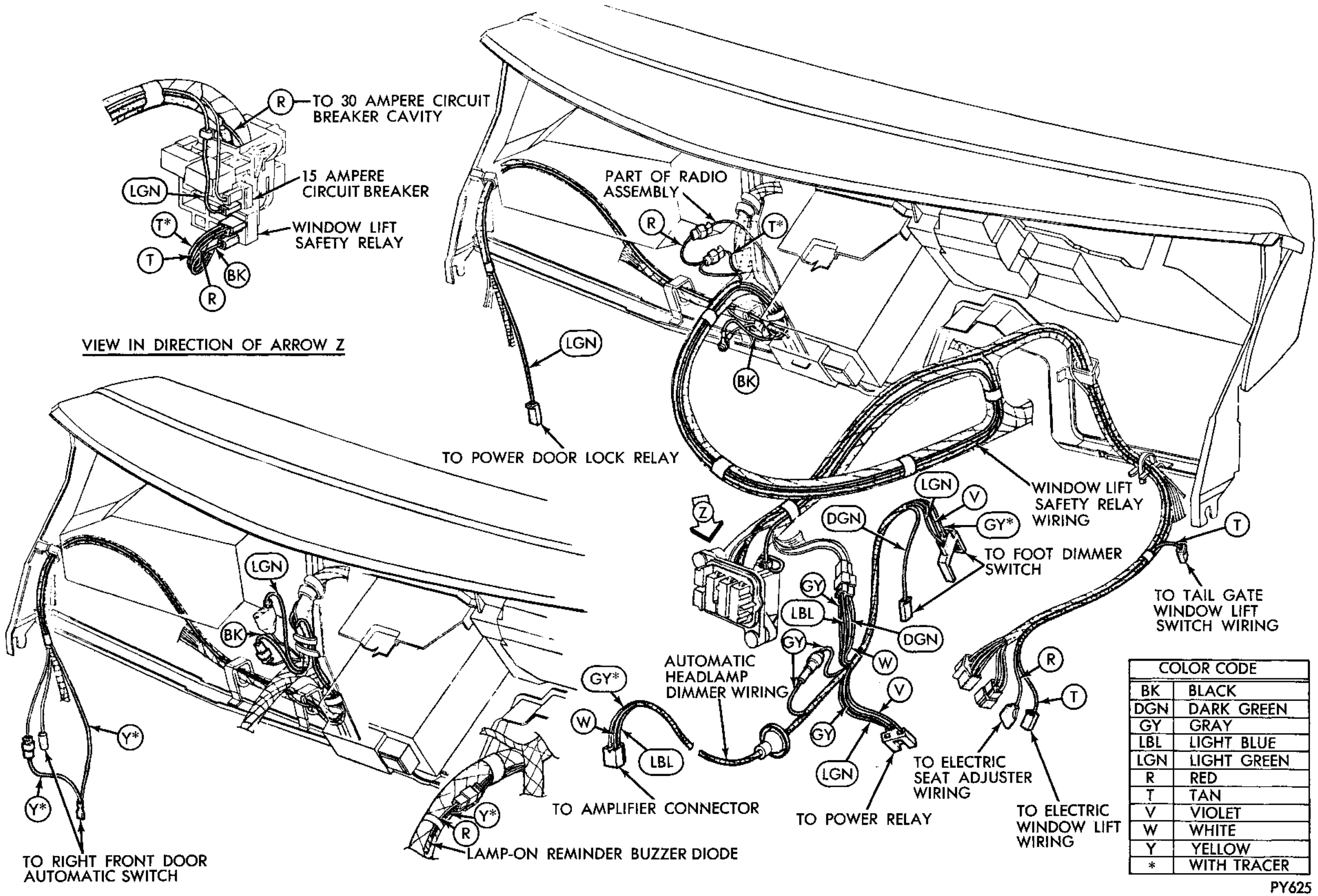
DGN	DARK GREEN
GY	GRAY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 4—Instrument Panel, Main Harness Hook-up—Chrysler



COLOR CODE	
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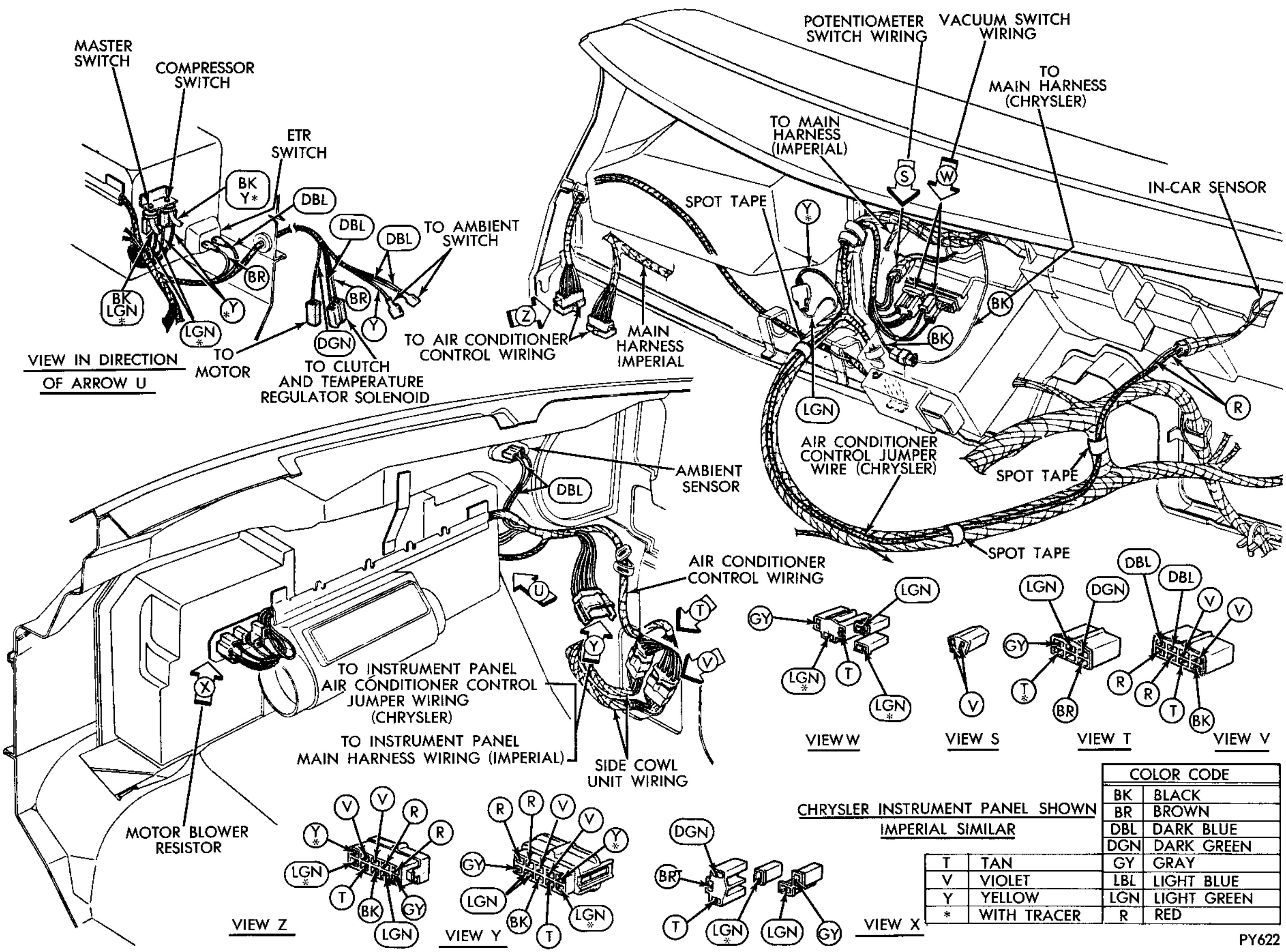
DGN	DARK GREEN
GY	GRAY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 5—Power Door Locks, Relay Feed Cable, Window Lift Safety Relay, Automatic Headlamp Dimmer and Lamp-on Reminder Buzzer Wiring—Chrysler



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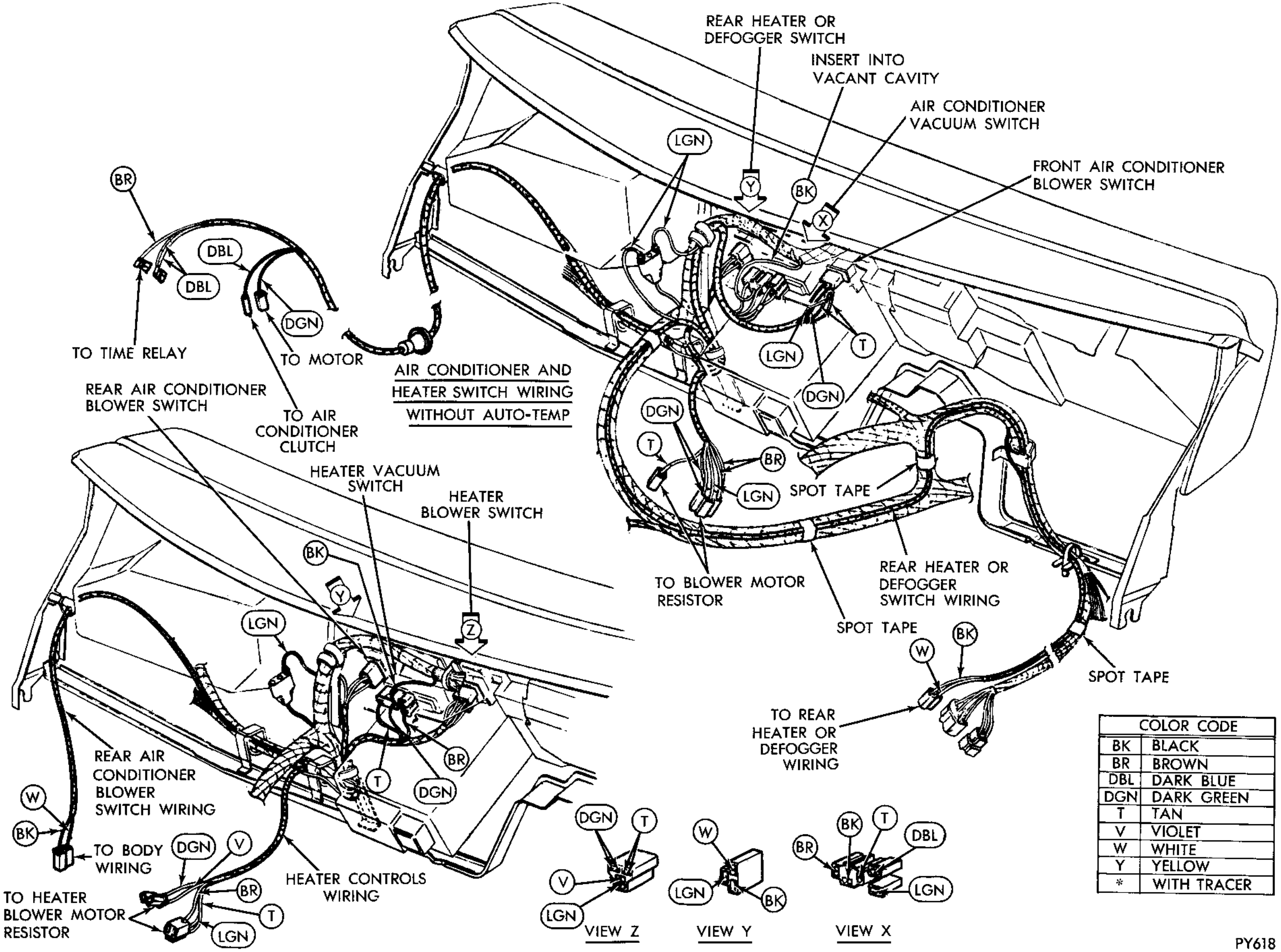
DGN	DARK GREEN
GY	GRAY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
R	RED
T	TAN
V	VIOLET
Y	YELLOW
*	WITH TRACER

Fig. 6—Air Conditioner with Automatic Temperature Control Wiring—Chrysler and Imperial



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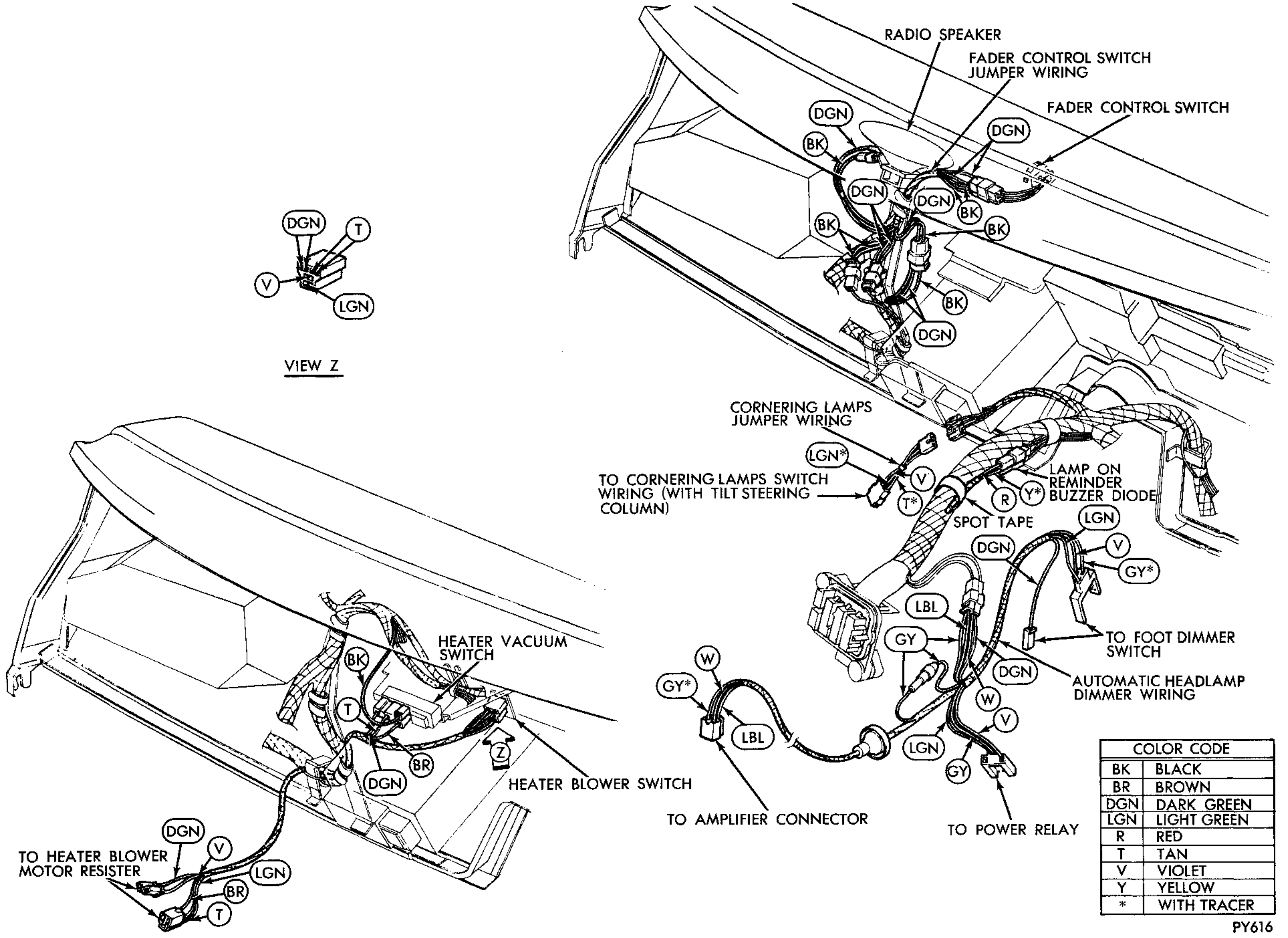
DGN	DARK GREEN
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 7—Air Conditioner and Heater without Auto-Temp., Rear Air Conditioner, Heater Controls, Rear Heater and Rear Window Defogger—Chrysler and Imperial



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DGN	DARK GREEN
LGN	LIGHT GREEN
R	RED
T	TAN
V	VIOLET
Y	YELLOW
*	WITH TRACER

Fig. 8—Heater Control, Fader Control, Switch Jumper, Automatic Headlamp Dimmer and Cornering Lamps Jumper Wiring—Imperial

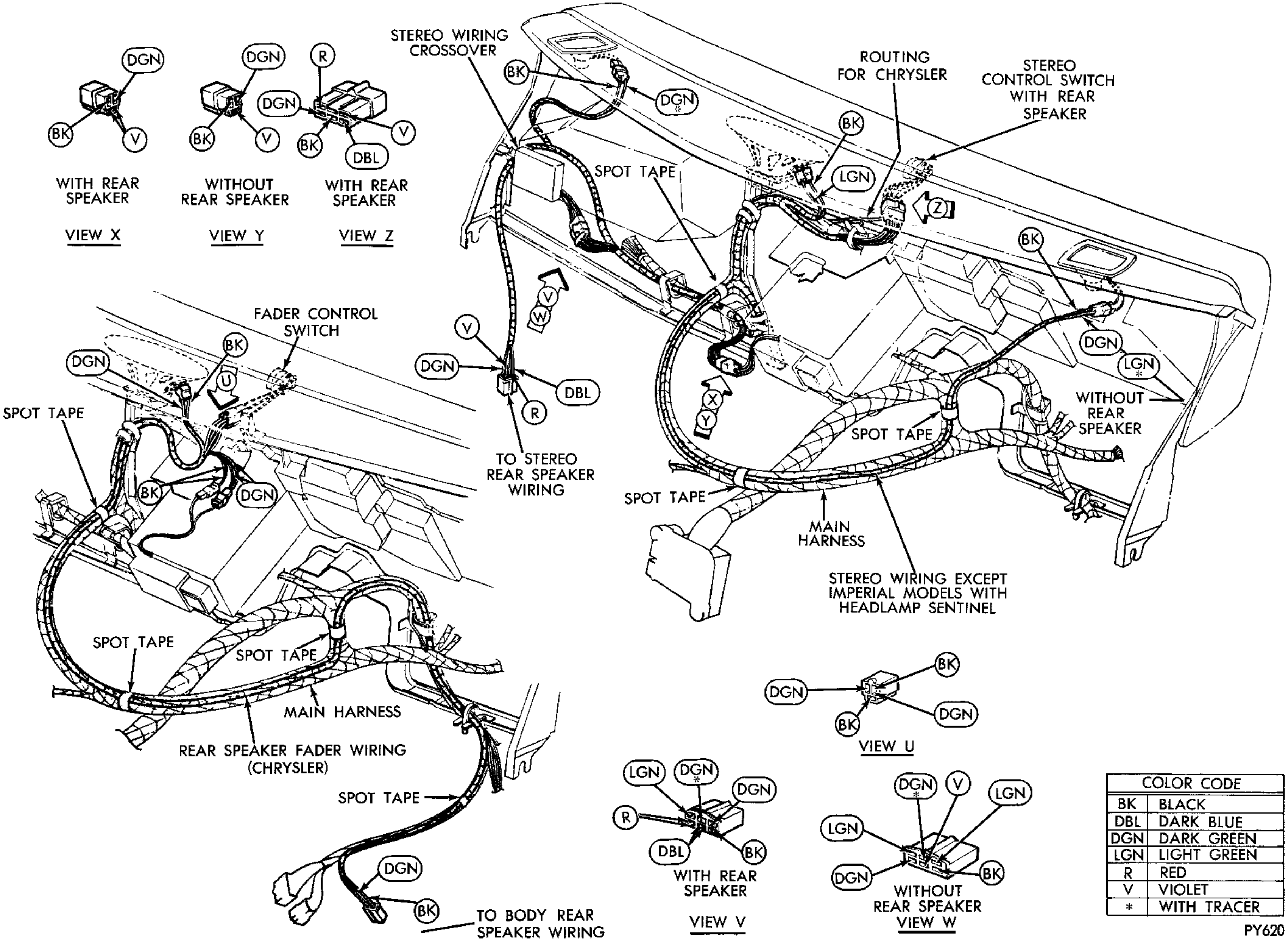
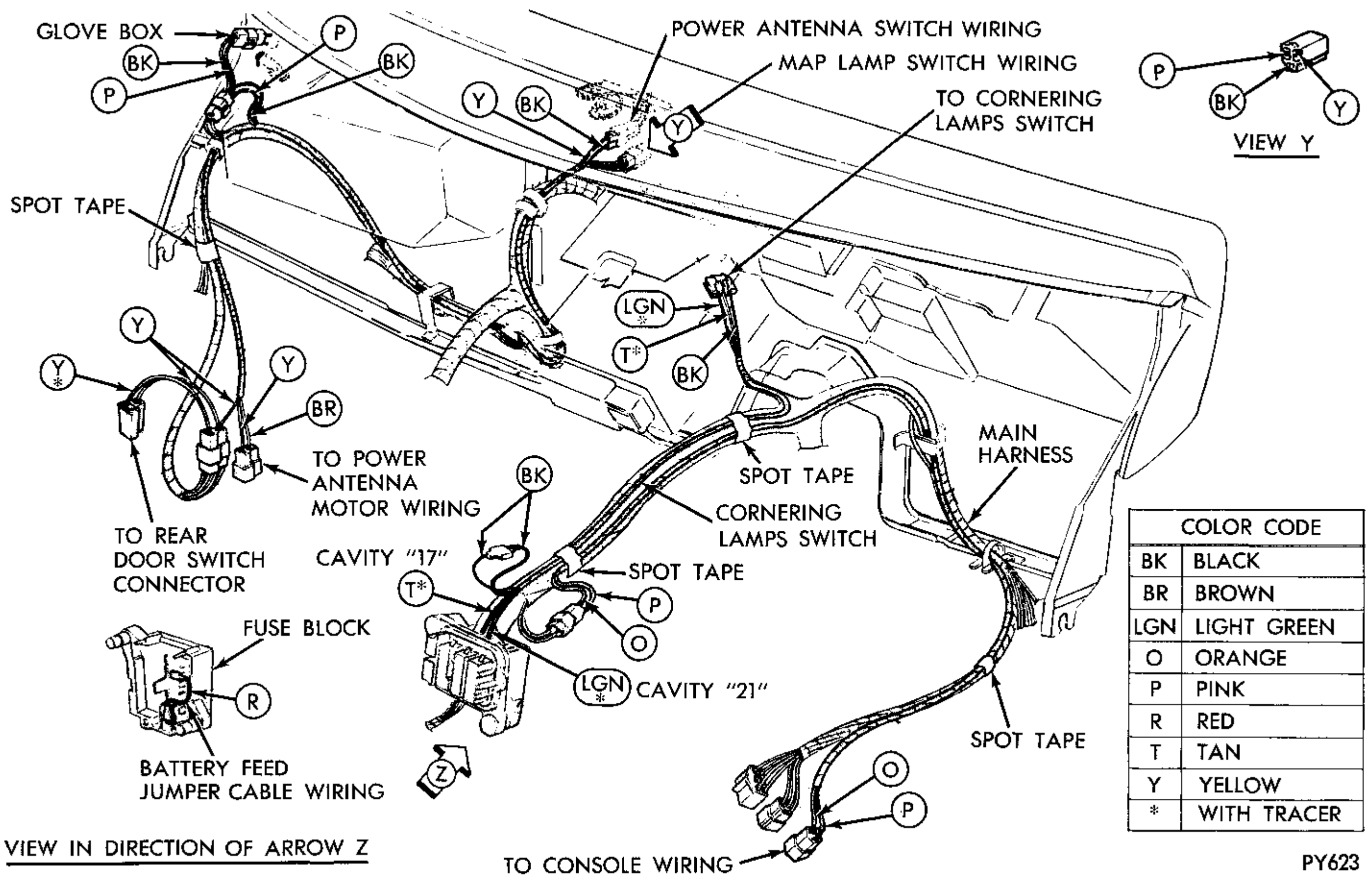


Fig. 9—Stereo and Rear Speaker Wiring—Chrysler and Imperial



COLOR CODE	
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LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
Y	YELLOW
*	WITH TRACER

Fig. 10—Map Lamp, Power Antenna, Cornering Lamps, Battery Feed Jumper Cable and Console Wiring—Chrysler and Imperial

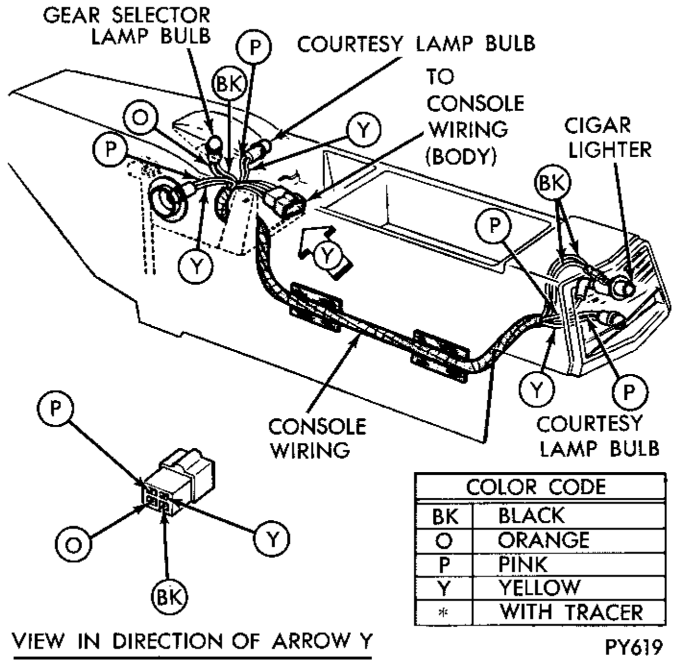


Fig. 11—Console Wiring—Chrysler

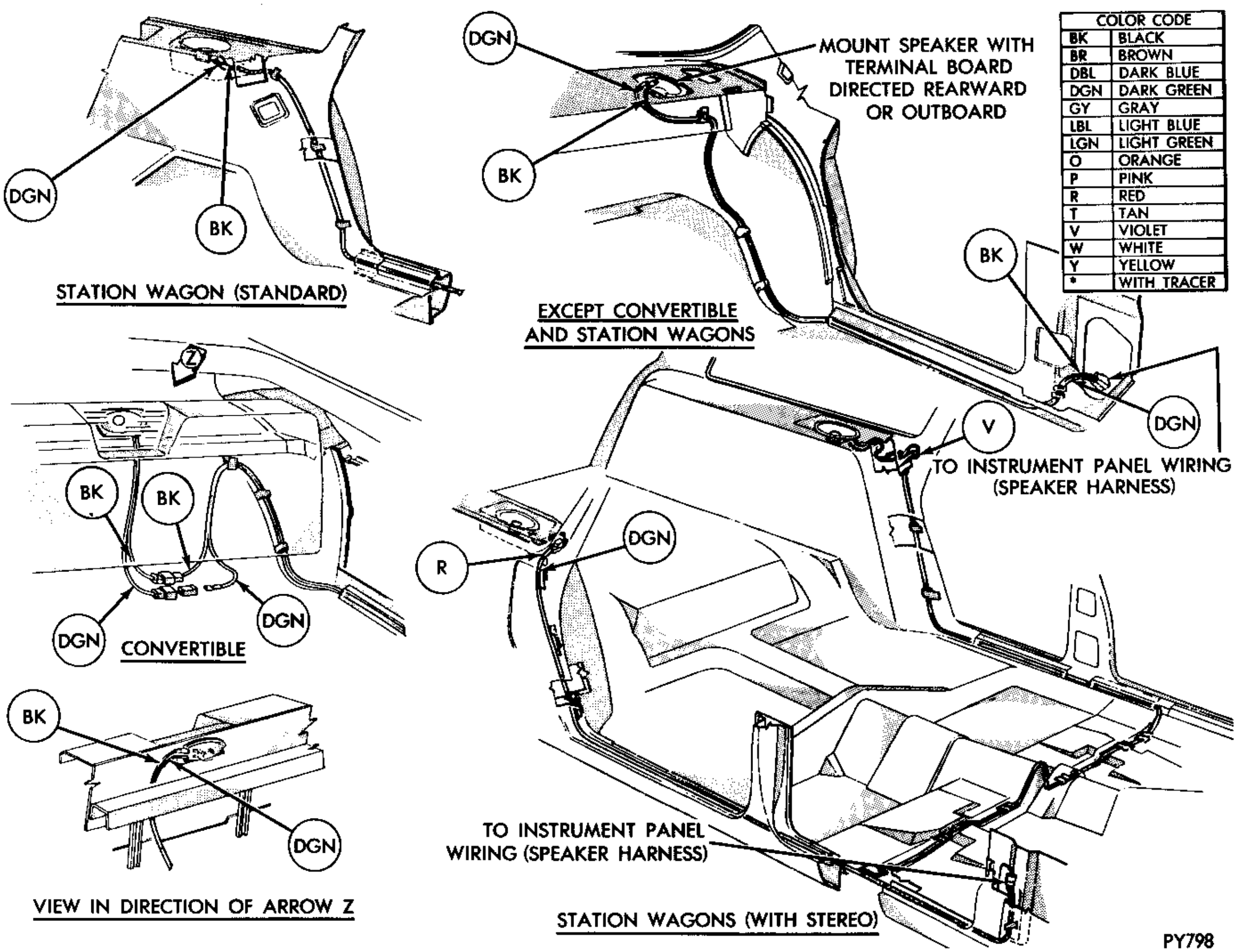


Fig. 12—Rear Speaker Harness Connections and Routing

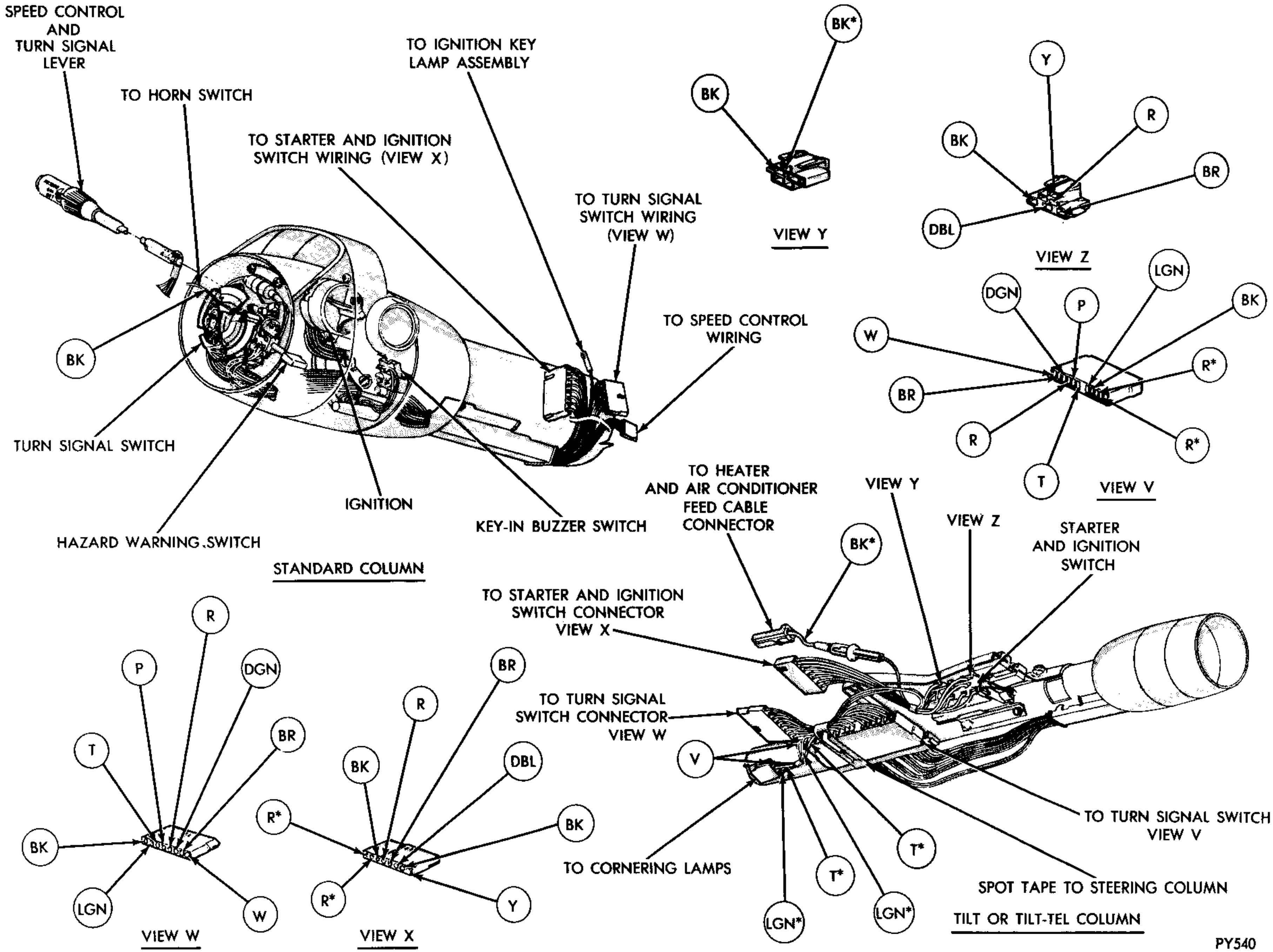


Fig. 13—Steering Column Cross Section Showing Turn Signal, Speed Control and Ignition Switches Installation

ENGINE

CONTENTS

ENGINE APPLICATION

Model Application		No. Cyl.	Engine Type & Displacement	Compression Ratio	
Newport and Town and Country	(Std.)	8	"LB" 383 Cubic Inch	8.7 to 1	2 BBl. Carb., Std. Cam., Single Exhaust
	(Opt.)	8	"LB" 383 Cubic Inch	9.5 to 1	4 BBl. Carb., Std. Cam., Dual Exhaust
	(Opt.)*	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Spec. Cam., Dual Exhaust
300	(Std.)	8	"LB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Std. Cam., Singe Exhaust
	(Opt.)	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Spec. Cam., Dual Exhaust
New Yorker	(Std.)	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Std. Cam., Singe Exhaust
	(Opt.)	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Spec. Cam., Dual Exhaust
Imperial		8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Std. Cam., Singe Exhaust

*Town and Country—Standard Cam Only

GENERAL INFORMATION

The V8 engines for the 1970 Chrysler and Imperial Models are all the valve-in-head type with hydraulic tappets. The engines vary in compression ratio, piston displacement, camshaft, valve springs, carburetor, manifold arrangement.

The standard NEWPORT ENGINE with two bore carburetor, 8.7 to 1 compression ratio uses regular fuel.

All other engines with a 4 bore carburetor; use premium fuel.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ENGINE WILL NOT START	(a) Weak Battery.	(a) Test battery specific gravity. Recharge or replace as necessary.
	(b) Corroded or loose battery connections	(b) Clean and tighten battery connections. Apply a coat of petrolatum to terminals.
	(c) Faulty starting motor.	(c) Refer to "Starting Motor."*
	(d) Moisture on ignition wires and distributor cap.	(d) Wipe wires and cap clean and dry.
	(e) Faulty ignition cables.	(e) Replace any cracked or shorted cables.
	(f) Faulty coil or condenser.	(f) Test and replace as necessary.*
	(g) Dirty or corroded distributor contacts.	(g) Clean or replace as necesasry.
	(h) Incorrect spark plug gap.	(h) Set gap at .035".
	(i) Incorrect ignition timing.	(i) Refer to "Ignition Timing."*
	(j) Dirt or water in fuel line or carburetor.	(j) Clean lines and carburetor.**
	(k) Carburetor flooded.	(k) Adjust float level—check seats.**

Condition	Possible Cause	Correction
	(l) Incorrect carburetor float setting.	(l) Adjust float level—check seats.**
	(m) Faulty fuel pump.	(m) Install new fuel pump.**
	(n) Carburetor percolating. No fuel in the carburetor.	(n) Measure float level. Adjust bowl vent.** Inspect operation of manifold control valve.
ENGINE STALLS	(a) Idle speed set too low.	(a) Adjust carburetor.**
	(b) Incorrect choke adjustment.	(b) Adjust choke.**
	(c) Idle mixture too lean or too rich.	(c) Adjust carburetor.**
	(d) Incorrect carburetor float setting.	(d) Adjust float setting.**
	(e) Leak in intake manifold.	(e) Inspect intake manifold gasket and replace if necessary.***
	(f) Dirty, burned or incorrectly gapped distributor contacts.	(f) Replace contacts and adjust.*
	(g) Worn or burned distributor rotor.	(g) Install new rotor.
	(h) Incorrect ignition wiring.	(h) Install new wiring.
	(i) Faulty coil or condenser.	(i) Test and replace if necessary.*
ENGINE LOSS OF POWER	(a) Incorrect ignition timing.	(a) Refer to "Ignition Timing."*
	(b) Worn or burned distributor rotor.	(b) Install new rotor.
	(c) Worn distributor shaft or cam.	(c) Remove and repair distributor.*
	(d) Dirty or incorrectly gapped spark plugs.	(d) Clean plugs and set gap at .035".
	(e) Dirt or water in fuel line, carburetor or filter.	(e) Clean lines, carburetor and replace filter.**
	(f) Incorrect carburetor float setting.	(f) Adjust float level.**
	(g) Faulty fuel pump.	(g) Install a new pump.
	(h) Incorrect valve timing.	(h) Refer to "Checking Valve Timing."***
	(i) Blown cylinder head gasket.	(i) Install new head gasket.***
	(j) Low compression.	(j) Test compression of each cylinder.*
	(k) Burned, warped, pitted valves.	(k) Install new valves or regrind.***
	(l) Plugged or restricted exhaust system.	(l) Install new parts as necessary.
	(m) Faulty ignition cables.	(m) Replace any cracked or shorted cables.
	(n) Faulty coil or condenser.	(n) Test and replace as necessary.*
ENGINE MISSES ON ACCELERATION	(a) Dirty, burned, or incorrectly gapped distributor contacts.	(a) Replace contacts and adjust.*
	(b) Dirty, or gap too wide in spark plugs.	(b) Clean spark plugs and set gap at .035".
	(c) Incorrect ignition timing.	(c) Refer to "Ignition Timing."*
	(d) Dirt in carburetor.	(d) Clean carburetor.**
	(e) Acceleration pump in carburetor.	(e) Install new pump.**
	(f) Burned, warped or pitted valves.	(f) Install new valves or regrind.***
	(g) Faulty coil or condenser.	(g) Test and replace if necessary.*
ENGINE MISSES AT HIGH SPEED	(a) Dirty or incorrectly gapped distributor contacts.	(a) Clean or replace as necessary.*
	(b) Dirty or gap set too wide in spark plug.	(b) Clean spark plugs and set gap at .035".
	(c) Worn distributor shaft cam.	(c) Remove and repair distributor.*
	(d) Worn or burned distributor rotor.	(d) Install new rotor.
	(e) Faulty coil or condenser.	(e) Test and replace if necessary.*
	(f) Incorrect ignition timing.	(f) Refer to "Ignition Timing."*
	(g) Dirty jets in carburetor.	(g) Clean jets.**
	(h) Dirt or water in fuel line, carburetor or filter.	(h) Clean lines, carburetor and replace filter.**
NOISY VALVES	(a) High or low oil level in crankcase.	(a) Check for correct oil level.***
	(b) Thin or diluted oil.	(b) Change oil.***
	(c) Low oil pressure.	(c) Check engine oil level.***
	(d) Dirt in tappets.	(d) Clean tappets.***
	(e) Bent push rods.	(e) Install new push rods.***
	(f) Worn rocker arms.	(f) Inspect oil supply to rockers.***
	(g) Worn tappets.	(g) Install new tappets.***
	(h) Worn valve guides.	(h) Ream and install new valves with oversize stems.***

Condition	Possible Cause	Correction
	(i) Excessive run-out of valve seats or valve faces.	(i) Grind valve seats and valves.***
CONNECTING ROD NOISE	(a) Insufficient oil supply.	(a) Check engine oil level.***
	(b) Low oil pressure.	(b) Check engine oil level. Inspect oil pump relief valve and spring.***
	(c) Thin or diluted oil.	(c) Change oil to correct viscosity.
	(d) Excessive bearing clearance.	(d) Measure bearings for correct clearance.***
	(e) Connecting rod journals out-of-round.	(e) Replace crankshaft or regrind journals.***
	(f) Misaligned connecting rods.	(f) Replace bent connecting rods.***
MAIN BEARING NOISE	(a) Insufficient oil supply.	(a) Check engine oil level.***
	(b) Low oil pressure.	(b) Check engine oil level. Inspect oil pump relief valve and spring.***
	(c) Thin or diluted oil.	(c) Change oil to correct viscosity.***
	(d) Excessive bearing clearance.	(d) Check bearings for correct clearances.***
	(e) Excessive end play.	(e) Check No. 3 main bearings for wear on flanges.***
	(f) Crankshaft journals out-of-round or worn.	(f) Replace crankshaft or regrind journals.***
	(g) Loose flywheel or torque converter.	(g) Tighten to correct torque.
OIL PUMPING AT RINGS	(a) Worn, scuffed, or broken rings.	(a) Hone cylinder bores if necessary and install new rings.**
	(b) Carbon in piston ring grooves and oil ring slots.	(b) Remove rings. Clean grooves. Check groove width. Install new rings.***
	(c) Rings fitted too tight in grooves.	(c) Remove rings. Check grooves. If groove is not proper width, replace pistons.***
OIL PRESSURE DROP	(a) Low oil level.	(a) Check engine oil level.
	(b) Faulty oil pressure sending unit.	(b) Install new sending unit.
	(c) Clogged oil filter.	(c) Install new oil filter.
	(d) Worn parts in oil pump.	(d) Replace worn parts or pump.
	(e) Thin or diluted oil.	(e) Change oil to correct viscosity.
	(f) Excessive bearing clearance.	(f) Measure bearings for correct clearance.***
	(g) Oil pump relief valve stuck.	(g) Remove valve and inspect, clean, and reinstall.
	(h) Oil pump suction tube loose, bent or cracked.	(h) Remove oil pan and install new tube if necessary.

* Refer to the "Electrical and Instrument" Group 8 for service procedures.
** Refer to the "Fuel System" Group 14 for service procedures.
*** Refer to the "Engine" Group 9 for service procedures.

383-440 CUBIC INCH ENGINES

INDEX

SERVICE PROCEDURES

TUNE-UP

(1) Test battery specific gravity, add water if necessary, clean and tighten battery connections.

(2) Test cranking voltage. See "Starting Motor Cranking Voltage" Electrical Section of this manual.

(3) Tighten the intake manifold bolts to 50 foot-pounds.

(4) Perform cylinder compression test. Compression should not be less than 100 pounds for 383 Cubic Inch Engine with two barrel carburetor and not vary more than 40 pounds. 110 pounds for 383, 440 Cubic Inch Engine with four barrel carburetor and should not vary more than 40 pounds. The recommended pressures are to be used only as a guide to diagnosing engine problems. An engine in good condition may exhibit higher pressures. Many conditions which are difficult to control cause variations in compression readings. An engine should not be disassembled to determine the cause of low compression unless some other malfunction is present.

(5) Clean or replace spark plugs as necessary and adjust gap to .035 inch. Tighten to 30 foot-pounds using new gaskets.

(6) Test resistance of spark plug cables. Refer to "Ignition System Secondary Circuit Inspection" Electrical Section.

(7) Inspect the breaker plate contacts, primary wire and vacuum advance operation. Test coil output voltage, primary and secondary resistance. Test Condenser. Replace parts as necessary. Refer to Ignition System and make necessary adjustments.

(8) Reset the ignition timing with the vacuum advance line disconnected. The ignition timing should be set to compensate for altitudes and/or gasoline grades.

(9) Set carburetor idle mixture adjustment. Adjust throttle stop screw to specifications. Perform a combustion analysis.

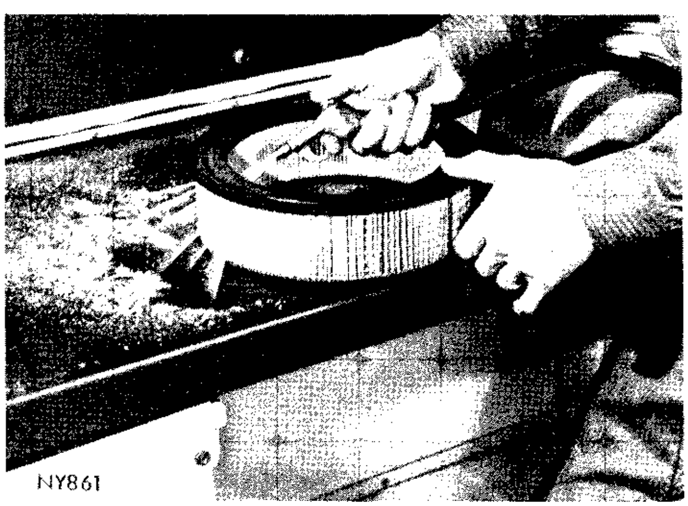


Fig. 1—Cleaning Filter Element

(10) Test the fuel pump for pressure and vacuum. Refer to "Fuel System" Group 14, Specifications.

(11) Inspect the manifold heat control valve in the right exhaust manifold for proper operation and apply Manifold Heat Control Valve Solvent Number 2525054 or equivalent to the bushing and shafts.

(12) Every 6 months, remove filter element and blow out dirt gently with air hose. Direct air from inside out, and keep nozzle 2 inches away from element to avoid damaging (Fig. 1). Clean the metal housing and replace the element. Every two years install a new factory recommended filter element. Service the unit more frequently when driving under severe conditions, such as in dusty areas.

(13) Inspect crankcase ventilation system as outlined on page 25.

(14) Inspect and adjust the accessory belt drives referring to "Cooling System" Group 7 for proper adjustments.

(15) Road test vehicle as a final check.

FRONT ENGINE MOUNTS (Fig. 2)

Removal

(1) Disconnect throttle linkage at transmission and at carburetor.

(2) Raise hood and position fan to clear radiator hose and radiator top tank.

(3) Remove torque nuts from insulator studs.

(4) Raise engine just enough to remove front engine mount assembly.

Installation

(1) Install insulator to engine bracket and tighten to specified torque.

(2) Lower the engine and install washers and prevailing torque nuts to insulator studs; tighten nuts to specified torque.

(3) Connect throttle at transmission and carburetor.

REAR ENGINE MOUNT (Fig. 3)

Removal

(1) Raise vehicle on hoist.

(2) Install transmission jack.

(3) Remove rear engine crossmember from frame and remove rear mount.

Installation

(1) Install rear engine mount to crossmember and tighten nut to specified torque.

(2) Install rear crossmember to frame and tighten bolts to specified torque.

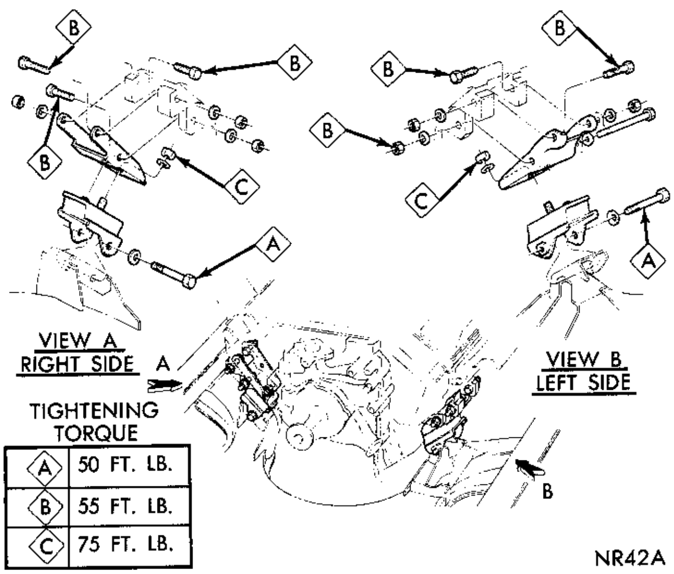


Fig. 2—Engine Front Mounts

ENGINE ASSEMBLY

Removal

(1) Scribe the outline of hinge brackets on hood to assure proper adjustments when installing.

(2) Remove hood.

(3) Drain cooling system and remove battery.

(4) Remove all hoses, fan shroud, disconnect oil cooler lines and remove radiator.

(5) Disconnect fuel lines and wires attached to engine units. Remove air cleaner and carburetor.

(6) Attach engine lifting fixture to carburetor flange studs on intake manifold.

(7) Raise vehicle on a hoist and install engine support fixture Tool C-3487-A to support rear of engine.

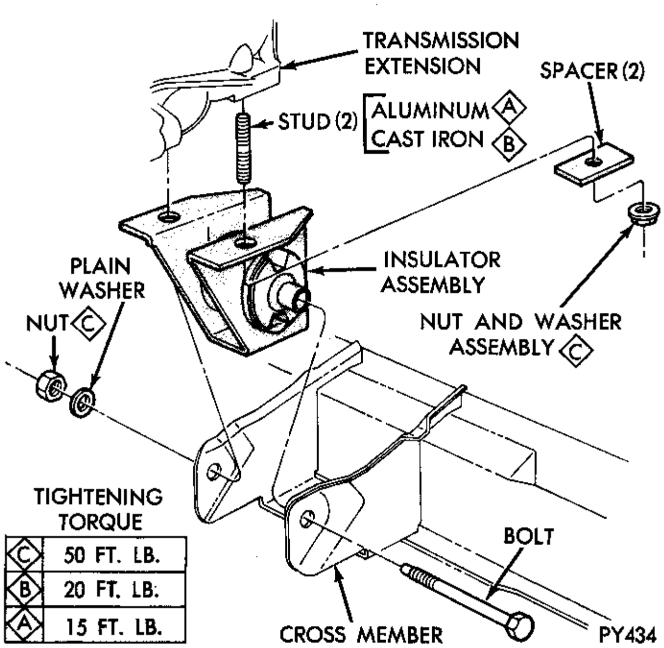


Fig. 3—Engine Rear Support

(8) Drain transmission and torque converter.

(9) Disconnect exhaust pipes at manifolds, propeller shaft, wires, linkage, cable, and oil cooler lines at the transmission.

(10) Remove engine rear support crossmember and remove transmission from vehicle.

(11) Lower vehicle and attach chain hoist to fixture eyebolt.

(12) Remove engine front mounting bolts. Raise engine with a chain hoist and work engine out of chassis.

(13) Place engine in repair stand Tool C-3167 and adapter C-3662 for disassembly, using transmission mounting bolts.

Installation

(1) Attach engine lifting fixture to carburetor flange studs on intake manifold.

(2) Attach chain hoist to fixture eyebolt.

(3) Remove engine from repair stand and lower engine carefully until engine is positioned in vehicle.

(4) Install engine support fixture Tool C-3487A and adjust to support rear of engine.

(5) Remove chain hoist from fixture eyebolt.

(6) Raise vehicle on hoist, install and tighten engine front support mounting bolts.

(7) Install transmission and engine rear support crossmember.

(8) Lower engine into position and install engine rear support crossmember bolts. Remove engine support fixture Tool C-3487A.

(9) Connect propeller shaft, wires, linkage, cable, oil cooler lines at the transmission, connect exhaust pipes to manifold using new gaskets. Install transmission filler tube.

(10) Lower vehicle and install radiator, fan shroud, hoses, oil cooler lines and connect all wires and linkage.

(11) Remove engine lifting fixture from intake manifolds and install carburetor and fuel lines. Connect throttle linkage.

(12) Install hood, using scribe marks for proper alignment.

(13) Close all drain cocks and fill cooling system.

(14) Fill engine crankcase and tranmission. Refer to "Lubrication" Group 0 for quantities and lubricants to use and check entire system for leaks and correct as necessary.

Whenever an engine has been rebuilt and/or a new camshaft and/or tappets are installed, one quart of engine supplement, Chrysler Part Number 1879406 or equivalent should be added to the engine oil to aid in break-in. The oil mixture should be left in the engine for a minimum of 500 miles. Drain the oil mixture at the next normal oil change.

(15) Start engine and run engine until normal operating temperature is reached.

(16) Inspect ignition timing and adjust carburetor as necessary.

(17) Adjust accelerator and transmission linkages. Road test vehicle.

ROCKER ARMS AND SHAFT ASSEMBLY

The rocker arms are of stamped steel and are arranged on one rocker arm shaft, per cylinder head. The push rod angularity tends to force the pairs of rocker arms toward each other where oilite spacers carry the side thrust at each rocker arm. The rocker shaft is held in place by bolts and stamped steel retainers attached to the five brackets on the cylinder head.

Removal

(1) Remove cylinder head cover and gasket.

(2) Remove rocker shaft bolts and retainers and remove rocker arms and shaft assembly.

(3) If rocker arm assemblies have been disassembled for cleaning, inspection, or replacement, refer to Figure 4 for proper reassembly.

Installation

(1) Install rocker arms and shaft assembly making sure to install the long stamped steel retainers in the number two and four positions.

(2) Install rocker shafts so that 3/16 inch diameter rocker arm lubrication holes point downward into the rocker arm, so that the 15° angle of these holes point outward towards the valve end of the rocker arms, (Fig. 5). This is necessary to provide proper lubrication to the rocker assemblies.

The 15° angle of the rocker arm lubrication holes is determined from the center line of the bolt holes through the shaft which are used to attach the shaft assembly to the cylinder head.

(3) Tighten rocker shaft bolts to 25 foot-pounds.

(4) Inspect cylinder cover for distortion. Straighten if necessary.

(5) Place new cylinder head cover gaskets in position and install cylinder head covers. Tighten nuts to 40 inch pounds.

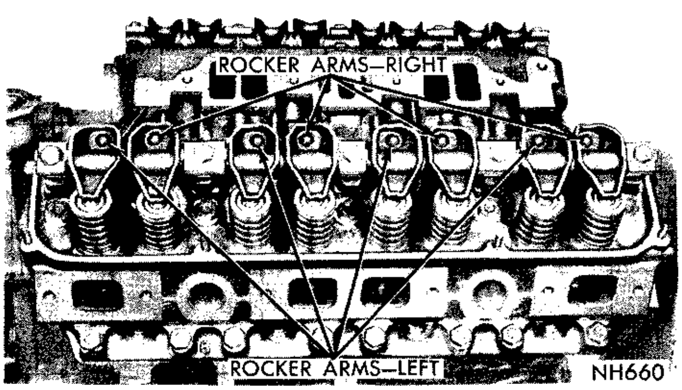


Fig. 4—Rocker Arm Assemblies Installed

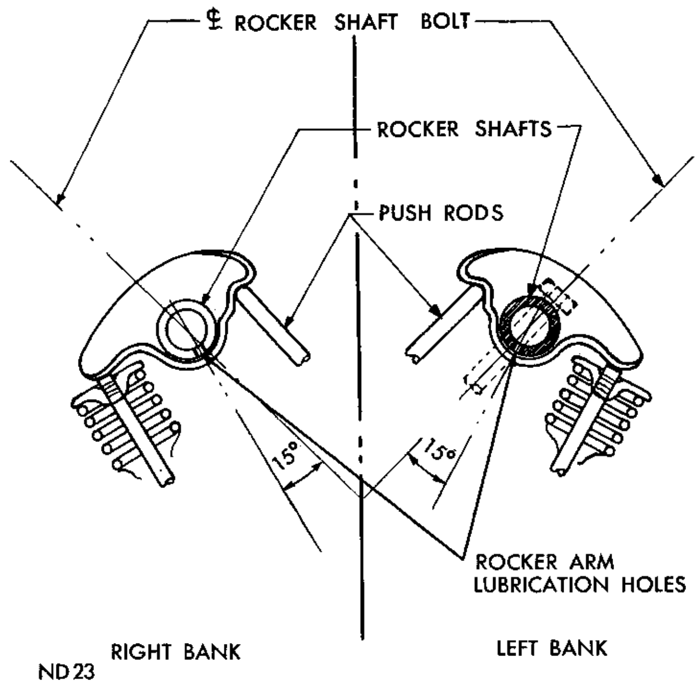


Fig. 5—Rocker Arm Lubrication Holes

(6) Install crankcase ventilation system and evaporative control system (if so equipped).

CYLINDER HEADS

The chrome alloy cast iron cylinder heads are held in place by 17 bolts. The spark plugs enter the cylinder head horizontally and are located at the wedge of the combustion chambers.

Removal

(1) Drain cooling system.

(2) Remove alternator, carburetor, air cleaner and fuel line.

(3) Disconnect accelerator linkage.

(4) Remove closed ventilation system and evaporative control system (if so equipped).

(5) Remove vacuum control tube at carburetor and distributor.

(6) Disconnect distributor cap, coil wires and heater hose.

(7) Disconnect heat indicator sending unit wire.

(8) Remove spark plugs.

(9) Remove intake manifold, ignition coil and carburetor as an assembly.

(10) Remove tappet chamber cover.

(11) Remove cylinder head covers and gaskets.

(12) Remove exhaust manifolds.

(13) Remove rocker arm and shaft assemblies. Remove push rods and **identify to insure installation in original location.**

(14) Remove the 17 head bolts from each cylinder head and remove cylinder heads.

(15) Place cylinder head in holding fixture tool C-3626.

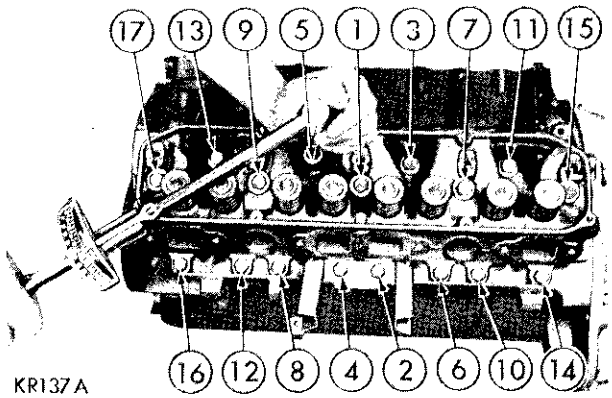


Fig. 6—Cylinder Head Tightening Sequence

Installation

(1) Clean gasket surfaces of the cylinder block and cylinder head. Remove all burrs from edges of cylinder heads.

(2) Inspect all surfaces with a straightedge if there is any reason to suspect leakage. If out of flatness exceeds .00075 times the span length in any direction; either replace head or lightly machine the head gasket surface. As an example, if a 12 inch span is .004″ out of flat, allowable is 12 x .00075 = .009″. Head is OK.

The cylinder head surface finish should be 70-180 micro-inches.

(3) Coat new gaskets lightly with a suitable sealer, Chrysler Number 1057794 or equivalent. Install gaskets and cylinder heads.

(4) Install cylinder head bolts. Starting at top center, tighten all cylinder head bolts to 40 foot-pounds in sequence (Fig. 6). Repeat the procedure, tightening all head bolts to 70 foot-pounds.

(5) Inspect push rods and replace any worn or bent rods.

(6) Install push rods in the tappets maintaining alignment, using rod (Fig. 7).

(7) Install rocker arm and shaft assembly starting each push rod into its respective rocker arm socket (Fig. 4) making sure to install the long stamped steel retainers in the number two and four positions. **Tighten bolts to 25 foot-pounds.**

(8) Place new cylinder head gasket in position and install cylinder head covers. Tighten nuts to 40 inch pounds.

(9) Install exhaust manifolds and tighten nuts to 30 foot-pounds.

(10) Adjust spark plugs to .035 inch gap and install plugs, tighten plugs to 30 foot-pounds.

(11) Install a new tappet chamber cover and tighten end bolts to 9 foot-pounds.

(12) Install intake manifold, carburetor and ignition coil as an assembly and tighten manifold bolts to 40 foot-pounds.

(13) Install distributor cap. Connect the coil wire, heat indicator sending unit wire, accelerator linkage, spark plug cables and insulators.

(14) Install vacuum hose at carburetor and distributor.

(15) Install closed ventilation system and evaporative control system (if so equipped).

(16) Install alternator and drive belts. Tighten alternator adjusting strap bolt to 200 inch-pounds, and alternator mounting bolt to 30 foot-pounds.

(17) Install fuel line and carburetor air cleaner.

(18) Fill cooling system. Adjust belt tensions as outlined in "Cooling System" Group 7.

VALVES AND VALVE SPRINGS

Valves are arranged in-line in the cylinder heads and inclined 30 degrees outward from vertical. The intake and exhaust valves operate in guides that are cast integral with the heads.

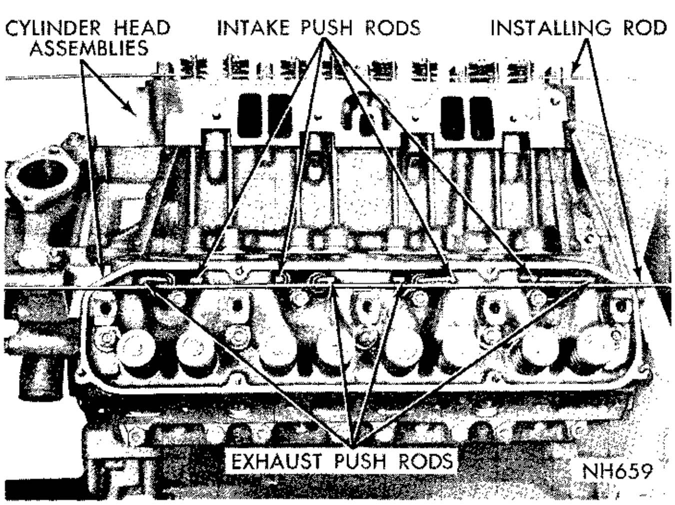


Fig. 7—Push Rods Installed

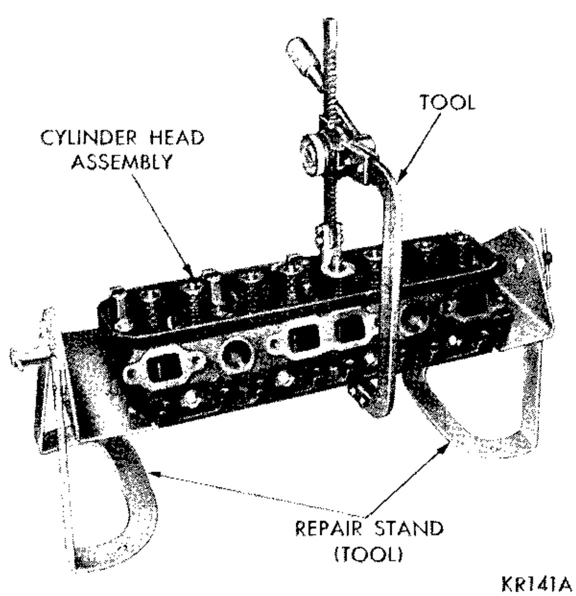


Fig. 8—Compressing Valve Spring

Removal

(1) With cylinder head removed, compress valve springs, using Tool C-3422A, (Fig. 8).

(2) Remove valve retaining locks, valve spring retainers, valve stem cup seals and valve springs.

(3) Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guide. **Identify valves to insure installation in original location.**

Valve Inspection

(1) Clean valves thoroughly, and discard any burned, warped or cracked valves.

(2) Measure valve stems for wear. Refer to specifications for proper size. If wear exceeds .002 inch, replace the valve.

(3) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

(4) Measure valve stem guide clearance as follows: Install sleeve Tool C-3973 over valve stem (Fig. 9) and install valve.

(5) The special sleeve places the valve at the correct height for measuring with a dial indicator. Attach dial indicator Tool C-3339 to the cylinder head and set it at a right angle to the valve stem being measured (Fig. 10).

(6) Move valve to and from the indicator. Total dial indicator reading should not exceed .017 inch. If the dial indicator reading is excessive or if the stems are scored or worn excessively, ream the guides for new valves with oversize stems.

(7) Service valves with oversize stems are available in .005, .015 and .030 inch oversizes. Reamers to accommodate the oversize valve stem are as follows:

Reamer Tool Number	Reamer Oversize	Valve Guide Size
C-3433	.005 in.	.379-.380 in.
C-3430	.015 in.	.389-.390 in.
C-3427	.030 in.	.404-.405 in.

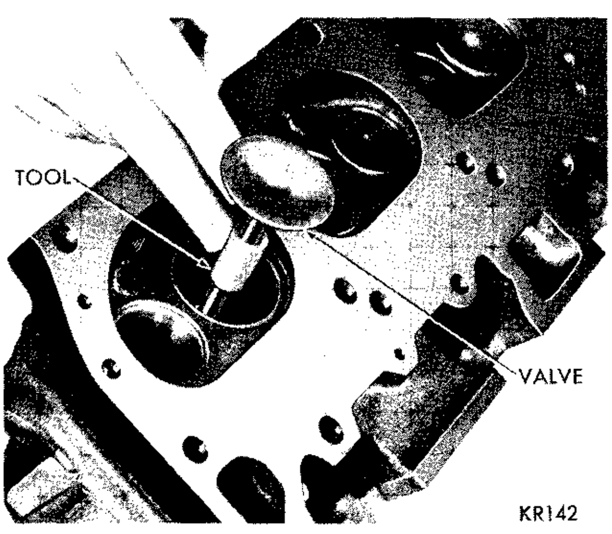


Fig. 9—Installing Valve and Tool C-3973

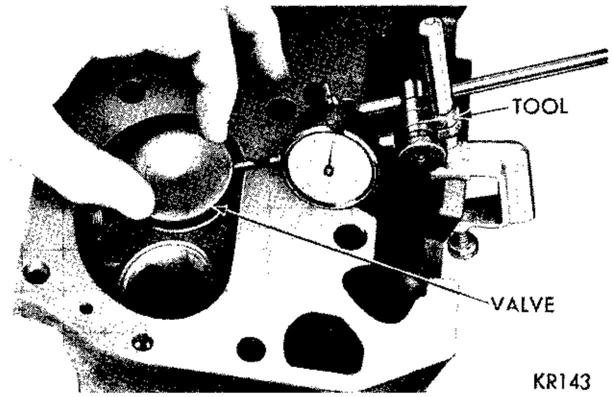


Fig. 10—Measuring Valve Guide Wear

(8) Slowly turn reamer by hand and clean guide thoroughly before installing new valve. **Do not attempt to ream the 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 the valve seat.**

Refacing Valves and Valve Seats

The intake and exhaust valve faces have a 45 degree angle. Always inspect the remaining valve margin after the valves are refaced (Fig. 11). Valves with less than 3/64 inch margin should be discarded.

(1) The angle of both the valve and seat should be identical. When refacing valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete valve seat surface must be obtained.

(2) Inspect valve seat with Prussian blue to determine where valve contacts seat. To do this, coat valve seat lightly with Prussian blue, then set valve in place. Rotate valve with light pressure. If the blue is transferred to the center of the valve face, the contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat with a 30°

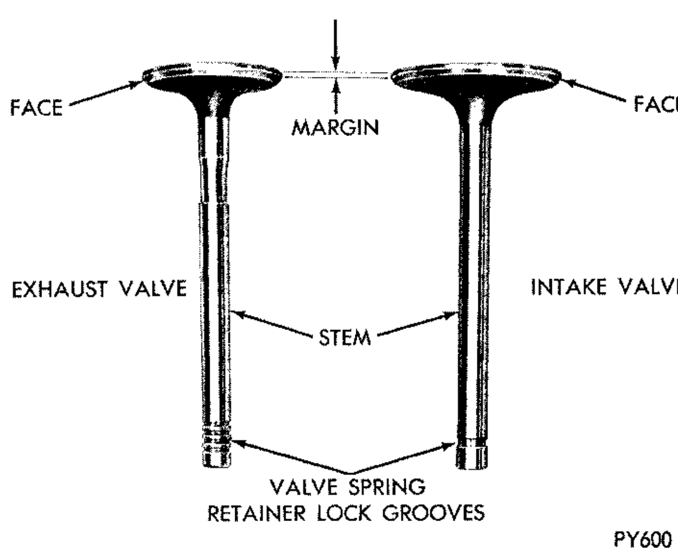


Fig. 11—Intake and Exhaust Valves

stone. If the blue is transferred to the bottom edge of the valve face raise the valve seat with a 60° stone.

(3) When the seat is properly positioned the width of the intake seats should be 1/16 to 3/32 inch. The width of the exhaust seats should be 3/64 to 1/16 inch.

(4) Measure the concentricity of the valve seat using dial indicator No. 13725. The total runout should not exceed .003 inch (total indicator reading).

(5) When valves and seats are reground, the position of the valve in the cylinder head is changed, shortening the operating length of the hydraulic tappet. This means that the plunger is operating closer to its "bottomed" position, and less clearance is available for thermal expansion of the valve mechanism during high speed driving.

(6) The design of the valve mechanism includes a safety factor to allow for a limited amount of wear, and the refacing of the valves and seats.

(7) To insure that limits have not been exceeded, the dimension from valve spring seat in the head to the valve tip should be measured with gauge, Tool C-3648 (Fig. 12).

(8) The end of the cylindrical gauge and the bottom of slotted area represent the maximum and minimum allowable extension of the valve stem tip beyond the spring seat.

(9) If the tip exceeds the maximum, grind stem tip to within gauge limits. Clean tappets if tip grinding is required.

Testing the Valve Springs (Fig. 13)

(1) Whenever valves are removed for inspection, reconditioning or replacement, the valve springs should be tested. As an example, the compressed length of the spring to be tested is 1-15/32 inches. Turn the table of Tool C-647 until the surface is in line with the 1-15/32 inch mark on the threaded stud and the zero mark to the front. Place the spring over the stud on the table and lift the compressing lever to set the tone device. Pull on the torque wrench until a ping is heard. Take the reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at the test length. Fractional measurements are indicated on the table for finer adjustments. Refer to specifications to obtain specified height and allowable tension. Discard the springs that do not meet specifications.

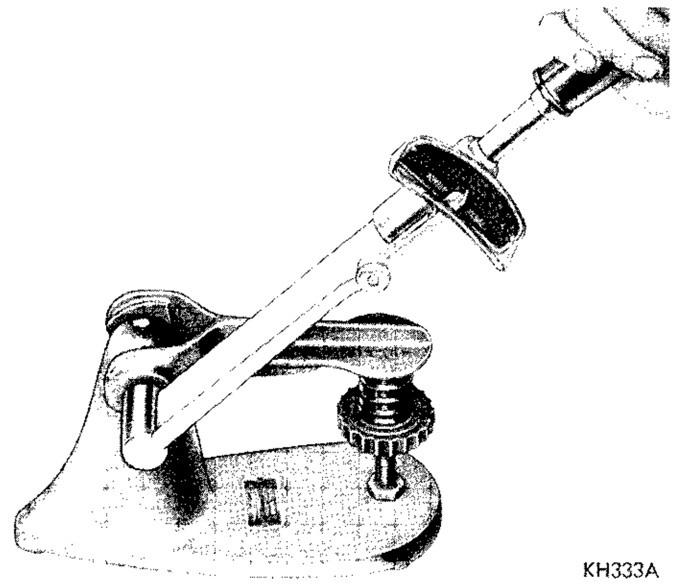


Fig. 13—Testing Valve Springs

(2) Inspect each valve spring for squareness at both ends with a steel square and surface plate (Fig. 14).

(3) If the spring is more than 1/16 inch out of square, install a new spring.

Installation

(1) Coat valve stems with lubricating oil and insert them in position in cylinder head.

(2) Install new cup seals on the intake and exhaust valve stems and over valve guides (Fig. 15 and 16) and install valve springs and retainers.

(3) Compress valve springs with Tool C-3422A. Install locks and release tool. **If valves and/or seats are reground, measure installed height of the springs.**

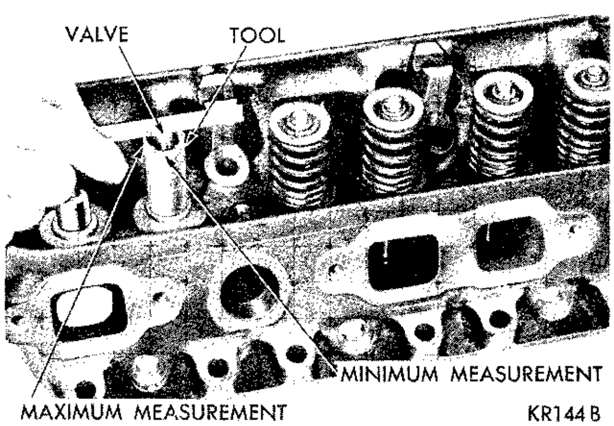


Fig. 12—Measuring Valve Stem Length

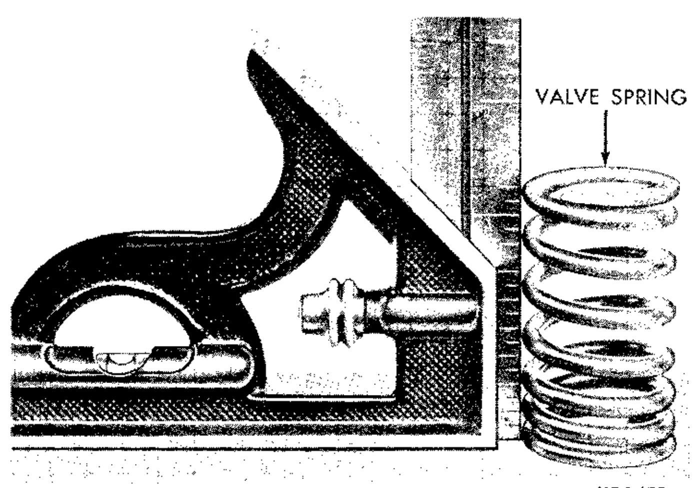


Fig. 14—Inspecting Valve Spring Squareness

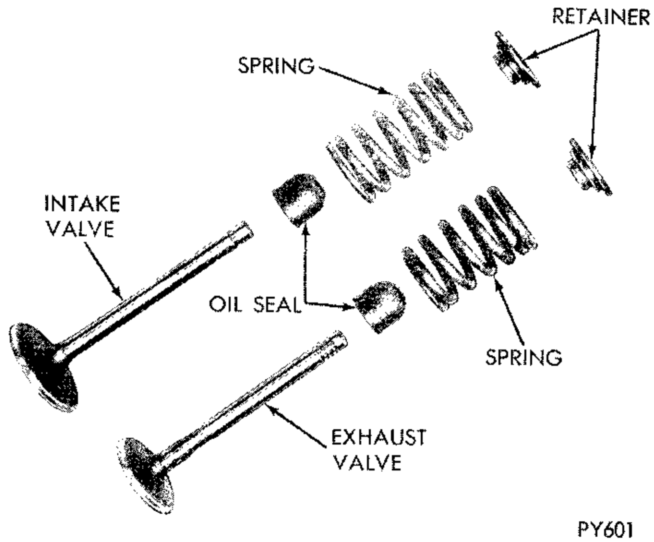


Fig. 15—Valve Assembly (Disassembled View)

Make sure measurement is taken from the bottom of spring seat in cylinder head to bottom surface of spring retainer. If the height is greater than 1-57/64 inches, install a 1/16 inch spacer in the head counterbore to bring the spring height back to normal 1-53/64 to 1-57/64 inch. (If spacers are installed, measure from the top of the spacer.)

HYDRAULIC TAPPETS

Preliminary to Checking the Hydraulic Tappets

(1) Before disassembling any part of the engine to correct tappet noise, read the oil pressure at the gauge (Install a reliable gauge at pressure sending unit if vehicle has no oil pressure gauge.) and check the oil level in the oil pan. The pressure should be between 45 and 65 pounds at 1000 R.P.M.

(2) The oil level in the pan should never be above the "full" mark on dipstick, or below the "add oil" mark. Either of these two conditions could be responsible for noisy tappets.

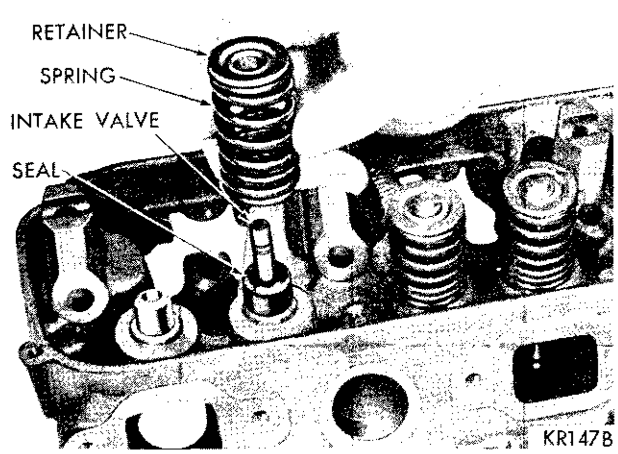


Fig. 16—Installing Valve, Spring, Cup Seal and Retainer

Oil Level Too High

(3) If oil level is above the "full" mark on dipstick, it is possible for the connecting rods to dip into the oil while engine is running and create foam. Foam in oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow valves to seat noisily.

Oil Level Too Low

(4) Low oil level may allow oil pump to take in air which, when fed to the 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 and leaks have been corrected, engine should be operated at fast idle for sufficient time to allow all of the air inside of the tappets to be bled out.

Tappet Noise Diagnosis

(1) To determine source of tappet noise, operate engine at idle with cylinder head covers removed.

(2) Feel each valve spring or rocker arm to detect noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation. **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 the valve spring. If noise is not appreciably reduced, it can be assumed the noise is in the tappet. Inspect the rocker arm push rod sockets and push rod ends for wear.**

(3) Valve tappet noise ranges from light noise to a heavy click. A light noise is usually caused by excessive leakdown around the unit plunger which will necessitate replacing the tappet, or by the plunger partially sticking in the tappet body cylinder. A heavy click is caused either by a tappet check valve not seating, or by foreign particles becoming wedged between the plunger and the tappet body, causing the plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and rocker arm as valve closes. In either case, tappet assembly should be removed for inspection and cleaning.

Tappet Removal

(1) The tappet can be removed without removing intake manifold or cylinder heads by following this recommended procedure: Remove cylinder head covers.

(2) Remove rocker arms and shaft assembly.

(3) Remove push rods and **identify to insure installation in original location.**

(4) Slide a magnetic pickup tool through push rod opening in cylinder head and seat tool firmly in the head of tappet.

(5) Pull tappet out of bore with a twisting motion. If all tappets are to be removed, **identify tappets to insure installation in original location.**

A diamond shaped marking stamped on the engine numbering pad indicates that some tappet bodies are .008 inch oversize.

CAUTION: 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 of parts. Mixed parts are not compatible. Do not disassemble a tappet on a dirty work bench.

Disassembly (Fig. 17)

(1) Pry out plunger retainer spring clip.

(2) Clean varnish deposits from inside of tappet body above plunger cap.

(3) Invert tappet body and remove plunger cap, plunger, flat check valve, check valve spring, check valve retainer and plunger spring.

Cleaning and Assembly

(1) Clean all tappet parts in a solvent that will remove all varnish and carbon.

(2) Replace tappets that are unfit for further service with new assemblies.

(3) 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.

(4) Assemble tappets (Fig. 17).

Testing

(1) Fill a pan with clean kerosene.

(2) Remove cap from plunger and plunger from tappet body.

(3) Fill tappet body with kerosene and install plunger.

(4) Unseat check valve with a brass rod to permit complete installation of plunger. Replace cap.

(5) Hold tappet in an upright position and insert lower jaw of pliers, Tool C-3160, in the groove of tappet body (Fig. 18).

(6) Engage jaw of pliers with top of tappet plunger. Test leakdown by compressing the pliers. If plunger

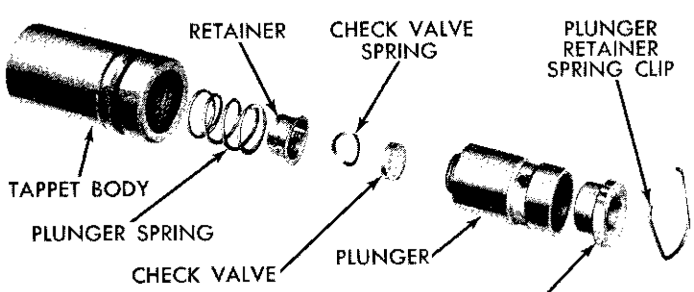


Fig. 17—Hydraulic Tappet Assembly (Disassembled View)

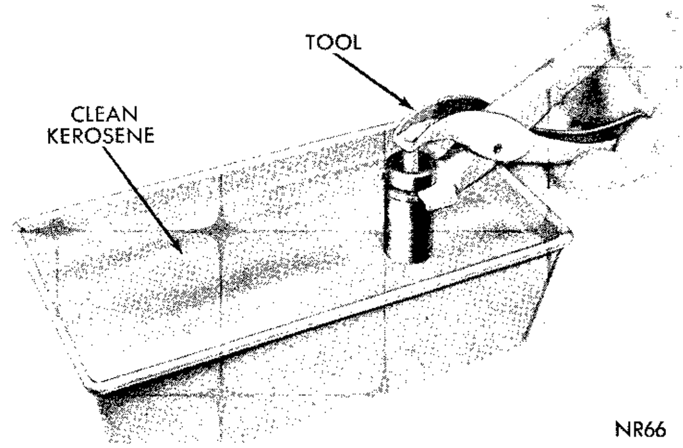


Fig. 18—Testing Tappet Using Tool C-3160

collapses almost instantly as pressure is applied, disassemble tappet, clean and test again (Fig. 18).

(7) If tappet still does not operate satisfactorily after cleaning, install a new tappet assembly. **If the tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream the bore to next oversize.**

Installation

(1) Lubricate tappets.

(2) Install tappets and push rods in their original positions.

(3) Install rocker arm and shaft assembly.

(4) Start and operate engine. Warm up to normal operating temperature.

CAUTION: To prevent damage to valve mechanism, engine must not be run above fast idle until all hydraulic tappets have filled with oil and have become quiet.

VALVE TIMING

(All Models)

(1) Turn crankshaft until NO. 6 exhaust valve is closing and NO. 6 intake valve is opening.

(2) Insert a 1/4 inch spacer between rocker arm pad and stem tip of No. 1 intake valve (second valve on the left bank).

(3) Install a dial indicator so plunger contacts valve spring retainer as nearly perpendicular as possible.

(4) Allow spring load to bleed tappet down giving in effect a solid tappet. Zero the indicator.

(5) Turn the crankshaft clockwise (normal running direction) until intake valve has lifted .025 inch with 256-260° camshaft and .033 inch with 268-284° camshaft. See specifications for engine application. The timing on the timing indicator, located on the chain case cover, should read from 10 degrees BTDC to 2 degrees ATDC. If the reading is not within specified limits: Inspect timing sprocket index marks, inspect timing chain for wear, and determine accuracy of

the DC mark on timing indicator. Turn crankshaft counterclockwise until valve is closed and remove the indicator and spacer.

CAUTION: Do not turn crankshaft any further clockwise, as the valve spring might bottom and result in serious damage.

TIMING CHAIN COVER, OIL SEAL AND CHAIN

Cover Removal

(1) Drain cooling system and remove radiator and water pump assembly.

(2) Remove crankshaft vibration damper attaching bolt.

(3) Remove two of the pulley bolts, install Tool C-3688, and pull damper assembly off end of crankshaft (Fig. 19).

(4) Remove chain cover and gasket. **It is normal to find particles of neoprene collected between seal retainer and crankshaft oil slinger after seal has been in operation.**

(5) Slide crankshaft oil slinger off end of crankshaft.

Measuring Timing Chain for Stretch

(1) Place a scale next to the timing chain so any movement of the chain may be measured.

(2) Place a torque wrench and socket over camshaft sprocket attaching bolt and apply torque in the direction of crankshaft rotation to take up slack; 30 foot-pound (with cylinder heads installed) or 15 foot-pounds (cylinder heads removed). **With torque applied to the camshaft sprocket bolt, crankshaft should not be permitted to move. It may be necessary to block crankshaft to prevent rotation.**

(3) Holding a scale with dimensional reading even with edge of a chain link, apply torque in the reverse direction 30 foot-pounds (with cylinder heads installed) or 15 foot-pounds (cylinder heads removed), and note amount of chain movement (Fig. 20).

(4) Install a new timing chain, if its movement exceeds 3/16 inch.

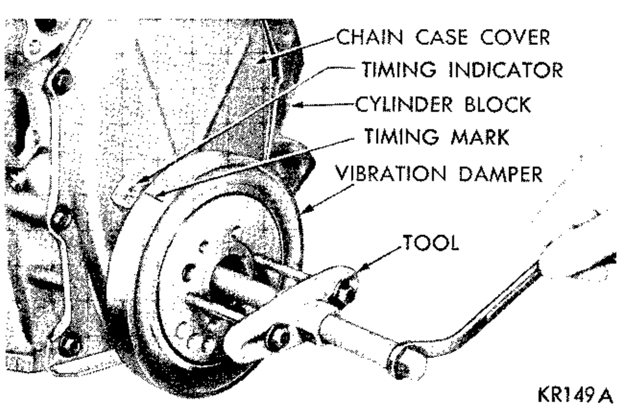


Fig. 19—Removing Vibration Damper Assembly

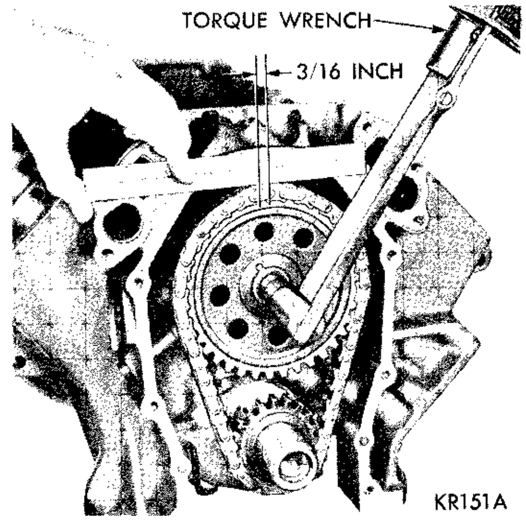


Fig. 20—Measuring Timing Chain Stretch

(5) If chain is satisfactory, slide crankshaft oil slinger over shaft and up against sprocket (flange away from sprocket).

(6) If chain is not satisfactory, remove camshaft sprocket attaching bolt and remove timing chain with crankshaft and camshaft sprockets. **When installing timing chain, use Tool C-3509 to prevent camshaft from contacting the welch plug in the rear of engine block. Remove distributor and oil pump-distributor drive gear. Locate tool against rear side of cam gear and attach tool with distributor retainer plate bolt (Fig. 21).**

(7) Place camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary center line through both camshaft and crankshaft sprocket bores.

(8) Place timing chain around both sprockets.

(9) Turn crankshaft and camshaft to line up with keyway location on crankshaft sprocket and dowel hole in camshaft sprocket.

(10) Lift sprockets and chain (keep sprockets tight against chain in position as described).

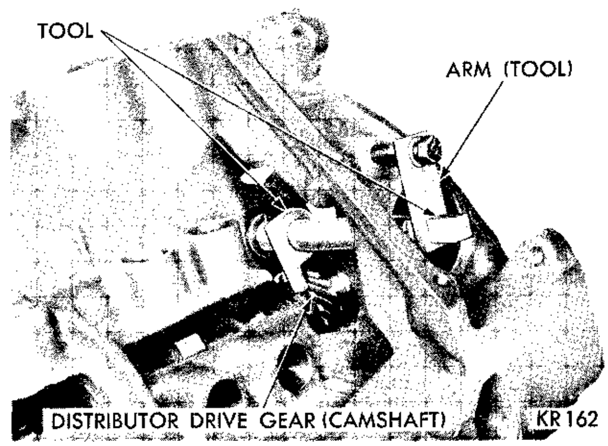


Fig. 21—Camshaft Holding Tool C-3509

Fig. 22—Alignment of Timing Marks

(11) Slide both sprockets evenly over their respective shafts.

(12) Use a straight edge to measure alignment of timing marks (Fig. 22).

(13) Install washer and camshaft sprocket bolt, tighten to 35 foot-pounds. Check to be sure that rear face of aluminum camshaft sprocket is **flush** with end of camshaft. Slide the crankshaft oil slinger over shaft and up against sprocket (flange away from sprocket).

Oil Seal Replacement (Cover Removed)

(1) Position remover screw of Tool C-3506 through case cover, inside of case cover up. Position remover blocks directly opposite each other, and force the angular lip between the neoprene and flange of seal retainer.

(2) Place washer and nut on remover screw. Tighten nut, forcing the blocks into the gap to a point

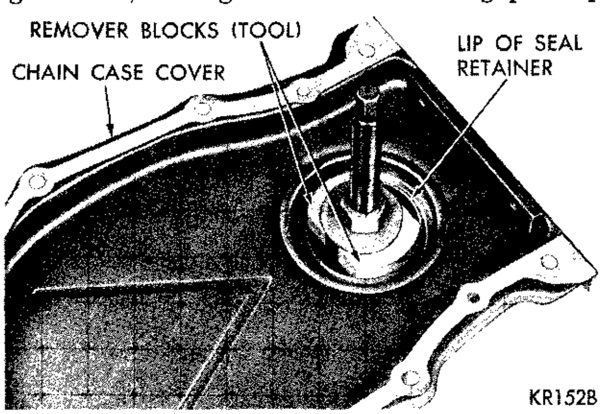


Fig. 23—Remover Blocks Expanded to Puller Position

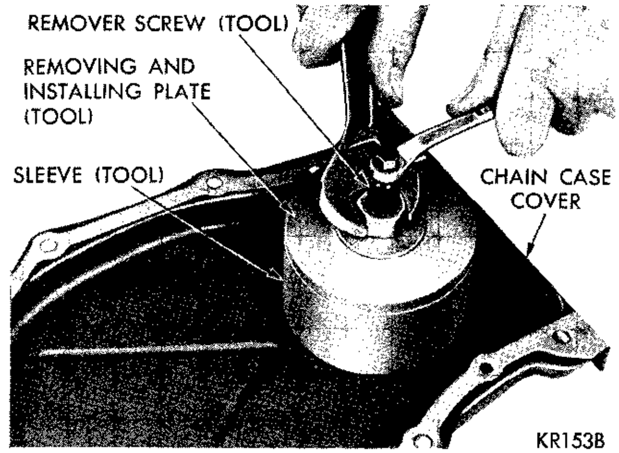


Fig. 24—Removing Oil Seal

of distorting the seal retainer lip (Fig. 23). This is important, **remover is only positioned at this point.**

(3) Place sleeve over retainer and place removing and installing plate into the sleeve.

(4) Place flat washer and nut on the remover screw. Hold center screw and tighten remover nut to remove the seal (Fig. 24).

(5) Insert remover screw through the removing and installing plate so thin shoulder will be facing up.

(6) Insert remover screw with the plate through seal opening (inside of chain case cover facing up).

(7) 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. 25). **The lip of the neoprene seal must be toward source of oil.**

(8) Install flat washer and nut on remover screw, hold screw and tighten nut (Fig. 26).

(9) The seal is properly installed when the neoprene is tight against face of cover. Try to insert a .0015 inch feeler gauge between the neoprene and the cover (Fig. 27). If the seal is installed properly, feeler gauge cannot be inserted. **Do not over compress neoprene.**

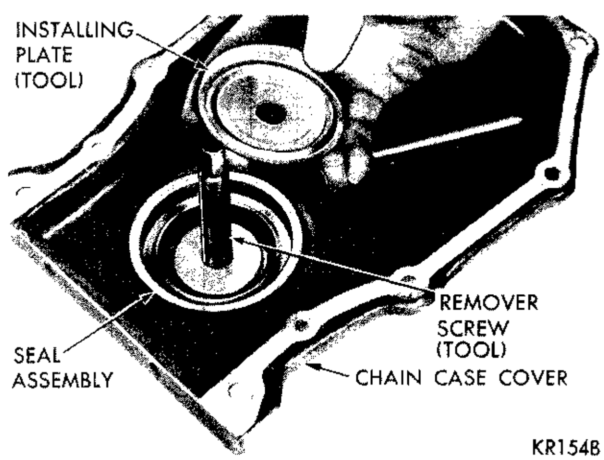


Fig. 25—Positioning Installer Plate

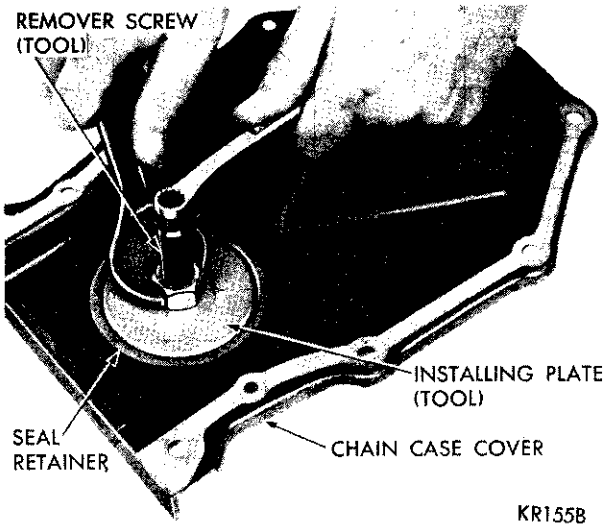


Fig. 26—Installing New Seal

Cover Installation

(1) Be sure mating surfaces of chain case cover and cylinder block are clean and free from burrs.

(2) Using a new gasket slide chain case cover over locating dowels. Install and tighten bolts 15 foot-pounds.

(3) Lubricate seal lip with Lubriplate, place damper hub slot on key in crankshaft, and slide vibration damper on crankshaft.

(4) Place installing tool, part of Tool C-3688 in position and press damper on the crankshaft (Fig. 28).

(5) Install damper retainer washer and bolt. Tighten to 135 foot-pounds.

(6) Slide belt pulley over shaft and attach with bolts and lockwashers. Tighten bolts to 200 inch-pounds.

CAMSHAFT

The camshaft has an integral oil pump and distributor drive gear and fuel pump eccentric (Fig. 29).

The rearward camshaft thrust is taken by the rear face of the aluminum camshaft sprocket hub, bearing directly on the front of cylinder block, eliminating

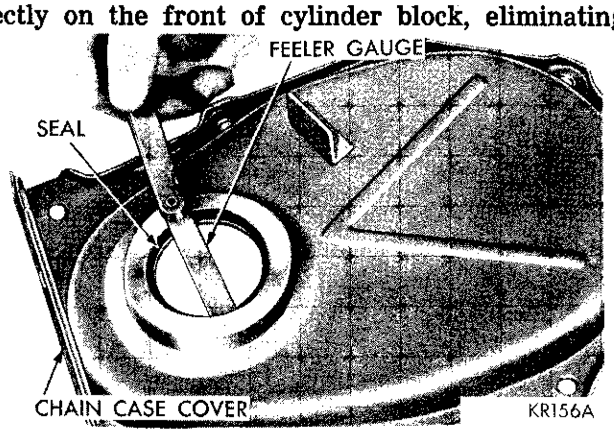


Fig. 27—Inspecting Seal for Proper Seating

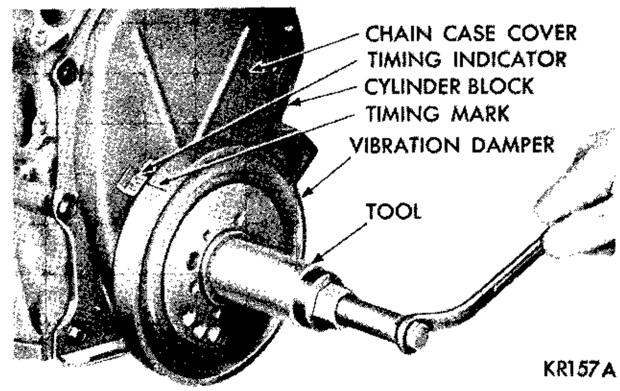


Fig. 28—Installing Vibration Damper Assembly

need for a thrust plate. The helix of the oil pump and distributor drive gear and camshaft lobe taper both tend to provide a rearward thrust.

Removal

(1) With tappets and the timing chain and sprockets removed, remove distributor and lift out oil pump and distributor drive shaft.

(2) Remove fuel pump to allow fuel pump push rod to drop away from cam eccentric.

(3) Remove camshaft, being careful not to damage camshaft bearings with the cam lobes.

Installation

(1) Lubricate camshaft lobes and camshaft bearing journals and insert camshaft to within 2 inches of its final position in cylinder block.

(2) Modify Tool C-3509 by grinding off index lug holding the upper arm on the tool and rotate arm 180 degrees.

(3) Install Tool C-3509 in place of distributor drive gear and shaft, as shown in Figure 21.

(4) Hold tool in position with distributor lock plate screw. This tool will restrict camshaft from being pushed in too far and prevent knocking out the welch plug in the rear of cylinder block. **The tool should remain installed until camshaft and crankshaft sprockets and timing chain have been installed.**

Whenever an engine has been rebuilt and/or a new camshaft and/or tappets are installed, one quart of engine supplement, Chrysler Part Number 1879406 or

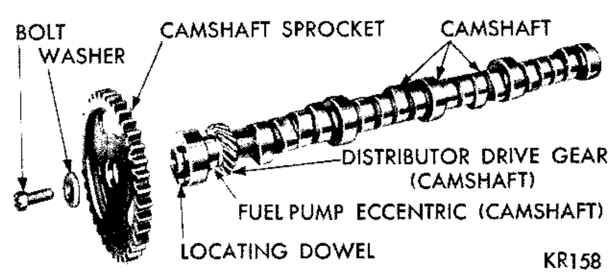


Fig. 29—Camshaft and Sprocket Assembly (Disassembled View)

equivalent should be added to the engine oil to aid in break-in. The oil mixture should be left in the engine for a minimum of 500 miles. Drain the oil mixture at the next normal oil change.

Whenever camshaft is replaced, all tappet faces must be inspected for crown with a straight edge. If any contact surface is dished or worn, tappet must be replaced.

CAMSHAFT BEARINGS
(Engine Removed from Vehicle)

Removal

(1) With engine completely disassembled drive out camshaft rear bearing welch plug.

(2) Install proper size adapters and horse shoe washers (part of Tool C-3132A) at the back of each bearing to be removed and drive out bearings (Fig. 30).

Installation

(1) Install new camshaft bearings with Tool C-3132A. Place new camshaft bearing over proper adapter.

(2) Position bearing in the tool. Install the horse shoe lock and by reversing removal procedure, carefully drive bearing into place.

(3) Install remaining bearings in like manner. **Install the NO. 1 camshaft bearing 1/32 inward from the front face of cylinder block.**

The oil holes in camshaft bearings and the cylinder block must be in exact register to insure proper lubrication (Fig. 30).

The camshaft bearing index can be inspected after installation by inserting a pencil flashlight in the bearing. The camshaft bearing oil hole should be perfectly aligned with the drilled oil passage from the main bearing. Other oil holes in the camshaft bearings should be visible by looking down on the left bank oil hole above and between NO. 6 and NO. 8 cylinders to NO. 4 camshaft bearing and on the right bank above and between NO. 5 and 7 cylinders to NO. 4 camshaft bearings. If camshaft bearing oil holes are not in exact register, remove and reinstall them correctly. Install a new welch plug at rear of camshaft. **Be sure this plug does not leak.**

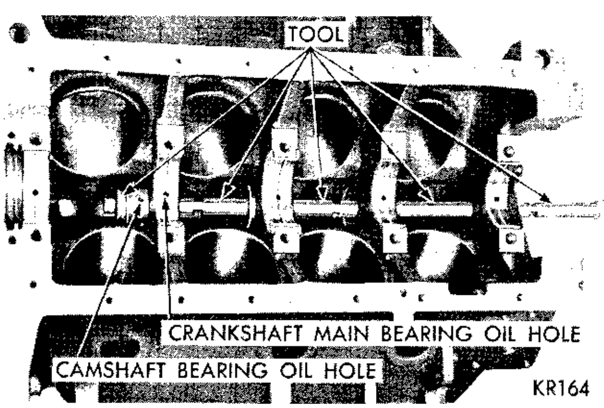


Fig. 30—Removing Camshaft Bearing

DISTRIBUTOR DRIVE SHAFT BUSHING

Removal

(1) Insert Tool C-3052 into the old bushing and thread down until a tight fit is obtained.

(2) Hold remover screw and tighten nut until bushing is removed, (Fig. 31).

Installation

(1) Slide a new bushing over burnishing end of Tool C-3053 and insert tool bushing into the bore.

(2) Drive bushing and tool into position, using a soft hammer, (Fig. 32).

(3) As the burnisher is pulled through the bushing by tightening remover nut, the bushing is expanded tight in the block and burnished to correct size (Fig. 33). **DO NOT REAM THIS BUSHING.**

Distributor Timing

Before installing distributor and oil pump drive shaft, time the engine as follows:

(1) Rotate crankshaft until NO. 1 cylinder is at top dead center on the firing stroke.

(2) When in this position, the straight line on the vibration damper should be under "0" on timing indicator.

(3) Coat shaft and drive gear with engine oil. Install the shaft so that after gear spirals into place, it will index with the oil pump shaft, so slot in top of drive gear will be parallel with center line of crankshaft (Fig. 34).

Installation of Distributor

(1) Hold distributor over mounting pad on cylinder block with vacuum chamber pointing toward center of engine.

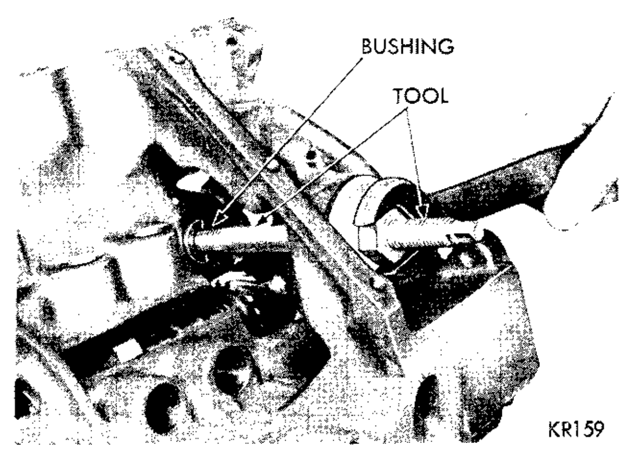


Fig. 31—Removing Distributor Drive Shaft Bushing

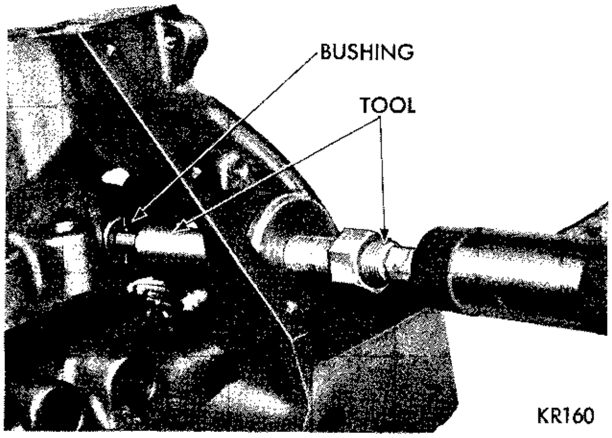


Fig. 32—Installing Distributor Drive Shaft Bushing

(2) Turn rotor until it points forward and to approximate location of No. 1 tower terminal in the distributor cap.

(3) Place distributor gastet in position.

(4) Lower the distributor and engage the shaft in the slot of distributor drive shaft gear.

(5) Turn distributor clockwise until breaker contacts are just separating, install and tighten hold down clamp.

CYLINDER BLOCK

The cylinder block is of the deep block design which eliminates the need for a torque converter housing adapter plate. Its sides extend three inches below the crankshaft center line.

Piston Removal

(1) 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.**

The pistons and connecting rods must be removed from the top of the cylinder block. When removing piston and connecting rod assemblies from the engine, rotate the crankshaft so each connecting rod is centered in cylinder bore.

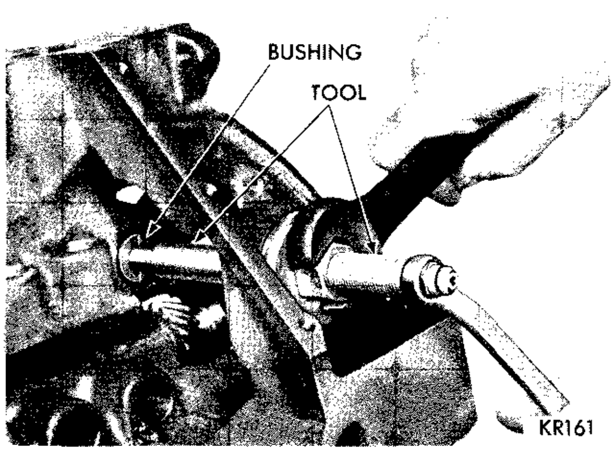


Fig. 33—Burnishing Distributor Drive Shaft Bushing

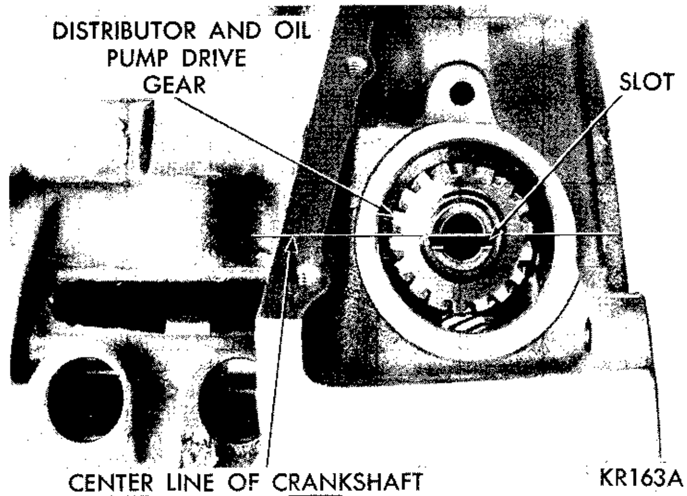


Fig. 34—Distributor Drive Gear Installed

(2) Inspect connecting rods and connecting rod caps for cylinder identification. Identify them if necessary.

(3) Remove connecting rod cap. Install connecting rod bolt guide set on connecting rod bolts. Push each piston and rod assembly out of cylinder bore. **Be careful not to nick crankshaft journals.**

(4) Install bearing caps on mating rods.

Cleaning and Inspection

(1) Clean cylinder block thoroughly and inspect all core hole plugs for evidence of leaking.

(2) If new core plugs are installed, coat edges of plug and core hole with Number 1057794 Sealer or equivalent. Drive the core plug in so that the rim lies at least 1/64" below the lead-in chamfer.

(3) Examine block for cracks or fractures.

Cylinder Bore Inspection

The cylinder walls should be measured for out-of-round and taper with Tool C-119. If the cylinder bores show more than .005" out-of-round, or a taper of more than .010" or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed, and new pistons and rings fitted. Whatever type of boring equipment is used, boring and honing operation should be closely coordinated with the fitting of pistons and rings in order that specified clearance may be maintained.

Honing Cylinder Bores

Before honing, stuff plenty of clean rags under the bores, over the crankshaft to keep the abrasive materials from entering the crankcase area.

(1) Used carefully, the cylinder bore resizing hone C-823 equipped with 220 grit stones and 390 extensions necessary with 383 and 440 cubic inch engines

is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, Tool C-3501, equipped with 280 grit stones (3501-3810) if the cylinder bore is straight and round. 20 to 60 strokes depending on the bore condition will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes. Using honing oil C-3501-3880 or a light honing oil available from major oil distributors. **Do not use engine or transmission oil, mineral oil or kerosene.**

(3) Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 60°, cross hatch angle is most satisfactory for proper seating of rings (See Fig. 35).

(4) After honing, it is necessary that the block be cleaned again to remove all traces of abrasives. Wash cylinder block and crankshaft thoroughly.

CAUTION: Be sure all abrasives are removed from the engine parts after honing. It is recommended that a solution of soap and water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and the cloth remains clean. Oil bores after cleaning to prevent rusting.

PISTONS, PINS and RINGS

Pistons

The pistons are cam ground so that the diameter at the pin boss is less than its diameter across the thrust face. This allows for expansion under normal operating conditions. Under operating temperatures, expansion forces the pin bosses away from each other, thus causing the piston to assume a more nearly round shape. It is important that old or new pistons be measured for taper and elliptical shape before they are fitted into the cylinder bore (See Fig. 36).

Finished Pistons

All pistons are machined to the same weight in grams, regardless of oversize so piston balance can be maintained. For cylinder bores which have been honed or rebored, pistons are available in standard and the following oversizes: .005, .020, and .040 inch.

Fitting Pistons

Piston and cylinder wall must be clean and dry. Specified clearance between the piston and the cylinder wall is .0003 to .0013 inch.

Piston diameter should be measured at the top of skirt 90 degrees to piston pin axis. Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line. **Pistons and cylinder bores should be measured at normal room temperature, 70 degrees F.**

All service pistons include pins, and are available in standard and the following oversizes: .005, .020 and .040 inch.

Fitting Rings

(1) Measure piston ring gap about two inches from bottom of cylinder bore in which it is to be fitted. (An inverted piston can be used to push rings down to insure positioning rings squarely in cylinder wall before measuring.)

(2) Insert feeler stock in the gap. Ring gap should be between .013 to .052 inch for the compression rings and .015 to .062 inch for the oil ring steel rails in standard size bores. Maximum gap on .005 inch O/S bores should be .060 inch for compression rings and .070 inch for the oil ring steel rails.

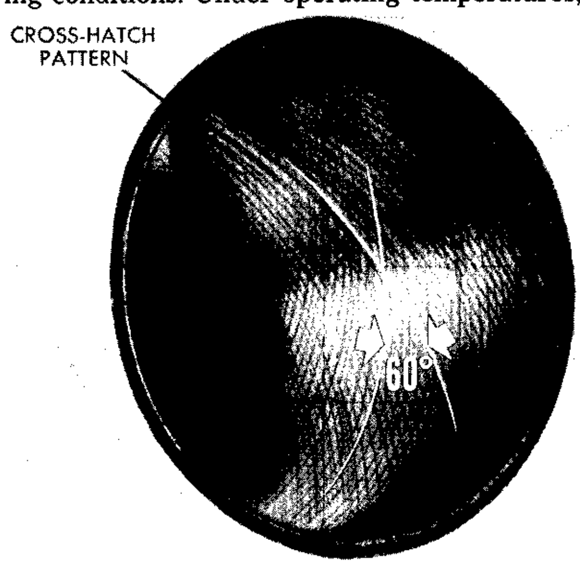


Fig. 35—Cross Hatch Pattern

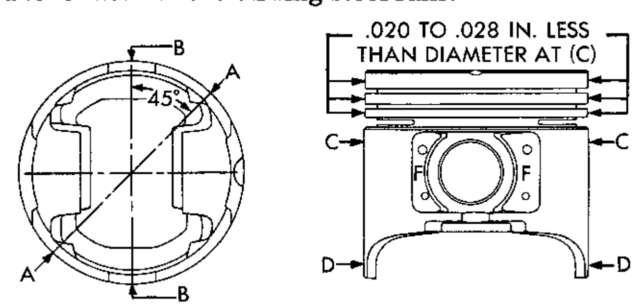


Fig. 36—Piston Measurements

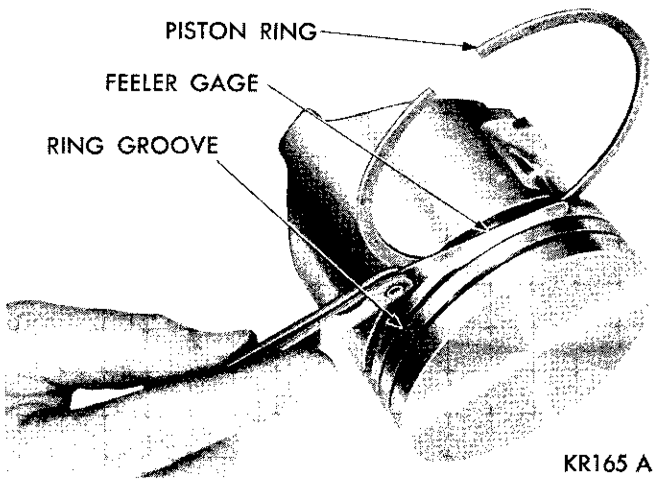


Fig. 37—Measuring Piston Ring Clearance

(3) Measure side clearance between piston ring and ring groove (Fig. 37). Clearance should be .0015 to .003 inches for the top compression ring and intermediate ring. Steel rail service oil ring should be free in groove, but should not exceed .005 inch side clearance.

(4) Install the three piece oil ring in lower ring groove using instructions in ring package.

(5) Install compression rings in middle and top groove as shown on instruction sheet. Be sure the mark "top" on each compression ring faces top of piston.

(6) For the two top rings use ring installer Tool C-3673 for 383 cubic inch engines and Tool C-4001 for the 440 cubic inch engines.

Piston Pin Removal

(1) Arrange Tool C-3684 parts for removal of piston pin, (Fig. 38).

(2) Install pilot on main screw.

(3) Install main screw through piston pin.

(4) Install anvil over threaded end of main screw with small end of anvil against piston boss. **Be sure spring is removed from anvil.**

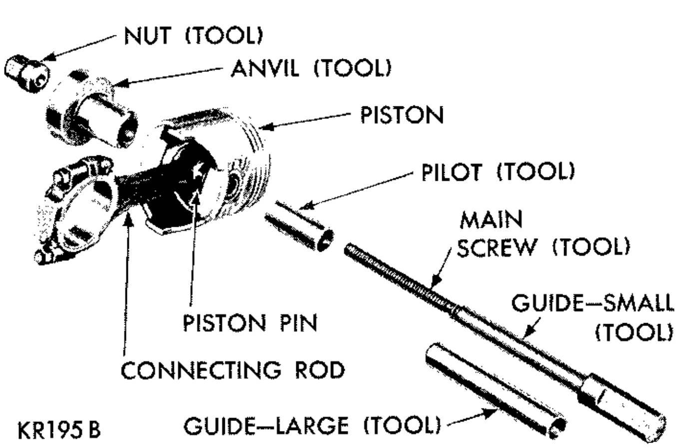


Fig. 38—Tool Arrangement for Removing Piston Pin

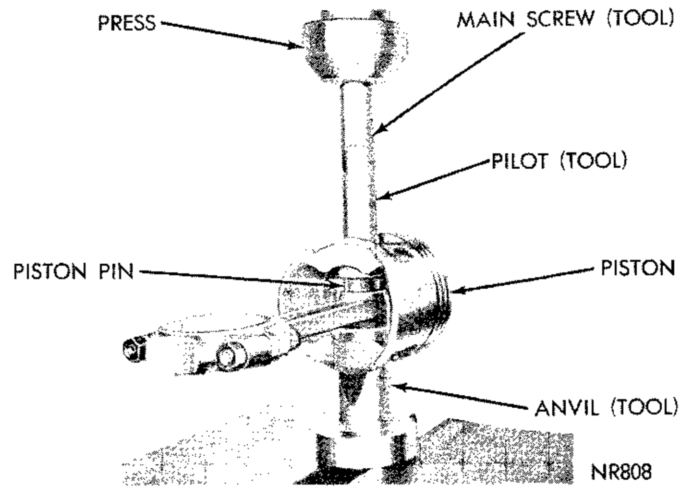


Fig. 39—Removing Piston Pin

(5) Install nut loosely on main screw and place assembly on a press, (Fig. 39).

(6) Press piston pin out of connecting rod. **When pin falls free from connecting rod, stop press to prevent damage to bottom of anvil.**

(7) Remove tool from piston.

Installation

(1) Test piston pin fit in the piston. It should be a sliding fit in the piston at 70 degrees F. Piston pins are supplied in standard sizes only.

(2) Lubricate piston pin holes in the piston and connecting rod.

(3) Arrange Tool C-3684 parts for installation of piston pin (Fig. 40).

(4) Install spring inside the pilot and install spring and pilot in the anvil. Install piston pin over main screw.

(5) Place piston, with "front" up, over the pilot so pilot extends through piston pin hole.

(6) Position connecting rod over the pilot which extends through piston pin hole. **Assemble rods to pistons of the right cylinder bank (2, 4, 6, and 8) with indent on piston head opposite to the larger chamfer**

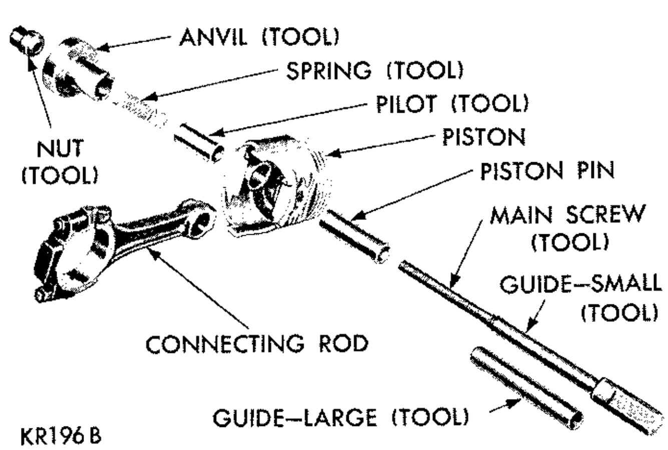


Fig. 40—Tool Arrangement for Installing Piston Pin

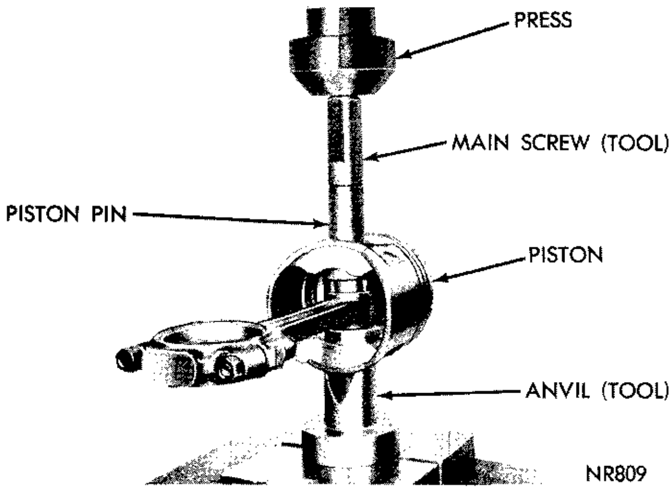


Fig. 41—Installing Piston Pin

on the large bore end of connecting rod. Assemble rods to pistons of the left cylinder bank (1, 3, 5, and 7) with indent on piston head on the same side as the large chamfer on the large bore end of the connecting rod.

(7) Install main screw and piston pin in piston, (Fig. 40).

(8) Install nut on puller screw to hold assembly together. Place assembly on a press (Fig. 41).

(9) Press piston pin in until piston pin "bottoms" on the pilot. This will position pin in connecting rod.

(10) Remove tool and arrange tool parts and piston assembly in same manner (Fig. 38).

(11) Place assembly in a vise (Fig. 42).

(12) Attach torque wrench to nut and tighten up to 15 foot-pounds. If the connecting rod moves downward on piston pin, reject this connecting rod and piston pin combination. Obtain a connecting rod with

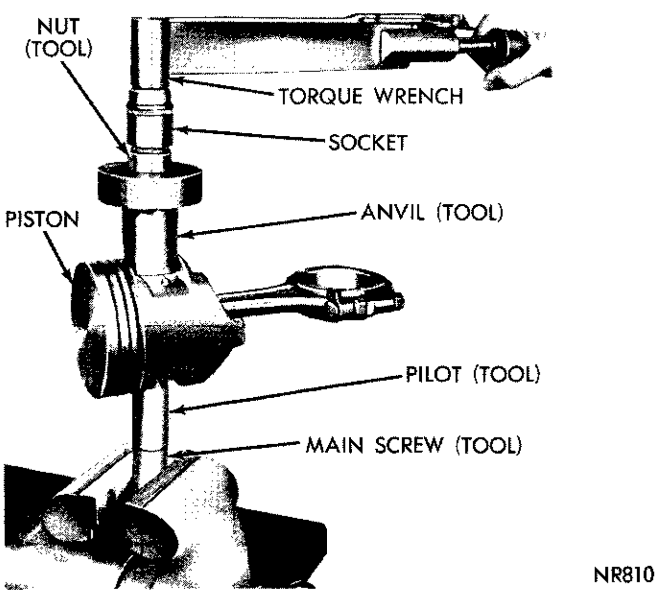


Fig. 42—Testing Fit of Piston Pin in Connecting Rod

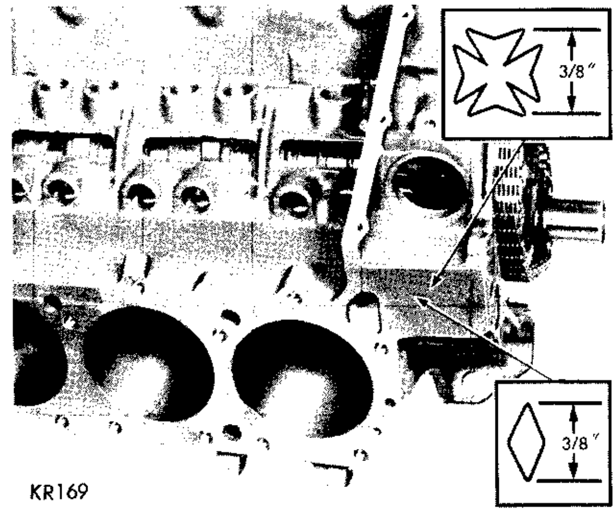


Fig. 43—Showing Location of External Engine Numbering Pad

proper small end bore diameter and repeat the installation and tightening procedure.

(13) If connecting rod does not move under 15 foot-pounds, piston pin and connecting rod interference is satisfactory, remove tool.

CRANKSHAFT IDENTIFICATION

IMPORTANT: A Maltese Cross stamped on the engine numbering pad (Fig. 43) indicates that engine is equipped with a crankshaft which has one or more connecting rods and/or main bearing journals finished .001 inch undersize. The position of the undersize journal or journals is stamped on a machine surface of the NO. 3 counterweight (Fig. 44). A Maltese Cross with an X indicates .010 inch undersize journals.

The connecting rod journals are identified by the letter "R" and main bearing journals by the letter "M." For example "M-1" indicates that NO. 1 main bearing is .001 inch undersize.

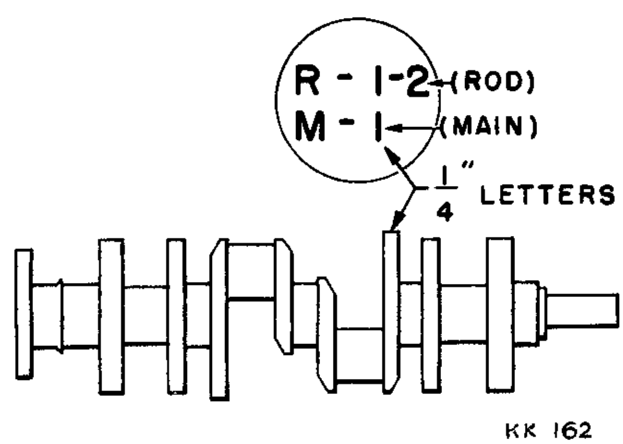


Fig. 44—Showing Location of Internal Marking of Counterweight

CONNECTING RODS

Installation of Connecting Rod Bearings

Fit all rods on one bank until complete. Do not alternate from one bank to another, because when rods are assembled to the piston correctly, they are not interchangeable from one bank to another.

Each bearing cap has a small "V" groove across parting face. When installing the lower bearing shell, make certain "V" groove in shell is in line with "V" groove in cap. This allows lubrication of the cylinder wall. The bearings should always be installed so that the small formed tang fits into the machined grooves of the rods. The end clearance should be from .009 to .017 inch (two rods).

Limits of taper or out-of-round on any crankshaft journals should be held to a maximum of .001 inch. Bearings are available in .001, .002, .003, .010 and .012 inch undersize. **Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.**

MEASURING CONNECTING ROD BEARING CLEARANCE

Shim Stock Method

(1) (a) 383 engine with 2-barrel carburetor, place an oiled .001 inch brass shim stock (1/2 inch wide and 3/4 inch long) between the bearing and connecting rod journal.

(b) 383 engine with 4-barrel carburetor and 440 with tri-metal bearings, use an oiled .002 inch brass shim stock (1/2 inch wide and 3/4 inch long) between the bearing and connecting rod journal.

(2) Install bearing cap and tighten to 45 foot-pounds.

(3) Turn crankshaft 1/4 turn in each direction. A slight drag should be felt which indicates clearance is satisfactory. 383 engine with 2-barrel carburetor, correct clearance is from .0005 to .0015 inch; 383 with 4-barrel carburetor and 440 with tri-metal bearings, correct clearance is from .001 to .002 inch.

(4) Side play should be from .009 to .017 inch (two rods).

INSTALLING PISTON AND CONNECTING ROD ASSEMBLY IN CYLINDER BLOCK

(1) Before installing pistons, rods, and rod assemblies in the bore, be sure that the compression ring gaps are staggered so that neither are in line with oil ring rail gaps.

(2) The oil ring expander ends should be positioned toward the outside of the "V" of the engine. The oil ring rail gaps should be positioned opposite each other and above the piston pin holes.

(3) Immerse piston head and rings in clean engine oil, slide ring compressor, Tool C-385, over the piston and tighten with special wrench (part of Tool C-385). **Be sure position of rings does not change during this operation.**

(4) Install connecting rod bolt protectors on rod bolts, the long protector should be installed on the numbered side of the connecting rod.

(5) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston into cylinder bore and guide rod over the crankshaft journal (Fig. 45).

(6) Tap piston down in cylinder bore, using handle of a hammer. At the same time, guide connecting rod into position on crankpin journal.

(7) The notch or groove on top of piston must be pointing toward front of engine and larger chamfer of connecting rod bore must be installed toward crank pin journal fillet.

(8) Install rod caps, tighten nuts to 45 foot-pounds.

CRANKSHAFT MAIN JOURNALS

Crankshaft main bearing journals should be inspected for excessive wear, taper and scoring. Journal grinding should not exceed .012 inch under the standard journal diameter. DO NOT grind the thrust faces of the 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.

CRANKSHAFT MAIN BEARINGS

New lower main bearings halves Numbers 1, 2, 4 5 are interchangeable (Fig. 46). New upper main bearing halves Number 2, 4 and 5 are also interchangeable. Upper and lower bearing halves are not interchangeable because upper bearing is grooved and lower bearing is not.

The NO. 1 upper main bearing IS NOT INTER-

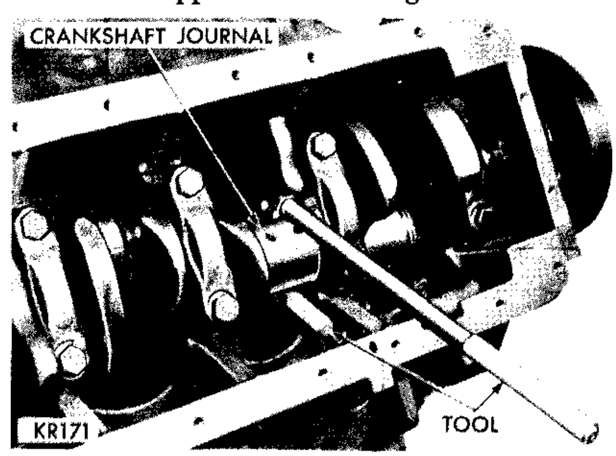


Fig. 45—Installing Connecting Rod

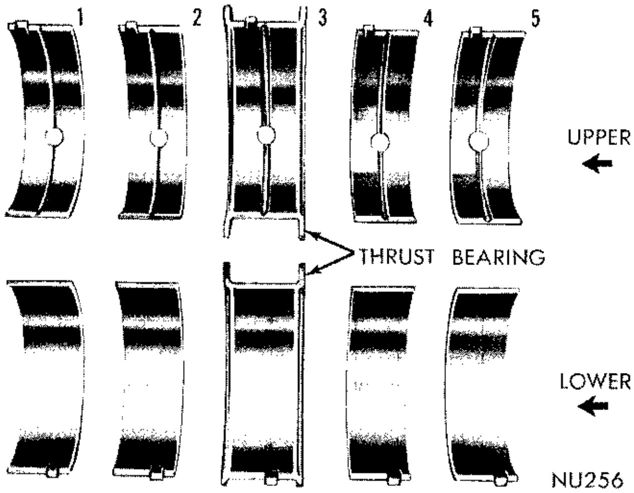


Fig. 46—Main Bearing Identification

CHANGEABLE AND IS CHAMFERED on the tab side for timing chain oiling and can be identified by a red marking on edge of bearing.

Upper and lower NO. 3 bearings are flanged to carry the crankshaft thrust loads and are **not interchangeable** with any other bearings in the engine. **Bearings that are not badly worn or pitted must be reinstalled in the same position.**

Bearing caps are not interchangeable and should be marked at removal to insure correct assembly. Bearings are available in standard and the following undersizes: .001, .002, .003, .010, .011 and .012 inch. Do not install an undersize bearing that will reduce clearance below specifications.

Removal

(1) Remove oil pan and identify bearing caps before removal.

(2) Remove bearing caps one at a time. Remove upper half of bearing by inserting Tool C-3059 (Fig. 47) into oil hole of crankshaft.

(3) Slowly rotate crankshaft clockwise, forcing out upper half of bearing.

Installation

Only one main bearing should be selectively fitted while all other main bearing caps are properly torqued.

When installing a new upper bearing shell, slightly chamfer the sharp edges from the plain side.

(1) Start bearing in place, and insert Tool C-3059 into oil hole of crankshaft (Fig. 47).

(2) Slowly rotate crankshaft counter-clockwise sliding the bearing into position. Remove Tool C-3059.

MEASURING MAIN BEARING CLEARANCE

Shim Stock Method

(1) Smooth edges of a 1/2 x 3/4 inch piece of brass shim stock, .001 inch thickness.

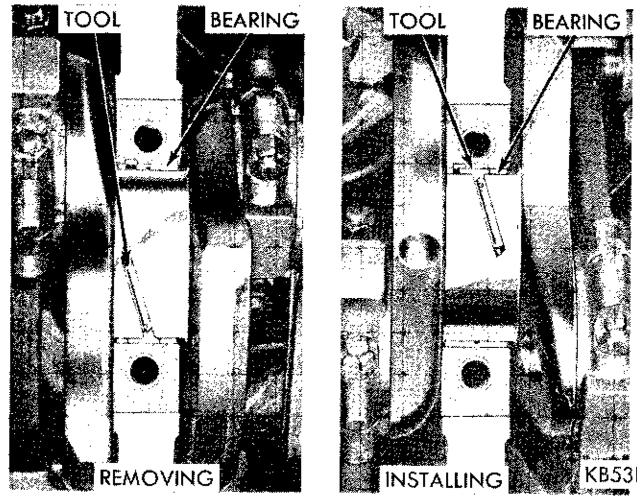


Fig. 47—Removing or Installing Upper Main Bearing

(2) Install bearing in center main bearing cap, bearing tang in groove in cap, lubricate bearing and position shim stock across the bearing, install cap, tighten bolts to 85 foot-pounds.

(3) If a slight drag is felt as crankshaft is turned (moved no more than 1/4 turn in either direction), clearance is .001 inch or less and is considered satisfactory.

If, however, no drag is felt, the bearing is too large or crankshaft cannot be rotated, bearing is too small and should be replaced with the correct size.

(4) Measure crankshaft end play .002 to .007 inch. If end play is less than .002 inch or more than .007 inch, install a new number 3 main bearing.

(5) Fit remaining bearings in same manner.

It is permissable to use one .001 inch undersize bearing shell with one standard bearing shell or one .002 inch undersize bearing shell with one .001 inch undersize shell. **Always use the smaller diameter bearing half as the upper. Never use an upper bearing half more than .001 inch smaller than the lower**

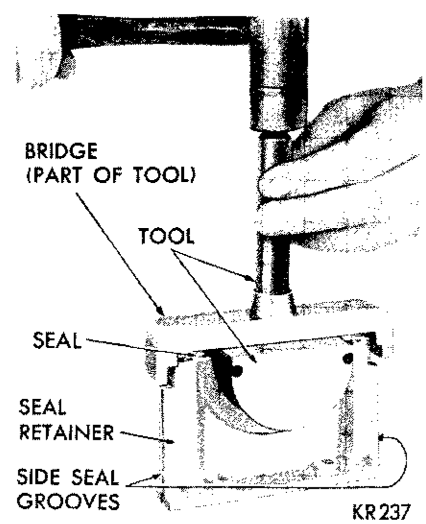


Fig. 48—Installing Rear Main Bearing Lower Oil Seal

bearing half and never use a new bearing half with a used bearing half.

REAR MAIN BEARING OIL SEAL
(Crankshaft Removed)

Upper Rear Main Seal Installation

(1) Install a new rear main bearing oil seal in cylinder block so that both ends protrude.

(2) Tap seal down into position, using Tool C-3625 for 383 Cubic Inch Engines or Tool C-3743 for 440 Cubic Inch Engines, with bridge removed until tool is seated in bearing bore.

(3) Hold the tool in this position and cut off portion of seal that extends above the block on both sides.

Lower Rear Main Seal Installation

(1) Install a new seal in seal retainer so ends protrude (Fig. 48).

(2) Install bridge on tool and tap the seal down into position with Tool C-3625 for 383 Cubic Inch Engines or Tool C-3743 for 440 Cubic Inch Engines until tool is seated.

(3) Trim off that portion of the seal that protrudes above the cap (Fig. 49).

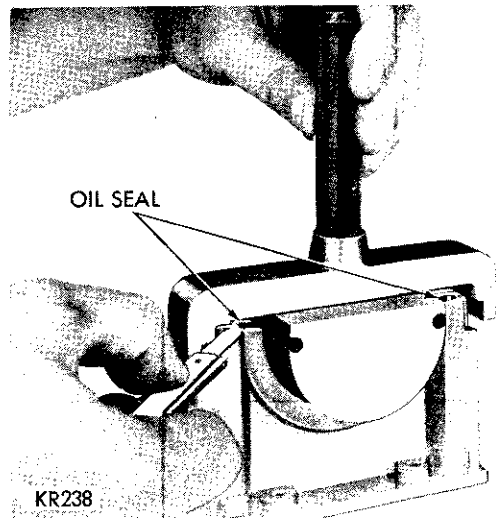


Fig. 49—Trimming Rear Main Bearing Lower Oil Seal

Side Seals Installation

Perform the following operations as rapidly as possible. These side seals are made from a material that expands quickly when oiled.

(1) Apply mineral spirits or diesel fuel to the side seals.

(2) Install seals immediately in the seal retainer grooves.

(3) Install seal retainer and tighten screws to 30 foot-pounds.

Failure to pre-oil the seals will result in an oil leak.

ENGINE OILING SYSTEM (Fig. 50)

OIL PAN

Removal

(1) Disconnect battery cable and remove dipstick.

(2) Raise vehicle on a hoist and disconnect steering linkage from idler arm and steering arm.

(3) Disconnect exhaust pipe branches from right and left manifolds.

(4) Remove clamp attaching exhaust pipe to extension and remove exhaust pipe.

(5) Drain crankcase oil.

(6) Remove converter dust shield.

(7) Remove oil pan bolts. Turn flywheel until counterweight and connecting rods at front end of crankshaft are at their highest position to provide clearance, and lower the pan. Turn pan counterclockwise to clear oil screen and suction pipe as it is lowered.

Installation

(1) Inspect alignment of oil strainer. The bottom of the strainer must be on a horizontal plane with machined surface of cylinder block. The bottom of the strainer must touch the bottom of oil pan.

(2) Install oil pan.

(3) Install converter dust shield.

(4) Connect exhaust pipe branches to the manifolds and to the exhaust extension.

(5) Connect steering linkage at idler arm and at pitman arm.

(6) Connect battery cable, install dipstick.

(7) Install drain plug and refill crankcase with the proper grade and quantity of oil.

OIL PUMP

Removal

Remove oil pump attaching bolts and remove pump and filter assembly from bottom side of engine.

Disassembly

(1) Remove filter base and oil seal ring.

(2) Remove pump rotor and shaft and lift out outer pump rotor.

(3) Remove the oil pressure relief valve plug and lift out the spring and relief valve plunger (Fig. 51).

Inspection and Assembly

(1) Clean all parts thoroughly. The mating face of filter base (oil pump cover) should be smooth. Replace filter base if it is scratched or grooved.

(2) Lay a straightedge across oil pump filter base surface (Fig. 52). If a .0015 inch feeler gauge can be

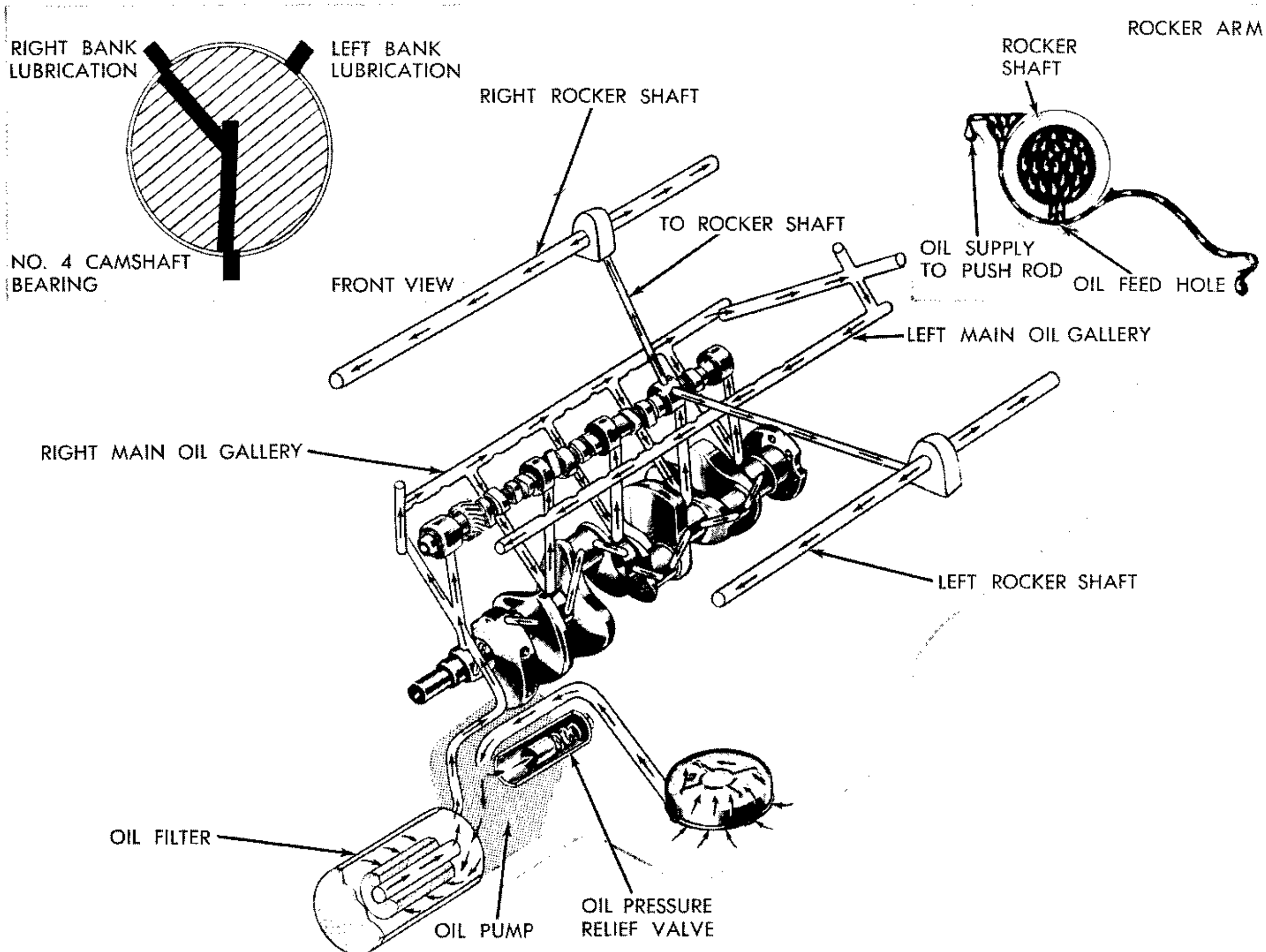


Fig. 50—Engine Oiling System

inserted between the base and straightedge, filter base should be replaced.

(3) If outer rotor length measures less than .943

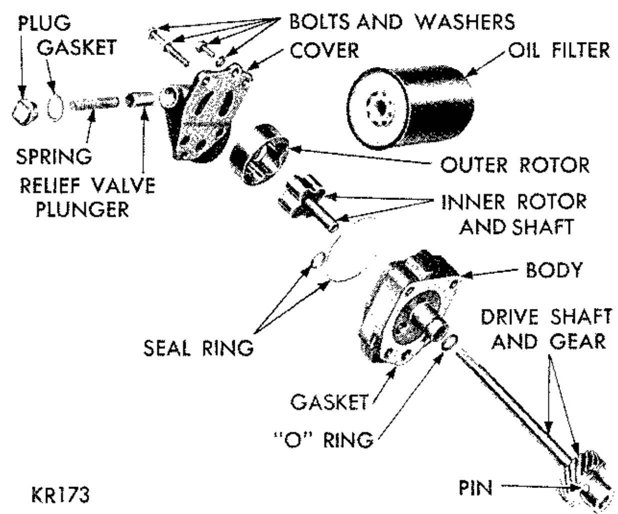


Fig. 51—Oil Pump and Filter Assembly (Disassembled View)

inch (Fig. 53) and diameter less than 2.469 inches, replace outer rotor.

(4) If inner rotor length measures less than .942 inch (Fig. 54), a new inner rotor should be installed.

(5) Install outer rotor into pump body, pressing to one side with fingers and measure clearance between outer rotor and pump body (Fig. 55). If measurement

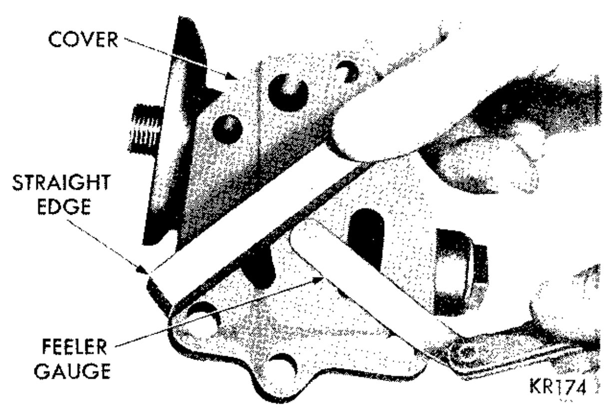


Fig. 52—Measuring Oil Pump Cover Flatness

Fig. 53—Measuring Outer Rotor Thickness

is more than .014 inch, replace oil pump body.

(6) Install inner rotor into pump body and place a straightedge across the face between bolt holes (Fig. 56). If a feeler gauge of more than .004 inch can be inserted between the rotors and straightedge, replace pump body.

(7) If the tip clearance between inner and outer rotors (Fig. 57) is more than .010 inch, replace inner and outer rotor.

Servicing Oil Pressure Relief Valve

Inspect oil pump relief valve plunger for scoring and free operation in its bore. Small scores may be removed with 400 grit wet or dry paper providing extreme care is used not to round off the sharp edge portion of the valve.

The relief valve spring has a free length of 2-9/32 to 2-19/64 inch and should test 14.85 to 15.85 lbs. when compressed to 1-19/32 inch. Discard spring that fails to meet specifications.

If the oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of oil pressure. **When assembling the oil pump, be sure to use new oil seal rings between filter base and pump body.**

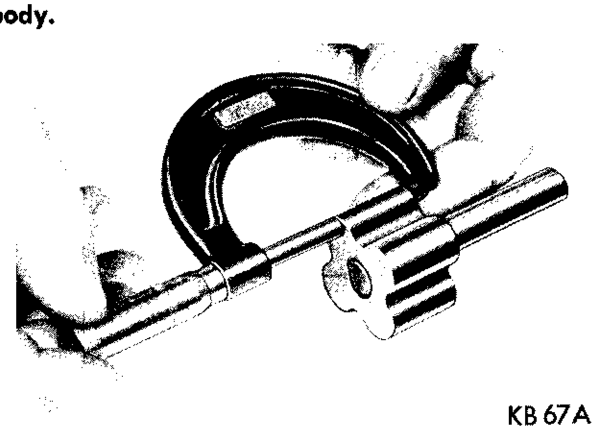


Fig. 54—Measuring Inner Rotor Thickness

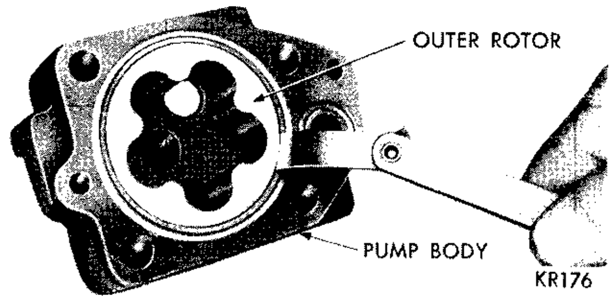


Fig. 55—Measuring Outer Rotor Clearance

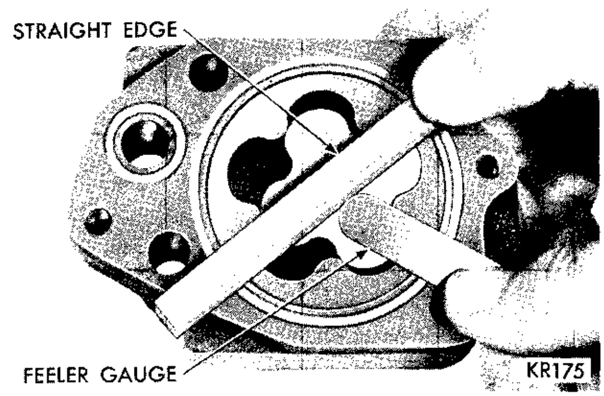


Fig. 56—Measuring Clearance Over Rotors

Installation

(1) Install a new "O" ring seal on the pilot of oil pump before attaching oil pump to cylinder block.

(2) Install oil pump on engine, using a new gasket on engine and tighten attaching bolts to 30 foot-pounds. Install oil filter element.

OIL FILTER REPLACEMENT

The "spin on" oil filter should be replaced preferably to coincide with every second oil change.

Removal

Use care so as not to damage transmission oil cooler lines.

(1) Using Tool C-4065 unscrew the filter from the base on bottom side of engine and discard (Fig. 58).

(2) Wipe base clean.

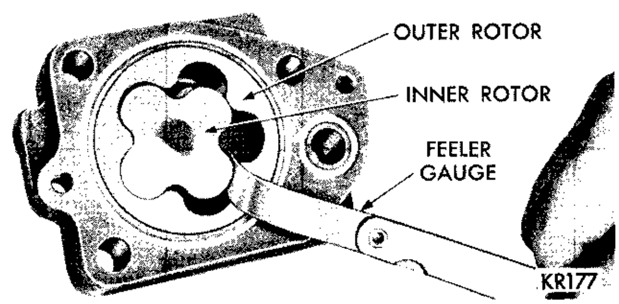


Fig. 57—Measuring Clearance Between Rotors

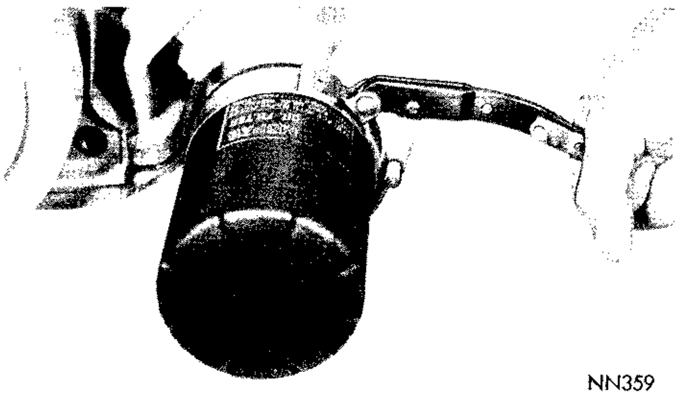


Fig. 58—Removing Oil Filter

Installation

(1) Install the "spin" oil filter by hand, finger tight. Do not use tool.

(2) To obtain an effective seal, tighten filters by hand the additional number of turns indicated on the replacement filter. Start engine and inspect for leaks.

CRANKCASE VENTILATION SYSTEM

(1) A fully closed crankcase ventilation system is installed on all vehicles. The fully closed ventilation system operates by air drawn into the crankcase from the air cleaner and through the crankcase inlet air cleaner by means of a hose (Fig. 1).

Air is circulated through the engine and drawn out of the cylinder head cover by manifold vacuum into the combustion chambers and dispelled with the exhaust gases.

The system consists of a ventilation valve installed in the outlet vent of the cylinder head cover, and a hose. The hose is connected between the outlet vent and the lower part of the carburetor body. The function of the valve is to regulate the flow of crankcase ventilation at various throttle positions and will operate effectively as long as normal maintenance is applied.

The valve and hose are subject to fouling with sludge and carbon formation due to the nature of the material carried by the ventilation system.

A plugged vent system may in turn cause excessive engine crankcase sludge formation and may also cause rough and erratic engine idle or excessive oil

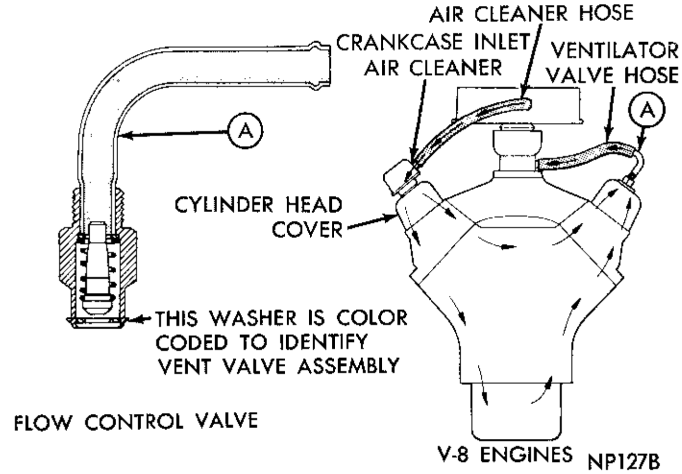


Fig. 1—Fully Closed Ventilation System

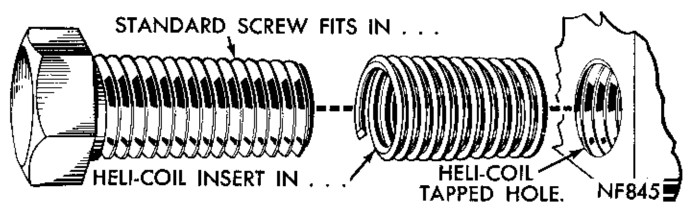


Fig. 2—Heli-Coil Installation

leakage. The ventilation system should be cleaned every six months and valve replaced every year in average service and more frequently if the vehicle is used extensively for short trips—driving less than 10 miles—with frequent idling, such as city traffic.

See the "Lubrication and Maintenance" section, Group O of this manual for proper service procedures.

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads can be repaired by the use of Heli-Coils. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tape, and installing a Heli-Coil Insert into the tapped holes. This brings the hole back to its original thread size (See Fig. 2).

The following chart lists the threaded hole sizes which are used in the engine block and the necessary tools and inserts for the repair of damaged or worn thread. Heli-Coil tools and inserts are readily available from automotive parts jobbers.

Heli-Coil Insert			Drill	Tap	Inserting Tool	Extracting Tool
Thread Size	Part No.	Insert Length	Size	Part No.	Part No.	Part No.
1/2-20	1185-4	3/8"	17/64(.266)	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32"	Q(.332)	5 CPB	528-5N	1227-6
3/8-16	1185-6	9/16"	X(.397)	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32"	29/64(.453)	7 CPB	528-7N	1227-16
1/2-13	1185-8	3/4"	33/64(.516)	8 CPB	528-8N	1227-16

SPECIFICATIONS

ENGINE	
Type	90°V
Number of Cylinders	8
Bore	
383 Cubic Inch	4.25 inch
440 Cubic Inch	4.320 inch
Stroke	
383 Cubic Inch	3.375 inch
440 Cubic Inch	3.750 inch
Minimum Compression with Engine Warm, Spark Plugs Removed, Wide-Open Throttle	100 psi* 110 psi**
Maximum Variation Between Cylinders (any one engine)	40 psi
Firing Order	1-8-4-3-6-5-7-2
Basic Timing...... Manual	TDC±2-1/2°
Automatic 383 and 440 Hi. Perf.	2.5°BTC±2-1/2°
440 Std. Automatic	5°BTC±2-1/2°
CYLINDER NUMBERING (FRONT TO REAR)	
Left Bank	1-3-5-7
Right Bank	2-4-6-8
CYLINDER BLOCK	
Cylinder Bore (Standard)	
383 Cubic Inch	4.2495-4.2515″
440 Cubic Inch	4.320-4.322″
Cylinder Bore out-of-round (Maximum allowable)	.005″
Cylinder Bore Taper (Maximum allowable)	.010″
Reconditioning Working Limits (for taper and out-of-round)	.001″
Maximum Allowable Oversize (cylinder bores)	.040″
Tappet Bore Diameter	.9050-.9058″
Distributor Lower Drive Shaft Bushing (press fit in cylinder block)	.0005-.0040″
Ream to	.4865-.4880″
Shaft to Bushing Clearance	.0007-.0027″
CRANKSHAFT	
Type	Fully Counter-Balanced
Bearings	Steel Backed Babbitt△
Journal Diameter 383 Cubic Inch	2.6245 to 2.6255″
440 Cubic Inch	2.7495 to 2.7505″
Crank Pin Diameter	2.374 to 2.375″
Maximum Out-of-Round Permissible	.001″
Number of Main Bearings	5
Clearance Desired (Bearings Installed I.D. Minus Journal O.D.)	.0005 to .0015″
Maximum Clearance Allowable	.0025″
End Play	.002 to .007″
Thrust Taken by	No. 3 Main Bearing
Finish at Rear Seal Surface	Diagonal Knurling
Interchangeability of Bearings	Upper Nos. 2, 4, 5 Lower Nos. 1, 2, 4, 5
MAIN BEARINGS (Service)	
All available in standard and the following undersizes	.001, .002, .003, .010, .011, .012″
CONNECTING RODS AND BEARINGS	
Type	Drop Forged "I" Beam
Length (Center to Center) 383 Cubic Inch	6.356 to 6.360″
440 Cubic Inch	6.766 to 6.770″
Weight (Less Bearing Shells) 383 Cubic Inch	812 ± 4 GMS.
440 Cubic Inch	846 ± 4 GMS.
Bearings 383 2-BBL.	Steel Backed Babbitt
383 4-BBL., 440 4-BBL.	Tri-Metal Steel Backed
Diameter and Length	2.376 x .927″
Clearance Desired (Bearings Installed I.D. Minus Journal O.D.)	
383 2-BBL.	.0005 to .0015″
383 4-BBL., 440 4-BBL.	.001 to .002″
Maximum Allowable	.0025″

* 383-2BBL. Carb.

**383-440-4BBL. Carb.

△440—#3 Tin Aluminum Alloy Steel Backed

Side Clearance	.009 to .017"
Bearings for Service	Standard .001, .002, .003, .010, .012" Undersize
Piston Pin Bore Diameter	1.0923 to 1.0928"

CAMSHAFT

Drive	Chain
Bearings	Steel Backed Babbitt
Number	5
Thrust Taken By	Cylinder Block
Clearance Desired (Bearing Installed I.D. Minus Journal O.D.)	.001 to .003"
Maximum Allowable	.005"

CAMSHAFT BEARING JOURNALS

Diameter	
No. 1	1.998 to 1.999"
No. 2	1.982 to 1.983"
No. 3	1.967 to 1.968"
No. 4	1.951 to 1.952"
No. 5	1.748 to 1.749"

CAMSHAFT BEARINGS

Diameter (after reaming)	
No. 1	2.000 to 2.001"
No. 2	1.984 to 1.985"
No. 3	1.969 to 1.970"
No. 4	1.953 to 1.954"
No. 5	1.750 to 1.751"

VALVE TIMING	383 and 440 Cubic Inch	440 Cubic Inch Hi. Perf.
Intake Opens (BTC)	18°	21°
Intake Closes (ABC)	58°	67°
Exhaust Opens (BBC)	66°	79°
Exhaust Closes (ATC)	14°	25°
Valve Overlap	32°	46°
Intake Valve Duration	256°	268°
Exhaust Valve Duration	260°	284°

TIMING CHAIN

Adjustment	None
Number of Links	50
Pitch	.50"
Width	.75"

TAPPETS

Type	Hydraulic
Body Diameter	.9040 to .9045
Clearance in Cylinder Block	.0005 to .0018 inch
Oversize Available for Service	.001, .008, .030 inch
Clearance Between Valve Stem and Rocker Arm Pad (Dry Lash)	.060-.210 inch

PISTONS

Type	Autothermic w/Steel Struts
Land Clearance (diametrical)	
440 Cubic Inch	.021" to .029"
383 Cubic Inch	.023" to .030"
Clearance at Top of Skirt	.0003" to .0013"
Weight (Standard Through .040" Oversize)	
383 Cubic Inch	770 grms.
440 Cubic Inch	857.5 grms.
Piston Length (Overall)	
383 Cubic Inch	3.874 in.
440 Cubic Inch	3.650 in.
Ring Groove Depth	
No. 1—	
383 Cubic Inch	.220 in.
440 Cubic Inch	.220 in.
No. 2—	
383 Cubic Inch	.220 in.
440 Cubic Inch	.220 in.

No. 3—	
383 Cubic Inch	.208 in.
440 Cubic Inch	.208 in.
Pistons for Service	Standard, .005″, .020″, .040″, Oversize
PISTON PINS	
Type	Press Fit in Rod
Diameter	1.0935 to 1.0937″
Length	3.555 to 3.575″
Clearance in Piston	.00045 to .00075″
Interference in Rod	.0007 to .0012″
Piston Pins for Service	Standard Only
Direction Offset in Piston	Toward Right Side of Engine
PISTON RINGS	
Number of Rings Per Piston	3
Compression	2
Oil	1
Oil Ring Type	3-Piece Chrome-Plated Rails with Stainless Steel Expander-Spacer
Ring Width	
Compression	.0775″-.0780″
Oil—Steel Rails	.025″
Ring Gap	
Compression	.013″-.023″
Oil—Steel Rails	.015″-.055″
Ring Side Clearance	
Compression	.0015″-.0030″
Oil—Steel Rails	.0000″-.005″
Service Rings	
Ring Gap	
Compression	.013″-.023″
Oil—Steel Rails	.015″-.062″
Ring Side Clearance	
Compression	.0015″-.004″
Oil—Steel Rails	.0000″-.005″

Valves—Intake	383-440	440 High Performance
Head Diameter	2.008″	2.008″
Length to (center of valve face)	4.87″	4.87″
Stem Diameter	.3723″-.3730″	.3718″-.3725″
Stem to Guide Clearance	.0010″-.0027″	.0015″-.0032″
Maximum Allowable	.017″*	.017″*
Face Angle	45°	45°
Valve for Service (Oversize Stems Diameter)	Std., .005″, .015″, .030″	Std., .005″, .015″, .030″
Lift (Zero Lash)	.425″	.450″
Valves—Exhaust		
Head Diameter	1.75″	1.75″
Length to (center of valve face)	4.87″	4.87″
Stem Diameter		
Hot End	.3713″-.3720″	.3708″-.3715″
Cold End	.3723″-.3730″	.3718″-.3725″
Stem to Guide Clearance		
Hot End	.0020″-.0037″	.0025″-.0042″
Cold End	.0010″-.0027″	.0015″-.0032″
Maximum Allowable	.017″*	.017″*
Face Angle	45°	45°
Valve for Service (Oversize Stem Diameter)	Std., .005″, .015″, .030″	Std., .005″, .015″, .030″
Lift (Zero Lash)	.435″	.458″
Valve Springs		
Number	16	16
Free Length	2.58″	2.23″
Load When Compressed to Valve Closed	121-129 @ 1-55/64″	100-110 @ 1-55/64″

*With Tools C-3973 and C-3339 using wobble method.

Valve Open	192-208 @ 1-7/16″	236-256 @ 1-23/64″
Valve Spring I.D.	1.01″-1.03″	1.07″-1.09″
Maximum Allowable Out of Plumb	.060″	.080″
Valve Spring Installed Height (spring seat to retainer)	1-53/64-1-57/64″	1-53/64″-1-57/64″
Use 1/16″ spacer to reduce spring height when over specifications		
VALVE GUIDES		
Type		Cast in Head
Guide Bore Diameter		.374-.375″ std.
CYLINDER HEAD		
Number Used		2
Combustion Chamber		Wedge Type
Valve Seat Runout (maximum)		.002″
Intake Valve Seat Angle		45°
Intake Seat Width		.060 to .085″
Exhaust Valve Seat Angle		45°
Exhaust Seat Width		.040 to .060″
Cylinder Head Gasket Compressed (thickness)		.021″
ENGINE LUBRICATION		
Pump Type		Rotor Full Pressure
Capacity (qts.)		4 U.S. or 3-1/4 Imperial Quarts*
Pump Drive		Camshaft
Operating Pressure at 1000 R.P.M.		45 to 65 lbs.
Oil Filter Type		Full Flow
Pressure Drop Resulting from Clogged Filter		7 to 9 lbs.
OIL PUMP INSPECTION LIMITS FOR REPLACEMENT		
Oil Pump Cover (filter base)		.0015 inch or more
Outer Rotor Length		.943 inch or less
Outer Rotor Diameter		2.469 inch or less
Inner Rotor Length		.942 inch or less
Clearance Over Rotor—Outer		.004 inch or more
Inner		.004 inch or more
Outer Rotor Clearance		.014 inch or more
Tip Clearance Between Rotors		.010 inch or more

*When filter is replaced, add 1 U.S. Quart or 3/4 of an Imperial Quart.

OVERSIZE AND UNDERSIZE ENGINE COMPONENT MARKINGS

Engine Displacement	Condition	Identification	Location of Identification
383 cu. in. 440 cu. in.	.001″ U/S Crankshaft	Maltese Cross M-2-3 etc. (indicating #2 & 3 main bearing journal) and/or R-1-4 etc. (indicating #1 & 4 connecting rod journals)	Top Pad—Front of Engine Crankshaft Counterweight
	.010″ U/S Crankshaft	Maltese Cross and X M-10 (indicate .010″ U/S all main journals) and/or R-10 (indicates .010″ U/S all rod journals)	Top Pad—Front of Engine Crankshaft Counterweight
	.020″ O/S Cylinder Bores	A	Top Pad—Front of Engine
	.008″ O/S Tappets	Diamond	Top Pad—Front of Engine
	.005″ O/S Valve Stems	O.S.	Single Bolt Boss on End of the Head

TIGHTENING REFERENCE

ENGINE

	Foot-Inch Pounds	
A/C Compressor to Engine Bolt	30	
Alternator Adjusting Strap Mounting Bolt	30	
Alternator Adjusting Strap Bolt		200
Alternator Mounting Bolt	30	
Camshaft Lock Bolt	35	
Carburetor to Manifold Nut		200
Connecting Rod Nut	45	
Cylinder Head Bolt	70	
Chain Case Cover Bolt		200
Clutch Housing Bolt	30	
Crankshaft Rear Bearing Seal Retainer	25	
Crankshaft Vibration Damper Bolt	135	
Cylinder Head Cover Stud and Nut		40
Distributor Clamp Bolt		200
Exhaust Manifold Nut	30	
Exhaust Pipe Flange Nut	50	
Exhaust Pipe Clamp Nut	20	
Exhaust Pipe Support Clamp Bolt	20	
Fan Attaching Bolt	15-18	
Fan Belt Idler Pulley Nut	45	
Fan Belt Idler Pulley Bracket Bolt	30	
Flex Plate to Crankshaft	55	
Flex Plate to Converter		270
Flywheel to Crankshaft	55	
Fuel Pump Attaching Bolt	30	
Intake Manifold Bolt	50	
Main Bearing Cap Bolt	85	
Oil Pan Drain Plug	20	
Oil Pan Screws		200
Oil Pump Cover Bolt	10	
Oil Pump Attaching Bolt	30	
Rocker Shaft Bracket Bolt	25	
Spark Plug	30	
Starter Mounting Bolt	50	
Transmission Case to Block	30	
Vibration Damper Belt Pulley Bolts		200
Valve Tappet Cover End Bolt	9	
Water Pump to Housing Bolt	30	
Water Pump Housing to Cylinder Block Bolt	30	

CLEANER AIR SYSTEM

CONTENTS

CLEANER AIR SYSTEM (CAS)

The Federal government has imposed more stringent exhaust emissions requirements on all U.S. and most imported cars. These new standards require that exhaust emissions from all cars not exceed 2.2 grams of hydrocarbons and 23 grams of carbon monoxide per vehicle mile as measured during a prescribed test. This constitutes about a 33% decrease in exhaust emission levels. The new grams per mile standards take into consideration that total emission levels are a function of vehicle weight.

Several changes have been made to our engines to meet these new standards and maintain or improve vehicle driveability (Fig. 1).

HEATED AIR SYSTEM

All engines have a heated air intake system. This system provides a faster more efficient engine warm up with improved fuel economy and reduced exhaust emissions (Fig. 2).

The HEATED AIR SYSTEM is basically a two air flow circuit system.

(1) When the under hood air temperature is 10° F or lower, the air flow will be through the stove, into a flexible connector, into the adaptor on the bottom of the snorkel and into the air cleaner.

(2) When the under hood air temperature is above 100° F, the air flow will be through the snorkel into the air cleaner.

When the under hood air temperature is between approximately 10° F and 100° F, there will be air flow through both circuits after the engine has been started and the exhaust manifold starts to give off heat. The colder the under hood air the greater the

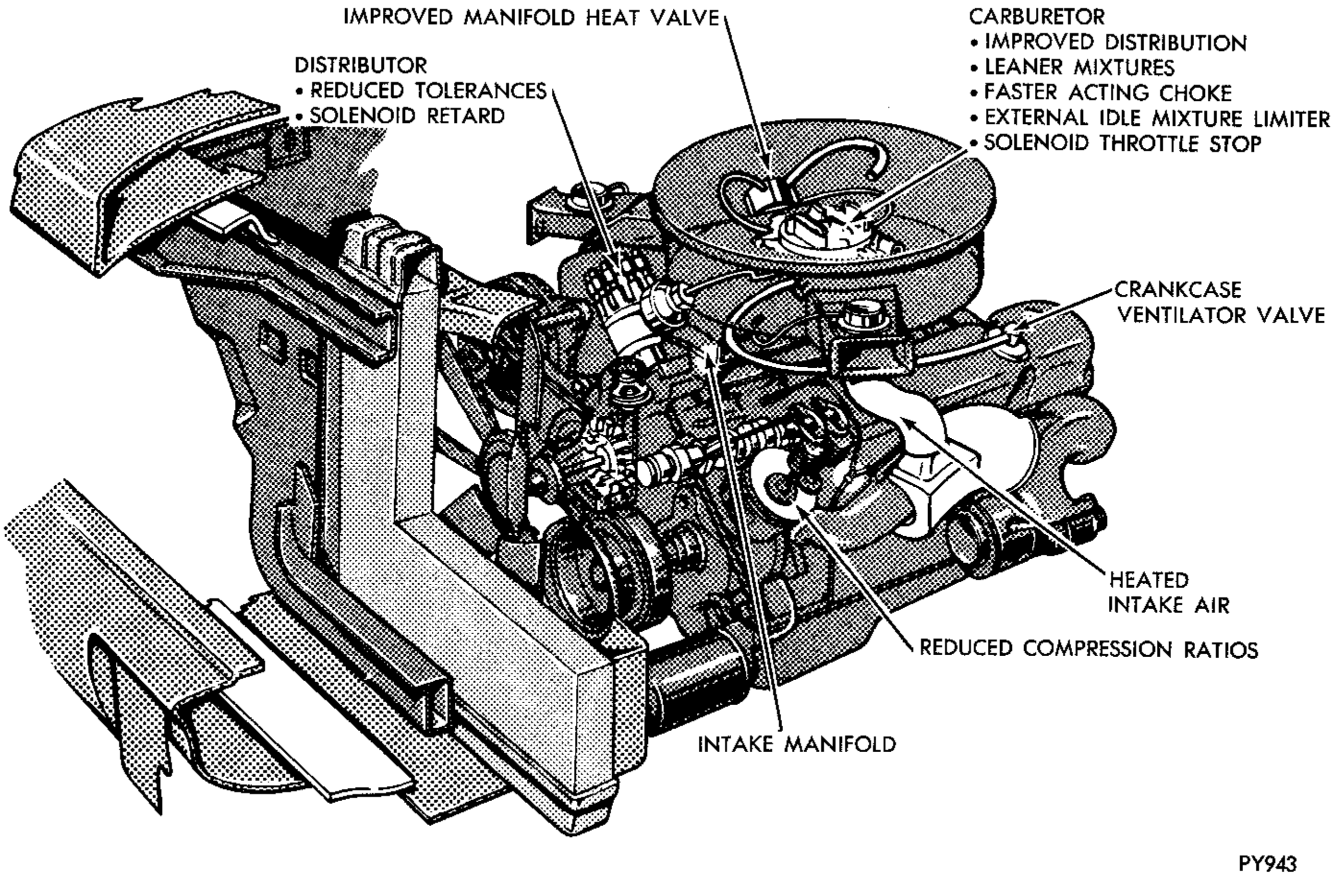


Fig. 1—1970 Cleaner Air System

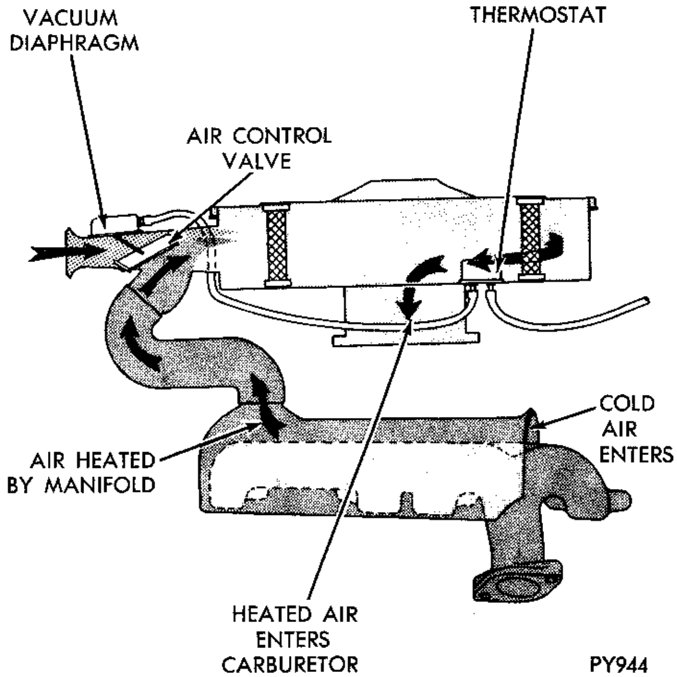


Fig. 2— Heated Inlet Air System

flow of air through the stove, and the warmer the air the greater the flow through the snorkel. The quantity of air through each circuit is controlled by a heat control door in the snorkel so as to maintain a temperature of 95° to 105° F at the temperature sensor mounted inside the air cleaner housing.

The modulation of the induction air temperature is performed by intake manifold vacuum, a temperature sensor and a vacuum diaphragm which operates the heat control door in the snorkel.

A vacuum hose connects to a hose nipple on the base of the carburetor and leads to one side (either side) of the sensor and another hose connected to the opposite side of the sensor and leads to the vacuum diaphragm on the snorkel.

The sensor is simply a bimetalic strip attached rigidly at one end and controls a small air valve at the other end. This valve is connected into the same vacuum chamber on the bottom of the sensor that the 2 hoses connect into. When the temperature at the sensor is less than 95° F the valve is closed and the intake manifold vacuum is communicated to the vacuum diaphragm which in turn lifts the heat control door and allows heated air from the exhaust manifold stove to enter the air cleaner. When the temperature at the sensor is above 105° F, the valve in the sensor opens and decreases the vacuum at the vacuum diaphragm and the spring in the diaphragm housing pushes the heat control door downward decreasing the heated air flow from the stove and increases the air flow through the snorkel.

The vacuum diaphragm is simply a bellows type diaphragm mounted in a housing with a spring between the diaphragm and the top of the housing and a hose nipple in the side of the housing to connect to the vacuum hose from the sensor. Permanently connected to the piston of the vacuum diaphragm is a link which hooks into the heat control door. Since the diaphragm is opposed by a spring, it requires not less than 5″ Hg to lift the heat control door off the floor of the snorkel and not greater than 9″ Hg to raise the door to the top of the snorkel.

With the vacuum diaphragm opposed by a spring it is obvious that temperature modulation will occur only at road load throttle positions or when the intake manifold vacuum is above the operating vacuum of the vacuum diaphragm. But should a burst of power be required, and the throttle is opened wide, the intake manifold vacuum drops and the heat control door drops to the floor of the snorkel closing off the hot air and opens the snorkel to eliminate any undue resistance to free breathing of the engine.

SERVICE PROCEDURES

HEATED AIR SYSTEM

Improper functioning of this system will affect driveability as well as affecting the vehicle exhaust emission control system and may result in failure of the vehicle to meet Federal Emission regulations.

To determine whether the system is functioning properly, the following procedure should be used:

(1) Make sure all vacuum hoses (Figs. 3 and 4), and the stove to air cleaner flexible connector are properly attached and are in good condition.

(2) With a cold engine and ambient temperature in the engine compartment of less than 100 degrees F., the heat control door (valve plate) in the snorkel should be in the **up position** or **heat on position.**

(3) With the engine warmed up and running, check the air temperature entering the snorkel or at the sensor. When the air temperature entering the outer end of snorkel is 105 degrees F. or higher the door should be in the **down** position (**heat off**).

(4) Remove the air cleaner from the engine and allow it to cool down to 90 to 95 degrees F. With 20″ Hg vacuum applied to the sensor the door should be in the **up** position (**heat on** position). Should the door not rise to the heat on position, check the vacuum diaphragm for proper operation.

(5) Check the vacuum diaphragm by applying vacuum directly to the vacuum diaphragm (with Tool C-3707 and vacuum pump C-4081) with a vacuum gauge in the line and a bleed valve to control the vacuum

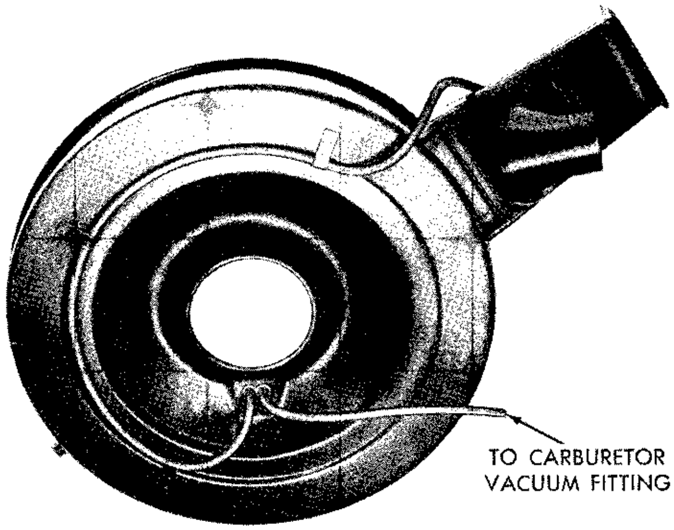


Fig. 3—Routing of Vacuum Hoses Single Snorkel Air Cleaner

inserted in the line between the gauge and the vacuum source. Apply 20 inches Hg to the vacuum diaphragm and stop off the line and check for diaphragm leaks (Fig. 5). The diaphragm should hold 20" Hg for five minutes. Next release the vacuum on the vacuum diaphragm. Then with the use of the bleed valve build the vacuum slowly and observe the door operation. The door should lift off the bottom of the snorkel at not less than 5 inches Hg and be in the full up position with no more than 9 inches Hg.

(6) Should the vacuum diaphragm not perform adequately, replace it and repeat the checks in steps 2 and 3.

(7) Should the vacuum diaphragm perform adequately but proper temperature is not maintained, replace the sensor and repeat the temperature checks in steps 2 and 3.

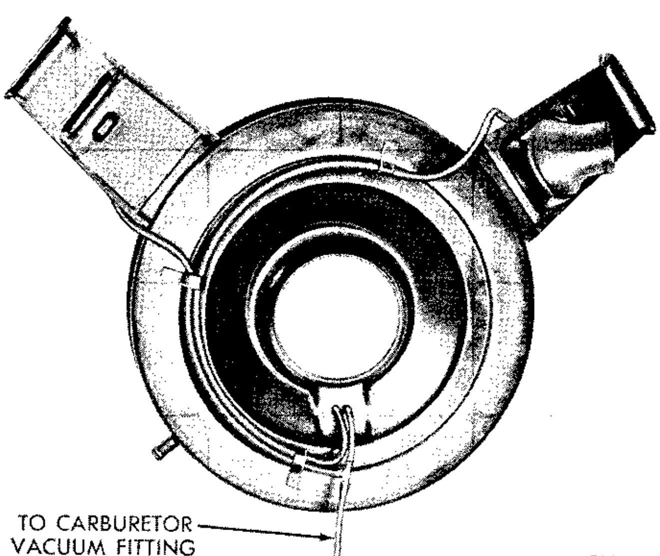


Fig. 4—Routing of Vacuum Hoses Dual Snorkel Air Cleaner

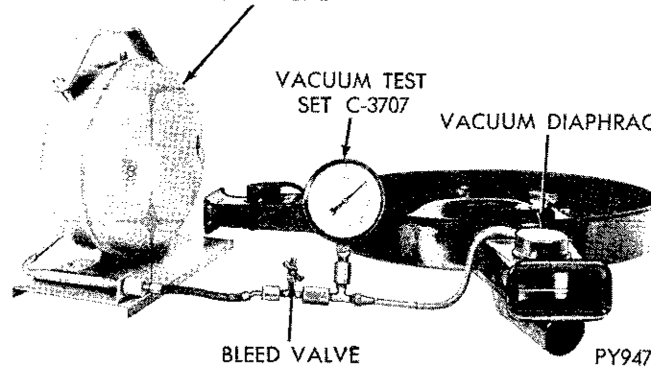


Fig. 5—Inspecting Vacuum Diaphragm

DUAL SNORKEL

The dual snorkel air cleaner performs at low temperatures and above 105 degrees F. basically like a single snorkel air cleaner with one exception:

(1) On deep throttle accelerations, both snorkels are open (when intake manifold vacuum drops below the 5 inches Hg).

(2) The non-heat air snorkel is conencted to manifold vacuum through a **"TEE"** in the vacuum hose between the carburetor and the sensor (Fig. 4).

Check second snorkel vacuum diaphragm as one with heat connector.

VACUUM DIAPHRAGM

With air cleaner housing removed from vehicle.

(1) Bend down lock tab (Fig. 6) and carefully lift forward edge to clear lock tab, then slide forward to disengage rear lock tab, then slide to right to unhook operating rod from heat control door (Fig. 7).

(2) With the vacuum diaphragm removed, check the door for freedom of travel. When the door is

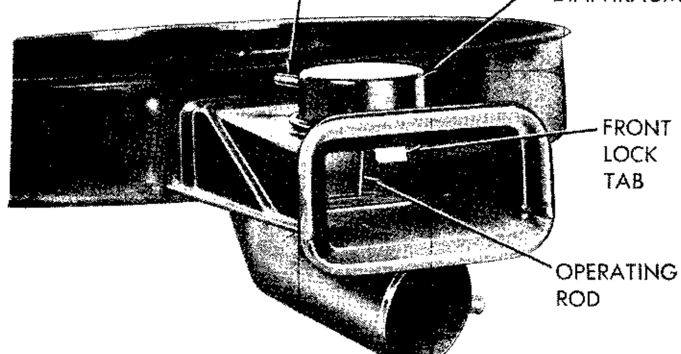


Fig. 6—Opening Front Lock Tab

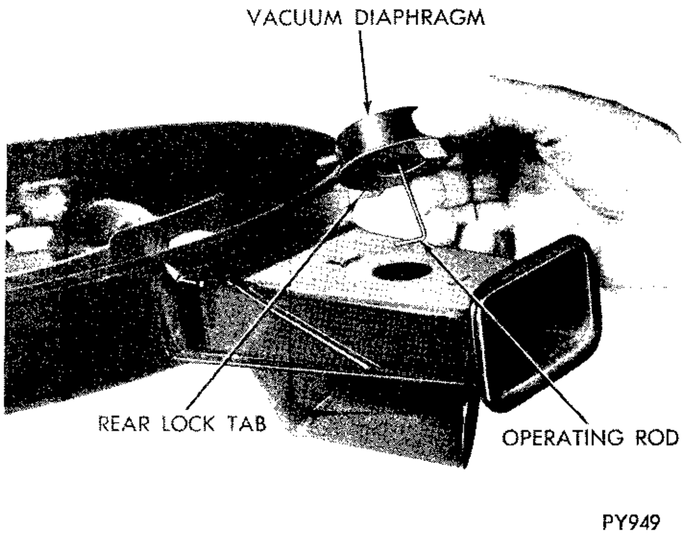


Fig. 7—Removing or Installing Vacuum Diaphragm

raised to the up position, it should fall freely when released. If it does not, observe door to snorkel side walls for interference or foreign matter. Also check hinge pin for foreign matter. Try to release by blowing with compressed air or by releasing the interference.

Installation

(1) Insert operating rod into heat control door, then slide rearward engaging the rear lock tab, when front lock is in position press forward edge down.

(2) While holding vacuum diaphragm down, apply 9 inches of vacuum to diaphragm hose nipple, door should operate freely. If door operates freely, bend lock tab forward. While supporting snorkel and the lock tab with a piece of flat steel held securely under lock tab, flatten flush with snorkel. **Manually operating heater door could cock rod and diaphragm which would restrict operation of the heater door.**

(3) Assembly air cleaner, install on vehicle and test operation.

SENSOR

Removal

With air cleaner housing removed from vehicle.

(1) Disconnect vacuum hoses from sensor, remove retainer clips (Fig. 8), and discard (new clips are supplied with a new sensor).

(2) Remove sensor with gasket and discard.

Installation

(1) Position gasket on air cleaner housing and install sensor (Fig. 9).

(2) Supporting sensor on outer diameter, install new retainer clips securely being sure gasket is compressed to form an air seal. **Supporting sensor on plastic guard could damage bi-metal strip. No attempt should be made to adjust sensor.**

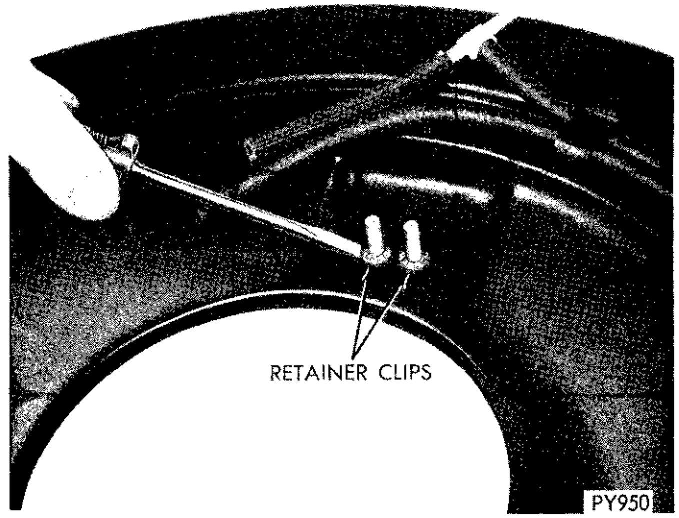


Fig. 8—Removing Retainer Clips

(3) Install vacuum hoses (Figs. 3 and 4).

(4) Install air cleaner and test operation. Refer to Exhaust System, Group 11, for service procedures on Air Heaters.

CARBURETORS AND CHOKES

All carburetors have leaner mixtures and mixture distribution has been improved on all engines. All two and four barrel carburetors will have dual idle mixture screws with an external adjustment limiting device for better control of idle mixtures. Other carburetor changes include: idle fuel discharged into a bypass air slot for better atomization (383 CID 2V).

Used in conjunction with heater intake air is a new fast acting automatic choke control. This unit reacts quickly to hot exhaust gases to provide a shortened period of mixture enrichment, and hence improved

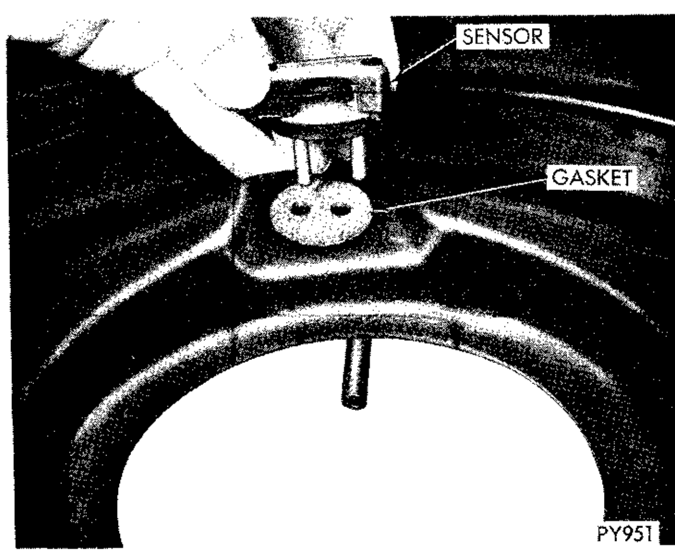


Fig. 9—Installing Gasket and Sensor

fuel economy and reduced emissions. This is achieved by using a removable, thin stamped, stainless-steel cup between the thermostatic choke control unit and the exhaust passage gases in place of the thicker cast-in manifold pocket used previously. A gasket is installed between the steel cup and manifold to ensure that no exhaust leak occurs. Also a part of the heated air system is a heat insulating spacer between the intake manifold and carburetor. This is used in place of a gasket and is essential for correct operation.

IDLE SPEED SOLENOID

The 440 high performance engines employ idle speeds between 800 and 1000 rpm to obtain acceptable lower emissions during idle and deceleration. In order to prevent "after running" with such high idle speeds, these engines have an electrical solenoid throttle stop which holds the throttle at the correct idle position when energized but de-energizes when the ignition is turned off, allowing the throttle blades to close more completely. Refer to "Fuel System" Group 14 for service procedures.

LOWER COMPRESSION RATIOS

The 383 and 440 CID engines have new pistons to reduce compressions by about 0.5. The lower compression ratio reduce hydrocarbon emissions by producing a better combustion chamber shape and by leaving more heat in the exhaust to assist the after combustion reaction.

DISTRIBUTOR SOLENOID

All 383 and 440 engines have a solenoid incorporated in the distributor vacuum advance mechanism to retard the ignition timing when the throttle is closed. At closed throttle, electrical contacts on the carburetor throttle stop and with idle adjusting screw in the closed position, causes the distributor solenoid to energize. This retards the ignition timing to provide reduced exhaust emissions under hot idle conditions. Cold or part throttle starting is not penalized because the distributor solenoid is not energized unless the hot idle adjusting screw is against the throttle stop contact. **Timing must be set at closed throttle to give ignition full retard.**

SERVICE PROCEDURES

IGNITION TIMING (383 Cu. In. 440 Cu. In.)

(Solenoid Distributor)

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give proper ignition timing. The ignition timing test will indicate the timing of the spark at No. 1 cylinder at curb idle (Hot only).

Test procedure as follows:

(1) Disconnect vacuum hose at distributor, and plug hose.

(2) Connect the secondary lead of a power timing light to No. 1 spark plug, red primary lead to positive terminal of the battery and the black primary lead to the negative battery terminal. **Do not puncture cables, boots or nipples with test probes. Always use proper adapters. Puncturing the spark plug cables with a probe will damage the cables. The probe can separate the conductor and cause high resistance. In addition breaking the rubber insulation may permit secondary current to arc to ground.**

(3) Loosen the distributor hold-down mounting screw just enough so distributor housing can be rotated in its mounting.

(4) Start the engine and set the curb idle as shown in "Specifications." (Transmission in Neutral and Engine Hot).

(5) Aim the power timing light at the timing marks on the chain case cover. If the timing light flash occurs when the timing mark on the vibration damper is located ahead of specified degree mark on the timing plate. The timing is advanced. To adjust turn distributor housing **(Not Vacuum Chamber)** Counter clockwise. **Do not use vacuum chamber as a turning handle.** If the timing light flash occurs when the timing mark on the vibration damper is located past the specified degree mark on the timing plate. The timing is retarded. **To adjust turn distributor housing clockwise**. Timing may vary from the specified specifications a plus or minus 2-1/2° and still fall within range, but if the timing is checked it should be adjusted to the specification shown on the distributor charts.

(6) To check the distributor solenoid for proper operation, disconnect the wire at the carburetor. Aim the power timing light at the timing marks on the chain case. The timing should advance above 5-1/2° and the engine speed should increase.

(7) Stop the engine and tighten the distributor hold-down screw.

(8) Reconnect the wire at the carburetor throttle stop.

(9) Reconnect the vacuum hose to the distributor.

(10) Remove the timing light.

EVAPORATION CONTROL SYSTEM

Chrysler Corporation cars sold in California have an Evaporation Control System (ECS) to reduce the loss of fuel from the fuel system to the atmosphere by evaporation. This is a closed system which controls fuel expansion and feeds fuel evaporation emissions from the carburetor or fuel tank. The vapors pass through vent lines to the crankcase by way of the crankcase inlet air cleaner. Since fuel vapors are two

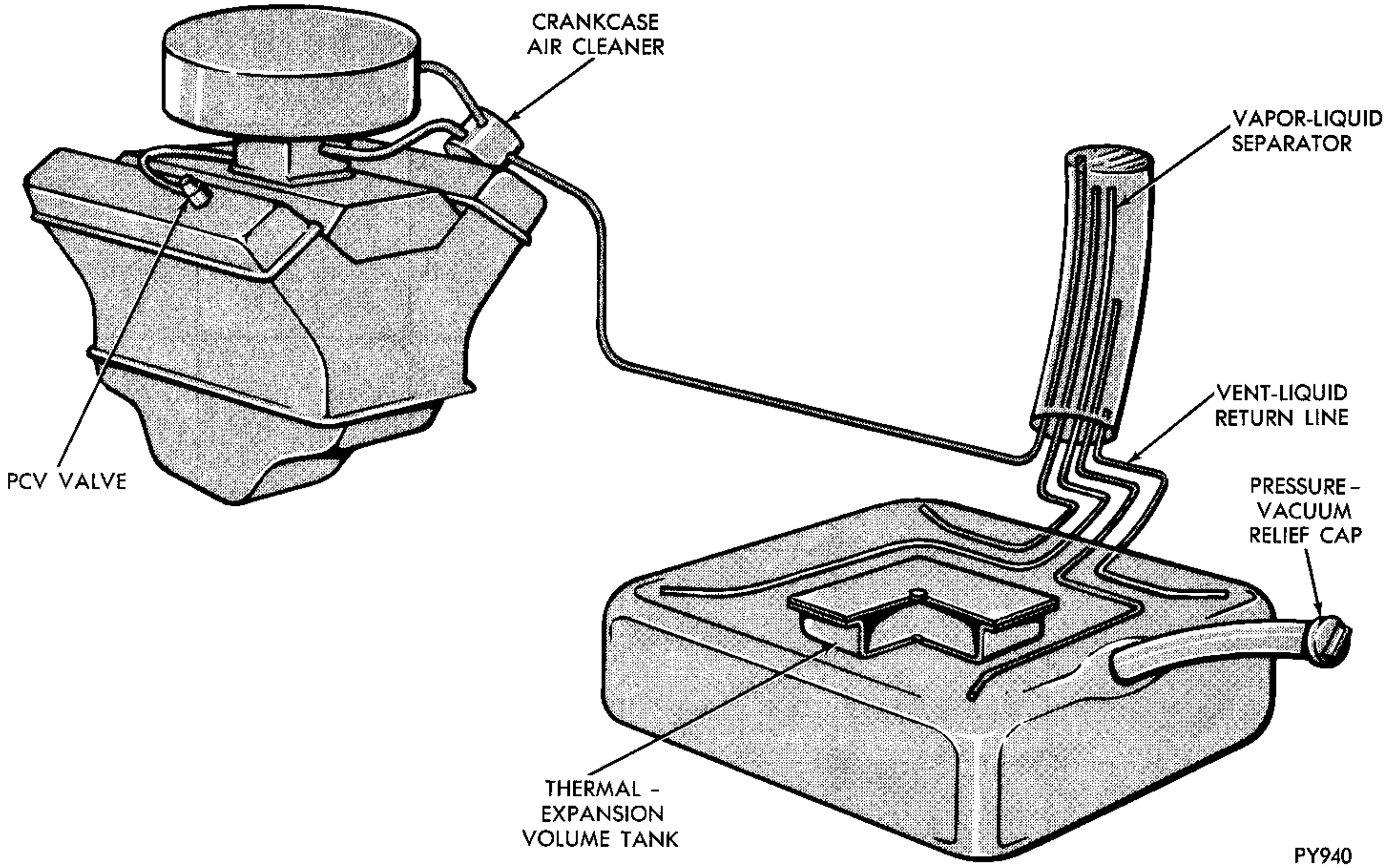


Fig. 10—Evaporation Control System

to four times heavier than air, they settle to the bottom of the crankcase. With the engine running the fuel vapors are purged from the crankcase and together with the normal crankcase vapor are drawn via the crankcase ventilation system, which is an existing part of the Cleaner Air System (CAS) into the base of the carburetor to be burnt by engine combustion.

The possible expansion of fuel in a full fuel tank, due to a rise in temperature, is allowed for by a 1.4 gallon over-fill limiter tank inside the main fuel tank which fills much slower than the main tank. When the main tank is filled, it remains essentially empty to allow for thermal expansion ((Fig. 10).

The loss of any fuel or vapor out of the filler neck is prevented by the use of a filler cap which will release only under significant pressure (1/2 to 1 psi) or vacuum (1/4 to 1/2 psi). This cap is identified by the words **pressure-vacuum** and must be replaced by a similar unit if replacement is necessary, in order for the system to remain effective.

Because the fuel tank is flat on top, four vents are used, one in each corner of the tank and are connected to a vapor-liquid separator by rubber hoses. The vapor-liquid separator is a piece of two inch steel tubing mounted at an angle inside the trunk of the vehicle (quarter panel) which internally holds four vent lines from the tank and a vent line which leads to the crankcase inlet air cleaner. These lines are of different heights so the tank will always be vented regardless of vehicle attitude, and fuel vapor will be transferred to the crankcase. One vent line from the tank is short to provide a drain back to the tank for any liquid fuel which may get into the separator during maneuvers or incline parking. The vent to the crankcase is at the highest point in the separator and has a small orifice to minimize liquid fuel transfer to the crankcase.

The ECS system also includes closed ventilation of fuel vapor from the carburetor bowl. On eight cylinder engines this is accomplished via a hose connection from the carburetor bowl to the crankcase inlet air cleaner.

SERVICE DIAGNOSIS

The ECS sysem should not require any maintenance in normal service. Any loss of fuel or vapor from the fuel filler cap would indicate one or more of the following:

(1) An unsatisfactory seal between cap and filler neck.

(2) A malfunction of ECS cap release valve. A quick check of the ECS fuel cap may be made by placing against the mouth and blowing into the hole in the release valve housing. An immediate leak with light blowing or lack of release with hard blowing indicates a defective or incorrect unit.

(3) All ECS lines plugged between fuel tank and vapor separator.

(4) Plugged ECS line between the vapor separator and the crankcase air inlet filter.

(5) Plugged fuel tank expansion chamber inlet hole in main tank. A removable plug is provided in the top surface of ECS fuel tanks, for access to expansion chamber in event of plugging of its fill/drain hole. If purging of the fuel tank is required, the expansion chamber must be purged separately through the top access plug hole.

EXHAUST SYSTEM AND INTAKE MANIFOLD

CONTENTS

GENERAL INFORMATION

Exhaust Pipes, Mufflers and Tail Pipes

The single line exhaust system, used on Chrysler and Imperial models (Fig. 1), uses mufflers made of aluminized steel components. This system, when used on all models except station wagons, uses in addition to the conventional muffler, a straight-through resonator type muffler located rearward of the kick-up.

The dual exhaust system, used on Chrysler models (Fig. 2), uses mufflers made of aluminized and stainless or chromized steel components.

Tail pipes on all Chrysler and Imperial models are made of aluminized steel.

Ball joint connections are used in the exhaust pipes on **all** models to facilitate installation and alignment of the exhaust system. No gaskets are used at the ball joints connections.

The single and dual exhaust systems on all Chrysler and Imperial models are suspended from the shock absorber crossmember brackets at the top of the tail pipe kick-up by flexible, double loop type supports. A U-bolt and saddle clamping arrangement secures the tail pipe to the muffler outlet extension. Flexible "L" shaped supports are used to suspend the rear ends of the tail pipes.

Manifold Heat Control Valve

A thermostatic heat control valve is incorporated in the right hand exhaust manifold, (Fig. 4). This valve directs exhaust gases to the heat chamber beneath the carburetor mounting flange in the intake manifold to help vaporize the fuel mixture during the warm-up period.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXCESSIVE EXHAUST NOISE	(a) Leaks at pipe joints. (b) Burned or blown out muffler. (c) Burned or rusted out exhaust pipe. (d) Exhaust pipe leaking at manifold flange. (e) Exhaust manifold cracked or broken. (f) Leak between manifold and cylinder block.	(a) Tighten clamps at leaking joints. (b) Replace muffler assembly. (c) Replace exhaust pipe. (d) Install a new gasket and tighten exhaust pipe flange nuts to 50 foot-pounds. (e) Replace manifold. (f) Tighten manifold to cylinder block nuts to 30 foot-pounds.
LEAKING EXHAUST GASES	(a) Leaks at pipe joints. (b) Damaged or improperly installed gaskets. (c) Restriction in muffler or tail pipe.	(a) Tighten clamps at leaking joints. (b) Replace gaskets as necessary. (c) Remove restriction, if possible, or replace as necessary.
ENGINE HARD TO WARM UP OR WILL NOT RETURN TO NORMAL IDLE	(a) Heat control valve frozen in open position.	(a) Free up manifold heat control valve using a suitable solvent.
NOISE IN MANIFOLD	(a) Thermostat broken. (b) Weak, broken or missing anti-rattle spring.	(a) Replace thermostat. (b) Replace spring.
MANIFOLD HEAT CONTROL VALVE RATTLE	(a) Thermostat broken. (b) Broken, weak or missing anti-rattle spring.	(a) Replace thermostat. (b) Replace spring.

SERVICE PROCEDURES

EXHAUST PIPES, MUFFLERS, TAIL PIPES

Removal

(1) Raise vehicle on hoist and apply penetrating oil to all clamp bolts and nuts to loosen rust and corrosion. **If only the muffler is to be replaced, cut the extension pipe just forward of the muffler with a hack saw or cutter. It is not necessary to remove the exhaust pipe. The replacement muffler can be installed, using a U-bolt and saddle clamping arrangement at the front of the muffler.**

(2) Remove clamps and supports from exhaust pipe, muffler and tail pipe (Figs. 1 and 2).

(3) Remove bolts at ball joint connections.

(4) Disconnect exhaust pipe at exhaust manifolds and remove exhaust pipe. Discard gaskets and carefully clean manifold flanges of any gasket particles.

(5) Remove muffler and extension pipe.

(6) Raise rear end of vehicle to relieve body weight from rear springs and remove tail pipe.

Installation

(1) Assemble exhaust pipe, muffler and tail pipe loosely to permit proper alignment (Figs. 1 and 2).

(2) Assemble exhaust pipe to exhaust manifolds, using new gaskets. Tighten bolt nuts to specifications.

(3) Adjust tail pipe and muffler supports to provide proper clearance with underbody and adjacent parts. **Do not fully tighten attaching bolts and screws at this time.**

(4) Tighten all slip joint U-bolt nuts 150 inch-pounds, working from rear to front.

(5) Tighten tail pipe support attaching clamp screws to 95 inch-pounds, at same time maintaining proper clearance with adjacent parts.

(6) Tighten tail pipe front support clamp screws to 100 inch-pounds.

(7) Tighten exhaust pipe ball joint connection bolts to 24 foot-pounds. Alternate tightening to insure parallelism of flanges.

INTAKE MANIFOLD

Refer to "Engine" Group 9 for removal and installation of intake manfold.

With manifold removed, clean and inspect it as follows:

(1) Clean manifold in solvent. Blow dry with compressed air.

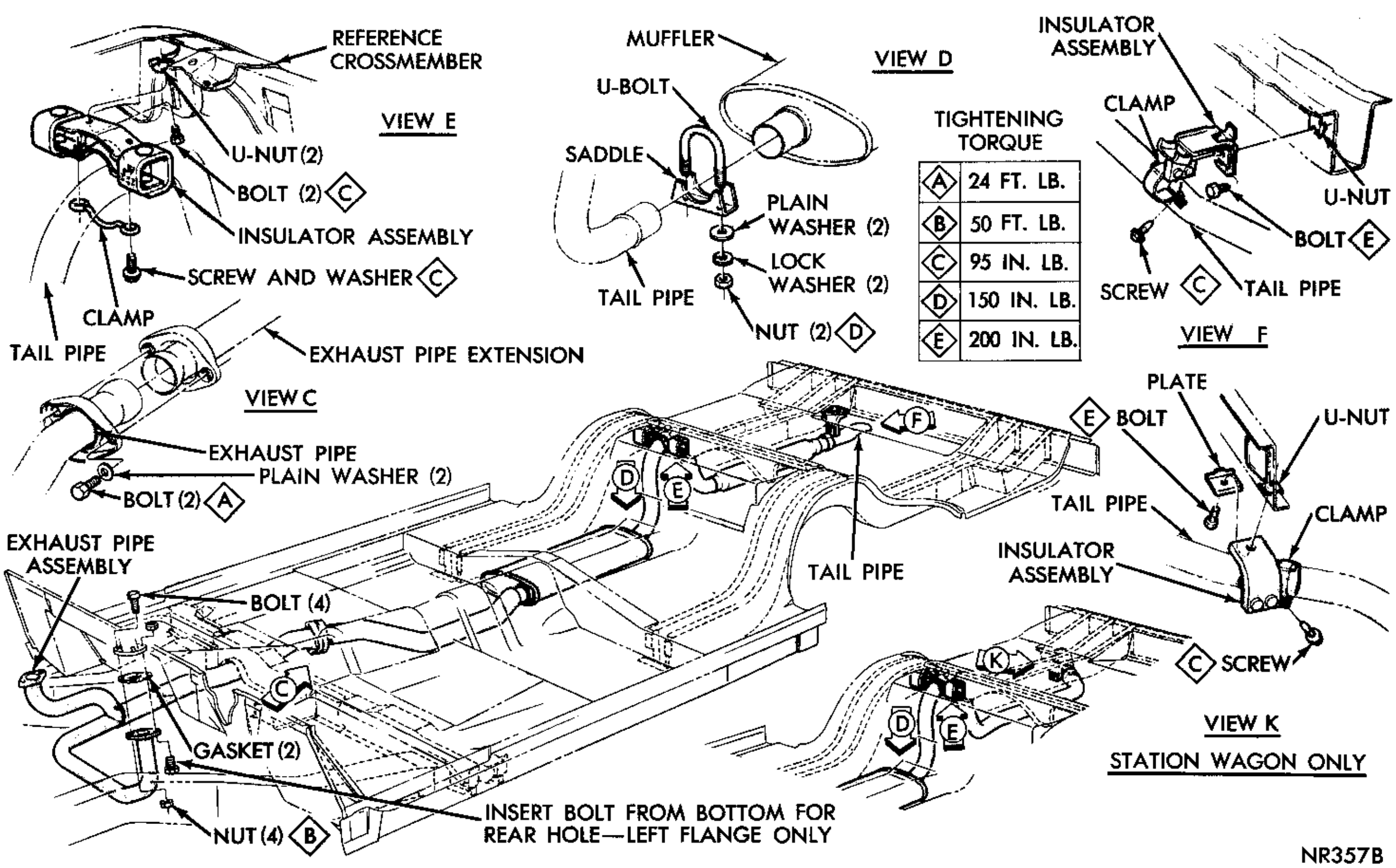


Fig. 1—Single Exhaust System

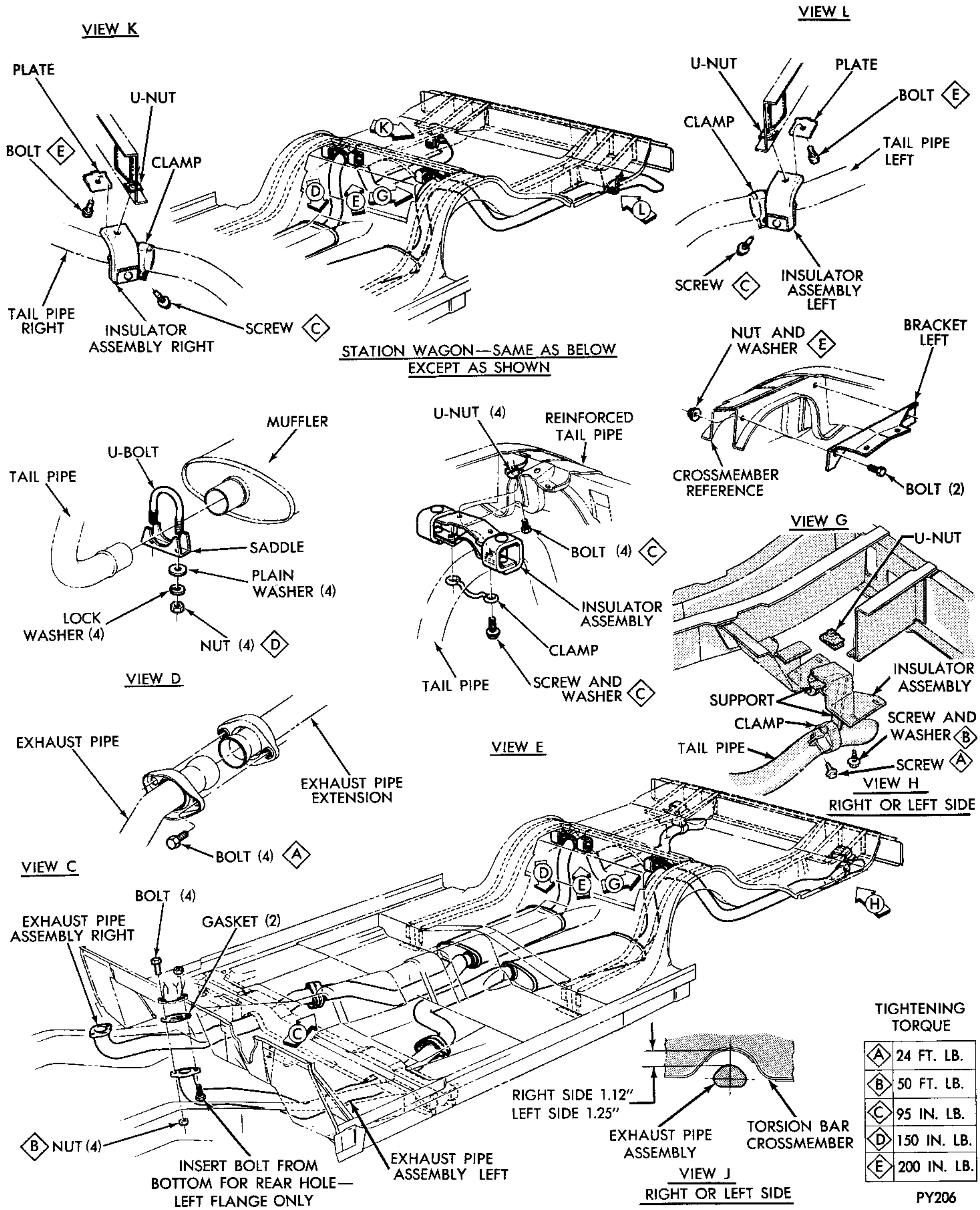


Fig. 2—Dual Exhaust System

(2) Inspect exhaust cross-over passages and pressure test for leakage into any of the intake passages.

(3) Inspect mating surfaces for parallelism.

(4) Use new gaskets when installing manifold.

CARBURETOR AIR HEATER

Removal

(1) Disconnect flexible connector between air cleaner and air heater (Fig. 3).

(2) Remove stud nuts attaching carburetor air heater to exhaust manifold.

(3) Remove upper half of carburetor air heater by lifting straight up.

(4) Slide lower half of carburetor air heater off studs and away from exhaust manifold.

Installation

(1) If studs come out with the nuts, install new studs and tighten to 45 inch-pounds.

(2) Install lower half of carburetor air heater on studs.

(3) Position upper half of carburetor air heater on manifold and studs.

(4) Install nut and washer assemblies and tighten to 45 inch-pounds.

(5) Install flexible connector between air cleaner and air heater.

EXHAUST MANIFOLD

Removal

(1) Remove spark plugs.

(2) Remove alternator from right hand cylinder head.

(3) Remove bolts and nuts attaching exhaust pipe to exhaust manifold flanges.

(4) Remove nuts attaching exhaust manifolds to

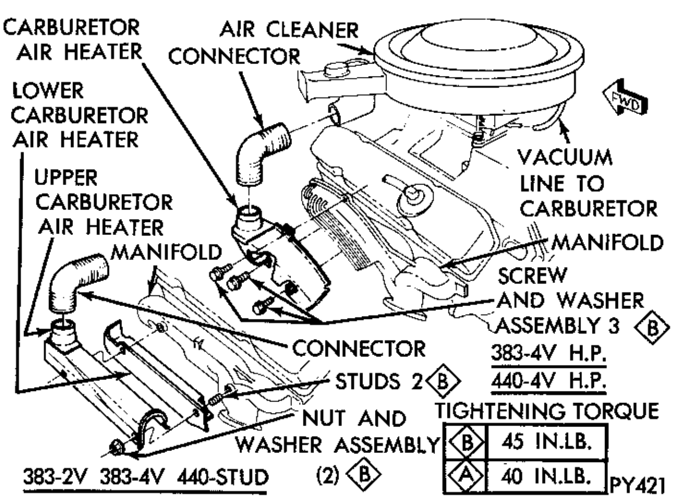


Fig. 3—Carburetor Air Heater

cylinder heads.

(5) Slide manifolds off studs and away from cylinder heads.

Cleaning and Inspection

(1) Clean exhaust manifolds in solvent. Blow dry with compressed air.

(2) Inspect manifolds for cracks and distortion.

(3) On **right hand** manifold test manifold heat control valve for free operation. If necessary to free up, apply a suitable manifold heat control valve solvent to both ends of valve shaft. A suitable solvent is available under Part Number 2525054, Manifold Heat Control Valve Solvent or equivalent. Be sure manifold is **COOL** and solvent is allowed to soak a few minutes to dissolve deposits. Then, work valve back and forth until it turns freely.

Installation

CAUTION: If studs came out with the nuts, install new studs, applying sealer on the coarse thread ends. If this precaution is not taken, water leaks may develop at the studs.

(1) Install manifolds on cylinder heads. No gaskets are required. Tighten stud nuts to 30 foot-pounds.

(2) Install exhaust pipe on exhaust manifolds. Tighten nuts to 50 foot-pounds.

(3) Install alternator on right hand cylinder head and adjust belt tension.

(4) Install spark plugs and tighten to 30 foot-pounds.

MANIFOLD HEAT CONTROL VALVE (All Models)

Operation of the manifold heat control valve should be inspected periodically. With engine idling, accelerate momentarily to wide open throttle. The counterweight should respond by moving **clockwise** approximately 1/2 inch and return to its original position. If no movement is observed, the shaft is binding due to accumulation of deposits or the thermostat is weak or broken.

The application of a suitable manifold heat control valve solvent, every engine oil change to both ends of the manifold heat control valve shaft at the bushings, will keep the valve working freely. A suitable solvent is available under Part Number 2525054, Manifold Heat Control Valve Solvent or equivalent. The solvent should be applied when manifold is **COOL** and allowed to soak a few minutes to dissolve deposits. Then, work valve back and forth until it turns freely.

383-440 CUBIC INCH ENGINES

Remove exhaust manifold as outlined on this page.

(1) Position valve plate, grind off spot welds from valve plate and shaft.

(2) Remove counterweight and shaft assembly, valve plate.

(3) Press out bushings and cup seals from manifold (Fig. 4).

(4) Inspect vent holes and clean out if necessary.

Installation

(1) **Press** in cup seals until seals extend into manifold .100 inch on each side with cupped ends facing outward (Fig. 4).

(2) **Press** in bushings flush with outer edge of exhaust manifold.

(3) Line ream bushings and seals .3095 to .3110 inch diameter. Test for free fit of shaft in bushings and seals.

(4) Mark one end of shaft with a suitable dye at 1,240 inches, press counterweight on marked end of shaft until flush with end of shaft.

(5) Install thermostatic spring on counterweight with center end or tab pointing **left** and outer end or hook pointing right.

(6) Install valve stop on counterweight with looped ends facing away from thermostatic spring hook end.

(7) Holding thermostatic spring wrapped 215 degrees in a **counterclockwise** direction viewed from counterweight end, install shaft assembly in manifold and valve plate with strap facing flange end of manifold; attach hook end of thermostatic spring to stop pin (Fig. 4).

(8) With counterweight end of shaft positioned 1,240 inches (previously identified) away from manifold, valve plate centered between seals and valve plate closed (Fig. 3).

(9) Arc weld valve plate to shaft with stainless steel rod. **Arc welding ground must be made at counterweight.**

(10) Test for free operation. Install anti-rattle spring.

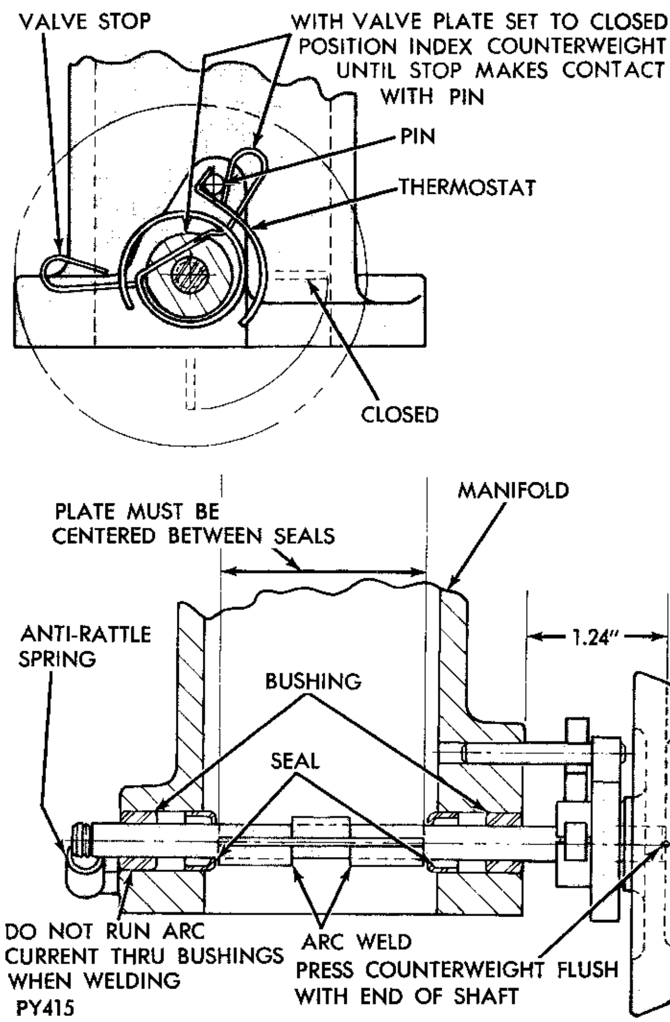


Fig. 4—Proper Manifold Heat Control Valve Installation

(11) Complete assembly and installation as outlined on page 4.

TIGHTENING REFERENCE

	Pounds Foot	Pounds Inch
Converter Housing Bracket Screw	15	
Exhaust Manifold Stud Nuts	30	
Exhaust Pipe U-Bolt Nuts		150
Exhaust Pipe Ball Joint Bolt	24	
Exhaust Pipe Flange Bolt Nuts	50	

	Pounds Foot	Pounds Inch
Support Clamp Screws		95
Tail Pipe Front Support Clamp Screws		150
Tail Pipe Support to Crossmember Screws		200

FUEL SYSTEM

CONTENTS

GENERAL INFORMATION

SERVICING 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 original designed performance.

When overhauling the carburetor, several items of importance should be observed to assure a good job:

(1) All parts (except the choke diaphragm assembly) should be carefully cleaned in a suitable solvent, then inspected for damage or wear.

(2) Use air pressure only, to clear the various orifices and channels.

(3) Replace questionable parts with NEW ones. When checking parts removed from the carburetor, it is at times rather difficult to be sure they are satisfactory for further service. It is therefore, recommended that in such case, NEW parts be installed.

(4) Always use a complete kit when overhauling the carburetor. Using the code number stamped on the air horn, adjacent to the fuel inlet, refer to the parts catalog and order the correct repair kit for the carburetor being worked on.

CLEANING CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents, (such as Metalclene) which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or soft wire brush. Shake dirt or other foreign material from the stem side of the diaphragm. Depressing the diaphragm stem to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt, **but should not be connected to the vacuum inlet fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a 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 gasoline or kerosene 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 fuel mixture too rich for proper performance.

AUTOMATIC CHOKE (Well Type)

A new design well for the automatic choke has been incorporated in all engines except the 440 cu. in. tri-carb installation and the 426 cu. in. Hemi. This new design allows faster opening of the choke mechanism resulting in leaner fuel mixtures during the warm-up period for reduced emissions and fuel consumption. (Fig. 1).

To function properly, it is important that all parts be clean and move freely. 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. Move the choke rod up and down to check for free movement in the coil housing. If unit binds, a new unit should be installed. **The well type choke is serviced as an assembly. Do not attempt to repair or change the setting, unless authorized by service literature. Changes of the choke setting materially affect summer temperature cold starting and seldom are a satisfactory correction of drive-ability problems, which are generally associated with carburetors or vacuum diaphragms.**

Two types of wells are in general usage. One is cast as an integral part of the manifold. The second is a

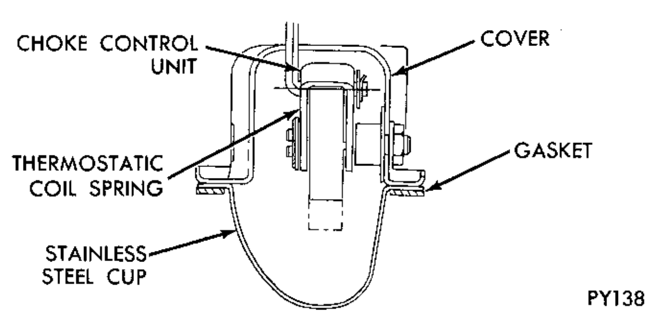


Fig. 1—Choke Control (Open Well) 8-cylinder Engine

stainless steel cup fastened over a port in the manifold (Fig. 1).

The stainless steel well cups are held in place by choke retainer bolts. A steel-asbestos gasket seals the exhaust gas within the manifold. **Loosening or removing the choke retainer bolts will allow exhaust gases to escape into the engine compartment. DO NOT RUN THE ENGINE WITHOUT THE CHOKE FIRMLY BOLTED TO THE MANIFOLD. FIRE OR HEAT DAMAGE MAY OCCUR.**

When installing the steel well cup, make certain the gasket is in good condition and is in place to prevent exhaust leakage.

Do not lubricate any of the choke parts or the control unit. This causes dirt to accumulate, and would result in binding of the choke mechanism.

The choke control unit is accurately adjusted when first assembled. Under normal servicing do **NOT** change the setting or disassemble the control unit. If however, the setting has been disturbed, reset as follows: Loosen locknut and turn shaft with screwdriver until index mark on disc is in alignment with correct mark on the frame. Hold in this position with screwdriver while tightening nut, (Refer to Specifications for indexing).

All the carburetors referred to in the Fuel System are either equipped for use with a Cleaner Air System (C.A.S.) or an Evaporation Control System, (E.C.S.) depending on the area in which the vehicle is to be used. The servicing procedures covering these carburetors are nearly identical. Differences between the two types of carburetors are covered (where applicable) in the service procedures.

CLEANER AIR SYSTEM (C.A.S.)

The cleaner air system consists of a special air cleaner, breather cap, ventilation valve, carburetor, distributor and various other automatic control devices, (Fig. 2) as required.

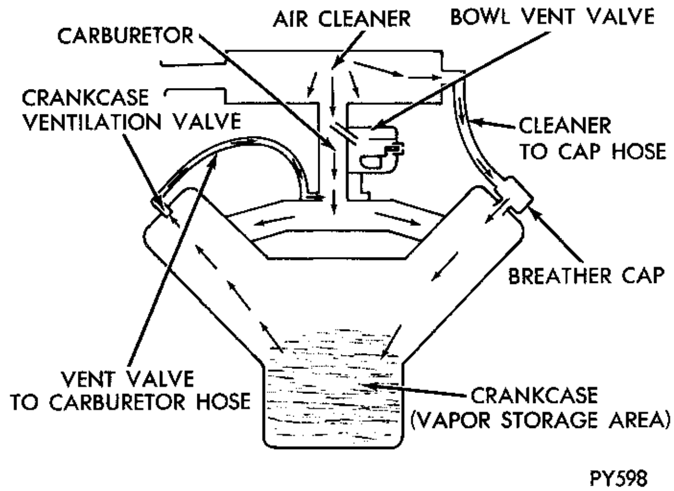


Fig. 2—Cleaner Air System (C.A.S.)

The function of the cleaner air system is to reduce the unburned hydro-carbons emitted by the vehicle's engine. Fresh air is drawn into the air cleaner, for consumption by the engine. A portion of this fresh air is diverted through a hose to the breather cap and into the crankcase. Manifold vacuum causes crankcase vapors (including fresh air and unburned hydro-carbons) to flow through the crankcase ventilation valve to the base (or throttle body) of the carburetor. These vapors are joined with the fuel mixture in the intake manifold and are delivered into the combustion chamber, from which they are ejected as essentially completely burned exhaust products.

EVAPORATION CONTROL SYSTEM (E.C.S.)

The evaporation control system consists of the C.A.S. system plus, a special vented fuel tank, separator, fuel tank vapor tube, breather cap, enclosed bowl vent valve, a vacuum pressure relief fuel tank cap and hoses (Fig. 3).

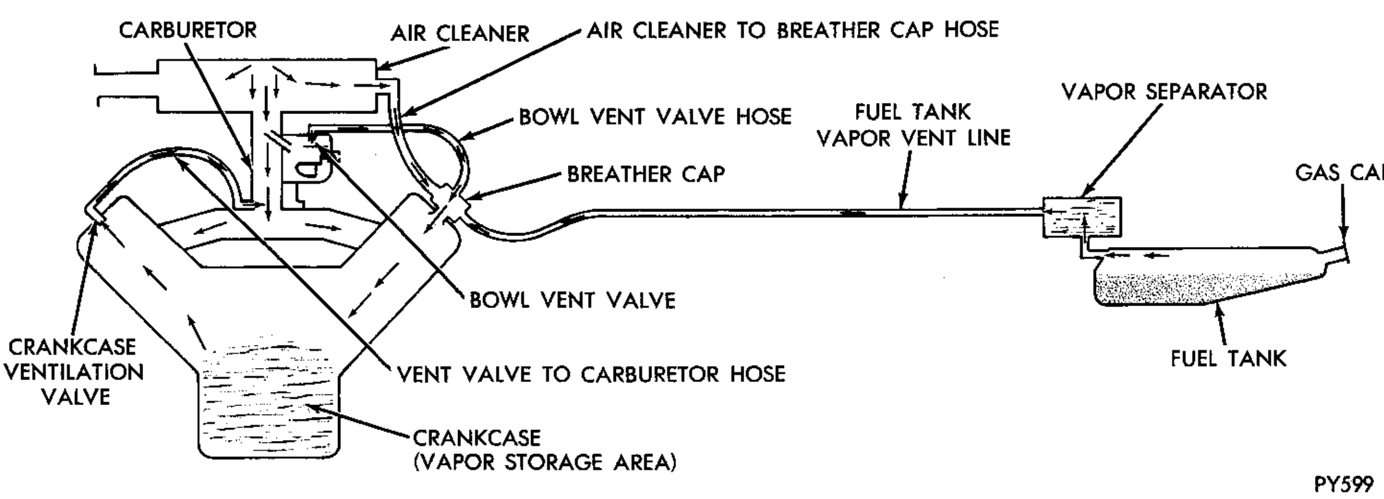


Fig. 3—Evaporation Control System (E.C.S.)

The function of the evaporation control system is to reduce the loss of fuel from the fuel system to the atmosphere by evaporation and reduce the unburned hydro-carbons emitted by the vehicle's engine. When fuel evaporates from the carburetor or fuel tank, it passes through vent hoses or tubes to the crankcase. With the engine running, vapors are purged from the crankcase through the crankcase ventilation system, as in the Cleaner Air System previously described.

The fuel tank contains a one gallon overfill limiter tank. When the fuel tank is filled, the overfill limiter tank remains essentially empty, to allow for thermal expansion. Each corner of the fuel tank is vented and each of the hoses from these vents are connected to the separator. A tube from the separator leads to the breather cap. Thus evaporated fuel vapor from the fuel tank, flows through the separator, to the engine crankcase and then through the crankcase ventilation system. In addition, the carburetor fuel bowl vent valve is also included, by a tube from the vent valve to the breather cap, or fuel pump. (6 Cylinder engines.) This completely seals the fuel system.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment on carburetors, secure an accurate ignition tachometer and a Sun Electric Combustion-Vacuum Unit, Model 80, Exhaust Condenser, Model EC, and Hose 669-14 or equivalent. (The above analyzer is recommended; however, other reliable makes of analyzers in good condition may be used). Proceed as follows:

(1) Engine running at normal operating temperature, and timing checked, (refer to Distributor Specifications).

(2) Air Cleaner installed.

(3) Automatic transmissions in neutral position (not in park position).

(4) On air conditioned cars, turn air conditioning **off.**

(5) Connect ignition tachometer.

(6) Insert probe of exhaust gas analyzer in tail pipe as far as possible (2 ft. minimum distance). On dual exhaust cars use left side tail pipe (side opposite heat valve). It is very important that probe and connecting tubing be free of leaks to prevent erroneous reading. If a garage exhaust system is used to conduct exhaust gases away, a plenum chamber or other means must be used to reduce vacuum or exhaust system to 1/2 inch water or less.

(7) Connect exhaust gas analyzer, warm up and calibrate according to manufacturer's instructions.

(8) Disconnect hose between distributor vacuum control valve and intake manifold.

(9) Set idle speed to specified value for specific engine-transmission combination.

(10) **IMPORTANT: When adjusting mixture screws to obtain air/fuel ratio specified, do not turn the mixture screw more than 1/16 turn at a time. The combustion analyzer is so sensitive that the ratio must be changed in very small increments if accurate readings are to be obtained. The meters read in air/fuel ratio so that a higher reading indicates a leaner mixture and vice versa.**

(a) Adjust each screw 1/16 turn richer (counterclockwise) and wait 10 seconds before reading meter.

(b) If necessary, repeat step "a" until meter indicates a definite increase in richness (lower reading). This step is very important since meter reverses its readings and indicates a richer mixture as carburetor is leaned out if carburetor is set too lean.

(c) When it has been established that meter is indicating a lower reading (richer mixture) when idle mixture screws are turned in richer direction, proceed to adjust carburetor to give 14.2 air/fuel ratio, turning screws counterclockwise (richer) to lower meter reading and clockwise (leaner) to increase meter reading.

(d) If idle speed changes as mixture screws are turned, adjust speed to specified value and readjust mixture as required so that 14.2 air/fuel ratio is obtained at specified idle speed.

ROUGH IDLE AND LOW SPEED SURGE

Rouge idle and low speed surge on vehicles (using 1-1/2" BBD, AVS, and Holley 4160 carburetors) may be the result of improper idle setting balance between the right and left carburetor bores. To correct this condition the following steps should be followed.

(1) Remove the plastic caps from the two idle screws in base of carburetor (1-1/2" BBD and AVS) or cup or in the sides if the primary metering block (Holley). (Figs. 1, BBD, AVS, and Holley).

(2) With exhaust thoroughly warmed up, install an approved exhaust gas analyzer for carburetor idle speed and mixture adjustment as described under "Idle Speed Adjustment".

(3) With a narrow screw driver, turn the two idle screws clockwise until they are both seated.

(4) Turn both idle screws 1-1/2 turns counterclockwise for 1-1/2" BBD carburetors and 2 to 3 turns counterclockwise for AVS carburetors as a starting point (experience may dictate more or less turns as a rough setting but both screws should be turned equally).

(5) Start engine and set specified idle speed for engines with 300 or more miles. Set 75 rpm below specifications if under 50 miles or 50 rpm below specifications if 50 to 300 miles are on engine.

(6) Observe air/fuel ratio reading of exhaust gas analyzer. Turn each screw 1/16 turn richer (counter-

clockwise) and note change in air/fuel meter reading. From this point on, follow instructions for idle setting until 14.2 air/fuel ratio is obtained at approximate idle speed. It is very important that both idle limiter screws be turned the same amount on each adjustment so that as finally set both screws will be the same number of turns from the seated position.

(7) Install plastic caps over idle screws.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
POOR IDLING	(a) Idle air bleed carbonized or of incorrect size.	(a) Disassemble carburetor. Then, use compressed air to clear idle bleed after soaking it in a suitable solvent.
	(b) Idle discharge holes plugged or gummed.	(b) Disassemble carburetor. Then, use compressed air to clear idle discharge holes after soaking main and throttle bodies in a suitable solvent.
	(c) Throttle body carbonized or worn throttle shaft.	(c) Disassemble carburetor. Check throttle valve shaft for wear. If excessive wear is apparent, replace throttle body assembly.
	(d) Damaged or worn idle mixture needle.	(d) Replace worn or damaged idle needle. Adjust air mixture.
	(e) Low grade fuel or incorrect float level.	(e) Test fuel level in carburetor. Adjust as necessary to obtain correct float level.
	(f) Loose main body to throttle body screws.	(f) Tighten main body to throttle body screws securely to prevent air leaks and cracked housings.
	(g) Worn or corroded needle valve and seat.	(g) Clean and inspect needle valve and seat. If found to be in questionable condition, replace assembly. Then, test fuel pump pressure. Refer to Specifications for correct fuel pump pressure.
	(h) Incorrect valve lash.	(h) Adjust valves.
	(i) Engine miss (ignition).	(i) Check ignition system.
	(j) Incorrect timing.	(j) Reset timing.
POOR ACCELERATION	(a) Accelerator pump piston (or plunger) leather too hard, worn, or loose on stem.	(a) Disassemble carburetor. Replace accelerator pump assembly if leather is hard, cracked or worn. Test follow-up spring for compression.
	(b) Faulty accelerator pump discharge ball.	(b) Disassemble carburetor. Use compressed air to clean discharge nozzle and channels after soaking main body in a suitable solvent. Test accelerator pump capacity.
	(c) Faulty accelerator pump inlet check ball.	(c) Disassemble carburetor. Check accelerator pump inlet check ball for poor seat or release. If part is faulty, replace.
	(d) Incorrect fuel or float level.	(d) Test fuel or float level in carburetor. Adjust as necessary to obtain correct float level.
	(e) Worn accelerator pump and throttle linkage.	(e) Disassemble carburetor. Replace worn accelerator pump and throttle linkage and measure for correct position.
	(f) Manifold heat valve sticking.	(f) Free up manifold heat control valve; using recommended solvent.
	(g) No power mixture.	(g) Test power piston operation.
	(h) Incorrect timing.	(h) Reset timing.
	(i) Incorrect pump setting.	(i) Reset pump.
CARBURETOR FLOODS OR LEAKS	(a) Cracked body.	(a) Disassemble carburetor. Replace cracked body. Make sure main to throttle body screws are tight.

Condition	Possible Cause	Correction
	(b) Faulty body gaskets.	(b) Disassemble carburetor. Replace defective gaskets and test for leakage. Be sure screws are tightened securely.
	(c) High float level.	(c) Test fuel level in carburetor. Make necessary adjustment to obtain correct float level.
	(d) Worn needle valve and seat.	(d) Clean and inspect needle valve and seat: If found to be in a questionable condition, replace complete assembly and test fuel pump pressure. Refer to Specifications for correct fuel pump pressure.
	(e) Excessive fuel pump pressure.	(e) Test fuel pump pressure. If pressure is in excess of recommended pressure (refer to Specifications), replace fuel pump.
POOR PERFORMANCE MIXTURE TOO RICH	(a) Restricted air cleaner.	(a) Remove and clean air cleaner.
	(b) Leaking float.	(b) Disassemble carburetor. Replace leaking float. Test float level and cor rect as necessary, to proper level.
	(c) High float level.	(c) Adjust float level as necessary to se cure proper level.
	(d) Excessive fuel pump pressure.	(d) Test fuel pump pressure. Refer to specifications for recommended pressure. If pressure is in excess of recommended pressure, replace fuel pump assembly.
	(e) Worn metering jet.	(e) Disassemble carburetor. Replace worn metering jet, using a new jet of correct size and type.
POOR COLD ENGINE STARTING INCORRECT PROCEDURE	(a) (See owner's Manual.)	(a) Instruct owner.
CHOKE VALVE FAILS TO CLOSE	(a) Choke thermostat adjustment leaner than specified.	(a) Adjust.
	(b) Choke thermostat corroded such that it has cracked and distorted lean.	(b) Replace assembly.
	(c) Choke linkage, shaft or related parts corroded, bent or dirty such that system is not entirely free to move from open to closed position.	(c) Repair, clean or replace.
	(d) Choke valve improperly seated.	(d) Reseat valve.
	(e) Air cleaner interfers with choke shaft or linkage.	(e) Rotate cleaner to correct position, instruct owner.
	(f) Air cleaner gasket interfers with choke valve or linkage.	(f) Reinstall gasket properly.
	(g) Spring staging spring distorted or missing.	(g) Replace or install new spring.
LOW ENGINE OUTPUT (10°F or lower)	(a) Engine lubricating oil incorrect viscosity.	(a) Recommend 5W-20.
	(b) Choke thermostat adjustment incorrect, rich.	(b) Adjust to correct setting.

ENGINE RUNS LEAN, FIRST HALF MILE

CHOKE LEAN	(a) Review items under (Poor Starting).	(a) See "Choke Valve Fails to Close."
	(b) Diaphragm adjustment lean.	(b) Readjust to specification.

ENGINE RUNS LEAN AFTER HALF MILE

ENGINE HEAT INSUFFICIENT	(a) Heat valve stuck open.	(a) Free with solvent.
	(b) Heat valve thermostat distorted.	(b) Replace thermostat.

Condition	Possible Cause	Correction
	(c) Heat valve failed within exhaust. See engine section for proper diagnosis.	(c) Replace heat valve.
	(d) Water temperature subnormal.	(d) Check thermostat.
CARBURETOR MIXTURES LEAN	(a) Air leak bypassing the carburetor.	(a) Repair.
	(b) Carburetor has economy metering system.	(b) Inform customer.

ENGINE RUNS EXCESSIVELY RICH AFTER COLD START

Condition	Possible Cause	Correction
CHOKE SYSTEM RICH	(a) Choke thermostat adjustment richer than specified.	(a) Correct.
	(b) Choke vacuum diaphragm inoperative or misadjusted.	(b) Correct or replace.
	(c) Choke vacuum passage blocked or leaking.	(c) Correct.
CARBURETOR RICH	(a) Incorrect gasket or gasket installation between carburetor and intake manifold.	(a) Replace or correct.

EXCESSIVE STALLS AFTER COLD START

Condition	Possible Cause	Correction
CHOKE SYSTEM LEAN	(a) Review items under "Poor Starting-Choke Valve Fails to Close."	
	(b) Choke vacuum diaphragm adjustment lean.	(b) Adjust to Specification.
ENGINE OUTPUT LOW	(a) Fast idle speed low.	(a) Adjust to Specification.
	(b) Fast idle cam position adjustment incorrect.	(b) Adjust to Specification.
	(c) Engine lubrication oil of incorrect viscosity.	(c) Recommended 5W-20.
	(d) Incorrect timing.	(d) Reset timing.
CARBURETOR LEAN	(a) Curb idle set very lean.	(a) Adjust.
	(b) Air leak bypassing the carburetor.	(b) Repair.

BBD SERIES CARBURETORS (1½")

INDEX

GENERAL INFORMATION

The Ball and Ball dual throat 1-1/2 inch Carburetor Model C.A.S. (Cleaner Air System) BBD-4725S, BBD-4726S and BBD-4894S are used on the 383 cu. in. Engines when the vehicles are equipped with manual or automatic transmissions respectively (Fig. 1). BBD-4726S is used only on vehicles without air conditioning while BBD-4894S is used only on vehicles with air conditioning. This carburetor is equipped with a hot idle compensator valve, which is a thermostatically operated air bleed, to relieve an overrich condition at idle. This condition is the result of excessive heat and resultant overrich mixtures. These three carburetors are also equipped with a distributor ground switch, which retards the distributor when the carburetor is at curb idle, for better emission control.

The Ball and Ball dual throat 1-1/2 inch carburetor models E.C.S. (Evaporation Control System) BBD-4727S and BBD-4728S are used on the 383 cu. in. engines when the vehicles are equipped with manual and automatic transmissions respectively (Fig. 2). Both of these carburetors are equipped with a hot idle compensator valve which is a thermostatically operated air bleed to relieve an overrich condition at idle. This condition is the result of excessive heat and resultant overrich mixtures. These two carburetors are also equipped with a distributor ground switch, which retards the distributor when the carburetor is at curb idle, for better emission control.

Since the service procedures are identical on all BBD carburetors, the illustrations showing the various disassembly procedures will not always show any one specific carburetor.

The Ball and Ball carburetor is of the dual downdraft type. Each throat has its own throttle valve, and main metering systems and are supplemented by the float, accelerating, idle and power systems.

On each BBD series carburetor, the 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 overhaul carburetor, refer to model number and secure a repair kit for number indicated on tag.

SERVICE PROCEDURES

DISASSEMBLING CARBURETOR (Figs. 1 or 2.)

(1) Insert three Tool T-109-287S and one Tool T-109-288S elevating legs through carburetor throttle body stud holes. (These tools are used to protect throttle valves from damage and to provide a suitable base for working.)

(2) Remove hairpin clip and disengage fast idle connector rod from fast idle cam and choke lever.

(3) Remove hairpin clip and disengage accelerator rod from throttle lever and pump rocker arm.

(4) Remove vacuum hose between carburetor throttle body fitting and vacuum diaphragm.

(5) Remove clip from choke operating link and disengage link from diaphragm plunger and choke lever. (Figs. 1 or 2).

(6) Remove vacuum diaphragm and bracket assembly and place to one side, to be cleaned as a special item. **A liquid cleaner may damage the diaphragm material.**

(7) Remove screws that attach hot idle compensator valve cover to main body. Remove cover and lift out hot idle compensator valve and gasket (Fig. 3).

(8) Remove air horn retaining screws and lift air

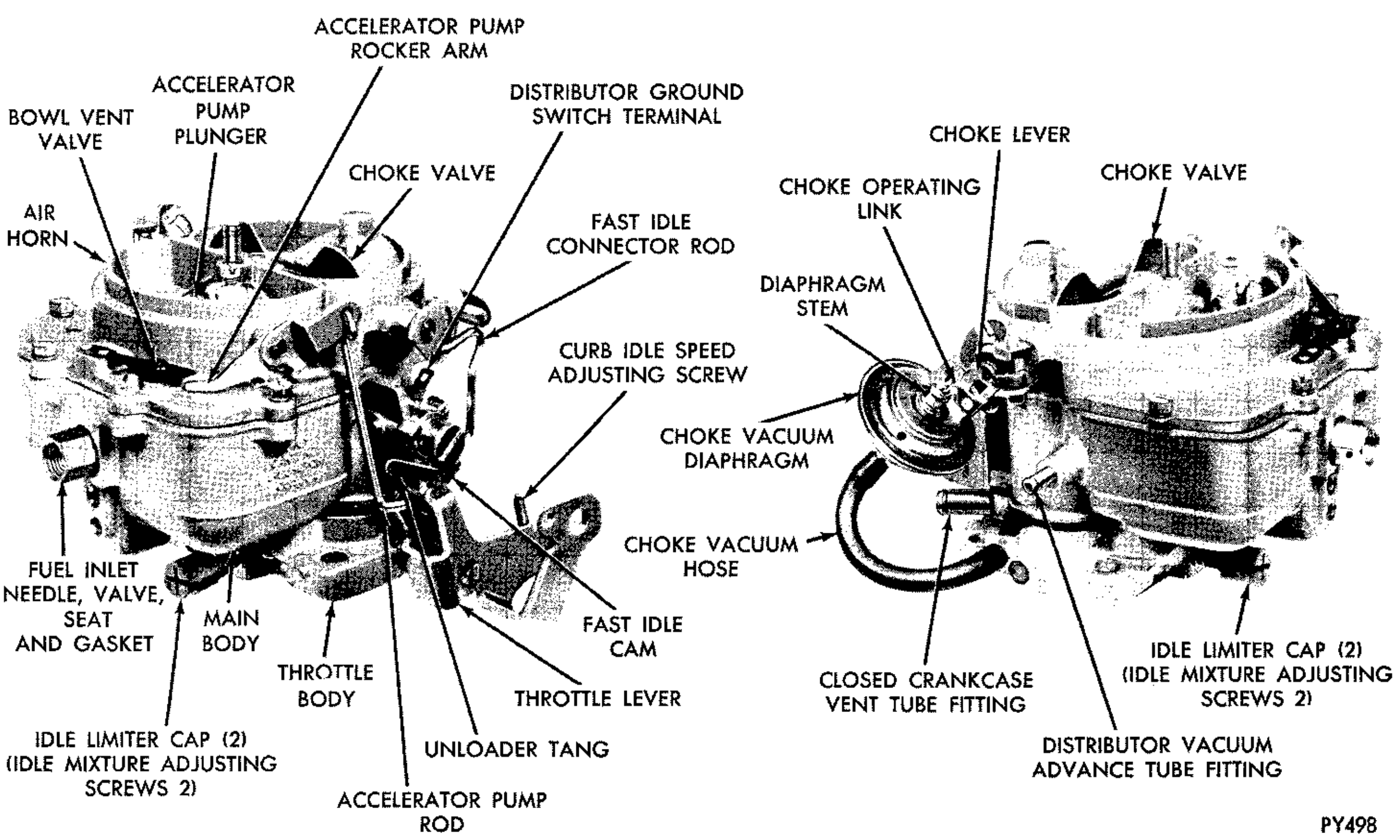


Fig. 1—Carburetor Assembly (BBD-1-1/2 inch) C.A.S.

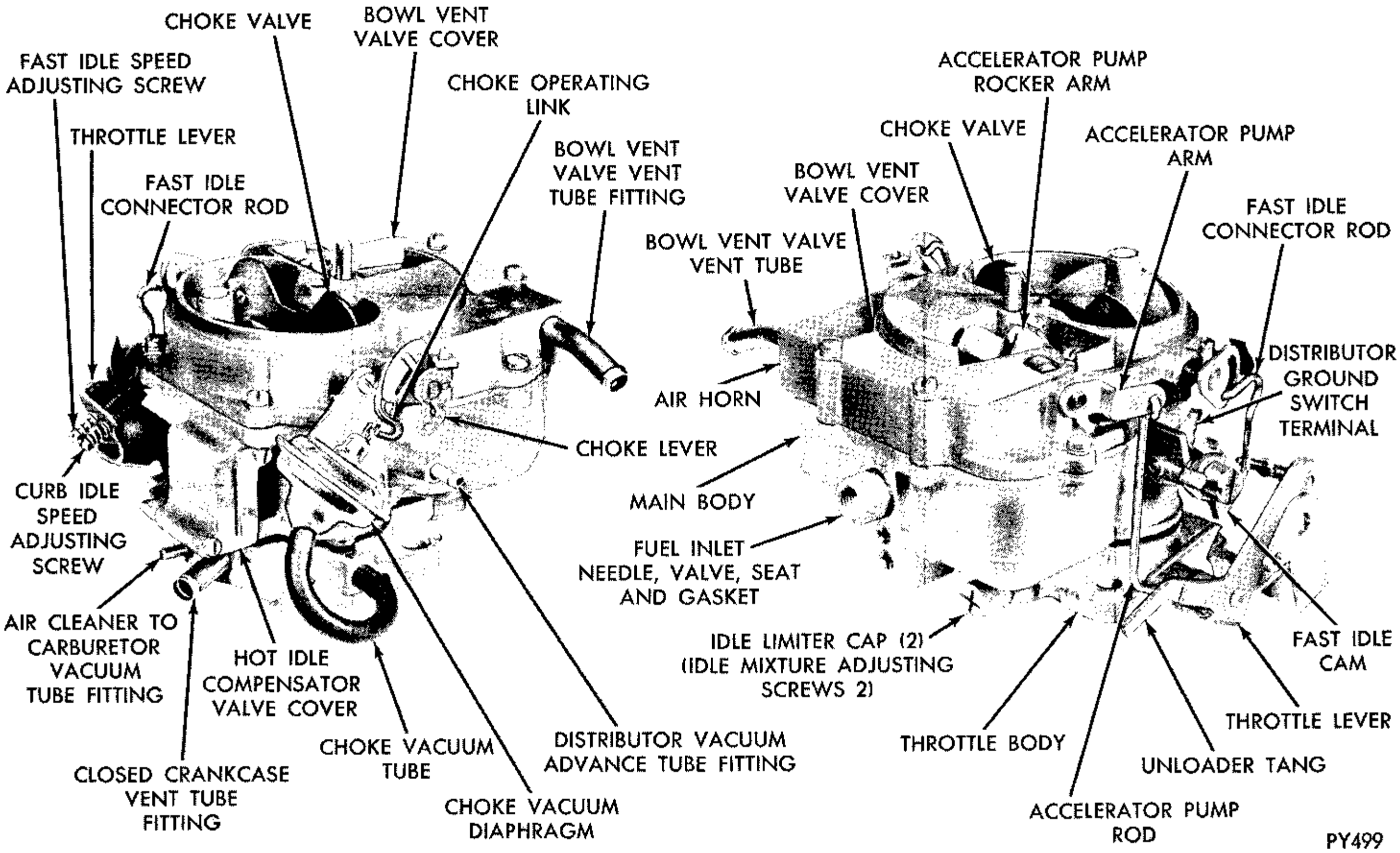


Fig. 2—Carburetor Assembly (BBD 1-1/2 inch) E.C.S.

horn straight up and away from main body. Discard gasket (2 screws recessed).

(9) Disengage accelerator pump plunger from accelerator pump arm by pushing up on bottom of plunger and sliding plunger shaft off hook. Slide plunger out of air horn and remove compression spring and seat. Remove bowl vent valve cover.

If old plunger can be used again or if a new plunger is to be installed, place plunger in a jar of clean gasoline or kerosene to prevent leather from drying out.

(10) Remove fuel inlet needle valve, seat and gasket from main body.

(11) Lift out float fulcrum pin retainer, and lift out floats and fulcrum pin.

(12) Remove step-up piston and retaining screw and slide step-up piston and rods out of well, (Fig. 4). Lift out step-up piston spring. Remove step-up piston gasket from bottom of well.

(13) Remove main metering jets (Fig. 5).

(14) Remove venturi cluster screws, then lift venturi cluster and gaskets up and away from main body, (Fig. 6). Discard gaskets. **Do not remove idle orifice**

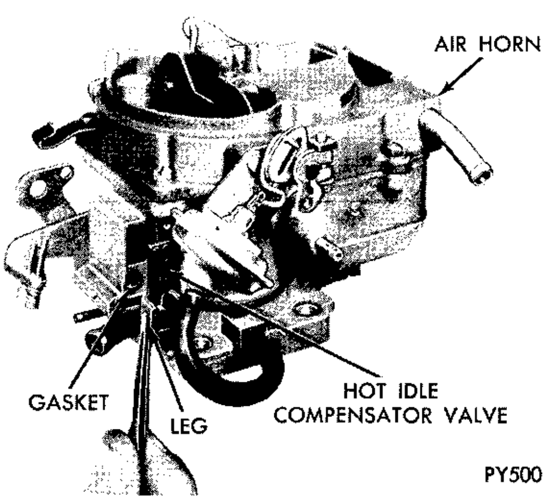


Fig. 3—Removing or Installing Hot Idle Compensator Valve

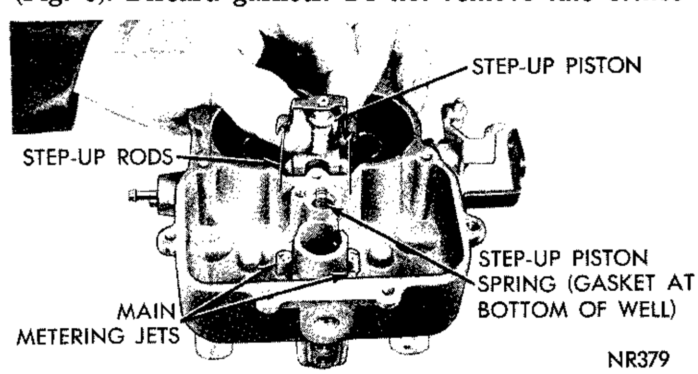


Fig. 4—Removing or Installing Step-Up Piston

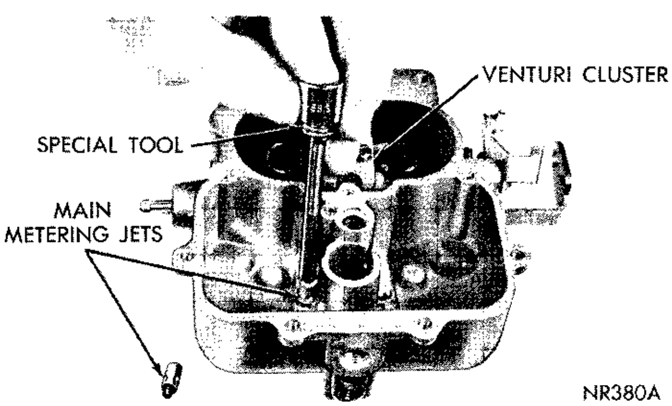


Fig. 5—Removing or Installing Main Metering Jets

tubes or main vent tubes from cluster. They can be cleaned in a solvent and dried with compressed air.

(15) Invert carburetor and drop out accelerator pump discharge check ball and intake check ball. (The intake check ball is the largest.)

(16) Remove screws that attach throttle body to main body. Separate the bodies and discard gasket.

(17) Remove plastic limiter caps from idle air mixture screws. (Be sure and count number of turns to seat the screws, as the same number of turns (from the seat) must be maintained at installation.) Remove screws and springs from throttle body.

The carburetor now has been disassembled into three sub-assemblies, the air horn, main body and throttle body and the components of each disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shaft or valves from the throttle body, unless wear or damage necessitates the installation of new parts.

There is about .005 inch clearance between the throttle shaft and the throttle shaft bores in the throttle body. Any clearance over .010 inch, a new throttle shaft and/or throttle body should be installed.

INSPECTION AND REASSEMBLY

Throttle Body

(1) Inspect the throttle shaft and throttle body for excessive wear. If either or both are worn to the point where the carburetor operation will be affected, replace as required.

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve, is carefully established for one particular assembly, (Fig. 7).

If a new shaft should be installed in an old, worn throttle body, it would be very unlikely that the original relationship of the ports to the valves would be obtained. Changing the relationship of the valves to the ports would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. If it has been determined, however, that a new shaft or

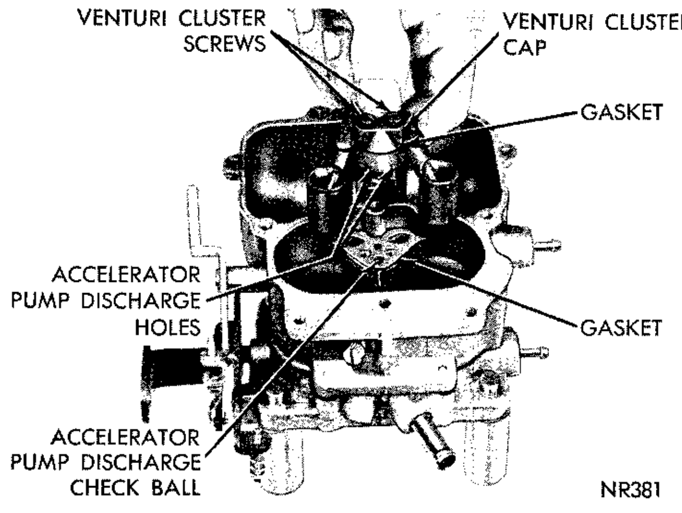


Fig. 6—Removing or Installing Venturi Cluster

valves is to be installed, adhere to the following instructions:

(2) Mark position of throttle valves in bores.

(3) Remove screws that hold throttle valves to shaft and slide valves out of bores. **These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft.**

Remove the staked end of the screws with a file.

(4) Slide throttle shaft and lever out of body.

(5) Install new throttle shaft and lever.

(6) Install throttle valves in their respective bores (with valve numbers toward manifold). Install new screws but do not tighten. Hold valves in place (fully closed position) with fingers pressing on high sides of valves. Tap valves lightly with a screwdriver to seat in throttle bores. Partially tighten screws. Hold up to a strong light to check for a proper position in bore. (They may have to be rotated slightly as the valves are eliptical.) When properly positioned tighten screws securely and stake, using pliers.

(7) Install idle mixture screws and springs in body. (The tapered portion must be straight and smooth. If tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control.) **DO NOT USE A SCREW DRIVER.** Turn screws lightly against their seats with

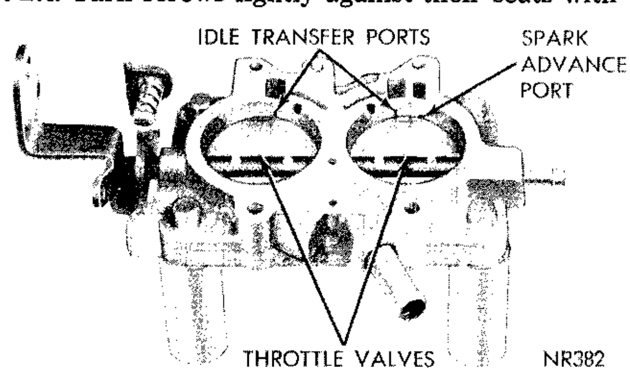


Fig. 7—Ports in Relation to Throttle Valves

fingers. Back off the number of turns counted at disassembly. Install new plastic caps with tabs against stop. **This screw has a left hand thread. Turn counterclockwise (Richer) and clockwise (Leaner).**

Main Body

(1) Invert main body and place a new gasket in position and place throttle body on main body and align. Install screws and tighten securely.

(2) Install accelerator pump discharge check ball in discharge passage and check accelerator pump system; fuel inlet and discharge check balls as follows:

(3) Pour clean gasoline into carburetor bowl, approximately 1/2 inch deep. Remove pump plunger from jar of gasoline, flex leather several times, then slide down into pump cylinder. Raise plunger and press lightly on plunger shaft to expel all air from pump passage.

(4) Using a small clean brass rod, hold discharge check ball down firmly on its seat. Again raise plunger and press downward. No fuel should be emitted from either intake or discharge passage, (Fig. 8).

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball seat. Check the passage again and repeat test. If leakage is still evident, install a new check ball. The fuel inlet check ball is located at the bottom of the plunger well.

(5) Install new gaskets on venturi cluster, and install in position in main body. Install cluster screws and tighten securely. Test pump discharge by pressing pump plunger down. Two fine streams of fuel should be forced from cluster. If either stream is restricted or diverted, remove cluster and reclean. After test, pour fuel from the bowl and remove pump plunger.

(6) Install main metering jets. Tighten securely. (Fig. 5).

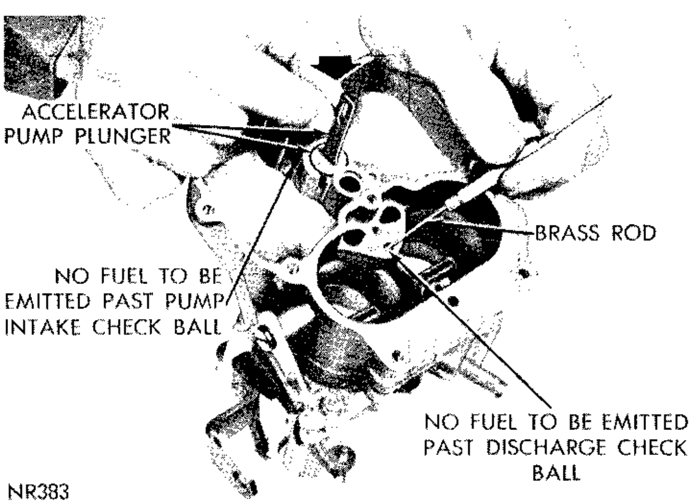


Fig. 8—Testing Accelerator Pump Intake and Discharge Check Balls

(7) Before installing step-up piston, be sure step-up rods are able to move freely, each side of the vertical position, (Fig. 9). (The step-up rods must be straight, smooth and free to move forward and backward from vertical.)

(8) Slide step-piston gasket down into position in piston well, then install the step-up piston spring, step-up piston and rods. Carefully guide step-up rods into main metering jets (Fig. 4). Install retaining screw and tighten securely. Check piston for free operation in well.

A step-up piston stuck in the **Up** position will cause a rich mixture at part throttle, whereas a piston stuck in the **Down** position will cause a lean mixture at wide open throttle and poor acceleration.

Measuring Float Setting

The carburetors are equipped with a rubber-tipped fuel inlet needle. The rubber tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding. Care should be taken to perform this operation accurately in order to secure the best performance and fuel economy.

(1) To correctly set float height when carburetor is being overhauled, install floats with fulcrum pin and pin retainer in main body.

(2) Install rubber-tipped needle, seat and gasket in body and tighten securely.

(3) Invert main body so that weight of float only is forcing needle against seat. Hold finger against retainer to fully seat fulcrum pin.

(4) Using Tool T-109-280 or a "T" scale, measure float, (Fig. 10). There should be 5/16 inch from surface of fuel bowl to crown of each float at center.

If an adjustment is necessary, hold the floats on bottom of the bowl and bend float lip toward or away from needle. Recheck the 5/16 inch setting again and repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the synethetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

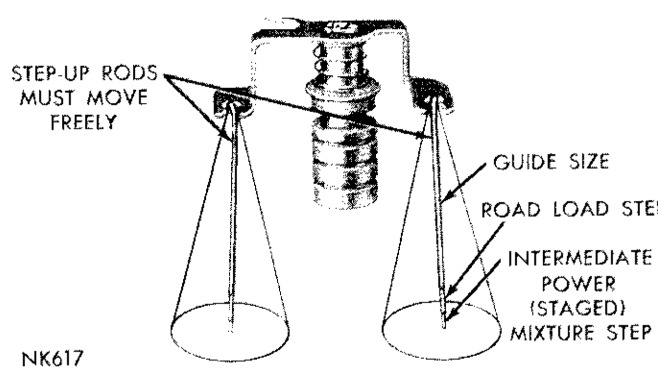


Fig. 9—Step-Up Rods Freeplay

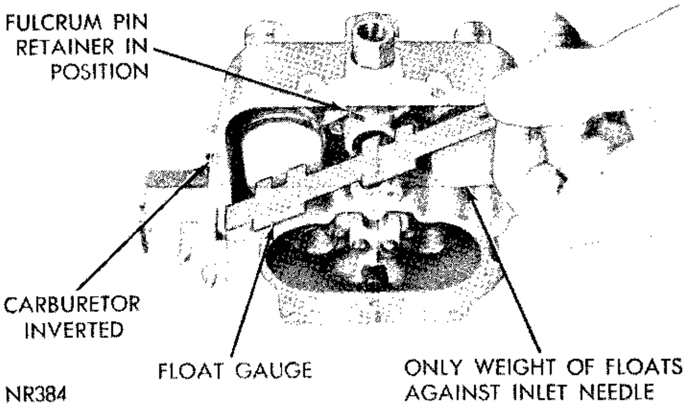


Fig. 10—Checking Float Setting

After being compressed, the tip is very slow to recover its original shape.

CAUTION: It is very important that the float lip be perpendicular to the needle or slanted not more than ten degrees away from the needle when the float height is correct.

Air Horn

(1) Test freeness of choke mechanism in air horn. The choke shaft must float free to operate correctly. If choke shaft sticks in bearing areas, or appears to be gummed from deposits in air horn, a thorough cleaning will be required.

(2) Remove accelerator pump plunger from gasoline, slide compression spring and spring seat over shaft. Install assembly in air horn and engage with accelerator pump arm.

(3) Place a new gasket on main body, and install air horn. Install attaching screws and tighten securely. (When installing air horn, be sure leather on plunger does not wrinkle or fold back.)

(4) Engage accelerator pump rod with pump rocker arm and install loose end in outer hole of throttle lever. Install hairpin clip to secure (Fig. 1).

(5) Engage fast idle connector rod (loop at top) in fast idle cam and in slotted choke lever. Install retaining clips to secure.

(6) Install hot idle compensator valve gasket in position in recess in main body, followed by valve. (Be sure valve is positioned with legs toward outside of main body.) (Fig. 3). Place cover over opening and install attaching screws. Tighten securely. (If so equipped).

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to be sure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the fitting to seal the opening. Release the stem. If the stem moves more than 1/16 inch in ten (10) seconds, the leakage is excessive and the assembly must be replaced.

Install the diaphragm assembly on the airhorn as follows:

(1) Assemble diaphragm to air horn and tighten attaching screws securely.

(2) Install choke operating link in position between diaphragm plunger (stem) and choke lever. Install clip to secure.

(3) Inspect rubber hose for cracks before placing it on correct carburetor fitting. (Fig. 1). Do not connect vacuum hose to diaphragm fitting until after vacuum kick adjustment has been made. (See Carburetor Adjustments.)

CARBURETOR ADJUSTMENTS

It is very important that the following adjustments are made on a reconditioned carburetor and in the sequence listed:

Accelerator Pump

(1) Back off idle speed adjusting screw. Open choke valve so that fast idle cam allows throttle valves to be completely seated in bores. Be sure that pump connector rod is installed in outer hole of throttle lever.

(2) Close throttle valves tightly. Measure the distance between top of air horn and end of plunger shaft, (Fig. 11). This measurement should be 1 inch.

(3) To adjust pump travel, bend pump operating rod using Tool T-109-213, at lower angle of rod, until correct setting has been obtained.

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in the Fast Idle Speed Adjustment (On the Vehicle) Paragraph. How-

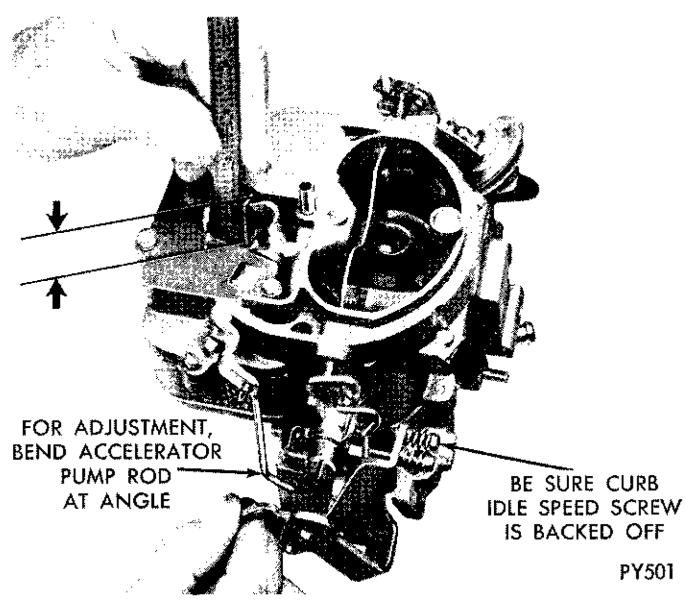


Fig. 11—Checking Accelerator Pump Setting

ever, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to assure that the speeds of each step of the cam occur at the proper time during engine warm-up.

(1) With fast idle speed adjusting screw contacting second highest speed step on fast idle cam, move choke valve toward closed position with light pressure on choke shaft lever.

(2) Insert specified drill (see specifications) between choke valve and wall of air horn. An adjustment will be necessary if a slight drag is not obtained as drill is being removed.

(3) If an adjustment is necessary, bend fast idle connector rod at lower angle, using Tool T109-213, until correct valve opening has been obtained (Fig. 12).

Vacuum Kick Adjustment—This test can be made **ON** or **OFF** vehicle.

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source, or vacuum supplied by the vehicle.

(1) If adjustment is to be made with engine running, disconnect fast idle linkage to allow choke to close to the kick position with engine at curb idle. If an auxiliary vacuum source is to be used, open throttle valves (engine not running) and move choke to closed position. Release throttle first, then release choke.

(2) When using an auxiliary vacuum source, disconnect vacuum hose from carburetor and connect it to hose from vacuum supply with a small length of tube to act as a fitting. Removal of hose from diaphragm may require forces which damage the system. Apply a vacuum of 10 or more inches of mercury.

(3) Insert specified drill (refer to Specifications) between choke valve and wall of air horn (Fig. 13). Apply sufficient closing pressure on lever to which choke rod attaches to provide a minimum choke valve opening without distortion of diaphragm link. Note that the cylindrical stem of diaphragm will extend as internal spring is compressed. This spring must be fully compressed for proper measurement of vacuum kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as drill is being removed. Shorten or lengthen diaphragm link to obtain correct choke opening. Length changes should be made carefully by bending (open or closing) the bend provided in diaphragm link. **CAUTION: DO NOT APPLY TWISTING OR BENDING FORCE TO DIAPHRAGM.**

(5) Reinstall vacuum hose on correct carburetor fitting. Return fast idle linkage to its original condition if disturbed as suggested in Step No. 1.

(6) Make following check. With no vacuum applied to diaphragm, the **CHOKE VALVE SHOULD MOVE FREELY** between open and closed positions. If movement is not free, examine linkage for misalignment or interferences caused by bending operation. Repeat adjustment if necessary to provide proper link operation.

Choke Unloader (Wide Open Kick)

The choke unloader is a mechanical device to partially open the choke valve at wide open throttle. It is used to eliminate choke enrichment during cranking of an engine. Engines which have been flooded or stalled by excessive choke enrichment can be cleared

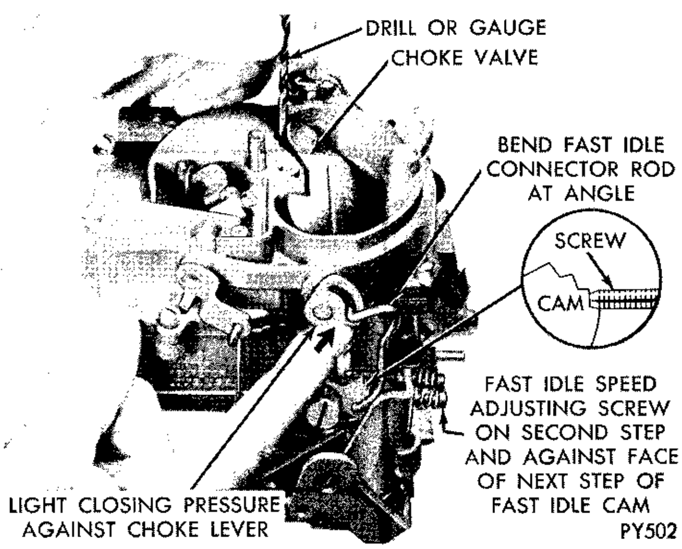


Fig. 12—Fast Idle Cam Position Adjustment

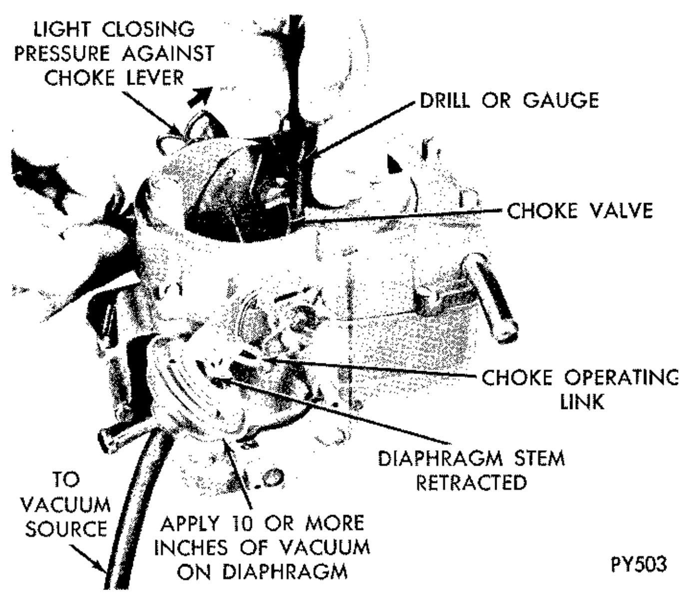


Fig. 13—Checking Choke Vacuum Kick Setting (Wide Open Kick)

by use of the unloader. Adjust the choke unloader as follows:

(1) Hold throttle valves in wide open position. Insert specified drill (see Specifications) between upper edge of choke valve and inner wall of air horn. (Fig. 14).

(2) With a finger lightly pressing against shaft lever, a slight drag should be felt as drill is being withdrawn. If an adjustment is necessary, bend unloader tang on throttle lever until correct opening has been obtained (Fig. 15). Use Tool T109-214.

Bowl Vent Adjustment (E.C.S.)

(1) Open choke valve so that fast idle cam allows valves to close, (curb idle).

(2) Be sure that pump operating rod is in long stroke hole in throttle lever. Remove bowl vent valve cover if not previously done.

(3) Close throttle valves tightly. Using a narrow ruler, measure the distance from top of bowl vent valve rubber tip, to top of air horn casting (Fig. 16). This measurement should be 5/32 inch.

(4) If an adjustment is necessary, bend bowl vent lift arm, using a suitable tool, until correct opening has been obtained. **(WARNING: DO NOT BEND BOWL VENT VALVE LEAF SPRING DURING BENDING OPERATION OR IMPROPER VENT VALVE OPERATION WILL RESULT.)** Install bowl vent valve cover and secure with attaching screws.

(5) **On C.A.S. carburetors,** with the throttle valves closed, (curb idle), there should be 1/16 inch clearance between bowl vent valve and seat on air horn (Fig. 16). (When measured at outermost or largest dimension with a drill shank).

(6) If an adjustment is necessary, bend vent valve lifter arm until correct clearance has been obtained.

Idle Speed Adjustment (Curb Idle)

Refer to General Information at Front of Section.

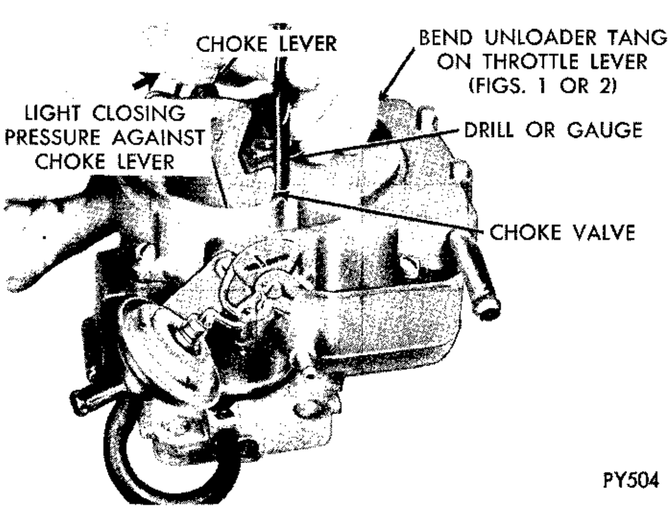


Fig. 14—Checking Choke Unloader Setting

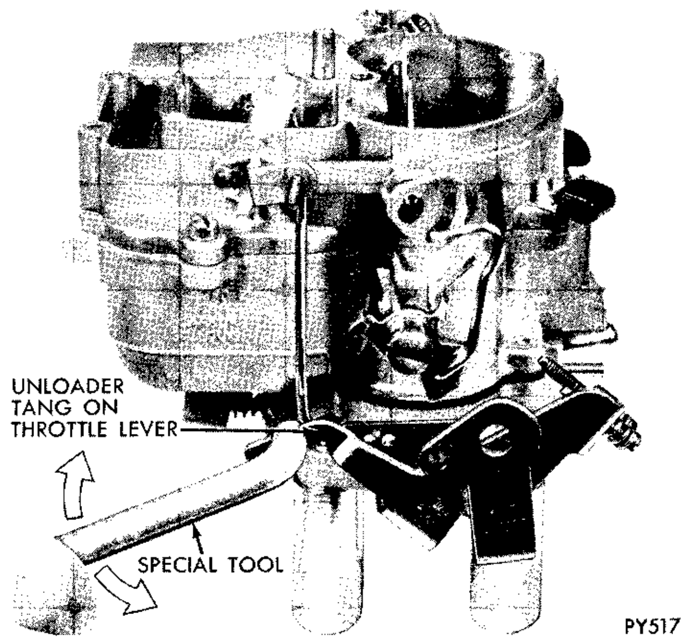


Fig. 15—Bending Choke Unloader Tang

Measuring Float Setting (On Vehicle)

(1) Remove hairpin clip and disengage accelerator pump rod from throttle lever and pump rocker arm. Disconnect automatic choke rod by unsnapping clip.

(2) Remove air horn attaching screws and lift air horn straight up and away from main body. Remove gasket.

(3) Set float fulcrum pin by pressing a finger against fulcrum pin retainer.

There should be enough fuel in the bowl to raise floats so that the lip bears firmly against needle. Additional fuel may be admitted by slightly depressing

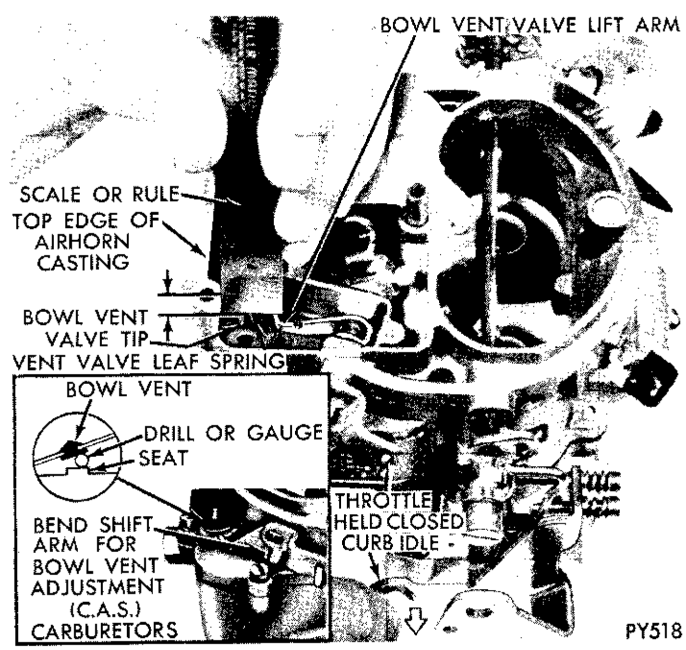


Fig. 16—Measuring Bowl Vent Valve Opening (C.A.S., E.C.S.)

float. If fuel pressure in the line is insufficient to force additional fuel into bowl, add necessary fuel from a clean container.

WARNING: Since the manifold may be hot, it is dangerous to spill fuel onto these surfaces. Take the necessary precautions to avoid spillage.

(4) With only pressure from buoyant float holding lip against inlet needle, check float setting, using Tool T-109-280, or a "T" scale. There should be 5/16 inch from surface of bowl (gasket removed) to crown of floats at center.

If an adjustment is necessary, hold the floats on the bottom of the bowl, then bend the float lip toward or away from the needle. Recheck the 5/16 inch setting again, then repeat the lip bending operation as required. **When bending the float lip, do not allow the lip to push against the needle as the rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl. After being compressed, the rubber tip is very slow to recover its original shape. It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly.**

(5) After float has been correctly set, reassemble the air horn.

Fast Idle Speed Adjustment (On Vehicle)

Fast idle engine speed is used to overcome cold engine friction, stalls after cold starts and stalls because of carburetor icing. Set this adjustment after the vehicle odometer indicates over 500 miles to insure a normal engine friction level. Prepare engine by driving at least 5 miles. Connect a tachometer and

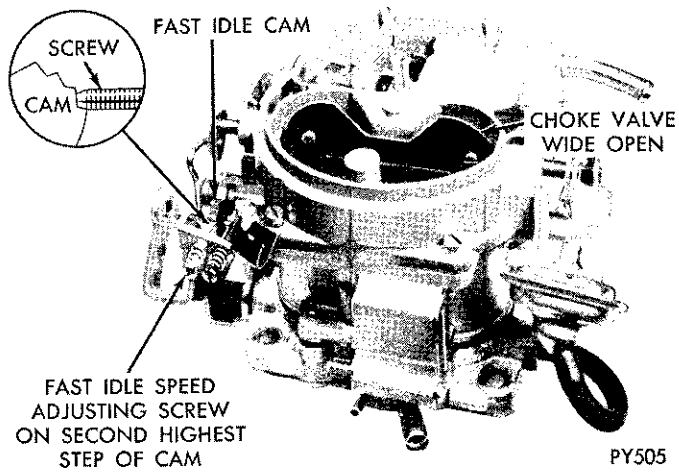


Fig. 17—Fast Idle Speed Adjustment (On Vehicle)

set the curb idle speed and mixture, then proceed as follows:

(1) With engine off and transmission in PARK or NEUTRAL position, open throttle slightly.

(2) Close choke valve until fast idle screw can be positioned on second highest-speed step of fast idle cam (Fig. 17).

(3) Start engine and determine stabilized speed. Turn fast idle speed screw in or out to secure specified speed. (See Specifications.)

(4) Stopping engine between adjustments is not necessary. However, reposition fast idle speed screw on cam after each speed adjustment to provide correct throttle closing torque.

To set the idle speed on vehicles, refer to Fuel System General Information Paragraph.

HOLLEY 2200 SERIES CARBURETOR

INDEX

GENERAL INFORMATION

The Holley dual throat, 2200 series carburetor model C.A.S. (Cleaner Air System) R-4371A, (Fig. 1) is used on the 383 cu. in. engine when the vehicles are equipped with an automatic transmission and without air conditioning only. This carburetor is equipped with a distributor ground switch, which retards the distributor when the carburetor is at curb idle, resulting in better emission control.

Each throat of the carburetor has its own throttle valve and main metering systems and are supplemented by the float, accelerating, idle and power systems.

CARBURETOR SYSTEMS

The carburetor utilizes four basic fuel metering

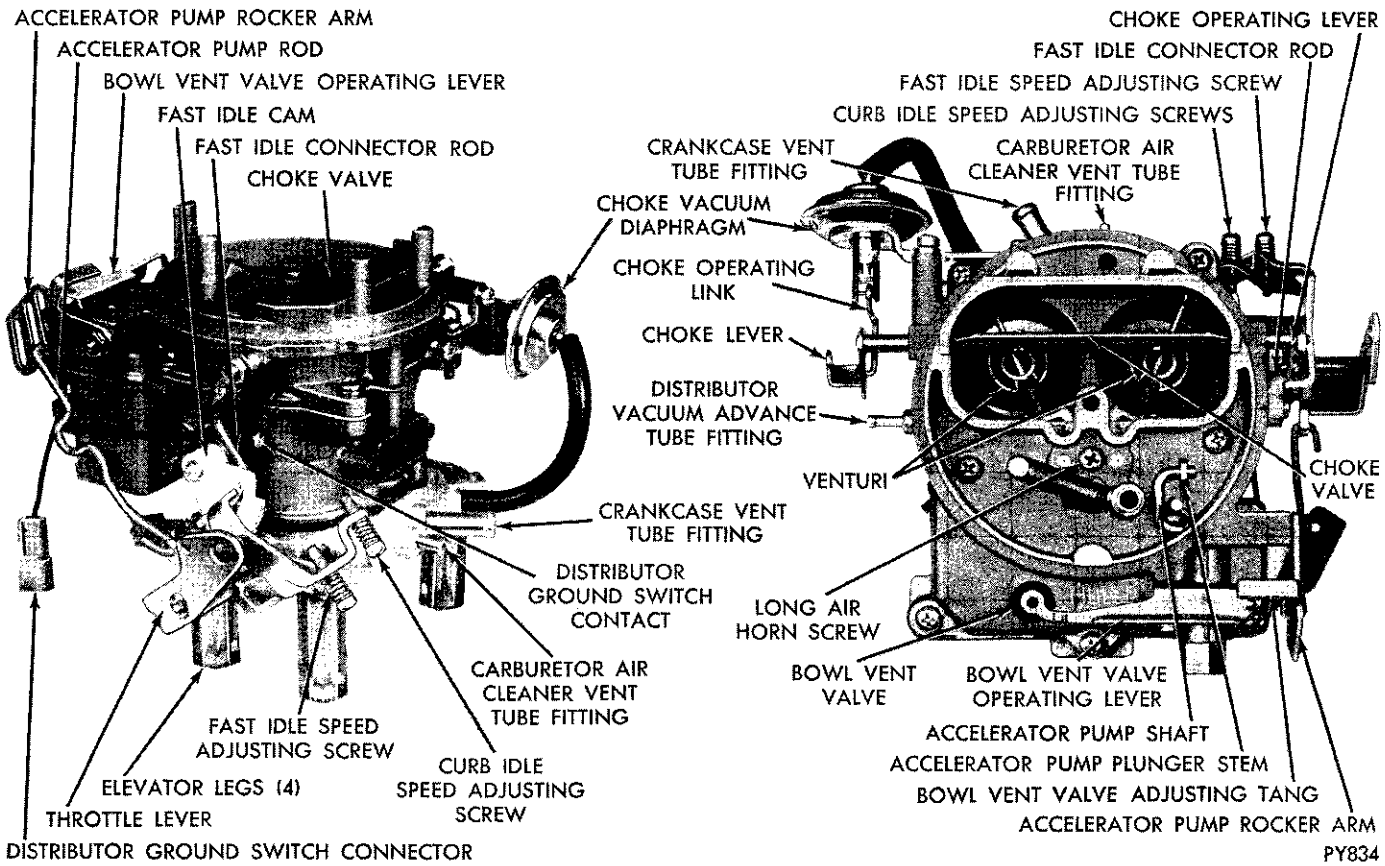


Fig. 1—Carburetor Assembly (Holley 2210 Series)

systems. The Idle System provides a rich mixture for smooth idle and low speed performance; the Accelerator Pump System, provides additional fuel during acceleration; the Main Metering System, provides an economical mixture for normal cruising conditions; and the Power Enrichment System, provides a richer mixture when high power output is desired.

In addition to these four basic systems, there is a fuel inlet system that constantly supplies the fuel to the basic metering systems, and a choke system which temporarily enriches the mixture to aid in starting and running a cold engine.

Fuel Inlet System (Fig. 2)

All fuel enters the fuel bowl through the fuel inlet fitting in the bowl cover.

The "Viton" tipped fuel inlet needle seats directly in the fuel inlet seat. The fuel inlet needle is controlled by a nitrophyl float (a cellular buoyant material which cannot collapse or leak) and stainless steel float lever which is hinged by a "Delrin" float fulcrum pin.

The fuel inlet system must constantly maintain the specified level of fuel as the basic fuel metering systems are calibrated to deliver the proper mixture only when the fuel is at this level. When the fuel level in the bowl drops the float also drops permitting additional fuel to flow past the fuel inlet needle into the bowl. A baffle over the needle assists in separating the air bubbles from the fuel to provide a more solid fuel supply in the bowl.

The float chamber is vented internally into the air horn. An external vent actuated by the pump lever is opened at curb idle or when the engine is not running to release fuel vapors from the bowl.

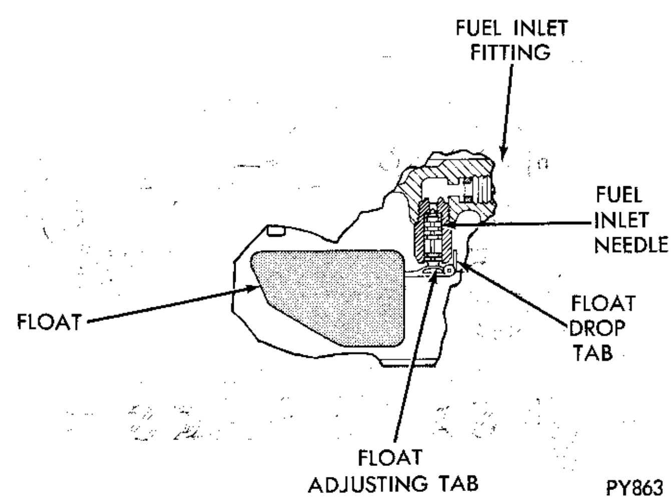


Fig. 2—Fuel Inlet System

Idle System (Fig. 3)

Fuel used during curb idle and low speed operation flows through the main metering jet into the main well.

A horizontal connecting passage permits the fuel to flow from the main well into the idle well. Fuel continues up the idle well and through an idle feed restriction into an idle channel where the fuel is mixed with air which enters through idle air bleeds located in the air horn.

At curb idle the fuel and air mixture flows down the idle channel and is further mixed or broken up by air entering the idle channel through the transfer slot which is above the throttle valve at curb idle.

During low speed operation the throttle valve moves exposing the transfer slot and fuel begins to flow through the transfer slot as well as the idle port. As the throttle valves are opened further and engine speed increases the air flow through the carburetor also increases. This increased air flow creates a vacuum or depression in the venturi and the main metering system begins to discharge fuel.

Main Metering System (Fig. 4)

As the engine approaches cruising speed the increased air flow through the venturi creates vacuum (low pressure area) in the venturi of the carburetor. Near atmospheric pressure present in the bowl in the area above the fuel causes the fuel to flow to the lower pressure area created by the venturi and magnified by the booster venturi.

Fuel flows through the main jet into the main well; air enters through the main well air bleeds and into the main well through holes in the main well tube. The mixture of fuel and air being lighter than raw fuel responds faster to changes in venturi vacuum and is also more readily vaporized when discharged into the venturi.

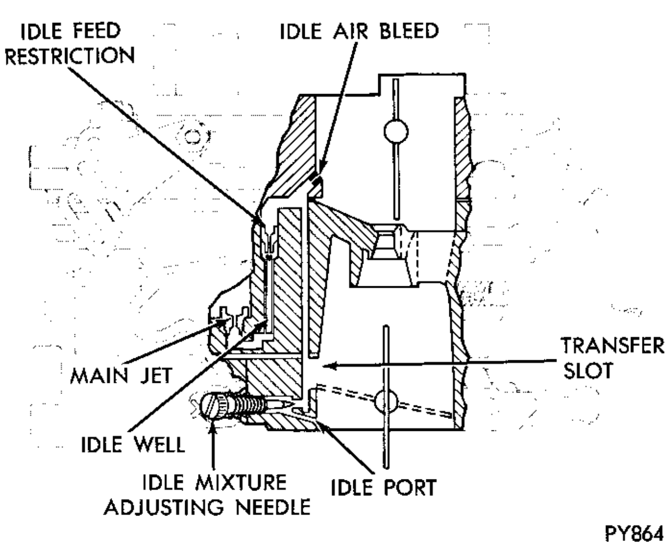


Fig. 3—Idle System

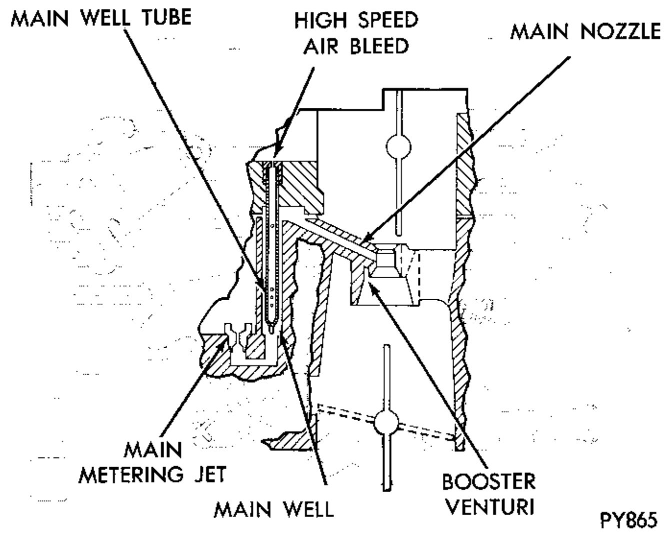


Fig. 4—Main Metering System

The main discharge nozzle passage is a part of the booster venturi which is an integral part of the main body casting. Distribution tabs in the main venturi provide further vaporization of the fuel and air mixture.

The main metering system is calibrated to deliver a lean mixture for best overall economy. When additional power is required a vacuum operated power system enriches the fuel-air mixture.

Power Enrichment System (Fig. 5)

The power enrichment system consists of a power valve installed in the center of the carburetor body between the main jets and a vacuum piston installed in the bowl cover. A vacuum passage leads from the top of the piston down to the manifold flange.

When manifold vacuum is high the vacuum piston is raised to the top of its cylinder and the spring on the piston stem is compressed.

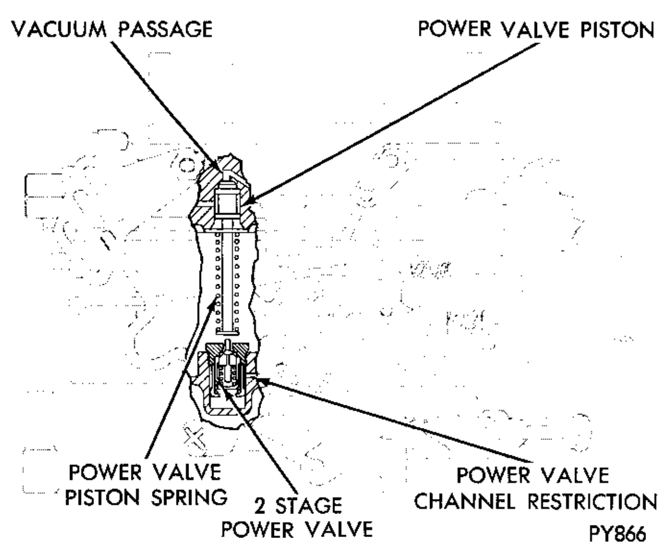


Fig. 5—Power Enrichment System

When manifold vacuum drops to a predetermined level the spring overcomes the vacuum and pushes the piston stem down.

The piston stem in turn pushes the power valve stem down opening the power valve and permitting fuel to flow through the power valve through power valve channel restrictions and into the main well on either side of the power valve.

Accelerating Pump System (Fig. 6)

When the throttle valves are opened suddenly the air flow through the carburetor responds almost immediately. However, there is a brief time interval or lag before the fuel can overcome its inertia and maintain the desired fuel-air ratio.

The piston type accelerating pump system mechanically supplies the fuel necessary to overcome this deficiency for a short period of time.

Fuel enters the pump cylinder from the fuel bowl through a slot in the pump well above the normal position of the pump piston. When the engine is turned off, fuel vapors in the pump cylinder are vented through the area between the pump rod and pump plunger.

As the throttle lever is moved the pump link operating through a system of levers and a pump override spring pushes the pump piston down. Fuel is forced through a passage around the pump discharge needle valve and out the pump discharge jets which are drilled in the main body.

Automatic Choke System (Fig. 7)

The automatic choke provides the richer fuel-air mixture required for starting and operating a cold engine. A bi-metal spring inside the choke housing, which is installed in a well in the intake manifold, holds the choke valve in the closed position.

When the engine starts, manifold vacuum is applied to the choke diaphragm through a rubber hose from the throttle body to the choke diaphragm assembly. The adjustment of the choke valve opening, when the engine starts and vacuum is applied to the choke diaphragm, is called vacuum kick.

Manifold vacuum alone is not strong enough to provide the proper degree of choke opening during the entire choking period. The impact of in rushing air past the offset choke valve provides the additional opening force.

As the engine warms up manifold heat transmitted to the choke housing relaxes the bi-metal spring until it eventually permits the choke to open fully.

Distributor Vacuum Advance

As engine speed increases, the spark timing must be advanced so that the burning in the cylinder may be completed at the proper time to achieve maximum pressure and efficiency.

A vacuum spark port located in the throttle bore, just above the closed throttle valve, is connected to the distributor vacuum chamber by a series of passages to a fitting in the carburetor body and a flexible hose.

As the throttle is opened, this port is exposed to manifold vacuum which varies with changes in engine speed and load.

This changing vacuum is applied to the distributor vacuum diaphragm.

The diaphragm, in turn rotates the distributor breaker plate through a connecting rod changing the spark timing to meet engine demands.

At curb idle, the curb idle screw contacts the distributor retarding solenoid. This in turn retards the distributor to maximum retard for improved emission control at idle.

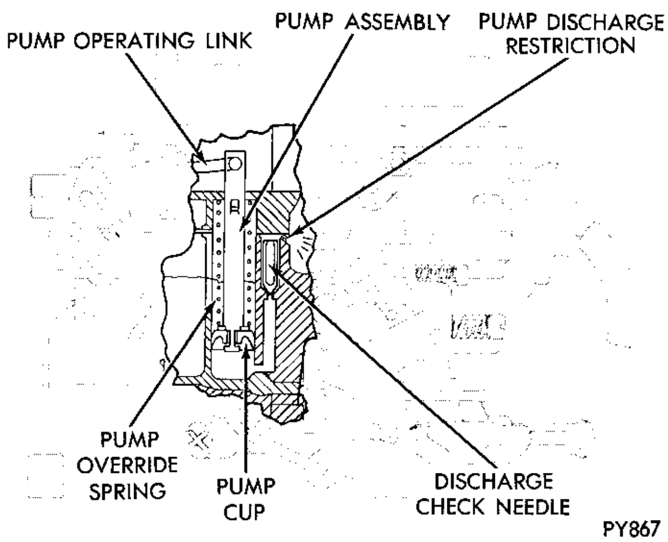


Fig. 6—Accelerating Pump System

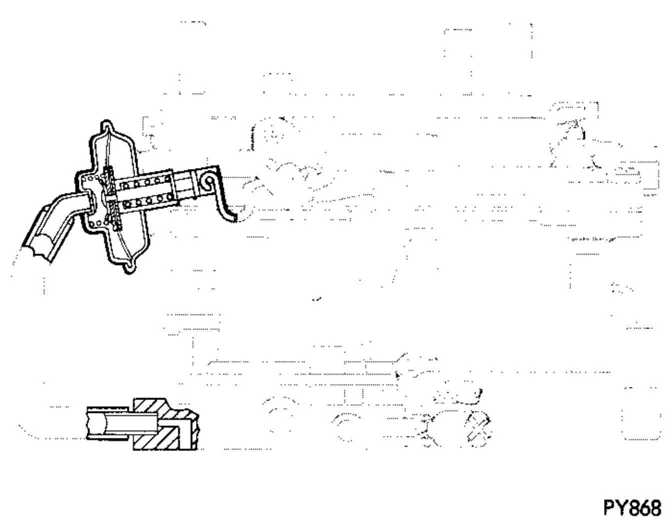


Fig. 7—Automatic Choke System

SERVICE PROCEDURES

DISASSEMBLING CARBURETOR

(1) Insert three Tool T-109-287S and one Tool T109-288S elevating legs through carburetor throttle body mounting stud holes. (These tools are used to protect throttle valves from damage and to provide a suitable base for working.) (Fig. 1).

(2) Remove nut and washer attaching accelerator pump rocker arm to accelerator pump shaft. Remove arm from flats on pump shaft, then disengage accelerator pump rod from center slot in arm and from hole in throttle lever. (Fig. 2).

(3) Remove nut and washer that attaches choke lever to choke shaft. Disengage fast idle connector rod from lever and fast idle cam. (Fig. 3).

(4) Remove choke vacuum diaphragm hose from throttle body tube fitting. Remove screws that attach choke diaphragm and mounting bracket to air horn.

(5) Remove choke diaphragm and at the same time, disengage choke operating link from slot in choke operating lever. (Fig. 4). Place choke unit to one side to be cleaned as a special item. **A liquid cleaner may damage diaphragm material.**

(6) Remove "E" clip that retains bowl vent valve operating lever on stub shaft of air horn. Slide lever off shaft, being careful not to lose lever spring. (Note position of spring). (Fig. 5).

(7) Remove eight air horn ataching screws, then lift air horn straight up and away from main body (long screw in center.) **USE EXTREME CARE WHEN HANDLING AIR HORN SO AS NOT TO BEND OR DAMAGE WELL TUBES.** (Fig. 6).

(8) Disengage accelerator pump plunger from pump shaft by pushing **up** on bottom of plunger, then tilting slightly toward center, then slide off pump shaft. Slide plunger stem out of air horn and remove compression spring (Fig. 7).

(9) Slide accelerator pump shaft out of air horn. (Fig. 8).

(10) Remove fuel inlet fitting and gasket from air horn.

(11) With air horn inverted, remove screw that attaches fuel baffle to air horn (Fig. 9).

(12) Slide nylon float fulcrum pin out of air horn, then remove float. Invert air horn and drop out fuel inlet needle. Using a wide blade screw driver, remove fuel inlet needle valve seat and gasket (Fig. 10).

(13) Remove air horn gasket. (**Note: This gasket is a self sealing type and will stick to air horn mounting surface. Care should be used at removal so as not to**

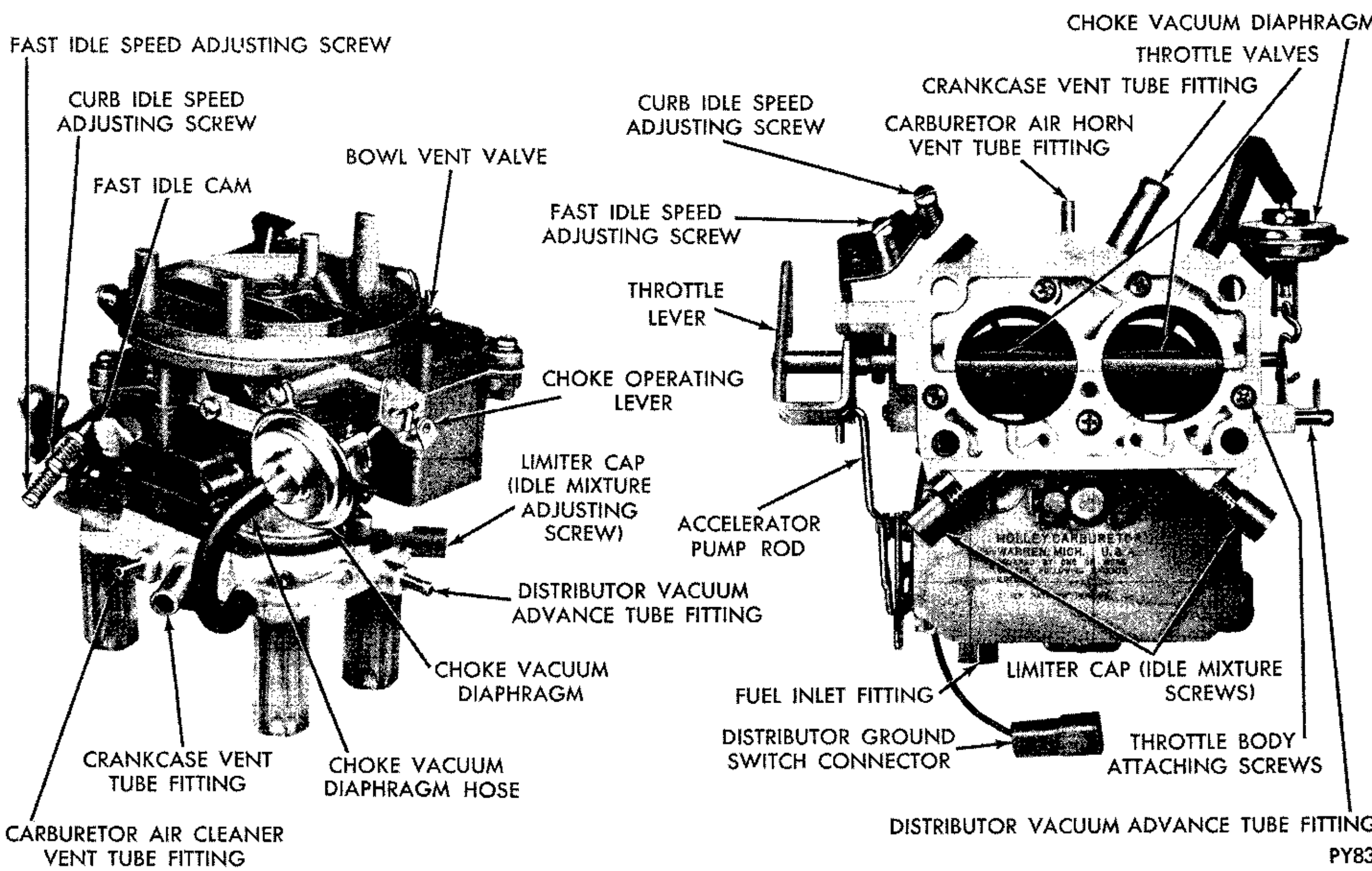


Fig. 1—Carburetor Assembly

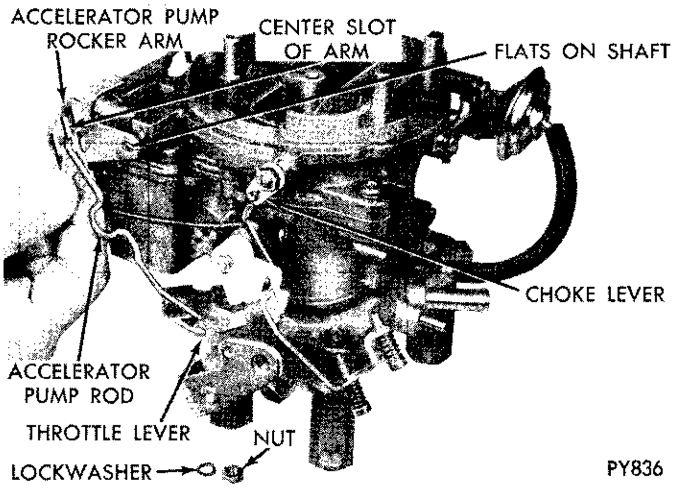


Fig. 2—Removing or Installing Accelerator Pump Rocker Arm

mar or scratch mating surface of air horn.

(14) Remove vacuum power piston from air horn, using tool C-4141 (Fig. 11). (This assembly is staked in position and care must be used at removal.) Remove staking using a suitable sharp tool.

(15) **WARNING: DO NOT ATTEMPT TO REMOVE MAIN WELL TUBES FROM AIR HORN.** These tubes are a pres fit in air horn, and will be damaged if removed. They can be cleaned in a solvent and blown dry with compressed air. If carburetor parts are cleaned in a basket, be sure other carburetor parts are not striking these tubes.

(16) Using Tool TMC-36A, remove main metering jets (Fig. 12). (Number 65 located on throttle lever side of bowl; number 63 on opposite side.)

(17) Using Tool T109-73S, remove power valve assembly (Fig. 13).

(18) Invert main body and drop out accelerator pump discharge check needle from discharge pas-

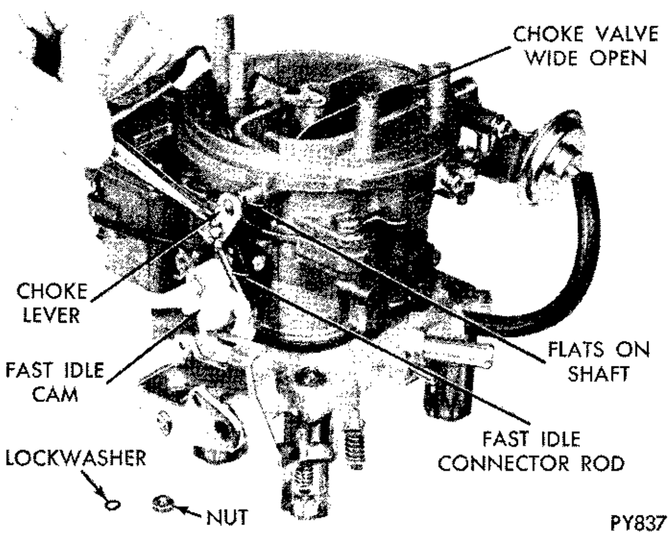


Fig. 3—Removing or Installing Fast Idle Connector Rod

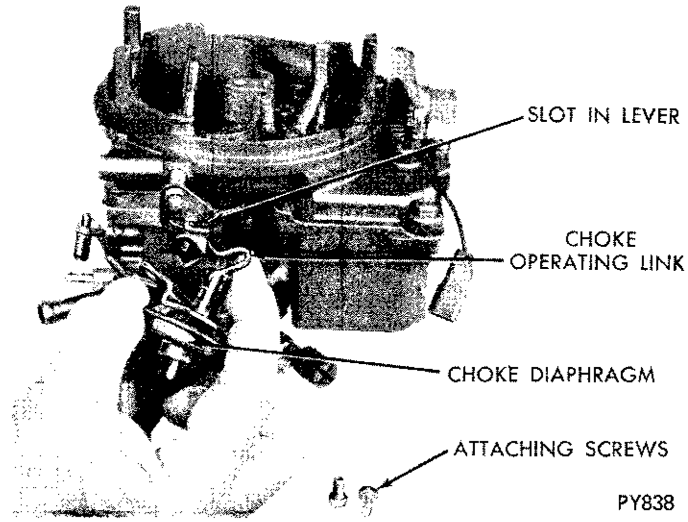


Fig. 4—Removing or Installing Choke Diaphragm

sage (Fig. 15).

(19) Remove fast idle cam retaining "E" clip, then slide fast idle cam off stub shaft (Fig. 14).

(20) Invert main body and remove throttle body to main body attaching screws. Separate bodies and discard gasket.

(21) Turn idle limiter caps to stop. (Top of throttle lever side and bottom of stop on other.) Remove idle limiter caps by prying off with suitable tool. (Be careful not to bend screws.) Be sure and count number of turns to seat the screws, as the same number of turns (from the seat) must be maintained at installation. Remove screws and springs from throttle body.

The carburetor now has been disassembled into three sub-assemblies, the air horn, main body, throttle body and the components of each disassembled as far as necessary for cleaning and inspection.

Caution: In normal routine cleaning and overhaul of the carburetor, do not remove throttle valves unless

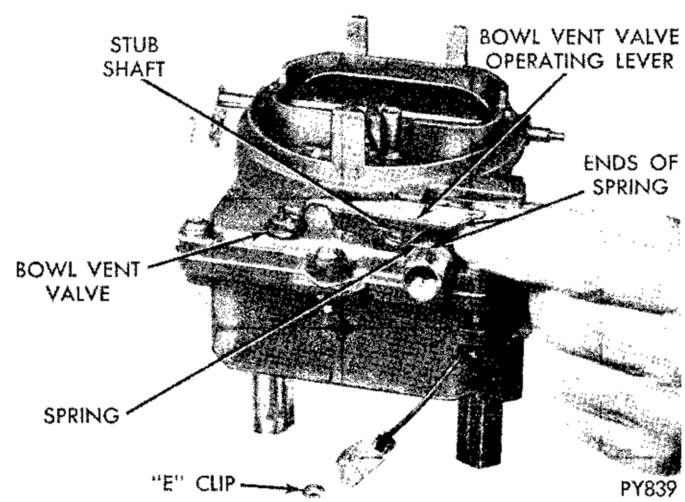


Fig. 5—Removing or Installing Bowl Vent Valve Operating Lever

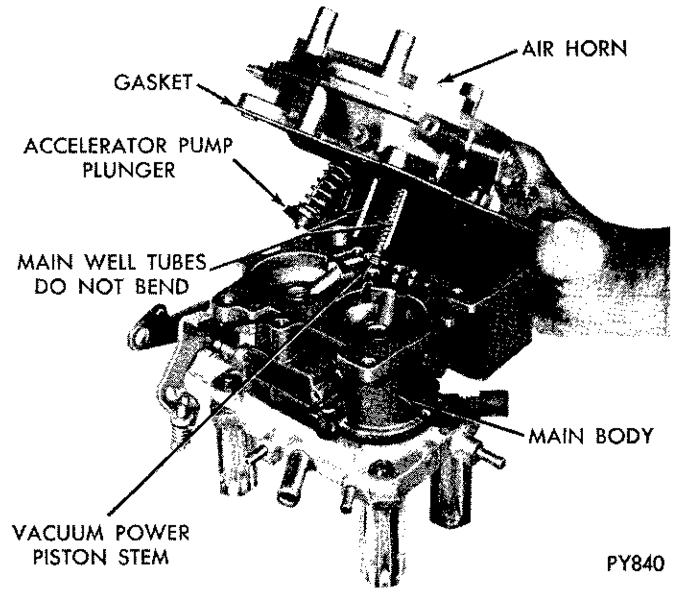


Fig. 6—Removing or Installing Air Horn

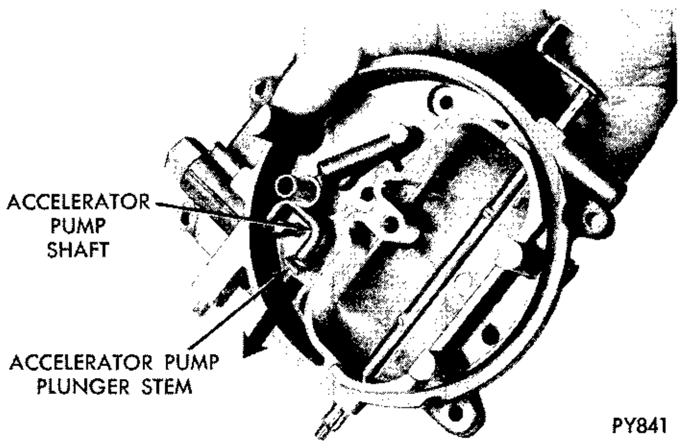


Fig. 7—Removing or Installing Accelerator Pump Plunger

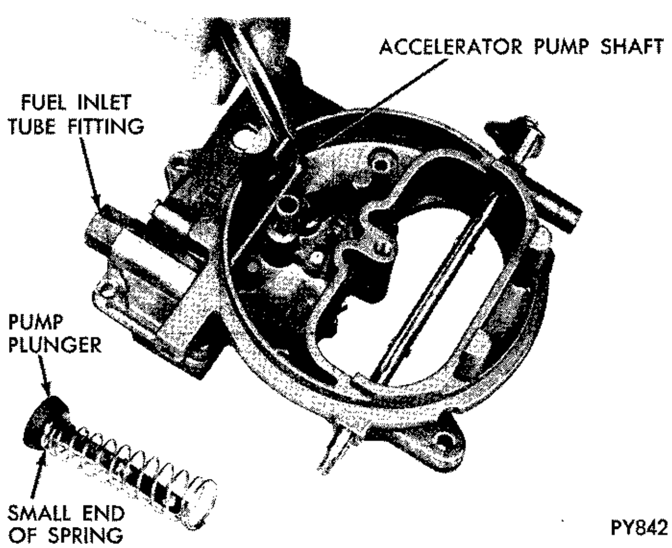


Fig. 8—Removing or Installing Accelerator Pump Shaft

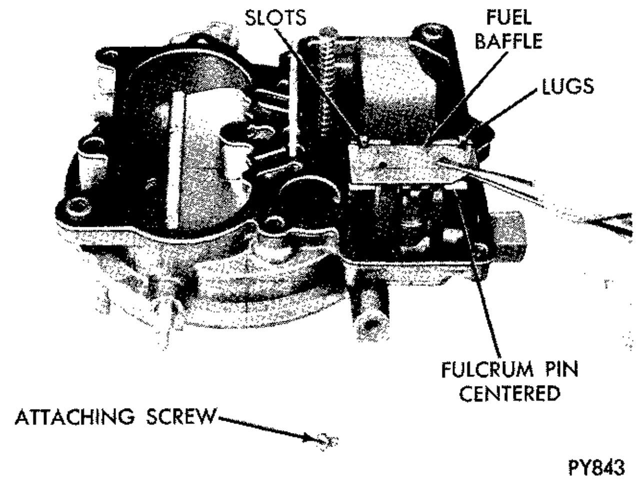


Fig. 9—Removing or Installing Fuel Baffle

they are nicked or damaged. If necessary to remove, proceed as follows:

(1) Remove screws that hold throttle valves in throttle shaft. **These screws are staked to prevent loosening and care is necessary to avoid breaking off in shaft. Remove staking with a file.**

(2) Slide damaged valves out of bores. It should be noted at this time, that the numbered side is on the bottom (or carburetor mounting flange side) and opposite the idle mixture screw ports.

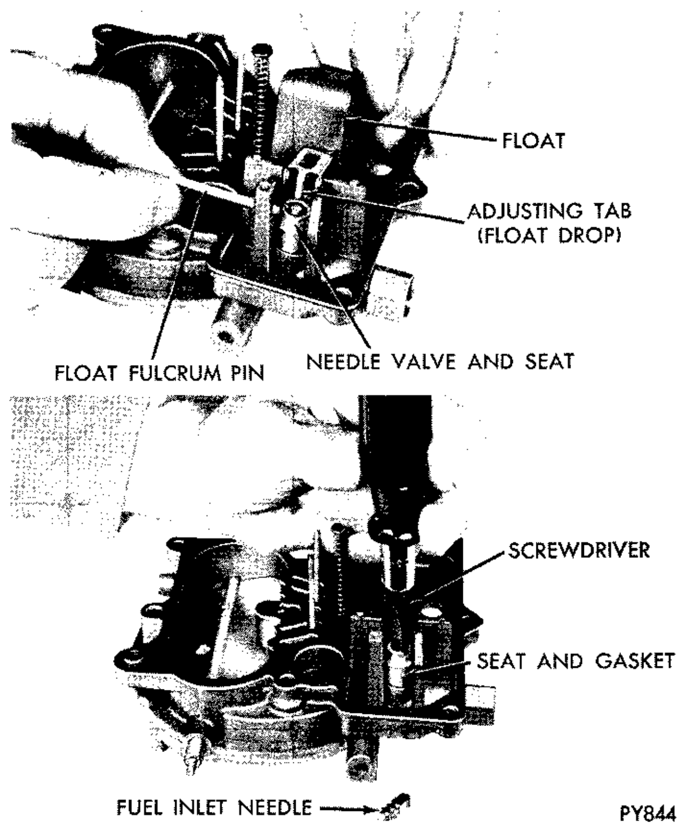


Fig. 10—Removing or Installing Float and Needle Seat

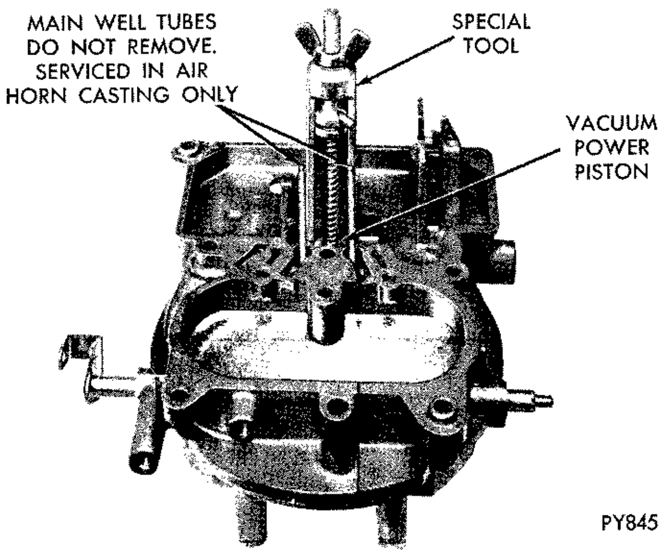


Fig. 11—Removing Vacuum Power Piston

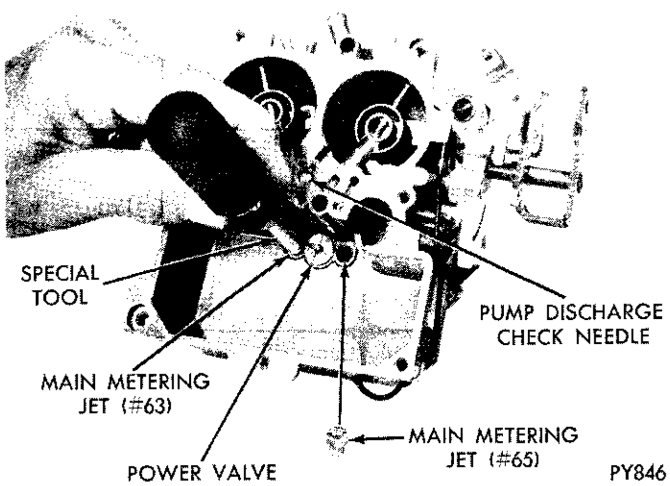


Fig. 12—Removing or Installing Main Metering Jets

CLEANING CARBURETOR PARTS

Refer to General Information Section at front of Fuel System, for cleaning instructions.

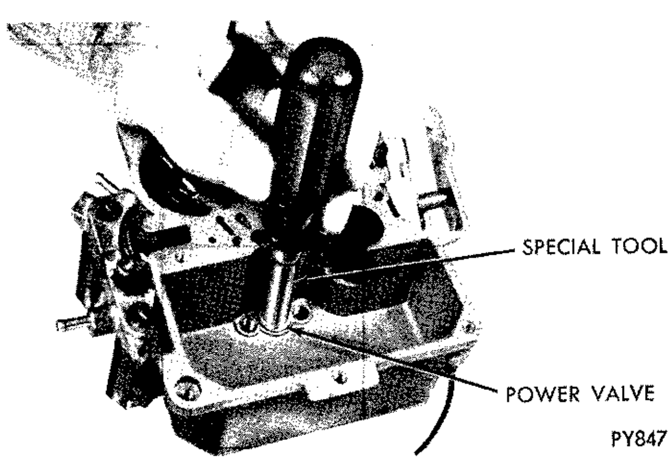


Fig. 13—Removing or Installing Power Valve

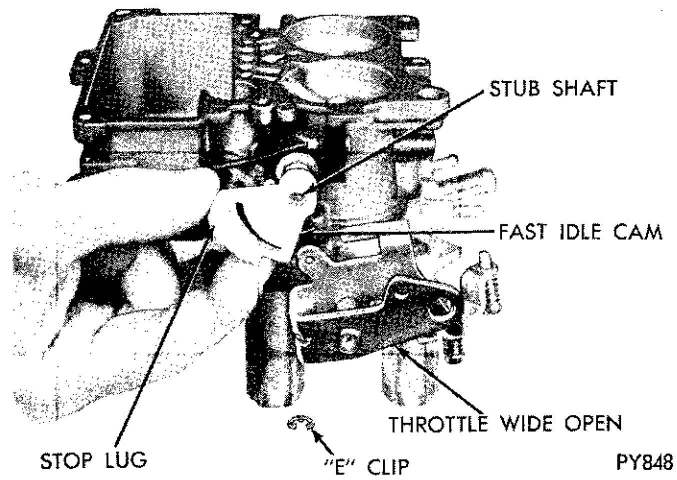


Fig. 14—Removing or Installing Fast Idle Cam

INSPECTION AND REASSEMBLY

DO NOT clean any rubber or plastic parts including diaphragms and electrical parts (that may be attached to carburetor) in cleaning solvent because of possible damage.

Check for cracks, warpage, stripped screw threads, damaged or marred mating surfaces, on all major castings. The passages in the castings should be free of restrictions. Install new castings as required. Check float assembly for damage or any condition that would impair this item from further service. The choke and throttle valves should be replaced if the edges have been nicked or if the protective plating has been removed. Be sure that the choke and throttle shafts are not bent or scored. Replace any broken or distorted springs. Replace all threads and lockwashers that show signs of stripped threads or distortion.

Throttle Body

If the throttle valves were removed because of dam-

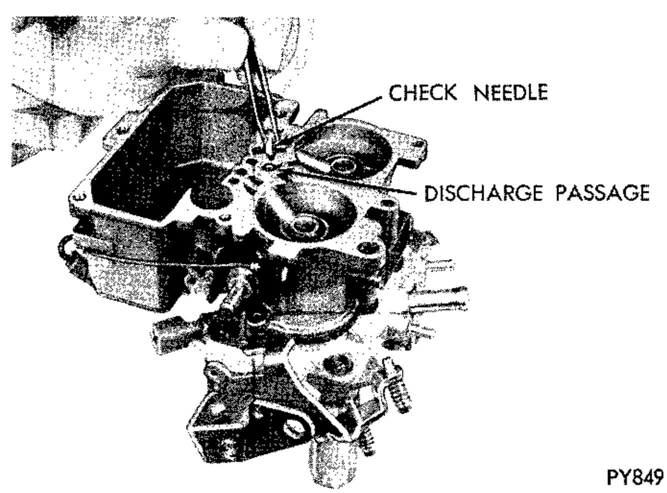


Fig. 15—Installing Accelerator Pump Discharge Check Needle

age, install new valves as follows:

(1) Slide new valves into position in throttle shaft, with the valve number on the bottom, (or mounting flange side,) and away from idle air mixture adjusting screw ports.

(2) Install new valve screws but do not tighten.

(3) Hold valves in place with fingers. (Fingers pressing on high side of valves.)

(4) Tap valve lightly with a screw driver to center in bores. Now, tighten valve attaching screws securely. Operate the throttle shaft. From closed to open position, they must operate smoothly without drag or sticking. Hold throttle body up to a strong light. The light which is visible around the outer diameter of valves in bore should be uniform. Stake screws, using a pair of pliers.

(5) Install idle mixture screws and springs in body. (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control.) **DO NOT USE A SCREW DRIVER.** Turn screws lightly against their seats with fingers. Back off the number of turns (from the seat) counted at disassembly. Install new plastic caps with tab against stop.

Main Body

(1) Invert main body and place a new gasket in position. Place throttle body on main body and align. Install attaching screws and tighten securely.

(2) Install accelerator pump discharge check needle in discharge passage (Fig. 15). Check accelerator pump, fuel inlet and discharge systems as follows:

(3) Pour clean gasoline into fuel bowl, approximately 1 inch deep. Slide accelerator pump plunger into cylinder. Raise plunger and press down lightly on plunger stem to expell all air from pump passage.

(4) Using a small clean brass rod, hold discharge check needle down on its seat. Again raise plunger and press downward. No fuel should be emitted from pump discharge passage (Fig. 16).

If any fuel does emit from discharge passage, it indicates the presence of dirt or a damaged or worn check needle, or seat. Clean the passage again and retest as above. If leakage is still evident, attempt to form a new seat as follows:

(5) With discharge check needle installed, insert a piece of drill rod down on needle. Lightly tap 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 service fix does not correct the condition, a new main body should be installed. Remove accelerator pump plunger, discharge check needle and fuel from main body.

(6) Install power valve, using Tool T109-73S, (Fig. 13). Tighten securely.

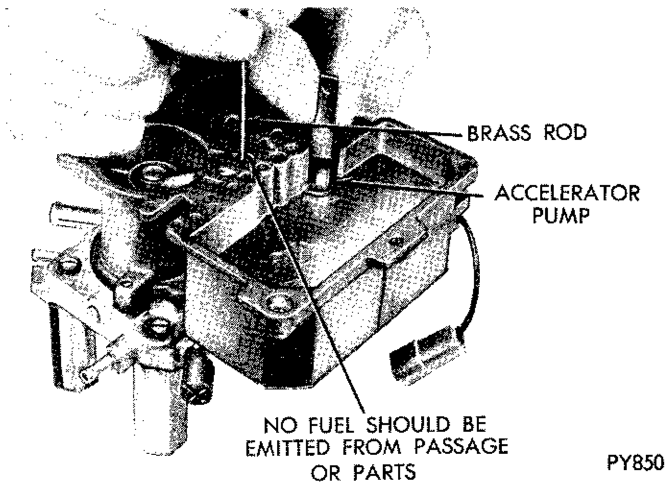


Fig. 16—Testing Accelerator Pump Discharge Check Needle

(7) Install main metering jets, using Tool TMC-36A. (Fig. 12). Tighten securely. (Number 65 on throttle lever side and number 63 an other side of bowl.)

(8) Install accelerator pump discharge check needle in pump discharge passage (Fig. 15).

Air Horn

(1) Test freeness of choke mechanism in air horn. The choke shaft must float free to operate correctly. If choke sticks in bearing bores, or appears to be gummed from deposits in air horn, a thorough cleaning will be required.

(2) Install vacuum power piston in its cylinder (Fig. 17). Lock in position by prick punching rim of cylinder (at least three places.) Do not over-stake. Compress piston to be sure no binding exists. If piston sticks or binds enough to hinder smooth operation, a new piston should be installed.

(3) Slide accelerator pump plunger compression spring over plunger stem, with small diameter toward

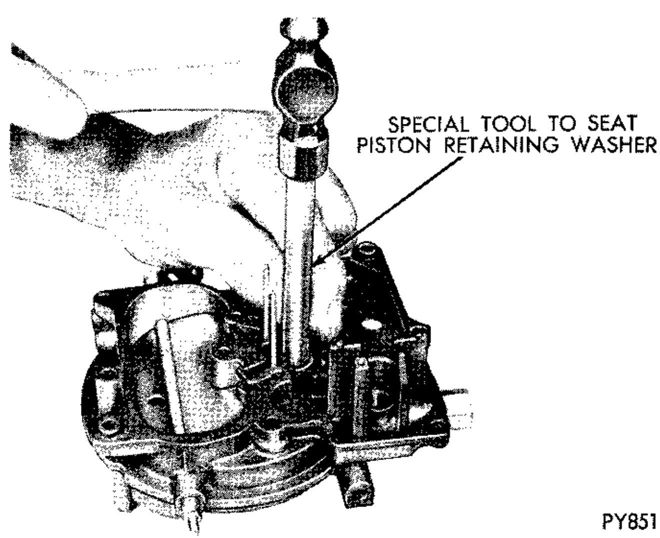


Fig. 17—Installing Vacuum Power Piston

plunger. Install pump shaft in air horn (Fig. 8).

(4) As plunger is being installed in air horn, slightly tilt plunger to engage with plunger shaft.

(5) Install fuel inlet needle valve seat and gasket in air horn. Tighten securely, using a wide blade screwdriver. Install fuel inlet needle in seat (Fig. 10).

(6) Install float in position, then slide nylon fulcrum pin through float hinge to retain float. Center fulcrum pin (Fig. 9).

(7) Install fuel baffle on bosses with slots engaged lugs. Install attaching screw and tighten securely (Fig. 9).

Measuring Float Setting

The carburetors are equipped with a viton tipped fuel inlet needle. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding. **Care should be taken to perform this operation accurately in order to secure best performance and fuel economy.**

(1) To correctly set float height when carburetor is being overhauled, proceed as follows:

(2) Invert air horn so that weight of float **only** is forcing needle against seat.

(3) Measure the clearance between top of float and float stop (Fig. 18). The clearance should be .200 inch ± 1/64 (#7 drill). Be sure drill or gauge is perfectly level when measuring.

If an adjustment is necessary, bent float lip toward or away from needle, using a narrow blade screwdriver (Fig. 19), until correct clearance or setting has been obtained.

(4) Check float drop, by holding air horn in an upright position. The bottom edge of float should be parallel to underside surface of air horn (Fig. 20). If an adjustment is necessary, bend tang on float arm until parallel surfaces have been obtained.

Installing Air Horn

(1) Place a new gasket on air horn, then check to be sure main well tubes are straight. Lower air horn straight down on main body; guiding accelerator

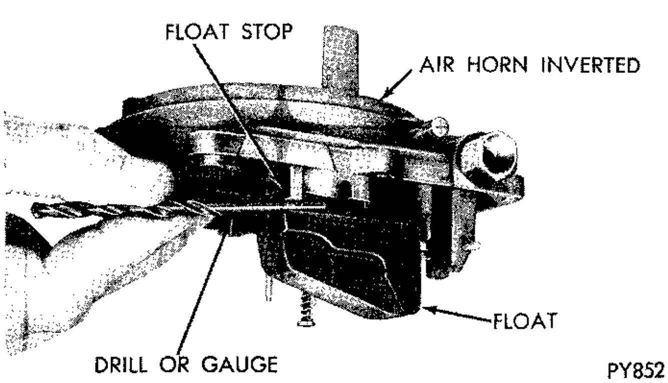


Fig. 18—Checking Float Setting

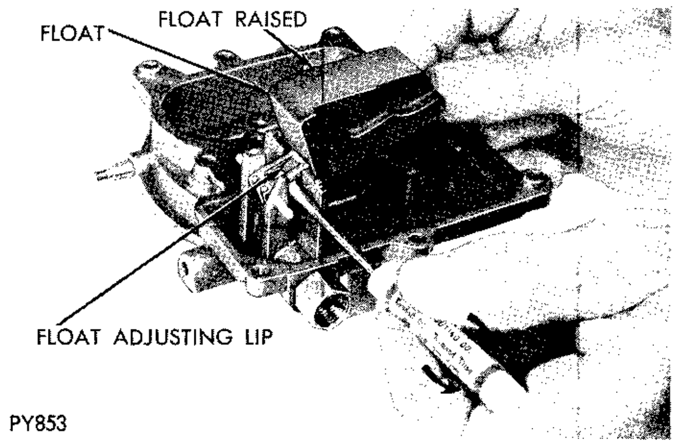


Fig. 19—Bending Float Adjusting Lip

pump plunger into its cylinder. **Caution: Do not cut lip of plunger on sharp edge of cylinder.** Install attaching screws (long screw in center) and tighten securely (Fig. 6).

(2) Install fuel inlet tube fitting and gasket in air horn and tighten securely.

(3) Engage hooked end of accelerator pump rod in throttle lever (hook end toward outside). Engage other end of rod in center slot of pump rocker arm (Fig. 2).

(4) Install rocker arm on accelerator pump shaft with flats in alignment (Fig. 2). Install attaching lockwasher and nut. Tighten securely.

(5) Install bowl vent valve lever on air horn, by first inserting spring into position in arm, with ends of spring pointing toward fuel inlet fitting (Fig. 5). Slide assembly over stub shaft on air horn. Align spring and arm with stub shaft and end of spring over raised portion of fuel inlet fitting. Install "E" clip to secure. Vent valve should be in closed position.

(6) Install fast idle cam on air horn stub shaft, with steps toward fast idle adjusting screw. Install "E" clip to secure (Fig. 14).

(7) To install fast idle connector rod, engage plain end in slot of fast idle cam (from inside). Engage other end of rod in choke lever. With choke valve wide open,

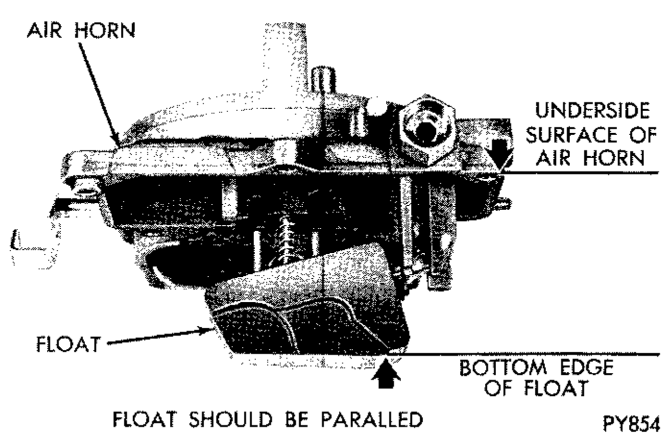


Fig. 20—Checking Float Drop

slide lever over choke shafts; (aligning flats) and pointing directly to fast idle cam stub shaft (Fig. 3). Install attaching lockwasher and nut. Tighten securely.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to be sure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the fitting to seal the opening. Release the stem. If the stem moves more than 1/16 inch in 10 (ten) seconds, the leakage is excessive and the assembly must be replaced.

Install choke diaphragm assembly on the air horn as follows:

(1) Engage free end of choke operating link in slot of choke lever.

(2) Install choke diaphragm and mounting bracket on air horn. Install attaching screws and tighten securely.

(3) Inspect rubber hose for cracks before placing it on correct carburetor fitting, (Fig. 1) after vacuum kick adjustment has been made.

CARBURETOR ADJUSTMENTS

It is very important that the following adjustments are made on a reconditioned carburetor and in the sequence listed:

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in the Fast Idle Speed Adjustment (On Vehicle) paragraph. However, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to assure that the speeds of each step of the cam occur at the proper time during engine warm-up.

(1) With fast idle speed adjusting screw contacting second highest speed step on the fast idle cam, move choke valve toward closed position with light pressure on choke shaft lever.

(2) Insert specified drill (see Specifications) between top of choke valve and wall of air horn (Fig. 21). An adjustment will be necessary if a slight drag is not obtained as drill shank is being removed.

(3) If an adjustment is necessary, bend fast idle connector rod at angle, using Tool T109-213, until correct valve opening has been obtained.

Vacuum Kick Adjustment—(This test can be made On or Off vehicle.)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum

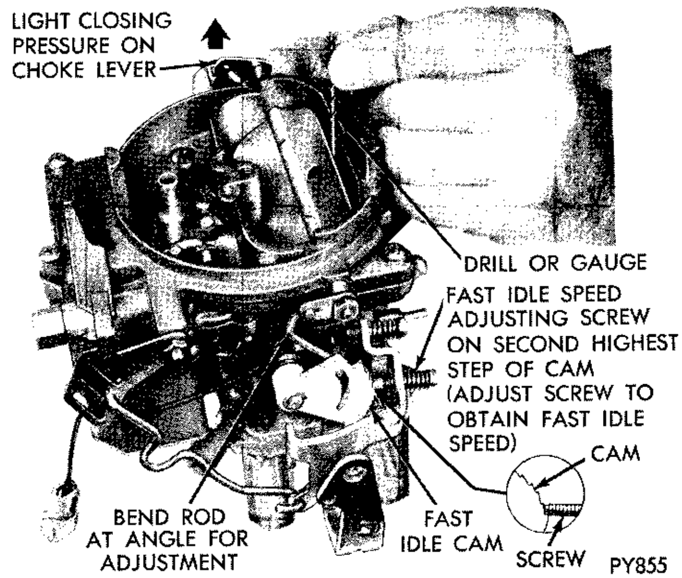


Fig. 21—Fast Idle Speed and Cam Position Adjustment

kick adjustment. Use either a distributor test machine with a vacuum source, or vacuum supplied by another vehicle.

(1) If adjustment is to be made with engine running, disconnect fast idle linkage to allow choke to close to the kick position with engine at curb idle. If an auxiliary vacuum source is to be used, open throttle valves (engine not running) and move choke to closed position. Release throttle first, then release choke.

(2) When using an auxiliary vacuum source, disconnect vacuum hose from carburetor and connect it to hose from vacuum supply, with a small length of tube to act as a fitting. Removal of hose from diaphragm may require forces which can damage the system. Apply a vacuum of 10 or more inches of mercury.

(3) Insert specified drill (refer to Specifications) be-

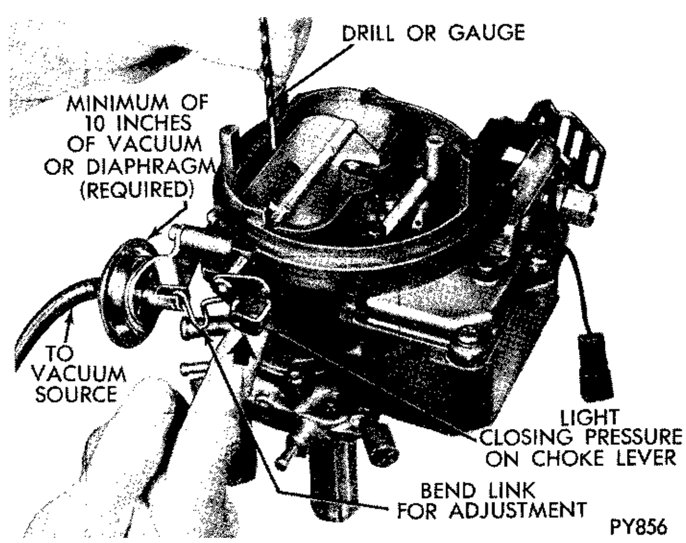


Fig. 22—Vacuum Kick Adjustment

tween top of choke valve and wall of air horn (Fig. 22). Apply sufficient closing pressure on lever to which choke rod attaches to provide a minimum choke valve opening, without distortion of diaphragm link. Note that the cylindrical stem of diaphragm will extend as internal spring is compressed. This spring must be fully compressed for proper measurement of vacuum kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as drill is being removed. Shorten or lengthen diaphragm link to obtain correct choke opening. Length changes should be made carefully by bending (open or closing) the bend provided in diaphragm link. **CAUTION: DO NOT APPLY TWISTING OR BENDING FORCE TO DIAPHRAGM.**

(5) Reinstall vacuum hose on correct carburetor fitting. Return fast idle linkage to its original condition if disturbed as suggested in Step No. 1.

(6) Make following check. With no vacuum applied to diaphragm, the **choke valve should move freely** between open and closed positions. If movement is not free, examine linkage for misalignment or interferences caused by bending operation. Repeat adjustment if necessary to provide proper link operation.

Choke Unloader (Wide Open Kick)

The choke unloader is a mechanical device to partially open the choke valve at wide open throttle. It is used to eliminate choke enrichment during cranking of an engine. Engines which have flooded or stalled by excessive choke enrichment can be cleared by use of the unloader. Adjust the choke unloader as follows:

(1) Hold throttle valves in wide open position. Insert specified drill (see Specifications) between upper edge of choke valve and inner wall of air horn (Fig. 23).

(2) With a finger lightly pressing against shaft lever, a slight drag should be felt as drill is being withdrawn. If an adjustment is necessary, bend unloader tang on throttle lever until correct opening has been obtained (Fig. 23). Use Tool T109-213.

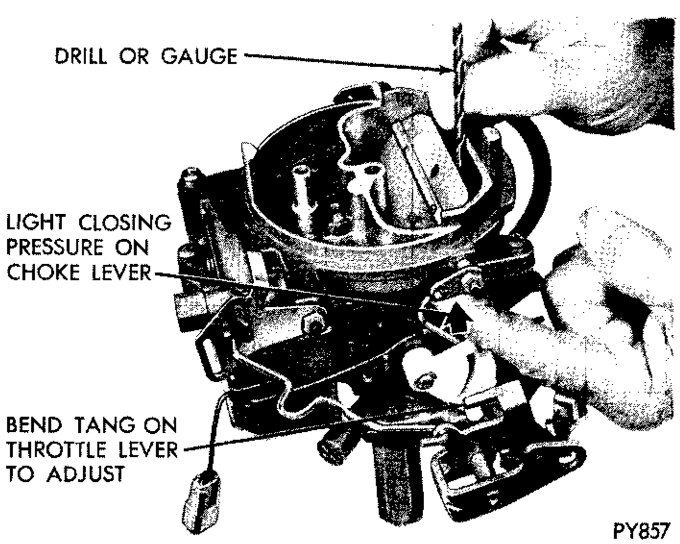


Fig. 23—Choke Unloader Adjustment (Wide Open Kick)

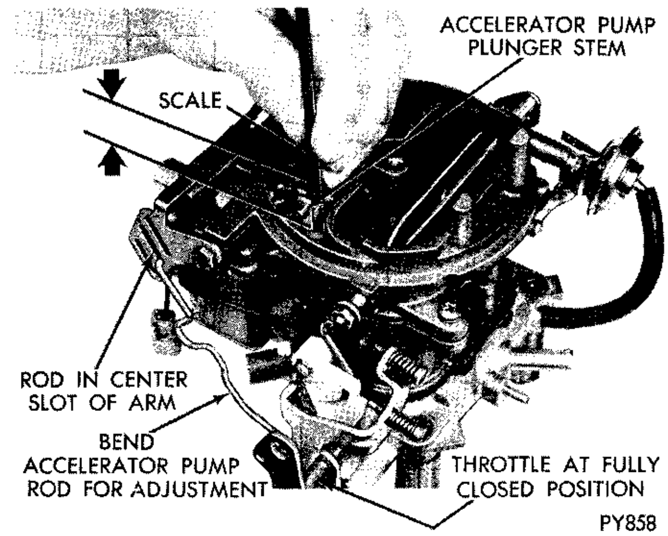


Fig. 24—Accelerator Pump Adjustment

Accelerator Pump

(1) Back off curb idle speed adjusting screw. Open choke valve so that fast idle cam allows throttle valves to be completely seated in bores. Be sure that pump connector rod is installed in center slot of accelerator pump rocker arm.

(2) Close throttle valves tightly. Measure the distance between top of air horn and end of plunger shaft (Fig. 24). This measurement should be 9/16 inch.

(3) To adjust pump travel, bend pump operating rod, using Tool T109-213, at loop of rod, until correct setting has been obtained.

Bowl Vent

(1) With curb idle speed adjusting screw at curb

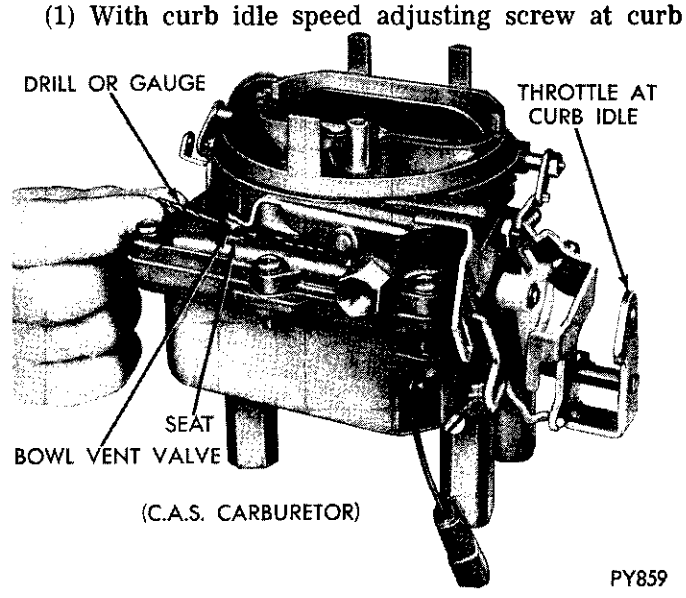


Fig. 25—Bowl Vent Adjustment

idle, there should be 5/64 inch clearance between bowl vent valve and seat on air horn when throttle valves are closed (Fig. 25).

(2) If an adjustment is necessary, bend tang on accelerator pump rocker arm, using Tool T109-41, until correct vent valve opening has been obtained.

Idle Speed Adjustment (Curb Idle)

(Refer to General Information at Front of Section.)

Fast Idle Speed Adjustment (On Vehicle)

Fast idle engine speed is used to overcome cold engine friction stalls, after cold starts and stalls because of carburetor icing. Set this adjustment after the vehicle odometer indicates over 500 miles to insure a normal engine friction level. Prepare engine by driving at least five miles. Connect a tachometer and set the curb idle speed and mixture, then proceed as follows:

(1) With engine off and transmission in **PARK** or **NEUTRAL** position, open throttle slightly.

(2) Close choke valve until fast idle screw can be positioned on second highest step of fast idle cam (Fig. 26).

(3) Start engine and determine stabilized speed. Turn fast idle speed screw **in** or **out** to secure specified speed. (See Specifications.)

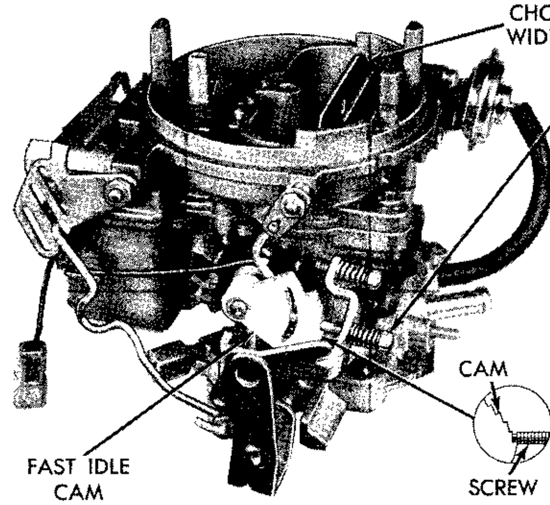


Fig. 26—Fast Idle Speed Adjustment (On Vehicle)

(4) Stopping engine between adjustments is not necessary. However, reposition fast idle speed screw on cam after each speed adjustment to provide correct throttle closing torque.

To set idle speed on vehicles, refer to Fuel System General Information Paragraph.

AVS SERIES CARBURETOR

INDEX

GENERAL INFORMATION

383 Cubic Inch Engine

The Carter four barrel carburetor models C.A.S. (Cleaner Air System) AVS-4736S and AVS-4732S are used on the 383 cu. in. engines when the vehicles are equipped with automatic transmissions. AVS-4732S is used on vehicles with air conditioning only, and is equipped with a hot idle compensator valve. This valve is a thermostatically operated air bleed, to relieve an overrich condition at idle. This condition is the result of excessive heat and resultant overrich mixtures (Fig. 1).

The Carter four barrel carburetor model E.C.S. (Evaporation Control System) AVS-4734S is used when the vehicle is equipped with an automatic transmission. This carburetor is also equipped with a hot idle compensator valve, as AVS-4732S above. (Fig. 1).

All of these carburetors are equipped with a distributor ground switch, which retards the distributor when the carburetor is at curb idle, for better emission control.

440 Cubic Inch Engine

The Carter four barrel carburetor models C.A.S. (Cleaner Air System) AVS-4737S, AVS-4738S and AVS-4741S are used on the 440 cu. in. engines when the vehicles are equipped with a standard or automatic transmission respectively. AVS-4741S is used with air conditioning only and has a hot idle com-

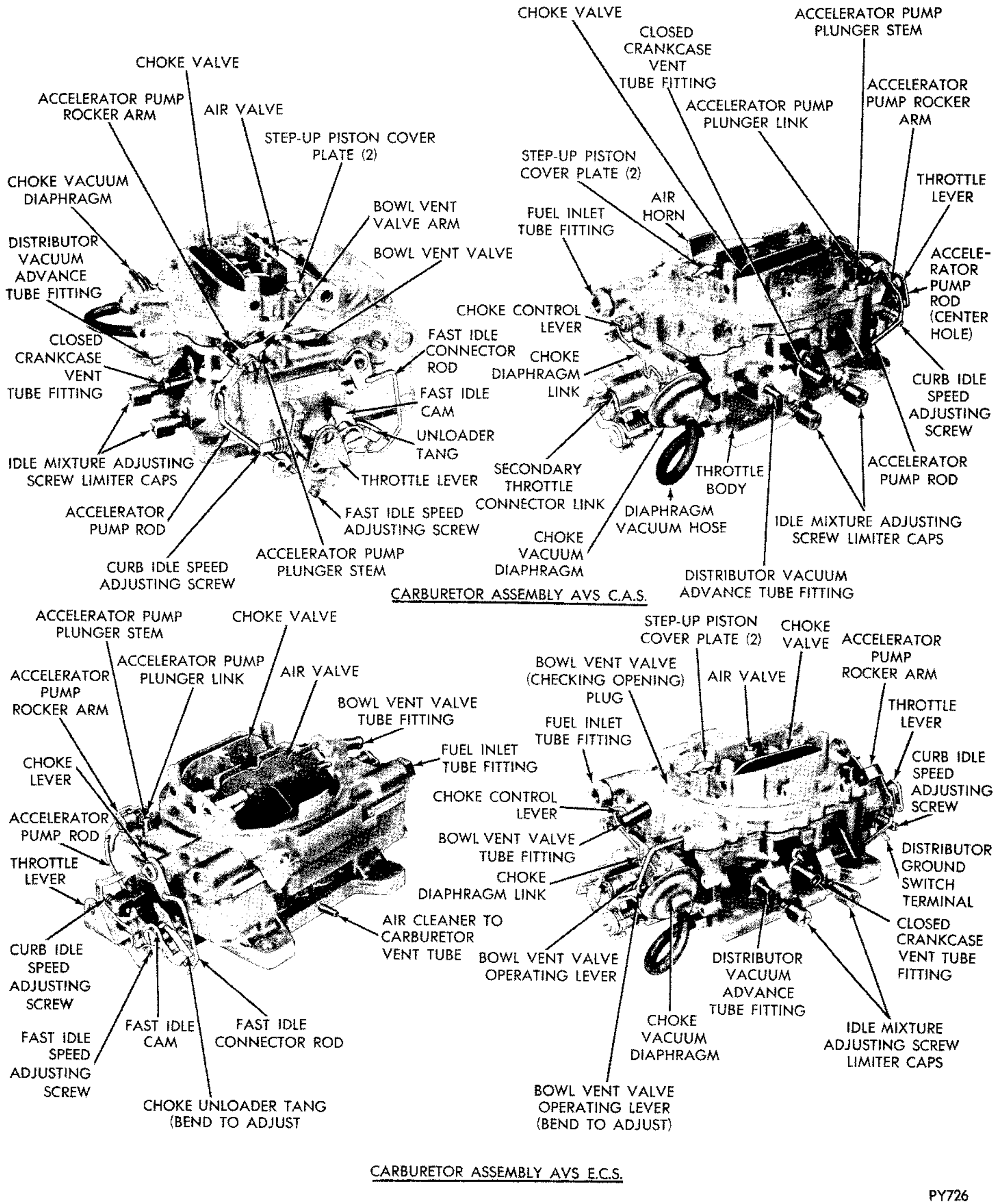


Fig. 1—Carburetor Assembly

pensator valve, as described previously. (Fig. 1).

The Carter four barrel carburetor models E.C.S. (Evaporation Control System) AVS-4739S and AVS-4740S are used on the 440 cu. in. engines when the vehicles are equipped with standard or automatic transmissions respectively. These two carburetors are also equipped with a hot idle compensator valve as is AVS-4741S above. (Fig. 1).

These five AVS carburetors are equipped with a distributor ground switch, which retards the distributor when the carburetor is at idle, for better emission control. The idle speed solenoid which is mounted on these carburetors, (Fig. 21) is used to maintain a higher idle speed when the vehicle is running and allows the throttle to close to a low idle speed throttle position when the ignition key is turned off, to prevent "after running."

Since the service procedures are identical on all Carter AVS carburetors, the illustrations showing the various disassembly procedures will not always show any one specific carburetor.

The throttle valves of the secondary half of the carburetor are mechanically connected to the primary valves and open with the primary after an approximate 60° lag; and continue to open until both primary and secondary throttle valves reach the wide open position simultaneously. As engine speed increases, the forces exerted by the velocity of intake air down through the venturis of the carburetor increases and tends to overcome the air valve spring attached to the air valve, permitting the air valve to position its self according to engine requirements.

The AVS (air valve secondary) carburetor contains many features, some of which are the locations for the step-up rods and pistons. The step-up rods, pistons and springs are accessible for service without removing the air horn or the carburetor from the engine. The primary venturi assemblies are replaceable and contain many of the calibration points for both the high and low speed system. One fuel bowl feeds both the primary and secondary nozzles on the right side while the other fuel bowl takes care of the primary and secondary nozzles on the left side. This provides improved performance in cornering, quick stops and acceleration.

All the major castings of the carburetor are aluminum, with the throttle body cast integral with the main body. This allows an overall height reduction in the carburetor. The section containing the accelerator pump is termed the primary side of the carburetor. The rear section 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.

SERVICE PROCEDURES

DISASSEMBLING CARBURETOR (Fig. 1)

(1) Place carburetor assembly on repair stand Tool C-3400 or T-109-287S elevating legs. These tools are used to protect throttle valves from damage and to provide a suitable base for working.

(2) Remove hairpin clip that attaches fast idle connector rod to fast idle cam. Disengage rod from cam then swing rod at an arc until it can be disengaged from choke operating lever.

(3) Remove hairpin clip that holds throttle connector rod in center hole of accelerator pump arm. Disengage rod from arm and throttle lever, then remove from carburetor.

(4) Remove screws attaching step-up piston and rod cover plates. Hold cover down with a finger to prevent piston and rods from flying out. Lift off plates and slide step-up pistons and rods out of air horn, (Fig. 2). Remove step-up piston springs.

(5) Remove vacuum hose between carburetor throttle body and vacuum diaphragm.

(6) Remove clip from choke operating link and disengage link from diaphragm plunger (stem) and choke lever. (Fig. 1).

(7) Remove vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item. A liquid cleaner may damage diaphragm material.

(8) Remove screws that attach idle solenoid bracket and solenoid to air horn and main body. Remove sole-

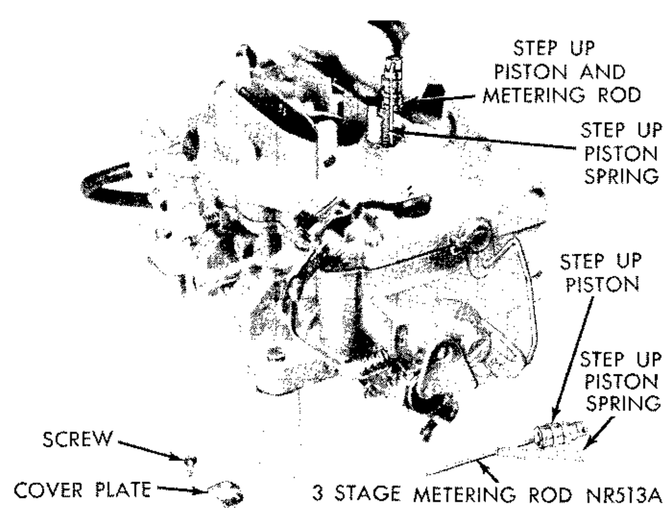


Fig. 2—Removing or Installing Step-Up Pistons and Rods

noid assembly from carburetor. (If so equipped.)

(9) Remove eight screws that attach air horn to main body. Lift air horn straight up and away from main body. When removing air horn, use care so as not to bend or damage floats. Remove accelerator pump, plunger lower spring from pump cylinder.

(10) Remove hot idle compensator and gasket (if so equipped).

Disassembling Air Horn

Place air horn in an inverted position on bench (to protect the floats) then proceed to disassemble as follows:

(1) Using a suitable tool, remove float fulcrum pins, (left and right) then lift float up and out of bosses on air horn. It is suggested that the float on the pump side be marked so that floats can be reinstalled in their respective positions.

(2) Remove two needle valves from their respective seats, after marking one on pump side for identification. Using a wide blade screw driver, remove needle valve seats. Be sure each needle valve is returned to its original seat at reassembly.

(3) Remove shoulder screw and spring holding accelerator pump rocker arm and bowl vent arm to air horn (C.A.S.). Remove arms and disengage pump link from pump stem. Slide accelerator pump plunger and spring out of air horn. Remove gasket.

(4) Place accelerator pump plunger in a jar of clean gasoline or kerosene, to prevent leather from drying out.

(5) Remove fuel inlet fitting and filter screen from air horn.

(6) Test freeness of choke mechanism in air horn. The choke shaft must float free to operate correctly. If choke shaft sticks in bearing area, or appears to be gummed from deposits in air horn, a thorough cleaning will be required.

Main Body Disassembly

(1) Remove screws that attach accelerator pump jet housing to main body. Lift out jet housing and gasket (Fig. 3). Discard gasket. Now, invert main body and drop out discharge check needle from discharge passage.

(2) Using Tool T-109-58, remove main metering jets (primary side), (Fig. 4). **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.**

(3) Again using Tool T-109-58, remove main metering jets (secondary side), (Fig. 4). Remove intake check.

(4) Remove screws that attach primary venturi (choke and pump side) to main body. Lift venturi straight up and away from main body, (Fig. 5). Discard gaskets. **The venturi assemblies are not interchangeable, side for side and must be reinstalled in their original locations at reassembly.**

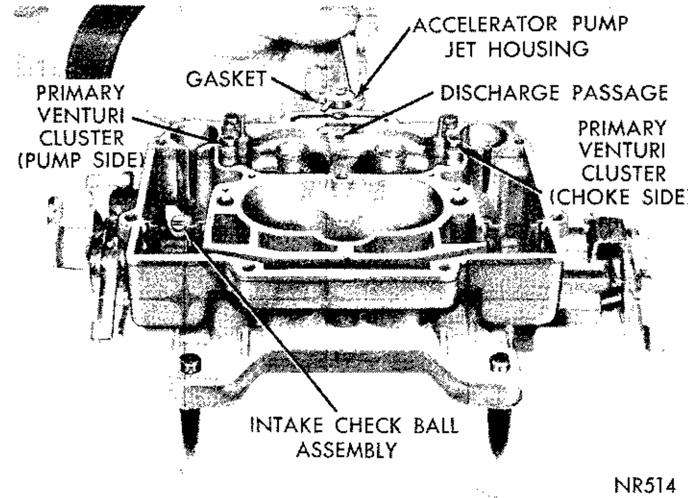


Fig. 3—Removing or Installing Accelerator Pump Jet Housing

(5) Using Tool T-109-59, screw driver bit, remove accelerator pump intake check valve located inside fuel bowl, adjacent to accelerator pump cylinder.

(6) Remove plastic limiter caps from idle air mixture screws. (Be sure and count number of turns to seat the screws (from stop), as the same number of turns (from seat) must be maintained at installation.) Remove screws and springs from throttle body.

The carburetor now has been disassembled into two units, namely 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, (Fig. 6).

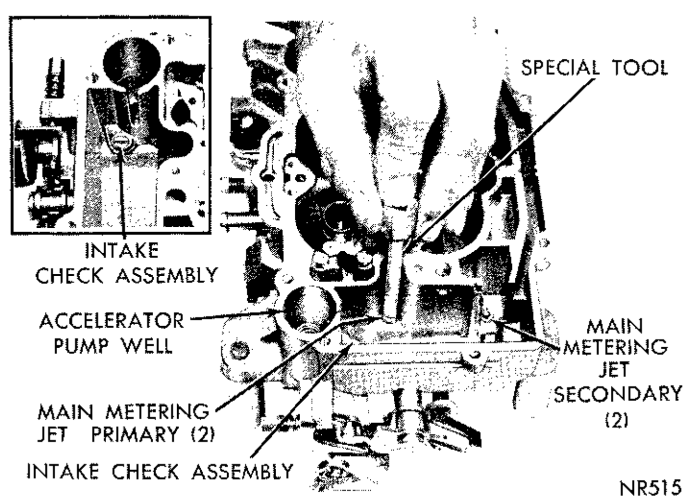


Fig. 4—Removing or Installing Main Metering Jets

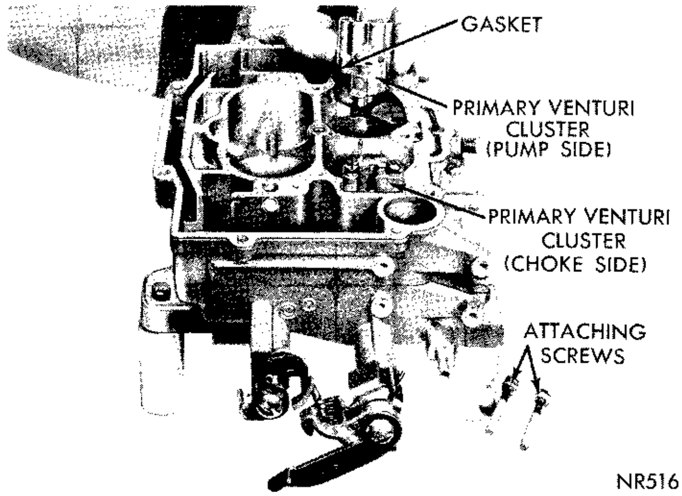


Fig. 5—Removing or Installing Primary Venturi Cluster

The valves are milled to give 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 bores.

Remove the screws that attach the secondary throttle valves to the throttle shaft and slide valve (or valves) out of bores.

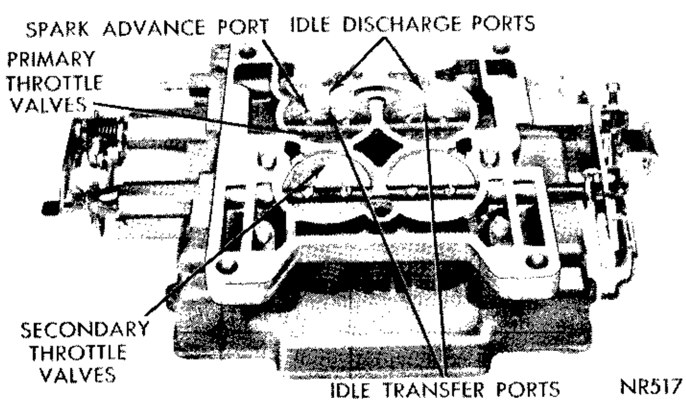


Fig. 6—Ports in Relation to Throttle Valves

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 (Fig. 7).

INSPECTION AND REASSEMBLY

(1) Slide primary throttle valve (or valves) into their respective bores, install new screws, but do not tighten. Be sure idle speed adjusting screw is backed out. Hold valves in place with fingers. (Fingers pressing on high side of valves.)

(2) Tap valves lightly in this position, tighten screws securely. Stake screws by squeezing with pliers.

(3) Install idle mixture screws and springs in throttle body. (The tapered portion must be straight and smooth. If tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control.) **DO NOT USE A SCREW DRIVER.** Turn screws lightly against their seats with fingers. Back off the number of turns counted at disassembly. Install new plastic caps with tab against stops. This screw has a left hand thread. Turn counterclockwise (Richer) and clockwise (Leaner).

(4) **Be sure all the metering holes and vent tubes are clean, in the primary venturi.** Place new primary venturi gaskets in position, then install the primary venturi (pump and choke side) by lowering straight down on gaskets (Fig. 5). Install attaching screws and tighten securely.

(5) Install primary and secondary main metering jets, using Tool T-109-58. (Fig. 4.) Tighten jets securely. Install intake check.

(6) Install accelerator pump intake check ball using Tool T-109-59.

(7) Install hot idle compensator and gasket (if so equipped). Tighten screws securely.

Accelerator Pump Test

(1) Pour clean gasoline into carburetor bowl (ap-

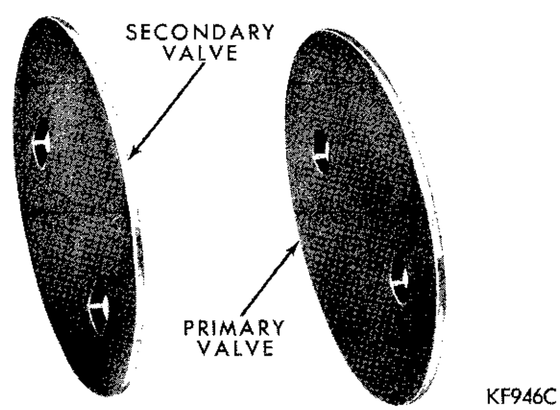


Fig. 7—Throttle Valve Identification

proximately 1/2 inch deep). Remove accelerator pump plunger from jar of gasoline. Flex leather several times, then slide into pump cylinder.

(2) Install accelerator pump discharge check needle in discharge passage. Raise pump plunger and press lightly on plunger shaft to expel air from pump passages. Using a small clean brass rod, hold discharge check needle firmly on its seat. Again raise plunger and press downward. No fuel should be emitted from either the intake or discharge passage.

(3) If fuel does emit from intake passage, remove intake check ball and reclean the passage. Fuel leakage at discharge check needle indicates presence of dirt or a damaged check needle. Clean again and then install a new check needle. Retest for leakage.

(4) If either intake check assembly or discharge check needle leaks after above test and service fix, attempt to reseat as follows:

Intake Check Ball

Remove the intake check assembly from the throttle body. Install a new check assembly, then retest as described previously (Fig. 4).

Discharge Check Needle

(1) With discharge check needle installed, insert a piece of drill rod down on needle. Lightly tap 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 service fix does not correct the condition, a new carburetor will have to be installed.

(2) Install accelerator pump discharge check needle, jet housing and gasket. Install housing and attaching screws. Tighten screws securely.

(3) Press down on accelerator pump plunger shaft, and as plunger is being depressed, a clear straight stream should emit from each jet. If streams are not identical, (if either one is diverted or restricted) a new accelerator pump jet housing should be installed. After test, pour gasoline from carburetor bowl and remove pump plunger.

Assembling Air Horn

(1) Slide fuel inlet screen into fuel line fitting, then install in air horn. Tighten securely.

(2) Check to see if leather on accelerator pump plunger is hard, cracked or worn. If any sign of wear or deterioration is evident, install a new plunger assembly. Install pump link.

(3) Place pump arm in position over boss of air horn and engage pump link. Install bowl vent arm in position over pump arm. Slide spring over pivot screw and install through arms and boss. Be sure shoulder of screw enters arms. Tighten securely. Engage ends of spring with tang on vent arm and pin on air horn. Check for proper operation.

The carburetors are equipped with synthetic rubber tipped fuel inlet needles. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of new inlet needles require that care be used when making float adjustments. Avoid applying any pressure on the floats which might compress the tip of the fuel inlet needles. **The tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.**

(4) Place a new air horn to main body gasket in position on air horn, then install float needle valve seats. (Be sure each needle seat and needle is reinstalled in its original position.)

(5) Slide right and left floats into position in air horn, then install float fulcrum pins. **(Be sure marked float is installed on pump side of the air horn.) See disassembly procedures.**

(6) After floats have been installed, check float alignment, level and drop settings as follows:

Float Alignment Setting

(1) Sight down side of each float shell to determine if side of the float is parallel to outer cage of air horn casting, (Fig. 8).

(2) If sides of float are not in alignment with edge of casting, bend float lever by applying pressure to end of float shell with thumb. **To avoid damage to the float, apply only enough pressure to bend the float lever.**

(3) After aligning floats, remove as much clearance as possible between arms of float lever and lugs of air horn. To do this, bend float lever. The arms of float lever should be as parallel as possible to inner surfaces of lugs of casting.

Float Level Setting

(1) With air horn inverted, air horn gasket in place

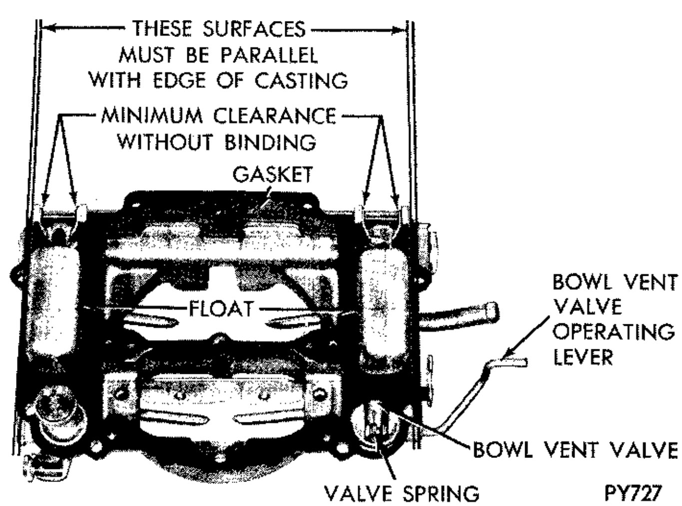


Fig. 8—Checking Float Alignment

and float needle seated, slide float gauge (refer to specifications for carburetor being worked on) between top of the float (at outer end) and air horn gasket, (Fig. 9). Float should just touch gauge (T-109-107).

(2) Check other float in same manner. If an adjustment is necessary, bend float arm using Tool T-109-22, until correct clearance has been obtained. After bending arm, recheck the float alignment.

Float Drop Setting

Float drop is the distance the floats move from the inverted air horn (float level setting position) to the airhorn in upright position.

(1) With air horn inverted (upside down) place air horn in upright position and measure the distance floats move from inverted to upright position. This measurement should be 1/2 inch (Fig. 10). Air horn gasket installed. If an adjustment is necessary, bend stop tabs on float levers until correct drop setting has been obtained. Bend tab toward needle seat to lessen drop, or away from seat to increase drop.

(2) After floats have been checked and adjusted, continue to assemble carburetor as follows:

(3) Place accelerator pump plunger lower spring in pump cylinder, then lower air horn carefully down on main body. Care must be taken to center small brass main bleed tubes so that they will pass through holes in air horn without being damaged. **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.** Place curb idle solenoid in position on carburetor. Install attaching screws and tighten securely. (If so equipped.)

(4) Install air horn attaching screws and tighten securely.

The change from low speed, best fuel economy, road load mixtures to richer wide open throttle full power mixtures is now accomplished in two steps. This has made it possible to secure best low speed fuel economy without sacrificing performance in the

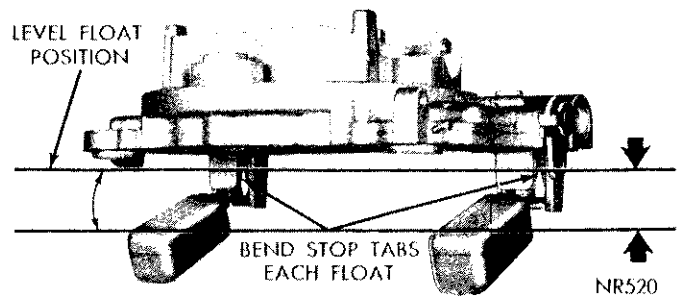


Fig. 10—Checking Float Drop

intermediate speed range. To do this, there is a step-up piston, new metering rods with three diameters, and primary metering jets, (Fig. 11).

(5) Slide step-up piston spring into piston cylinders, followed by step-up pistons and step-up rods. Install cover plates and attaching screws while holding step-up pistons down in position. Tighten screws securely.

(6) Check fit of choke valve in air horn. The valve should be evenly spaced on all sides. Loosen screws and reposition if necessary.

(7) Engage throttle connector rod with hole in throttle lever. Install other end in accelerator pump rocker arm, (center hole) and install hairpin clip to secure.

(8) Engage upper end of fast idle connector rod in slot of choke operating lever. Swing rod in an arc and engage with fast idle cam. Secure with hairpin clip.

Installing Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to be sure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than 1/16 inch in ten (10) seconds, the leakage is excessive and the assembly must be replaced. Install the diaphragm assembly on the carburetor as follows:

(1) Assemble to carburetor and tighten attaching screws securely.

(2) Install choke operating link in position between diaphragm plunger (stem) and choke lever. Install

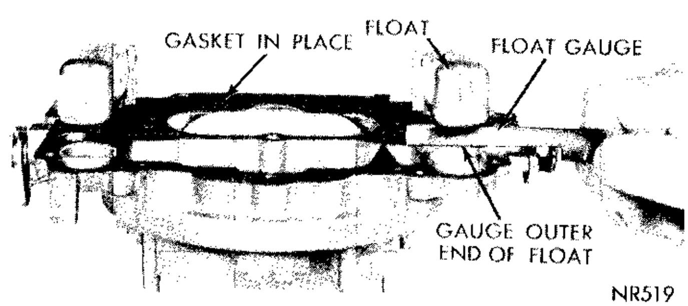


Fig. 9—Checking Float Height

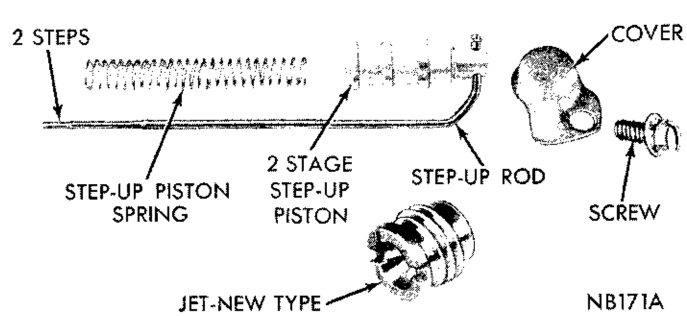


Fig. 11—Step-Up Piston Rod and Jet

clip to secure. Secure choke lever end with spring "E" clip.

(3) Inspect rubber hose for cracks, before placing it on correct carburetor fitting. (Fig. 1). **Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)**

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:

Fast Idle Speed Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in the Fast Idle Speed Adjustment (On Vehicle Paragraph.) However, the Fast Idle Cam Position Adjustment can be made on the bench.

This adjustment is important to assure that the speeds of each cam step occur at the proper time during engine warm-up. Adjust as follows:

(1) With fast idle speed adjusting screw contacting second highest speed step on fast idle cam, move choke valve toward closed position with light pressure on choke shaft lever.

(2) Insert specified drill (refer to Specifications), between choke valve and wall of air horn (Fig. 12). An adjustment will be necessary if a slight drag is not obtained as the drill is being removed.

(3) To adjust, bend fast idle connector rod at angle, using Tool T-109-213 until correct valve opening has been obtained (Fig. 12).

Vacuum Kick Adjustment—(This test can be made ON or OFF vehicle.)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by use of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source, or vacuum supplied by the vehicle.

(1) If adjustment is to be made with engine running, disconnect fast idle linkage to allow choke to close to kick position with engine at curb idle. If an auxiliary vacuum source is to be used, open throttle valves (engine not running) and move choke valve to closed position. Release throttle first, then release choke.

(2) When using an auxiliary vacuum source, disconnect vacuum hose from carburetor and connect it to hose from vacuum supply with a small length of tube to act as a fitting. Removal of hose from diaphragm may require forces which damage the system. Apply a vacuum of 10 or more inches.

(3) Insert specified drill (refer to Specifications) between choke valve and wall of air horn (Fig. 13). Apply sufficient closing pressure on **lever** to which choke rod attaches to provide a minimum choke valve opening without distortion of diaphragm link. Note that on most units, a cylinderical stem extends as an internal spring is compressed. This spring must be fully compressed for proper measurement of vacuum kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as drill is being removed. Shorten or lengthen diaphragm link to obtain correct choke opening. Length changes should be made by carefully opening or closing the bend provided in diaphragm link. **CAUTION: DO NOT APPLY TWISTING OR BENDING FORCE TO DIAPHRAGM.**

(5) Reinstall vacuum hose on correct carburetor

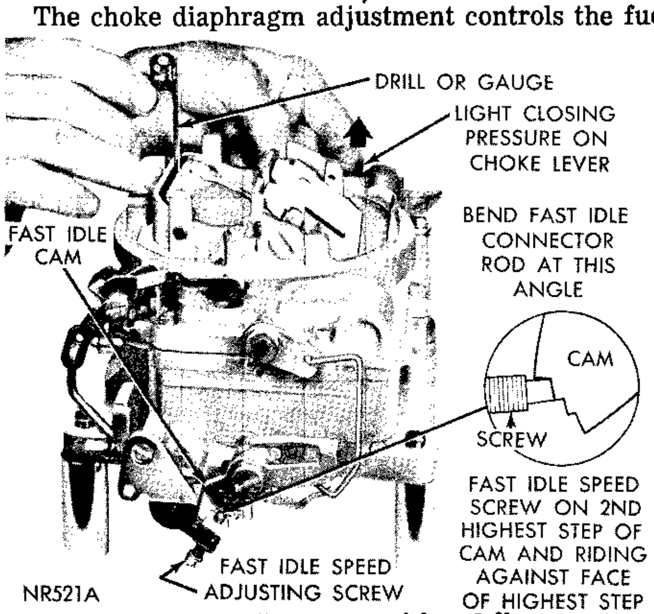


Fig. 12—Fast Idle Cam Position Adjustment

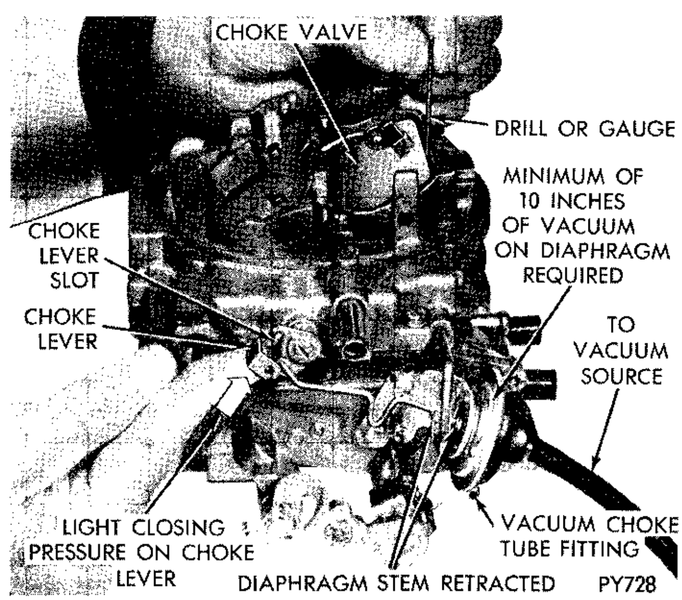


Fig. 13—Checking Choke Vacuum Kick Setting

fitting. Return fast idle linkage to its original condition if disturbed as suggested in step no. 1.

(6) Make following check. With no vacuum applied to diaphragm. **CHOKE VALVE SHOULD MOVE FREELY** between open and closed positions. If movement is not free, examine linkage for misalignment or interferences caused by bending operation. Repeat adjustment if necessary to provide proper link operation.

Choke Unloader Adjustment

The choke unloader is a mechanical device to partially open the choke at wide open throttle. It is used to eliminate choke enrichment during cranking of an engine. Engines which have been flooded or stalled by excessive choke enrichment can be cleared by use of the unloader. Adjust the system as follows:

(1) Hold throttle valves in wide open position. Insert specified drill (refer to Specifications), between upper edge of choke valve and inner wall of air horn (Fig. 14).

(2) With a finger lightly pressing against choke lever, a slight drag should be felt as drill is being withdrawn. If an adjustment is necessary, bend unloader tang on fast idle cam, using Tool T-109-22, until correct opening has been obtained (Fig. 14).

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, (Fig. 15). This distance should be 7/16 inch.

If an adjustment is necessary, bend the throttle connector rod at the lower angle, using Tool T-109-

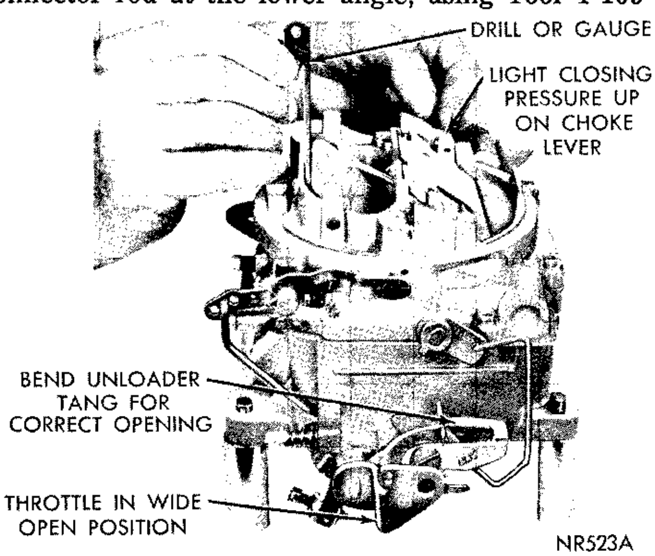


Fig. 14—Checking Choke Unloader (wide open kick)

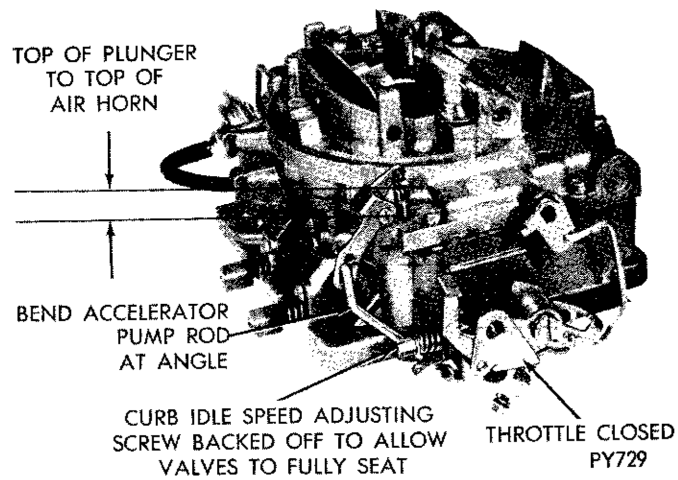


Fig. 15—Checking Accelerator Pump Adjustment

213, until correct travel has been obtained.

Secondary Throttle Lever Adjustment

To check the secondary throttle lever adjustment, 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 between the lower edge of the primary valve and the bore (opposite idle port) (Fig. 16). (Refer to Specifications). The secondary valves should just start to open. If an adjustment is necessary, bend the secondary throttle operating rod at the angle, using Tool T-109-213, until correct adjustment has been obtained.

With primary and secondary throttle valves in tightly closed position, it should be possible to insert Tool T-109-29 (.020″) wire gauge, between positive closing shoes on the secondary throttle levers, (Fig. 17).

If an adjustment is necessary, bend the shoe on the secondary throttle lever, using Tool T-109-22, until correct clearance has been obtained.

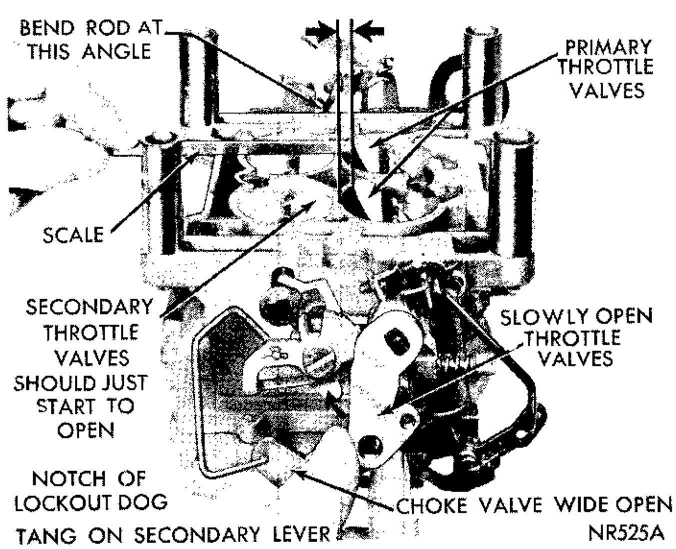


Fig. 16—Checking Secondary Throttle Adjustment

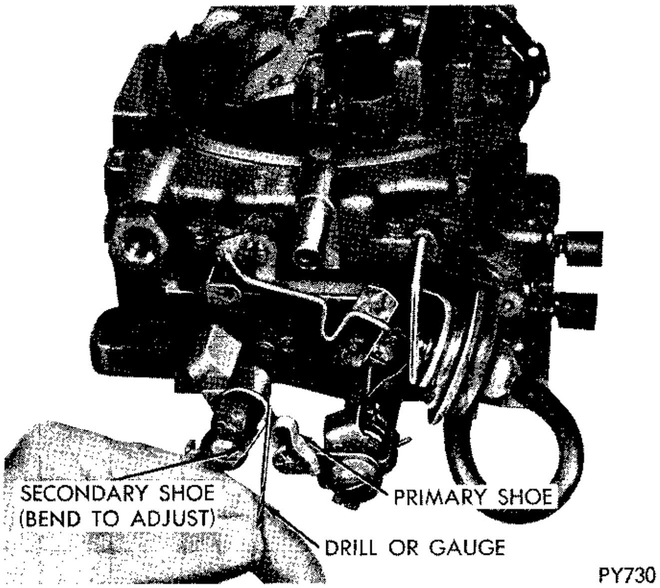


Fig. 17—Checking Clearance Between Closing Shoes

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 lockout dog (Fig. 16).

If an adjustment is necessary, bend the tang on the secondary throttle lever, until engagement has been made. Use Tool T-109-22 for this operation.

After adjustments have been made, reinstall carburetor on engine, using a new gasket.

It is suggested that the carburetor 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.

Bowl Vent Valve Adjustment (C.A.S.)

To check the bowl vent valve adjustment, proceed as follows:

(1) With throttle valves tightly closed, insert a 1/8 inch drill between air horn and valve at smallest opening (Fig. 18).

(2) If an adjustment is necessary, bend adjusting tang (on pivot end of lever) until correct opening has been obtained.

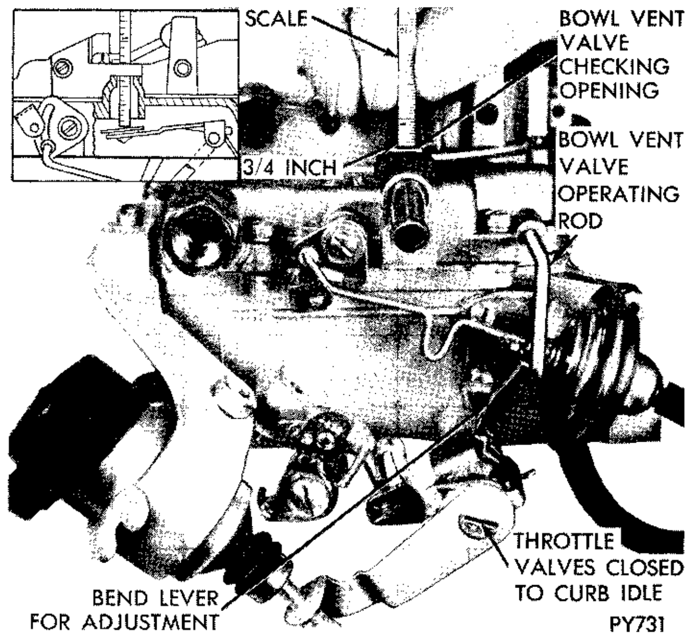
Bowl Vent Valve Adjustment (E.C.S.)

To check the bowl vent valve adjustment, proceed as follows:

(1) Using Tool T109-43, remove bowl vent valve checking hole plug in air horn.

(2) With throttle valves at closed curb idle position, insert a narrow ruler down through hole. Allow ruler to rest lightly on top of valve. The reading should be 3/4 inch from top of valve to top of air horn casting at opening. (Fig. 18).

(3) If an adjustment is necessary, bend bowl vent



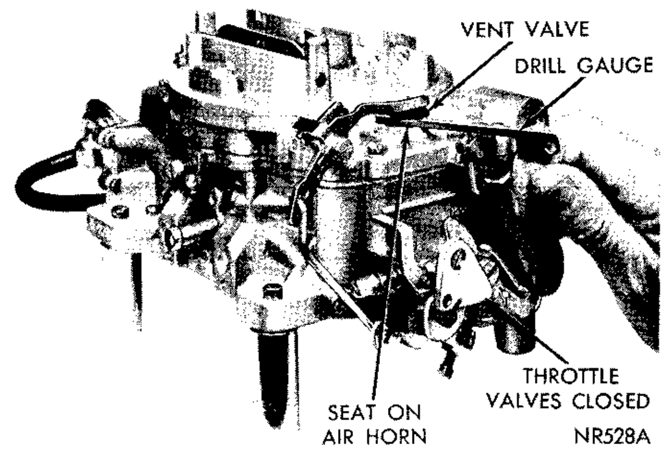


Fig. 18—Bowl Vent Valve Adjustment (C.A.S.) (E.C.S.)

valve operating lever, until correct valve opening has been obtained.

(4) Install new plug and rap lightly to seat, using a hammer.

Secondary Air Valve Adjustment

(1) Loosen lock screw (Fig. 19) and allow air valve to position itself at wide open position.

(2) From wide open position, (spring barely moving valve), turn slotted sleeve **two full turns** counter clockwise, (Fig. 19).

(3) Hold in this position with finger, then tighten lock screw securely. Check valve for freedom of movement.

Idle Speed Adjustment—(Curb Idle)

Refer to General Information at Front of Group.

Fast Idle Speed Adjustment (On Vehicle)

Fast idle engine speed is used to overcome cold engine friction, stalls after cold starts and stalls because of carburetor icing. Set this adjustment after

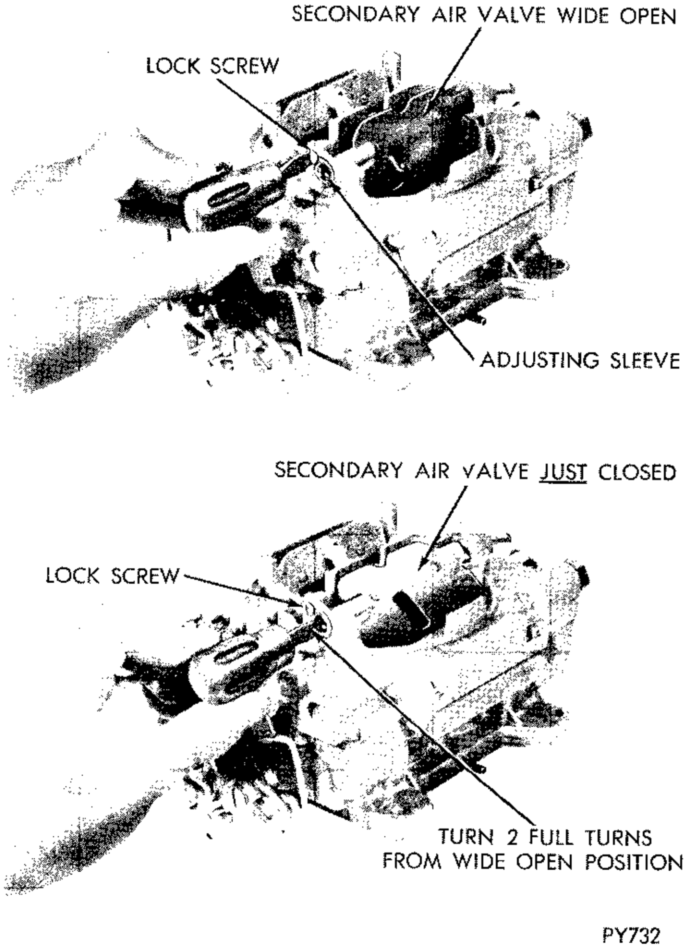


Fig. 19—Secondary Air Valve Adjustment

vehicle odometer indicates over 500 miles to insure a normal engine friction level. Prepare engine by driving at least 5 miles. Connect a tachometer and set curb idle speed and mixture, then proceed as follows:

(1) With engine off and transmission in **PARK** or **NEUTRAL** position open throttle slightly.

(2) Close choke valve until fast idle screw can be positioned on the second highest speed step of fast idle cam (Fig. 20).

(3) Start engine and determine stabilized speed. Turn fast idle speed screw **in** or **out** to secure specified speed. (Refer to Specifications).

(4) Stopping engine between adjustments is not necessary. However, reposition fast idle speed screw on cam after each speed adjustment to provide correct throttle closing torque.

Before adjusting idle and/or fast idle speeds and mixtures, make sure that the basic timing is correctly adjusted as outlined under Idle Speed Adjustment (Curb Idle).

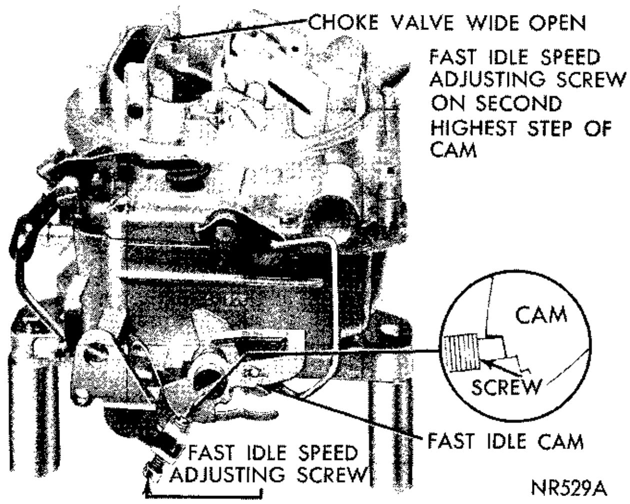


Fig. 20—Fast Idle Speed Adjustment (On Vehicle)

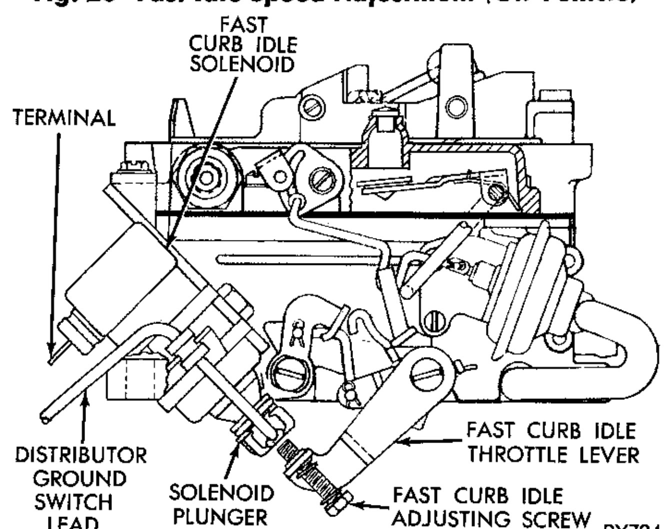


Fig. 21—Idle Speed Solenoid Adjustment

Idle Speed Solenoid Adjustment (If so equipped)

To set idle speed solenoid for correct engine r.p.m., proceed as follows:

(1) Warm up engine to normal operating temperature, then attach a tachometer.

(2) With engine running, turn idle speed solenoid adjusting screw **in** or **out** to obtain 900 r.p.m. for manual transmission equipped vehicles and 800 r.p.m. for automatic transmission equipped vehicles (Fig. 21).

(3) After specified r.p.m. has been obtained and with engine still running (to energize solenoid), adjust curb idle speed screw until end of screw **just touches** stop on carburetor throttle body. Now, back off 1 full turn to obtain slow curb idle speed setting. (Approximately 650 to 700 r.p.m.)

To set the idle speed on vehicles, refer to the Fuel System General Information Paragraph.

HOLLEY 4160 SERIES CARBURETOR

INDEX

GENERAL INFORMATION

383 Cubic Inch Engine

The Holley four barrel carburetor models C.A.S. (Cleaner Air System) R-4367A, R-4368A and R-4369A are used on the 383 cu. in. engines when the vehicles are equipped with manual or automatic transmissions respectively. Model R-4369A is used with vehicles equipped with air conditioning only and has a hot idle compensator valve. This valve is a thermostatically operated air bleed, to relieve an overrich condition at idle. This condition is the result of excessive heat and resultant overrich mixtures. (Fig. 1).

The Holley four barrel carburetor models E.C.S. (Evaporation Control System) R-4217A and R-4218A are also used on the 383 cu. in. engines when the vehicles are equipped with a manual or automatic transmission respectively. These two carburetors are also equipped with a hot idle compensator valve as is R-4369A above. (Fig. 2).

All of these carburetors are equipped with a distributor ground switch, which retards the distributor when the carburetor is at curb idle, for better emission control.

440 Cubic Inch Engine

The Holley four barrel carburetor model C.A.S. (Cleaner Air System) R-4366A is used on the 440 cu. in. engine when the vehicle is equipped with an automatic transmission. (Fig. 1).

The Holley four barrel carburetor model E.C.S. (Evaporation Control System) R-4360A is also used on the 440 cu. in. engine when the vehicle is equipped with an automatic transmission. (Fig. 2).

Both of these carburetors are equipped with a hot idle compensator valve. This valve is a thermostatically operated air bleed, to relieve an overrich condition at idle. This condition is the result of excessive heat and resultant overrich mixtures. The distributor ground switch retards the distributor when the carburetor is at curb idle, for better emission control.

Since the service procedures are identical on all Holley four barrel carburetors, the illustrations showing the various disassembly procedures will not always show any one specific carburetor.

The Holley 4160 Series Carburetor (Figs. 1, 2 and 3) can be considered as two dual downdraft carburetors mounted side by side, each having its own fuel bowl and float system. The two fuel bowls insure a constant supply of fuel for all the fuel metering systems. Fuel from the bowls flow into the primary and the secondary metering bodies where the fuel is mixed with air for all phases of engine operation. This type of metering provides for adequate diagnosis and easier servicing.

The two primary bores have one choke valve, connected to a well type automatic choke. Each bore has its own venturi, booster venturi, main fuel discharge nozzle and throttle valve.

Additional fuel for acceleration is supplied by a diaphragm type, mechanically operated pump which is located on the primary fuel bowl. The pump is actuated from a cam on the primary throttle. An override spring on the pump operating lever prolongs the discharge of fuel for smoother acceleration.

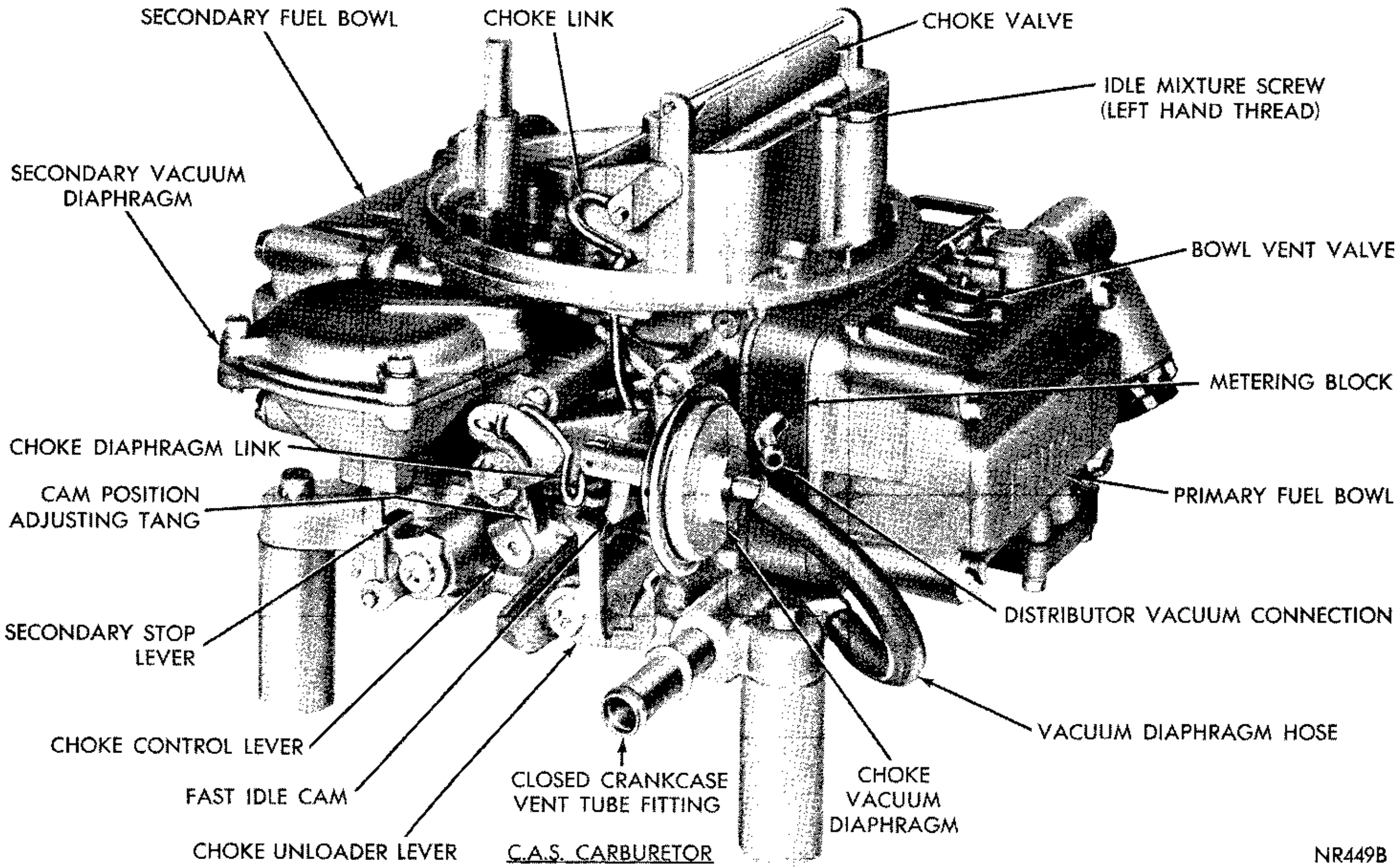
A power valve, mounted on the primary metering body, which is actuated by manifold vacuum, delivers the additional fuel necessary for full power and high speed operation.

The larger volume of fuel, in two separate bowls exposed to the cooling air stream, is an effective means of reducing percolation and hard starting when the engine is hot. An external vent on the primary bowl, vents the primary fuel bowl when the throttle is closed.

The primary and/or secondary bowls can be quickly removed to adjust the fuel level or change the fuel inlet valve without removing the carburetor from the engine.

Primary Fuel Inlet System

All fuel first enters the primary fuel bowl which supplies the four basic metering systems with the required amount of fuel (Fig. 4).



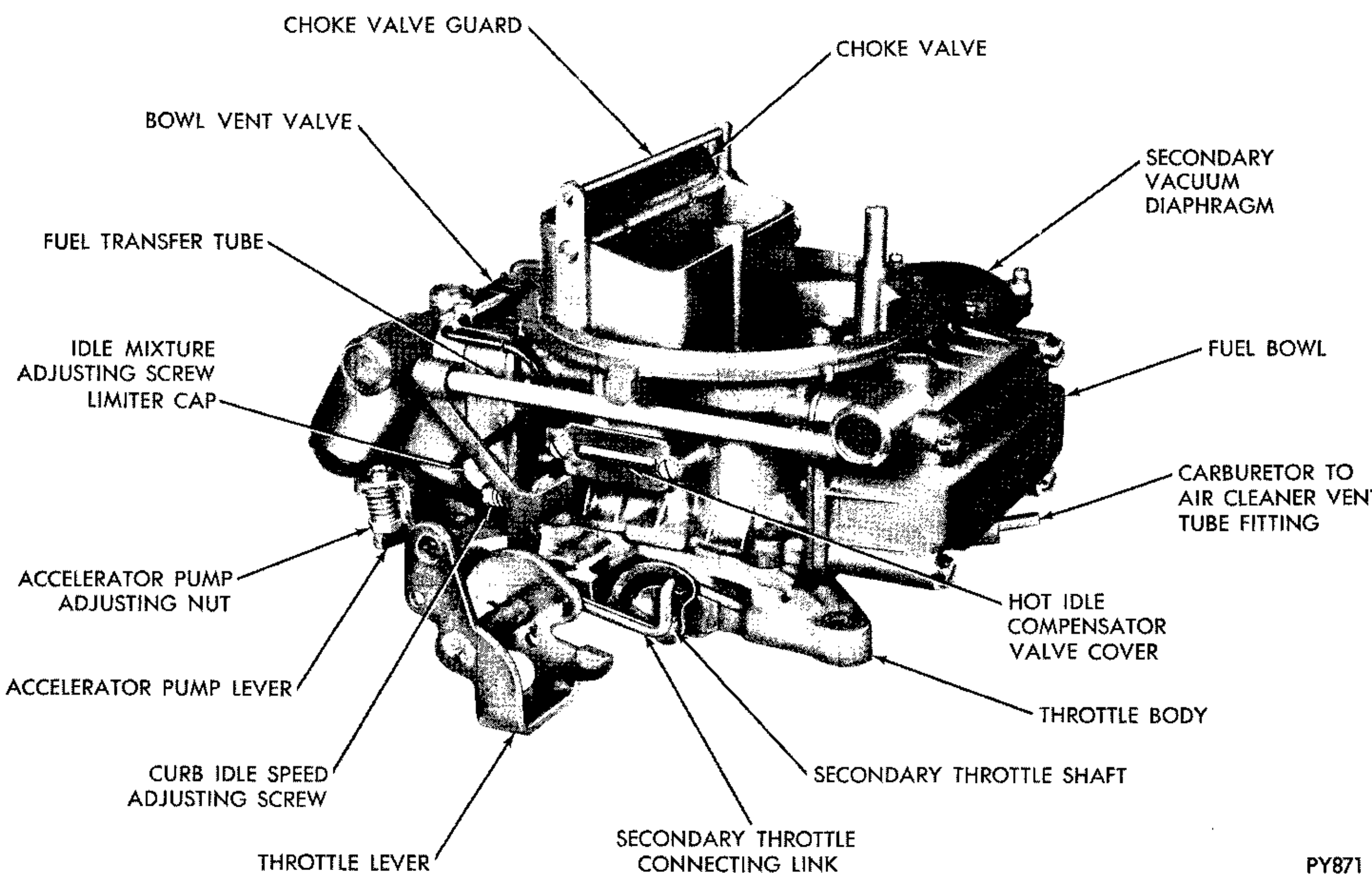


Fig. 1—Carburetor Assembly (C.A.S.)

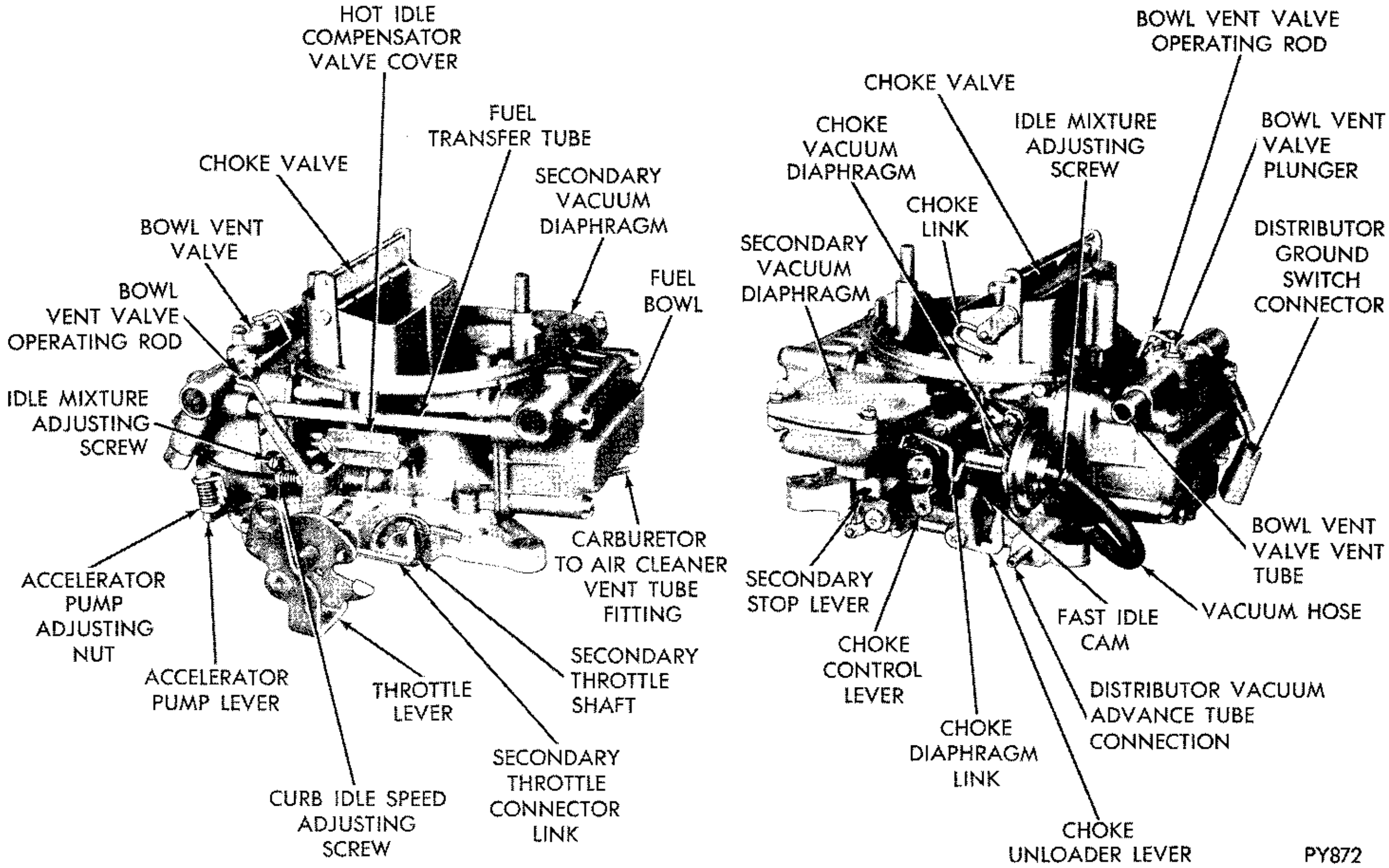


Fig. 2—Carburetor Assembly (E.C.S.)

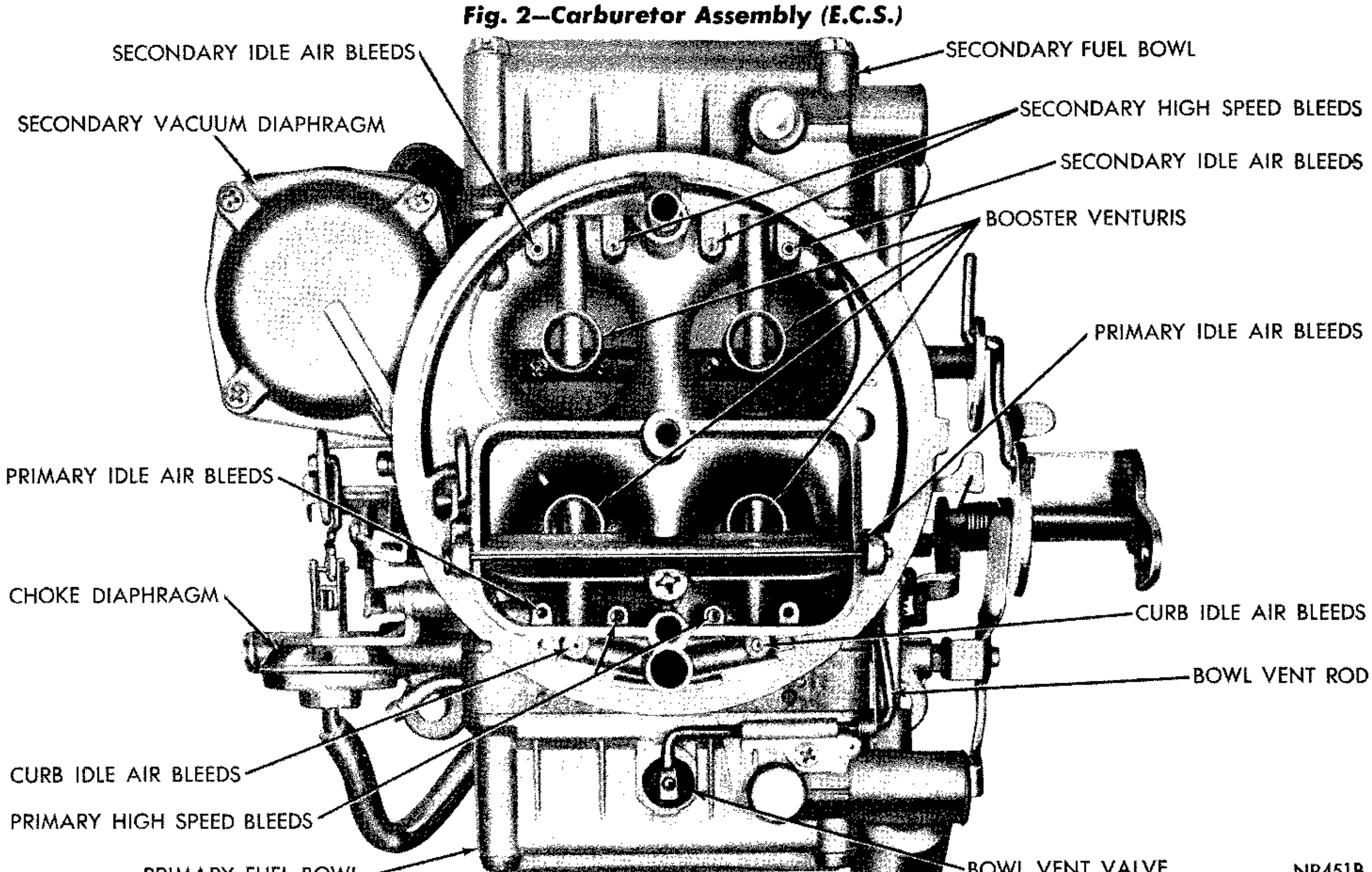


Fig. 3—Carburetor Assembly (Top View)

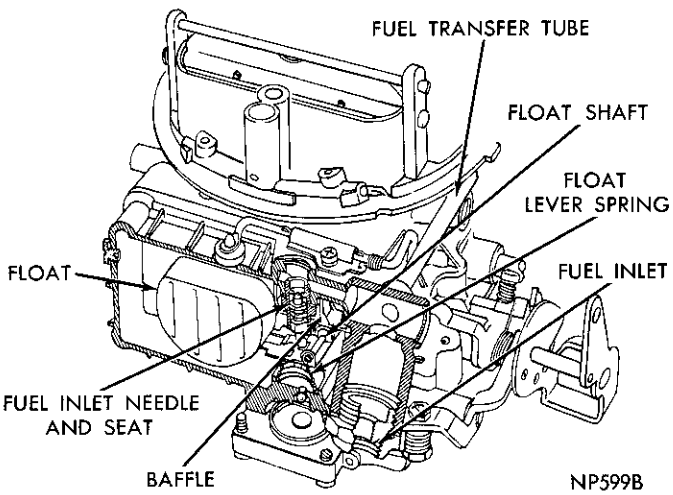


Fig. 4—Primary Fuel Inlet System

The fuel enters the fuel bowl through a fuel inlet fitting and into the fuel inlet valve. The amount of fuel entering the fuel bowl is determined by the space between the top of the movable needle and its seat and also by the pressure from the fuel pump.

The fuel inlet system must constantly maintain the specified level of fuel as the basic fuel metering systems are calibrated to deliver the proper mixture only when the fuel is at this level.

A float spring is incorporated under the float to keep the float in a stable position.

The float chamber is vented internally by the vent tube at all times. At curb idle or when the engine is stopped, the chamber is also vented by the external vent on top of the primary fuel bowl. This external vent provides a release of excess fuel vapors from the bowl.

Idle System (Fig. 5)

At idle and low speeds, the air flow through the carburetor is not sufficiently strong enough to draw fuel through the primary barrel venturi for the main metering system. Intake manifold vacuum is high because of the greater restriction to the air flow by the nearly closed throttle valves. This high manifold vacuum is used to provide the pressure differential which operates the idle system.

The carburetor utilizes two idle systems, one for each primary barrel. Since the two passages function identically, only one side will be considered in this explanation (Fig. 5).

At idle, the near atmospheric pressure in the float chamber causes the fuel to flow through the idle system to the greatly reduced pressure area below throttle plate. Fuel flows from the float chamber through a restriction into the curb idle well.

The fuel flows up this vertical idle well through the idle feed restriction, and then it is mixed with air coming in from the idle air bleed. This fuel-air mixture then flows down another vertical passage. At the bottom of this vertical passage the fuel-air mixture is metered by an idle limiter screw. (This adjustment is made at the factory and no field adjustment should be required. However, if an adjustment is necessary, refer to "Rough Idle and Low Speed Surge" paragraph, under General Information.

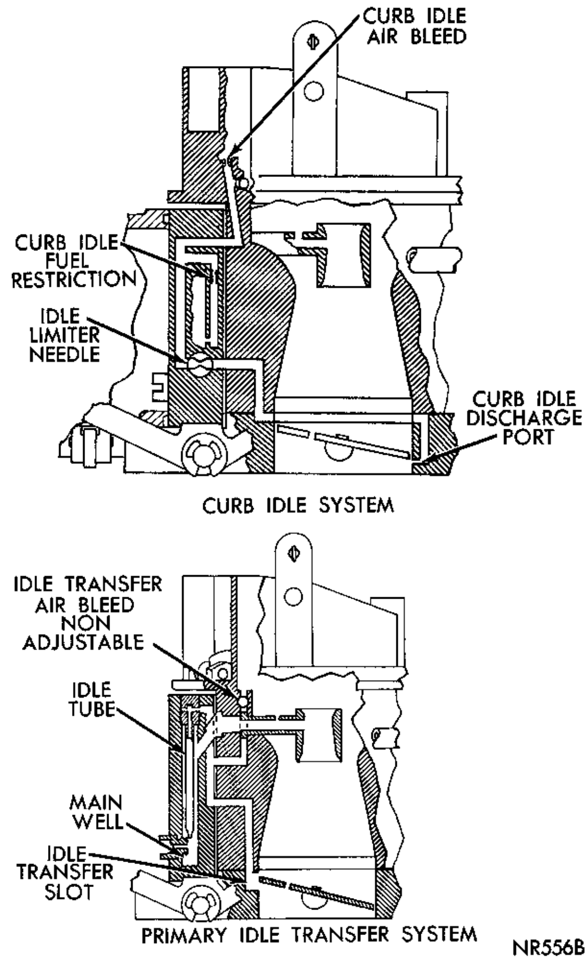


Fig. 5—Idle System

The mixture then flows through a channel in the throttle body to the curb idle discharge port. The fuel is discharged into the throttle bore just below the throttle valve.

The air that is supplied to the curb idle system is supplied through two idle air bleed restrictions and by a curb idle air bleed adjusting screw.

This is the only screw used to adjust curb idle mixture.

The screw is located near the primary bowl vent on the choke air horn.

Turning the screw clockwise leans the curb idle mixture; counter-clockwise enrichens the mixture.

Primary Idle Transfer System (Fig. 5)

A separate off-idle system is used in the carburetor to provide fuel air mixture from idle operation until the main system is in full operation.

Fuel for the idle transfer system enters the main well through the main jet and travels up through the idle transfer tube and crosses over a passage into a vertical channel where air is added from the idle air bleeds. The fuel air mixture is then discharged through the primary transfer slots.

As the throttle valve is opened still wider and engine speed increases, the air flow through the carburetor is also increased. This creates an increased vacuum in the venturi to bring the main metering system into operation. The flow from the idle transfer system tapers off as the main metering systems begin discharging fuel. The two systems are engineered to provide smooth gradual transition from idle to cruising speeds.

Main Metering System

As the engine is running, the intake stroke of each piston draws the air through the carburetor venturi and booster venturi. The air, passing through the restriction of the venturi, creates a low pressure commonly called a vacuum. The strength of this low pressure is determined primarily by the velocity of the air flowing through the venturi. This, in turn, is regulated by the speed and power output of the engine. The difference, between the pressure in the booster venturi and the normal air pressure in the float chamber, causes fuel to flow through the main metering system (Fig. 6).

At cruising speed, the fuel flows from the float chamber through the main jet, which measures or meters the fuel flow, into the bottom of the main well. The fuel moves up the main well past the main well air bleed hole in the side of the well. Filtered air, enters through the high speed air bleed in the main body and then into the main metering body by interconnecting passages. This mixture of fuel and air, being lighter than raw fuel, responds faster to any change in venturi vacuum and vaporizes more readily when discharged into the air stream of the venturi. The mixture of fuel and air moves up the main well and passes into the short horizontal passage leading to the main body, then through the horizontal channel of the discharge nozzle. This fuel is discharged into the booster venturi and then in the air stream of the carburetor venturi.

The throttle valve controls the amount of fuel-air mixture admitted to the intake manifold, regulating the speed and power output of the engine in accordance with accelerator pedal movement.

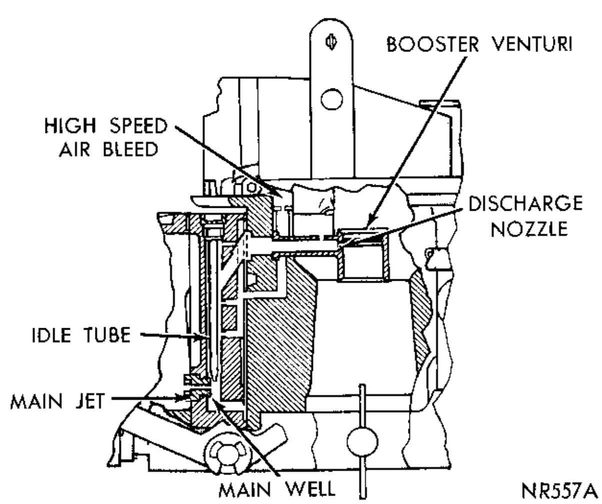


Fig. 6—Main Metering System

Power Enrichment System

During high power operation, the carburetor must provide a mixture richer than is needed when the engine is running at cruising speed under no great power requirements. The added fuel for power operation is supplied by the power enrichment system (Fig. 7).

This system is controlled by manifold vacuum which gives an accurate indication of the power demands placed upon the engine. Manifold vacuum is strongest at idle and decreases as the load on the engine increases. As the load on the engine is increased, the throttle valve must be opened wider to maintain a given speed. Manifold vacuum is thus reduced because the opened throttle valve offers less restriction to air entering the intake manifold.

A vacuum passage in the throttle body transmits manifold vacuum to the power valve chamber in the main body. The power valve which is located in the main metering body is effected by this manifold vacuum. The manifold vacuum, acting on the diaphragm at idle or normal load conditions, is strong enough to hold the diaphragm closed, and overcomes the tension of the power valve spring. When high power demands place a greater load on the engine and manifold vacuum drops below a predetermined point, the power valve spring overcomes the reduced vacuum opening the power valve. Fuel flows from the float chamber, through the valve and out the small

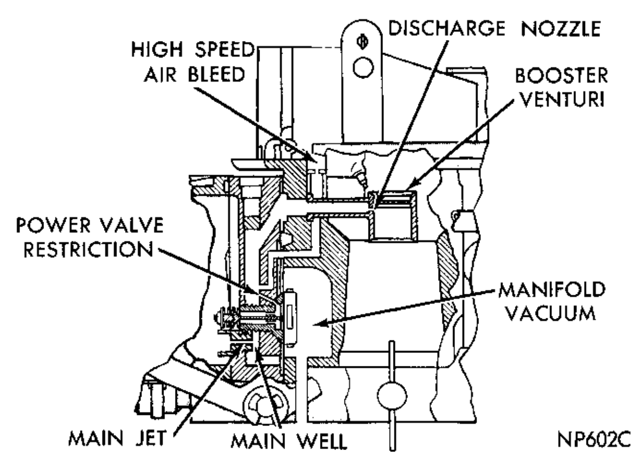


Fig. 7—Power Enrichment System

holes in the side of the valve through the diagonal restrictions in the main metering body and then into the main well. In the main well, the fuel joins the fuel flow in the main metering system, enriching the mixture.

As engine power demands are reduced, manifold vacuum increases. The increased vacuum acts on the diaphragm, overcoming the tension of the power valve spring. This closes the power valve and shuts off the added supply of fuel which is no longer required.

Accelerating Pump System

Upon acceleration, the air flow through the carburetor responds almost immediately to the increased throttle opening.

Therefore during the brief interval before the fuel, which is heavier than air, can gain speed and maintain the desired balance of fuel and air, the accelerating pump supplies fuel until the other systems can once again provide the proper mixture (Fig. 8).

The accelerating pump is located in the bottom of the primary fuel bowl. The pump begins to function when the pump operating lever is actuated by throttle movement. When the throttle is opened, the pump linkage, actuated by a cam on the primary throttle shaft, forces the pump diaphragm up. As the diaphragm moves up, the pressure forces the pump inlet check ball on its seat preventing fuel from flowing back into the float chamber. The fuel flows from the short passage in the fuel bowl into the long diagonal passage in the primary metering body. The fuel passes into the main body and then in the pump discharge chamber. The pressure of the fuel causes the discharge needle valve to raise and fuel is discharged into the venturi.

As the throttle is moved toward the closed position, the linkage returns to its original position and the diaphragm spring forces the diaphragm down. As the diaphragm returns to its original position the pump inlet check ball is moved off its seat and the diaphragm chamber is filled with fuel from the float bowl.

Secondary Throttle Operating System

At lower speeds, the secondary throttle valves remain nearly closed, allowing the engine to maintain satisfactory fuel air velocities and distribution. When engine speed increases to a point where additional breathing capacity is needed, the vacuum controlled secondary throttle valves open automatically.

Vacuum taken from one of the primary barrels and one of the secondary barrels acts upon a diaphragm which controls the secondary throttle valves. At high speeds when engine requirements approach the capacity of the two primary bores, the increased primary venturi vacuum moves the diaphragm, compressing the diaphragm spring. The diaphragm, acting through the diaphragm link and lever, will commence to open the secondary throttle valves (Fig. 9).

The position of the secondary throttle valves depends on the strength of the vacuum. This in turn, is determined by the air-flow through the bores to the engine. As the air-flow increases, a greater secondary throttle valve opening will result and the secondary barrels will supply a greater portion of the engine's requirements. As top speed is reached, the secondary throttle valves will approach wide open.

As the secondary throttle valves begin to open, a vacuum is created in the secondary barrels, first at the throttle valves and then, as air flow increases, at the throat of the secondary venturi. This vacuum assists the secondary metering system to operate.

When engine speed is reduced, venturi vacuum in the bores become weaker. As the vacuum acting on the diaphragm is lessened, the load on the diaphragm spring will commence closing the secondary valves. The diaphragm spring is assisted by the design of the secondary valves. Each secondary valve is slightly

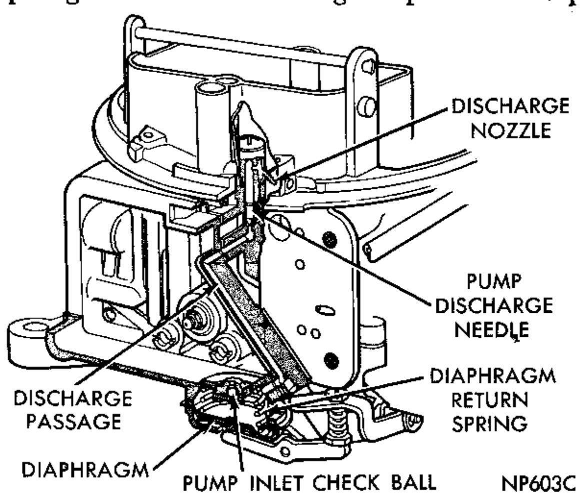


Fig. 8—Accelerating Pump System

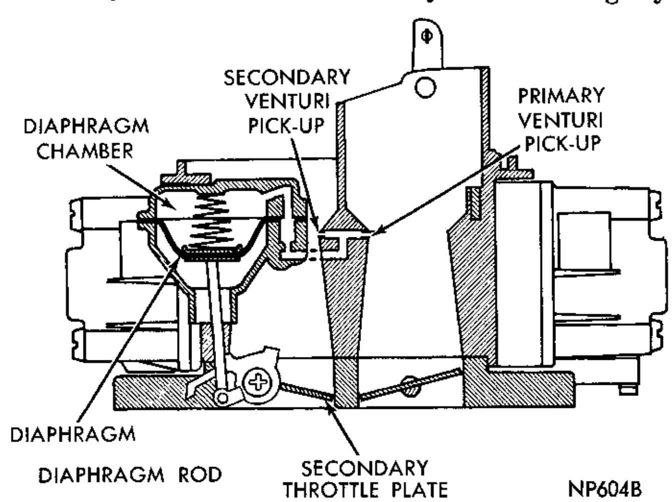


Fig. 9—Secondary Throttle Operating System

offset. When the valves are closing, the combined force of manifold vacuum and the air stream has greater effect on the larger, upstream area of the valves forcing the valves to a closed position. The secondary valves are retained in the closed position when the primary valves are fully closed by the secondary throttle connecting rod. This rod, which is fastened to the primary throttle lever, rides in a slot in the secondary throttle lever.

Secondary Fuel Metering Systems

The secondary system is supplied with fuel from the secondary fuel bowl, which receives its fuel through a connecting tube, from the primary fuel inlet.

The secondary fuel bowl is equipped with a fuel inlet assembly which regulates the flow of fuel into the bowl, the same as the primary fuel bowl. The secondary fuel inlet system must maintain a specified level of fuel as the two secondary fuel systems are calibrated to deliver the proper mixture only when the fuel is at this level.

As the valves begin to open the fuel flows through the secondary metering restrictions into the idle well (Fig. 10).

A secondary fixed curb idle discharge passage supplies fuel directly to the intake manifold, thus allowing a smoother idle.

When the secondary throttle valves are opened further the pressure differential causes the secondary main metering system to begin functioning.

Automatic Choke

The automatic choke supplies enriched fuel-air mixture for starting and operating a cold engine (Fig. 11). Most of the fuel from the carburetor of a cold engine is liquid. This fuel in liquid form burns slowly and incompletely. Power loss and stalls result. The choke valve supplies the extra fuel by restricting air flow during cranking and warm-up. Vacuum created by the restriction causes this fuel flow from both the main metering and idle systems.

The thermostat spring of a cold engine pushes the choke valve toward the closed position. When the engine is started, manifold vacuum acts on both the choke valve and a vacuum diaphragm attached to the carburetor body. This vacuum acts to oppose the thermostat spring and partially opens the choke valve to prevent stalls from richness. The choke shaft does not pass through the center of a choke valve. Instead, it is offset to expose a large area at one side to manifold vacuum. During idle or low temperature cranking, manifold vacuum is not sufficiently strong to open the choke valve. But air impact against the valve causes partial opening. These two factors, vacuum and air impact allow ample air to run the engine. Continued running of the engine develops heat and causes the thermostat assembly to move to the open choke position.

During the warm-up period, air flow past the partially open offset choke valve acts to open the valve. Just as in the start cycle, vacuum and air impact combine to control the choke valve. The engine required less choking at high speeds. The offset choke valve, vacuum diaphragm and thermostat spring are engineered to provide satisfactory choking for most conditions of engine speed, output and temperature.

Fast Idle

The choke control lever at the carburetor actuates a fast idle cam during choking. A cam has a series of steps designed to increase carburetor air flow to maintain satisfactory cold engine speed levels. The proper cam step is moved into position as the choke rod is moved from closed to open conditions. Each step permits a slower idle rpm as engine temperature rises and choking is reduced.

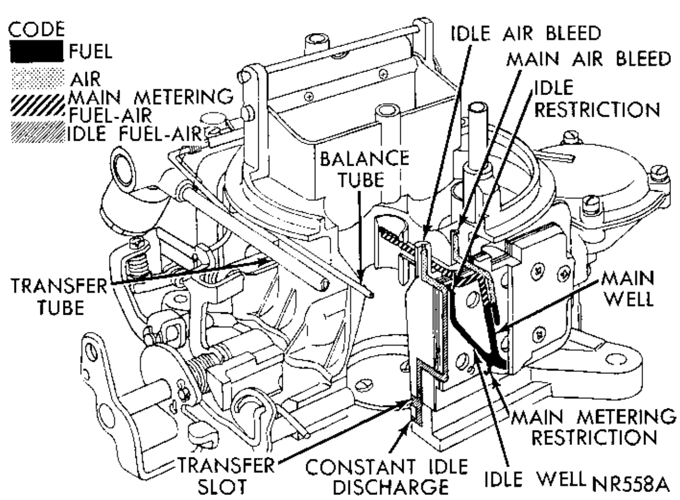


Fig. 10—Secondary Fuel Metering System

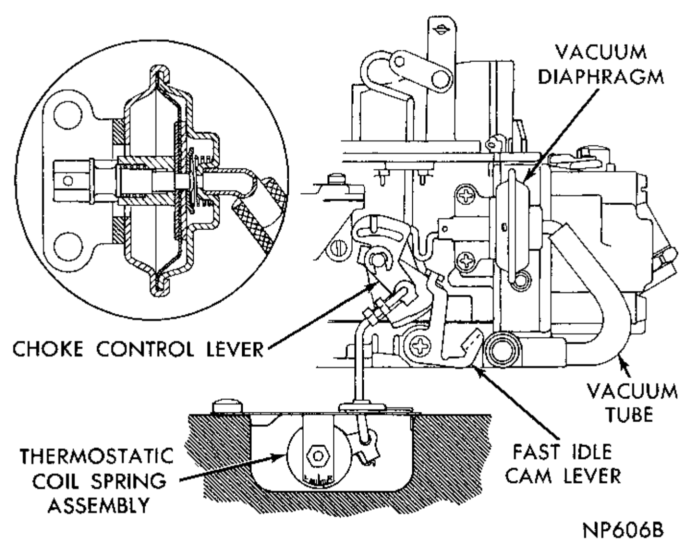


Fig. 11—Automatic Choke System

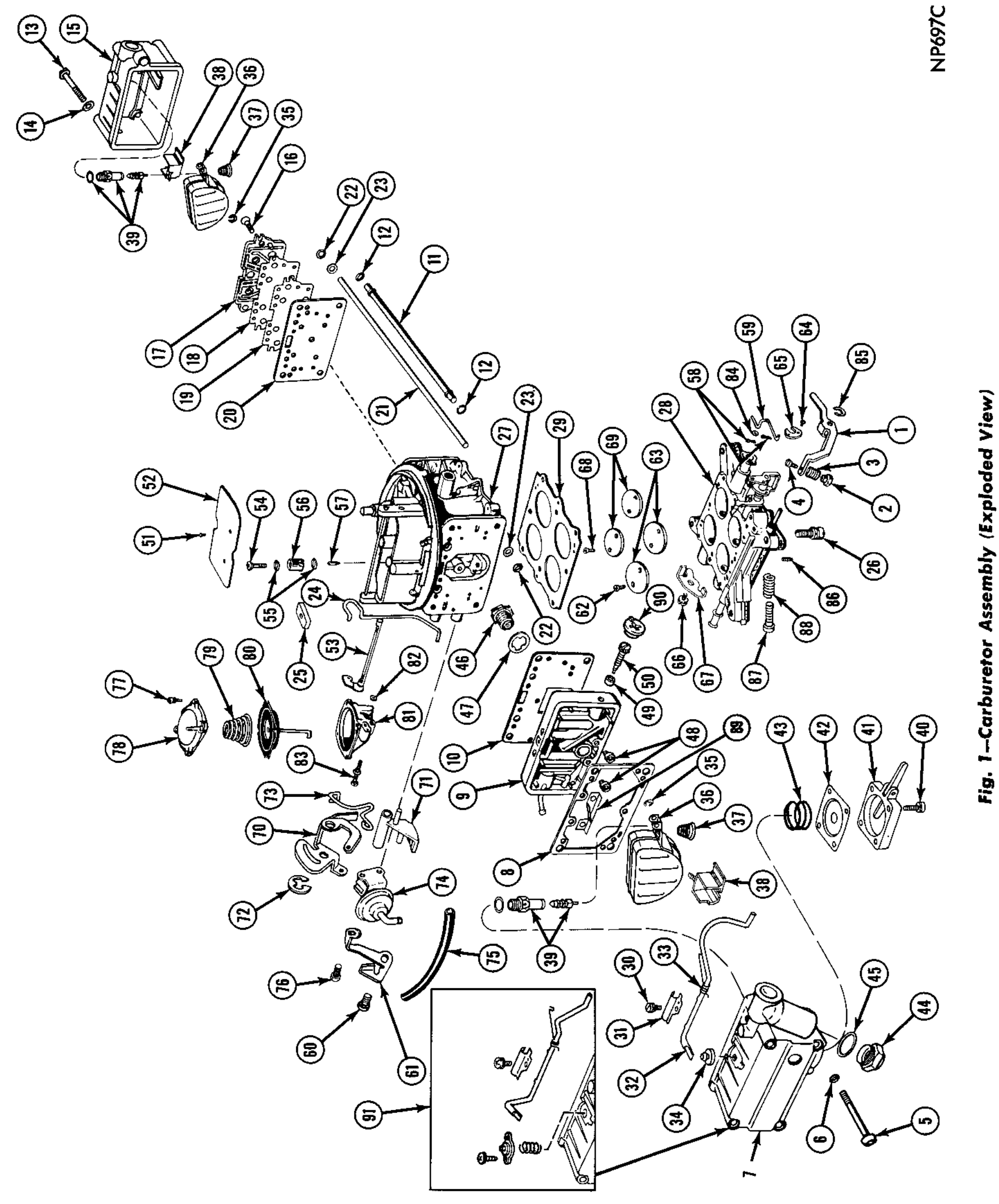


Fig. 1—Carburetor Assembly (Exploded View)

1—Lever, Pump Operating
2—Locknut
3—Spring, override
4—Screw, Pump Adjusting
5—Screw, Fuel Bowl (Primary)
6—Gasket, Bowl Screw
7—Fuel Bowl (Primary)
8—Gasket, Fuel Bowl
9—Metering Body (Primary Side)
10—Gasket, Metering Body
11—Fuel Tube (Float Bowl Connecting)
12—"O" Rings, Fuel Tube
13—Screw, Fuel Bowl (Secondary)
14—Gasket, Bowl Screw
15—Fuel Bowl (Secondary)
16—Screw, Metering Body (Secondary)
17—Metering Body (Secondary)
18—Gasket, Metering Body (Secondary)
19—Plate, Metering Body (Secondary)
20—Gasket, Metering Body Plate
21—Balance Tube
22—Washers, Balance Tube
23—"O" Rings, Balance Tube
24—Choke Link
25—Seal, Choke Rod
26—Throttle Body Screws
27—Main Body
28—Throttle Body
29—Gasket, Main to Throttle Body
30—Screw, Bowl Vent Valve Rod Clamp
31—Clamp, Valve Rod
32—Rod, Bowl Vent Valve
33—Spring Vent Valve Rod
34—Valve, Bowl Vent
35—Retainer, Clip, Float
36—Float
37—Spring, Float
38—Baffle, Float
39—Needle Valve and Seat
40—Screws, Fuel Pump Cover
41—Cover Assembly, Fuel Pump
42—Diaphragm, Fuel Pump
43—Spring, Fuel Pump Diaphragm
44—Fitting, Fuel Inlet
45—Gasket, Fuel Inlet, Fitting
46—Valve Assembly, Power
47—Gasket, Power Valve
48—Primary Jets
49—Needle, Idle Adjusting Mixture
50—Gasket, Idle Mixture Needle
51—Screws, Choke Valve
52—Choke Valve
53—Choke Shaft & Lever Assembly
54—Discharge Nozzle Screw, Pump
55—Gasket, Nozzle Screw
56—Nozzle, Pump Discharge
57—Needle, Pump Discharge Jet
58—Cotter Pins, Connecting Rods
59—Rod, Secondary Connecting
60—Screw and Lockwasher, Fast Idle Cam Lever
61—Lever, Fast Idle Cam
62—Screws, Primary Throttle Valve
63—Throttle Valves, Primary
64—Screw, Pump Cam
65—Pump Cam
66—Screw and Lockwasher, Secondary Stop Lever
67—Lever, Secondary Stop
68—Screws, Secondary Throttle Valves
69—Throttle Valves, Secondary
70—Fast Idle Cam Lever
71—Fast Idle Cam
72—Retainer (E-Clip)
73—Choke Diaphragm Link
74—Choke Diaphragm Assembly
75—Choke Vacuum Hose
76—Choke Diaphragm Bracket Screw
77—Secondary Diaphragm Cover Screw
78—Diaphragm Cover (Machine)
79—Secondary Diaphragm Return Spring
80—Secondary Diaphragm Assembly
81—Secondary Diaphragm Housing (Machine)
82—Secondary Diaphragm Housing Gasket
83—Secondary Diaphragm Assembly Screw
84—Throttle Connecting Rod Retainer Washer
85—Pump Operating Lever (E-Clip)
86—Secondary Stop Screw
87—Throttle Stop Screw
88—Throttle Stop Screw Spring
89—Baffle
90—Limiter Cap
91—Bowl Vent Valve Assy. (E.C.S.)

Spark Advance

The distributor utilizes changes in air pressure within the carburetor to control spark timing to satisfy all engine speed and load conditions.

In order to obtain a vacuum to operate the spark advance as dictated by the engine speed and load conditions, a port is located in the throttle bore just above the full closed position of the throttle valves, as the throttle is opened, this port is subject to manifold vacuum, which varies with changes in engine load. This port in the throttle body is connected to the main body by a short vertical passage, and then to a passage in the main metering body. This passage leads to an outlet on the side of the main metering body which connects to a single flexible tube to the distributor.

SERVICE PROCEDURES

Servicing 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 carburetor, several items of importance should be observed to assure a good job:

(1) All parts should be carefully cleaned in a suitable solvent, then inspected for damage or wear.

(2) Use air pressure only to clear the various orifices and channels.

(3) Replace questionable parts with New Ones.

When checking parts removed from the carburetor, it is at times rather difficult to be sure they are satisfactory for further service. It is, therefore, recommended that in such cases, New Parts be installed.

(4) Always use a complete repair kit when overhauling the carburetor. Using the code number stamped on the airhorn, adjacent to the fuel inlet, refer to the parts catalog and order the correct repair kit for the carburetor being worked on.

DISASSEMBLING CARBURETOR

To disassemble the carburetor (Fig. 1) for cleaning or overhaul, proceed as follows:

(1) Install four elevating legs, Tool T109-287S in

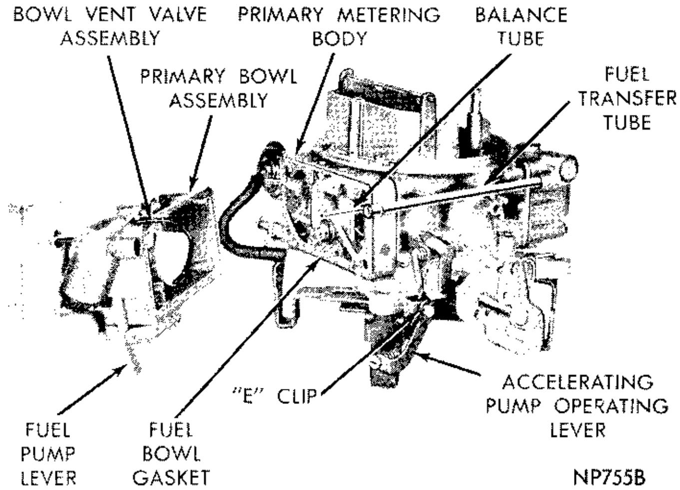


Fig. 2—Removing or Installing Primary Fuel Bowl

mounting flange holes in throttle body, or use Carburetor Stand C-3886. (These tools are used to protect the throttle valves from damage and to provide a suitable base for working).

(2) Remove primary fuel bowl assembly by sliding straight off balance tube (Fig. 2).

(3) Remove primary metering body by sliding straight off balance tube (Fig. 3). Remove plate to body gasket.

(4) Remove accelerating pump operating lever "E" clip and slide lever assembly off stub shaft. Remove adjusting nut, spring and screw.

(5) Remove fuel transfer tube and "O" rings (Fig. 3).

(6) Remove secondary fuel bowl assembly.

(7) Using a clutch head screwdriver (Tool CL-13) remove clutch head screws, carefully work secondary metering body, plate and gaskets off balance tube (Fig. 4).

(8) Remove balance tube, washers and "O" rings by sliding out of main body (either end).

(9) Disconnect choke diaphragm hose from throttle body fitting, then remove diaphragm assembly, at the same time disengaging link from fast idle cam lever.

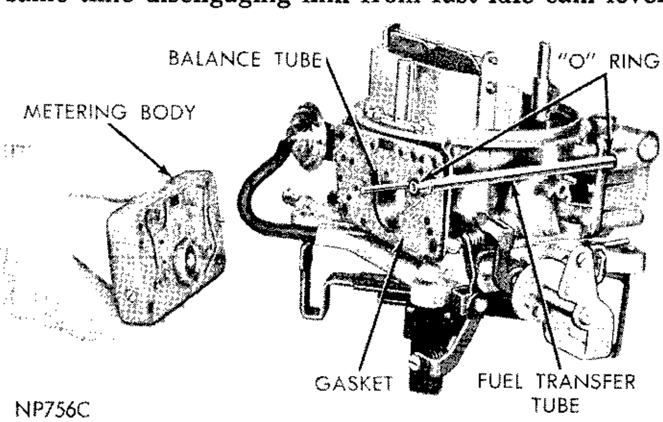


Fig. 3—Removing or Installing Primary Metering Body and Plate

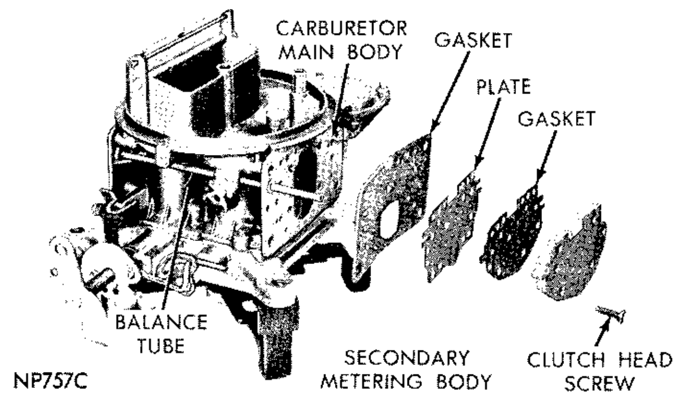


Fig. 4—Secondary Metering Body, Plate and Gaskets

(10) Remove "E" clup that retains fast idle cam lever and cam. Slide lever and cam off stub shaft, and at the same time, disengage choke rod from cam lever. (Note position of fast idle cam to cam lever.)

(11) Remove secondary diaphragm attaching screws and remove diaphragm assembly. Disengage diaphragm stem from secondary stop lever. Remove gasket.

(12) Remove pump discharge nozzle retaining screw, then lift out discharge nozzle. Remove gasket from nozzle (top and bottom).

(13) Remove screws that attach hot idle compensator valve cover to main body. Lift off cover, then remove valve and gasket. (Fig. 5). If so equipped.

(14) Remove curb idle speed screw and spring. Then remove insulating washer from between lead terminal and stop. Remove distributor ground switch lead. Using a thin blade screw driver, remove insulator bushing from boss on body. (Fig. 5).

(15) Invert carburetor and drop out pump discharge jet needle from discharge passage.

(16) With carburetor inverted, remove screws that

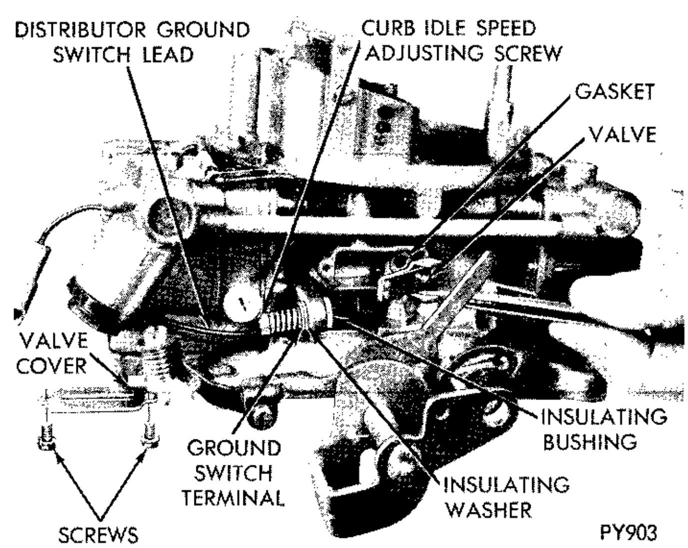


Fig. 5—Removing or Installing Hot Idle Compensator Valve

attach the throttle body to main body (Fig. 5). Remove throttle body and discard gasket.

Disassembling Fuel Bowls (Primary and Secondary)

Primary

(1) Remove primary bowl vent valve assembly (Fig. 6). On E.C.S., remove operating rod assembly.

(2) Remove float retainer "E" clip, then slide float and spring out of float chamber. (As float is being removed, the fuel inlet needle may drop out of seat assembly.) Remove float baffle.

(3) Remove fuel inlet needle valve seat. Discard the gasket.

(4) Remove screws attaching accelerator pump cover. Remove cover, then carefully remove diaphragm and spring.

(5) Remove fuel inlet fitting and discard gasket.

(6) Remove screws attaching bowl vent valve cover to fuel bowl. Lift off cover and remove vent valve, spring and seal. (Fig. 1). Remove seal from bottom of valve.

Secondary

(1) Remove float retainer "E" clip, then slide float and spring out of float chamber. (As float is being removed, the fuel inlet needle may drop out of seat assembly.) Remove float baffle.

(2) Remove fuel inlet needle valve seat. Discard gasket.

It should be noted that the Primary and Secondary fuel bowl baffles are of a different design and should be installed in the correct bowl at reassembly.

Disassembling Main Metering Body

Primary

(1) Using Tool C-3747, remove power valve assembly from primary metering body (Fig. 7).

(2) Using Tool C-3748, remove main metering jets. (Fig. 8).

(3) Remove idle adjusting needles and gaskets.

(4) Turn idle limiter caps to stops. Remove caps by

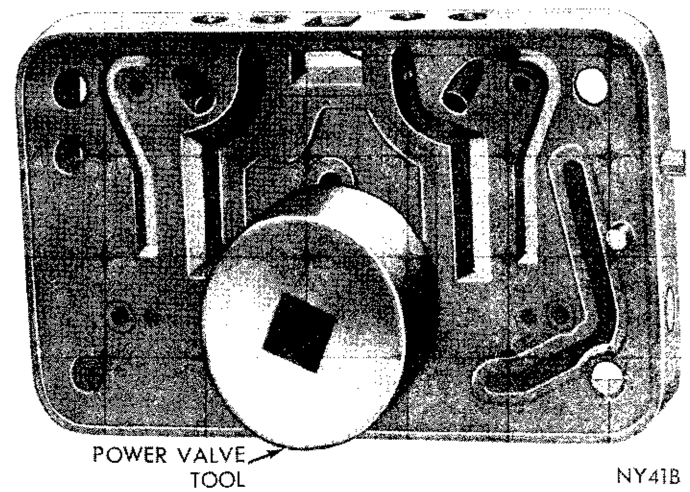


Fig. 7—Removing or Installing Power Valve

prying off ends of screws, using a suitable tool. (Be careful not to bend screws.) Be sure and count number of turns to seat the screws, as the same number of turns (from the seat) must be maintained at installation. Remove screws and springs from metering body.

Secondary

No disassembly required, but it is very important that the well bleed parts, main metering restrictions and idle feed restrictions are clean (Fig. 9).

Disassembling Secondary Diaphragm

(1) Remove the diaphragm cover screws and separate diaphragm cover from housing.

(2) Remove diaphragm return spring from cover, then slide diaphragm out of housing.

Disassembling Throttle Body

CAUTION: In normal routine cleaning and overhaul of the carburetor, do not remove the throttle valves unless they are nicked or damaged. If necessary to remove, proceed as follows:

(1) Remove screws that hold throttle valves to throttle shafts. **These screws are staked to prevent**

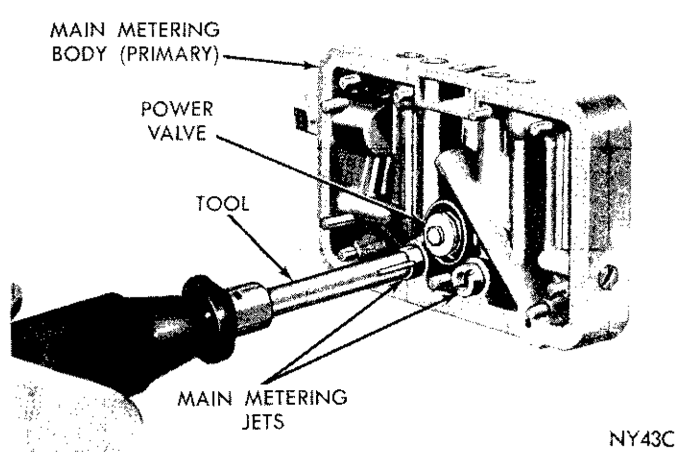


Fig. 8—Removing or Installing Main Metering Jets

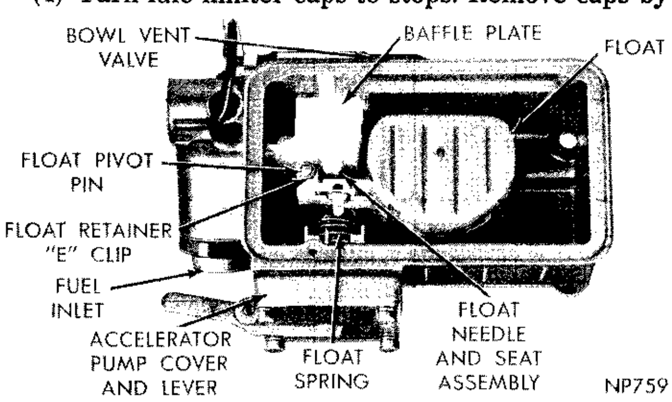


Fig. 6—Primary Fuel Bowl Assembly

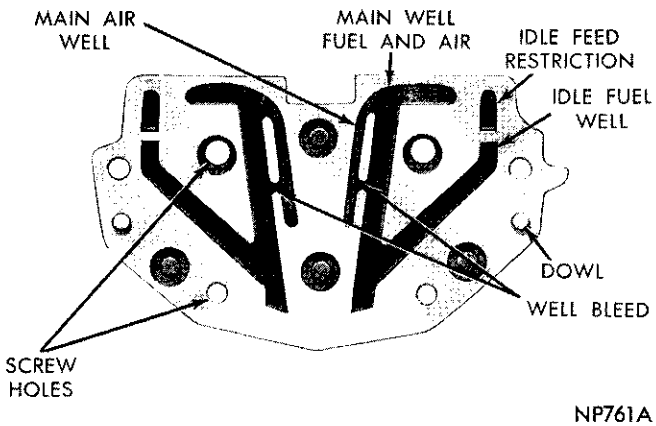


Fig. 9—Secondary Metering Body

loosening and care is necessary to avoid breaking off in shaft. Remove staking with a file.

(2) Slide damaged throttle valves out of bores. It should be noted at this time, that the secondary throttle valves are thicker than the primary valves. **Do not install secondary valves in primary bores or visa versa as the relationship of the primary valves to the idle transfer port and spark advance control ports is carefully established for one particular assembly.**

CLEANING CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents, (such as Metalclene) which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in ANY liquid. Clean the external surfaces with a clean cloth or soft wire brush. Shake dirt or other foreign material from the stem side of the diaphragm. Depressing the diaphragm stem to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt, **but should not be connected to the vacuum inlet fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a 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 gasoline or kerosene 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 fuel mixture too rich for proper performance.

DO NOT clean any rubber diaphragms or plastic parts in cleaning solvent because of possible damage.

INSPECTION AND REASSEMBLY

Throttle Body

If the throttle valves were removed because of damage, install new valves as follows:

(1) Slide new primary throttle valves in position on throttle shaft, with the valve number on the bottom (flange side) and toward idle transfer and spark advance control ports.

(2) Install new attaching screws but do not tighten.

(3) Hold valves in place with fingers. (Fingers pressing on high side of valves.)

(4) Tap valves lightly with screwdriver in this position to center in bores. Tighten securely. Operate the throttle shafts. From closed to open position, they must operate smoothly without drag or sticking. Hold throttle body up to a strong light. The light which is visible around the outer diameter of the valves and the bores should be uniform.

(5) Install secondary throttle valves in the same manner as described previously. The numbers stamped on the valves must be toward idle transfer and spark advance ports in primary bores. For adjustment (See Secondary Throttle Adjustment).

Assembling Main Metering Body (Primary)

(1) Install idle mixture screws and springs in metering body. (The tapered portion must be straight and smooth. If tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control.) **DO NOT USE A SCREW DRIVER.** Turn screws lightly against their seats with fingers. Back off the number of turns counted at disassembly. Install new plastic caps with tabs against stop.

(2) Slide a new gasket over power valve and install, using Tool C-3747. Tighten securely (Fig. 7).

(3) Install main metering jets (Fig. 8), using Tool C-3748. Tighten securely.

Assembling Fuel Bowls
Primary

(1) Install accelerator pump spring in position in fuel bowl, followed by diaphragm and pump cover. (When installing diaphragm, be sure contact button is toward pump lever in cover.) (Fig. 10).

(2) Place cover over diaphragm (with lever on fuel inlet fitting side) (Fig. 10). Install attaching screws and tighten securely.

(3) Install new gasket on fuel inlet needle seat (Fig. 11) then install in fuel bowl. Tighten securely. Slide fuel inlet needle into seat.

(4) Install float baffle in position, then slide float hinge over pivot and secure with "E" clip. Install float spring.

(5) Install new gasket over fuel inlet fitting, then install fitting in primary fuel bowl. Tighten securely.

(6) Install bowl vent valve assembly on fuel bowl, being sure vent valve spring is hooked into bracket and loop of spring under operating rod. Position

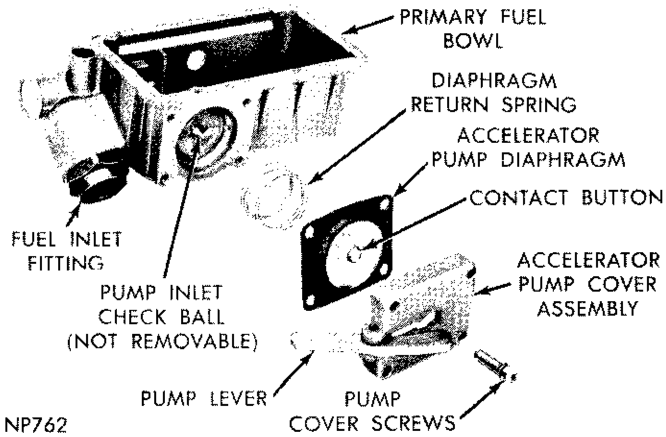


Fig. 10—Accelerating Pump (Exploded View)

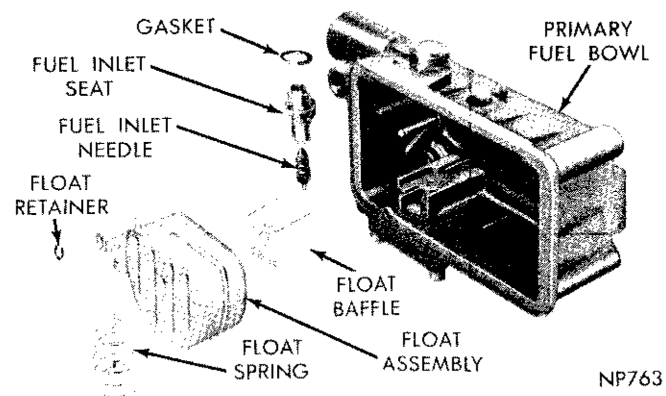


Fig. 11—Float, Needle, Seat and Baffle (Exploded View)

clamp then install attaching screw and tighten securely. (C.A.S.) Carburetors. (Figs. 1 or 2).

(7) On E.C.S. carburetors, install seal on bottom of vent valve. Slide plastic valve and seal into cover, with valve recess, mating with shoulder on underside of cover.

(8) Install bowl vent valve spring in position in opening in bowl, then install valve and cover over spring. Install attaching screws and tighten securely.

(9) Install bowl vent operating rod, clamp and spring in position on bowl. Install attaching screw and tighten securely.

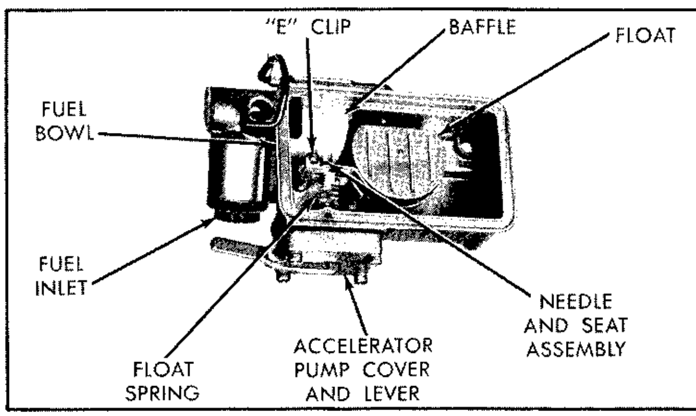
Secondary

(1) Install new gasket on fuel inlet needle seat (Fig. 11), then install in fuel bowl. Tighten securely. Slide fuel inlet needle into seat.

(2) Install float baffle in position, then slide float hinge over pivot and secure with "E" clip. Install float spring.

Adjusting Floats

(1) Invert the primary fuel bowl and using a 15/64 inch drill shank or gauge, measure the clearance between toe of float and surface of fuel bowl. (Fig. 12).



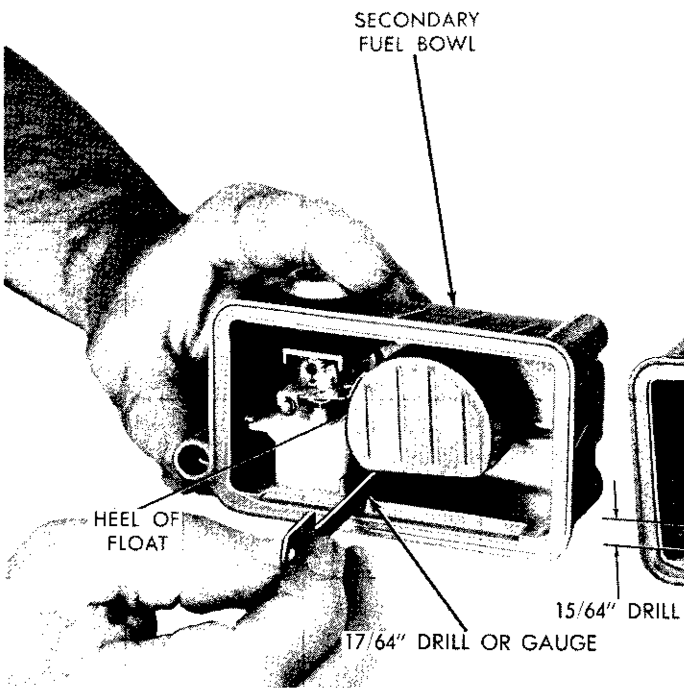
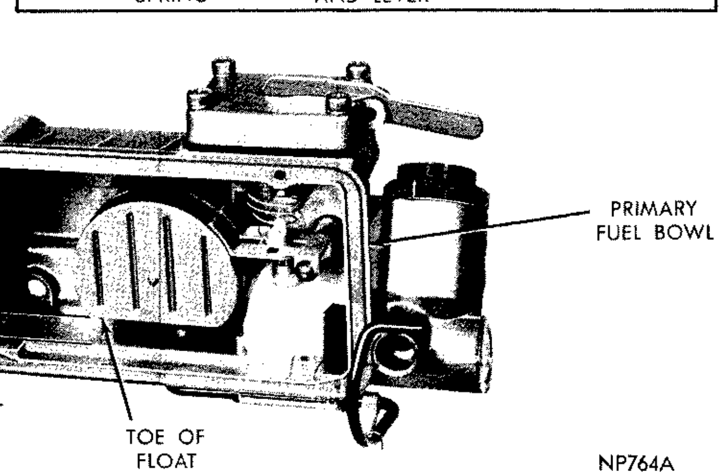



Fig. 12—Checking Float Setting (Primary and Secondary)

If an adjustment is necessary, bend float tang until correct clearance has been obtained.

(2) Invert the secondary fuel bowl and using a 17/64 inch drill shank or gauge, measure the clearance between heel of float and surface of fuel bowl (Fig. 12). If an adjustment is necessary, bend float tang until correct clearance has been obtained.

Assembling Main Body

(1) Place a new gasket on throttle body, then lower main body (Fig. 13) down on throttle body, aligning roll pin guides with openings in main body. Be sure primary bores of throttle body are on the same side as primary venturi.

(2) Holding assembly together, invert assembly and install attaching screws. Tighten securely.

(3) Install balance tube into main body and install new "O" rings and washers at each end. Be sure "O" rings are seated in recesses, followed by washers.

(4) Install a new secondary metering body to main body gasket (Fig. 4) followed by metering body plate, plate gasket and body. Install clutch head screws and tighten securely. (Be sure the main metering restriction ports are at the bottom).

(5) Position balance tube so that only 1 inch extends beyond the secondary metering body (Fig. 14). (Use a 6 inch ruler for this measurement.)

(6) Place a new gasket over primary metering body aligning pin. (Rear) Carefully slide metering body over balance tube and down into position against main body.

(7) Slide a new gasket over metering body alignment studs and carefully position against body.

(8) Carefully install primary fuel bowl over balance tube and down against metering body. Slide new gaskets over the long fuel bowl mounting screws, then install in position through fuel bowl. Tighten securely.

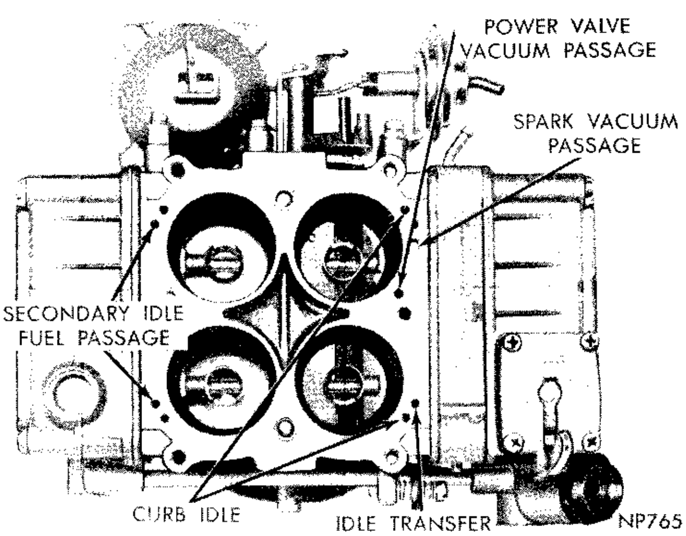


Fig. 13—Main Body Identification (Bottom View)

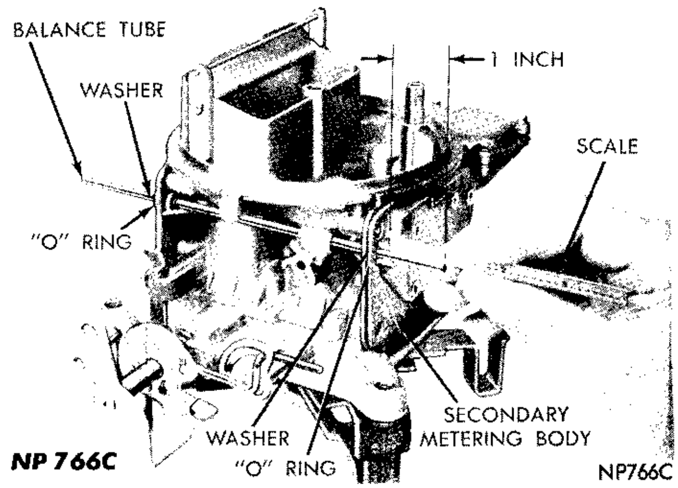


Fig. 14—Positioning Balance Tube

If new gaskets are not used, a fuel leak will develop.

(Be sure and install distributor ground switch lead and lead clamp on long screw adjacent to fuel inlet.)

(9) Slide a new "O" ring on each end of fuel tube, then install fuel tube into opening in primary fuel bowl. Press in on tube end until seated.

(10) Carefully slide secondary fuel bowl over balance tube and fuel tube and seat against gasket. Install secondary fuel bowl attaching screws after installing new gaskets. Tighten securely.

(11) Install accelerating pump discharge needle in the discharge passage in the center of primary venturi.

To test needle for sealing, pour clean gasoline into primary fuel bowl through vent valve opening. Push down on accelerator pump arm to expel air from the pump passages. Using a small clean brass rod, hold the discharge check needle firmly on its seat. Again press down on pump arm. No fuel should be emitted from the discharge passage. Fuel leakage at the discharge needle indicates the presence of dirt or a damaged check needle. Clean again and install a new needle. Retest for leakage.

If fuel continues to leak past discharge check needle, attempt to reseat as follows:

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.

(12) Install pump discharge nozzle gasket, nozzle and mounting screw and gasket. Tighten screw securely. Test nozzle operation. Press pump lever down. The two streams from the nozzle should be identical and should strike the two venturi in the same spot.

(13) Slide the bowl vent valve shaft down between fuel tube and carburetor body. Hold in position, then

install clamp, after engaging stub end of spring in clamp. Install retaining screw and tighten securely.

(14) Loosen choke valve attaching screws slightly.

(15) Tap lightly on choke valve to center valve in air horn. Holding choke valve with the fingers, tighten attaching screws securely. Stake by squeezing with pliers.

(16) Engage fast idle cam with fast idle cam lever, then slide assembly onto stub shaft positioning fast idle cam behind fast idle cam lever. At the same time engage fast idle cam lever with choke rod. Install "E" clip to secure.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to be sure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the fitting to seal the opening. Release the stem. If the stem moves more than 1/16 inch in ten (10) seconds, the leakage is excessive and the assembly must be replaced.

Install the diaphragm assembly on the carburetor as follows:

(1) Engage choke link in slot in choke lever.

(2) Place the diaphragm on the mounting surface. Install and tighten the attaching screws securely.

(3) Inspect the rubber hose for cracks before placing it on the correct carburetor fitting. Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made.

(4) Install hot idle compensator valve gasket in position in recess in main body, followed by valve. (Be sure valve is positioned with legs toward outside of main body.) (Fig. 5). Place cover over opening and install attaching screws. Tighten securely. (If so equipped.)

(5) Slide a new distributor ground switch insulated bushing into stop on main body, with the notch aligned with raised portion of boss. Force into position against stop.

(6) Place insulating washer over tangs on lead wire terminal, then install curb idle speed screw with spring through terminal and washer.

(7) Turn screw into boss, at the same time, keep insulating washer aligned.

Assembling Secondary Diaphragm

(1) Slide diaphragm into housing (Fig. 15).

(2) Position diaphragm so that the vacuum hole in housing is aligned with vacuum hole in diaphragm.

(3) Install diaphragm return spring with coiled end snapped over button in cover.

(4) Support diaphragm stem in order to keep diaphragm flat as spring and cover are installed.

(5) Align vacuum port in cover with port in housing

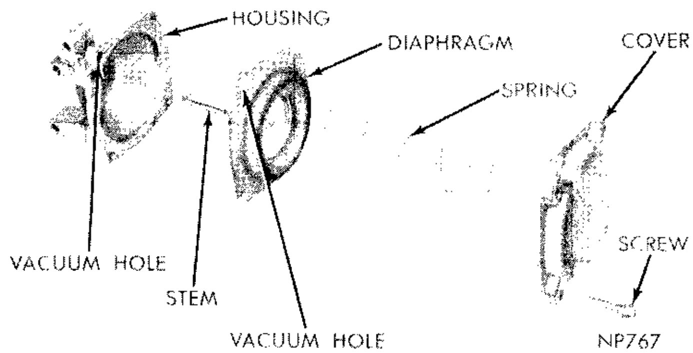


Fig. 15—Secondary Throttle Diaphragm (Exploded View)

then carefully lower cover. Install attaching screws and tighten securely.

(6) Check diaphragm by pressing **in** on stem and placing finger over port. Diaphragm should stay in retracted position.

(7) Install a new gasket in vacuum passage recess in diaphragm housing, then install secondary diaphragm on main body of carburetor and at the same time engage stem with secondary stop lever. Install screws and tighten securely.

(8) Install pump lever on stub shaft and secure with "E" clip. Slide spring and locknut between fuel pump lever and pump operating lever. Open throttle valve and install adjusting screw. Tighten 2 or 3 threads to hold. The correct setting of the adjusting screw will be covered under adjustments.

CARBURETOR ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor:

Qualifying the Choke Control Lever
Choke Unloader Adjustment (wide open kick)
Fast Idle Cam Position Adjustment
Vacuum Kick Adjustment (On or off vehicle)
Fast Idle Speed Adjustment (On the vehicle)
Checking the Bowl Vent Valve Clearance.
Checking the Pump Lever Clearance
Idle Speed Adjustment (Curb idle)
Adjusting the Float
Secondary Throttle Adjustment
Idle Mixture Adjustment
Checking Wet Fuel Level

Checking Bowl Vent Valve Clearance (C.A.S.)

To check the bowl vent valve clearance (Fig. 16), proceed as follows:

(1) With throttle valves at curb idle, it should be possible to insert a 1/16 inch drill shank between bowl vent valve and top of primary fuel bowl, with the idle speed properly set.

(2) If an adjustment is necessary, bend rod to

change arc of contact with throttle lever, using Tool T109-213 until correct clearance has been obtained.

Checking Bowl Vent Valve Clearance (E.C.S.)

To check the bowl vent valve clearance adjustment, proceed as follows:

(1) With the throttle valves at curb idle, it should be possible to insert a number 72 drill shank (.005 to .025 inch) between bowl vent valve plunger stem and operating rod, (Fig. 16).

(2) If an adjustment is necessary, bend rod to change arc of contact with throttle lever, using Tool T109-213, until correct clearance has been obtained.

Checking Accelerator Pump Lever Clearance

To check accelerator pump lever clearance (Fig. 17), proceed as follows:

(1) With throttle valves wide open, and the pump lever held down, it should be possible to insert a .015 inch gauge between adjusting nut and lever.

(2) If an adjustment is necessary, adjust pump override screw until correct clearance has been obtained.

(3) There must be no free movement of pump leverage when throttle is at curb idle.

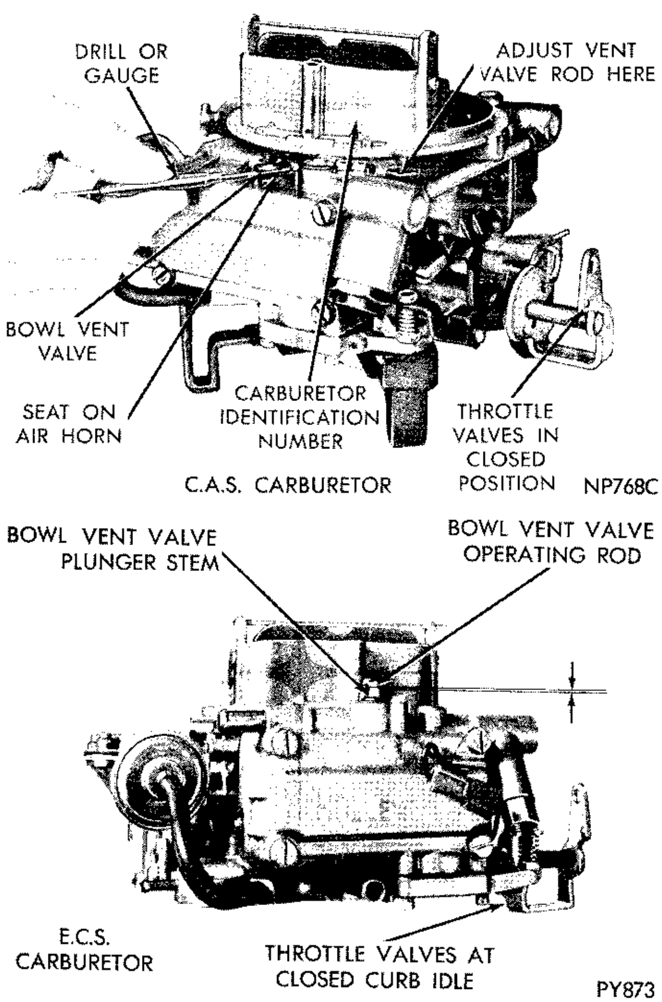


Fig. 16—Checking Bowl Vent Valve Clearance (C.A.S. and E.C.S.)

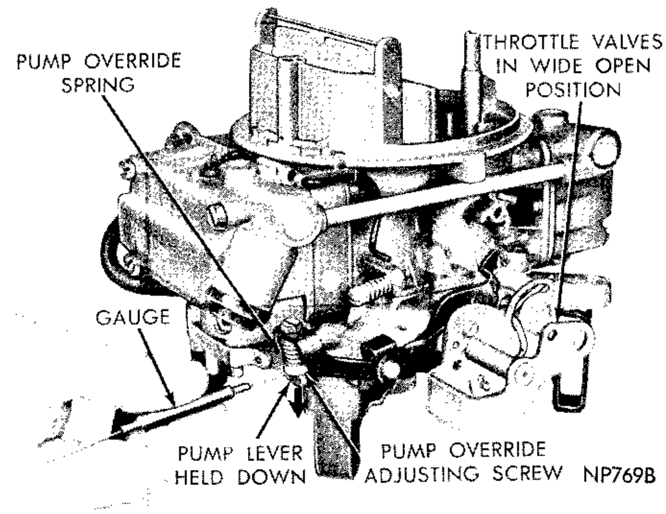


Fig. 17—Checking Accelerator Pump Lever Clearance

Qualifying Choke Control Lever

Adjustment of the choke control lever is necessary to provide correct relationship between choke valve, thermostatic coil spring and the fast idle cam. It should be checked and adjusted (if necessary) after carburetor assembly or as preparation of the choke system linkage before making the Vacuum Kick, Cam Position or Unloader Adjustment. These three adjustments must and should be made after qualification of the choke control lever.

(1) Open the throttle to mid-position.

(2) Close the choke valve by slight pressure on choke control lever.

(3) The top of choke rod hole in control lever should be 1-11/16 ± 1/64 inch above choke assembly (carburetor on engine) or 1-23/32 ± 1/64 inch above carburetor base (Carburetor on bench) (Fig. 18).

(4) Adjust if necessary by bending choke shaft rod at point indicated.

CAUTION: Improper bending will cause binding of rod. Test for free movement between open and closed

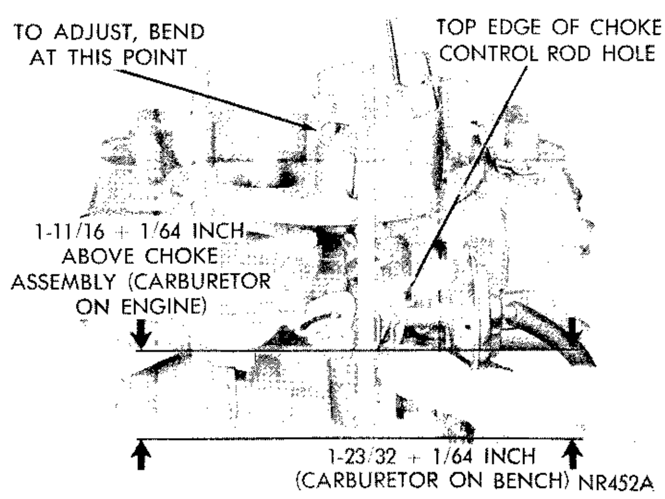


Fig. 18—Qualifying Choke Control Lever

choke positions and rebend if necessary to eliminate any interferences.

Choke Unloader Adjustment (wide open kick)

The choke unloader is a mechanical device to partially open the choke at wide open throttle. It is used to eliminate choke enrichment during cranking of an engine. Engines which have been flooded or stalled by excessive choke enrichment can be cleared by use of the unloader. Adjust the system as follows.

(1) Qualify the choke control lever, if necessary. (See Qualifying Choke Control Lever Paragraph).

(2) Hold the throttle valves in the wide open position. Insert the specified drill between the upper edge of the choke valve and the inner wall of the air horn (see specifications).

(3) With a finger lightly pressing against the choke control lever, a slight drag should be felt as the drill is being withdrawn. If an adjustment is necessary, bend the indicated tang until correct opening has been obtained (Fig. 19).

Fast Idle Speed Adjustment (On Vehicle)

Fast idle engine speed is used to overcome cold engine friction, stalls after cold starts and stalls because of carburetor icing. Set this adjustment after the vehicle odometer indicates over 500 miles to insure a normal engine friction level. Prepare the engine by driving at least 5 miles. Connect a tachometer and set the curb idle speed and mixture, then proceed as follows:

(1) With the engine off and the transmission in the PARK or NEUTRAL position, open the throttle slightly.

(2) Close choke valve until fast idle screw tang can be positioned on the second highest-speed step of the fast idle cam (Fig. 20).

(3) Start the engine and determine the stabilized

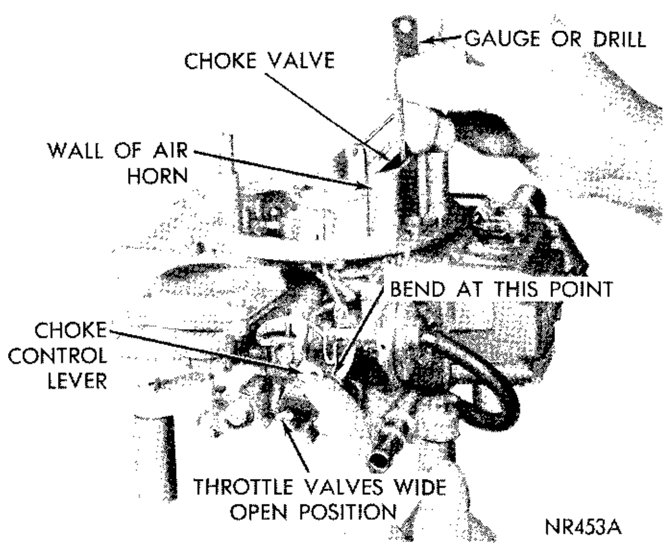


Fig. 19—Choke Unloader Adjustment (Wide Open Kick)

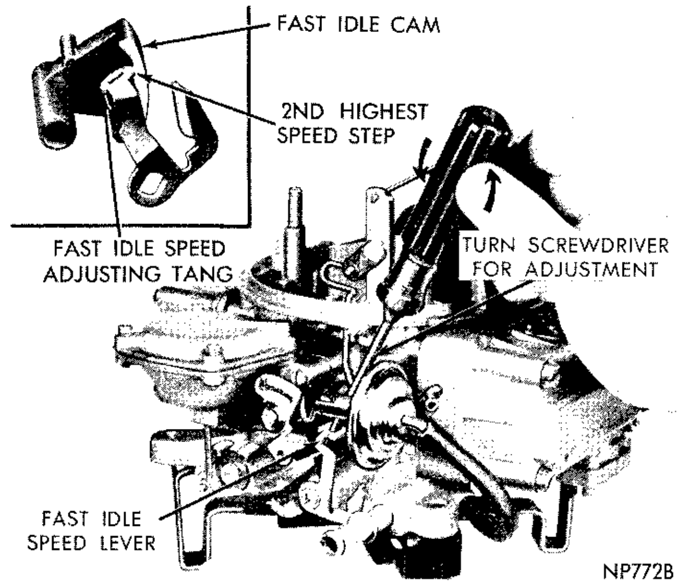


Fig. 20—Fast Idle Speed Adjustment (On Vehicle)

speed. Bend the fast idle tang by use of a screwdriver placed in the tang slot to secure the specified speed.* **CAUTION: Bend only in a direction perpendicular to the contact surface of the cam. Movement in any other direction changes the CAM POSITION ADJUSTMENT described earlier.**

(4) Stopping the engine between adjustments is not necessary. However, reposition the fast idle tang on the cam after each speed adjustment to provide correct throttle closing torque.

Fast Idle Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle as described in the Fast Idle Speed Adjustment (on the vehicle) paragraph. However, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to assure that the speeds of each step of the cam occur at the proper time during engine warm-up.

(1) Qualify the choke control lever, if necessary. (See Qualifying the Choke Control Lever Paragraph).

(2) With fast idle speed adjusting tang contacting second highest speed step on fast idle cam, move choke valve toward the closed position with light pressure on choke control lever.

(3) Insert specified drill between the choke valve and wall of the air horn (see specifications).

An adjustment will be necessary if a slight drag is not obtained as the drill is being removed.

(4) To adjust, bend the indicated tang (Fig. 21) until the correct choke valve opening has been obtained.

Vacuum Kick Adjustment (ON or OFF Vehicle)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the

*See specifications.

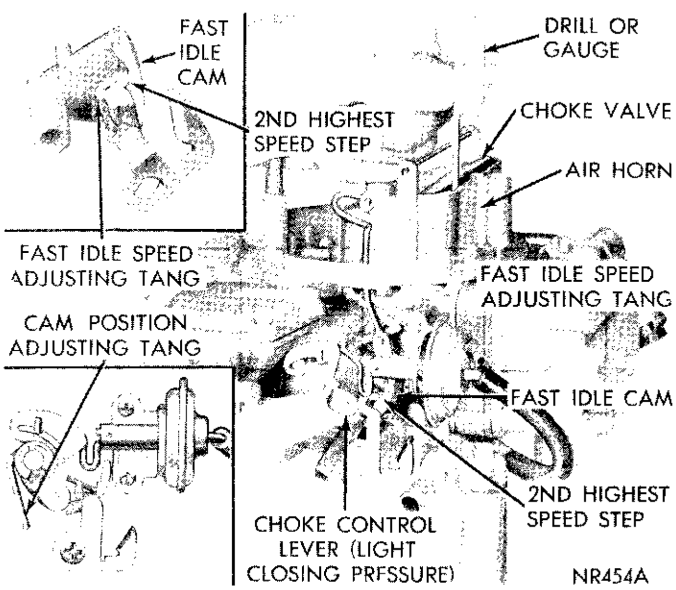


Fig. 21—Fast Idle Cam Position Adjustment

choke valve within the air horn by use of linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Vacuum can be supplied by a distributor test machine, another vehicle or vehicle to be adjusted.

(1) If the adjustment is to be made with the engine running, position the fast idle tang (Fig. 21) (Cam position adjustment) to allow choke closure to kick position. If auxiliary vacuum source is to be used, open throttle valves, (engine not running) and move choke to closed position. Release throttle first, then release choke.

(2) When using an auxiliary vacuum source, disconnect the vacuum hose from the carburetor and connect it to the hose from the vacuum supply with a small length of tube to act as a fitting. Removal of the hose from the diaphragm may require forces which damage the system. Apply a vacuum of 10 or more inches of hose.

(3) Insert the specified drill (see specifications) between the choke valve and the wall of the air horn. (Fig. 22). Apply sufficient closing pressure on the lever to which the choke rod attaches to provide a minimum choke valve opening without distortion of the diaphragm link. Note that the cylindrical stem of the diaphragm will extend as an internal spring is compressed. This spring must be fully compressed for proper measurement of the vacuum kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill is being removed. Shorten or lengthen the diaphragm link to obtain the correct choke opening. Length changes should be made by carefully opening or closing the bend provided in the diaphragm link. **CAUTION: DO NOT APPLY TWISTING OR BENDING FORCE TO DIAPHRAGM.**

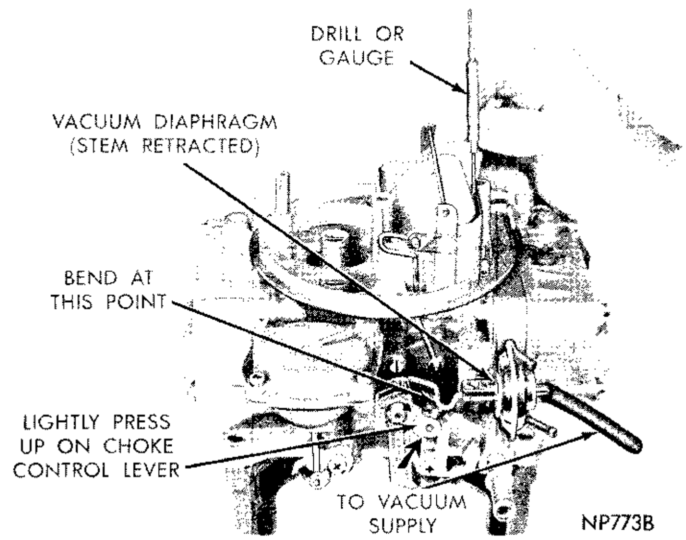


Fig. 22—Vacuum Kick Adjustment

(5) Reinstall the vacuum hose on the correct carburetor fitting.

(6) Make the following check. With no vacuum applied to the diaphragm, the CHOKE VALVE SHOULD MOVE FREELY between the open and closed positions. If movement is not free, examine the linkage for misalignment or interferences caused by the bending operation. Repeat the adjustment if necessary to provide proper link operation.

Secondary Throttle Adjustment

This adjustment no longer required as valves are pre-adjusted and need no further adjustment.

Idle Speed Adjustment (Curb Idle)

Refer to General Information at front of Group.

Checking Wet Fuel Level (On Vehicle)

Before checking wet fuel level, check the fuel pump pressure to be certain 5 pound reading is obtained.

To check wet fuel level, remove lower bolt furthest from fuel supply (Primary and Secondary) and install C-4051 wet fuel level gauge (Fig. 23). As screw is be-

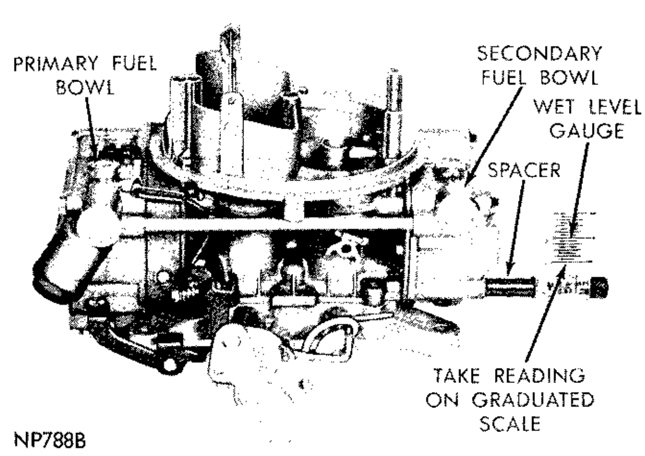


Fig. 23—Checking Wet Fuel Level (on Vehicle)

ing removed, fuel will be lost. Start or crank engine and allow fuel bowls to fill. The reading on level gauge should be 9/16 for Primary and 13/16 inch for Secondary, with 5 pounds fuel pump pressure.*

If an adjustment is necessary remove fuel bowl and bend tang on float until correct specifications are obtained.

*Fuel level will vary 1/32 inch for every pound of fuel pump pressure under or over specifications.

FUEL PUMP

INDEX

GENERAL INFORMATION

Fuel pump Model MS-4589SA and MS-4845S or Airtex RD-267A (Optional) (Figs. 1 or 2), is used on all Chrysler and Imperial engines. The MS-4589SA and MS-4845S fuel pump are of the pressed steel type and cannot be disassembled for service. If a pump malfunction occurs, remove the old pump and install a new one. Airtex Model RD-267A (Optional) is serviceable.

The fuel pumps are driven by an eccentric cam that is cast on the camshaft in the 383 and 440 cubic inch engines.

As the camshaft rotates, the eccentric cam presses down on the pump rocker arm. (On the 383 and 440 cubic inch engine, a push rod operates between the camshaft and the fuel pump rocker arm.) This action lifts the pull rod and diaphragm upwards against the fuel pump main spring, thus creating a vacuum in the valve housing and opens the inlet valve and fuel is drawn into the valve housing chamber. On the return stroke the main spring forces the diaphragm to the down position, which closes the inlet valve and expels the fuel in the valve housing chamber through the outlet valve, to the fuel filter and the carburetor.

The fuel filter should be changed every 24,000 miles, to insure having an unrestricted flow of fuel at all times. **Do not attempt to clean.**

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
FUEL PUMP LEAKS—FUEL	(a) Worn, ruptured or torn diaphragm.	(a) Install new pump.
	(b) Loose diaphragm mounting plates.	(b) Install new pump.
	(c) Loose inlet or outlet line fittings.	(c) Tighten line fittings.
FUEL PUMP LEAKS—OIL	(a) Cracked or deteriorated pull rod oil seal.	(a) Install new pump.
	(b) Loose rocker arm pivot pin.	(b) Install new pump.
	(c) Loose pump mounting bolts.	(c) Tighten mounting bolts securely.
	(d) Faulty pump to block gasket.	(d) Install new gasket.
INSUFFICIENT FUEL DELIVERY	(a) Vents in tank or filler cap restricted. (This will also cause collapsed fuel tank.)	(a) Install new cap, or unplug vents and inspect tank for leaks.
	(b) Leaks in fuel line or fittings.	(b) Tighten line fittings.
	(c) Dirt or restriction in fuel tank.	(c) Install new fuel filter and clean out tank.
	(d) Worn, ruptured, or torn diaphragm.	(d) Install new pump.
	(e) Frozen gas lines.	(e) Thaw lines and drain tank.
	(f) Improperly seating valves.	(f) Install new fuel pump.
	(g) Vapor lock.	(g) Install heat shield where lines or pump are near exhaust.
	(h) Low pressure.	(h) Install new fuel pump.
	(i) Incorrect fuel pump.	(i) Install correct fuel pump.
	(j) Restricted fuel filter.	(j) Install new filter.
FUEL PUMP NOISE	(a) Loose mounting bolts.	(a) Tighten mounting bolts.
	(b) Scored or worn rocker arm.	(b) Install new fuel pump.
	(c) Weak or broken rocker arm spring.	(c) Install new spring.

SERVICE PROCEDURES

TESTING FUEL PUMP (On Car)

If the fuel pump fails to supply fuel properly to the carburetor, the following tests should be made before removing the fuel pump from the vehicle.

Pressure Test

If leakage is not apparent, test pump for pressure, as follows:

(1) Insert a "T" fitting in fuel line at carburetor, (Fig. 3).

(2) Connect a 6 inch piece of hose between "T" fitting and gauge C-3411. (The hose should not exceed 6 inches. A longer hose may collect fuel and additional weight of fuel would be added to pressure of pump and result in an inaccurate reading.)

(3) Vent pump for a few seconds (this relieves air trapped in fuel chamber). If this is not done, pump will not operate at full capacity and low pressure reading will result.

(4) Connect a tachometer, then start engine and run at 500 r.p.m. The reading should be from 3-1/2 to 5 p.s.i. and remain constant or return to zero very, very slowly when engine is stopped. An instant drop to zero indicates a leaky outlet valve. If pressure is too low a weak diaphragm main spring, or improper assembly of the diaphragm may be the cause. If pressure is too high, main spring is too strong.

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 minimum reading should be at least 10 inches of vacuum at 500 r.p.m. with the fuel line disconnected at the carburetor.)

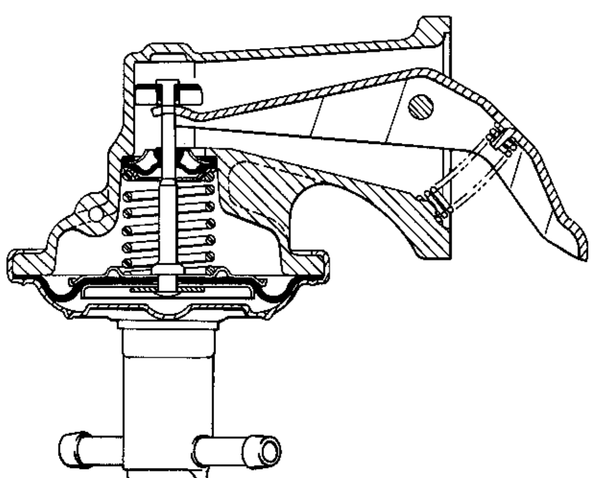


Fig. 1—Fuel Pump Assembly (383, and 440 Cu. In. Engine)

Volume Test

The fuel pump should supply 1 quart of fuel in 1 minute or less at 500 r.p.m.

Inlet Valve Test

To test the inlet valve, connect a vacuum gauge on the inlet fitting while the line is disconnected.

(1) Start engine or turn over with starting motor.

(2) There should be a noticeable vacuum present, not alternated by blowback.

(3) If blowback is present, inlet valve is not seating properly and a new pump should be installed.

If fuel pump does not perform to above test requirements, fuel pump should be removed from vehicle.

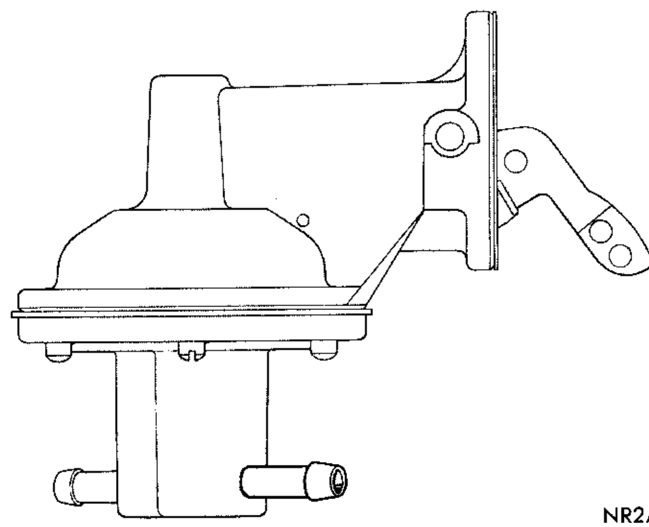


Fig. 2—Fuel Pump Assembly (RD-267A) Optional 383 and 440 Cu. In. Engine

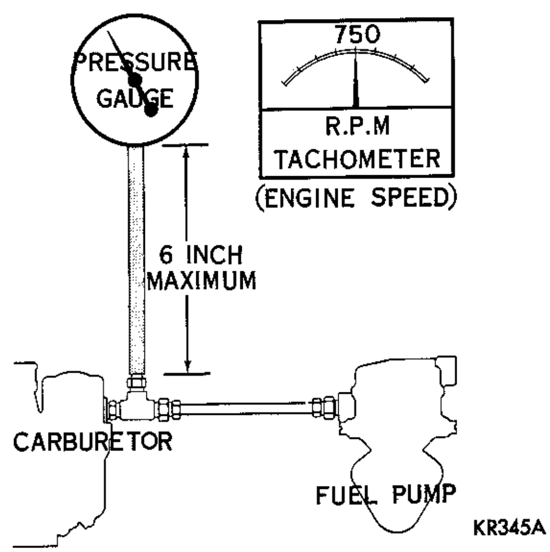


Fig. 3—Pressure Testing Fuel Pump

DISASSEMBLING FUEL PUMP (RD-267A)

Before disassembly, mark housings in such manner that the mark "Inlet" will be facing inlet fuel line when reassembled. This is important!

(1) Grind or file off peened end of pivot pin, then, drive out pivot pin. Remove washer.

(2) Remove rocker arm follower spring.

(3) Remove screws holding rocker arm housing to valve body. Separate body and housing.

(4) Press **in** on diaphragm and disengage rocker arm from diaphragm pull rod. Remove rocker arm and spacer washers.

(5) Slide diaphragm and spring out of rocker arm housing.

(6) Remove sleeve from two piece rocker arm, then separate rocker arm pull lever from eccentric arm.

Cleaning Fuel Pump Parts

Clean all fuel pump parts (except diaphragm) in a suitable solvent, then blow dry with compressed air. Check the condition of the valve seats and parts for gum deposits. If gum deposits are found, remove with denatured alcohol. If the valves are badly worn or damaged, install a complete new valve body assembly. **The valves are not serviced individually.** Examine the diaphragm for cracks, torn screw holes or ruptures. Check the rubber oil seal (diaphragm pull rod) in housing for deterioration. If unfit for further service, install a new rocker arm housing. Check the rocker arm for scoring or galling on the camshaft push rod bearing surface.

ASSEMBLING FUEL PUMP

(1) Assemble rocker arm by sliding the pull arm into eccentric cam and install sleeve. (Be sure the hook on the arm is facing up).

(2) Grease spacer washers and slide over each side of sleeve shoulder.

(3) Install diaphragm and spring rocker arm housing.

(4) Slide rocker arm in position and engage hook of arm with slot in pull rod. (Compress diaphragm and spring to engage arm with pull rod.)

(5) Using suitable drift, align rocker arm and washers then install pivot pin. Install retaining washer, then peen pivot pin to retain.

(6) Place valve body on diaphragm. Align, then install attaching screws. Draw down evenly.

(7) With pump held in vise, compress rocker arm to its full travel. Hold in this position, then tighten screws securely. (This will prevent tearing diaphragm when pump is operated at full stroke.)

(8) Install pump arm follower spring between rocker arm and housing. (Be sure spring is seated.)

(9) Test pump as described previously.

FUEL TANK (C.A.S.) CLEANER AIR SYSTEM

GENERAL INFORMATION

The fuel tank on all models except Station Wagon Models is located at the rear of the body, under the trunk compartment floor, (Fig. 1). In Station Wagon models, the fuel tank is mounted in the left rear quarter panel beyond the wheel house, (Fig. 2).

If the vehicle is to be stored for any appreciable

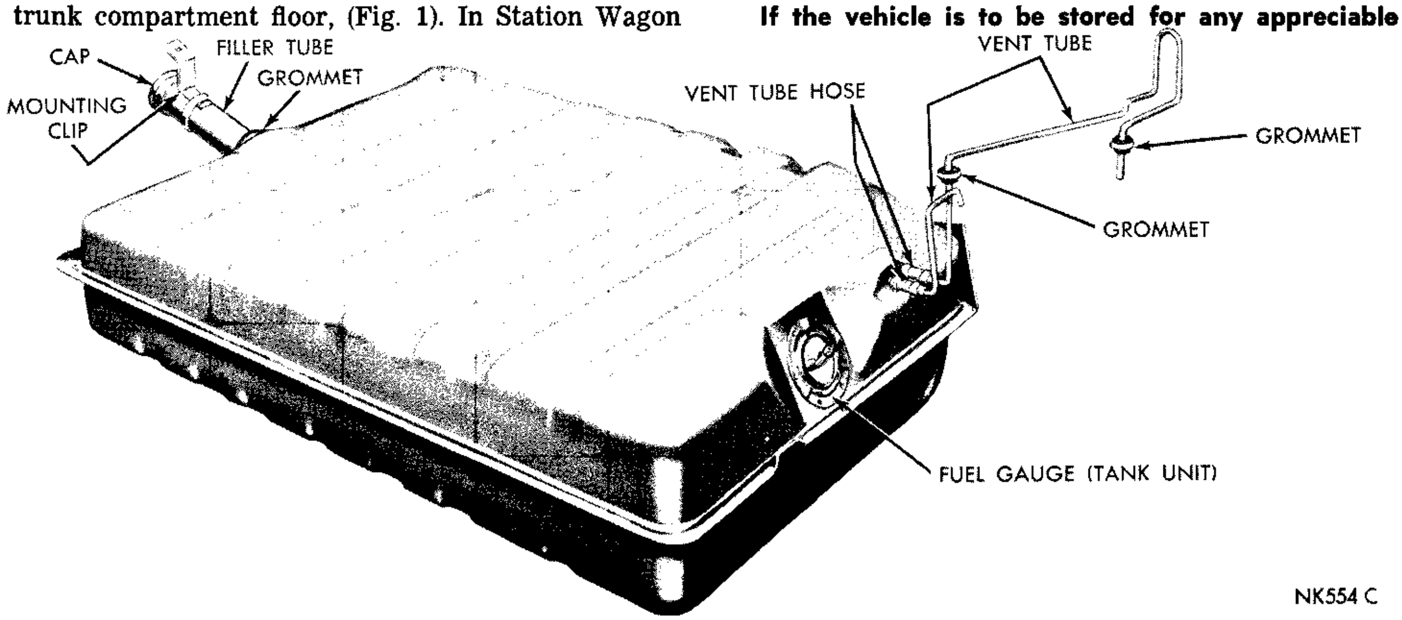


Fig. 1—Fuel Tank Mounting (119.5 inch W/B Vehicles)

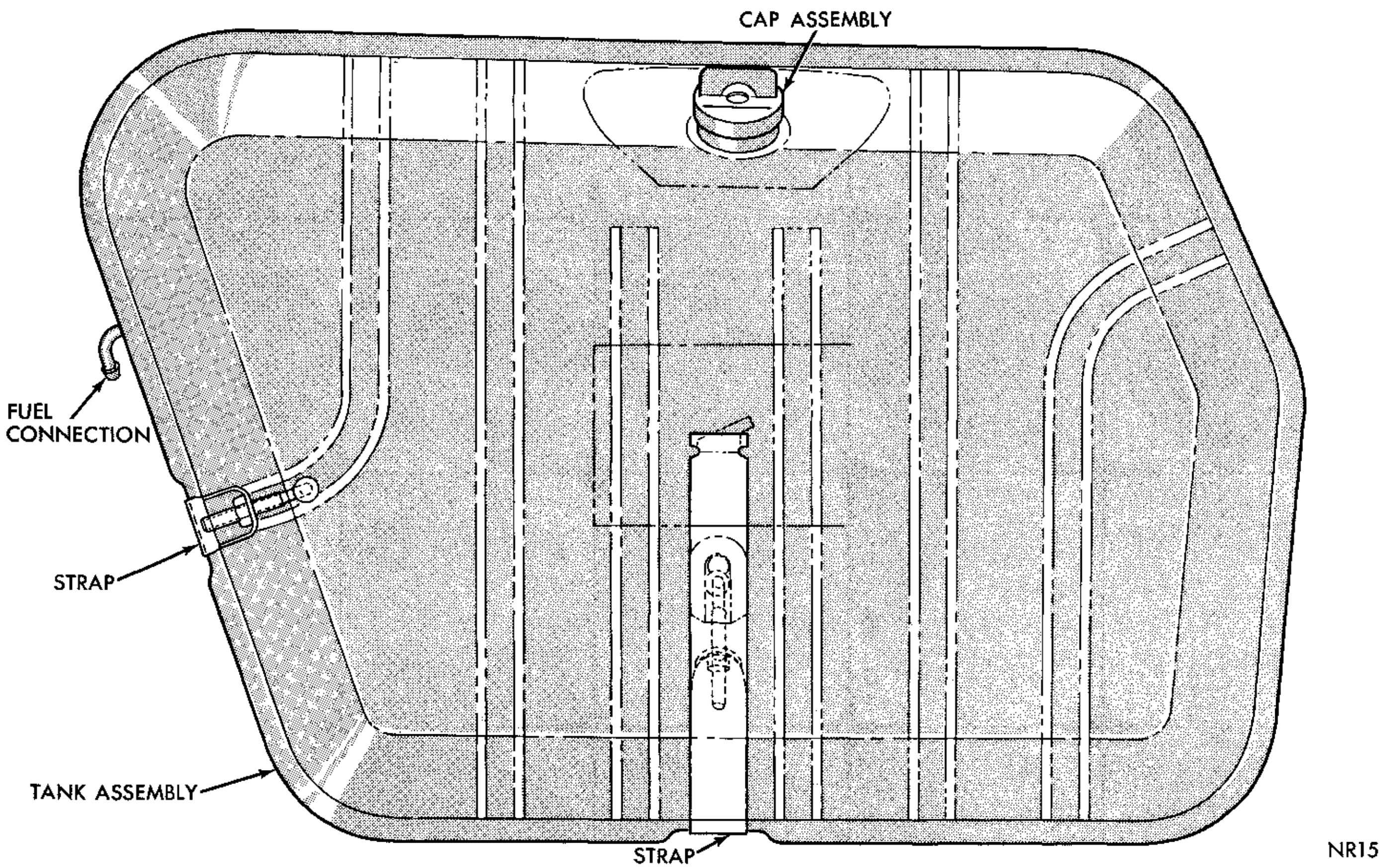


Fig. 2—Fuel Tank Assembly (121.5 inch W/B Vehicles)

length of time, the gasoline should be drained from the entire system, in order to prevent gum formation. If the vehicle has been undercoated, be sure the fuel tank vent tube (under kickup in floor pan) is open. If this is not done, a collapsed fuel tank will result.

The fuel tank on all models except Station Wagon has a 24 gallon (20 Imperial) capacity. The Station Wagon capacity is 22 (18-1/4 Imperial) gallons. The filler tube on the conventional models is accessible through the center of the deck opening lower panel, while the Station Wagon fills at the left rear upper quarter panel between the quarter post and the fin. The fuel tank is fitted with a gauge unit, including the suction pipe, (Fig. 3). The filter on the end of the suction pipe is replaceable unit and prevents the entry of water and dirt. When installing a tank unit, be sure the filter is pushed on the end of the tube until seated.

SERVICE PROCEDURES

REMOVING THE FUEL TANK (Except Station Wagon)

CAUTION: Be sure the ignition switch is turned off before disconnecting or connecting the gauge wire.

Removal

(1) Drain tank into a safety can, then disconnect fuel line and wire lead to gauge unit.

(2) Disconnect vent tube at hose connection at leading edge of tank.

(3) Remove screw that attaches filler tube bracket to rear crossmember.

(4) Remove nuts that hold ends of fuel tank hold down straps to frame. Lower front end of tank far enough to disengage filler tube from rear panel and slide out from under vehicle.

(5) Remove tank gauge unit, using spanner wrench Tool C-3582 (Fig. 3). Check rubber grommet around filler tube. If cracked or deteriorated, install a new grommet at reassembly.

Installation

Before installing the tank gauge unit, check the condition of the filter on the end of suction tube. If the filter is plugged, install a new filter.

(1) Position fuel tank gauge unit in tank, using a new gasket. Tighten securely, using Tool C-3582. (If tank insulator was torn or damaged during removal of tank, be sure and install a new insulator at reassembly.)

(2) Slide fuel tank under vehicle. Raise tank far enough to engage filler spout with opening in rear

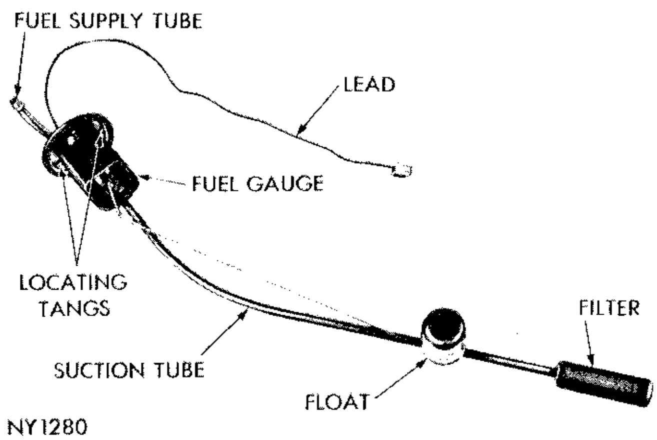


Fig. 3—Fuel Gauge (Tank Unit)

panel, and locator embossments on floor pan.

(3) Push tank toward rear to fully engage filler spout in opening.

(4) Hold fuel tank in this position, and place hold down straps in position, feeding attaching studs through holes in end of straps. Install nuts but do not tighten.

(5) Guide button head of studs into slots in frame and down into position. Tighten hold down strap attaching nuts securely. (40 in.-lbs.)

(6) Install filler tube mounting screw and tighten securely.

(7) Connect vent tubes and hose connections at leading edge of tank.

(8) Connect lead wire to tank gauge unit, reconnect fuel line and ground strap.

(9) Refill tank and check for leaks.

FUEL TANK (Station Wagon) (Fig. 2)

Removal

CAUTION: Be sure the Ignition Switch is turned OFF before disconnecting or connecting the gauge wire.

(1) Remove filler cap and syphon fuel into safety can.

(2) Raise vehicle on hoist and remove fender skirt (if so equipped).

(3) Remove left rear tire and wheel.

(4) Remove screws that attach stone shield to wheel house. Slide shield down and away from vehicle.

(5) Disconnect fuel line, ground strap and gauge wire.

(6) Place stands under frame at rear to support vehicle as hoist is lowered.

(7) Remove rear shock absorbers lower attaching nuts, then slide off lower pivot.

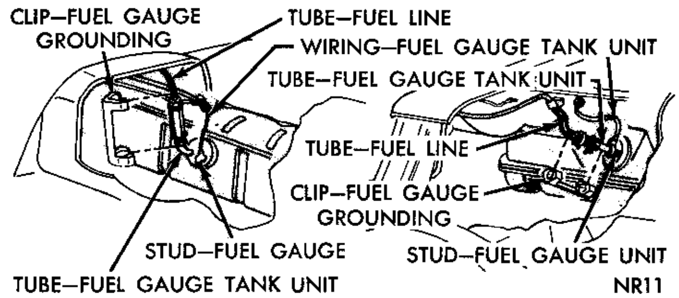


Fig. 4—Fuel Tank Ground Strap

(8) Remove left rear brake drum.

(9) Remove left rear spring hanger attaching bolts to frame.

(10) Lower hoist and allow rear axle to fall away from vehicle far enough so as not to stretch brake hose.

(11) Remove fuel tank support strap nuts from eyebolts.

(12) Slide fuel tank forward and tilt leading edge down. Work fuel tank out from under rear quarter panel.

(13) Loosen tank gauge unit, using spanner wrench Tool C-3582. Slide unit up and out of tank.

Installation

(1) Position fuel tank gauge unit in tank, using a new gasket. Tighten securely, using Tool C-3582.

(2) Work fuel tank up into position in quarter panel. Move rearward until filler tube is centered in opening of quarter panel. Place straps in position and install nuts. Tighten to 40 inch-pounds. Bottom strap should be tightened first.

(3) Install fuel line and connect ground strap (Fig. 4), and fuel gauge wire.

(4) Raise hoist far enough to engage spring hanger with frame.

(5) Position left rear spring hanger at frame and install attaching bolts. Tighten to 30 foot pounds.

(6) Slide shock absorbers over pivots and secure with nuts. Tighten to 50 foot-pounds.

(7) Install brake drum on axle flange.

(8) Slide stone shield up into position. Install attaching screws and tighten securely.

(9) Install wheel and tire and tighten wheel nut to 65 foot-pounds, in sequence.

(10) Raise hoist and remove car stands.

(11) Install fender skirt (if so equipped) and lower vehicle to floor.

(12) Refill fuel tank and check for leaks.

(13) For testing fuel gauge (tank unit) refer to Electrical Group 8 "Gauges".

FUEL TANKS (E.C.S.) EVAPORATION CONTROL SYSTEM

GENERAL INFORMATION

Certain Chrysler Corporation Vehicles are equipped with an Evaporation Control System (ECS) to reduce the loss of fuel from the fuel system to the atmosphere by evaporation. This is a closed system which controls fuel expansion and feeds fuel evaporation emissions from the carburetor or fuel tank. The vapors pass through vent lines to the crankcase by way of the crankcase inlet air cleaner. Since fuel vapors are two to four times heavier than air, they settle to the bottom of the crankcase. With the engine running the fuel vapors are purged from the crankcase and together with the normal crankcase vapor are drawn via the crankcase ventilation system, which is an existing part of the Cleaner Air System (CAS) into the base of the carburetor to be burnt by engine combustion.

The possible expansion of fuel in a full fuel tank, due to a rise in temperature, is allowed for by a 1.4 gallon over-fill limiter tank inside the main fuel tank which fills much slower than the main tank. When the main tank is filled, it remains essentially empty to allow for thermal expansion (Fig. 1).

The loss of any fuel or vapor out of the filler neck is prevented by the use of a filler cap which will release only under significant pressure (1/2 to 1 psi) or vacuum (1/4 to 1/2 psi). This cap is identified by the words **pressure-vacuum** and must be replaced by a similar unit if replacement is necessary, in order for the system to remain effective (Fig. 1).

Because the fuel tank is flat on top, four vents are used, one in each corner of the tank and are connected to a vapor-liquid separator by rubber hoses. The vapor-liquid separator is a piece of two inch steel tubing mounted at an angle inside the trunk of the vehicle (quarter panel), which internally holds four vent lines from the tank and a vent line which leads to the crankcase inlet air cleaner. These lines are of different heights so the tank will always be vented regardless of vehicle attitude and fuel vapor will be transferred to the crankcase. One vent line from the tank is short to provide a drain back to the tank for any liquid fuel which may get into the separator during maneuvers or incline parking. The vent to the crankcase is at the highest point in the separator and

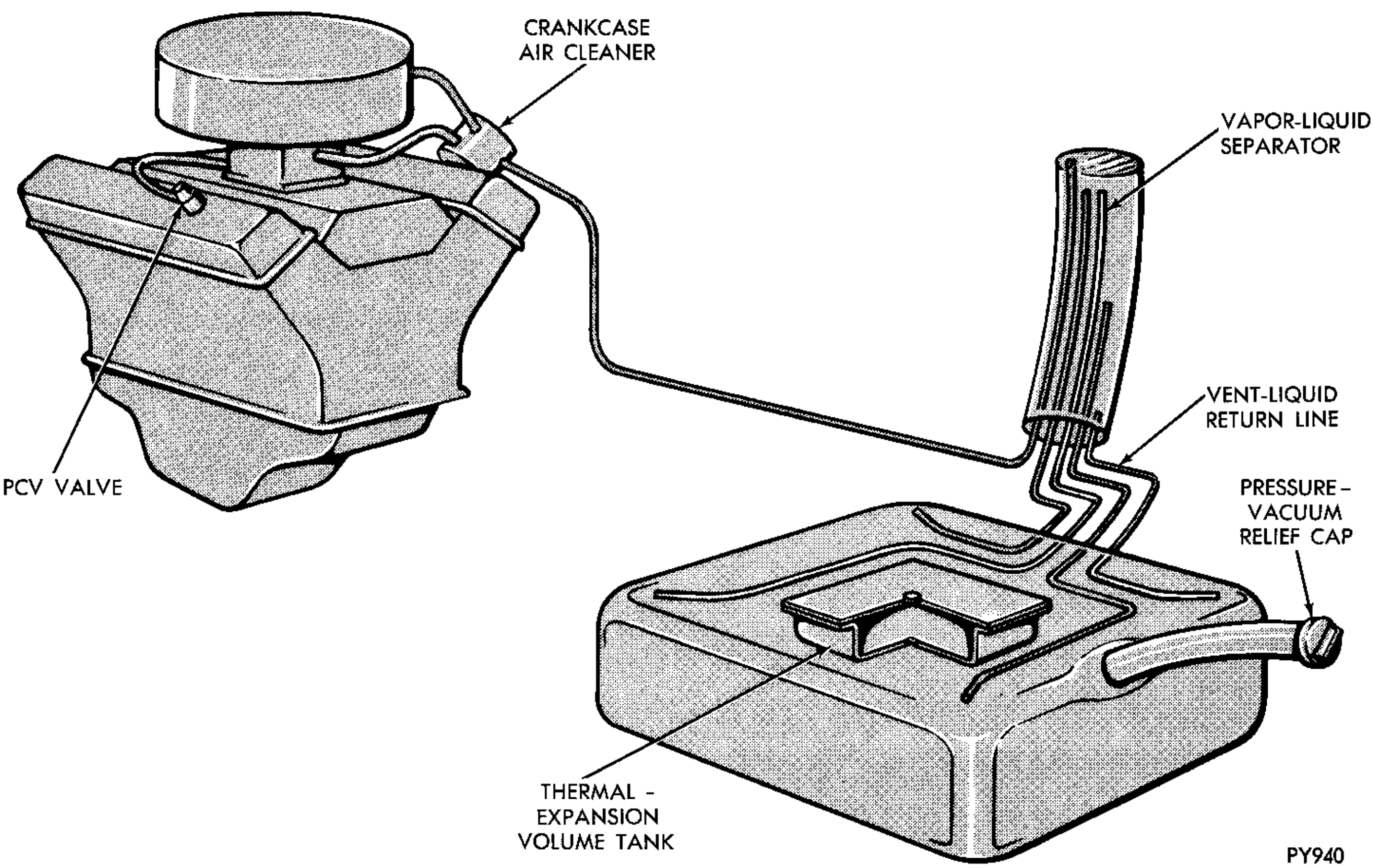


Fig. 1—Evaporation Control System

has a small orifice to minimize liquid fuel transfer to the crankcase (Fig. 1).

The ECS system also includes closed ventilation of fuel vapor from the carburetor bowl. On eight cylinder engines this is accomplished via a hose connection from the carburetor bowl to the crankcase inlet air cleaner.

SERVICE DIAGNOSIS

The ECS system should not require any maintenance in normal service. Any loss of fuel or vapor from the fuel filler cap would indicate one or more of the following:

(1) An unsatisfactory seal between cap and filler neck.

(2) A malfunction of ECS cap release valve.

A quick check of the ECS fuel cap may be made by placing against the mouth and blowing into the hole in the release valve housing. An immediate leak with light blowing or lack of release with hard blowing indicates a defective or incorrect unit.

(3) All ECS lines plugged between fuel tank and vapor separator.

(4) Plugged ECS lines between the vapor separator and the crankcase air inlet filter.

(5) Plugged fuel tank expansion chamber inlet hole in main tank. A removable plug is provided in the top surface of ECS fuel tanks, for access to expansion chamber in event of plugging of its fill/drain hole. If purging of the fuel tank is required, the expansion chamber must be purged separately through the top access plug hole.

SERVICE PROCEDURES

The fuel tank on all models except Station Wagon Models is located at the rear of the body, under the trunk compartment floor, (Fig. 1). In Station Wagon models, the fuel tank is mounted in the left rear quarter panel beyond the wheel house, (Fig. 2).

If the vehicle is to be stored for any appreciable length of time, the gasoline should be drained from the entire system, in order to prevent gum formation. If the vehicle has been undercoated, be sure the fuel tank vent tube (under kickup in floor pan) is open. If

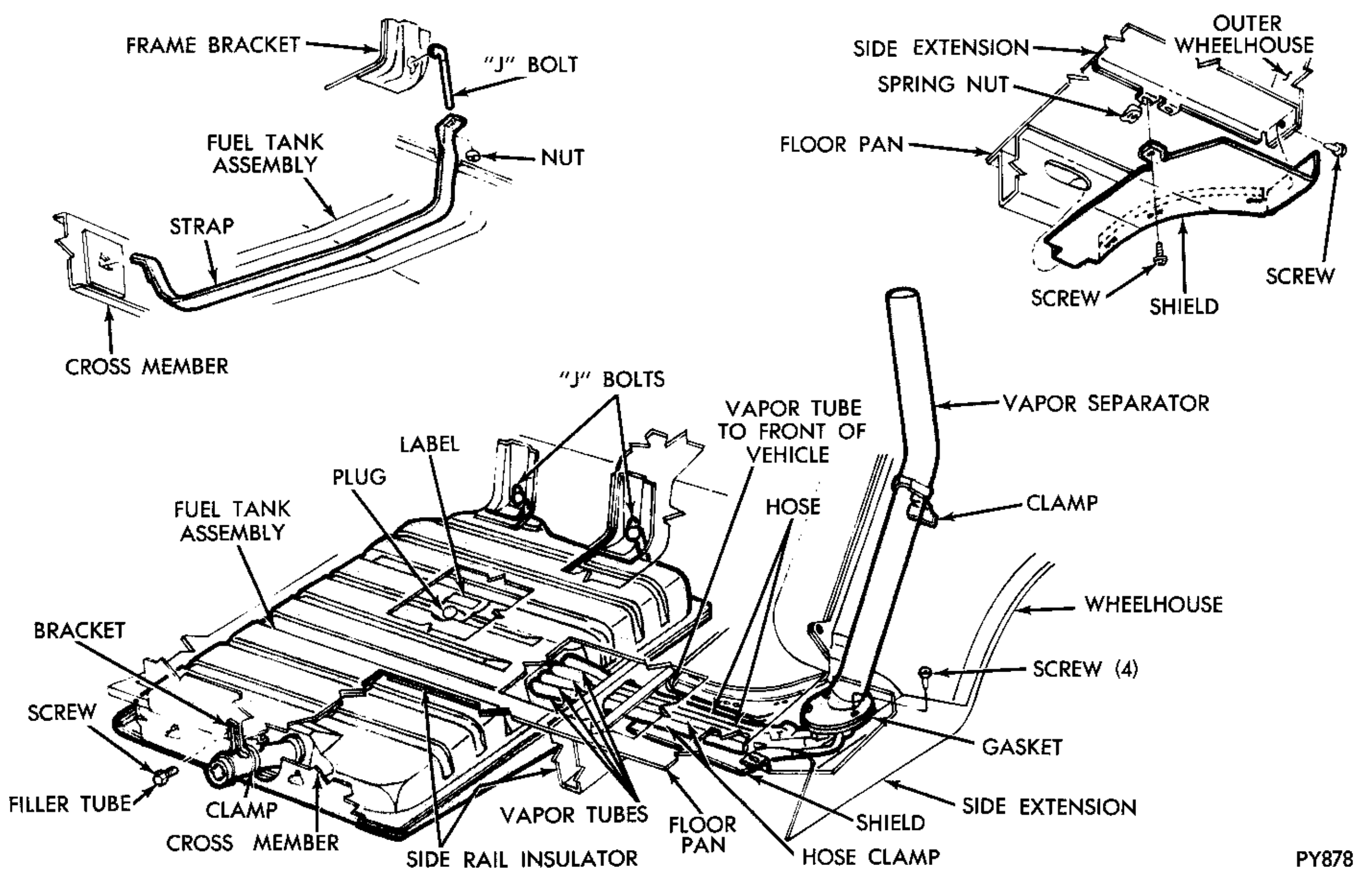


Fig. 1—Fuel Tank Assembly (E.C.S.) Evaporation Control System—Sedans

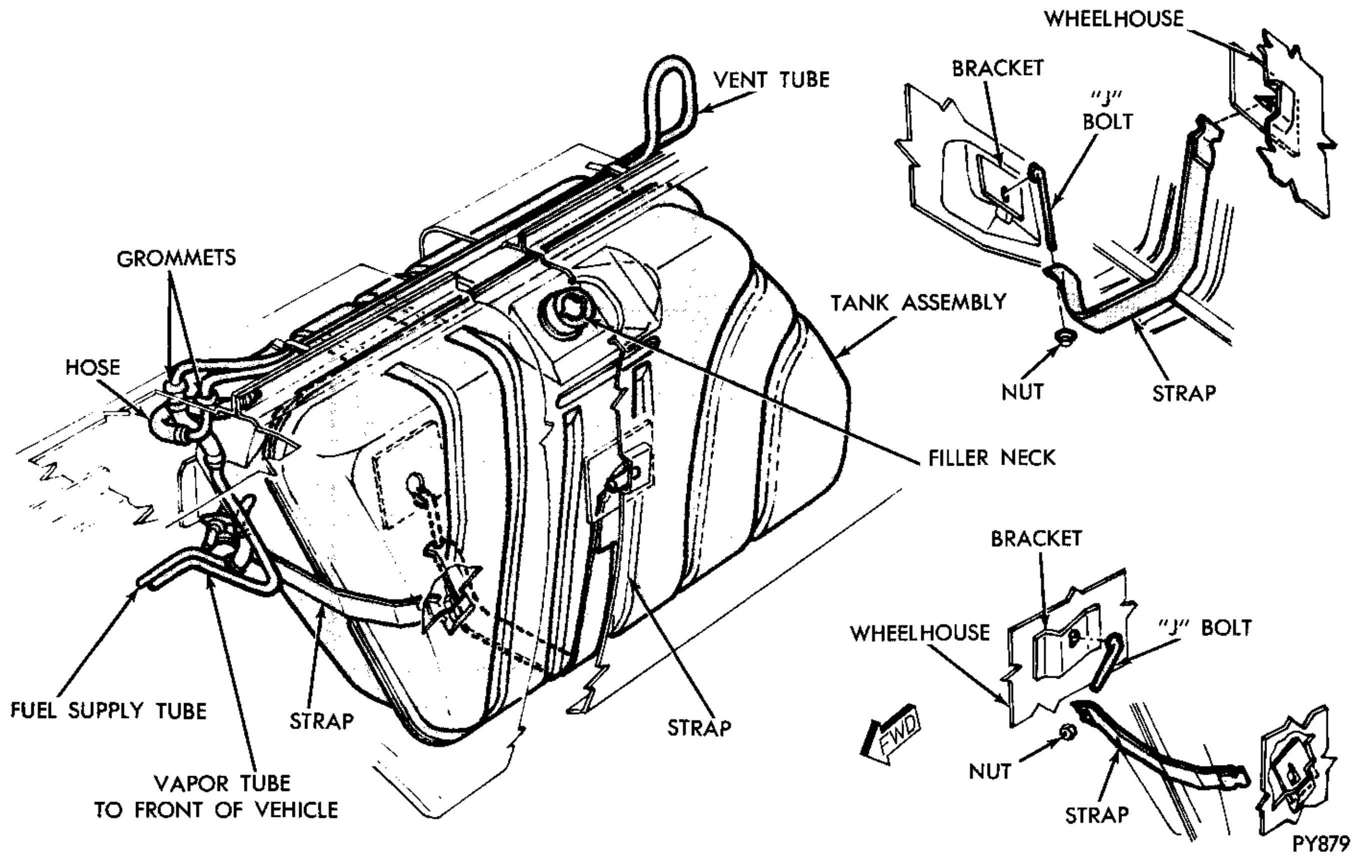


Fig. 2—Fuel Tank Asembly (E.C.S.) Evaporation Control System—Station Wagons

this is not done, a collapsed fuel tank will result.

The fuel tank on all models except Station Wagon has a 23 gallon (20 Imperial) capacity. The Station Wagon capacity is 22 (18-1/4 Imperial) gallons. The filler tube on the conventional models is accessible through the center of the deck opening lower panel, while the Station Wagon fills at the left rear upper quarter panel between the quarter post and the fin. The fuel tank is fitted with a gauge unit, including the suction pipe, (Fig. 3). The filter on the end of the suction pipe is replaceable unit and prevents the entry of water and dirt. When installing a tank unit, be sure the filter is pushed on the end of the tube until seated.

REMOVING THE FUEL TANK (Except Station Wagon)

CAUTION: Be sure the ignition switch is turned off before disconnecting or connecting the gauge wire.

Removal

(1) Drain tank into a safety can, then disconnect fuel line and wire lead to gauge unit.

(2) Remove keystone clamps from vent hoses at vapor separator, then slide vent tubes out of frame side rail. (Fig. 1).

(3) Remove screw that attaches filler tube bracket to rear crossmember.

(4) Remove nuts that hold ends of fuel tank hold down straps to frame. Lower front end of tank far enough to disengage filler tube from rear panel and slide out from under vehicle.

(5) Remove tank gauge unit, using spanner wrench Tool C-3582 (Fig. 3). Check rubber grommet around filler tube. If cracked or deteriorated, install a new grommet at reassembly.

Installation

Before installing the tank gauge unit, check the condition of the filter on the end of suction tube. If the filter is plugged, install a new filter.

(1) Position fuel tank gauge unit in tank, using a new gasket. Tighten securely, using Tool C-3582. (If tank insulator was torn or damaged during removal of tank, be sure and install a new insulator at reassembly.) Install vent hoses on tank, (if removed.)

(2) Slide fuel tank under vehicle. Raise tank far enough to engage filler spout with opening in rear panel, and locator embossments on floor pan.

(3) Push tank toward rear to fully engage filler spout in opening.

(4) Hold fuel tank in this position, and place hold down straps in position, feeding attaching studs through holes in end of straps. Install nuts but do not tighten.

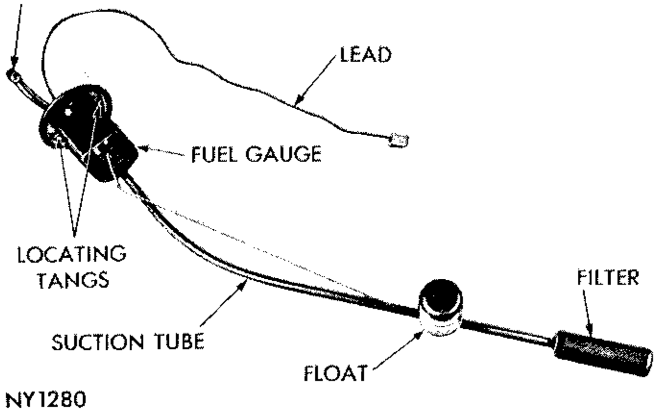


Fig. 3—Fuel Gauge (Tank Unit)

(5) Install new keystone clamps over vent hoses, then slide vent tubes through frame side rail and install on vapor separator fittings. Using keystone clamp pliers, tighten hose clamps securely. (Fig. 1).

(6) Guide button head of studs in slots in frame and down into position. Tighten hold down strap attaching nuts securely. (40 in-lbs.)

(7) Install filler tube mounting screw and tighten securely.

(8) Connect lead wire to tank gauge unit, reconnect fuel line and ground strap (Fig. 4).

(9) Refill tank and check for leaks.

FUEL TANK (Station Wagon) (Fig. 2)

Removal

CAUTION: Be sure the Ignition Switch is turned OFF before disconnecting or connecting the gauge wire.

(1) Remove filler cap and syphon fuel into safety can.

(2) Raise vehicle on hoist and remove fender skirt (if so equipped).

(3) Remove left rear tire and wheel.

(4) Remove screws that attach stone shield to wheel house. Slide shield down and away from vehicle.

(5) Disconnect fuel line, ground strap and gauge wire. Disconnect vent tubes.

(6) Place stands under frame at rear to support vehicle as hoist is lowered.

(7) Remove rear shock absorbers lower attaching nuts, then slide off lower pivot.

(8) Remove left rear brake drum.

(9) Remove left rear spring hanger attaching bolts to frame.

(10) Lower hoist and allow rear axle to fall away from vehicle far enough so as not to stretch brake hose.

(11) Remove fuel tank support strap nuts from eyebolts.

(12) Slide fuel tank forward and tilt leading edge down. Work fuel tank out from under rear quarter panel.

(13) Loosen tank gauge unit, using spanner wrench Tool C-3582. Slide unit up and out of tank.

Installation

(1) Position fuel tank gauge unit in tank, using a new gasket. Tighten securely, using Tool C-3582.

(2) Work fuel tank up into position in quarter panel. Move rearward until filler tube is centered in opening in quarter panel. Place straps in position and install nuts. Tighten to 40 inch-pounds. Bottom strap should be tightened first.

(3) Install fuel line and connect ground strap (Fig. 4), and fuel gauge wire. Install new clamps on vent tubes, then install tubes on tank fittings. Tighten clamps securely.

(4) Raise hoist far enough to engage spring hanger with frame.

(5) Position left rear spring hanger at frame and install attaching bolts. Tighten to 30 foot pounds.

(6) Slide shock absorbers over pivots and secure with nuts. Tighten to 50 foot pounds.

(7) Install brake drum on axle flange.

(8) Slide stone shield up into position. Install attaching screws and tighten securely.

(9) Install wheel and tire and tighten wheel nut to 65 foot pounds in sequence.

(10) Raise hoist and remove car stands.

(11) Install fender skirt (if so equipped) and lower vehicle to floor.

(12) Refill fuel tank and check for leaks.

(13) For testing fuel gauge (tank unit) refer to Electrical Group 8 "Gauges".

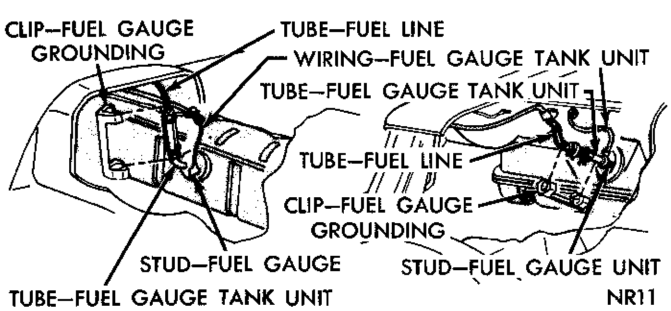


Fig. 4—Fuel Tank Ground Strap

THROTTLE LINKAGE ADJUSTMENT

Automatic Transmission

For adjustment of throttle linkage, refer to Transmission Section of this Manual.

Manual Transmission (Fig. 1) (Chrysler with 383 or 440 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on ball end and pocket (14) at rear end of throttle cable.

(2) Disconnect choke (8) at carburetor or block choke valve in full open position. Open throttle

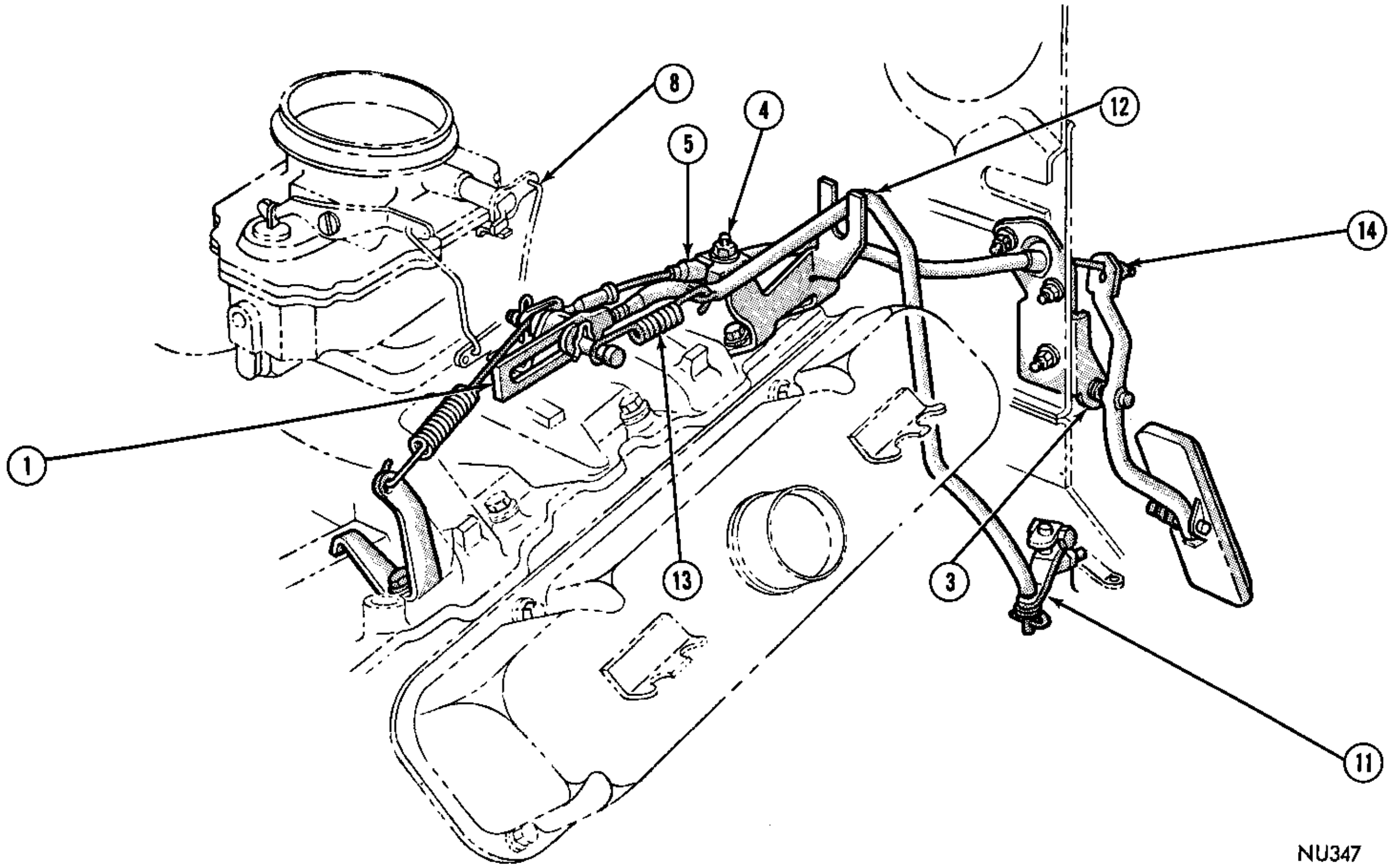


Fig. 1—Throttle Linkage Adjustment (383 and 440 Engines)

slightly to release fast idle cam, then return carburetor to curb idle.

(3) Loosen cable clamp nut (4), adjust position of cable housing ferrule (5) in the clamp so that all slack is removed from cable with carburetor at curb idle. To remove slack from cable, move ferrule (5) in the clamp in direction away from carburetor lever.

(4) Back off ferrule (5) 1/4". This provides 1/4" cable slack at idle. Tighten cable clamp nut (4) to 45 inch-pounds.

(5) Connect choke (8) rod or remove blocking fixture.

SPECIFICATIONS

HOLLEY MODEL 4160 4-BARREL DOWNDRAFT CARBURETOR

	C.A.S.	E.C.S.
Model	R-4366A	R-4360A
Engine Displacement (cu. in.)	440	440
Transmission Type	Automatic	Automatic
Throttle Bore		
Primary	1-9/16"	1-9/16"
Secondary	1-9/16"	1-9/16"
Main Venturi		
Primary	1-1/4"	1-1/4"
Secondary	1-5/16"	1-5/16"
Main Metering Jet		
Standard	64	64
1 Size Lean	63	63
2 Size Lean (5,000-10,000 ft.)	62	62
Adjustments		
Curb Idle Speed	650	650

Fast Idle Speed (No. 2 Step)	1600	1600
Bowl Vent Valve	5/64"	#72 Drill
Unloader Adjustment (wide open throttle)	#25 Drill	#25 Drill
Vacuum Kick Adjustment	#46 Drill	#46 Drill
Fast Idle Cam Position	#53 Drill	#53 Drill
Float Setting (Dry)		
Primary	15/64"	15/64"
Secondary	17/64"	17/64"
Float Setting (Wet)		
Primary	9/16"	9/16"
Secondary	13/16"	13/16"
Accelerator Pump		
Override Adjustment (wide open throttle)	.015 Min.	.015 Min.
Power Valve (stamped)	65	65
Choke		
Type	Well	Well
Control	Coil Spring	Coil Spring
Setting	2-Notches Rich	2-Notches Rich

SPECIAL TOOLS

T109-287	Elevating Legs
C-3886	Stand
C-3747	Power Valve Remover-Installer
C-3748	Main Metering Jet Remover-Installer
C-4051	Wet Fuel Gauge
CL-13	Clutch Head Screwdriver

BALL AND BALL 1½ INCH BBD CARBURETOR

	C.A.S.	C.A.S.	C.A.S.	E.C.S.	E.C.S.
Type	Ball and Ball Dual Downdraft				
Engine Displacement (cu. in.)	383	383	383	383	383
Manual Trans.	BBD-4725S	—	—	BBD-4727S	—
Automatic Trans.	—	**BBD-4726S	***BBD-4894S	—	BBD-4728S
Bore	1-9/16"	1-9/16"	1-9/16"	1-9/16"	1-9/16"
Venturi	1-5/16"	1-5/16"	1-5/16"	1-5/16"	1-5/16"
Main Metering Jet					
Standard	120-329S	120-306S	120-306S	120-329S	120-306S
One Step Lean	120-313S	120-304S	120-304S	120-313S	120-304S
Two Steps Lean	120-303S	120-329S	120-329S	120-303S	120-329S
Step-Up Wire (Standard)	75-1652	75-1730	75-1730	75-1652	75-1730
Diameter (2 Stage)	.035 x .027"	.042" x .039"	.042" x .039"	.035" x .027"	.042" x .039"
ADJUSTMENTS					
Accelerator Pump Setting	1.00"	1.00"	1.00"	1.00"	1.00"
Float Setting (at Center of Floats)	5/16"	5/16"	5/16"	5/16"	5/16"
Vacuum Kick Adjustment	#20	#28	#28	#20	#28
Fast Idle Cam Position Adjustment	#28	#28	#28	#28	#28
Bowl Vent Valve (at curb idle)	1/16"	1/16"	1/16"	1/16"	1/16"
Choke Unloader	1/4"	1/4"	1/4"	1/4"	1/4"
Idle Speed RPM (Curb Idle)	750	650	650	750	650
Fast Idle Speed RPM	1700*	1700	1700*	1700*	1700*
CHOKE					
Type	Well			Well	
Control	Thermostatic Coil Spring			Thermostatic Coil Spring	
Setting	2 Notches Rich			2 Notches Rich	

* After Approx. 500 Miles (If Necessary)
**Without Air Conditioning
***With Air Conditioning

HOLLEY 2210 SERIES 2-BARRELL DOWNDRAFT CARBURETOR

	C.A.S.
Type	Dual Downdraft
Engine Displacement (cu. in.)	383
Manual Transmission	—
Automatic Transmission	R-4371A
Bore	1-9/16"
Venturi	1-13/32"
Main Metering Jet	
Standard	#63 #65
One Step Lean	#62 #64
Two Steps Lean	#61 #63
ADJUSTMENTS	
Accelerator Pump Setting	9/16" (1/4" Travel)
Float Setting	#7 drill (.200)
Vacuum Kick Adjustment	#28 drill
Fast Idle Cam Position Adjustment	#35 drill
Bowl Vent Valve (at Curb idle)	5/64"
Choke Unloader	11/64"
Idle Mixture Screws (Turns Open)	1-1/2
Idle Speed RPM (Curb Idle)	650
Fast Idle Speed RPM	1700*
CHOKE	
Type	Well
Control	Thermostatic Coil Spring
Setting	2 Notches Rich

* After Approx. 500 Miles (If Necessary)

CARTER AVS SERIES CARBURETORS

	C.A.S.	C.A.S.	E.C.S.	C.A.S.
Type	Carter 4 Barrel Downdraft			
Model	**AVS-4736S	***AVS-4732S	AVS-4734S	AVS-4737S
Transmission Type	Automatic	Automatic	Automatic	Manual
Engine Displacement (Cu. In.)	383	383	383	440
THROTTLE BORE				
Primary	1-7/16"	1-7/16"	1-7/16"	1-11/16"
Secondary	1-11/16"	1-11/16"	1-11/16"	1-11/16"
MAIN VENTURI				
Primary	1-3/16"	1-3/16"	1-3/16"	1-3/16"
MAIN JET				
Primary	.089"	.089"	.089"	.089"
Secondary	.098"	.098"	.098"	.095"
LOW SPEED JET				
Primary	#68-.031"	#68-.031"	#68-.031"	#65.035"
STEP-UP ROD (2-Stage)				
Standard	16-546	16-546	16-546	16-617
ADJUSTMENTS				
Accelerator Pump (top of plunger to air horn)	7/16"	7/16"	7/16"	7/16"
Fast Idle Cam Position (drill size)	#50	#50	#50	#50
Choke Unloader	1/4"	1/4"	1/4"	1/4"
Vacuum Kick (drill size)	#44	#44	#44	#20
Bowl Vent Valve Setting	3/64"	3/64"	3/4"	3/64"
Fast Idle Speed (r.p.m.)	1700*	1700*	1700*	2000*
Idle Speed (r.p.m.)	700	700	700	900
Secondary Throttle Lever Adj.	19/64"	19/64"	19/64"	23/64"
Secondary Throttle Lockout Adj.	.020"	.020"	.020"	.020"
Float Setting	5/16"	5/16"	5/16"	7/32"
Float Drop	1/2"	1/2"	1/2"	1/2"
Air Valve Spring Tension—(from Vertical-Turns)	2	2	2	2

CHOKE		
Type	Well	Well
Control	Coil Spring	Coil Spring
Setting	2 Notches Rich	2 Notches Rich

* After Approx. 500 Miles (If Necessary) **Without Air Conditioning ***With Air Conditioning

CARTER AVS SERIES CARBURETOR

	C.A.S.	C.A.S.	E.C.S.	E.C.S.
Type	Carter 4 Barrel Downdraft			
Model	**AVS-4738S	***AVS-4741S	AVS-4739S	AVS-4740S
Transmission Type	Automatic	Automatic	Manual	Automatic
Engine Displacement (Cu. In.)	440	440	440	440
THROTTLE BORE				
Primary	1-11/16"	1-11/16"	1-11/16"	1-11/16"
Secondary	1-11/16"	1-11/16"	1-11/16"	1-11/16"
MAIN VENTURI				
Primary	1-7/16"	1-7/16"	1-7/16"	1-7/16"
MAIN JET				
Primary	.101"	.101"	.101"	.101"
Secondary	.095"	.095"	.095"	.095"
LOW SPEED JET				
Primary	#69-.029"	#69-.029"	#65-.035"	#69-.029"
STEP-UP ROD (2-Stage)				
Standard	16-575	16-575	16-617	16-575
ADJUSTMENTS				
Accelerator Pump (top of plunger to air horn)	7/16"	7/16"	7/16"	7/16"
Fast Idle Cam Position (drill size)	#50	#50	#50	#50
Choke Unloader	1/4"	1/4"	1/4"	1/4"
Vacuum Kick (drill size)	#20	#20	#20	#20
Bowl Vent Valve Setting	3/64"	3/64"	3/4"	3/4"
Fast Idle Speed (r.p.m.)	1800*	1800*	2000*	1800*
Idle Speed (r.p.m.)	800	800	900	800
Secondary Throttle Lever Adj.	23/64"	23/64"	23/64"	23/64"
Secondary Throttle Lockout Adj.	.020"	.020"	.020"	.020"
Float Setting	7/32"	7/32"	7/32"	7/32"
Float Drop	1/2"	1/2"	1/2"	1/2"
Air Valve Spring Tension—(from Vertical-Turns)	2	2	2	2
CHOKE				
Type	Well		Well	
Control	Coil Spring		Coil Spring	
Setting	2 Notches Rich		2 Notches Rich	

* After Approx. 500 Miles (If Necessary) **Without Air Conditioning ***With Air Conditioning

FUEL PUMP

	383 and 440 cu. in. Engine	
Make	Carter	Airtex
Model	MS-4589SA	RD-267A
Type	Diaphragm	Diaphragm
Number of Valves	2	2
Driven by	Camshaft	Camshaft
Pump Pressure	3-1/2 to 5 psi	3-1/2 to 5 psi

PROPELLER SHAFT AND UNIVERSAL JOINTS

CONTENTS

GENERAL INFORMATION

The propeller shaft and universal joint applications on the Chrysler model vehicles incorporate an internally splined yoke at the front universal joint. The sliding splined yoke slides fore and aft on the transmission output shaft to compensate for the movement of the rear axle. A bellows type rubber seal on the transmission extension, with a nylon ring which fits over the sliding yoke is used to exclude road splash and other foreign material (Fig. 1).

The universal joints and sliding spline yoke are permanently lubricated. The universal joints should be inspected every time the vehicle is serviced, for external seal leakage. The joints need not be disassembled or relubricated unless seal leakage is evident. If the cross and roll universal joints are repacked with the recommended lubricant, see "Lubrication", Group 0 of this manual (Figs. 2, 3).

All Chrysler models except the Imperial use a propeller shaft which incorporates an internal vibration absorber inside the shaft in the location of the front universal joint. The servicing of the propeller shaft and universal joints are the same in all respects.

A single one piece propeller shaft will be used on the Imperial models, with a constant velocity universal joint at each end.

Both constant velocity universal joints incorporate a centering ball and socket arrangement, in which the centering balls are located between the yokes of each joint to maintain the relative position of the two joints. The centering balls cause each of the two joints to operate through exactly one half of the complete angle between the two joints (Fig. 4).

The constant velocity universal joints and centering ball and sockets are permanently lubricated and should not be disturbed unless external leakage is evident. See "Constant Velocity Universal Joint" for servicing instructions.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
PROPELLER SHAFT VIBRATION	(a) Undercoating or other foreign matter on shaft.	(a) Clean exterior of shaft and wash with solvent.
	(b) Loose universal joint flange bolts.	(b) Tighten bolt nuts to specific torque.
	(c) Loose or bent universal joint flange or high runout.	(c) Install new flange. Tighten to specifications.
	(d) Improper drive line angularity.	(d) Correct angularity. See "Propeller Shaft Angularity."
	(e) Rear spring center bolt not in seat.	(e) Loosen spring U-bolts, reseat center bolt and tighten U-bolts to specified torque.
	(f) Worn universal joint bearings or missing rollers.	(f) Recondition universal joint.
	(g) Propeller shaft damaged (bent tube) or out of balance.	(g) Install new propeller shaft.
	(h) Broken rear spring.	(h) Replace rear spring.
	(i) Excessive runout or unbalance condition.	(i) Reindex propeller shaft 180°, reride and correct as necessary.
UNIVERSAL JOINT NOISE	(a) Propeller shaft flange bolts nuts loose.	(a) Tighten nuts to specified torque.
	(b) Lack of lubrication.	(b) Recondition universal joint.

SERVICE PROCEDURES

PROPELLER SHAFT ANGULARITY

The increased emphasis on the need for a quiet, smooth operating drive line in all cars require that the universal joint angles be maintained within acceptable tolerances. Propeller shaft and rear axle

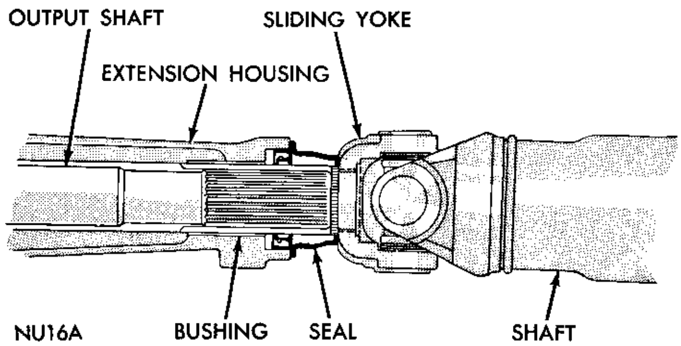


Fig. 1—Front Universal Joint Sliding Yoke

housing angularity may be measured by using the Propeller Shaft Angularity Tool C-3976A (Fig. 5). This tool makes it possible to check the angularity at the engine and differential and carrier.

All joint angle measurements on the vehicle should be made with the car supported by the tires if possible; such as, on an alignment pit or a platform hoist. A two post hoist may be used where other means are not available. The vehicle should be approximately level when taking angle measurements with any heavy items removed from the luggage compartment or passenger compartment. The fuel tank should be full or the equivalent weight simulated.

When using a twin post hoist, the vehicle must be supported by the lower control arms and rear axle housing. **DO NOT USE A FRAME CONTACT HOIST WHEN MEASURING PROPELLER SHAFT ANGULARITY.**

FRONT UNIVERSAL JOINT ANGLE

(1) Attach engine adapter SP-5046 to gauge SP-5060.

(2) Position gauge on left side of engine so that adapter pins contact flat surface of engine oil pan flange adjacent to vertical wall of the oil pan (Fig. 6). The gauge must be held vertical as shown with arrow on gauge SP-5060 pointing toward the front of car.

(3) Adjust position of bubble in spirit level in accordance with the listing for appropriate car model as shown in Chart (Fig. 12).

(4) Remove engine adapter SP-5046 and gauge SP-5060 from flange adjacent to the vertical wall of oil pan and separate the gauge from engine adapter.

(5) With gauge SP-5060 adjusted for the correct engine angle reference, position gauge SP-5060 squarely and firmly along underside of the propeller shaft (Fig. 7). Make sure Veeway is in alignment and that both adapter pins are contacting propeller shaft. Be sure arrow on gauge is pointing toward the front of car.

(6) Observe position of bubble in spirit level and compare the position with that shown on Chart (Fig. 12) for front joint angle. A normal joint angle will cause bubble to position itself within the acceptable range. If bubble is found to be slightly forward of the acceptable tolerance range, this means that the angle is actually smaller than that specified and does not need correcting. If bubble in spirit level is found to be rearward of the acceptable range, the angle is too large, and must be corrected. To reduce front universal joint angle, install a flat shim between the transmission extension housing and rear engine mount (Fig. 8). Flat shims 1/8 inch in thickness are required to move the bubble in spirit level one graduation.

(7) To install shim, loosen bolts in rear mount to

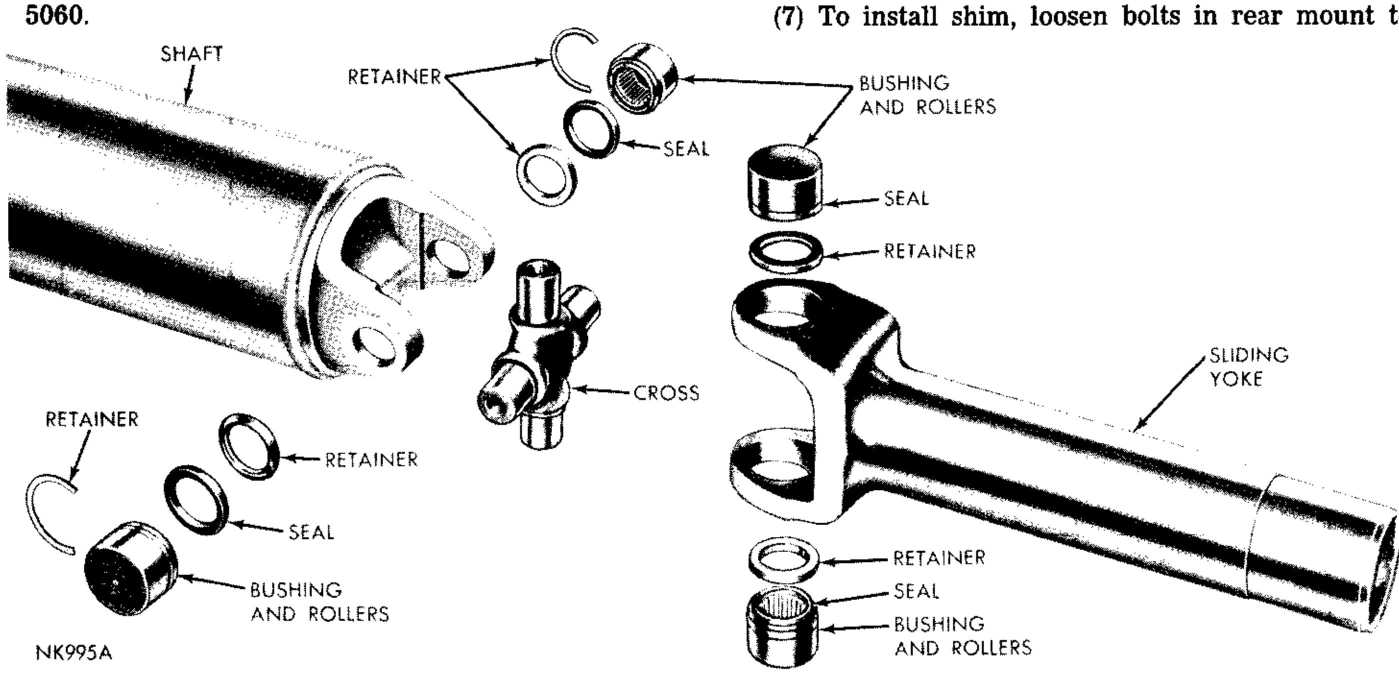


Fig. 2—Cross and Roller Universal Joint—Front

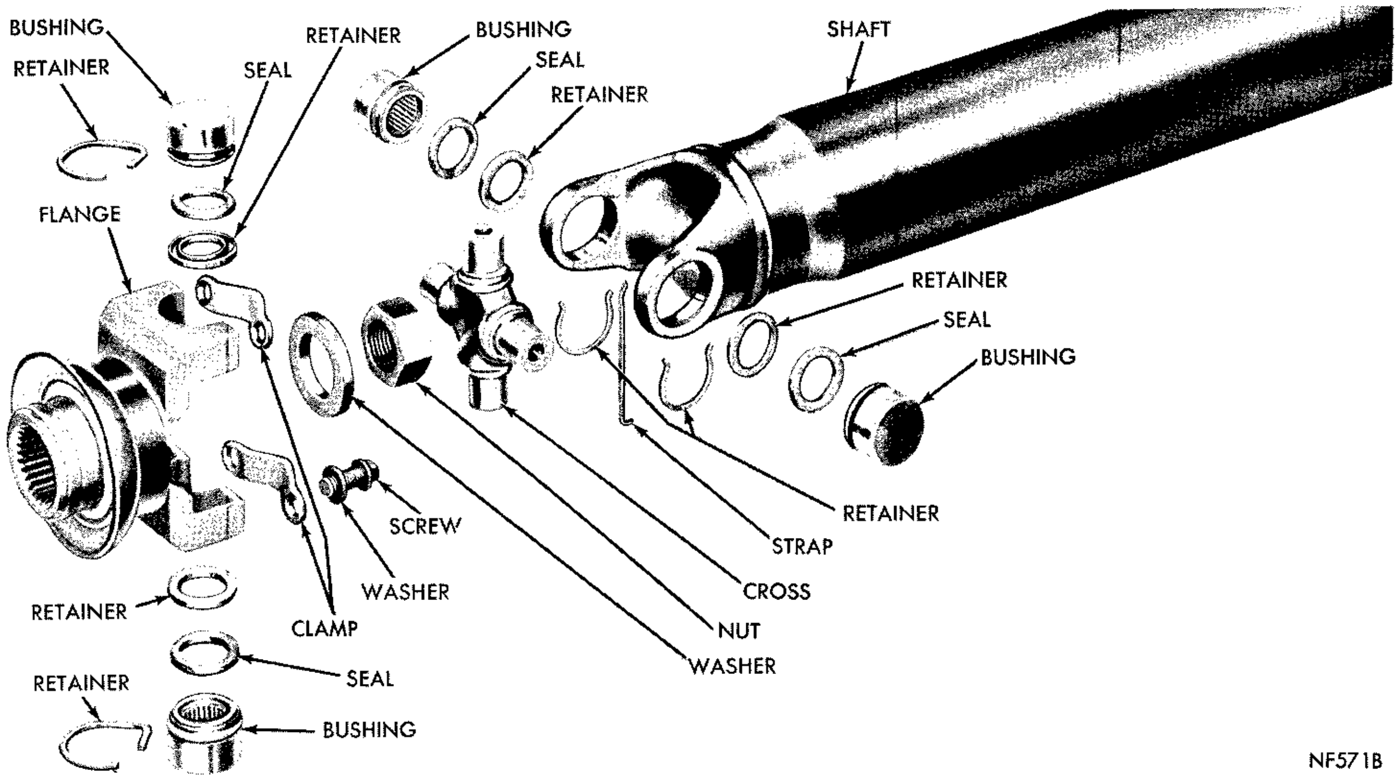


Fig. 3—Cross and Roller Universal Joint—Rear

transmission extension housing.

(8) Raise transmission sufficiently using a floor stand and block of wood beneath transmission oil pan.

(9) Install 1/8" shim, lower transmission, remove floor stand and tighten bolts in rear mount to transmission extension housing to specifications.

(10) Recheck front joint angle, starting with step (1) of "Procedure."

CAUTION: If a great amount of shimming is required at the transmission extension rear mount, make sure extension housing and propeller shaft will not make contact with floor pan or make interference with seat belt mounting bolts.

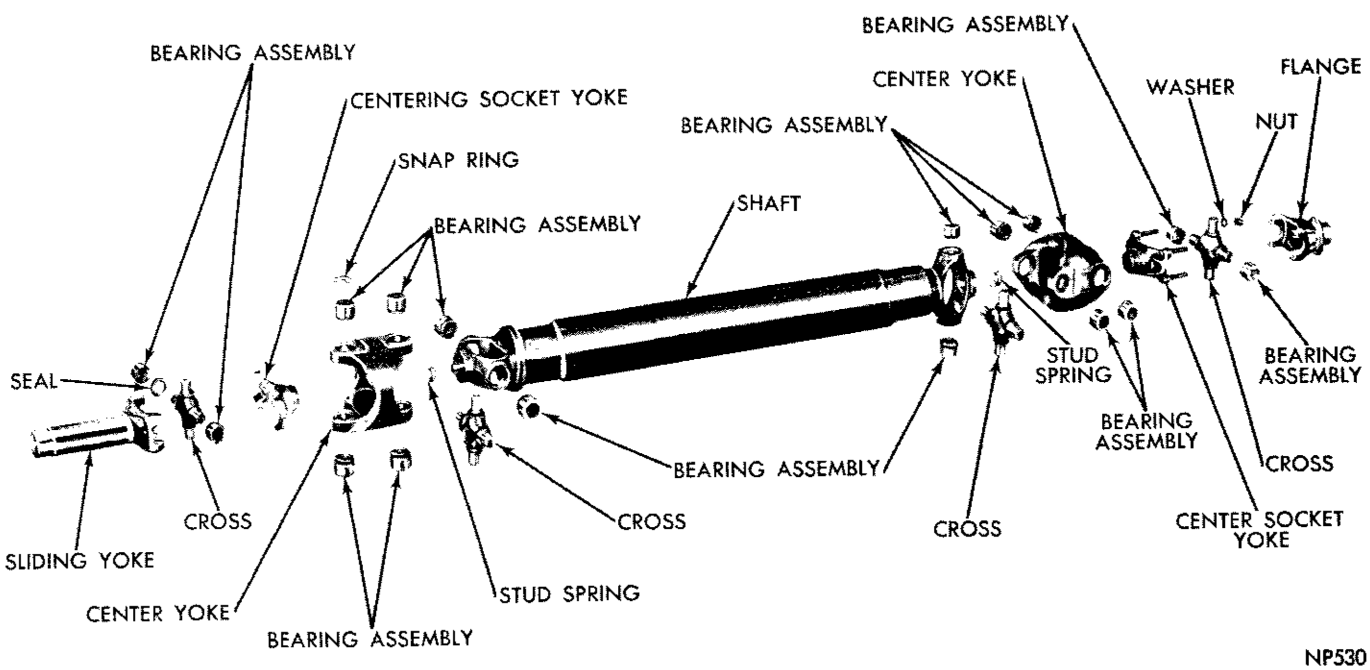


Fig. 4—Propeller Shaft and Constant Velocity Universal Joints (Imperial)

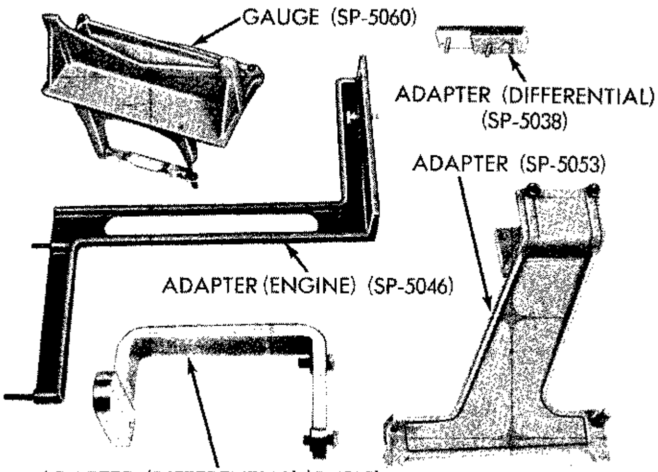


Fig. 5—Propeller Shaft Angularity Tool C3976A

REAR UNIVERSAL JOINT ANGLE

(1) Remove pinion bumper plate from differential and carrier housing and position gauge SP-5060 on the machined pads with locating pin in rear bolt hole (Fig. 9).

(2) Adjust position of bubble in spirit level in accordance with the listing for appropriate car model as shown in Chart (Fig. 13).

(3) Remove gauge SP-5060 from differential and carrier assembly and position it squarely and firmly along underside of propeller shaft (Fig. 10). Make sure Veeway is in alignment and that both adapter pins are contacting shaft. Be sure arrow on gauge is pointing toward the front of car.

(4) Observe position of bubble in spirit level and compare the position with that shown on Chart (Fig. 13) for rear joint angle. A normal joint angle will cause the bubble to position itself within the acceptable range.

(5) If bubble in spirit level is found outside the acceptable range indicated on Chart (Fig. 12), you will have to install a wedge type shim between both rear springs and the axle housing pads to bring position of bubble within the acceptable range.

To make sure shims are installed properly, remember this rule. If bubble is too far forward, insert shim with thick end toward front of car. If bubble is too far to rear, the nose of differential is too high, so thick end of shim goes toward rear of car (Fig. 11). A 1°

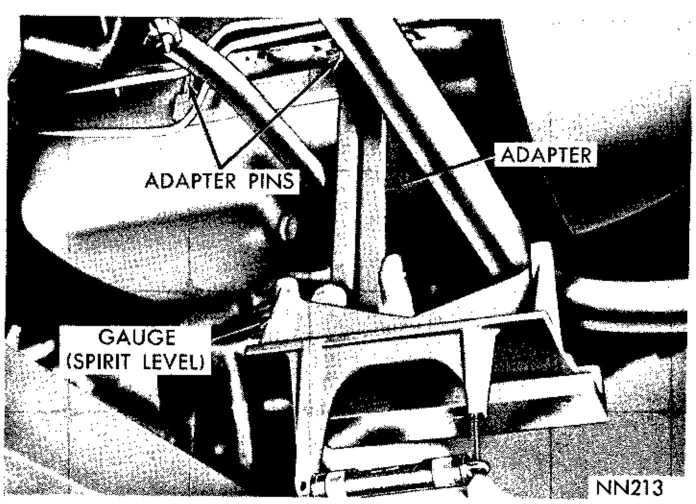


Fig. 6—Adjusting Gauge on Engine (Front Joint Angle Reference)

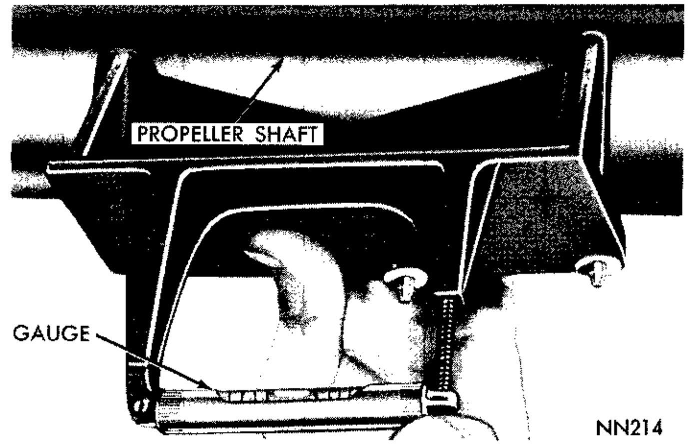


Fig. 7—Measuring Front Universal Joint Angle

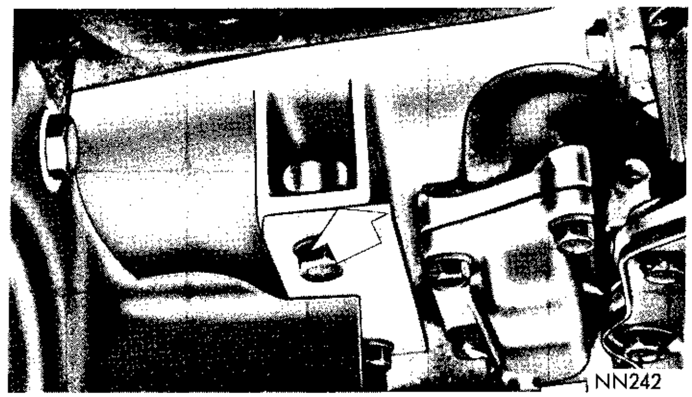


Fig. 8—Shim Location (Front Universal Joint Angle Correction)

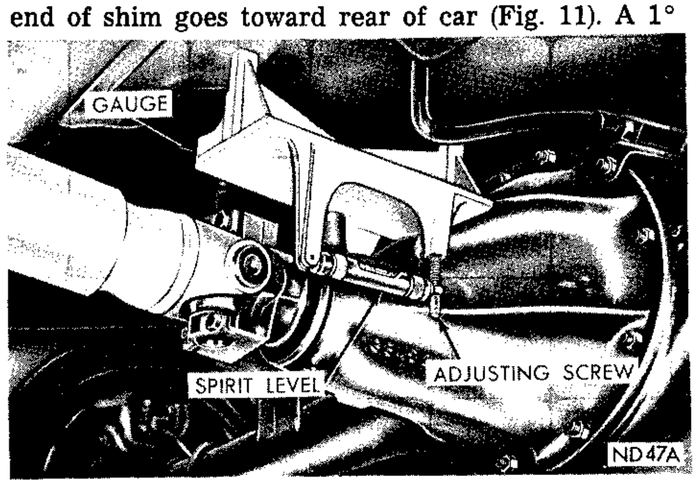


Fig. 9—Adjusting Gauge on Differential (Rear Joint Angle Reference)

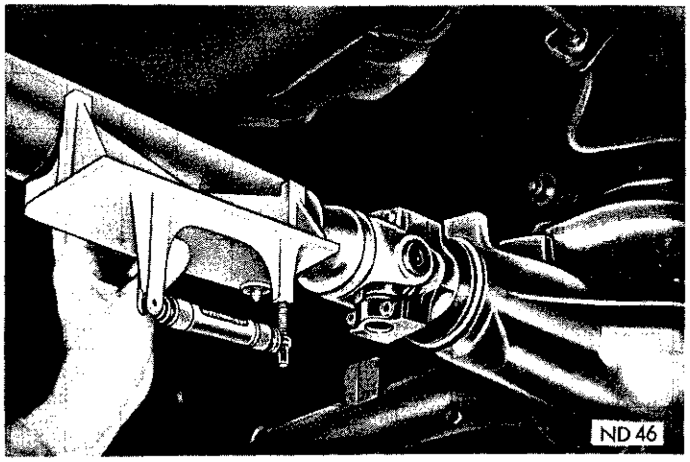


Fig. 10—Measuring Rear Universal Joint Angle

shim will move bubble in spirit level about 3 graduations forward or rearward, depending on which way the thick end is installed.

Presently, there are a number of makes of wedge type shims available commercially. Always make sure shims you use are made of steel and are the same width as the springs on the car. Chrysler Parts Division has made available steel shims in varying angles of 1/2°, 1°, 2°, and 3° making it possible with these combinations to set the rear universal joint angle within 1/2° of a perfect angle.

(6) To install shims, loosen spring "U" bolt nuts and install shims between rear springs and axle housing spring pads.

(7) Tighten spring "U" bolt nuts to proper specifications.

(8) Recheck rear universal joint angle after installation of wedge type shim, to make sure position of bubble in spirit level is within the acceptable range.

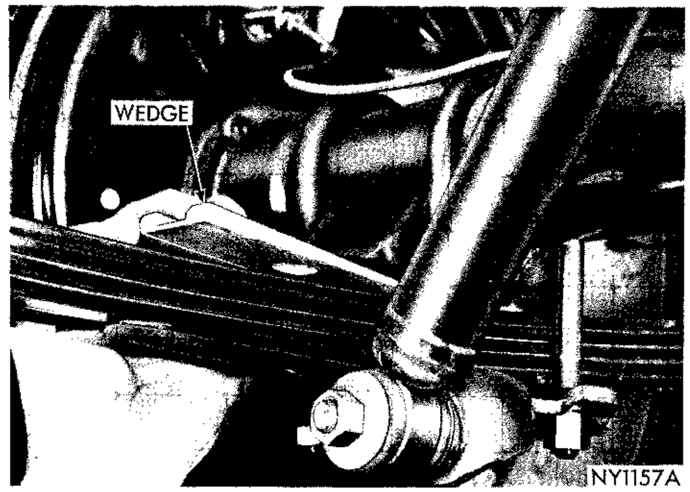


Fig. 11—Tapered Wedge Location (Rear Universal Joint Angle Correction)

(9) Reinstall rebound bumper and plate assembly on differential carrier, tighten screws to 200 inch-pounds.

CAUTION: Under no circumstances should a shim pack be used that is over 1/4 inch thick at the center. If that much shimming is required, look for a possible broken rear spring, mislocated spring seat, etc.

PROPELLER SHAFT

Removal—Rear Joint

(1) Remove both rear universal joint roller and bushing assembly clamps from rear axle drive pinion

ANGULARITY MEASUREMENT AND CORRECTION CHART

UNIVERSAL JOINT	FRONT JOINT ANGLE	REAR JOINT ANGLE
CAR TYPE AND WHEELBASE	ADJUST POSITION OF BUBBLE WITH GAUGE AT ENGINE OIL PAN FLANGE.	ADJUST POSITION OF BUBBLE WITH GAUGE ON DIFFERENTIAL CARRIER.
CHRYSLER 124" W.B. EXCEPT STATION WAGON	←FRONT OF CAR	←FRONT OF CAR
CHRYSLER 122" W.B. STATION WAGON		
FINAL READING ON PROPELLER SHAFT (ALL MODELS)	ACCEPTABLE REGION ANGLE LOW ANGLE HIGH ←FRONT OF CAR	ACCEPTABLE REGION ANGLE LOW ANGLE HIGH ←FRONT OF CAR
CORRECTION PROCEDURE	ADD SHIMS AT ENGINE REAR MOUNT (1/8" FOR EACH GAUGE DIVISION) TO REDUCE FRONT JOINT ANGLE. CORRECT LOW ANGLES ONLY IF FLOOR PAN INTERFERENCE IS ENCOUNTERED.	ADD SHIMS AT REAR AXLE HOUSING SPRING SEATS. 1° WEDGE SHIM MOVES BUBBLE 3 TO 4 GAUGE DIVISIONS. TO REDUCE ANGLE, INSTALL THICK END OF WEDGE TO FRONT OF CAR. PY269

Fig. 12—Universal Joint Angularity Reference Chart

flange (Fig. 3). **Do not disturb the retaining strap used to hold bushing assemblies on universal joint cross, if so equipped.**

CAUTION: Do not allow propeller shaft to drop or hang loose from either joint during removal. Wire up or otherwise support the loose end of shaft to prevent damage to joint.

Before removing propeller shaft with sliding yoke from Transmission, the vehicle front end should be lowered slightly to prevent the loss of Transmission Fluid.

Front Joint

(1) Slide propeller shaft with the front yoke from the transmission output shaft (Fig. 2). Be careful not to damage splines on output shaft or yoke. Examine sliding yoke seal for evidence of leakage. If no leakage is evident, do not disturb the seal. If necessary to replace the seal, see Transmission Group, 21.

CAUTION: It is important to protect the machined surface of the sliding yoke from damage after propeller shaft has been removed.

Installation—Front Joint

(1) Before installing propeller shaft, wipe sliding yoke clean and inspect machined surface for scratches, nicks, burrs and correct as necessary.

(2) Engage the yoke splines on end of output shaft, being careful not to burr the splines (Fig. 2).

Rear Joint

(1) Install rear universal joint cross and roller bushings in the seats of drive pinion flange. Install bushing clamps and attaching screws (Fig. 3). Tighten clamp screws to 170 inch-pounds on all models.

CROSS AND ROLLER UNIVERSAL JOINT

Disassembly

(1) **Before disassembling universal joint, mark yoke, cross and bushings to facilitate reassembly if inspection discloses parts are serviceable.**

(2) Remove four bushing retainers from universal joint cross assembly. Using a socket approximately the same diameter as bushing, press one bushing and roller assembly out of yoke by pressing opposite bushing in.

(3) Press out remaining bushing and roller assembly by pressing on end of cross.

(4) Remove cross assembly from yoke. Do not remove seal retainers from cross assembly. The cross and retainers are serviced as an assembly.

Cleaning and Inspection

(1) Clean all parts in a suitable solvent and dry with compressed air. Examine bearing surfaces of cross. They should be smooth and free from ripples and pits. If bearing surfaces or seal retainers are damaged, replace cross assembly.

(2) Examine rollers in bushings. Rollers that have operated on a worn cross should be replaced. Rollers should have a uniformly good appearance and roll freely inside bushings.

Assembly

(1) Lubricate bushing and roller assemblies with Multi-Purpose Grease NLGI Grade 2 EP or Multi Mileage Lubricant part number 2525035 or equivalent. Also, fill reservoirs in the ends of the cross.

(2) Place cross in propeller shaft yoke, observing identification marks made at disassembly. Install bushing and roller assemblies in yoke, matching identifying marks.

(3) Press both bushing assemblies into yoke while guiding cross into bushings. Correctly position bushings so retainers can be installed.

(4) Position remaining two bushing assemblies on cross. Install retainer strap to hold bushings on cross during installation of shaft on drive pinion flange. Lightly tap outer ends of bushings while rotating cross to be sure cross and bushings operate freely.

CONSTANT VELOCITY UNIVERSAL JOINT

IMPERIAL MODELS

PROPELLER SHAFT ANGULARITY

Due to the constant velocity universal joints being able to operate through greater angles, thus eliminating most driveline disturbances, resulting from excess angularity, it will not be necessary to check and adjust the propeller shaft angularity on Imperial models.

Removal

(1) Loosen and remove nuts and lockwashers attaching rear constant velocity universal joint to rear axle pinion flange (Fig. 13).

Before removing propeller shaft with sliding yoke from Transmission, the vehicle front end should be lowered slightly to prevent the loss of Transmission Fluid.

(2) Slide propeller shaft as far forward as possible until studs clear pinion flange and remove propeller shaft as an assembly toward rear of vehicle. **If interference between rear universal joint studs and pinion flange is encountered, it will therefore be necessary to disconnect the front universal joint from sliding yoke to remove propeller shaft. When rein-**

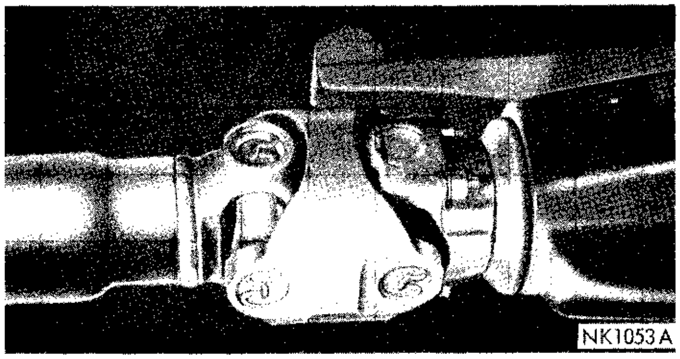


Fig. 13—Rear Constant Velocity Universal Joint

stalling, install in same manner as propeller shaft was removed.

CAUTION: Under no circumstances should propeller shaft be allowed to drop or hang by either universal joint during removal, as this can damage the centering ball arrangement. Tie up or otherwise support propeller shaft to prevent damage to universal joints.

Installation

(1) Before installing propeller shaft, wipe sliding yoke clean and inspect machined surface for scratches, nicks and burrs, correct as necessary.

(2) Engage sliding yoke on transmission output shaft splines being careful not to burr splines.

(3) Slide propeller shaft as far forward as possible and engage rear constant velocity universal joint studs into position through holes of rear axle pinion flange. Install lockwashers, nuts and tighten 300 inch-pounds. **Before disassembling joint, mark all parts for easy identification at reassembly.**

Disassembly

(1) Remove four screws and lockwashers which attach spline yoke to constant velocity joint and remove spline yoke (Fig. 4). Slide the two loose bearings from centering socket yoke.

(2) Remove snap rings securing the two bearings in front bores of center yoke.

CAUTION: If joints are heavily coated with rust or corrosion, apply penetrating oil in bearing bores before attempting to press out the bearings.

(3) Press bearing assemblies from yokes in following manner: Use a short length of round bar stock 3/4 inch in diameter, or a 3/4 inch socket as a remover. As a receiver on the opposite bearing, use a short length of pipe or a socket with an inside diameter of not less than 1-1/16 inch. Clamp the joint with remover and receiver in a vise (Fig. 14) and press one of the rear yoke bearings approximately 3/8 inch out of yoke.

(4) Securely clamp the exposed bearing in vise and drive yoke from bearing, using a brass drift (Fig. 15). Apply only light blows on drift.

(5) Using same procedure, press exposed end of cross to force bearing on opposite end approximately

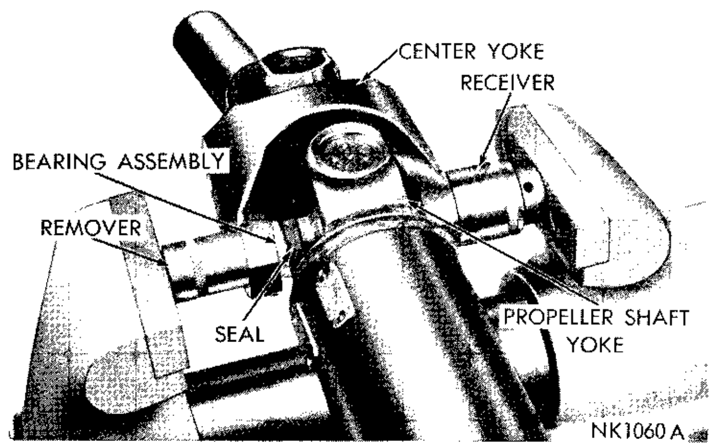


Fig. 14—Pressing Bearing from Center Yoke

3/8 inch out of yoke. Remove bearing from yoke, using brass drift as previously described.

(6) With propeller shaft firmly held in vise, press in on cross and centering socket yoke and remove cross and socket yoke assembly from center yoke.

(7) Remove remaining four bearings from rear bores of center yoke and propeller shaft yoke in manner described in steps 3, 4, and 5.

(8) Remove cross from propeller shaft yoke. Remove spring from centering stud (Fig. 4).

CAUTION: Be careful to avoid damaging cross seals and center stud yoke slinger.

Centering Socket Yoke Assembly

(1) Carefully pry centering ball seal assembly from socket yoke.

(2) Remove seal and bearing rollers from centering ball assembly.

(3) Fill cavity behind centering ball and inside the

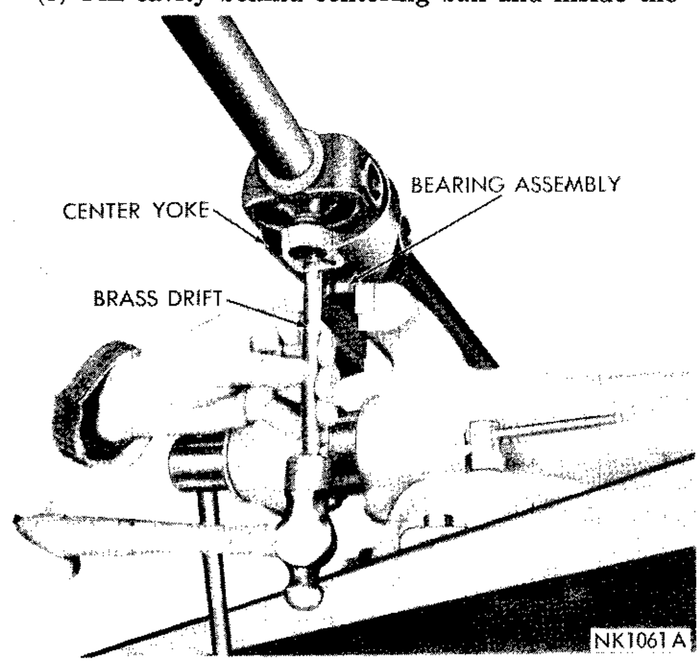


Fig. 15—Removing Bearing from Center Yoke

ball with Multi-Purpose Grease, NLGI grade 2 EP. Multi-Mileage Lubricant Part Number 2525035 is suitable for this application.

(4) Insert a rod, slightly smaller than inside diameter of centering ball, into ball and strike it sharply with a hammer (Fig. 16). The force applied by initial hammer blow will force the ball and retainer assembly from yoke.

Cleaning and Inspection

(1) Clean all parts in a suitable solvent and blow dry.

(2) Carefully examine all parts for excessive wear or damage. Discard parts that are not serviceable. Examine bearing races for grooves and ridges. Rollers that have been operating in damaged races should not be reused. Examine seals on cross assemblies for damage. Seals are not serviced separately. They are included in the cross assembly. Replace with parts contained in replacement packages. **All parts in the package should be used.** If propeller shaft is damaged, replace the shaft assembly to be assured of a balanced assembly.

Assembly

(1) Position the centering assembly in yoke with large diameter hole up and press it firmly to its seat.

(2) Apply a film of Multi-Purpose Grease, NLGI grade 2 EP. Multi Mileage Lubricant Part Number 2525035 is suitable for this application, on the inside surface of centering ball. Install rollers (34 required). Install centering stud seal in ball.

(3) Install centering ball seal assembly on yoke and press firmly in place.

(4) Coat the inside surfaces of bearing races with Multi-Purpose Grease, NLGI grade 2 EP. Multi-Mileage Lubricant Part Number 2525035 is suitable for this application, and install rollers (32 are required). Also, pack reservoirs in ends of cross with same lubricant.

(5) Place the cross in shaft yoke. Insert one bearing assembly in bearing bore of shaft yoke. Using bar stock or socket used as a remover when disassembling joint, press bearing into bore, at the same time guiding cross into bearing. Press bearing into yoke approximately 3/16 inch or far enough to in-

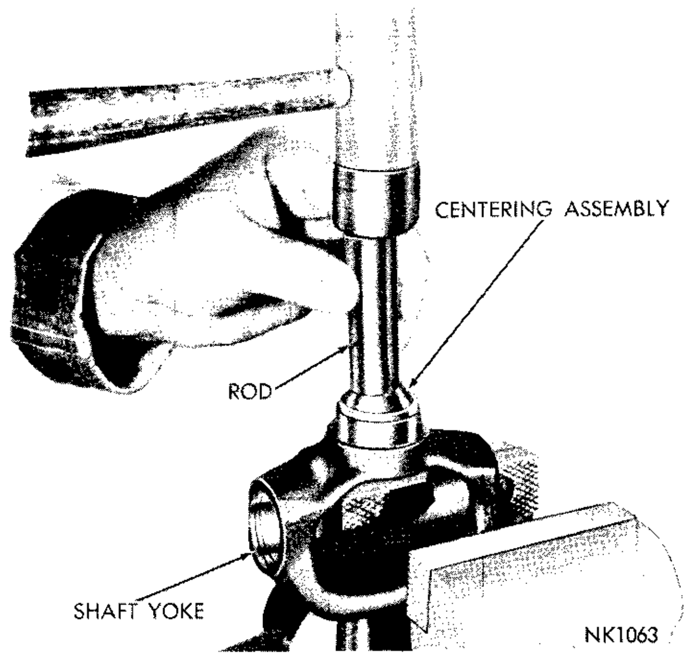


Fig. 16—Removing Centering Ball and Socket Assembly

stall snap ring. Install snap ring. Reverse the position of yoke and install bearing and snap ring in opposite bore in same manner.

(6) Install the two bearings in rear bores of center yoke and on cross, as previously described. Install two snap rings.

(7) Install centering stud spring on centering stud, large end first. Apply a film of Multi-Purpose Grease NLGI grade 2 EP. Multi-Mileage Lubricant Part Number 2525035 is suitable for this application, on stud.

(8) Install two slip spline yoke bearing assemblies on cross and assemble in bearing bores of centering yoke.

(9) Install centering yoke and cross as an assembly in center yoke, guiding centering ball on stud.

(10) Apply slight pressure on cross to align cross in front bores of center yoke. Insert one bearing in yoke and guide the end of cross into bearing.

(11) Press bearing into bore and install snap ring.

(12) Install remaining bearing in center yoke. Install snap ring.

(13) Install slip spline yoke on the constant velocity joints with screws and lockwashers and tighten to 300 inch-pounds.

SPECIFICATIONS

CHRYSLER

Model Application

PROPELLER SHAFT
Type ....

AXLE RATIO	*Length-Inches	Diameter-Inches 2.76	2.94	3.23
MANUAL TRANSMISSION 3-SPEED (A-230)				
383 C. I. Engine 2BBL—Except Station Wagon	58.17			3.25 (IVA)
AUTOMATIC TRANSMISSION (A-727)				
383 C. I. Engine 2BBL—Except Station Wagon	58.17	3.25 (IVA)		3.25 (IVA)
383 C. I. Engine 4BBL—except Station Wagon	57.93	3.25 (IVA)		3.25 (IVA)
383, 440 C. I. Engine Station Wagon	55.68	3.25 (IVA)	3.25 (IVA)	3.25 (IVA)
440 C. I. Engine—except Station Wagon	57.93	3.25 (IVA)		3.25 (IVA)
440 C. I. Engine H.P.—except Station Wagon	57.93			3.25 (IVA)

UNIVERSAL JOINTS
Type—Front .... Sliding Spline Cross and Roller
Rear .... Cross and Roller

*From Centerline of front yoke bearing bores to Centerline of rear bearing bores.
(IVA) Interval Vibration Absorber at front joint of propeller shaft.

IMPERIAL

	*Length-Inches	2.76	2.94	3.23
AUTOMATIC TRANSMISSION (A-727)				
440 C. I. Engine—All models	52.57		3.25 (CV)	

UNIVERSAL JOINTS
Type—Front .... Constant Velocity
Rear .... Constant Velocity

(CV) Constant Velocity universal joints.

TIGHTENING REFERENCE

	Pounds Foot	Pounds Inch
Front-Transmission Flange Clamp Screw..		170
Rear-Pinion Flange Clamp Screw		170
Rear-Pinion Yoke Stud Nuts (Imperial) ..		300
Pinion Bumper Plate Screw		200
Rear Spring "U" Bolt Nuts	45	

SHOCK ABSORBERS AND REAR SPRINGS

CONTENTS

GENERAL INFORMATION

The rear springs are of the semi-elliptical type and are designed to have little or no camber under very light loads. When the load on the rear suspension is increased, a small amount of reverse spring camber is normal. A relatively flat rear spring gives better lateral stability and reduces side sway which contributes to a well controlled ride and superior handling and stability characteristics.

On Imperial models the mounting of the rear axle assembly to the spring is the same as the previous years model. All Chrysler models with the exception of station wagons and convertibles will also use the same mounting as the Imperial. The spring is sandwiched between two rubber isolators which are contained by two channel type retainers. The bottom retainer contains the lower shock absorber stud. The rubber isolators reduce the amount of axle and road noise transmitted to the body.

Rubber bushings inserted into the "eye" of each end of the main leaf are the means by which the springs are attached to the mounting brackets bolted to the body at the front and to spring shackles at the rear. The rubber bushings serve as isolators and reduce noise being transmitted to the body.

Heavy duty rear springs offered as part of the heavy duty suspension option, have a higher rate for a greater load carrying capacity (Trailer Towing). They are part of a complete engineered option which includes heavy-duty torsion bars, heavy-duty sway bar and heavy-duty shock absorbers.

Zinc interleaves are used between the leaves of all springs to reduce corrosion and improve spring life.

The double acting shock absorbers do not help support the load, but are a means used to control ride motion. The shock absorbers are matched to the particular suspension of the vehicle. It is not usually necessary to replace shock absorbers in pairs. Their action does NOT change with use. Slight fluid seepage during cold weather operation, resulting in a damp appearance, is normal and does not affect the performance or life of the shock absorber. Replace a shock absorber only if it is broken or leaking badly (not just damp) or has lost resistance in one or both directions, due to internal damage. Resistance in the rebound direction is usually greater than in the jounce direction. Be sure to use the same replacement part as the original equipment.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
SPRINGS SAG OR BOTTOM	(a) Springs sagged or taken a set.	(a) Replace the spring.
	(b) Broken, bent or weak spring leaves.	(b) Replace the spring.
SPRING NOISE	(a) Loose "U" bolts.	(a) Tighten "U" bolt nuts to specifications.
	(b) Loose or worn eye bushings.	(b) Replace the bushings and tighten the shackle bolt nuts to specifications.
	(c) Worn or missing interliners.	(c) Install new interliners.
SPRING BREAKAGE	(a) Loose "U" bolts.	(a) Replace spring. Inspect "U" bolts for damage. Tighten "U" bolt nuts to specifications.
	(b) Shock absorber inoperative.	(b) Replace the spring and the shock absorber.
SHOCK ABSORBER NOISY	(a) Bushing excessively worn.	(a) Replace bushing.
	(b) Undercoating on shock absorber reservoir.	(b) Clean undercoating off shock absorber.
	(c) Loose bolt or stud.	(c) Tighten to specifications.
	(d) Air trapped in system.	(d) Purge shock absorber.
SHOCK ABSORBER DRIPPING OIL	(a) Worn seal.	(a) Replace shock absorber.
	(b) Damaged crimp or reservoir.	(b) Replace shock absorber.

SERVICE PROCEDURES

SHOCK ABSORBERS

Front—Removal (Figs. 1 and 2)

On Imperial models to remove the front shock absorbers you may find it necessary and also more convenient to remove the tire and wheel assembly and perform the removal from under the fender.

(1) Loosen and remove nut and retainer from upper end of shock absorber piston rod.

(2) Raise car so wheels are clear of floor and loosen and remove lower attachment bolt nut. Remove this bolt from lower shock absorber eye and lower control arm mounting bracket.

(3) Compress shock absorber by pushing upward and remove from vehicle by pulling down and out of upper shock absorber mounting bushing. (Imperial models you may find it necessary to remove the upper control arm bumper to obtain enough clearance to remove shock absorber and dust shield).

(4) Check appearance of upper shock absorber mounting bushing and if it appears worn, damaged, or deteriorated, remove bushing by first pressing out inner sleeve with a suitable tool then prying out or cutting out the rubber bushing. (This bushing will take some set after it has been in service and should be replaced once it has been removed.)

(5) If lower bushing requires replacement, remove it from shock absorber using Tool C-3553 by pressing on the outer sleeve of bushing (Fig. 3).

Pressing on inner sleeve of lower bushing will not remove outer sleeve from the shock absorber. **New shock absorbers are furnished with the lower bushing installed; however, bushings are furnished separately for service installation.** Test and expel air from shock absorber before installation.

Testing and Expelling Air

(1) With shock absorber removed, extend fully in an upright position.

(2) Inspect for evidence of fluid running from the upper end of reservoir. (Actual leakage will be a stream of fluid running down the side and dripping off lower end of unit. A slight amount of seepage is not unusual and does not affect performance.)

(3) Test for low fluid level or air trapped in cylinder, by holding shock absorber in its normal vertical position and alternately extending and compressing unit. There should be no lost motion in either direction.

(4) Should lost motion be evident hold shock

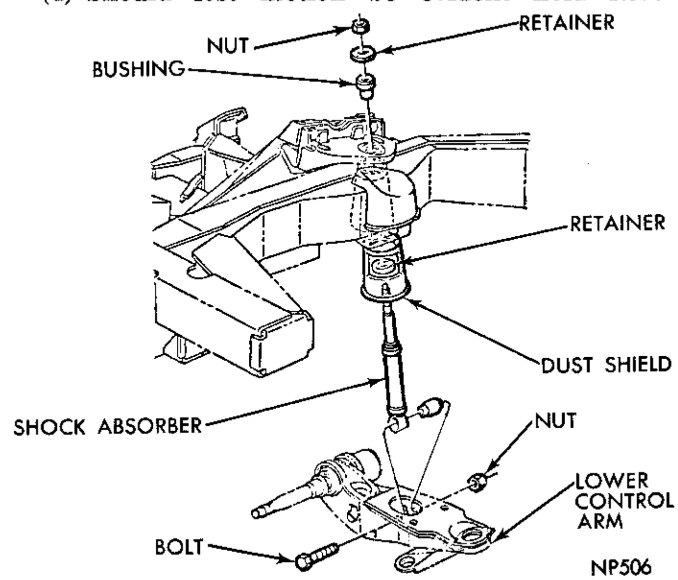


Fig. 2—Front Shock Absorber (Imperial)

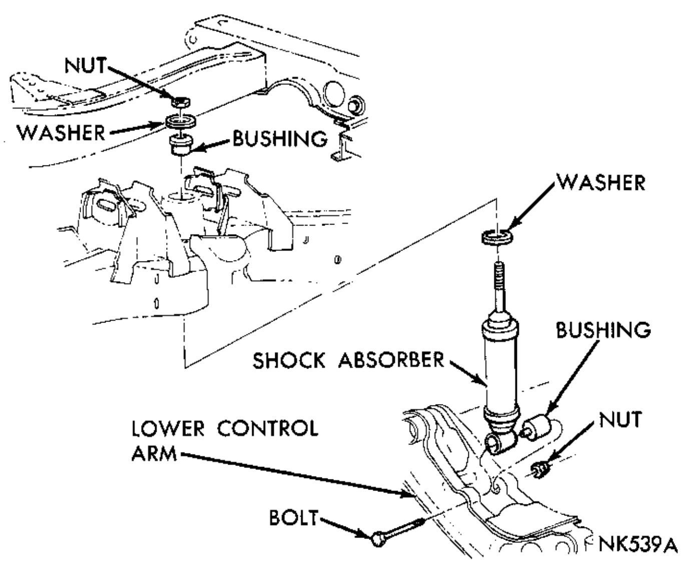


Fig. 1—Front Shock Absorber (Chrysler)

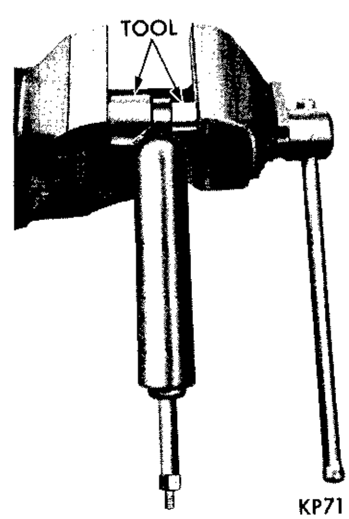


Fig. 3—Removing or Installing Shock Absorber Bushing

absorber in its normal vertical position and fully extend it.

(5) Invert unit and slowly compress it. **Do not extend unit while inverted.**

(6) Repeat steps 4 and 5 several times to expel any air trapped in cylinder.

(7) Should lost motion persist, replace shock absorber. Repeat operation 4 and 5 prior to installation of a new shock absorber. (New shock absorbers may have a greater resistance than an old one due to friction of new seal.)

Installation

(1) To install upper rubber bushing, remove inner steel sleeve and immerse bushing in water (DO NOT use oil or soap) and with a twisting motion, start bushing into hole of upper mounting bracket, then tap into position with a hammer. Reinstall steel inner sleeve in bushing.

(2) Install lower mounting bushing in eye of shock absorber using Tool C-3553 (Fig. 3).

(3) Test and expel air from shock absorber, then compress to its shortest length. **On Chrysler models** position retainer on upper rod of shock absorber and insert rod through upper bushing and install upper retainer and nut and tighten to 25 foot-pounds. **On Imperial models** position retainer on upper rod of shock absorber followed by dust shield. Insert rod through upper bushing and install upper retainer and nut and tighten to 25 foot-pounds.

In each case, install all retainers with the concave side in contact with the rubber.

(4) Position and align lower eye of shock absorber with that of lower control arm mounting holes. Install bolt and nut and tighten to 50 foot-pounds with the full weight of vehicle on the wheels.

Rear—Removal (Figs. 4 and 5)

(1) Raise vehicle on hoist to a comfortable working position.

(2) Using floor stands under axle assembly, raise axle to releave load on shock absorber.

(3) **On Chrysler** station wagon and convertible models, loosen and remove nut and retainer attaching shock absorbers to spring plate mounting stud and remove shock absorber from stud.

On all other Chrysler and Imperial models, loosen and remove nut and retainer attaching shock absorber to spring seat isolator retainer and remove shock absorber from stud.

(4) Loosen and remove nut and bolt from upper shock absorber mounting, and remove shock absorber.

(5) Inspect appearance of shock absorber mounting bushings and if they appear damaged or deteriorated, remove and replace.

(6) Test and expel air from shock absorber before

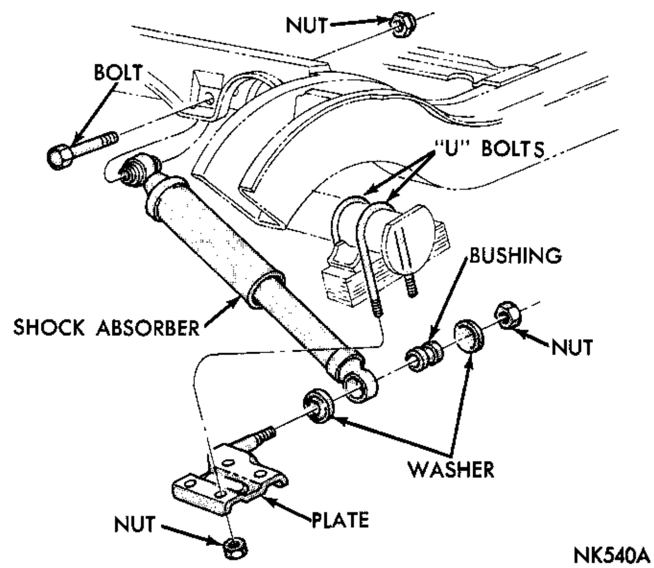


Fig. 4—Rear Shock Absorber (Station Wagon & Convertible)

installation, see "Testing and Expelling Air" procedure.

Installation

(1) Position and align upper eye of shock absorber with mounting holes in crossmember and install bolt and nut. DO NOT fully tighten.

(2) Position washer on shock absorber mounting stud and install shock absorber on stud followed by remaining cupped washer and nut. DO NOT fully tighten.

(3) Lower vehicle until full weight of vehicle is on the wheels. Tighten upper nut 70 foot-pounds, lower stud nut to 50 foot-pounds.

REAR SPRINGS

Measuring Spring Height

When measuring rear spring heights, vehicle

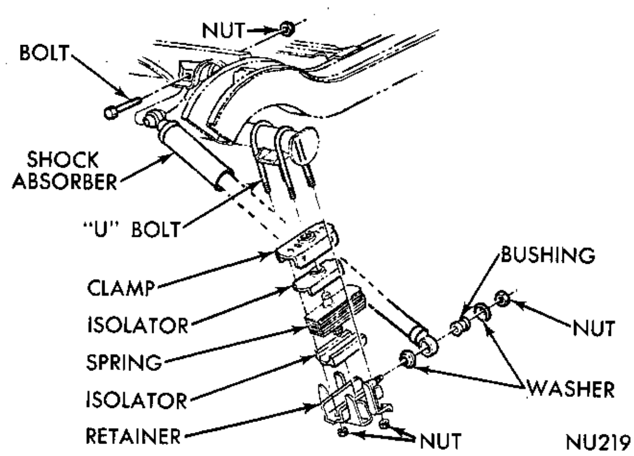


Fig. 5—Rear Shock Absorber (Chrysler-Imperial)

should be placed on a level floor, have correct front suspension height on both sides, correct tire pressures, no passenger or luggage compartment load and a full tank of fuel.

(1) Jounce car several times (front bumper first). Release bumpers at same point in each cycle.

(2) Measure shortest distance from highest point on underside of rear axle bumper strap (at rear of bumper) to top of axle housing.

(3) Measure both right and left sides.

If these measurements vary by more than 3/4 inch (side to side), it is an indication that one of the rear springs may need replacing.

It is normal for rear springs to show some reverse arch, even with no load, so appearance alone should not be reason for spring replacement.

REPLACEMENT

Removal—Chrysler Station Wagon and Convertible

(1) Raise vehicle on hoist to a comfortable working position.

(2) Using floor stands under axle assembly, raise axle assembly to relieve weight on rear spring.

(3) Disconnect rear shock absorber at spring plate lower mounting stud. Lower axle assembly, permitting rear springs to hang free.

(4) Loosen and remove "U" bolt nuts and remove "U" bolts and spring plate.

(5) Loosen and remove the nuts holding front spring hanger to body mounting bracket (Fig. 6).

(6) Loosen and remove rear spring hanger bolts and let spring drop far enough to pull front spring hanger bolts out of body mounting bracket holes.

(7) Loosen and remove front pivot bolt from front spring hanger.

(8) Loosen and remove shackle nuts and remove shackle from rear spring.

Removal—Chrysler and Imperial

(1) Raise vehicle on hoist to a comfortable working position.

(2) Using floor stands under axle assembly, raise axle assembly to relieve weight on rear spring.

(3) Disconnect rear shock absorber at spring seat isolator retainer mounting stud.

(4) Lower axle assembly, permitting rear springs to hang free.

(5) Loosen and remove "U" bolt nuts and remove lower spring seat isolator retainer and isolator (Fig. 7).

(6) Remove "U" bolts and upper isolator and clamp.

(7) Loosen and remove bolts holding front spring hanger to body mounting bracket.

(8) Loosen and remove rear spring hanger bolts and let spring drop far enough to pull front spring hanger bolts out of body mounting bracket holes.

(9) Loosen and remove front pivot bolt from front spring hanger.

(10) Loosen and remove shackle nuts and remove shackle from rear spring.

Installation—Chrysler Station Wagon and Convertible

Inspect rear spring front pivot bolt bushing and if necessary, replace bushing, see "Pivot Bushing Replacement" procedure.

(1) Assemble shackle and bushings in rear of spring and rear spring hanger. **(Do not lubricate rubber bushings.)** Start shackle bolt nut. **Do not tighten.**

(2) Assemble front spring hanger to front spring eye and install pivot bolt and nut. **Do not tighten.**

(3) Position rear spring hanger to body bracket and

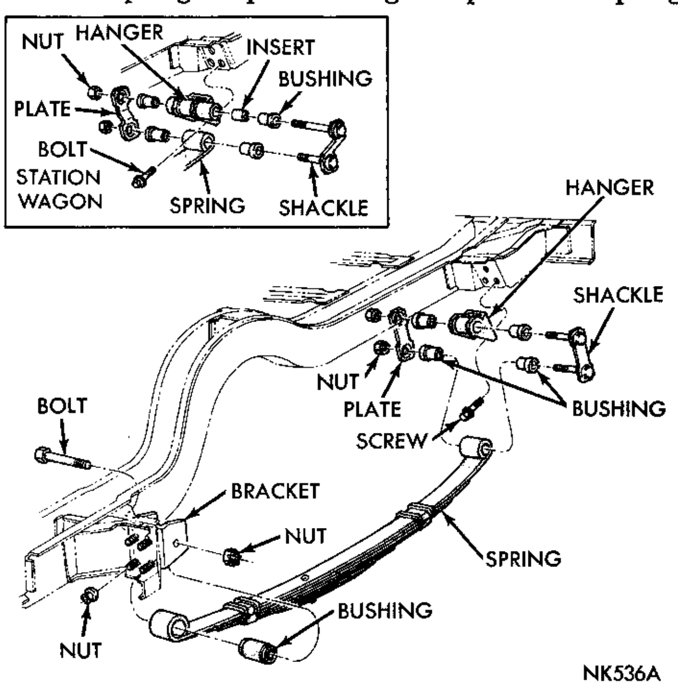


Fig. 6—Rear Spring (Station Wagon & Convertible)

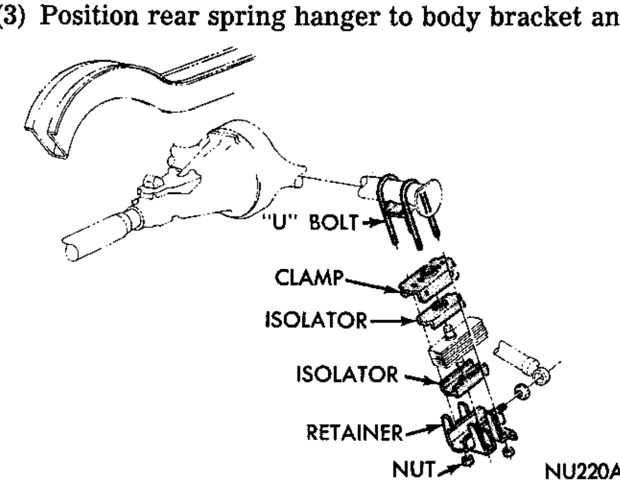


Fig. 7—Rear Spring (Chrysler-Imperial)

install bolts and tighten bolts to 30 foot-pounds.

(4) Raise the spring and start the spring hanger bolts in mounting bracket holes (light leverage such as mechanics shoulder under spring might be necessary to position spring hanger studs in mounting bracket holes. Install nuts and tighten to 30 foot-pounds.

(5) Lower axle assembly into correct position with axle centered over spring center bolt.

(6) Correctly position the lower spring plate and install "U" bolts and nuts and tighten nuts 45 foot-pounds. **DO NOT over tighten "U" bolt nuts.**

(7) Install shock absorber on stud and tighten nut 50 foot-pounds.

(8) Lower vehicle to floor and with full weight of vehicle on the wheels, tighten pivot bolts and/or nuts, 125 foot-pounds. Tighten shackle nuts 40 foot-pounds.

(9) It is recommended that after a rear spring has been replaced, that the vehicle be driven and the front suspension heights be remeasured and corrected if necessary.

Installation—Chrysler and Imperial

Inspect rear spring front pivot bolt bushing and if necessary, replace bushing, see "Pivot Bushing Replacement" procedure.

(1) Assemble shackle and bushings in rear of spring and rear spring hanger. **(Do not lubricate rubber bushings.)** Start shackle bolt nut. **DO NOT tighten.**

(2) Assemble front spring hanger to front spring eye and install pivot bolt and nut. **DO NOT tighten.**

(3) Position rear spring hanger to body bracket and install bolts and tighten to 30 foot-pounds.

(4) Raise spring and start front spring hanger bolts in mounting bracket holes (light leverage such as: mechanics shoulder under spring might be necessary to position spring hanger studs in mounting bracket holes). Install nuts and tighten to 30 foot-pounds.

(5) Correctly position upper isolator on rear spring over center bolt followed by upper clamp.

(6) Lower axle assembly into correct position with axle centered over spring center bolt and install "U" bolts.

(7) Correctly position bottom isolator and retainer over center bolt of spring with "U" bolts through retainer holes and install nuts, tighten 45 foot-pounds. **Do not over tighten "U" bolt nuts.**

(8) Install shock absorber on stud and tighten nut 50 foot-pounds.

(9) Lower vehicle to floor and with full weight of vehicle on the wheels, tighten pivot bolts and/or nuts, 125 foot-pounds. Tighten shackle nuts 40 foot-pounds.

(10) It is recommended that after a rear spring has been replaced, that the vehicle be driven and the front suspension heights be measured and corrected if necessary.

Pivot Bushing Replacement

The removal of old bushings and installation of the new bushings is performed in one operation, using Tool C-3709 (Fig. 8).

(1) Raise vehicle on hoist to a comfortable working position.

(2) Using floor stands under axle assembly, raise axle assembly to relieve weight on rear spring.

(3) Disconnect rear shock absorber at spring plate lower mounting stud. Lower axle assembly, permitting rear springs to hang free.

(4) To replace front pivot bushing, remove rear spring front hanger from body bracket. Remove pivot bolt and hanger from spring.

(5) Place new bushings on Tool C-3709 (Fig. 8). Arrange tool in spring eye, then press out old bushing while pressing new bushing in one operation.

(6) Assemble front hanger to spring but do not tighten pivot bolt nut until full weight of vehicle is on wheels.

(7) Attach spring hanger to body bracket and tighten mounting bolts to 30 foot-pounds.

(8) To replace rear spring shackle bushings remove rear spring hanger from body bracket. Remove shackle, then slide bushings out of spring and hanger.

(9) Insert new bushings in spring and hanger then assemble shackle and hanger on spring. Start shackle bolt nuts.

(10) Attach hanger to body bracket and tighten mounting bolt to 30 foot-pound.

(11) Lower vehicle and install shock absorber on spring plate stud and tighten nut 50 foot-pounds. With full weight of vehicle on the wheels, tighten rear spring front pivot bolt nut 125 foot-pounds and shackle nuts 40 foot-pounds.

Spring Interliner Replacement

Removal

(1) Raise vehicle on hoist to a comfortable working position.

(2) Using floor stands under axle assembly, raise axle assembly to relieve weight on rear spring.

(3) Disconnect rear shock absorber at spring plate

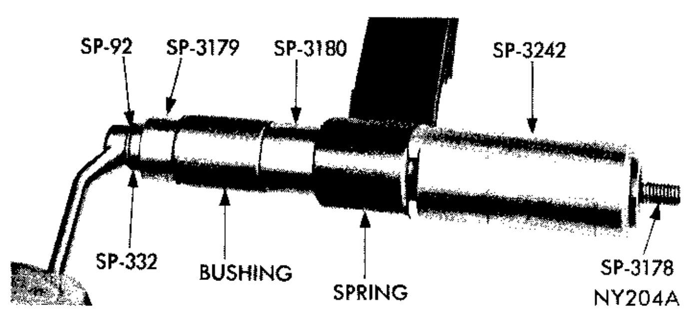


Fig. 8—Pivot Bushing Replacement

lower mounting stud. Lower axle assembly, permitting rear springs to hang free.

(4) Remove nut and washer from spring alignment clips; remove clips.

(5) Using a tapered pry bar or screwdriver, separate spring leaves and remove interliners.

(6) Keeping spring leaves separated, clean mating area of both spring leaves thoroughly. **If rust or corrosion is evident, wrap fine sandpaper around a flat file or putty knife and sand until area is smooth and clean.**

(7) With spring leaves still separated, insert new interliner with retaining buttons in alignment with locating holes.

(8) Press retaining buttons into retainer holes and remove pry bar or screwdriver from spring leaves.

(9) Repeat above procedure for balance of interliners. **DO NOT lubricate interliners.**

(10) Reinstall alignment clips.

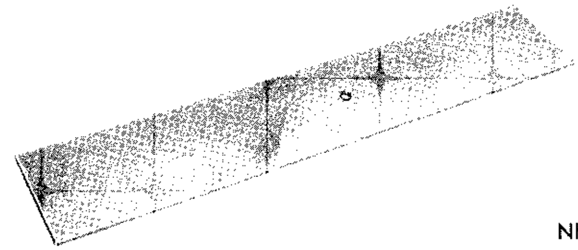


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Fig. 9—Zinc Interleaf

(11) Reinstall shock absorber on spring plate stud and install washer and nut, tighten to 50 foot-pounds.

(12) Lower vehicle onto its wheels.

Zinc Interleaf

To remove or install zinc interleaves (Fig. 9) between spring leaves, it will be necessary to remove center bolt and disassemble spring leaves. Tighten spring center bolt nut 10 foot-pounds.

SPECIFICATIONS

	Newport	300	New Yorker	Imperial
REAR SPRINGS				
Type	Semi-Elliptical			
NUMBER OF LEAVES				
Std.	4-1/2	5-1/2	5-1/2	7
Heavy Duty	6-1/2	6-1/2	6-1/2	6-1/2
Station Wagon (Standard)	6-1/2			
(Heavy Duty)	6-1/2			
Police & Taxi	6-1/2	6-1/2	6-1/2	
WIDTH (inches)	2.50	2.50	2.50	2.50
LENGTH (inches)	62	62	62	62
MOUNTING				
Front	Rubber Bushing			
Rear	Shackle, Rubber Bushing			
SHOCK ABSORBERS				
Type	Double Acting			
Mounting	Rubber Bushing			

TIGHTENING REFERENCE

	Foot Pounds
REAR SPRINGS	
Center Bolt Nut	10
Front Hanger Nut	30
Pivot Bolt or Nut	125
Rear Hanger	30
Shackle Nut	40
"U" Bolt Nut	45
SHOCK ABSORBERS	
Front Lower Bolt Nut	50
Upper Shaft Nut	25
Rear Lower Stud Nut	50
Upper Bolt Nut	70

STEERING

CONTENTS

MANUAL STEERING GEAR

INDEX

GENERAL INFORMATION

The manual steering gear (Fig. 1) is designed to provide easy steering with minimum friction in the steering gear. A ball nut travels up or down on the wormshaft, riding on recirculating balls acting as a screw thread.

The wormshaft and ball nut assembly is supported in the gear housing by an adjustable ball thrust type upper and lower bearing. The lower bearing cup is pressed into the gear housing, and the upper bearing cup is pressed into the wormshaft bearing adjuster.

The cross shaft is integral with the sector gear. The sector gear meshes with the rackteeth on the recirculating ball nut. Adjustment at this point is controlled by the cross shaft adjusting screw which extends through the housing cover.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HARD STEERING	(a) Low or uneven tire pressure.	(a) Inflate tires to recommended pressures.
	(b) Insufficient lubricant in the steering gear housing or in steering linkage.	(b) Lubricate as necessary.
	(c) Steering gear shaft adjusted too tight.	(c) Adjust according to instructions.
	(d) Front wheels out of line.	(d) Align the wheels. See "Front Suspension."
	(e) Steering column misaligned.	(e) See "Steering Column—Manual Transmission."
PULL TO ONE SIDE (Tendency of the Vehicle to veer in one direction only)	(a) Incorrect tire pressure.	(a) Inflate tires to recommended pressures.
	(b) Wheel bearings improperly adjusted.	(b) See "Front Wheel Bearing Adjustment."
	(c) Dragging brakes.	(c) Inspect for weak, or broken brake shoe spring, binding pedal.
	(d) Improper caster and camber.	(d) See "Front Wheel Alignment."
	(e) Incorrect toe-in.	(e) See "Front Wheel Alignment."
	(f) Grease, dirt oil or brake fluid on brake linings.	(f) Inspect, replace and adjust as necessary.
	(g) Front and rear wheels out of alignment.	(g) Align the front wheels. See "Front Suspension."
	(h) Broken or sagging rear springs.	(h) Replace rear springs.
	(i) Bent suspension parts.	(i) Replace parts necessary.
WHEEL TRAMP (Excessive Vertical Motion on Wheels)	(a) Incorrect tire pressure.	(a) Inflate tires to recommended pressures.
	(b) Improper balance of wheels, tires and brake drums.	(b) Balance as necessary. See "Wheels and Tires."
	(c) Loose tie rod ends or steering connections.	(c) Inspect and repair as necessary.

Condition	Possible Cause	Correction
	(d) Worn or inoperative shock absorbers.	(d) Replace shock absorbers as necessary.
EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL	(a) Steering gear shaft adjusted too loose or badly worn.	(a) Replace worn parts and adjust according to instructions.
	(b) Steering linkage loose or worn.	(b) Replace worn parts. See "Front Wheel Alignment."
	(c) Front wheel bearings improperly adjusted.	(c) Adjust according to instructions.
	(d) Steering arm loose on steering gear shaft.	(d) Inspect for damage to the gear shaft and steering arm, replace parts as necessary.
	(e) Steering gear housing attaching bolts loose.	(e) Tighten attaching bolts to specifications.
	(f) Steering arms loose at steering knuckles.	(f) Tighten according to specifications.
	(g) Worn ball joints.	(g) Replace the ball joints as necessary. See "Front Suspension."
	(h) Worm-shaft bearing adjustment too loose.	(h) Adjust worm bearing pre-load according to instructions.

SERVICE PROCEDURES

Adjustments

Two adjustments are provided in the steering gear (Fig. 2). The worm bearing pre-load adjustment, and the ball nut rack sector gear mesh adjustment.

Before correct adjustment can be made at ball nut rack and sector gear, it must be determined that worm bearing pre-load is properly adjusted.

The worm bearing pre-load adjustment is controlled by the worm thrust bearing adjuster which threads into the housing at the upper end of the wormshaft.

Worm Bearing Pre-Load

(1) Remove steering gear arm retaining nut and lock washer. Remove arm with Tool C-3646 (Fig. 3).

(2) Remove horn button or horn ring.

(3) Loosen cross shaft adjusting screw lock nut, and back out adjusting screw approximately two turns. This will relieve any friction load which may be present at closely meshed ball nut rack and sector gear teeth.

(4) Turn steering wheel two complete turns from straight ahead position, and place torque wrench Tool C-3380 on steering shaft nut.

(5) Rotate steering shaft at least one turn toward straight ahead position, while testing rotating torque with torque wrench.

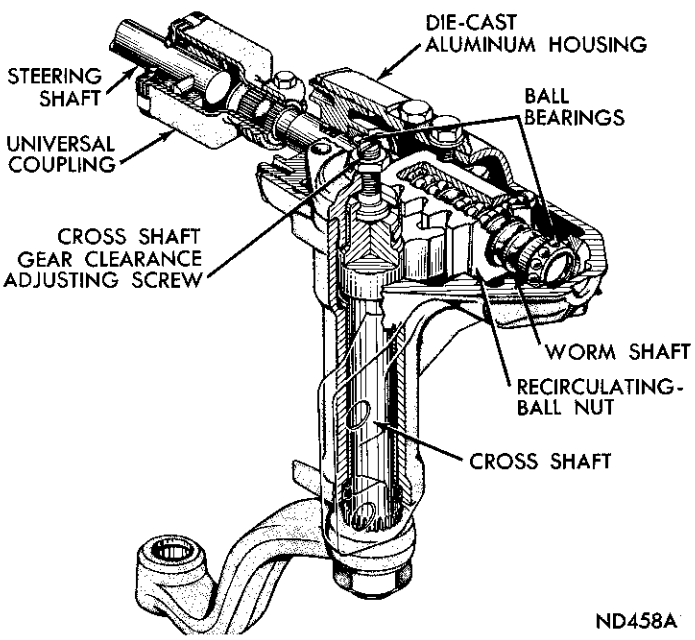


Fig. 1—Steering Gear Cross Section

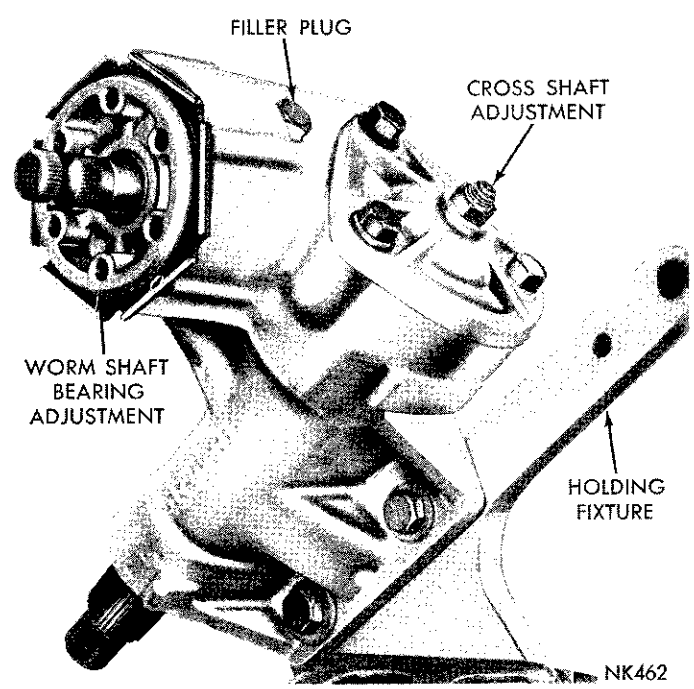


Fig. 2—Gear Adjustment Locations

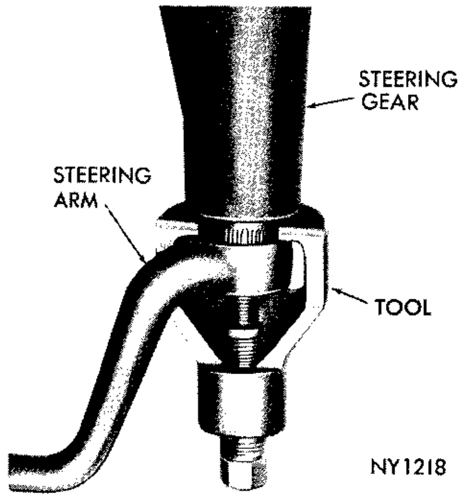


Fig. 3—Removing Steering Gear Arm

The torque required to keep wheel moving should be between 1-1/2 and 4-1/2 inch-pounds. If reading is not within these limits, adjustment can be made in or out of vehicle as follows:

(a) Loosen adjuster lock nut.

(b) Use adjuster wrench from Tool C-3884 set and turn adjuster clockwise to increase pre-load, or counterclockwise to decrease pre-load.

(c) While holding adjuster from turning, tighten lock nut securely. Retest worm bearing pre-load.

Ball Nut Rack and Sector Mesh

The cross shaft adjusting screw, located in housing cover, raises or lowers the shaft to provide proper mesh load between tapered teeth of sector gear and tapered teeth of ball nut. **This adjustment can be accurately made only after proper worm bearing pre-load has been established.**

(1) Turn steering wheel gently from one stop to the other, carefully counting number of turns. Turn steering wheel back exactly half way, to center position.

(2) Turn cross shaft adjusting screw clockwise to remove all lash between ball nut rack and sector gear teeth, then tighten adjusting screw lock nut to 35 foot-pounds.

(3) Turn steering wheel about 1/4 turn away from center or "high spot" position. Using torque wrench Tool C-3380, at steering wheel nut, measure torque required to rotate steering wheel through high spot at center position. The reading should be between 8-1/4 and 11-1/4 inch-pounds. This represents total of worm shaft bearing pre-load and ball nut rack and sector gear mesh load. Readjust cross shaft adjustment screw if necessary, to obtain proper torque reading.

(4) After adjustments have been completed, place front wheels in a straight ahead position, and with steering gear and steering wheel centered, install steering arm on cross shaft.

(5) Tighten steering arm retaining nut to 180 foot-pounds.

Gear Removal

To avoid damage to the energy absorbing steering column, it is recommended that the steering column be completely detached from floor and instrument panel before steering gear is removed. See Steering Column Section of this manual for proper removal, alignment and installation procedure.

(1) Remove steering column.

(2) From under vehicle, remove steering arm retaining nut and lock washer. Remove steering arm with Tool C-3646 (Fig. 3).

(3) Remove gear to frame retaining bolts and remove gear.

Gear Installation

(1) Position gear on frame and install gear to frame retaining bolts and lock washers. Tighten to specifications.

(2) Rotate worm shaft by hand and center cross shaft to mid point of its travel. Align master serration on cross shaft with splines in steering arm. Install steering arm with lock washer and nut. Tighten to specifications.

(3) Align and install steering column as outlined. (See "Steering Columns").

Worm Shaft Replacement

The master serration on the steering gear worm shaft spline, used for centering the steering shaft coupling, is machined after the steering gear is completely assembled.

If it should become necessary to replace a steering gear worm shaft, it will be necessary to file a master serration on the spline of the worm shaft, since the replacement part does not have a master serration machined in the spline.

To file a master serration on a worm shaft spline, the steering gear must be completely assembled and the worm shaft centered in its travel, then with the steering gear in its normal upright position remove one tooth of the spline, at the 12 o'clock position, with a suitable file.

Gear Reconditioning

Thoroughly clean entire outside surface of steering gear before disassembly to avoid contaminating worm-shaft and ball nut assembly with dirt or grit.

(1) Attach steering gear to holding fixture, Tool C-3323 and install holding fixture in a vise (Fig. 2).

(2) Loosen cross shaft adjusting screw lock nut, and back out screw about two turns to relieve load caused by close mesh between ball nut rack and sector gear teeth. **Remove cross shaft seal as outlined in "Cross Shaft Oil Seal Replacement."**

(3) Position steering wormshaft in straightahead position.

(4) Remove bolts from cross shaft cover and slowly remove cross shaft while sliding arbor Tool C-3786 into housing (Fig. 4).

(5) Remove lock nut from cross shaft adjusting screw and remove screw from cover by turning screw clockwise.

(6) Slide adjustment screw and shim out of slot in end of cross shaft.

(7) Loosen wormshaft bearing adjuster lock nut with a soft drift and remove the lock nut. Hold wormshaft from turning while unscrewing adjuster, using wrench from Tool Set C-3884 (Fig. 5).

(8) Slide worm shaft adjuster off shaft.

CAUTION: The adjuster must be handled carefully to avoid damage to aluminum threads.

Be careful that ball nut does not run down to either end of wormshaft. The ball guide ends can be damaged if ball nut is allowed to rotate until stopped at end of worm.

(9) Carefully remove worm and ball nut assembly (Fig. 6).

The ball nut and wormshaft are serviced as an assembly only, and are not to be disassembled. Do not remove or disturb ball return guides. **Place ball nut and wormshaft assembly in a clean place.**

(10) Remove cross shaft needle bearing by placing steering gear housing in an arbor press; insert Tool C-3786 in lower end of housing (Fig. 7) and press both bearings through housing. **The cross shaft cover assembly, including a needle bearing or bushing, is serviced as an assembly.**

(11) Remove wormshaft oil seal from wormshaft bearing adjuster, by inserting a blunt punch behind seal and tap alternately on each side of seal until seal is driven out of adjuster.

(12) Remove wormshaft spacer and upper bearing cup in same manner. However, this must be done carefully to avoid cocking bearing cup and distorting adjuster counterbore.

(13) Remove lower cup if replacement is necessary by positioning locking head jaws of remover Tool C-3868 (Fig. 8) behind bearing cup and expanding remover head by pressing down on center plunger of

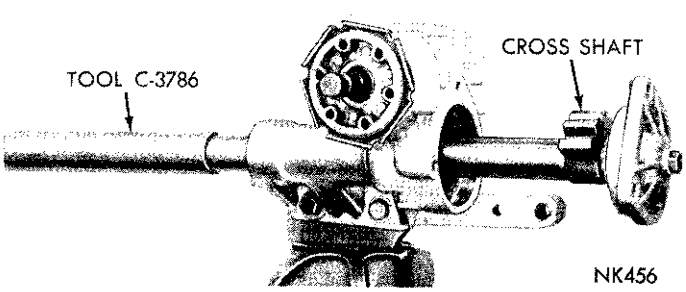


Fig. 4—Removing Cross Shaft

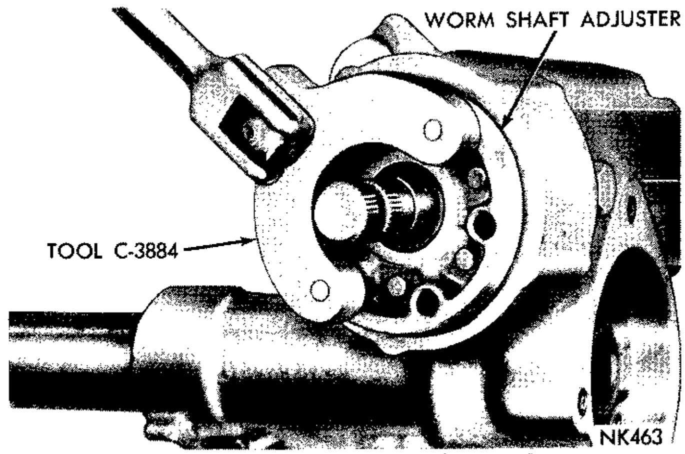


Fig. 5—Removing Worm Shaft Adjuster

tool. Withdraw bearing cup by turning remover screw nut in a clockwise direction while holding center screw.

(14) Wash all parts in clean solvent and dry with compressed air.

(15) Test operation of ball nut assembly on wormshaft. If ball nut does not travel smoothly and freely on wormshaft and there is roughness or binding, assembly must be replaced.

(16) Extreme care is necessary when handling aluminum worm bearing adjuster to avoid damaging threads. It is equally important to avoid damaging mating threads in gear housing. The wormshaft adjuster must **never** be screwed into housing without lubrication, or when threads are dirty or damaged. These precautions **must** be taken to avoid "picking up" threads and ruining housing and/or wormshaft bearing adjuster.

(17) Inspect cross shaft for wear and check fit of

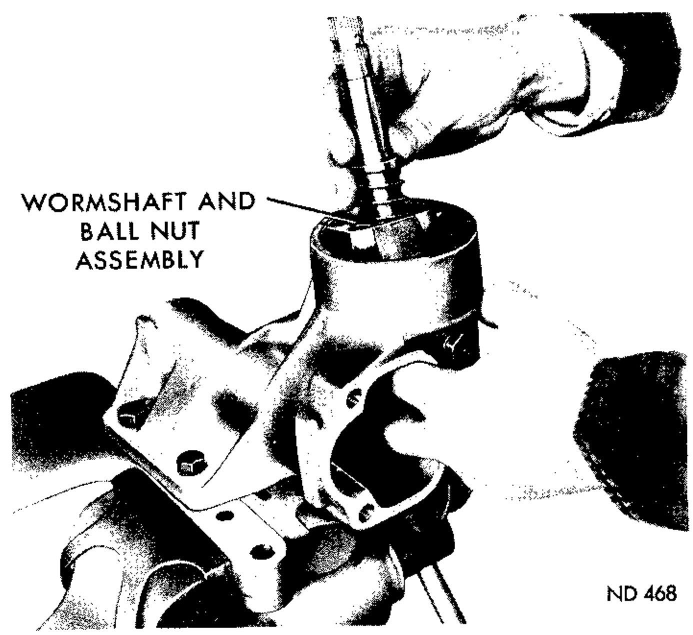


Fig. 6—Removing Worm Shaft And Ball Nut Assembly

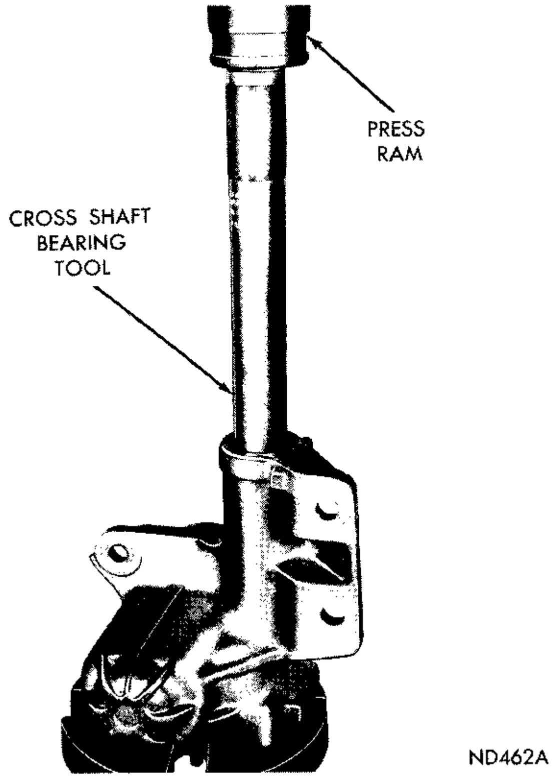


Fig. 7—Removing Cross Shaft Inner and Outer Bearings

shaft in housing bearings. Inspect fit of shaft pilot in cover bearing. Make sure wormshaft has not been bent or otherwise damaged.

(18) The cross shaft and wormshaft oil seals should be replaced when unit is reconditioned.

(19) Install cross shaft outer needle bearing by

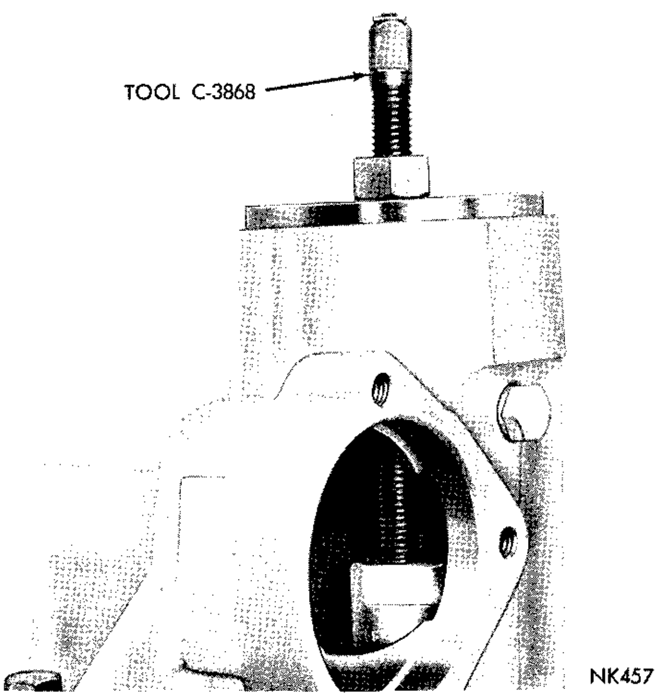


Fig. 8—Removing Lower Bearing Cup

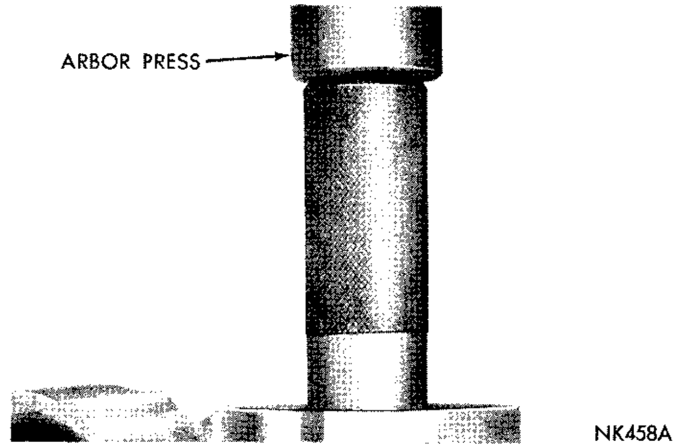


Fig. 9—Installing Inner Bearing

placing bearing on end of Tool C-3786 with adapter ring. Press bearing into housing to 1/2 inch below end of bore to provide space for oil seal.

(20) Install inner needle bearing by placing bearing on Tool C-3786 (Fig. 9). Press bearing into inside end of housing bore flush with inside end of bore surface.

(21) Install wormshaft bearing cups, position bearing cup and spacer into adjuster nut, and press them in place with Tool C-3865 (Figs. 10 and 11).

(22) Install wormshaft oil seal by positioning seal in wormshaft adjuster with seal metal retainer **UP.** Drive seal into place with a suitable sleeve so it is slightly below end of bore in adjuster.

(23) Apply a coating of steering gear lubricant to all moving parts during assembly, also place lubricant on and around oil seal lips.

(24) Clamp holding fixture and housing in a vise with bearing adjuster opening upward.

(25) Place a thrust bearing in lower cup in housing.

(26) Hold ball nut from turning (Fig. 6), and insert wormshaft and ball nut assembly into housing with end of worm resting in thrust bearing.

(27) Place upper thrust bearing on wormshaft.

Thoroughly lubricate threads on adjuster and threads in housing.

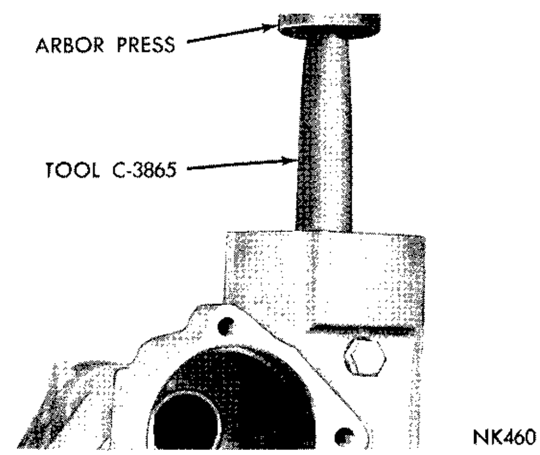


Fig. 10—Installing Wormshaft Lower Bearing Cup

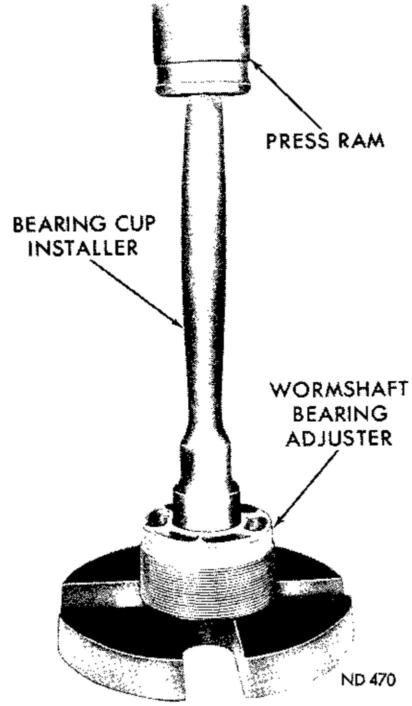


Fig. 11—Installing Wormshaft Upper Bearing Cup

(28) Place a protective sleeve of plastic tape over wormshaft splines so splines do not damage seal. Slide adjuster assembly over shaft.

(29) Thread adjuster into steering housing, and with Tool wrench C-3884 and splined nut set, tighten adjuster to 50 foot-pounds while rotating wormshaft. This is done to effectively seat bearings.

(30) Loosen adjuster so no bearing pre-load exists. Then, using torque wrench Tool C-3380, adjust wormshaft bearing pre-load from 1-1/8 to 4-1/2 inch-pounds.

(31) After adjusting pre-load, tighten bearing adjuster lock nut, and retest to be sure preload remains between 1-1/8 and 4-1/2 inch-pounds.

(32) Before installing cross shaft, pack wormshaft cavities in housing above and below ball nut with steering gear lubricant. Use steering gear lubricant whenever possible, but if not available, a good grade of multi-purpose lubricant may be used. Do not use gear oil. When gear is properly packed with steering gear lubricant it will contain eleven fluid ounces of lubricant, and level of lubricant will be at top of worm.

(33) Slide cross shaft adjusting screw and shim into slot in end of shaft.

(34) Test end clearance (Fig. 12). The screw must be free to turn with zero to .004 inch end play. Three different thickness shims are available to obtain specified clearance.

(35) Start cross shaft and adjuster screw into bearing in housing cover. Using a screw driver through hole in cover, turn screw counterclockwise to pull shaft into cover.

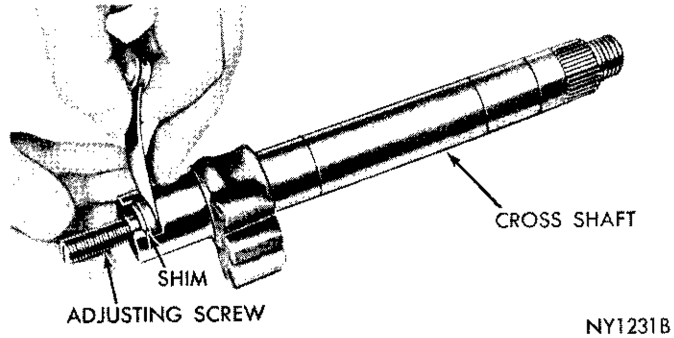


Fig. 12—Measuring Cross Shaft Adjusting Screw End Clearance

(36) Install adjusting screw lock nut, but do not tighten at this time.

(37) Rotate wormshaft to centralize ball nut.

(38) Place new cover gasket on housing cover.

(39) Carefully install cross shaft and cover assembly into steering gear housing (Fig. 4).

The cross shaft and sector teeth should be coated with steering gear lubricant before installing cross shaft in housing.

(40) Make certain some lash exists between cross shaft sector teeth and ball nut rack. Install and tighten cover bolts to 25 foot-pounds.

(41) Position cross shaft seal on cross shaft with lip of seal facing gear housing. Place installing adapter SP-3828 from Tool C-3880 against seal with **short step** toward seal (Fig. 14). Position nut from Tool C-3880 on cross shaft and turn it down against adapter, pressing seal into housing until step on adapter contacts end of housing. Remove tool.

(42) Turn worm shaft about 1/4 turn away from center of "high-spot" position. Using torque wrench C-3380 and 3/4 inch socket on worm shaft spline, check torque required to rotate shaft through high spot at center position. The reading should be between 8 and 11 inch pounds. Readjust cross shaft adjusting screw as necessary to obtain proper torque reading. Tighten lock nut to 35 foot pounds and recheck cross shaft torque.

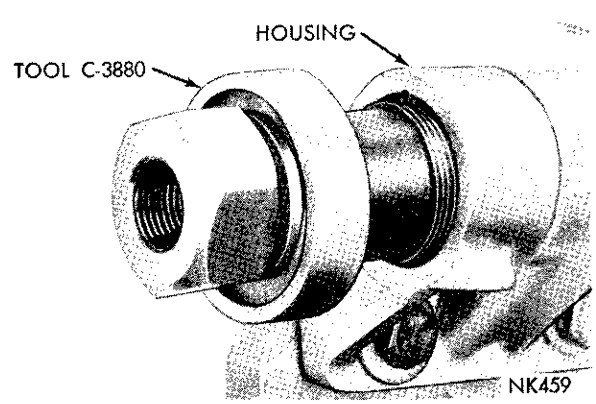


Fig. 13—Removing Cross Shaft Oil Seal

CROSS SHAFT OIL SEAL REPLACEMENT

The cross shaft oil seal may be replaced by the following procedure either on the bench, or without removing steering gear from vehicle.

CAUTION: When replacing oil seal in vehicle, clean the exposed portion of cross shaft to help prolong oil seal life.

(1) Remove steering gear arm retaining nut and lock washer. Remove arm with Tool C-3646 (Fig. 3).

Use Tool C-3880 to service cross shaft seal. The tool consists of adapter SP-3056; half rings SP-1932 and nut SP-3610.

(2) Slide threaded adapter over end of cross shaft and install nut portion of tool on shaft. (Fig. 13).

Maintain pressure on adapter with tool nut while screwing adapter into seal until it grips oil seal firmly Place two half rings and retainer over both portions of tool. Turn tool nut counterclockwise to withdraw seal from housing.

(3) Place seal onto splines on cross shaft with lip of seal facing gear housing.

(4) Place installing adapter SP-3052 from Tool C-3880 against seal. Press seal in until a gap of 1/4 inch exists between adapter and housings (Fig. 14).

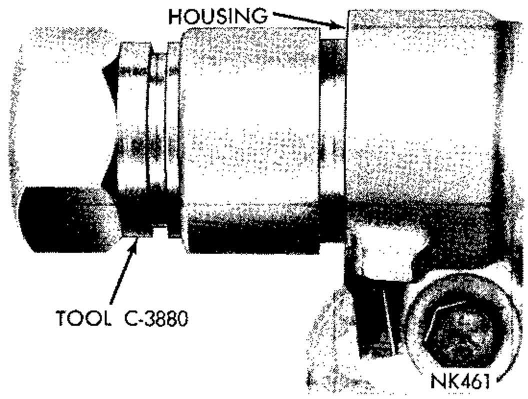


Fig. 14—Installing Cross Shaft Oil Seal

(5) Place nut from Tool Set C-3880 on cross shaft, and turn it down against adapter, pressing seal into housing until step on adapter contacts end of housing.

(6) Remove tool, install steering arm, lock washer and retaining nut and tighten nut to 180 foot-pounds.

POWER STEERING GEAR

INDEX

GENERAL INFORMATION

The power steering gear (Figs. 1 and 2) consists of a gear housing containing a cross shaft with sector gear, a power piston with gear teeth broached into the side of the piston which is in constant mesh with the Cross shaft gear, and a wormshaft connecting the steering wheel to the power piston through a Pot type coupling. The wormshaft is geared to the piston through recirculating ball contact. The steering valve, mounted on top of the steering gear, directs the flow of fluid in the system.

Fluid is supplied to the steering gear, by an engine driven constant displacement type pump through a pressure hose. Oil is returned to the pump reservoir from the steering gear through a return hose.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HARD STEERING	(a) Tires not properly inflated.	(a) Inflate tires to recommended pressures.
	(b) Low oil level in pump reservoir (usually accompanied by pump noise).	(b) See "Fluid Level," Power Steering Pump.
	(c) Loose pump belt.	(c) See "Group 7—Cooling."
	(d) Improper caster and camber.	(d) See "Front Wheel Alignment" Front Suspension Group 2.
	(e) Power steering output low.	(e) Pressure test pump.
	(f) Steering linkage binding.	(f) Repair and lubricate as necessary.
	(g) Steering gear malfunctions. 1. Cross shaft adjustment too tight. 2. Faulty or damaged valve lever.	(g) Adjust or repair as follows: 1. See "Cross Shaft Adjustment." 2. Repair as necessary.

Condition	Possible Cause	Correction
	3. External leakage.	3. Inspect for leakage at the lower sector shaft oil seal; the sector Cross cover "O" ring.
	4. Excessive internal leakage.	4. Recondition steering gear.
POOR RECOVERY FROM TURNS	(a) Tires not properly inflated.	(a) Inflate tires to recommended pressures.
	(b) Steering linkage binding.	(b) Repair and lubricate as necessary.
	(c) Improper wheel alignment.	(c) See "Front Wheel Alignment," Front Suspension Group 2.
	(d) Damaged steering tube bearing.	(d) Remove jacket tube and replace bearings.
	(e) Steering wheel column jacket and steering nut improperly aligned.	(e) See "Gear Installation."
	(f) Steering gear malfunctions.	(f) Adjust or repair as follows:
	1. Improper cross shaft adjustment.	1. See "Cross Shaft Adjustment."
	2. Column support spanner nut loose.	2. Repair as necessary.
	3. Damaged valve lever.	3. Repair as necessary.
	4. Improper worm thrust bearing adjustment.	4. Recondition steering gear.
	5. Worn or damaged cylinder head worm seal ring or faulty worm piston ring.	5. Recondition steering gear.
	6. Burrs or nicks in the reaction ring grooves in the cylinder head or column support.	6. Repair as necessary.
	7. Dirt or chips in the steering gear unit.	7. Recondition steering gear.
	8. Rough worm in the piston assembly.	8. Recondition steering gear.
	9. Valve binding.	9. Replace valve assembly.
CAR LEADS TO EITHER SIDE	(a) Tires not properly inflated.	(a) Inflate tires to recommended pressures; See "Wheels and Tires."
	(b) Improper wheel alignment.	(b) See "Front Suspension, Front Wheel Alignment." Group 2.
	(c) Valve body out of adjustment.	(c) If vehicle leads to the left, move the steering valve housing up on the steering housing. If vehicle leads to the right, move the steering valve housing down on the steering housing.
	(d) Valve lever damaged.	(d) Repair as necessary.
	(e) Column support spanner nut loose.	(e) Repair as necessary.
	(f) Coupling not centered.	(f) Center coupling. Refer to "Gear Installation."
	(g) Internal leakage in the steering gear valve body.	(e) Replace the steering gear valve body assembly.
TEMPORARY INCREASES IN EFFORT WHEN TURNING STEERING WHEEL TO THE RIGHT OR LEFT	(a) Oil level low in pump reservoir.	(a) See "Fluid Level."
	(b) Loose pump belts.	(b) See "Group 7—Cooling."
	(c) Oil on pump belt.	(c) Replace the belt and adjust.
	(d) Binding steering linkage.	(d) Lubricate and repair as necessary.
	(e) Engine idle too slow.	(e) See "Fuel Specifications." Group 14.
	(f) Air in the system.	(f) Work the steering wheel from right to left until the air is expelled.
	(g) Power steering pump output low.	(g) See Diagnosis "Hard Steering" correction (e).
	(h) Gear malfunction.	(h) Adjust and repair as outlined under "Hard Steering"—condition and correction (g).
NOISES	(a) Buzzing noise in neutral and stops when the steering wheel is turned.	(a) Noisy pump, make pressure test and repair as necessary. Damaged hydraulic lines or interference of the hoses with components attached to the fender shield. Air in system; work steering wheel from right to left until the air is expelled.

Condition	Possible Cause	Correction
	(b) Chucking noise. Cause as follows: 1. Improper cross shaft adjustment. 2. Improper worm shaft thrust bearing adjustment. 3. Coupling loose on the worm shaft. 4. Worn worm and piston assembly.	(b) Correct as follows: 1. See "Cross Shaft Adjustment." 2. Recondition steering gear. 3. Inspect worm shaft splines for wear. Inspect coupling bolt for tightness, if loose, replace bolt and inspect worm shaft and coupling. 4. Replace worm and piston assembly.
	(c) Metallic clatter or hissing noise.	(c) Replace back pressure valve cushion.
	(d) Knocking condition at the bracket stop when the engine is running.	(d) Rubber stop worn or missing from pump bracket.
	(e) Loose pump belt.	(e) See Group 7 Cooling.
EXCESSIVE STEERING WHEEL FREE-PLAY	(a) Improper gear shaft adjustment. (b) Column support spanner nut loose. (c) Improper worm thrust bearing adjustment. (d) Coupling loose on the worm shaft.	(a) See "Cross Shaft Adjustment." (b) Repair as necessary. (c) Repair as necessary. (d) Inspect wormshaft splines for wear.
LACK OF ASSIST (One Direction)	(a) Oil leaking past worm shaft oil seal ring. (b) Broken or worn ring on worm piston. (c) Piston end plug loose. (d) Reaction seal missing.	(a) Recondition steering gear. (b) Recondition steering gear. (c) Replace the worm and piston assembly. (d) Remove the steering gear and repair as necessary.
LACK OF ASSIST (Both Directions)	(a) Pump belt slipping. (b) Pump output low. (c) Broken or worn ring on worm piston. (d) Piston end plug loose.	(a) See Group 7. (b) Pressure test pump. (c) Recondition steering gear. (d) Replace the worm and piston assembly.

SERVICE PROCEDURES

SERVICE IN VEHICLE

Cross Shaft Adjustment

(1) Disconnect center link from steering gear arm.

(2) Start engine and run at idle speed.

(3) Turn steering wheel gently from one stop to the other, counting number of turns. Then turn wheel back exactly half way, to center position.

(4) Loosen adjusting screw until backlash is evident in steering gear arm. Feel backlash by holding end of steering gear arm between thumb and forefinger with a light grip. Tighten adjusting screw until backlash just disappears.

Continue to tighten to 3/8 to 1/2 turn from this position and tighten lock nut to 50 foot-pounds to maintain this setting.

Valve Body Recondition

(1) Disconnect high pressure and return hoses at the valve body and tie the ends above the reservoir fluid level.

(2) Remove two screws attaching valve body to main gear housing.

(3) Lift valve body upward to disengage from valve lever (Fig. 8).

(4) Remove the two screws attaching control valve body to steering valve body and separate two bodies (Fig. 3).

(5) Remove outlet fitting, washer, spring, valve piston and cushion spring.

(6) Carefully shake out spool valve and inspect for nicks, burrs and scores. Do not remove valve body end plug unless inspection indicates a leak at gasket. **If spool valve or valve body is damaged, replace valve and body assembly.** Small burrs and nicks may be removed with crocus cloth if extreme care is used not to round off sharp edges of valve. The sharp edge is vitally important to operation of this valve.

(7) Clean valve bodies and valve piston thoroughly in clean solvent. Blow out all passages with compressed air. Lubricate pistons and bores with power steering fluid.

(8) Install steering spool valve in valve body so valve lever hole is aligned with lever opening in valve body. Valve must be perfectly free in valve body without sticking or binding (Fig. 3).

(9) Install a new gasket on end plug (if removed). Tighten plug to 25 foot-pounds.

(10) Install piston cushion spring in control valve body being sure it seats in counterbore at bottom of housing. Lubricate piston and insert nose end of pis-

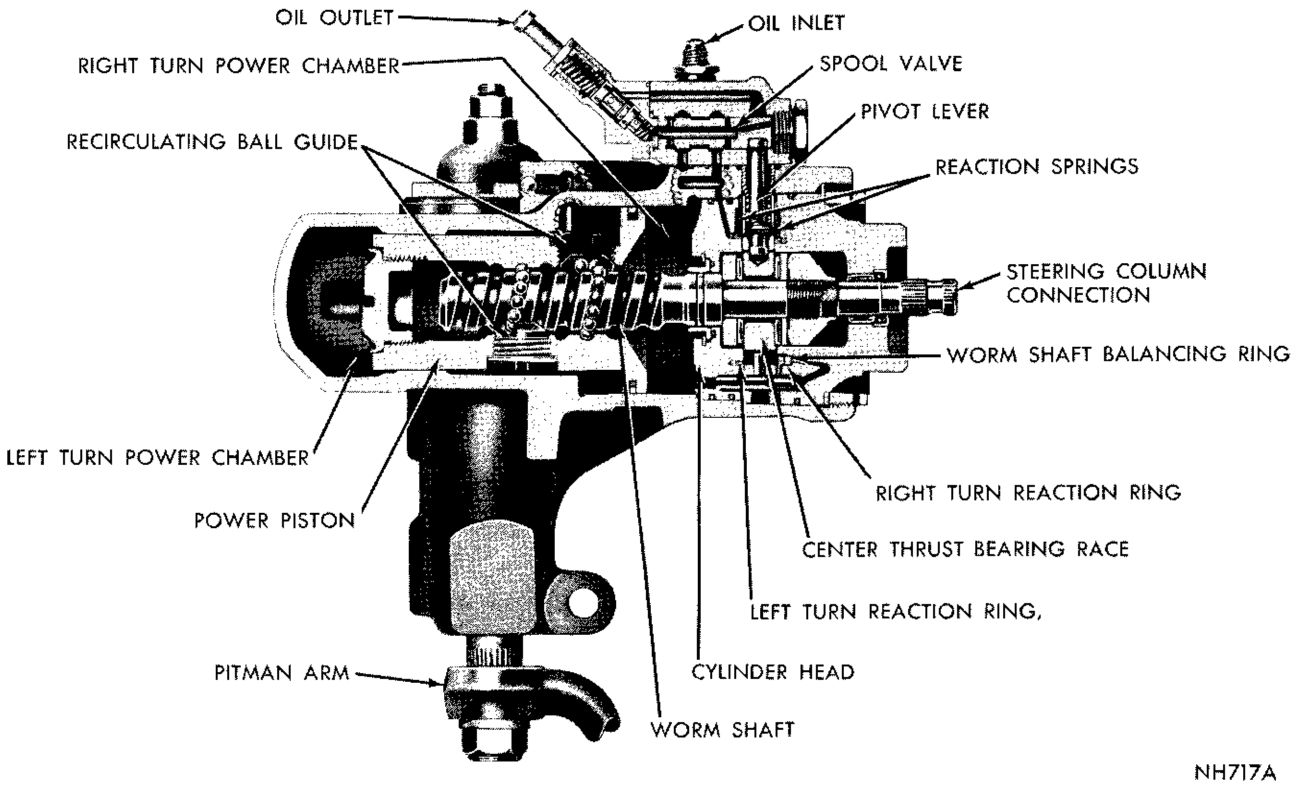


Fig. 1—Power Steering Gear

ton into body bore. Test for smooth operation. Be sure cushion spring is not cocked.

(11) Install spring on top of piston and install copper washer and fitting. Tighten to 20 foot-pounds.

(12) Position two new "O" rings on control valve body and attach to steering valve body. Tighten the two attaching screws to 95 inch-pounds.

(13) If pressure inlet fitting has been removed, tighten fitting to 30 foot-pounds.

(14) Align lever hole in valve spool with lever opening in valve body.

(15) Install on gear housing making sure the valve lever enters hole in valve spool and key section on bottom of valve body nests with the keyway in housing.

CAUTION: These parts should go together with relative ease. Use of force may damage the lever. If they do not go together easily, lift off valve assembly, realign valve spool hole with lever opening in valve body and install valve body.

(16) Install two screws and tighten to 7 foot-pounds to prohibit leakage during valve centering operation.

(17) Connect high pressure and return hoses to valve body.

(18) Start engine. If unit is self-steering tap the valve up or down to correct. **When tapping valve**

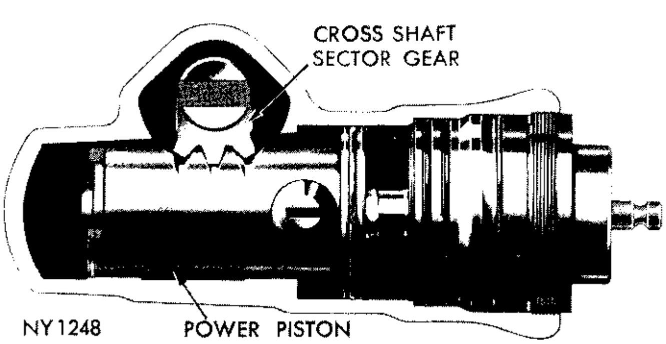


Fig. 2—Steering Gear Housing

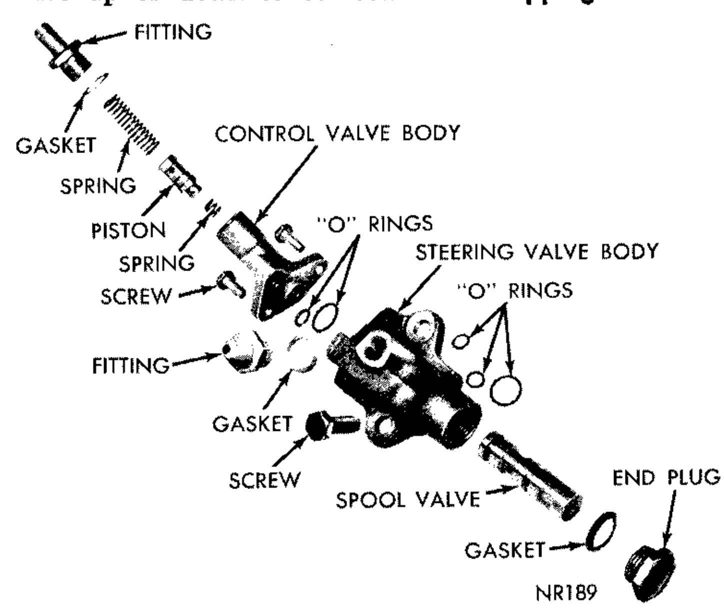


Fig. 3—Valve Body (Disassembled View)

"down," hit valve body on end plug. When tapping valve "up," tap on head of the screw attaching valve body to main valve body. Do not hit control valve body.

(19) Turn steering wheel from stop to stop several times to expel air from system. Refill reservoir as required.

CAUTION: Do not turn hard against ends of travel. This will generate high pressure and may blow out the "O" rings since the valve body screws have not been finally tightened.

(20) With steering wheel in straight ahead center position, start and stop the engine several times, tapping the valve body up or down as required until there is no movement of the steering wheel when the engine is started or stopped.

(21) The valve is now centered. Tighten the two screws attaching valve body to housing to 200 inch-pounds.

CROSS SHAFT OIL SEAL REPLACEMENT

The cross shaft oil seal may be replaced without removing the steering gear from the vehicle.

CAUTION: When replacing oil seal in vehicle, clean the exposed portion of cross shaft to help prolong oil seal life.

(1) Remove steering arm nut.

(2) Disconnect steering gear arm from sector shaft with Tool C-3646 (Fig. 4).

(3) Slide threaded adapter SP-3056 of Tool C-3350-A over end of cross shaft and thread tool nut on cross shaft. Maintain pressure on threaded adapter with tool nut while screwing adapter far enough to engage metal portion of grease retainer. Place the two half rings SP-1932, and Tool retainer ring over both portions of the Tool (Fig. 5). Turn the tool nut counterclockwise to withdraw grease retainer from housing.

(4) Remove oil seal snap ring with snap ring pliers and remove seal back-up washer.

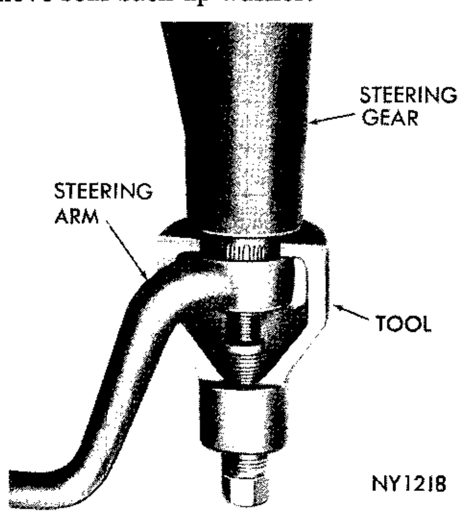


Fig. 4—Removing Steering Gear Arm

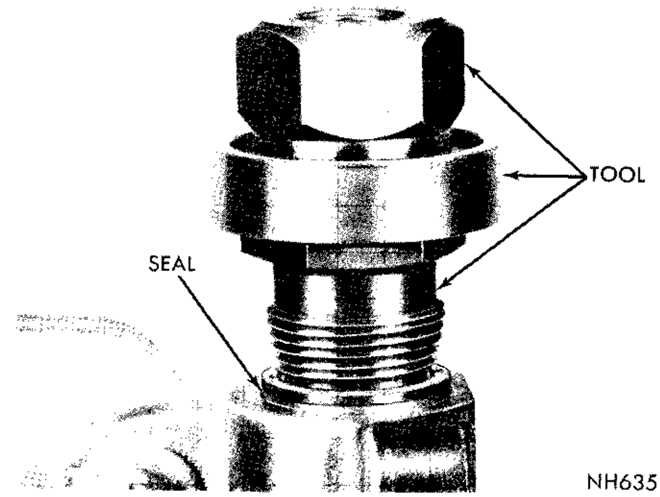


Fig. 5—Removing Gear Shaft Oil Seal

(5) Use Tool C-3350-A in same manner as outlined in step (3) to remove inner seal.

(6) Place new oil seal on flat surface, lip down, lubricate inside diameter with power steering fluid and insert seal protector sleeve SP-1601.

(7) Position seal with protector over cross shaft with lip of seal toward housing.

(8) Place tool adapter SP-3052 with long step of adapter against new seal (Fig. 6). Install tool nut on cross shaft and tighten tool nut until shoulder of tool adapter contacts gear housing.

(9) Remove tool nut, adapter and protector. Install seal back-up washer and oil seal snap ring with sharp edge out.

(10) Position grease retainer in housing bore. Place tool adapter SP-3052 with short step of lip against seal (Fig. 7). Install tool nut on cross shaft and tighten until shoulder of tool adapter contacts gear housing.

(11) Place steering gear and front wheels in straight ahead position and install steering gear arm and nut.

(12) Tighten steering gear arm nut to 180 foot-pounds.

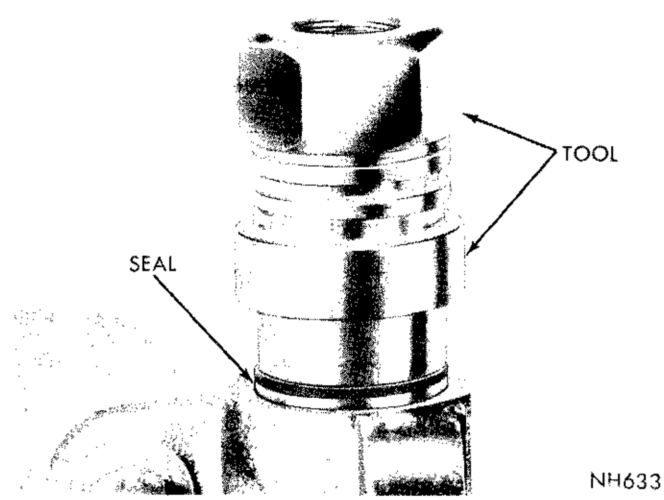


Fig. 6—Installing Gear Shaft Inner Oil Seal

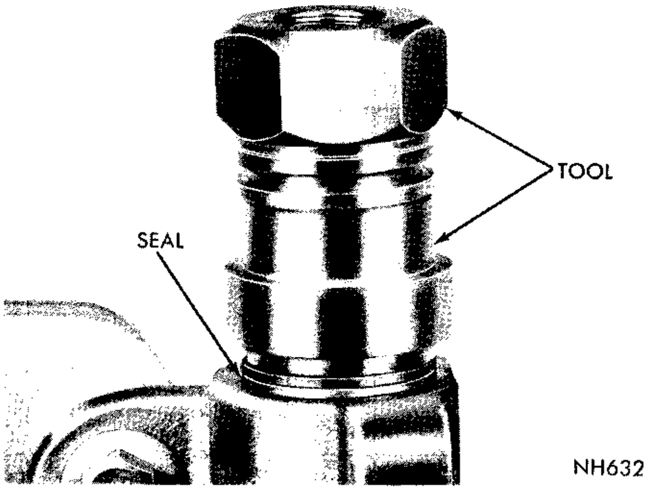


Fig. 7—Installing Gear Shaft Grease Retainer

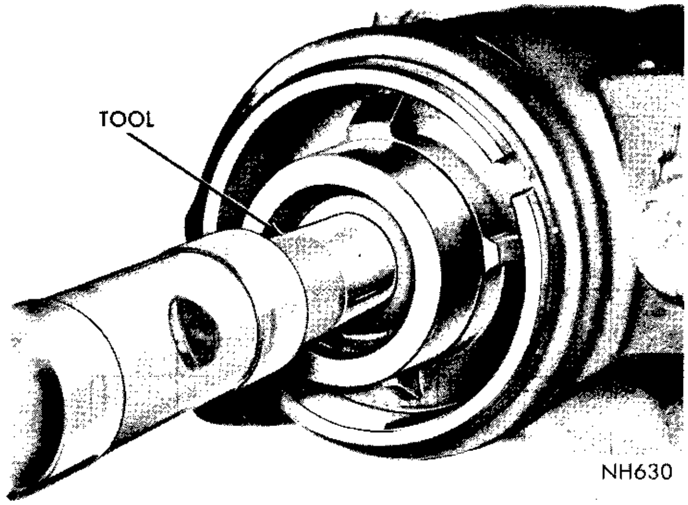


Fig. 9—Installing Worm Shaft Oil Seal

WORM SHAFT OIL SEAL REPLACEMENT

The worm shaft oil seal may be replaced without removing gear from vehicle. Remove steering column as outlined under "Steering Columns" and remove oil seal with Tool C-3638 (Fig. 8). Drive new oil seal in place (lip of seal toward housing) with Tool C-3650 (Fig. 9). Install and align steering column as described in "Steering Columns".

SERVICE OUT OF VEHICLE

WORM SHAFT AND PISTON REPLACEMENT

The master serration on the power steering gear worm shaft spline, used for centering the steering shaft coupling, is machined after the steering gear is completely assembled.

If it should become necessary to replace a power steering gear worm shaft and piston assembly, it will be necessary to file a master serration on the spline of the worm shaft, since the replacement part does not have a master serration machined in the spline.

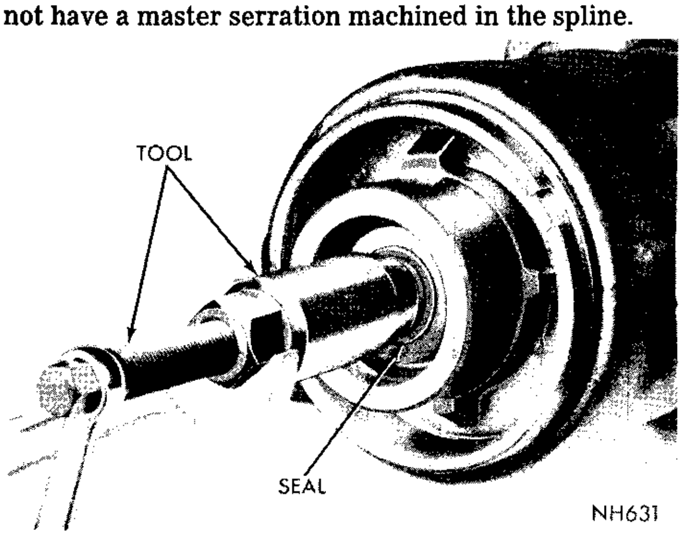


Fig. 8—Removing Worm Shaft Oil Seal

To file a master serration on a worm shaft spline, the power steering gear must be completely assembled and the worm shaft centered in its travel, then with the steering gear in its normal upright position remove one tooth of the spline, at the 12 o'clock position, with a suitable file.

Gear Removal

To avoid damage to the energy absorbing steering column, it is recommended that the steering column be completely detached from floor and instrument panel before steering gear is removed. See Steering Column Section of this Manual for proper removal, alignment and installation procedure.

(1) Remove steering column.

(2) Disconnect power steering pressure and return hoses at centering valve on gear. Tie free ends of hoses above pump level to avoid loss of fluid.

(3) From under vehicle, remove steering arm retaining nut and lock washer. Remove steering arm with tool C-3646.

(4) Remove three gear to frame retaining bolts (use 1/2 inch twelve point socket) remove gear.

Gear Reconditioning

Clean the gear assembly thoroughly in a suitable solvent and install unit in holding fixture Tool C-3323.

(1) Drain steering gear through the pressure and return connections by turning steering wormshaft from one extreme of travel to the other.

(2) Remove valve body attaching screws, and remove valve body and three "O" rings (Fig. 10).

(3) Remove pivot lever and spring. Pry under spherical head with a screw driver (Fig. 11).

CAUTION: Use care not to collapse slotted end of the valve lever as this will destroy the bearing tolerances of the spherical head.

(4) Remove gear shaft grease retainer and oil seal as outlined in "Gear Shaft Oil Seal Replacement."

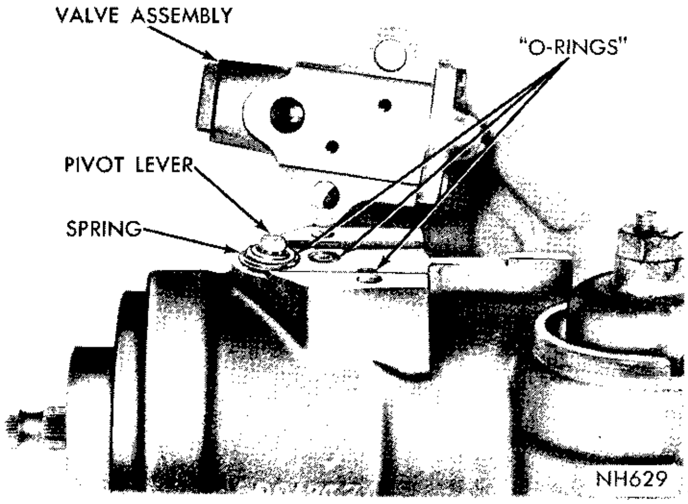


Fig. 10—Removing Valve Body Assembly

(5) Loosen gear shaft adjusting screw locknut and remove gear shaft cover spanner nut with Tool C-3988.

(6) Rotate wormshaft to position gear shaft sector teeth at center of piston travel. Loosen steering power train retaining nut with Tool C-3989.

(7) Position holding Tool C-3323 so sector shaft is in a horizontal position. Place Tool C-3875 on threaded end of gear shaft and slide tool into housing until both tool and shaft are engaged with bearings.

(8) Turn wormshaft to full left turn position to compress power train parts. Remove power train retaining nut with Tool C-3989. Remove housing head tang washer.

(9) While holding power train firmly compressed, pry on piston teeth with a screw driver using gear shaft as a fulcrum and remove complete power train (Fig. 12).

It is important that cylinder head, center race and spacer assembly and housing head be maintained in close contact with each other. This will eliminate the possibility of reaction rings becoming disengaged from their grooves in both cylinder head and housing head. It will prohibit center spacer from becoming separated from center race and becoming "cocked" in housing which may make it impossible to remove power train without damaging the spacer, the housing, or both.

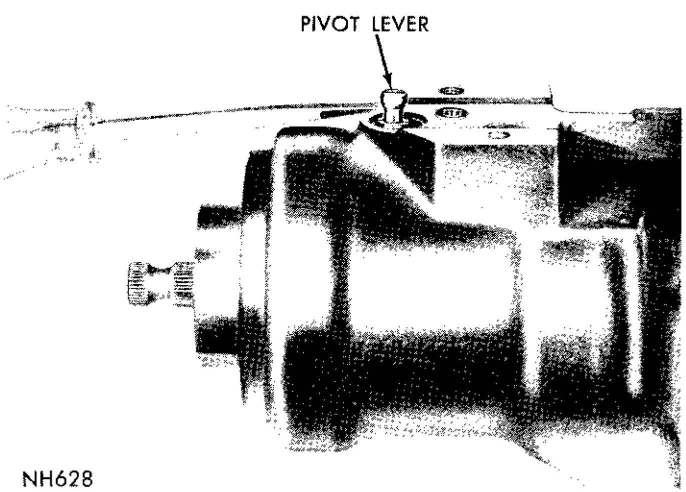


Fig. 11—Removing Pivot Lever

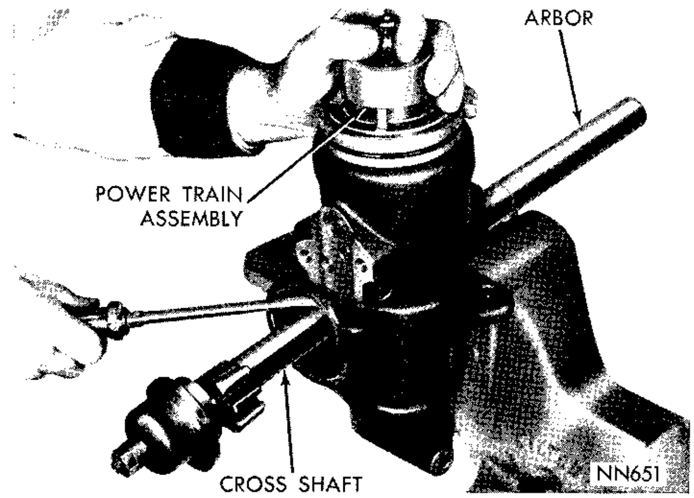


Fig. 12—Removing Power Train

(10) Place power train vertically in a vise equipped with soft jaws to avoid damaging piston assembly. See Fig. 13 for parts identification.

The 33 worm bearing needle rollers will fall out when housing head is removed from wormshaft. Use arbor Tool C-3929 (Fig. 14) to hold rollers in position when housing head is removed.

(11) Raise housing head until wormshaft oil seal just clears top of wormshaft and position arbor tool C-3929 on top of wormshaft and into oil seal. With arbor in position pull up on housing head until arbor is positioned in bearing. Remove housing head and arbor.

To reinstall rollers, if they should become dislodged, retain rollers in the cage with wheel bearing lubricant.

CAUTION: If the wormshaft oil seal is to be replaced, perform the operation with the housing head assembled in the steering gear housing.

(12) Remove large "O" ring from groove in housing head.

(13) Remove reaction seal from groove in face of housing head with air pressure directed into ferrule chamber (Fig. 15).

(14) Inspect all grooves for burrs. Make sure passage from ferrule chamber to upper reaction chamber is unobstructed.

(15) Remove reaction spring, reaction ring, worm balancing ring and spacer.

(16) Hold wormshaft from turning, then turn nut with sufficient force to release staked portions from knurled section and remove nut.

Wire brush the knurled sections to remove the

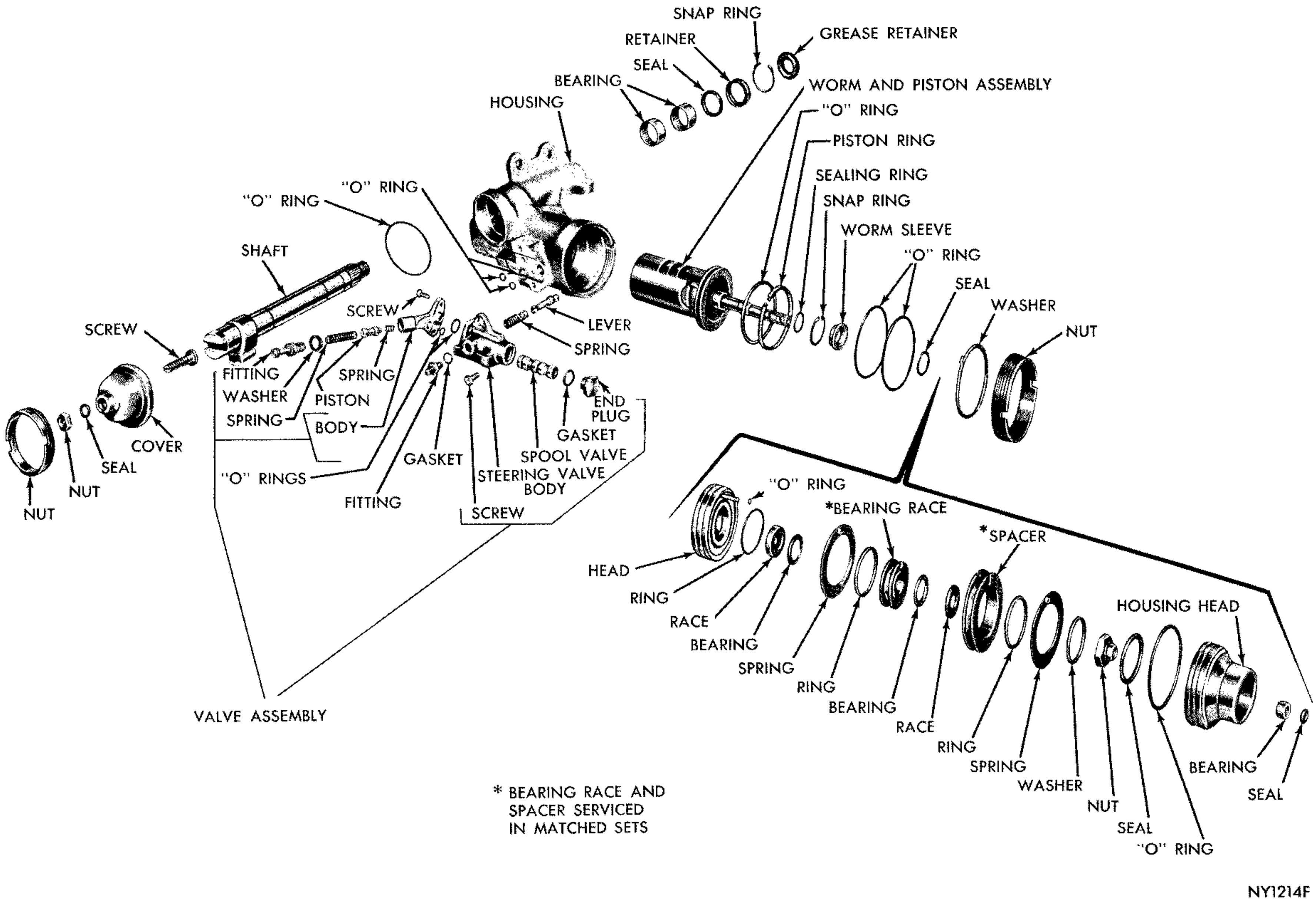


Fig. 13—Steering Gear Disassembled View

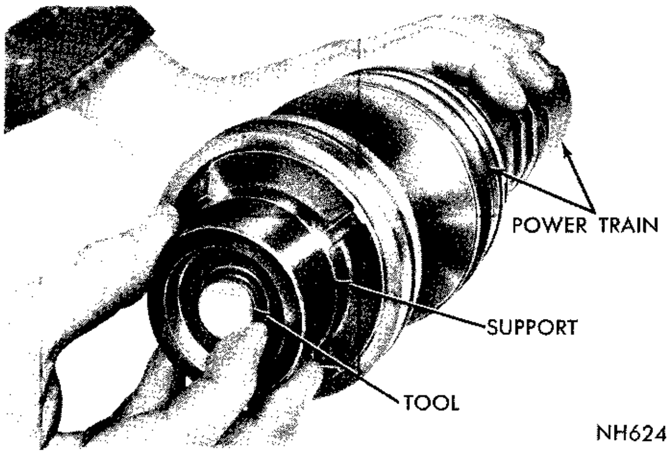


Fig. 14—Retaining Bearing Rollers with Arbor Tool

chips, then blow out the nut and wormshaft to remove any metal particles.

(17) Remove upper thrust bearing race (thin) and upper thrust bearing.

(18) Remove center bearing race.

(19) Remove lower thrust bearing and lower thrust bearing race (thick).

(20) Remove lower reaction ring and reaction spring.

(21) Remove cylinder head assembly.

(22) Remove two "O" rings in two outer grooves in cylinder head.

(23) Remove reaction "O" ring from groove in face of cylinder head with air pressure directed into oil hole located between two "O" ring grooves (Fig. 16).

(24) Remove snap ring, sleeve and rectangular oil seal ring from cylinder head counterbore (Fig. 17).

(25) Test operation of wormshaft. The torque required to rotate wormshaft throughout its travel in or out of piston must not exceed 2 inch-pounds with a 15 pound side load. The worm should run in and out of piston under its own weight.

The worm and piston is serviced as a complete assembly and should not be disassembled.

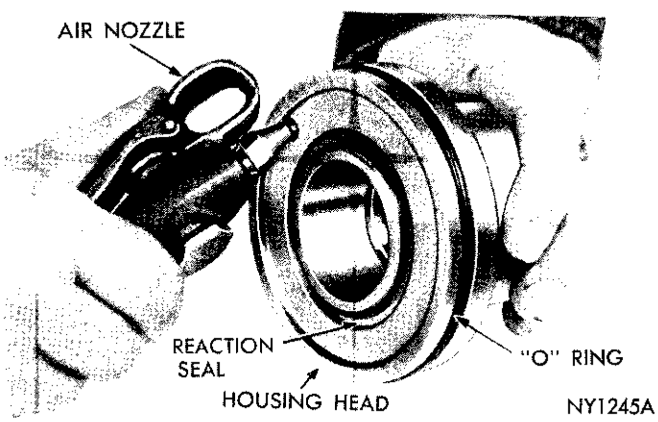


Fig. 15—Removing Reaction Seal From Worm Shaft Support

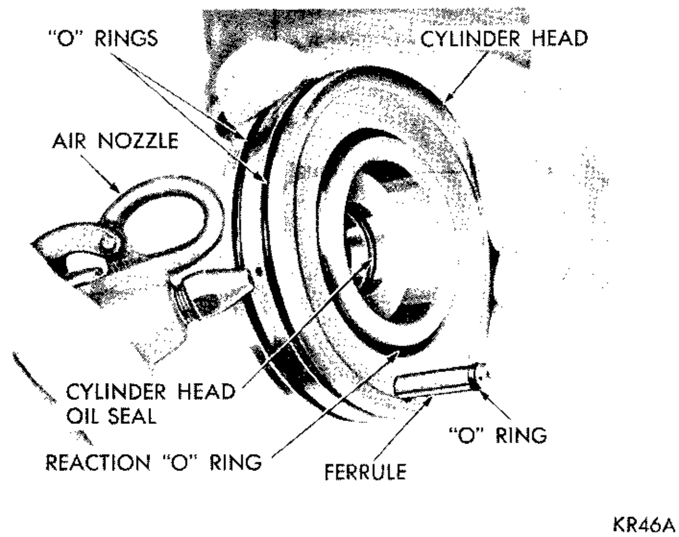


Fig. 16—Removing Reaction Seal from Cylinder Head

(26) Test for excessive side play with the piston held firmly in a vise with the rack teeth up, and the worm in its approximate center of travel. The vertical side play measured at a point 2-5/16 inches from the piston flange should not exceed .008 inch when the end of the worm is lifted with a force of 1 pound (Fig. 18).

(27) Inspect condition of rubber sealing ring located under cast iron ring and replace if necessary. Install cast iron piston ring as follows:

(a) Slide a new piston ring in place in piston groove, then place piston and ring assembly in Tool C-3676 with lower part of piston and ring resting on land of tool (Fig. 19).

(b) Press down on piston to seat ring in piston groove, forcing open ends of ring out for ease of locking the ring.

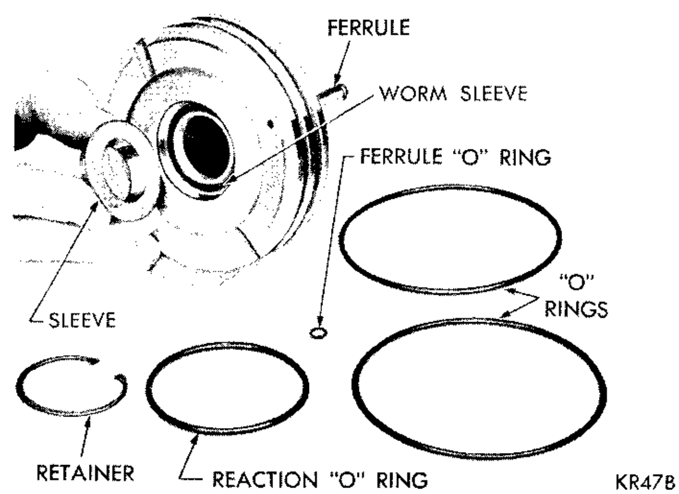


Fig. 17—Removing Cylinder Head Oil Seal

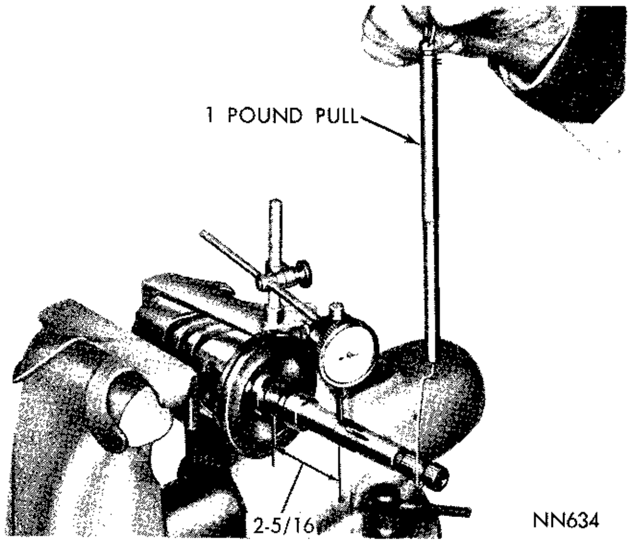


Fig. 18—Checking Worm Shaft Side Play

(28) Place piston assembly in a vertical position (wormshaft up) in a vise equipped with soft jaws.

(29) Inspect cylinder head ferrule oil passage for obstructions and the lands for burrs, then lubricate the two large "O" rings and install them in the cylinder head grooves (Fig. 13).

(30) Install worm sleeve seal, sleeve and snap ring (if removed). Make sure snap ring is seated in groove.

(31) Install lower reaction seal (O-ring) in cylinder head groove.

(32) Slide cylinder head assembly (ferrule up) on wormshaft. Check wormshaft seal ring making sure gap is closed to avoid damaging the ring as the cylinder head moves against piston flange.

(33) Lubricate with power steering fluid, and install parts in the following order:

(a) Lower thrust bearing race (thick).

(b) Lower thrust bearing.

(c) Lower reaction spring (with the small hole over the ferrule).

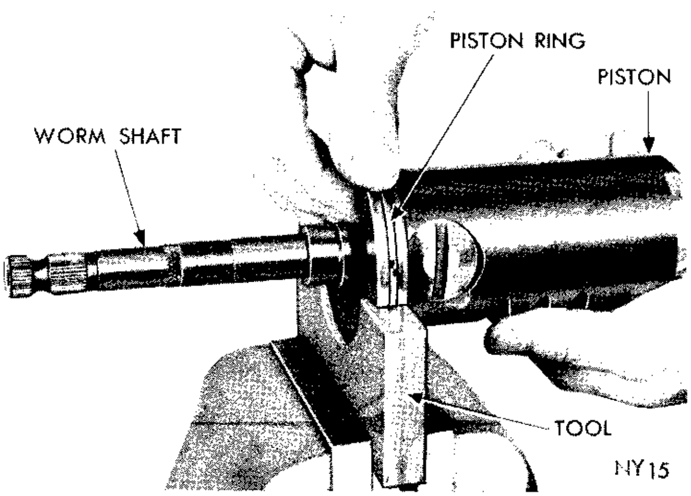


Fig. 19—Installing Piston Ring

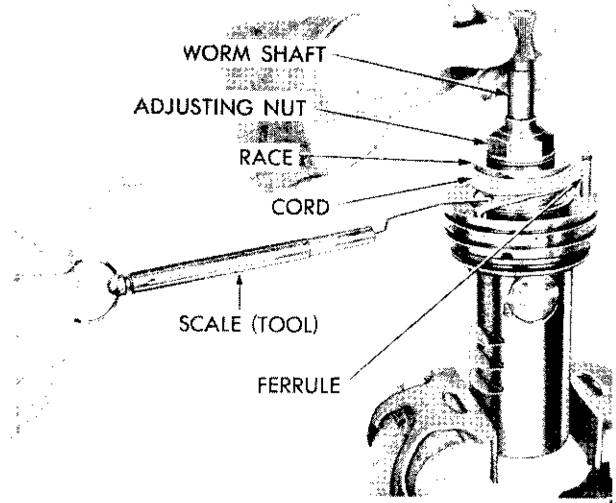


Fig. 20—Checking Center Bearing Preload

(d) Lower reaction ring (flange up so ring protrudes through reaction spring and contacts the reaction "O" ring in the cylinder head).

(e) Center bearing race.

(f) Upper thrust bearing.

(g) Upper thrust bearing race (thin).

(h) Start wormshaft thrust bearing adjusting nut (do not tighten).

(34) Turn wormshaft clockwise one-half turn. Hold wormshaft in this position with splined nut, Tool C-3637 and socket wrench, and hold in this position thru items 35 and 36, then tighten nut to 50 foot-pounds to prestretch wormshaft threads.

(35) Loosen adjusting nut. Place several rounds of cord around center bearing race (Fig. 20). Make a loop in one end of cord and hook loop of a distributor breaker arm spring scale Tool MTU-36 in cord loop. Pulling cord will cause bearing race to rotate. Retighten worm bearing adjusting nut while pulling on cord with scale. When adjusting nut is tightened properly, reading on the scale should be 16 to 24 ounces (20 ounces preferred while the race is turning).

(36) Stake upper part of wormshaft adjusting nut into knurled area of shaft.

(a) Hold a 1/4 inch flat end punch on center line of wormshaft end at a slight angle to nut flange (Fig. 21).

(b) Strike punch a sharp blow with a hammer and test preload.

If adjusting nut moved during staking operation, it can be corrected by striking the nut a glancing blow in the direction required to regain proper preload.

(c) After retesting for proper preload, stake the nut at three more locations 90° apart around upper part of the nut.

(d) To test total staking, apply 20 foot-pounds of

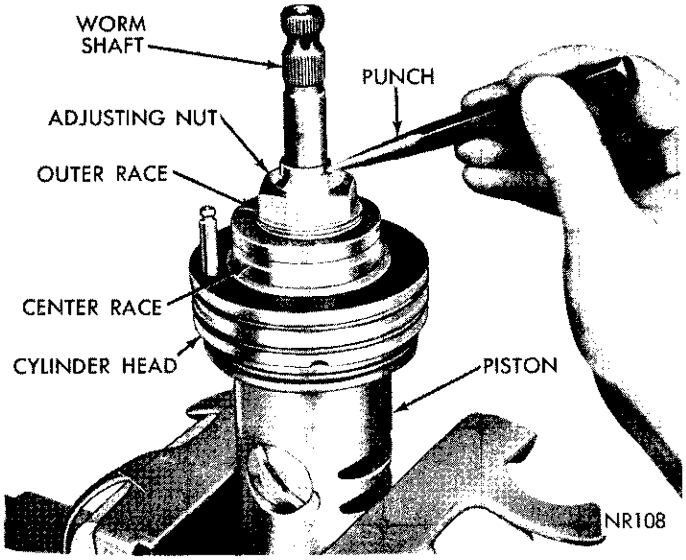


Fig. 21—Staking Worm Shaft Bearing Adjusting Nut

torque in each direction. If nut does not move, staking operation is satisfactory.

Retest wormshaft preload to determine that adjustment remains constant after nut is securely locked.

(37) Position spacer assembly over center race, engaging dowel pin of spacer in slot of race, and slot of spacer entered over cylinder head ferrule.

This will align the valve pivot lever hole in the center bearing race with the valve pivot lever hole in center bearing spacer assembly. The small "O" ring for the ferrule groove should not be installed until after upper reaction spring and spacer have been installed.

(38) Install upper reaction ring on center race and spacer with flange down against spacer.

(39) Install upper reaction spring over reaction ring with cylinder head ferrule through hole in reaction spring.

(40) Install worm balancing ring (without flange) inside upper reaction ring.

(41) Lubricate ferrule "O" ring with Petrolatum and install in groove on cylinder head ferrule.

(42) If oil seal was removed from housing head, install a new seal with Tool C-3650 (Fig. 7). See "Wormshaft Oil Seal Replacement." With lip of seal toward bearing, drive seal until tool bottoms on the support.

(43) Lubricate and install reaction seal in groove in face of housing head with flat side of seal out (Fig. 22 and 23). Install "O" ring in groove on housing head.

(44) Slide housing head and arbor, Tool C-3929 over the wormshaft carefully engaging cylinder head ferrule and "O" ring and making sure reaction rings enter circular groove in housing head. The power train is now ready for installation in housing.

(45) It is generally not necessary to remove sector shaft cover. However, this may be easily accomplished

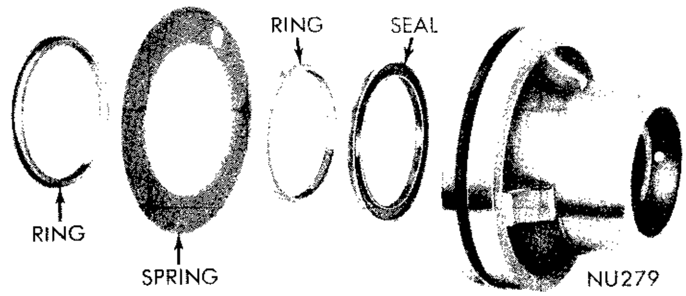


Fig. 22—Reaction Seal Ring In Shaft Support

by removing the adjusting screw. While holding the cover, turn adjusting screw clockwise until the shaft becomes disengaged from cover. The adjusting screw will now slide out of the "T" slot in end of shaft.

Gear Shaft Assembly

(46) To remove gear shaft needle bearings from housing, remove grease retainer, oil seal snap ring with pliers Tool C-3915 and remove seal back-up washer.

(47) Insert Tool C-3875 in steering housing; place housing in a press and press out bearings and oil seal.

(48) To install gear shaft lower needle bearing, place bearing on end of Tool C-3875. Press bearing into steering gear housing 1/32 inch below end of bearing bore to provide space for oil seal, back-up washer and snap ring and cross shaft grease retainer. See "Cross Shaft Oil Seal Replacement."

CAUTION: The arbor adapter ring must be used with C-3875 Remover and Installer Arbor, otherwise the bearings may be crushed.

(49) To install upper needle bearing, place bearing on end of Tool C-3875. Press bearing into housing flush with end surface of bore.

(50) Insert gear shaft and adjusting screw into cover and using a screwdriver through the threaded hole in cover, turn screw counterclockwise to pull shaft completely into the cover. Lubricate a new

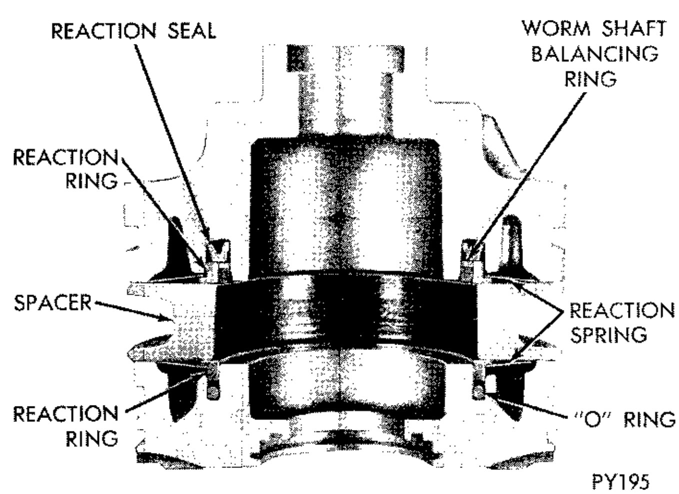


Fig. 23—Reaction Rings Installed (Cut-Away View)

square section seal ring and slide it over adjusting screw into position on top of cover. Install adjusting screw lock nut, but do not tighten at this time.

(51) Lubricate cross shaft cover "O" ring with wheel bearing grease and install on shelf of gear housing.

(52) Lubricate power train bore of the housing with power steering fluid, and carefully install power train assembly. To keep reaction rings from coming out of their grooves keep worm turned fully counterclockwise. The piston teeth must be facing to the right and the valve lever hole in center race and spacer must be in the "up" position.

CAUTION: Make sure the cylinder head is bottomed on the housing shoulder (Figs. 1 and 2).

(53) Align valve lever hole in center bearing race and spacer exactly with the valve lever hole in the gear housing. Turn the housing head by tapping on a reinforcing rib with hammer and drift. Use Tool C-3649 to maintain alignment (Fig. 24). **The aligning tool should not be removed until the spanner nut is securely tightened.**

(54) Install housing head tang washer to index with groove in housing. Install spanner nut and tighten to 110 to 200 foot-pounds with Tool C-3634.

(55) Set the power piston at the center of travel and install gear shaft and cover assembly so that sector teeth index with piston rack teeth. Make sure cover "O" ring is properly installed on shelf in housing.

(56) Install cover spanner nut and tighten 110 to 200 foot-pounds with Tool C-3988.

(57) Install valve pivot lever (double bearing end first) (Fig. 25) into center race and spacer through hole in steering housing so that slots in valve lever are parallel to wormshaft in order to engage the anti-rotation pin in center race. Install valve pivot lever spring small end first.

Turn worm until the piston bottoms in both directions and observe the action of the lever. It must be in the center of the hole and snap back to its center

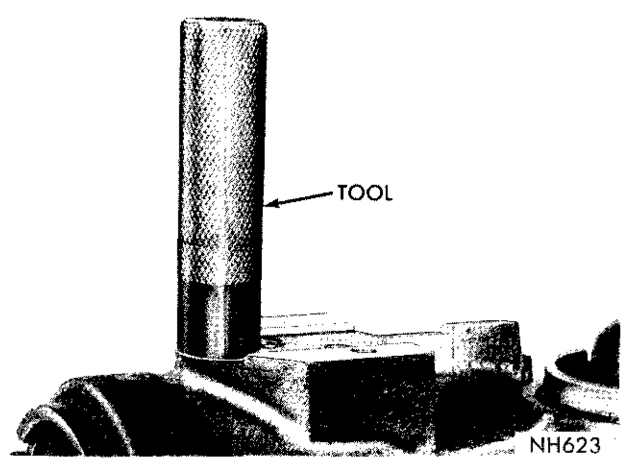


Fig. 24—Aligning Center Bearing Spacer with Steering Valve

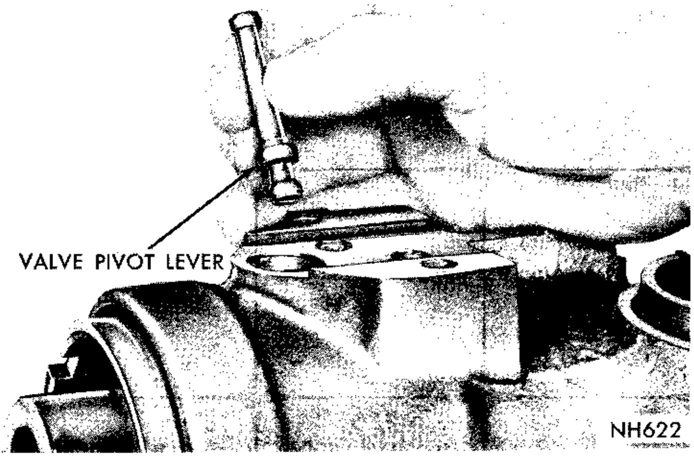


Fig. 25—Installing Valve Pivot Lever

position when the worm torque is relieved.

(58) Install valve body on housing making sure valve pivot lever enters hole in valve spool (Fig. 1). Be sure "O" ring seals are in place. Tighten valve mounting screws to 7 foot-pounds.

(59) Install new gear shaft seal followed by seal back-up washer and snap ring and a new grease retainer as outlined under "Gear Shaft Oil Seal Replacement."

Final Tests and Adjustments

(1) Remove oil reservoir cover and fill reservoir with Power Steering Fluid, Part No. 2084329 or equivalent, to the level mark.

(2) Connect test hoses with proper adapters to hydraulic pump on vehicle with pressure gauge C-3309B installed between pump and steering gear.

(3) Start the engine.

(4) Center valve until unit is not self-steering. Tap on the head of valve body attaching screws to move valve body up on steering housing, and tap on end plug to move valve body down on housing. Expel all air from the unit by turning wormshaft back and forth through the travel several times.

(5) Refill reservoir before proceeding with following tests and adjustments on the bench.

(a) With steering gear on center, tighten gear shaft adjusting screw until backlash in steering gear arm just disappears. See "Gear Shaft Adjustment."

If power train has been removed, tighten 1-1/4 turns from this position and while holding adjusting screw in this position, tighten lock nut (Fig. 26).

This is a temporary adjustment to bring piston rack and sector teeth in full alignment.

(b) Operate unit through full travel several times to align piston rack and sector teeth.

(c) With gear on center, readjust sector shaft backlash. This will require loosening adjusting screw until backlash is evident. Then retighten adjusting screw until backlash just disappears. Continue to

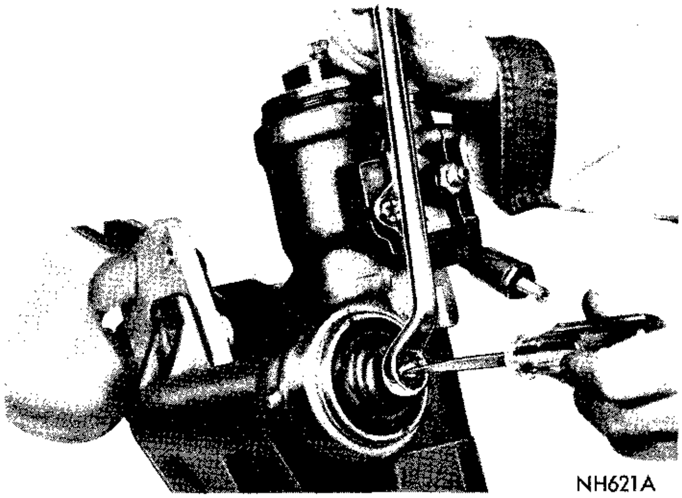


Fig. 26—Adjusting Steering Gear Mesh

tighten for 3/8 to 1/2 turn from this position and tighten lock nut to 50 foot-pounds to maintain this setting.

(d) Starting from a point at least one full turn of the wormshaft either side of center, torque at the sector 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.

(e) Adjust the torque to be equal in both directions by readjusting the valve.

Tighten valve body adjusting screw to 200 inch-pounds.

(f) With gear at or near full turn in either direction, attempt to return unit to center by applying a torque wrench at steering gear shaft. Hold wormshaft until cross shaft torque builds up to 50 foot-pounds. Release wormshaft and maintain a constant steady pull at 2 rpm on the gear shaft. If cross shaft torque does not drop to 20 foot-pounds maximum as the unit passes through center, check for too much interior drag; binding valve lever, binding spool valve, or tight cross shaft adjustment.

(6) With unit under power, but with no load, torque required to rotate wormshaft through an included angle of 180° (90° either side of center) at 6 rpm (or one revolution every ten seconds) shall be 6-10 inch-pounds. Disconnect test equipment and mounting fixture and install unit in vehicle.

Gear Installation

(1) From under vehicle, position steering gear on mounting bracket. Install three mounting bolts and tighten to 100 foot-pounds.

(2) Center the steering gear wormshaft. Wormshaft master spline should be in 12 o'clock position. With front wheels in straight ahead position, install steering arm, lock washer and nut. Tighten nut to 180 foot pounds.

(3) Connect pressure and return hoses to steering valve. (See Hose Installation).

(4) With steering wheel centered, lower steering column till column shaft indexes with wormshaft master spline. Master spline is indicated on lower coupling flange by a 1/4 inch hole next to roll pin hole.

(5) Install coupling roll pin.

(6) Install and adjust steering column as outlined in "Column" section of this manual.

Hose Installation

When either hose is reinstalled or replaced, it is essential that the sponge sleeve hose protector be installed as follows:

(1) Avoid sharp bends in a large section of hose (about 10 inch diameter is recommended).

(2) Hose must remain at least 1 inch away from all pulleys, battery case and brake lines and 2 inches away from exhaust manifold.

(3) Sponge sleeves must be installed where hose contacts composition or metal.

(4) Tighten pump end hose fitting to 24 foot-pounds and gear end fitting to 160 inch-pounds.

POWER STEERING PUMPS

INDEX

GENERAL INFORMATION

The .94 pump and the 1.06 pump are used on Chrysler models. Imperial models use only the 1.06 pump.

The .94 pump can be identified by the long oval shape of the filler neck and a drive pulley secured to the drive shaft with a large nut. (Fig. 1). Rectangular pumping vanes carried by a shaft driven rotor, move the fluid from the intake to the pressure cavities of the cam ring. As the rotor begins to rotate, centrifugal force throws the vanes against the inside surface of the cam ring to pick up residual oil which is forced into the high pressure area. As more oil is picked up by the vanes, oil is forced into the cavities of the thrust plate, through two cross-over holes in the cam ring and pressure plate which empty into the high pressure area between the pressure plate and the housing end plate.

Filling the high pressure area causes oil to flow under the vanes in the slots of the rotor forcing the vanes to follow the inside oval surface of the cam ring. As the vanes rotate to the small area of the cam ring, oil is forced out from between the vanes.

The 1.06 pump can be identified by a 3/8 inch threaded hole in the pulley end of the drive shaft (Fig. 2). The operation of the 1.06 pump is similar to the vane type pump but differs in appearance and design. The rotor is star shaped and upon rotation, propells 12 steel rollers against the inside surface of the cam ring. As the rollers follow the eccentric pattern of the cam ring, oil is drawn into the inlet ports and exhausted through the discharge ports as the rollers are forced into vee shaped cavities of the rotor.

A flow control valve permits a regulated amount of oil to return to the intake side of the pump when excess output is generated during high speed operation. This reduces the power requirements to drive the pump and minimizes temperature build-up.

The 1.06 pump incorporates a two-stage flow control valve. High pressure oil passes through two orifices in a metering insert. (The metering insert is located in an oil passage sealed with a 1/8 inch pipe plug.) At low speed, approximately 2.7 gpm is passed to the gear. As speed increases and the valve moves, excess oil is by-passed to inlet and the valve acts to block flow through one orifice. This drops flow to the gear to approximately 1.6 gpm at high speeds. Two-stage flow control provides high flow at low speed for improved steering, while reducing the flow at high speed to reduce the power steering system oil temperature.

When steering conditions exceed maximum pressure requirements, such as turning the wheels against the stops, the pressure built up in the steering gear also exerts pressure on the spring end of the flow control valve. This end of the valve houses the pressure relief valve on both the .94 and 1.06 models. High pressure lifts the relief valve ball from its seat and allows oil to flow through a trigger orifice located in the outlet fitting of the .94 pump and in the front land of the flow control valve of the 1.06 pump. This reduces pressure on the spring end of the valve which then opens and allows the oil to return to the intake side of the pump. This action limits maximum pressure output of the pump to a safe level.

Under normal operating conditions, the pressure requirements of the pump are below maximum, causing the pressure relief ball and the flow control valve to remain closed.

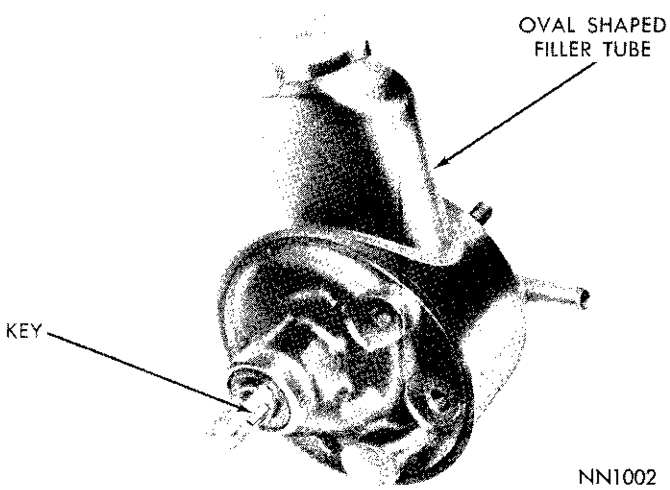


Fig. 1—.94 Pump

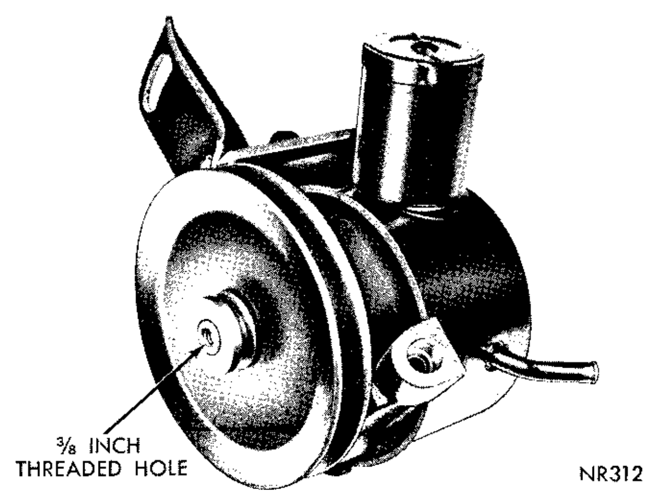


Fig. 2—1.06 Pump

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
INTERMITTENT OR NO ASSIST	(a) Loose belt.	(a) Tighten belt.
	(b) Low fluid level.	(b) Inspect and correct fluid level.
	(c) Low pump efficiency.	(c) Service as necessary.
	*(d) Pump seizure.	(d) Replace pump.
	(e) Flow control bore plug ring not in place.	(e) Replace snap ring. Inspect groove for depth.
	(f) Flow control valve sticking.	(f) Service flow control valve as necessary.
	(g) Wrong pressure-relief valve setting.	(g) Replace flow control valve—.94 pump. Replace pump partial assembly—1.06 pump.
	(h) Damaged "O" ring on flow control bore plug.	(h) Replace "O" ring.
	(i) Loose plug in end of flow control valve.	(i) Tighten plug. See "Tightening Reference".
	(j) Distorted pressure plate.	(j) Replace pressure plate—.94 pump.
	*(k) Cam ring badly worn.	(k) Replace cam ring—.94 pump.
	(l) Vanes improperly installed.	(l) Install vanes properly—.94 pump.
	(m) Plugged metering orifice(s) or trigger orifice.	(m) Disassemble pump and clean.
	(n) Damaged or leaky pressure relief valve seat (plug) or ball.	(n) Replace seat and ball—1.06 pump; replace flow control valve—.94 pump.
	(o) Damaged housing bore "O" ring(s) or pressure plate "O" ring.	(o) Replace "O" rings.
	*(p) Scored pressure plate, thrust plate, cam, rotor or rollers.	(p) Replace rotating group package—1.06 pump.
NOISY PUMP	(a) Low fluid level.	(a) Inspect and correct fluid level.
	(b) Belt noise.	(b) Inspect for pulley alignment, paint or grease on pulley and correct.
	(c) Belt loose (causing pump rattling noise).	(c) Adjust belt. See "Cooling System" Group 7—1.06 pump.
	(d) Foreign material blocking pump housing oil inlet hole.	(d) Remove reservoir, visually check inlet oil hole and service as necessary.
	(e) Vanes improperly installed.	(e) Install properly or replace if necessary—.94 pump.
	(f) Vanes sticking in rotor.	(f) Recondition pump and correct cause —.94 pump.
	(g) Faulty flow control valve.	(g) Replace flow control valve—.94 pump.
	*(h) Pressure plate, thrust plate or rotor scored.	(h) Replace badly scored part or lap in if lightly scored—.94 pump.
	*(i) Pressure plate, thrust plate, cam, rotor or rollers scored.	(i) Replace rotating group package—1.06 pump.
	(j) Pump hose interference with sheet metal or brake lines.	(j) Reroute hoses.
	(k) Pulley loose.	(k) Retorque pulley retaining nut .94 pump.
PUMP VIBRATION	(a) Pump hose interference with sheet metal or brake lines.	(a) Reroute hoses.
	(b) Faulty or loose belt.	(b) Replace or adjust belt as necessary. See "Cooling System," Group 7.
	(c) Pulley loose or out of round.	(c) Replace pulley.
	(d) Crankshaft pulley loose or damaged.	(d) Replace crankshaft pulley.
PUMP LEAKS	(a) Cap or filler neck leaks.	(a) Correct fluid level. (Fluid Level Too High).
	(b) Reservoir solder joints leak.	(b) Resolder or replace reservoir as necessary.
	(c) Reservoir "O" ring leaking.	(c) Inspect sealing area of reservoir. Replace "O" ring or reservoir as necessary.
	(d) Shaft seal leaking.	(d) Replace seal.

Condition	Possible Cause	Correction
	(e) Loose rear bracket bolts.	(e) Tighten bolts. See "Tightening Reference".
	(f) Loose or faulty pressure hose ferrule.	(f) Tighten fitting to 24 foot-pounds, 1.06 pump—20 foot-pounds, .94 pump, or replace as necessary.
	(g) Damaged pressure hose "O" ring.	(g) Replace "O" ring—1.06 pump.
	(h) Housing ball plug leaking.	(h) Replace pump partial assembly. Valve—1.06 pump.
	(i) Rear bolt holes stripped or casting cracked.	(i) Repair, if possible, or replace pump.

*Clean and flush high pressure and return hoses. Recondition gear valve body (see "Power Steering Gear")

SERVICE PROCEDURES

Checking Fluid Level

1.06 Model

(1) Start engine, turn steering wheel from stop to stop several times to expel air from system, then shut off engine.

(2) Wipe reservoir filler cap free of dirt, remove cap and visually inspect oil level in reservoir.

Engine Hot—Oil level should be one-half way up in filler neck. **Engine at room temperature**—Oil should just cover filler neck/reservoir joint (1-3/4 inches to 2 inches from top of filler neck.

.94 Model

The oil level in the .94 pump should be checked **only** after pump has reached normal operating temperature. A dip stick, built into the reservoir cap, indicates "FULL" or "ADD". Fluid level should be at the "FULL" mark when hot.

Replenish the fluid, if necessary, in all pumps with Power Steering Fluid, Part No. 2084329 or equivalent.

Pressure Test—All Models

(1) Inspect fluid level in reservoir. Fill to correct level indicated on dip stick if necessary.

(2) Measure belt tension and correct if necessary. See "Cooling System," Group 7.

(3) Disconnect the high pressure hose at the steering gear and connect the free end of the hose to the gauge side of C-3309D. Connect a second pressure hose from the valve side of C-3309D to the steering gear. The valve must be installed on the outlet side of the gauge. (Fig. 3).

(4) Insert thermometer in fluid reservoir, start engine and warm up fluid to a temperature between 150 and 170 degrees Fahrenheit.

Turning the wheels from stop to stop will aid in warming the fluid. Do not hold wheels against stop for extended period as undue internal pump overheating will result.

(5) With engine idling at 650 RPM, and gauge valve open, note pressure while turning steering wheel from one extreme position to the other. Turn the wheels all the way to one or the other stop momentarily and note the maximum pressure. A pressure of at least the minimum pressure shown for the particular pump in "Specifications" should be read.

(6) If pressure is under the specified rating, the steering system is not functioning properly. To determine which unit is faulty, momentarily close the pressure gauge valve and note maximum pressure registered on gauge. If the pressure reads less than the maximum pressure shown for the particular pump in "Specifications" the pump is faulty and should be reconditioned. Should pressure reading in step 5 read low but not in step 6, the steering gear is faulty.

When removing test equipment, be sure to reinstall hoses in original position to avoid interference with engine or sheet metal.

Pump Removal—All Models

(1) Loosen pump mounting and locking bolts and remove belt.

(2) Disconnect both hoses at pump.

(3) Remove mounting and locking bolts and remove pump and brackets.

PUMP INSTALLATION—All Models

(1) Position pump on engine and install mounting and locking bolts.

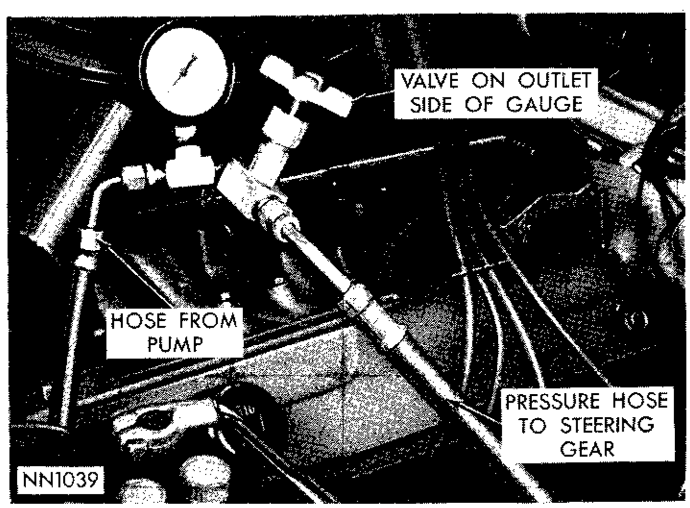


Fig. 3—Pressure Test

(2) Install drive belt and adjust. See "Cooling System—Group 7". Tighten mounting bolts to 30 foot-pounds.

(3) Connect pressure and return hoses. (Use new pressure hose "O" ring—1.06 pump only). See "Hose Installation".

(4) Fill pump reservoir to top of filler neck with Power Steering Fluid, Part No. 2084329 or equivalent.

(5) Start engine and turn steering wheel several times from stop to stop to bleed the system. Stop engine, check oil level and correct if necessary. See "Checking Fluid Level".

HOSE INSTALLATION—All Models

When either hose is reinstalled or replaced, the following points are essential:

(1) Route hoses in same position they were in before removal.

(2) Route hoses smoothly, avoiding sharp bends and kinking.

(3) When properly installed, the pressure hose tube ends should rest against the outside of the pump reservoir neck on one end, and the outside of the gear valve body on the other end. (Fig. 4).

(4) Tighten pump end hose fitting to 24 foot-pounds and gear end fitting to 160 inch-pounds.

(5) Hoses must remain at least one inch away from all pulleys, battery case and brake lines, and two inches away from exhaust manifold.

(6) When used, protective sponge sleeves must be properly positioned to prevent hose contact with other components in engine compartment.

(7) After hoses are installed, check for leaks while system is being bled. See "Pump Installation".

OIL SEAL REPLACEMENT

.94 Model

To service the drive shaft oil seal, it is necessary to remove the pump from the vehicle, disassemble and reassemble the pump as outlined in "Reconditioning—.94 Model."

Reconditioning—.94 Model

Disassembly

(1) Remove pulley retaining nut before loosening power steering pump belts. Remove pump from engine as an assembly.

(2) Tap pulley off shaft with plastic hammer.

(3) Remove brackets from pump, drain reservoir and clean exterior of pump with solvent.

(4) Remove key from drive shaft.

(5) Using soft protective jaws, clamp pump (shaft down) in vise between square boss and shaft housing (Fig. 5).

(6) Remove two mounting studs and pressure hose fitting. Gently tap reservoir filler tube back and forth with plastic hammer to loosen. Work reservoir off pump body (Fig. 5). Discard reservoir, two mounting stud and pressure fitting "O" rings.

(7) Using a punch, tap end cover retainer ring around till one end of ring lines up with hole in pump body. Insert punch in hole far enough to disengage ring from groove in pump bore and pry ring out of pump body (Fig. 6).

(8) Tap end cover with plastic hammer to jar it loose. Spring under cover should push cover up.

(9) Remove pump body from vise, place in inverted position on flat surface and tap end of drive shaft with plastic hammer to loosen pressure plate, rotor and thrust plate assembly from body. Lift pump body off of rotor assembly. Flow control valve and spring should slide out of bore also (Fig. 7).

(10) Remove and discard end plate and pressure plate "O" rings.

(11) Place pump body on flat surface and pry drive shaft oil seal out with a screw driver (Fig. 8).

(12) Inspect seal bore in housing for burrs, nicks

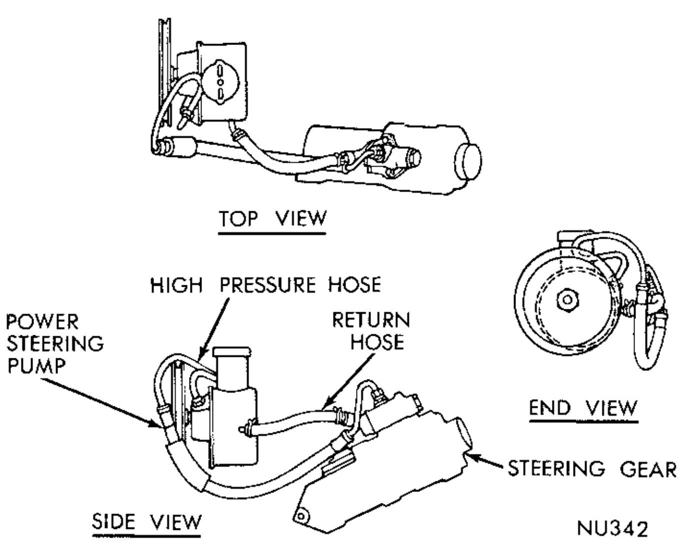


Fig. 4—Hose Routing—1.06 Pump 8 Cylinder Engines

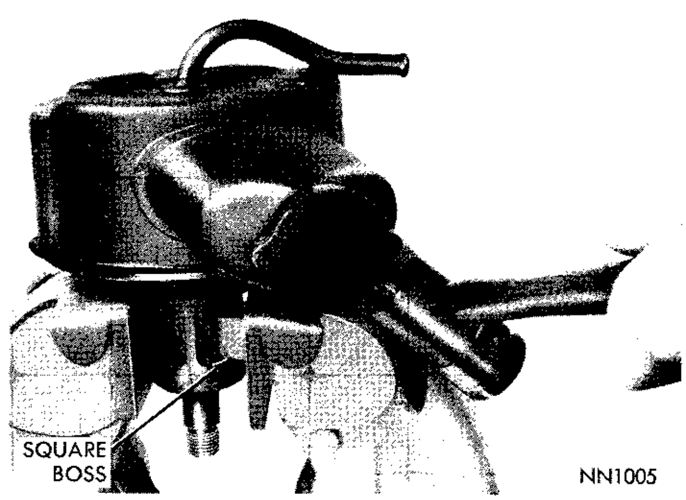


Fig. 5—Removing Reservoir

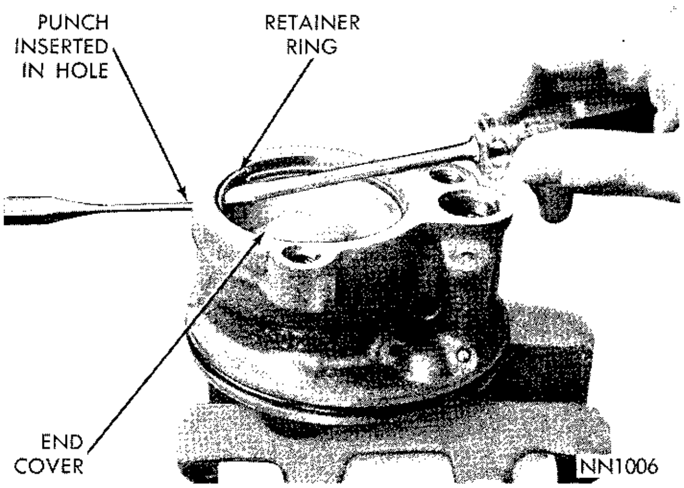


Fig. 6—Removing End Cover Retainer Ring

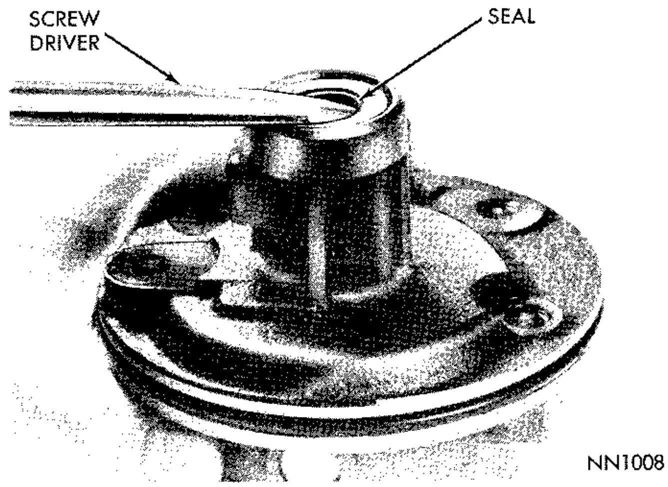


Fig. 8—Oil Seal Removal

or score marks that would allow oil to bypass outer seal surface.

(13) If necessary to disassemble flow control valve for cleaning, see "Flow Control Valve Disassembly".

(14) After lifting pressure plate and cam ring from rotor, remove ten vanes from slots in rotor.

(15) Clamp drive shaft in soft jawed vise, with rotor and thrust plate facing up.

(16) Remove rotor lock ring, pry ring off drive shaft using a screw driver (Fig. 9). Exercise care to avoid nicking the rotor end face. Discard ring.

(17) Slide rotor and thrust plate off of shaft and remove shaft from vise.

Inspection

(1) Wash all parts in clean solvent, blow out all passages with compressed air and air dry cleaned parts.

(2) Inspect drive shaft for excessive wear and seal area for nicks or scoring. Replace if necessary.

(3) Inspect fit of vanes in rotor. Vanes must slide freely in slots of rotor without binding. Excessively loose vanes require replacement of rotor and/or vanes. Binding can be relieved by cleaning or removal of burrs with a thin fine file.

(4) Inspect flat surfaces of pressure and thrust plates for wear or scoring. Light scoring can be removed by lapping on a flat surface. Remove all lapping compound thoroughly before reassembly.

(5) Inspect inner surface of cam ring for heavy scuff or chatter marks. Replace if necessary. Light score or scuff marks can be removed by polishing with a small, flat oil stone.

(6) Inspect end cover for nicks or burrs on surface contacting "O" ring and remove with a fine stone.

(7) Inspect pump body drive shaft bushing for excessive wear. Replace pump body and bushing as an assembly if badly worn or scored.

Assembly

(1) Place pump body on flat surface and drive new drive shaft seal into bore with a 7/8 or 15/16 inch socket till seal bottoms on shoulder (Fig. 10).

CAUTION: Excessive force will distort the seal.

(2) Lubricate seal with power steering fluid and clamp pump body in vise, (shaft end down).

(3) Install end cover and pressure plate "O" rings in grooves in pump cavity. These rings are the same

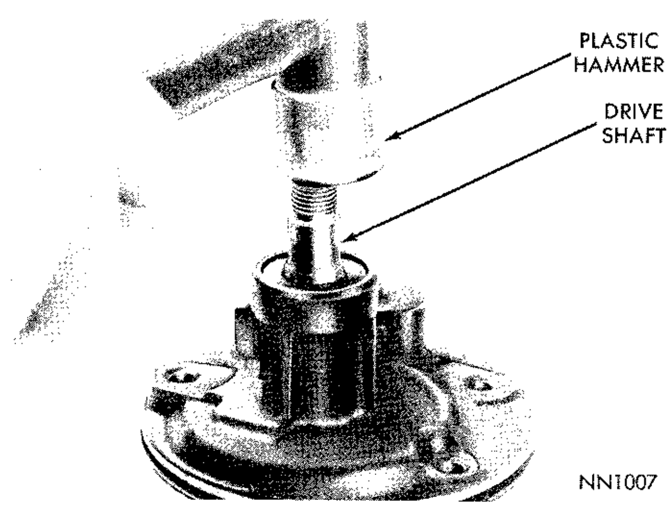


Fig. 7—Removing Drive Shaft Assembly

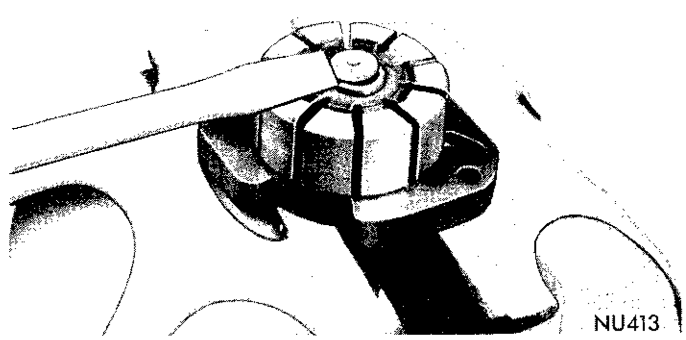


Fig. 9—Removing Full Diameter Lock Ring

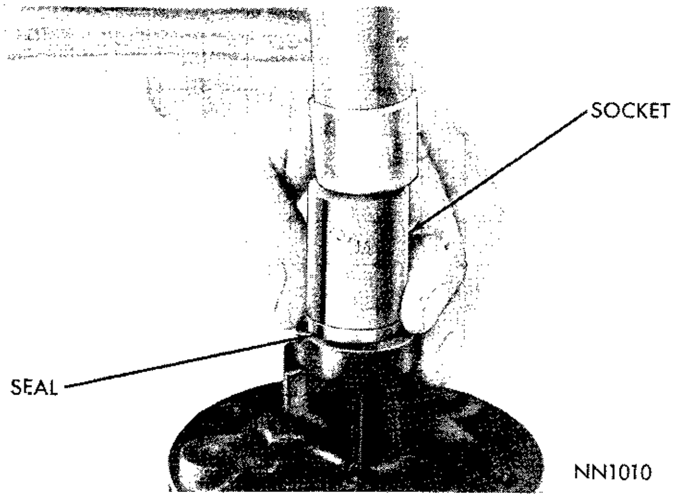


Fig. 10—Oil Seal Installation

size. Lubricate with power steering fluid.

(4) Lubricate large pump body to reservoir "O" ring and install on pump body.

(5) With drive shaft clamped splined end up in soft jawed vise, install thrust plate on drive shaft (smooth, ported side up) (Fig. 11).

(6) Slide rotor over splines with the counterbore of rotor facing **down.** Install rotor lock ring making sure ring is seated in groove (Fig. 12).

(7) Install two dowel pins in holes in pump cavity. Carefully insert drive shaft, rotor and thrust plate assembly in pump cavity indexing locating holes with dowel pins (Fig. 13).

(8) Slide cam ring over rotor on dowel pins with arrow on ring facing "UP" (Fig. 14).

(9) Install ten vanes in rotor slots with radius edge facing out towards cam ring inner surface (Fig. 15). **CAUTION: Vanes installed with flat edge out will result in noisy pump operation.**

(10) Position pressure plate on dowel pins. Place a 1-1/4 inch socket in groove of pressure plate and seat entire assembly on "O" ring in pump cavity by pressing down on socket with both thumbs (Fig. 16).

(11) Place spring in groove in pressure plate and position end cover lip edge UP over spring.

(12) Press end cover down below retaining ring

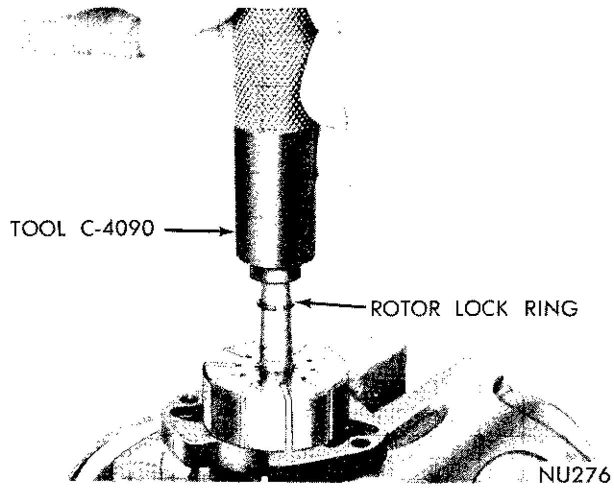


Fig. 12—Installing Rotor Lock Ring

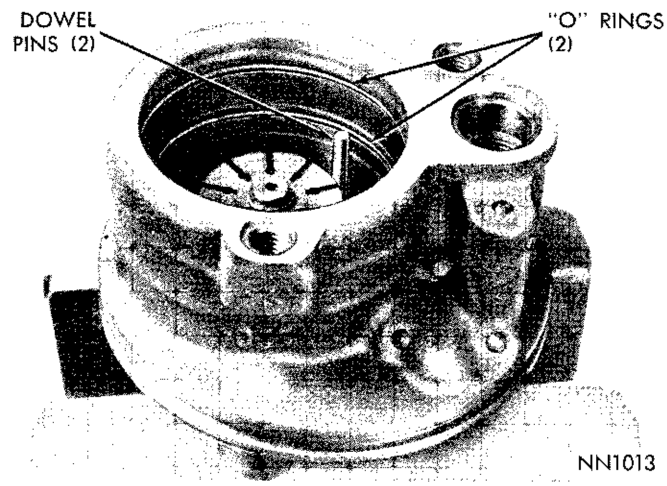


Fig. 13—Rotor and Thrust Plate Installed

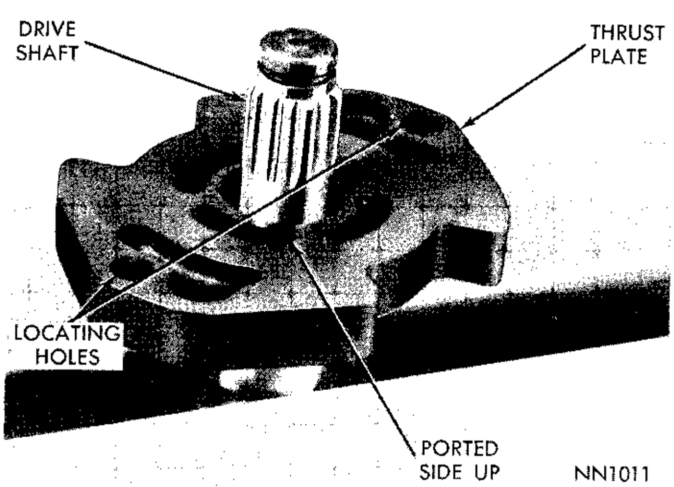


Fig. 11—Installing Thrust Plate

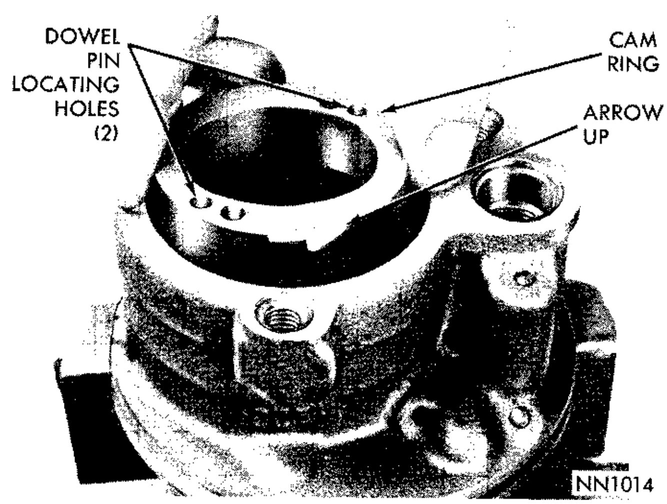


Fig. 14—Installing Cam Ring

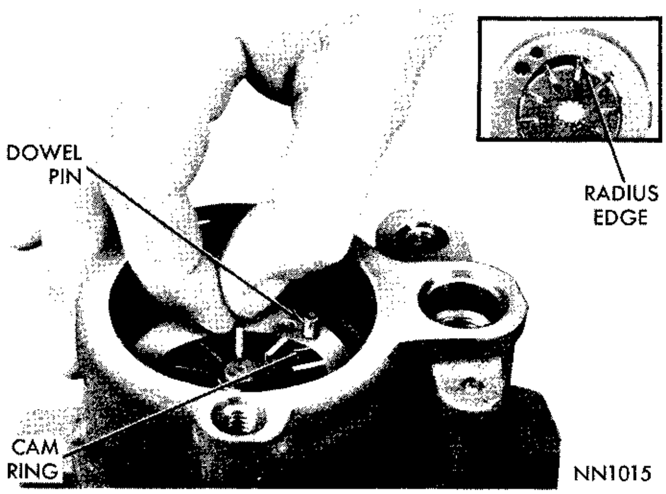


Fig. 15—Installing Rotor Vanes

groove with thumb and install ring making sure it is seated in groove (Fig. 16).

This operation can be performed in an arbor press if available. Care should be exerted to prevent cocking the end cover in the bore or distorting the assembly.

(13) Using a punch, tap retainer ring ends around in the groove until opening is opposite flow control valve bore. This is important for maximum retention of the retainer ring (Fig. 17).

(14) Replace reservoir "O" ring seal, two mounting stud "O" ring seals and flow control valve "O" ring seal on pump body, lubricate with power steering fluid and carefully position reservoir on pump body. Visually align the mounting stud holes till studs can be started in threads.

(15) Using a plastic hammer, tap reservoir down on pump and insert flow control valve spring and valve (slotted end up).

(16) Replace "O" ring on pressure hose fitting and lubricate with power steering fluid (Fig. 18).

CAUTION: Be sure "O" ring is installed on upper groove. It is possible to install "O" ring in lower groove. This would restrict relief outlet orifice.

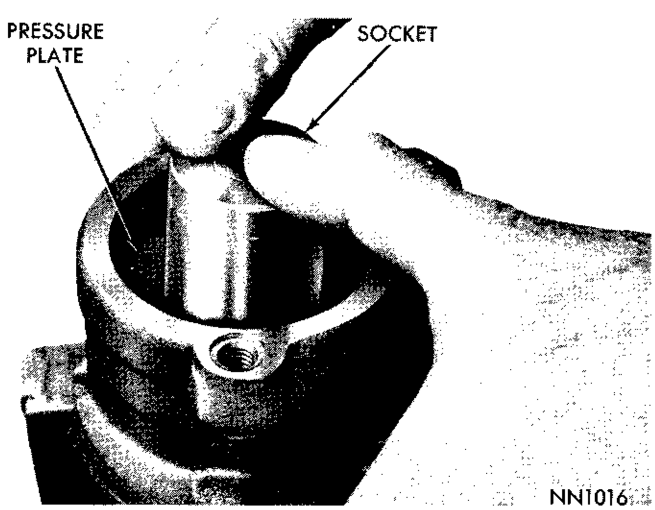


Fig. 16—Seating Pressure Plate

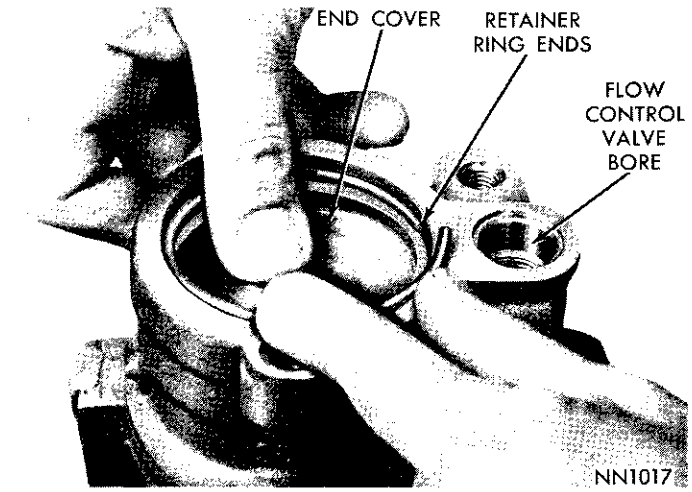


Fig. 17—Installing End Cover Plate and Retainer Ring

(17) Install pressure hose fitting and tighten mounting studs. Tighten pressure hose fitting to 20 foot-pounds and rear mounting studs 25-35 foot-pounds.

(18) Remove pump assembly from vise and install mounting brackets and drive shaft key.

(19) Install pulley on shaft and secure with retaining nut. **Tighten nut to 45-55 foot-pounds.**

(20) Install pump assembly on engine and refill reservoir. Start engine and inspect for leaks.

FLOW CONTROL VALVE

.94 Model

The flow control valve is serviced as an assembly. Nicks or burrs that might cause the valve to stick in the bore may be removed by rubbing valve over flat surface covered by crocus cloth. Care should be taken to prevent rounding the sharp edges of the lands.

The valve may be disassembled for cleaning if dirt has caused pump failure. It is important that if the

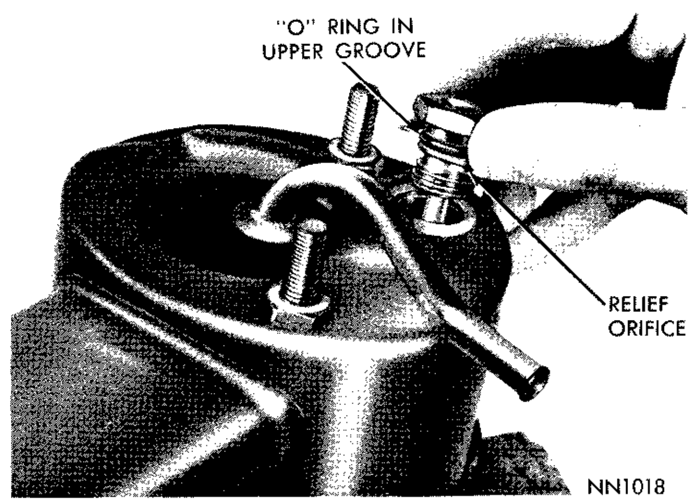


Fig. 18—Installing Pressure Hose Fitting

valve is disassembled for cleaning purposes, the entire pump should be disassembled and cleaned.

Disassembly

(1) Remove pressure hose fitting from pump reservoir. Discard "O" ring on fitting.

(2) Withdraw valve with a magnet. If valve is stuck in bore, it may be necessary to push in on valve against spring pressure. Release pressure exerted against valve abruptly and allow valve to spring out of bore.

(3) Clamp land end of valve in a soft-jawed vise and remove hex head plug and shim(s). Note number of shims on plug. Same number of shims should be installed on assembly of valve.

(4) Remove valve from vise and remove pressure relief ball, guide and spring.

Assembly

(1) Insert spring, guide and pressure relief ball in end of flow control valve (Fig. 19).

(2) Install hex head plug using the same number of shims as were removed. **Altering shim thickness will change relief pressure.**

(3) Install hex head plug and tighten to 50 inch-pounds.

(4) Insert flow valve spring and valve in bore. Install new "O" ring on pressure hose fitting and lubricate with power steering fluid.

(5) Thread fitting into pump body and tighten to 20 foot-pounds.

Oil Seal Replacement—1.06 Model

(1) Remove pump from engine. Drain reservoir and clean exterior before servicing.

(2) Clamp pump in vise securely at mounting bracket.

(3) Remove pulley with Tool C-4068 (Fig. 20).

(4) Position seal remover adapter SP-5323A over end of drive shaft with large opening toward pump.

(5) Place seal remover Tool C-4062 over shaft, through adapter and screw tapered thread well into metal portion of seal. Tighten large drive nut and remove seal (Fig. 21).

(6) Inspect seal bore in housing for burrs, nicks,

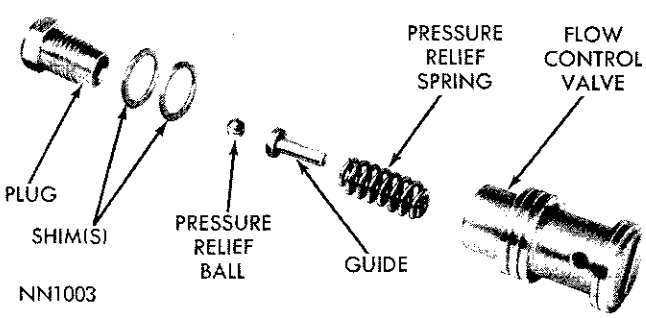


Fig. 19—Flow Control Valve (.94 Pump)

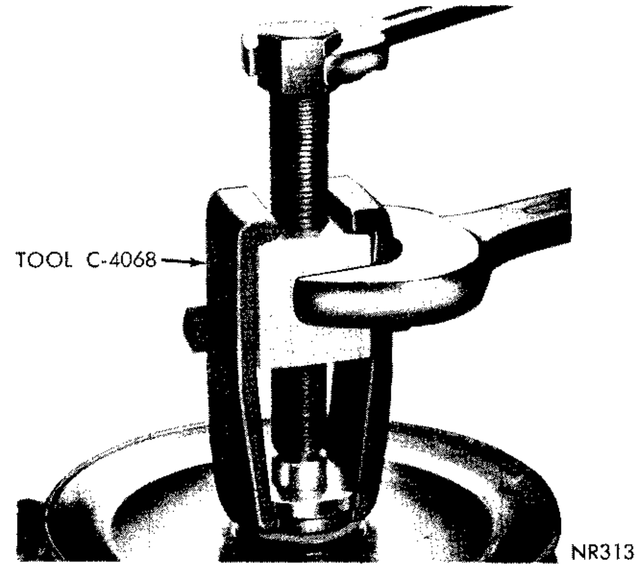


Fig. 20—Removing Drive Pulley (1.06 Pump)

or score marks that would allow oil to by-pass outer seal surface.

(7) Inspect shaft for scratches or burrs, if any, remove with crocus cloth. Lubricate new seal and install with lip toward pump. Use Tool C-4061 to drive seal flush with housing (Fig. 21).

(8) Install drive pulley. See "Pulley Installation". (Fig. 32).

(9) With installer shaft clamped securely in vise, tighten drive nut against thrust bearing and press pulley onto shaft.

CAUTION: Do not attempt to press pulley on to shaft without the use of special tool as serious damage will result to interior of pump.

A small amount of drive shaft end play will be observed when pulley is installed flush with end of shaft. This movement is necessary and will be minimized by a thin cushion of oil between the rotor and end plates when pump is in operation.

(10) Install pump and adjust belt as outlined under "Cooling" Group 7.

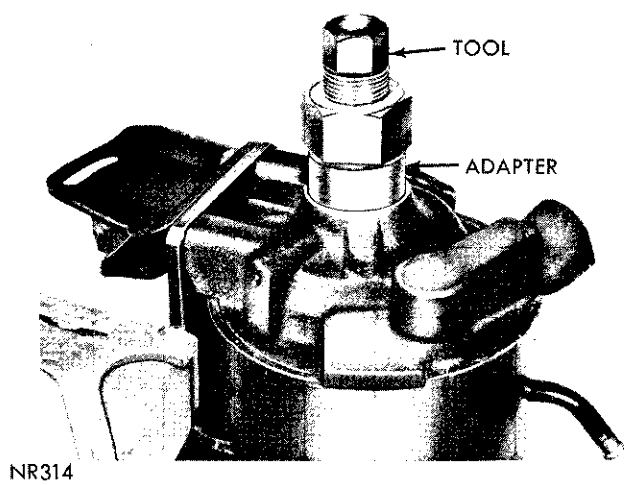


Fig. 21—Removing Shaft Seal

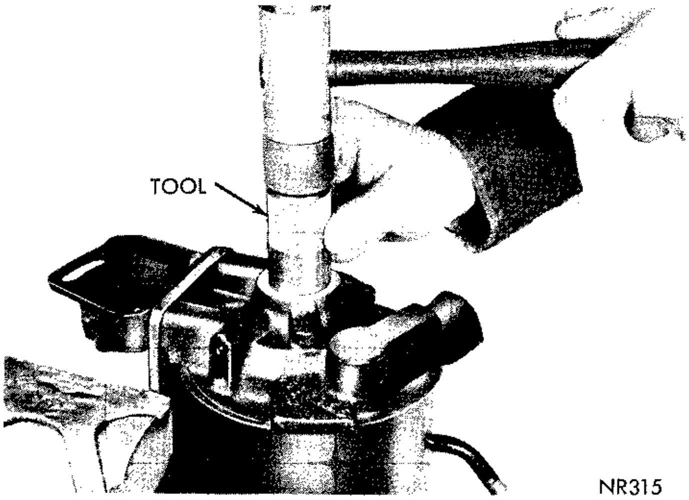


Fig. 22—Installing Shaft Seal

RECONDITIONING—1.06 Model

Disassembly (Fig. 23)

(1) Remove pump from engine. Drain reservoir and clean exterior before servicing.

(2) Clamp pump securely in vise at mounting bracket.

(3) Remove pulley with Tool C-4068 (Fig. 20).

(4) Remove oil seal as described in "Oil Seal Replacement" section.

(5) Remove pump from vise and remove three mounting bracket bolts, remove bracket.

(6) Remove reservoir and place pump in vise with shaft down (use vise with soft protective jaws). Discard mounting bolt and reservoir "O" rings.

(7) Using a punch, tap end cover retaining ring around until one end of ring lines up with hole in pump body. Insert punch in hole far enough to disengage ring from groove in pump bore and remove ring from body (Fig. 24).

(8) Tap end cover with plastic hammer to jar it loose. Spring under cover should push cover up.

(9) Remove pump body from vise, place in inverted position on clean flat surface and tap end of drive shaft to loosen rotating group. Lift pump body off rotating group.

(10) Remove and discard brass seal plate and fibre gasket. (Some pumps may be assembled with brass plates only). The fibre gasket may be found stuck to housing floor; it can easily be lifted or pulled away. Insure that all portions of gasket are removed and that housing floor is not scratched or damaged.

(11) Discard pressure plate and end cover "O" rings.

(12) Remove snap ring, bore plug, flow control valve and spring from housing. Discard "O" ring.

(13) If necessary to disassemble flow control valve

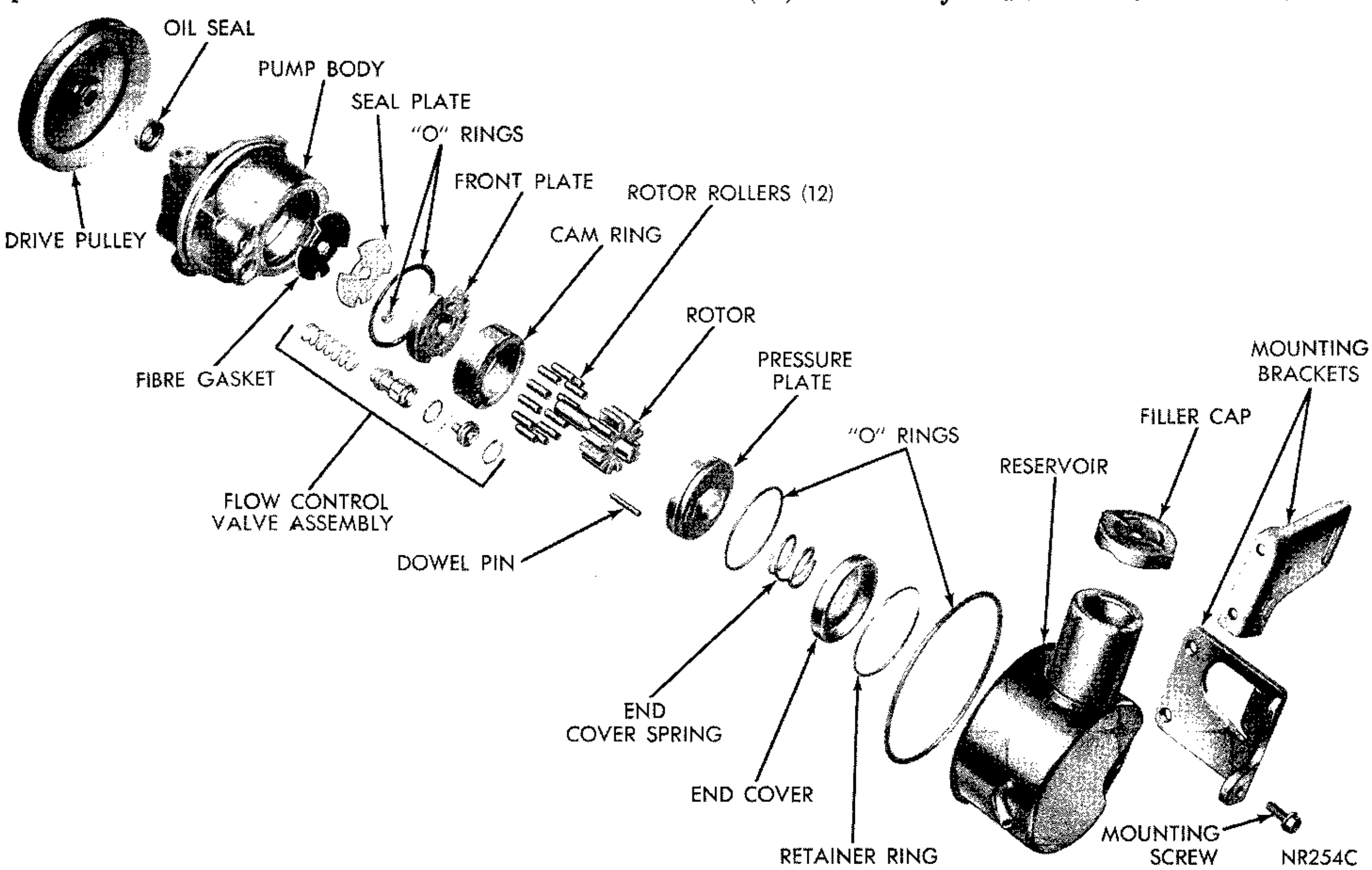


Fig. 23—1.06 Pump Disassembled View

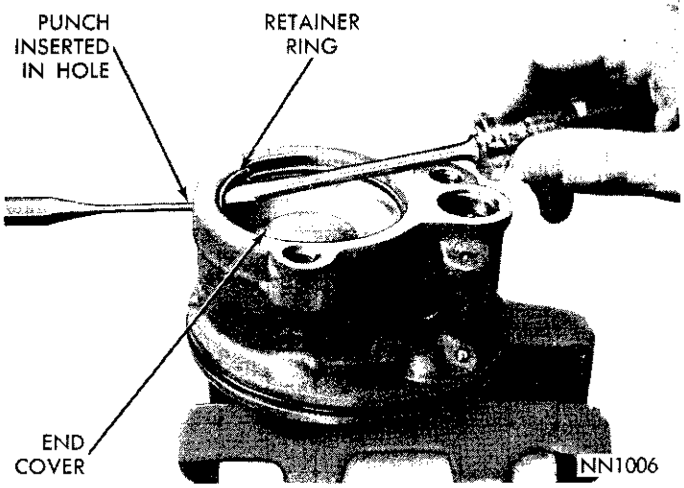


Fig. 24—Removing End Cover Retaining Ring

for cleaning, see "Flow Control Valve Disassembly".

Inspection

(1) Remove clean out plug with allen wrench (Fig. 24).

(2) Wash all parts in clean solvent, blow out all passages with compressed air and air dry all cleaned parts.

(3) Inspect drive shaft for excessive wear and seal area for nicks or scoring. Replace if necessary.

(4) Inspect end plates, rollers, rotor and cam ring for nicks, burrs, or scratches. If any of the components are damaged to a degree that the efficiency of the pump is affected it is recommended that all the interior parts be replaced.

(5) Inspect pump body drive shaft bushing for excessive wear. Replace pump with pump partial assembly if badly worn or scored. Pump partial assembly includes the entire pump with the exception of the reservoir, filler cap, mounting brackets, and drive pulley.

Assembly

(1) Install 1/8 inch pipe clean out plug. Tighten to 80 inch-pounds.

(2) Place pump body on flat surface and drive new shaft seal into bore with Tool C-4061.

(3) Install new end cover, "O" ring in groove in pump bore. Lubricate with power steering fluid.

(4) Lubricate new large pump body to reservoir "O" ring and install on pump body.

(5) Install new fibre gasket and brass seal plate to bottom of housing floor (fibre gasket on floor and brass seal plate on top of fibre). Note: **Pumps originally built with brass seal plate only, must be serviced with both brass seal plate and fibre gasket. Align index notches in plate and gasket with dowel pin hole in housing; cut-out sections of gasket and plate should be in line with core pockets on side of housing bore (Fig. 25). Caution: Pump will not operate properly if either gasket or seal plate are improperly installed.**

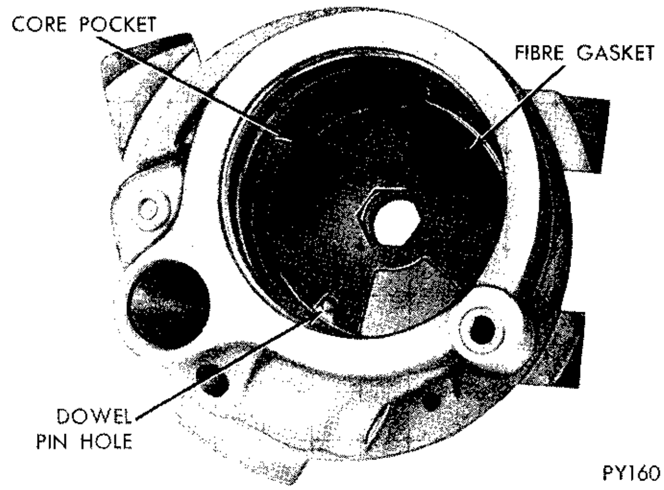


Fig. 25—Fibre Gasket Installed

(6) Carefully install front plate in pump bore. Chamfered edge first. Align index notch in plate with dowel pin hole in housing.

CAUTION: Use extreme care in aligning dowel pin. Pump can be completely assembled with dowel pin improperly positioned in end plates and not in indexing hole in housing.

(7) Place dowel pin in cam ring and position cam ring inside pump bore. Notch on cam ring must be up or away from pulley end of pump (Fig. 26). If cam ring has two notches, one machined and one cast, install with machined notch up. Machined notch has sharp corners and cast notch rounded corners.

If end of dowel pin in cam ring is more than 3/16 inch above surface of installed cam ring, it is not seated in index hole in housing.

(8) Install rotor and shaft in cam ring and carefully place 12 rollers in cavities of rotor (Figs. 27 and 28). Lubricate rotor, rollers, and cam I.D. with power steering fluid.

(9) Before installing pressure plate, rotate shaft by hand to make sure rollers are all seated parallel with pump shaft.

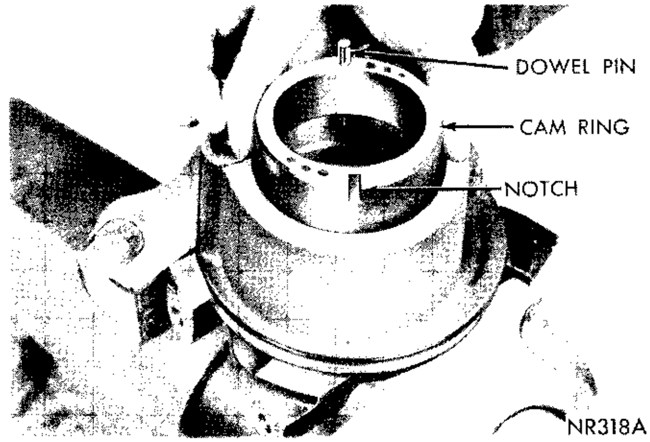


Fig. 26—Installing Cam Ring

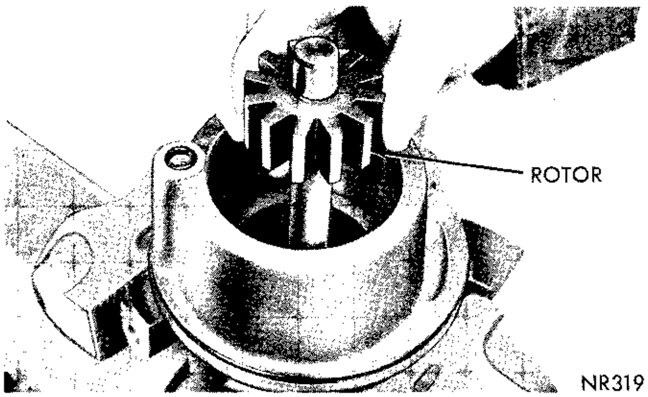


Fig. 27—Installing Rotor

(10) To insure proper alignment of pressure plate to dowel pin, insert the largest possible number drill into the large 3/16 inch diameter oil hole in the cam ring, next to the cam notch. Select from a number 13 through 16 drill, clean thoroughly, and bottom on housing floor (Fig. 29).

(11) Install new "O" ring on pressure plate, lubricate with power steering fluid and carefully position in pump bore. Before seating plate in pump bore, align index notch in plate with dowel pin and oil passage slot in plate with number drill. Seat plate on cam ring using a clean 1-1/8 inch socket and plastic hammer (Fig. 30 and 31). Remove drill. Inspect pressure plate at both oil passage slots to insure that plate is squarely seated on cam ring end face.

(12) Place large coil spring over raised portion of installed pressure plate.

(13) Position end cover, lip edge UP, over spring. Press end cover down below retaining ring groove with thumb and install ring making sure it is seated in groove. Light tapping on the end cover may be necessary to insure that the end cover chamfer is squarely seated against snap ring.

(14) Replace reservoir mounting bolt seal.

(15) Lubricate flow control valve with power steering fluid and insert valve spring and valve into bore. (Spring first then hex plug end of valve). Install new "O" ring on bore plug, lubricate with power steering

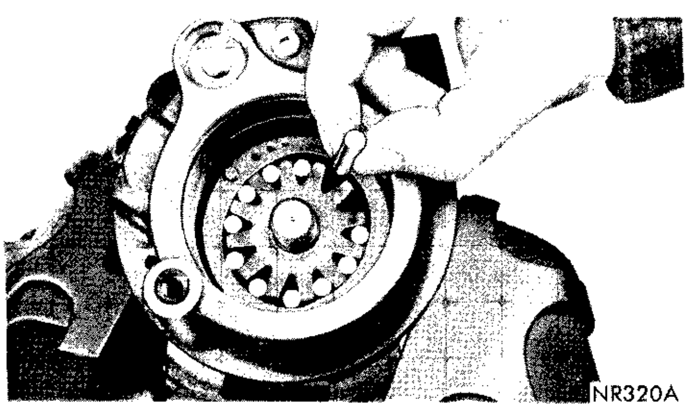


Fig. 28—Installing Rollers In Rotor

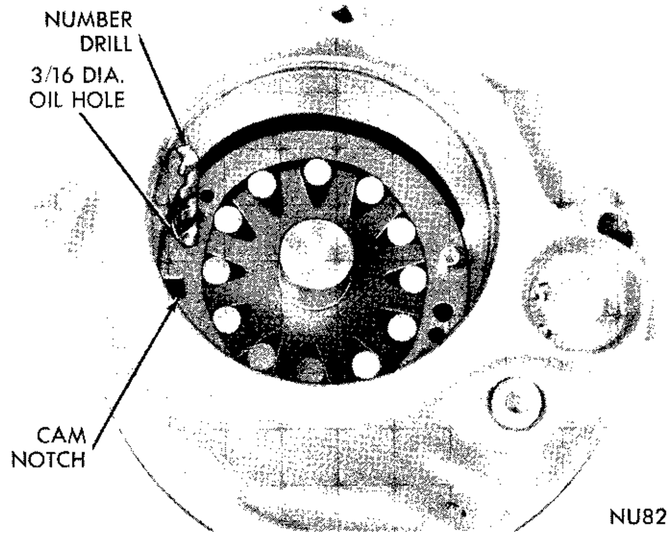


Fig. 29—Aligning Oil Holes

fluid and carefully install into bore. Install snap ring, with sharp edge UP.

CAUTION: Do not depress the bore plug more than 1/16 inch beyond snap ring groove.

(16) Place reservoir on pump body and visually align mounting bolt hole. Tap reservoir down on pump with plastic hammer.

(17) Remove pump from vise and install mounting brackets with three mounting bolts, tighten to 18 foot-pounds.

(18) Install drive pulley. See "Pulley Installation" (Fig. 32).

Pumps installed on eight cylinder engines have drive pulleys pressed flush with the end of the pump shaft. With drive pulley placed on end of shaft, securely thread installer Tool C-4063, **with** adapter SP-5399, into 3/8 inch threaded hole in end of shaft (Fig. 32).

(19) With installer shaft clamped securely in vise,

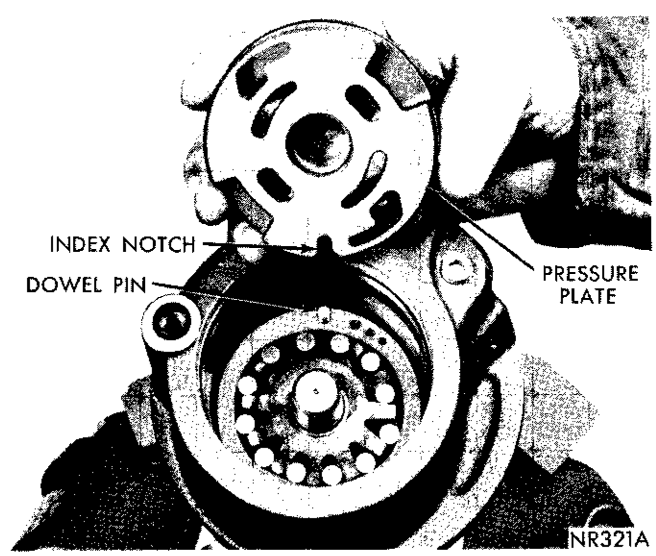


Fig. 30—Installing Pressure Plate

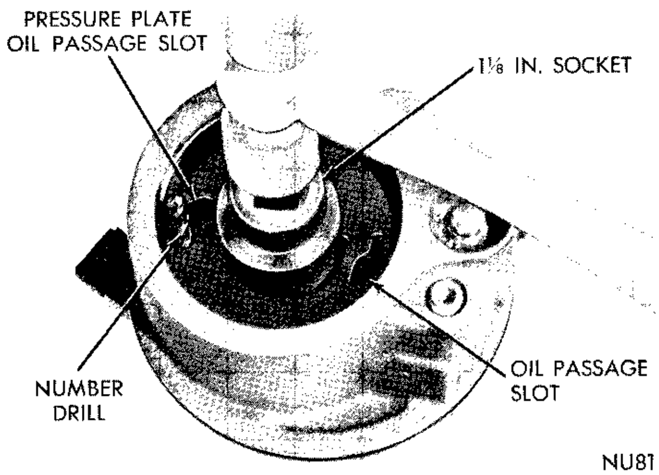


Fig. 31—Seating Pressure Plate

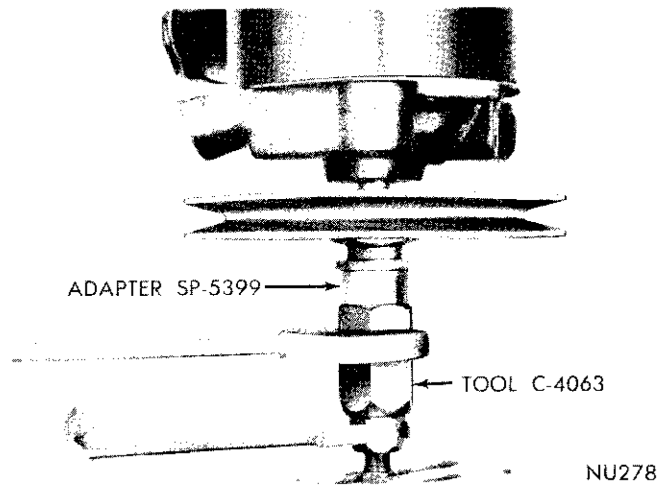


Fig. 32—Pulley Installation

tighten drive nut against thrust bearing and press pulley onto shaft.

CAUTION: Do not attempt to press pulley on to shaft without the use of special tool as serious damage will result to interior of pump.

A small amount of drive shaft end play will be observed when pulley is installed. This movement is necessary and will be minimized by a thin cushion of oil between the rotor and end plates when pump is in operation.

(20) Install pump assembly on engine, connect hoses (using new pressure hose "O" ring), and tighten drive belt see "Cooling System" Group 7. Fill reservoir with power steering fluid, test and inspect for leaks.

FLOW CONTROL VALVE

Disassembly—1.06 Model

(1) Remove pump from engine and reservoir from pump.

(2) Remove snap ring and plug from flow bore. Discard "O" ring from plug.

(3) Depress control valve against spring pressure and allow to spring back. The valve should pop out of bore far enough to be lifted out. Light tapping on rear face of pump body may be necessary to remove a stuck valve.

If dirt or foreign particles are found on valve or within valve bore, entire pump should be disassembled, cleaned and rebuilt. The high pressure and return hoses must also be flushed and the steering gear valve body reconditioned see "Power Steering Gear". If valve bore is badly scored, replace pump with pump partial assembly.

(4) Remove nicks or burrs that might cause the valve to stick by rubbing valve over a flat surface

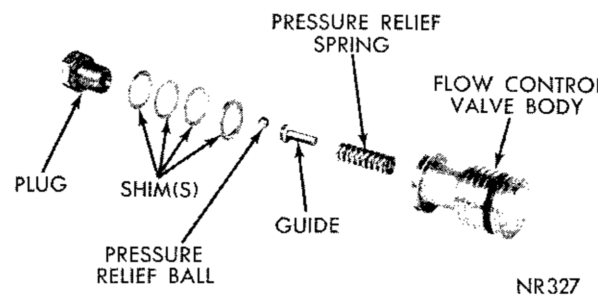


Fig. 33—Flow Control Valve Disassembled View

covered with crocus cloth.

(5) Clamp land of valve in a soft jawed vise and remove hex head ball seat and shim(s). Note number and gauge of shims on ball seat. Same number and gauge of shims must be installed on assembly of valve. Altering shim thickness will change relief pressure.

(6) Remove valve from vise and remove pressure relief ball, guide and spring.

(7) Clean all parts thoroughly. **Dirt Particles On Ball Or Ball Seat Will Cause Improper Pump Operation.**

Assembly

(1) Insert spring, guide and pressure relief ball in end of flow control valve (Fig. 33).

(2) Install hex head ball seat using the same number and thickness shims as were removed. Tighten to 50 inch pounds.

(3) Lubricate valve with power steering fluid and insert flow valve spring and valve in bore. Install new "O" ring on bore plug, lubricate with power steering fluid and carefully install into bore. Install snap ring.

CAUTION: Do not depress the bore plug more than 1/16 inch beyond snap ring groove.

STANDARD STEERING COLUMN

INDEX

GENERAL INFORMATION

The steering column under head-on collision conditions is designed to telescope at a controlled rate. The telescoping action reduces the likelihood of the steering wheel being driven rearward toward the driver. If the driver is thrown forward into the wheel, the column can telescope further at the controlled rate, thereby, reducing force of the impact.

The column assembly (Fig. 1 or 2) has four principal components.

1. A column jacket with a mesh section designed to shorten in "accordion" fashion.
2. A two-piece telescoping transmission gearshift tube interconnected by plastic inserts and shear pins.
3. A two-piece telescoping steering shaft with upper and lower sections connected by plastic friction collars and shear pins.
4. A mounting bracket connecting steering column to the instrument panel, which allows the column to slide forward but blocks its rearward movement toward the driver.

The center section of the column jacket has diamond-shaped perforations and is formed with accordion pleats. These pleats allow it to compress like a bellows from impact forces.

The gearshift tube is made up of two sections designed to telescope together. These sections are interconnected and held together by injections of plastic that form the interconnecting inserts and shear pins. Under impact, the pins shear first, followed by a gradual paring away of the inserts by the knife-like edge in the adjoining tube section.

The steering shaft is a two-piece assembly. The upper piece is solid and has a double-flatted lower section. The lower piece is hollow and formed to fit

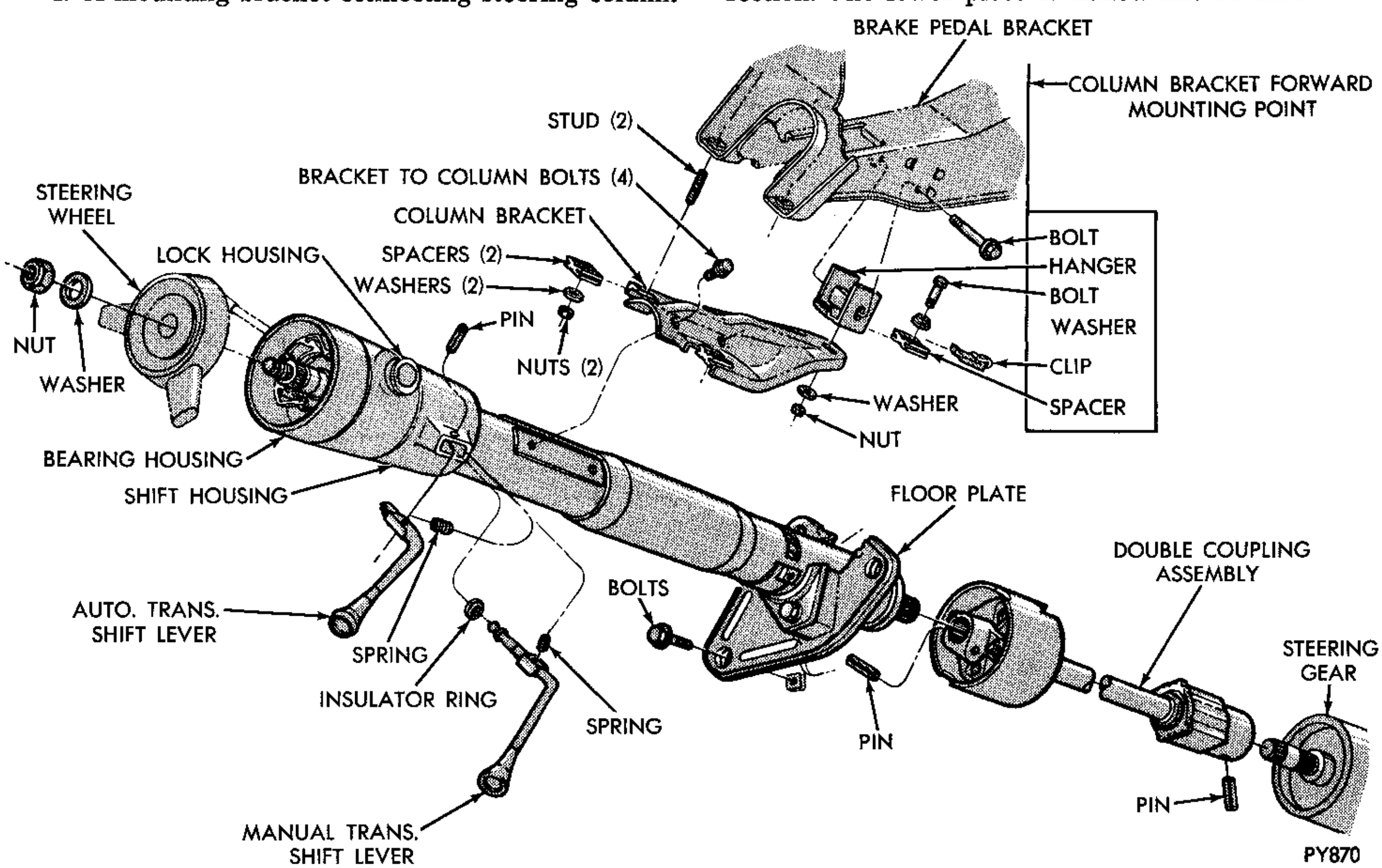


Fig. 1—Column Installation (Double Coupling)

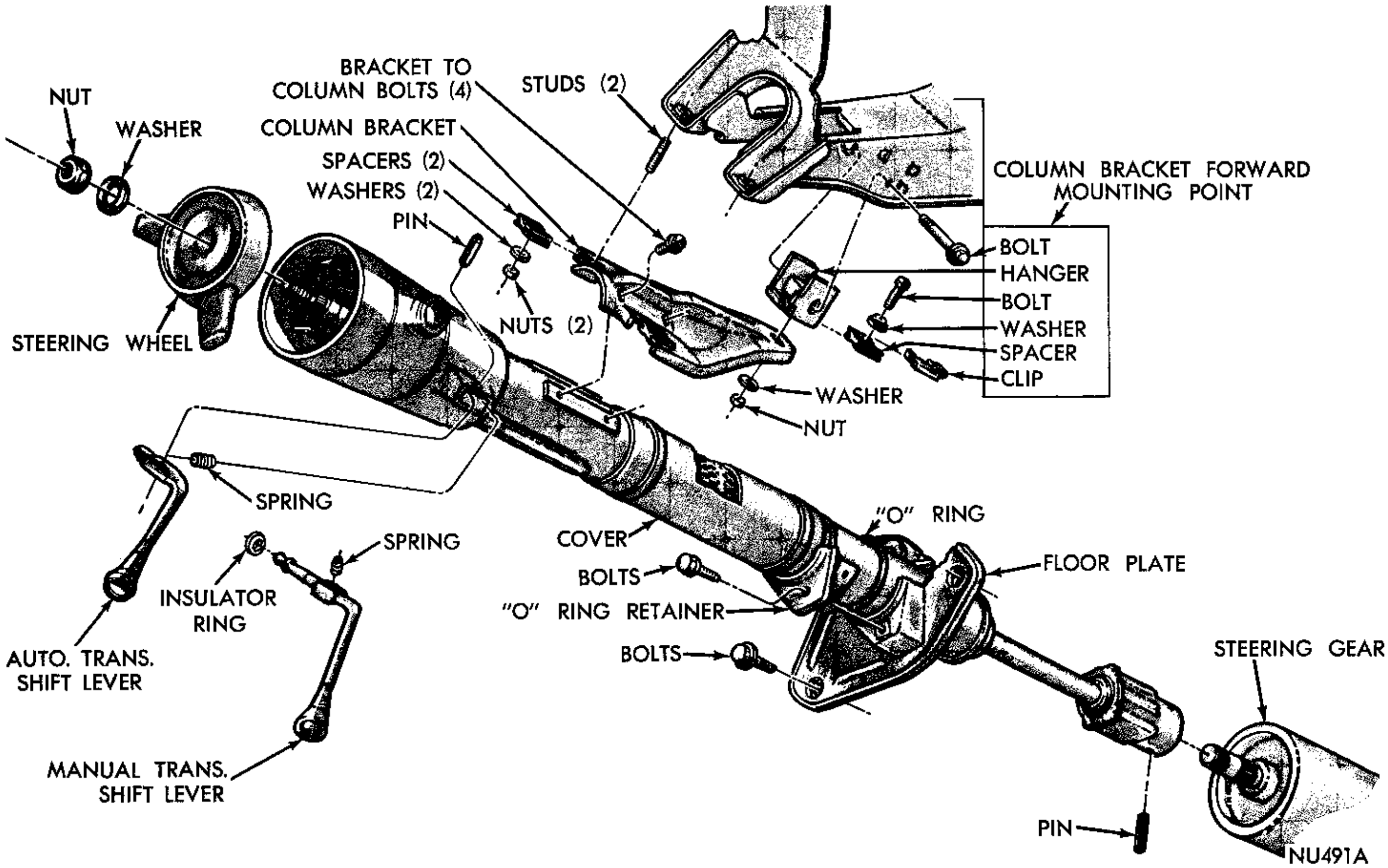


Fig. 2—Column Installation (Single Coupling)

over the double-flatted section of the upper piece. The purpose of the flatted section is to provide continued steering action even though completely telescoped. Plastic is injected through two small holes in the hollow piece into a pair of annular grooves on the solid portion of the shaft. The four small holes filled with plastic form the shear pins. Upon impact, the shear pins break off and the shaft gradually telescopes against a resistance provided by the plastic collars in the annular grooves.

The mounting bracket is designed to restrain the column from being shifted toward the driver during impact. It incorporates three "break-away capsules" that allow the mounting bracket to slip off the attaching points, permitting the steering column to compress or yield in a forward direction under a severe impact from the driver side.

When the column is installed in a car it is no more susceptible to damage through ordinary usage than previous columns; however, when it is removed, special care must be taken in handling this assembly. When the column is removed from the car such actions as a sharp blow on the end of the steering shaft or shift levers, leaning on the column assembly, or dropping of the assembly could shear or loosen the plastic shear joints that maintain column rigidity. It is, therefore, suggested that the removal and installation, and the disassembly and reassembly procedures be carefully followed when servicing this assembly.

IMPORTANT: Bumping, jolting and hammering on the steering shaft and gearshift tube must be avoided during all servicing operations. If the shear pins are broken, the controlled rate of the impact-absorbing features will be destroyed making these parts unfit for further use. The Special Tools required and their usage are covered in the following service procedures.

SERVICE PROCEDURES

COLUMN REMOVAL (Figs. 1 and 2)

(1) Disconnect negative (ground) cable from battery.

(2) Disconnect linkage from lower end of steering column.

(3) Remove steering shaft lower coupling to wormshaft roll pin.

(4) Disconnect wiring connectors at steering column jacket.

(5) Remove horn ring ornament assembly.

(6) Disconnect wire at horn switch. Remove screws attaching horn ring and switch to steering wheel, then remove horn ring and switch.

(7) Remove steering wheel retaining nut and washer. Remove steering wheel with Tool C-3428A. **Do not bump or hammer on steering shaft to remove wheel.**

(8) Remove turn signal lever (Fig. 3).

(9) Remove floor plate to floor pan attaching screws. Remove finish plate from under instrument panel to expose steering column bracket. If so equipped, disconnect automatic shift indicator pointer from shift tube bracket.

(10) Remove nuts or bolts attaching steering column bracket to instrument panel support.

(11) Carefully pry lower coupling from steering gear wormshaft, then remove column assembly out through passenger compartment being careful not to damage paint or trim.

COLUMN DISASSEMBLY

(1) Remove four bolts attaching bracket assembly to column jacket.

(2) Remove two screws and lift off wiring trough.

(3) Attach Column Holding Fixture C-4132 to column jacket and clamp the assembly in a vise.

(4) Drive out gearshift lever pin, then remove lever and spring from housing.

(5) Remove turn signal switch and upper bearing retainer screws. Remove retainer and lift switch upward out of the way (Fig. 4).

(6) Remove two retaining screws and lift the ignition key lamp assembly out of the way (Fig. 5).

(7) Remove snap ring from upper end of steering shaft (Fig. 6).

Steering Shaft

(1) Remove three screws which hold bearing housing to lock housing.

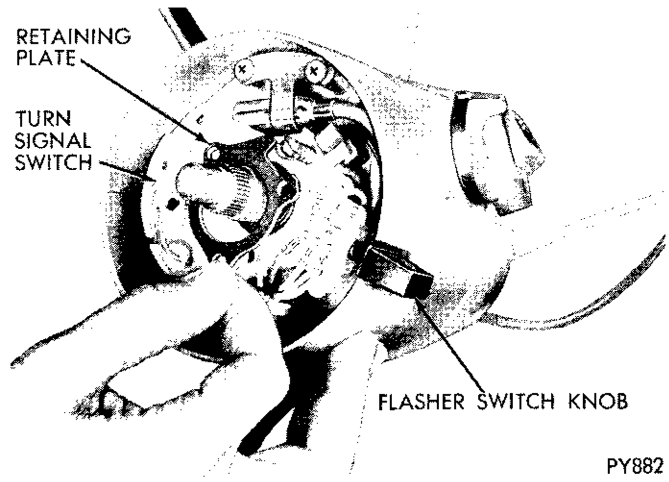


Fig. 4—Retainer and Turn Signal Switch

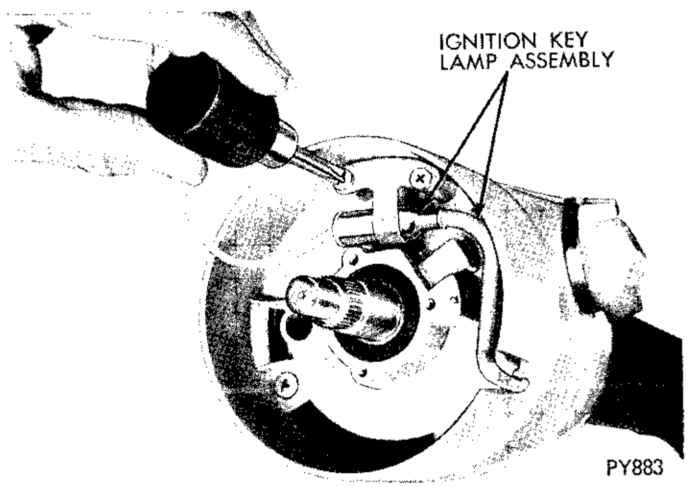


Fig. 5—Ignition Key Lamp

CAUTION: These screws must be removed before steering shaft removal.

(2) Install steering shaft remover C-4044 and press

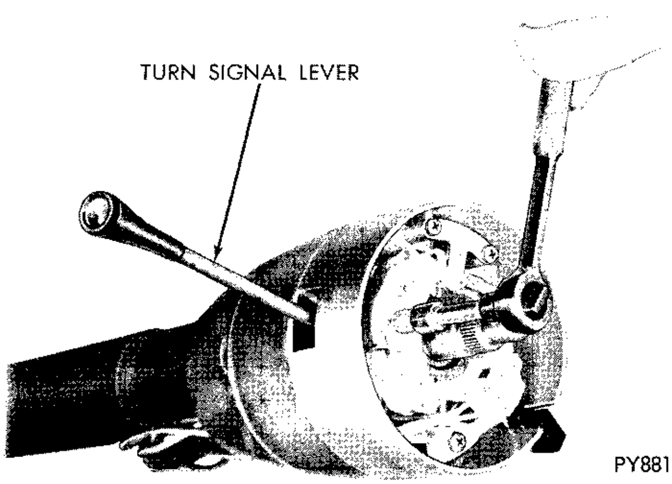


Fig. 3—Turn Signal Lever

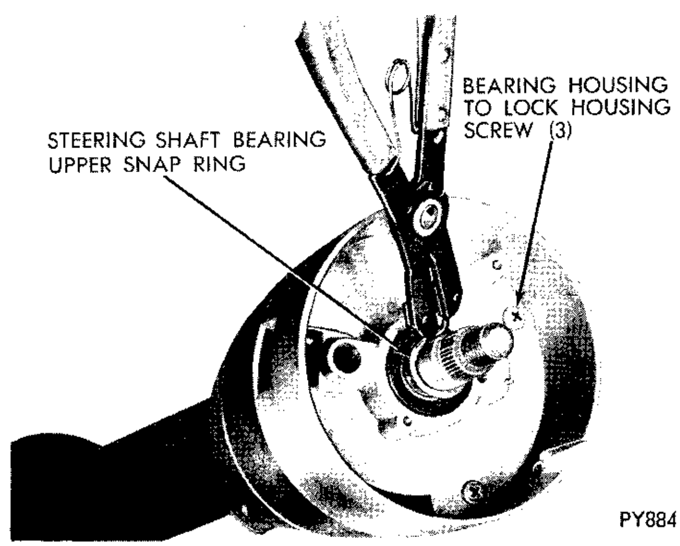


Fig. 6—Steering Shaft Bearing Upper Snap Ring

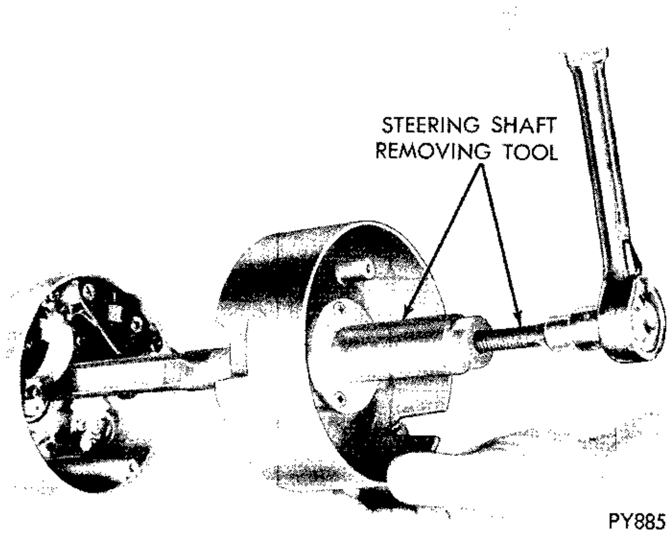


Fig. 7—Pressing Shaft Out of Bearing

shaft out of bearing and remove bearing housing from shaft (Fig. 7).

(3) Remove bearing lower snap ring from shaft.

(4) Pry sleeve off steering shaft lock plate hub to expose pin.

(5) Install Tool C-4113 on steering shaft lock plate hub to press pin out of shaft, **DO NOT HAMMER** (Fig. 8).

(6) Remove tool and lock plate from shaft.

(7) Remove shaft through lower end of column.

Lock Housing

(1) Remove two screws and lift out buzzer switch (Fig. 9).

(2) Remove two retaining screws and the lock lever

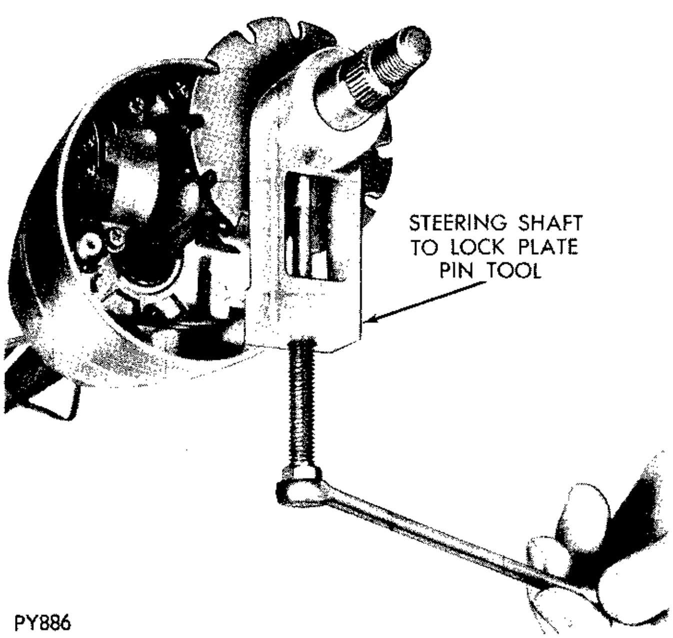


Fig. 8—Lock Plate Pin—Removal or Installation

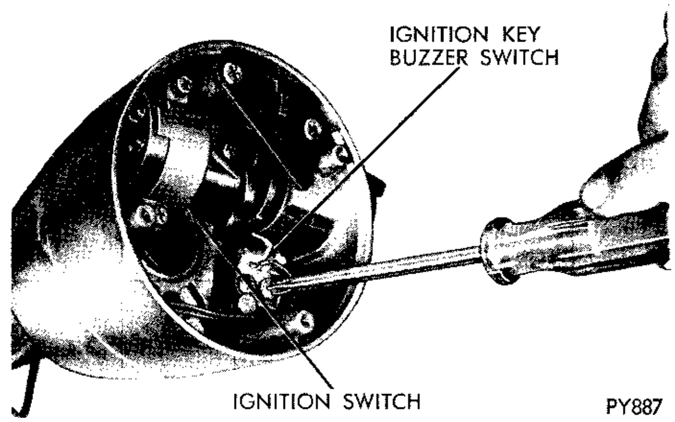


Fig. 9—Ignition Key Buzzer Switch

guide plate which will expose the lock cylinder release hole (Fig. 10).

(3) **Place cylinder in "lock" position and remove key.** Insert a small diameter screwdriver or similar tool into lock cylinder release hole and push in to release spring loaded lock retainer. At same time pull lock cylinder out of housing bore (Fig. 11).

(4) Remove the three retaining screws and the ignition switch assembly (Fig. 11).

(5) Grasp lock lever and spring assembly and pull straight out of housing (Fig. 12).

(6) Remove four lock housing to column jacket hex head retaining screws and remove housing from jacket (Fig. 13).

Shift Tube (Figs. 14, 15, 16 & 17)

(1) To remove shift tube from column shift automatic or floor shift models, first straighten the tabs at top of shift tube which are bent outward against shift housing casting. If so equipped, remove shift indicator bracket from shift tube. Remove shift tube

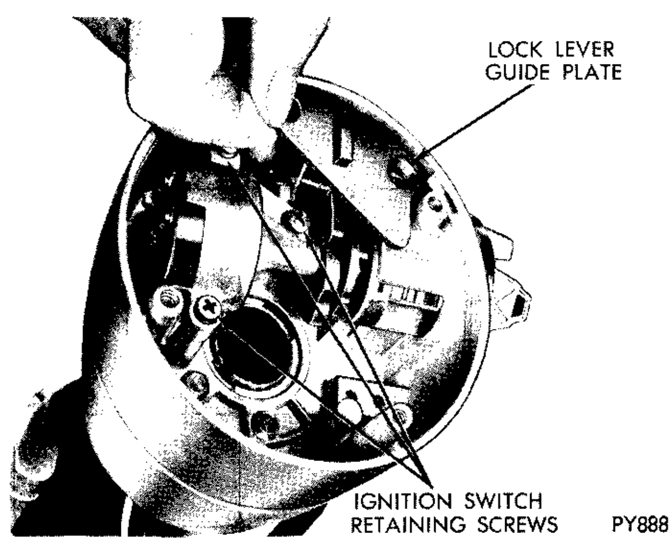


Fig. 10—Lock Lever Guide Plate

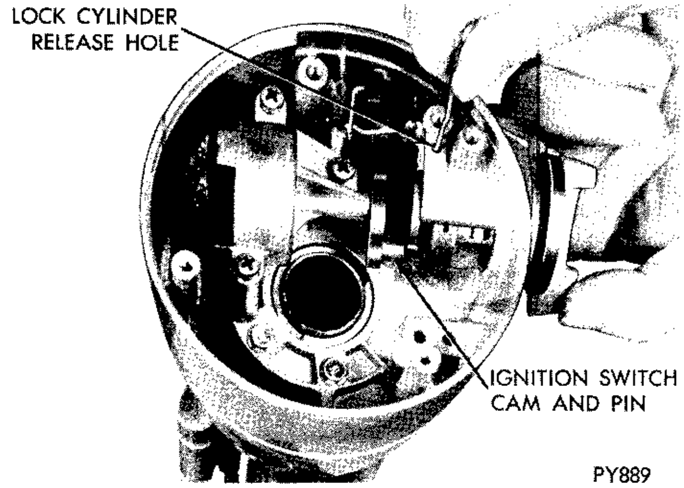


Fig. 11—Removing Lock Cylinder

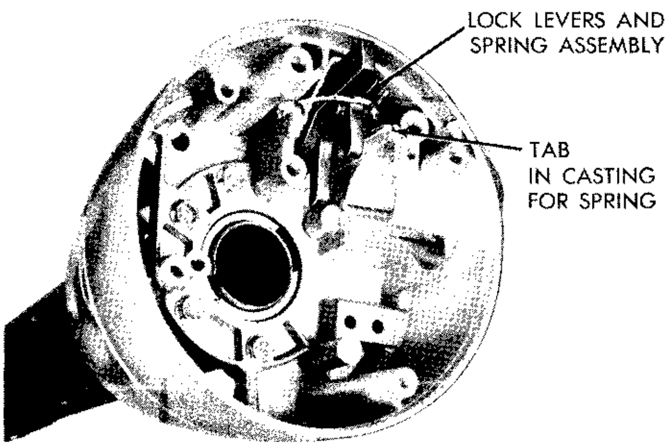


Fig. 12—Lock Levers and Spring Assembly Installed in Housing

support retaining clip from slots at bottom of jacket. Loosen shift tube set screw in shift housing and remove parts from jacket.

Models equipped with double coupling (Fig. 1) have

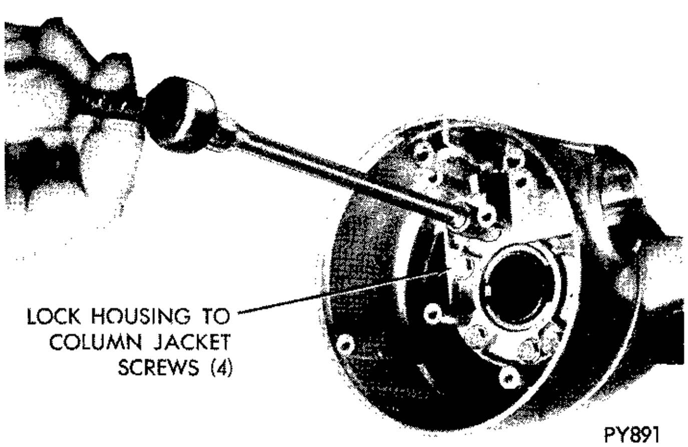


Fig. 13—Lock Housing to Column Jacket, Retaining Screws

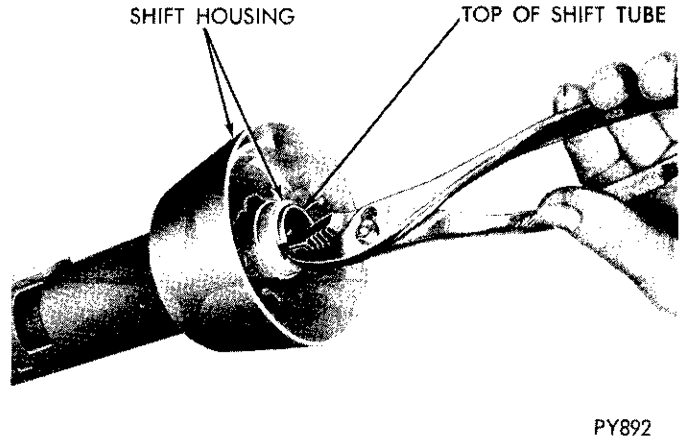


Fig. 14—Bending Shift Tube Tabs

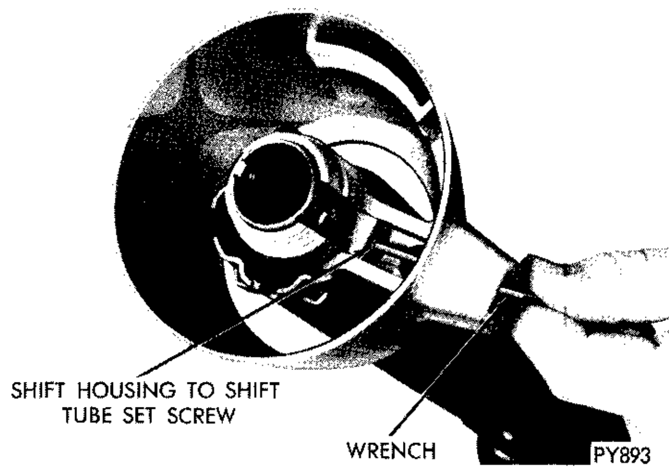


Fig. 15—Shift Tube Set Screw

a shift tube support with a bearing in it for the steering shaft. To remove shift tube, remove the two

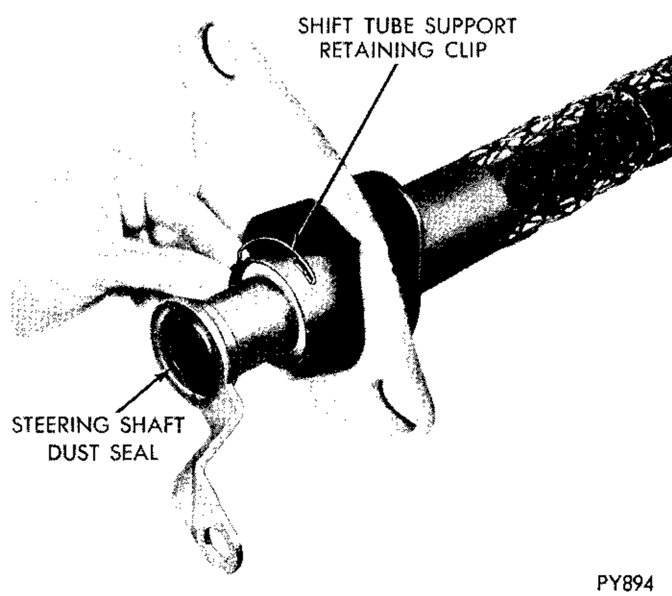


Fig. 16—Shift Tube Support Retaining Clip

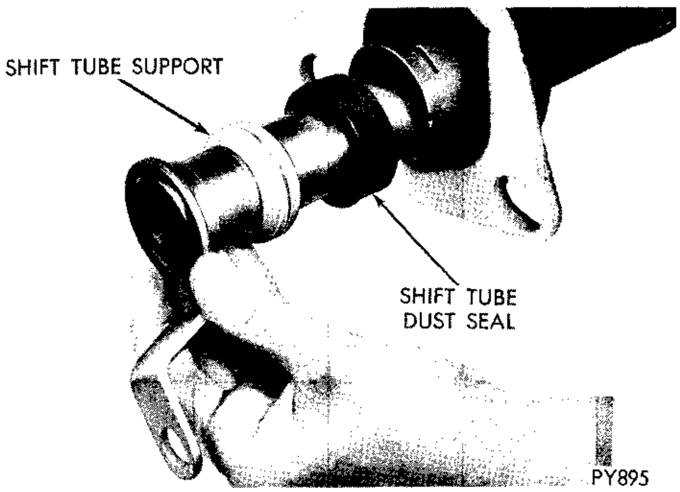


Fig. 17—Shift Tube Assembly—Removal or Installation

screws attaching the bearing and support to column jacket lower end.

(2) To remove shift tube from column shift manual models, remove the three bearing support screws at lower end of jacket and the two adjustable bushing screws from cam slots in jacket. Pull the tube and lever assembly out of jacket lower end (Figs. 18 & 19).

Steering Shaft Coupling (Fig. 20)

(1) Pry cover tangs out from coupling body and pull seal and cover from body.

(2) Drive the small short dowel pin at edge of coupling body, down into coupling and discard.

(3) Pull body off the shaft and shoe assembly.

(4) Separate and clean all parts.

Inspection

After cleaning, inspect all parts for wear or damage. Note condition of shift lever gate and inner end of

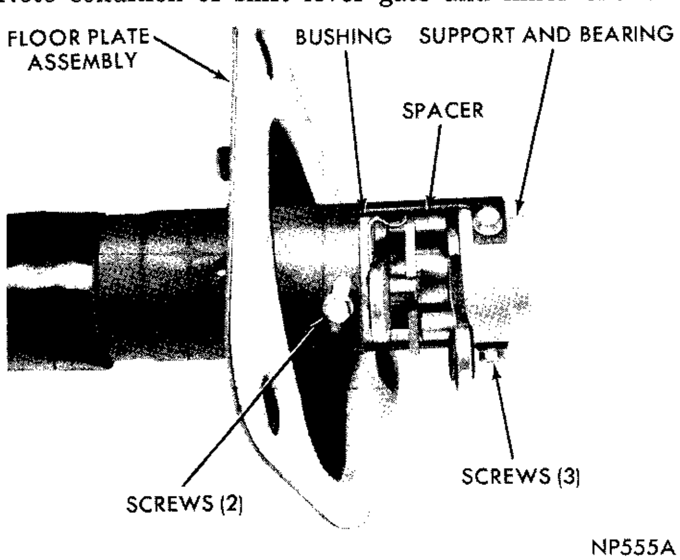


Fig. 18—Shift Tube and Levers Assembled

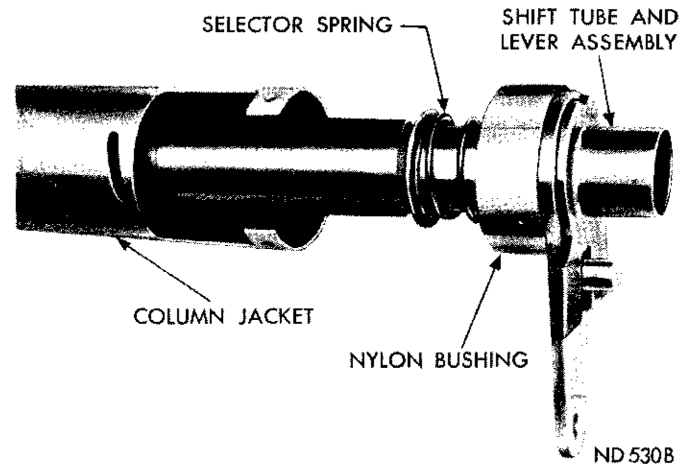


Fig. 19—Shift Tube Assembly—Removal or Installation

shift lever. Inspect turn signal switch for distortion, broken or damaged parts. Inspect wiring insulation for worn or bare spots.

Inspect steering shaft bearing for smooth operation, and lubricate with Multi-Purpose Chassis Lubricant or similar lubricant. If bearing has any signs of roughness or wear, it should be replaced.

COLUMN ASSEMBLY (Fig. 21)

The grease recommended for use during reassembly procedures is Automotive Multi-Purpose Grease NLGI Grade 2 E.P. or Multi-Mileage Lubricant, Part Number 2525035. Apply a thin coating to all friction surfaces.

(1) Install column holding tool C-4132 and clamp column in a vise with both ends of column accessible.

(2) Install the O-ring retainer, O-ring, and floor plate on lower end of column jacket. **This must be done before installing shift tube.**

(3) Coat spring washer with grease and install on lower hub of gearshift housing. Position gearshift housing on the jacket (Fig. 21).

(4) **Column Shift Automatics and Floor Shift Models**

(a) With dust seal and shift tube support installed

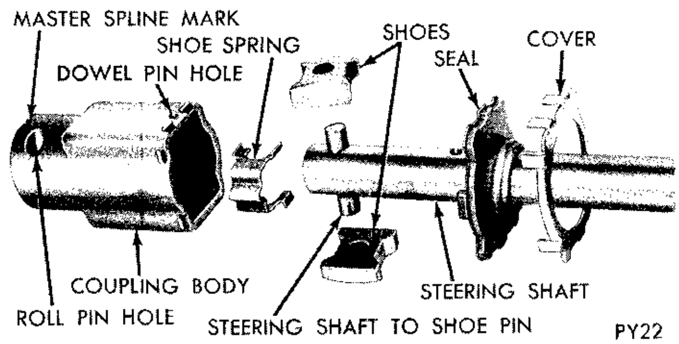


Fig. 20—Steering Shaft "Pot" Coupling Disassembled

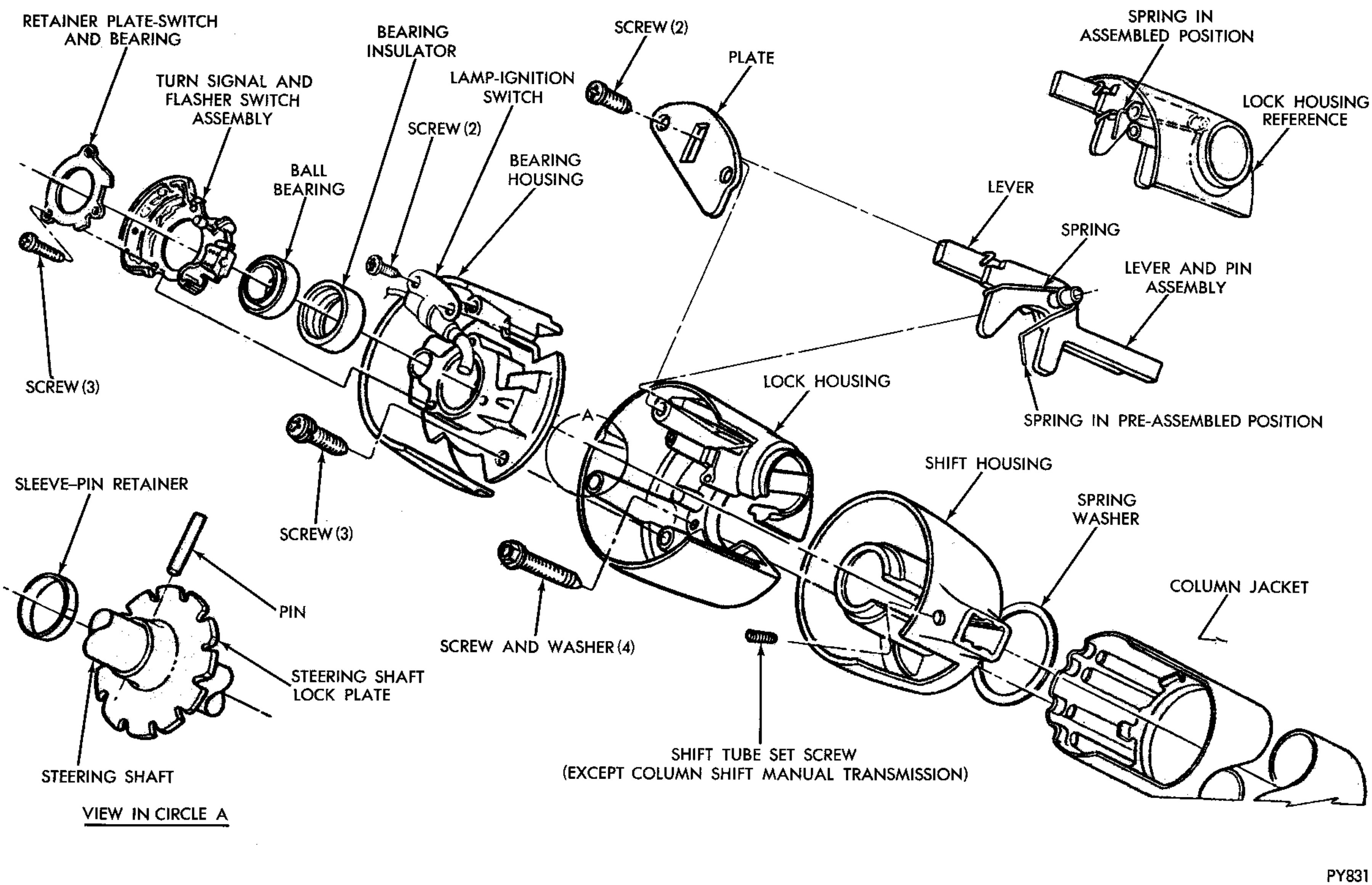


Fig. 21—Steering Column Upper End—Disassembled

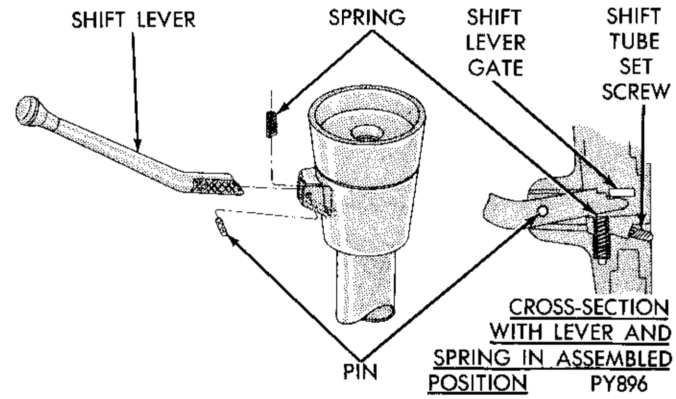


Fig. 22—Install Shift Lever—Automatic

on shift tube, slide the assembly into jacket. Guide key on upper end of tube into slot in gearshift housing. Hold firmly together and tighten lock screw in shift housing (Fig. 15).

(b) Bend corners of shift tube slot out against shift housing casting (Fig. 14).

(c) Insert wire retainer in slots in lower end of jacket and into groove in shift tube support (Fig. 16). **Models equipped with double coupling (Fig. 1)** have a shift tube support with a bearing in it for the steering shaft. Attach this support to the column jacket with two screws and tighten to 30 inch-pounds.

(d) **Column Shift Automatics only** Position the shift lever and crossover load spring in the gearshift housing and tap in the pivot pin (Fig. 22).

Install the shift lever gate on the lock housing (Fig. 23).

With gearshift lever in neutral position, attach indicator operating bracket to shift tube with two new plastic rivets Fig. 24).

(5) Seat the lock housing on top of the jacket, indexing the key in the housing with the slot in the jacket. Insert all four screws and tighten them alter-

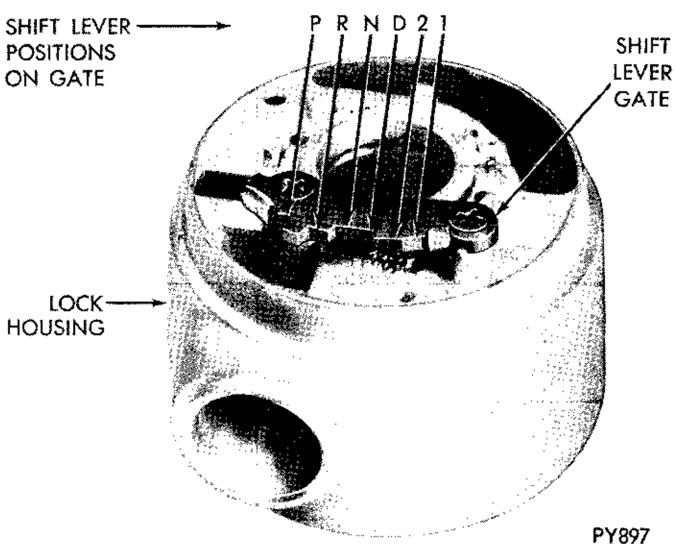


Fig. 23—Lock Housing and Shift Gate

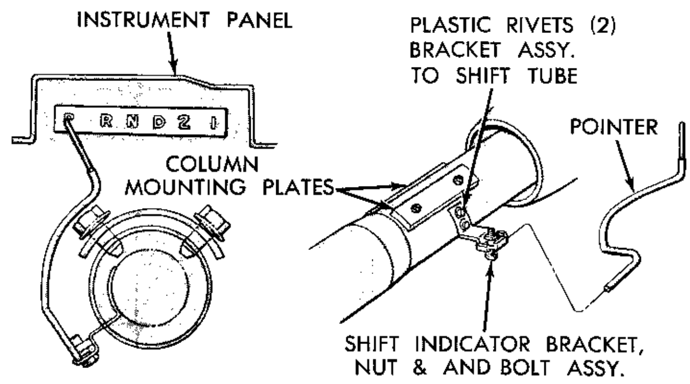


Fig. 24—Gear Selector Indicator Bracket

nately in steps to insure proper seating of the housing on the jacket. Tighten to 80 inch-pounds (Fig. 13).

(6) **Column Shift Manual Transmission Only**

(a) Turn bushing on shift tube (Fig. 19) so the two holes in bushing are aligned with centerline of 2nd and direct shift lever. Slide shift tube and lever assembly through jacket and into gearshift housing. Start the two bushing retaining screws through slots in jacket but do not tighten.

(b) Install spacer (Fig. 18) over crossover blade so it rests against the 2nd and direct shift lever. Install low and reverse lever, then install support and bearing assembly. Install and tighten the three retaining screws to 30 inch-pounds.

(c) Rotate bushing (Fig. 18) with screws so all play at shift levers and spacer is eliminated, but no binding occurs. With bushing in this position tighten the two bushing to jacket screws to 30 inch-pounds.

(d) Place a screwdriver blade between 2nd and direct shift lever and crossover blade, so it will be held in neutral position half-way between the two shift levers (Fig. 25).

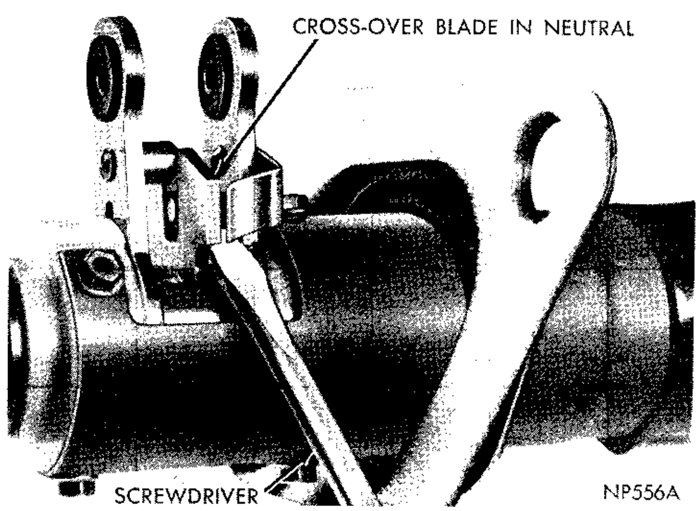


Fig. 25—Holding Crossover Blade in Neutral Position

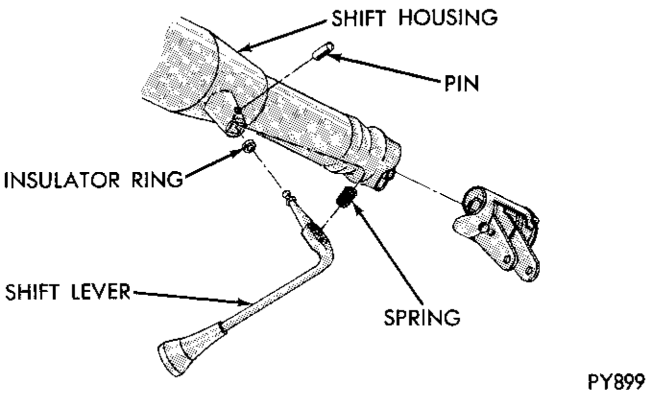


Fig. 26—Install Shift Lever—Manual

(e) Position gearshift lever and spring in housing so ball end with insulator ring engages hole in shift tube key. Align and install retaining roll pin (Fig. 26).

(7) Grease and assemble the two lock levers, lock lever spring, and pin (Fig. 27).

(8) Install the resulting assembly in the lock housing. Seat the pin firmly into the bottom of the slots. Make sure that the lock lever spring leg is firmly in place in lock casting notch (Fig. 12).

(9) Install the lock lever guide plate and retaining screws (Fig. 10).

(10) Position ignition switch to center detent (OFF) position. Feed wires down through the space between housing and jacket. Position switch in housing and tighten three mounting screws (Fig. 11).

(11) Feed buzzer switch wires behind wiring post and down through space between housing and jacket. Position switch in housing and tighten two mounting screws (Fig. 9).

(12) **With the ignition key cylinder in the LOCK position, and with the key removed,** insert the key cylinder into the lock housing. Press the cylinder into place until contact is made with the pin on the ignition switch cam. Insert the key into the lock and rotate the lock until the slot in the cylinder plate lines up with the pin. Press the key cylinder the remaining way into the lock housing, making sure the retainer bar snaps into its slot in the lock housing.

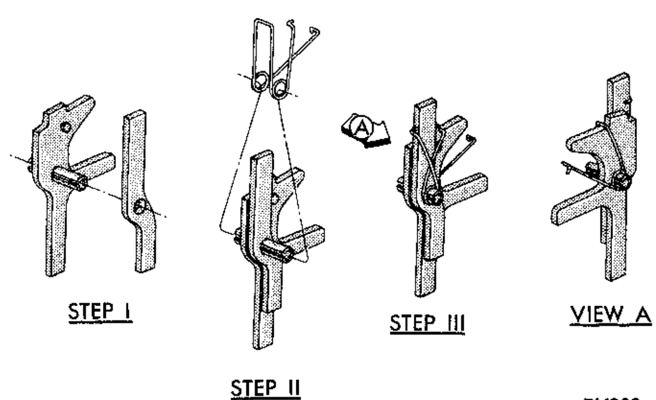


Fig. 27—Lock Levers and Spring—Assembly

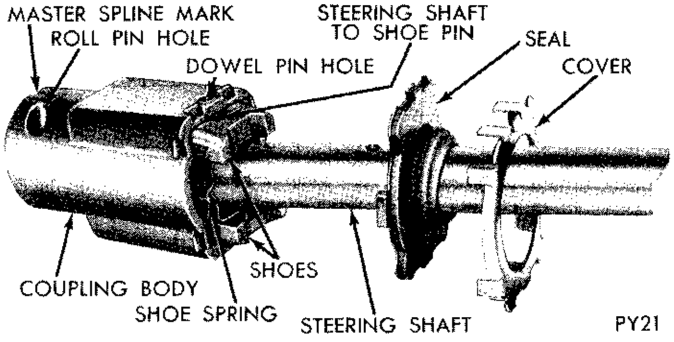


Fig. 28—Assembling Steering Shaft Coupling

Steering Shaft Coupling Assembly (Fig. 20)

(1) Fill coupling body with grease to approximately 1/2 inch from top.

(2) Place cover and seal on shaft.

(3) Press shoe pin into steering shaft so that it projects an equal distance on each side of shaft.

(4) Place spring on side of shaft, straddling the shoe pin.

(5) Place shoes on pin ends with flat side toward spring engaging tangs.

(6) Squeeze shoes together, compressing spring, and push assembly into coupling body (Fig. 28) with gauge hole in shaft aligned with master spline in coupling.

(7) Drive in a new dowel pin flush to outer surface of coupling body.

(8) Position seal and cover on body and crimp cover tangs over the projections on body securely.

Steering Shaft Installation

(1) Insert the steering shaft assembly into the column and shift tube assembly.

(2) Install the lock plate on the steering shaft and press the pin into place. **DO NOT HAMMER** use tool C-4113 (Fig. 8). Make sure pin is centered.

(3) Install steering column shaft lock plate sleeve over shaft lock plate pin and against lock plate.

(4) Install the bearing lower snap ring on the steering shaft.

Bearing Housing Assembly (Fig. 21)

(1) Place rubber insulator with ground staple, over column upper bearing and install assembly into bearing housing bore. Use a soap solution or rubber lubricant to ease installation.

(2) Install the turn signal switch in the bearing housing, feeding the wires through the opening in the housing. Feed the ignition key lamp assembly wires through the opening in the housing at this time.

(3) Install the retaining plate over the switch and tighten 3 screws to 27 in.-lbs. (Fig. 4).

(4) Install the turn signal lever or turn signal/speed control lever on the turn signal switch. If speed control, feed the wires through the opening provided in the bearing housing (Fig. 3).

(5) Position the bearing housing assembly on the column jacket assembly, feeding the wires through the space between the lower housings and the jacket.

(6) When installing this housing, the steering shaft must be drawn, not pushed, through the bearing, using the bearing inner race as a reaction member, or damage to the shaft plastic shear pins, lock housing components, or bearing could result. DO NOT DRIVE THE SHAFT INTO THE BEARING.

(7) Install on steering shaft, Tool C-3879, with washer and steering wheel nut (Fig. 29). Turn nut to pull shaft through bearing. Remove tool and install upper snap ring on shaft.

(8) Install and tighten to 35 in.-lbs. the 3 bearing housing to lock housing screws.

(9) Carefully install the ignition key lamp assembly in the bearing housing (2 screws).

(10) Install the wiring trough in place over the wires, being careful to not pinch wires between trough and jacket.

COLUMN INSTALLATION (Fig. 1 or 2)

(1) Tool C-4134 must be used to hold the steering shaft in the center of the shift tube while installing and aligning the column in the vehicle.

(This operation is not necessary on Column shift manual transmission columns or columns with a double coupling on the steering shaft or tilt columns.)

(a) Remove thumbscrew and open tool to straddle shift tube lever and steering shaft (Fig. 30).

(b) Close tool and tighten thumbscrew.

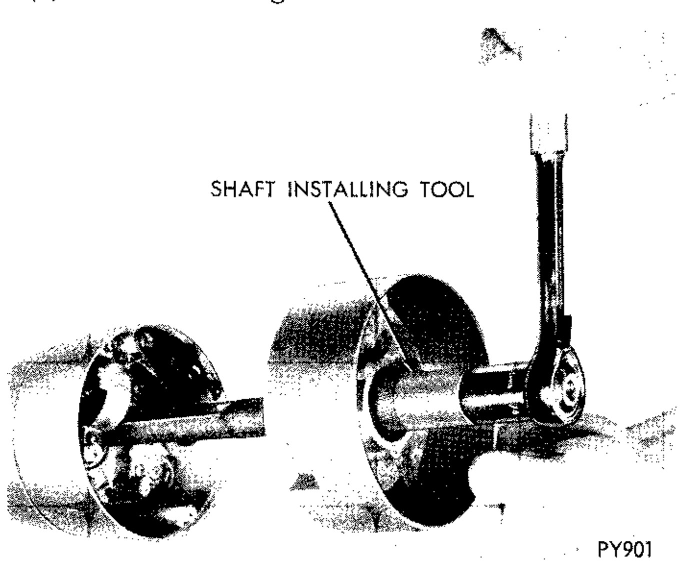


Fig. 29—Pulling Shaft into Bearing

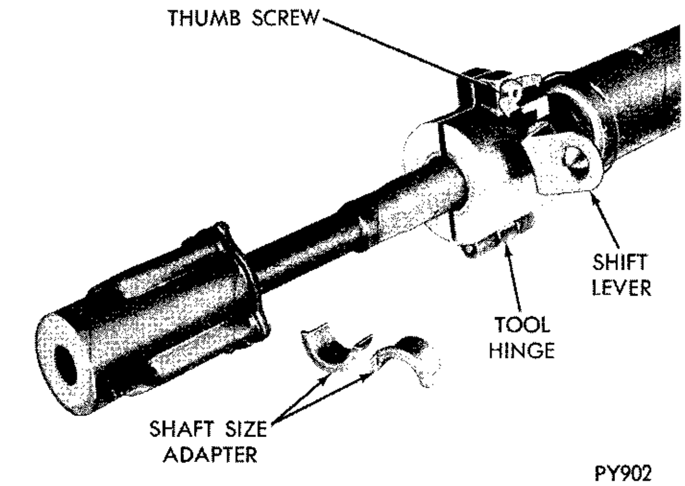


Fig. 30—Shaft Centering Tool

(c) If hole in tool is too large to grip steering shaft, add the split insert to adapt tool to smaller shaft diameter.

(2) Position bracket assembly on steering column (Fig. 1), install ground wire and tighten the four **short** retaining screws to 120 inch-pounds. Plastic capsules should be pre-assembled in bracket slots. Insert column assembly through floor pan opening, being careful not to damage paint or trim.

(3) With front wheels in straight ahead position and master splines on wormshaft and coupling aligned, engage coupling with wormshaft and install the roll pin. **CAUTION: Do not apply end loads to steering shaft.**

(4) Hold column assembly with bracket against the instrument panel support. Install but **do not tighten** the two upper bracket nuts.

(5) **Center steering shaft coupling at midpoint of its travel.** This is accomplished by moving column and bracket assembly fore and aft in the instrument panel support so dimension between top of coupling and center of gauge hole is 13-16 inch (Fig. 31). Tighten the two upper bracket nuts to 110 inch-

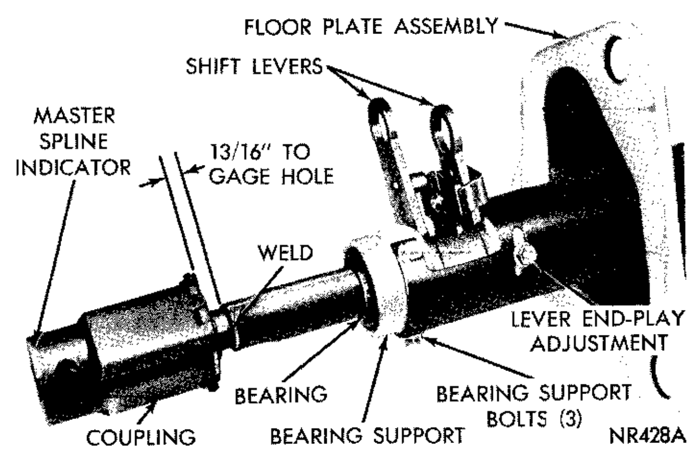


Fig. 31—Shaft Coupling Adjustment

pounds. Attach electrical ground wire to one of the rear mounting studs.

(6) Position floor plate over floor pan opening, centering it around the column, then install and tighten retaining bolts. Slide "O" ring down the jacket and into recess in floor plate, position retaining plate over "O" ring and secure with the two bolts. **Do not pry to align plates and attaching bolts or column misalignment will occur.**

(7) Loosen bolt attaching the forward adjustable hanger to the instrument panel support. Attach column bracket forward leg to the hanger and tighten to 110 inch-pounds. **Then tighten the hanger to instrument panel support bolt to 200 inch-pounds.**

(8) Connect gearshift indicator pointer (Fig. 24) to operating bracket on shift tube in its approximate original location. Slowly move gearshift lever from "1" (low) to "P" (park) pausing briefly at each selector position. The indicator pointer must align with each selector position. If necessary, loosen the bolt and readjust to align pointer correctly.

(9) Attach finish plate to bottom of instrument panel.

(10) Place steering wheel on steering shaft with master splines aligned. Install retaining nut and washer, tighten nut to 27 foot-pounds. **Do not drive wheel on shaft, draw wheel down with retaining nut.**

(11) Install horn switch parts previously removed from steering wheel. Connect horn switch wire.

(12) Connect wiring connectors at steering column jacket. Connect battery ground cable, test operation of lights and horns.

(13) Connect and adjust gearshift linkage, refer to "Transmission Group".

STEERING COLUMN (TILT-A-SCOPE)

INDEX

GENERAL INFORMATION

This optional steering column has the same impact absorbing design as the other columns described in this section. The installation is the same, therefore only the disassembly and reassembly of the column will be detailed here.

SERVICE PROCEDURES

REMOVAL (See Standard Columns)

Disassembly (Fig. 1)

(1) Remove four bolts attaching bracket assembly to column jacket.

(2) Unsnap and remove the wiring protector from column jacket.

(3) Attach column Holding Fixture C-4132 to jacket pads and clamp the assembly in a vise.

(4) Drive out gearshift lever pivot pin, then remove lever from housing. Remove tilt release lever and turn signal switch lever. If equipped with "Speed Control" see Accessories Group 1.

(5) Lock telescoping shaft with a set screw and install lock plate compressing tool C-4118 (Fig. 2). Depress lock and carrier far enough to remove "C" ring. Remove tool, lock plate, carrier and spring (Fig. 1).

(6) Remove three turn signal switch attaching screws, place shift bowl in low (1) position, and remove switch and wiring (Fig. 1).

(7) The buzzer switch can be pulled straight out of the housing. A flat spring wedges the switch toward the lock cylinder (Fig. 3). (This may be done without the removal of the lock cylinder.) If the lock cylinder is in the housing, it must be in the "ON" position.

(8) The lock cylinder may be removed in any position from "Accessory" to "ON". However, the "LOCK" position is recommended because of its positive location.

(9) Insert a thin tool (small screw driver or shim stock) into the slot next to the switch mounting screw boss (right-hand slot) and depress spring latch at bottom of slot, which releases lock. Remove lock (Fig. 4). NOTE: If lock cylinder has never been removed, the slot will be covered by a thin casting flash, which must be broken through when tool is inserted.

(10) Remove three housing cover screws and remove housing cover (Fig. 3).

(11) Install tilt release lever and place column in full "Up" position. Remove tilt spring retainer using

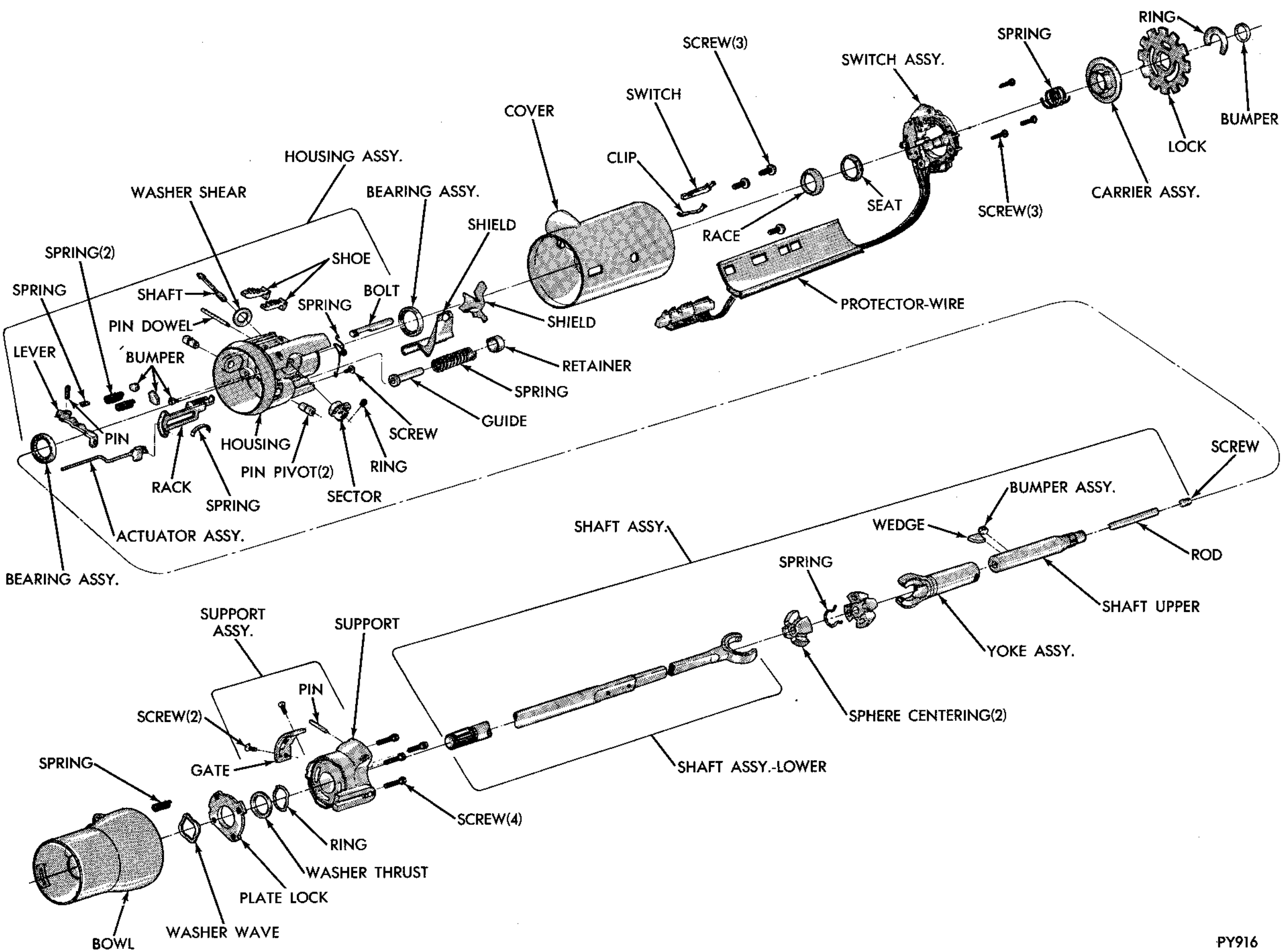


Fig. 1—Tilt-A-Scope Column Upper End—Disassembled

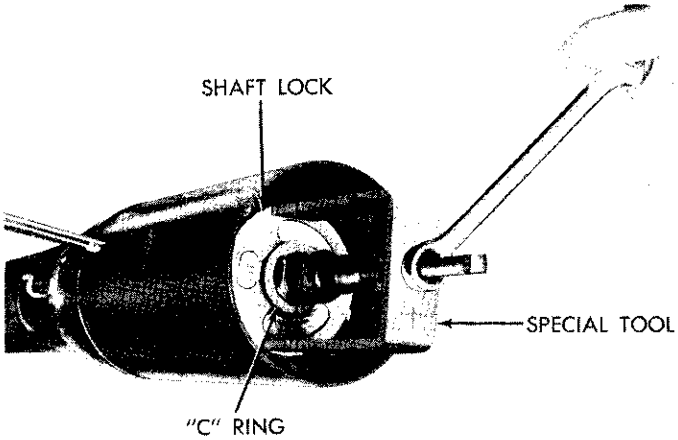


Fig. 2—Removing or Installing Lock Plate "C" Ring

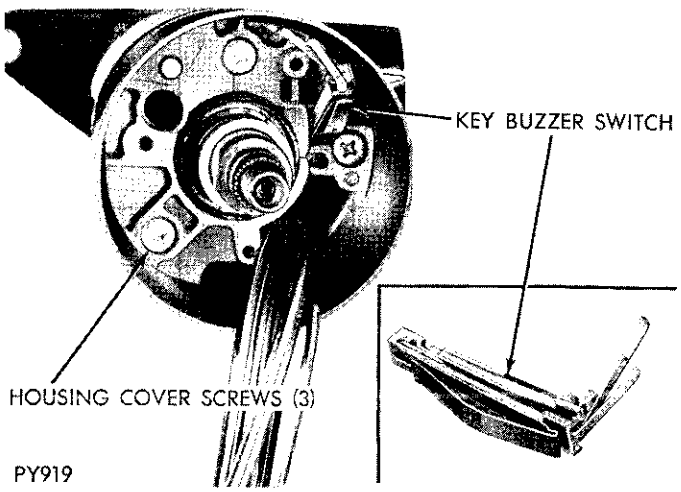


Fig. 3—Key Buzzer Switch

screw driver blade that just fits into slot opening. Insert screw driver in slot, press in approximately 3/16", turn approximately 1/8 turn counterclockwise until ears align with grooves in housing and remove spring and guide (Fig. 5).

(12) Remove seat and upper bearing race (Fig. 1).

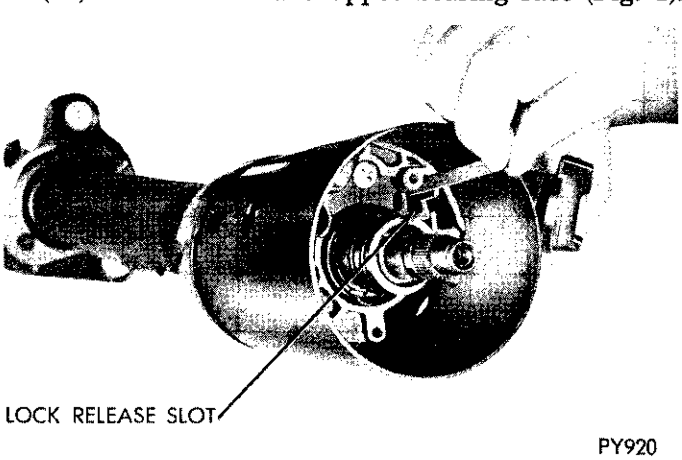


Fig. 4—Removing Lock Cylinder

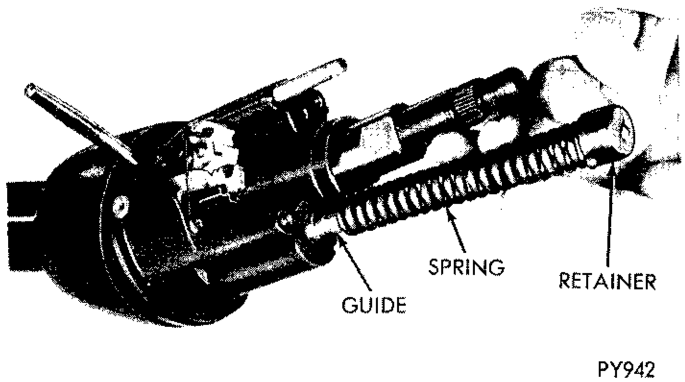


Fig. 5—Tilt Spring, Retainer, and Guide

(13) With ignition switch in "LOCK" position, remove two ignition switch mounting screws and ignition switch (Fig. 6).

(14) Place Pivot Pin Remover C-4016 over pivot pin and thread small portion of screw firmly into the pin. Hold screw from turning with one wrench, turn nut clockwise with a second wrench to withdraw pivot pin from the support (Fig. 7). Remove opposite pivot pin in same manner.

(15) Use tilt release lever to disengage lock shoes. Remove bearing housing assembly by pulling upward to extend rack full down and moving housing assembly to the left to disengage rack from actuator. Remove actuator rod assembly.

NOTE: If shaft has double coupling, remove pin and upper coupling from shaft. If equipped with a single coupling, it must be disassembled to remove shaft from column.

(16) Disassemble shaft coupling assembly (See Standard Columns). Press shoe pin out of steering shaft with an arbor press. **Do not hammer on coupling or steering shaft to remove.**

(17) Remove steering shaft assembly from upper end.

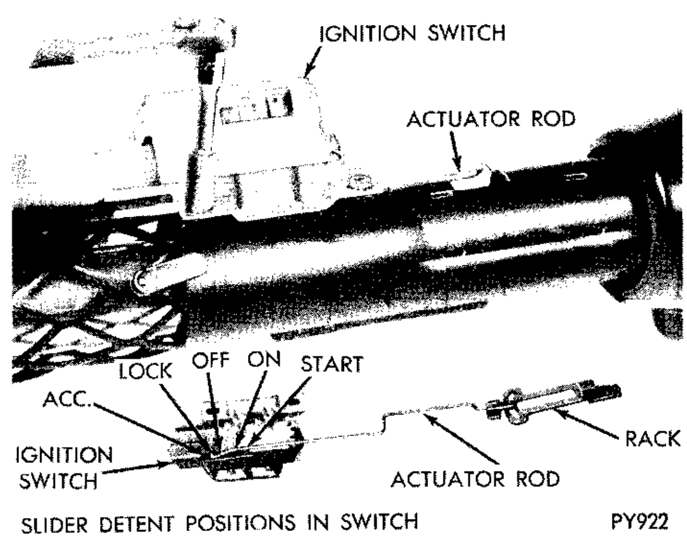


Fig. 6—Ignition Switch

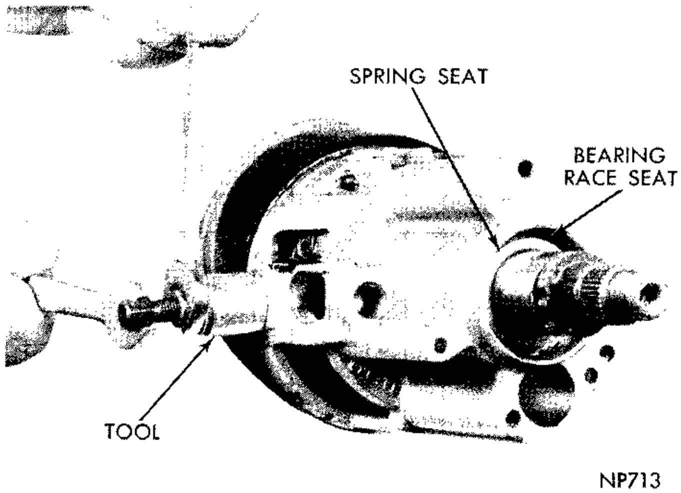


Fig. 7—Pivot Pin Removing Tool

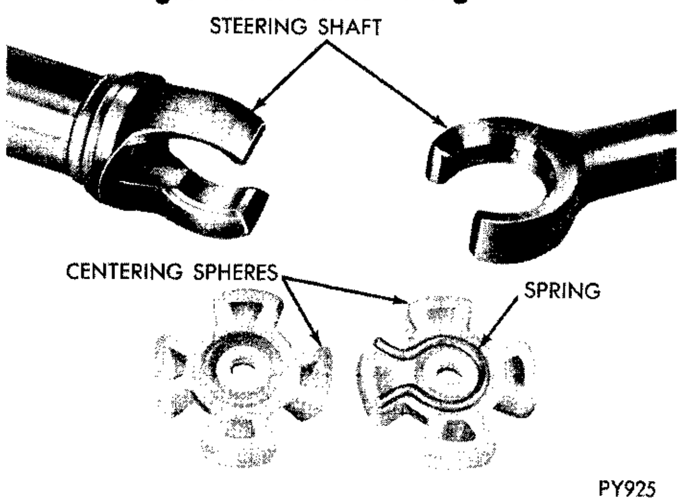


Fig. 8—Shaft Centering Spheres—Disassembled

(18) Disassemble steering shaft assembly by removing centering spheres and anti-lash spring (Fig. 8).

Disassemble upper steering shaft, locking wedge, locking rod and up bump stop from upper yoke (Fig. 9).

(19) Remove four bolts securing support to lock plate and remove support from end of column jacket. If necessary, remove two attaching screws and shift gate from the support.

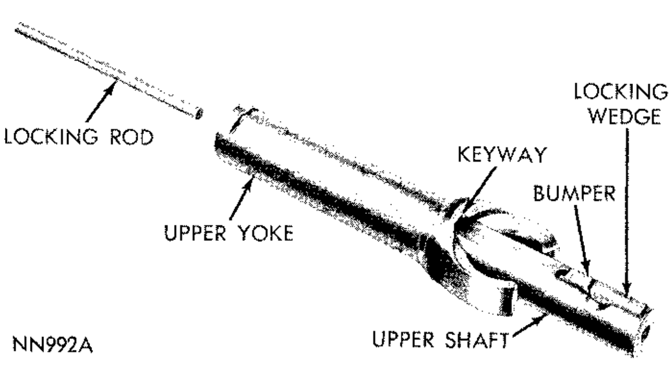


Fig. 9—Upper Steering Shaft and Yoke—Disassembled

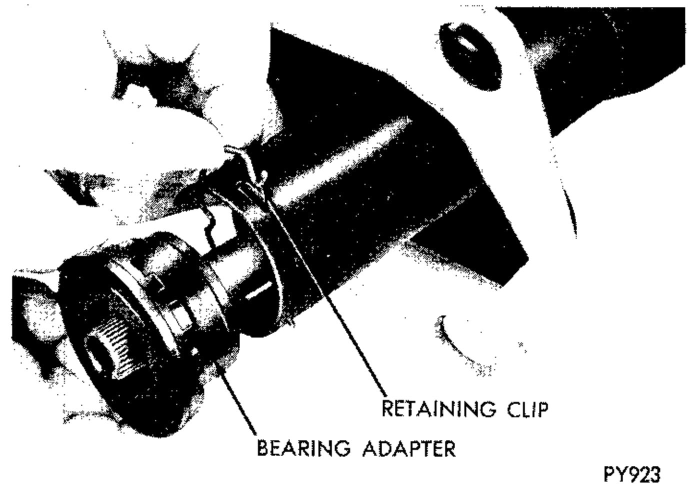


Fig. 10—Shaft Lower Bearing Adapter

(20) Remove shift tube retaining ring with screw driver. Remove thrust washer.

(21) Remove clip and bearing adapter from lower end of column jacket (Fig. 10).

(22) The column jacket with shift tube and bowl are serviced as an assembled unit.

BEARING HOUSING DISASSEMBLY (Fig. 1)

(1) Remove tilt lever opening shield and turn signal lever opening shield from housing.

(2) Remove lock bolt spring by removing spring retaining screw and moving spring clockwise to remove from bolt (Fig. 11).

(3) Remove snap ring from sector drive shaft. With small punch, lightly tap drive shaft from sector. Remove drive shaft, washer, sector and bolt. Remove rack and rack spring.

(4) Remove tilt release lever pin with punch and

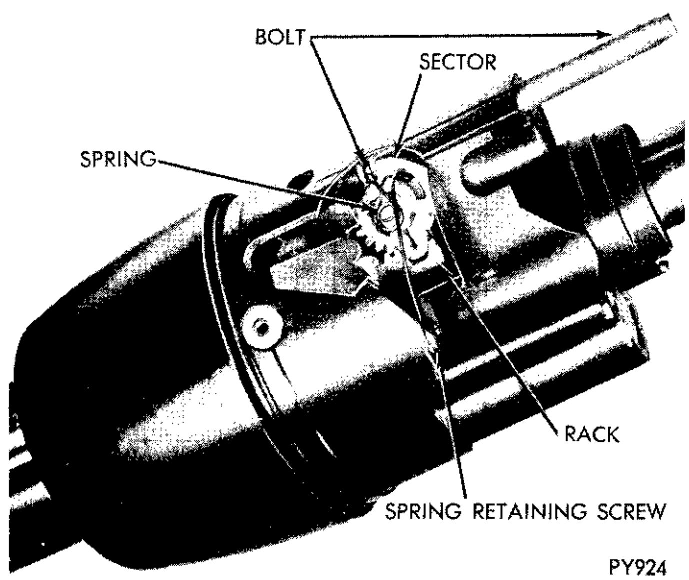


Fig. 11—Sector and Bolt Spring

hammer. Remove lever and release lever spring. (To relieve load on release lever, hold shoes inward and wedge block between top of shoes (over slots) and bearing housing).

(5) Remove lock shoe pin with punch and hammer. Remove lock shoes and lock shoe springs.

NOTE: With tilt lever opening on left side, shoes facing up, the four slot shoe is on the left.

(6) Remove bearings from bearing housing **only if they are to be replaced.** Remove separator and balls from bearing. Place housing on work surface. With a pointed punch againt back surface of race, carefully hammer race out of housing until bearing puller can be used. Repeat for other race.

Inspection

(1) Inspect all bearings and race seats for brinelling, nicks, scratches and wear.

(2) Inspect centering sphere for nicks, damage or wear. If damage is found, check shaft couplings for nicks, burrs or rough spots.

(3) Inspect actuator housing, shift lever bowl and support for cracks or other damage.

(4) Inspect turn signal switch unit for distortion, broken or damaged parts.

(5) Inspect horn and turn signal wires for worn or bare spots.

(6) Inspect the steering shaft and gearshift tube for loose or broken plastic shear joints.

(7) Inspect steering column mesh cover, mend with electricians tape if loose or torn.

Assembly

The grease recommended for use during reassembly procedures is Automotive Multi-Purpose Grease NLGI Grade 2 E.P. or Multi-Mileage Lubricant, Part Number 2525035.

BEARING HOUSING ASSEMBLY (Fig. 1)

(1) Install bearings in bearing housing, if removed.

(2) Install lock shoe springs, lock shoes and shoe pin in bearing housing. Use approximately .180 rod to line up shoes for pin installation.

(3) Install spring, release lever and pin in bearing housing. (Again, relieve load on release lever as in step (4) of disassembly procedure.)

(4) Install washer and drive shaft in housing. Lightly tap sector onto the shaft far enough to install snap ring.

(5) Install lock bolt and engage with sector cam surface.

(6) Install rack and spring. Block tooth on rack to engage block tooth on sector. Install external tilt release lever.

(7) Install bolt spring and spring retaining screw. Tighten to 35 inch-pounds (Fig. 11).

COLUMN ASSEMBLY (Fig. 1)

(1) Install thrust washer and retaining ring by pulling bowl up to compress wave washer.

(2) Install support by aligning "V" in support with "V" notch in jacket. Insert screws through support into lock plate. Tighten screws to 60 inch-pounds torque.

(3) Align lower bearing adapter notches in jacket and push in lower end of column jacket. Shift tube should pilot in adapter at this time. Install clip (Fig. 10).

(4) Install centering spheres and anti-lash spring in upper steering yoke. Install lower steering shaft from same side of spheres that spring ends protrude (Fig. 8). Install upper steering shaft, locking wedge, locking rod and up bump stop in yoke (Fig. 9).

(5) Install steering shaft assembly in shift tube from upper end. Carefully guide shaft through shift tube and bearing.

(6) Install ignition switch actuator rod through bowl from bottom and insert in slot in support. Extend rack downward from bearing housing. Assemble bearing housing over steering shaft and engage rack over end of actuator rod.

(7) Install external tilt release lever and, holding lock shoes in disengaged position, assemble bearing housing over steering shaft until the pivot pin holes line up.

(8) Install pivot pins.

(9) Place housing in full "UP" position and install guide, tilt spring and tilt spring retainer, using screw driver in retainer slot. Turn retainer clockwise to engage (Fig. 5).

(10) Install tilt lever opening shield and turn signal lever opening shield in housing.

(11) Remove tilt release lever, install housing cover and tighten three screws to 45 inch-pounds (Fig. 3).

(12) Assemble buzzer switch to spring clip with formed end of clip under end of switch and spring bowed away from switch on side opposite contact. Push switch and spring into hole in cover to the step with the contacts toward lock cylinder bore (Fig. 3).

(13) Install signal switch wires and connector through cover, bearing housing and bowl. Install switch and tighten screws to 35 inch-pounds.

(14) Install over the upper steering yoke the upper bearing race, followed by the seat, spring, carrier assembly and lock plate (Fig. 1). Lock the telescoping shaft with a set screw and install lock plate compressing Tool C-4118. Depress lock plate and carrier just far enough to install "C" ring on yoke (Fig. 2). Remove tool and set screw from shaft.

(15) Install tilt release lever and signal switch lever. Install shift lever and drive in pivot pin.

(16) To install key cylinder, place cylinder in

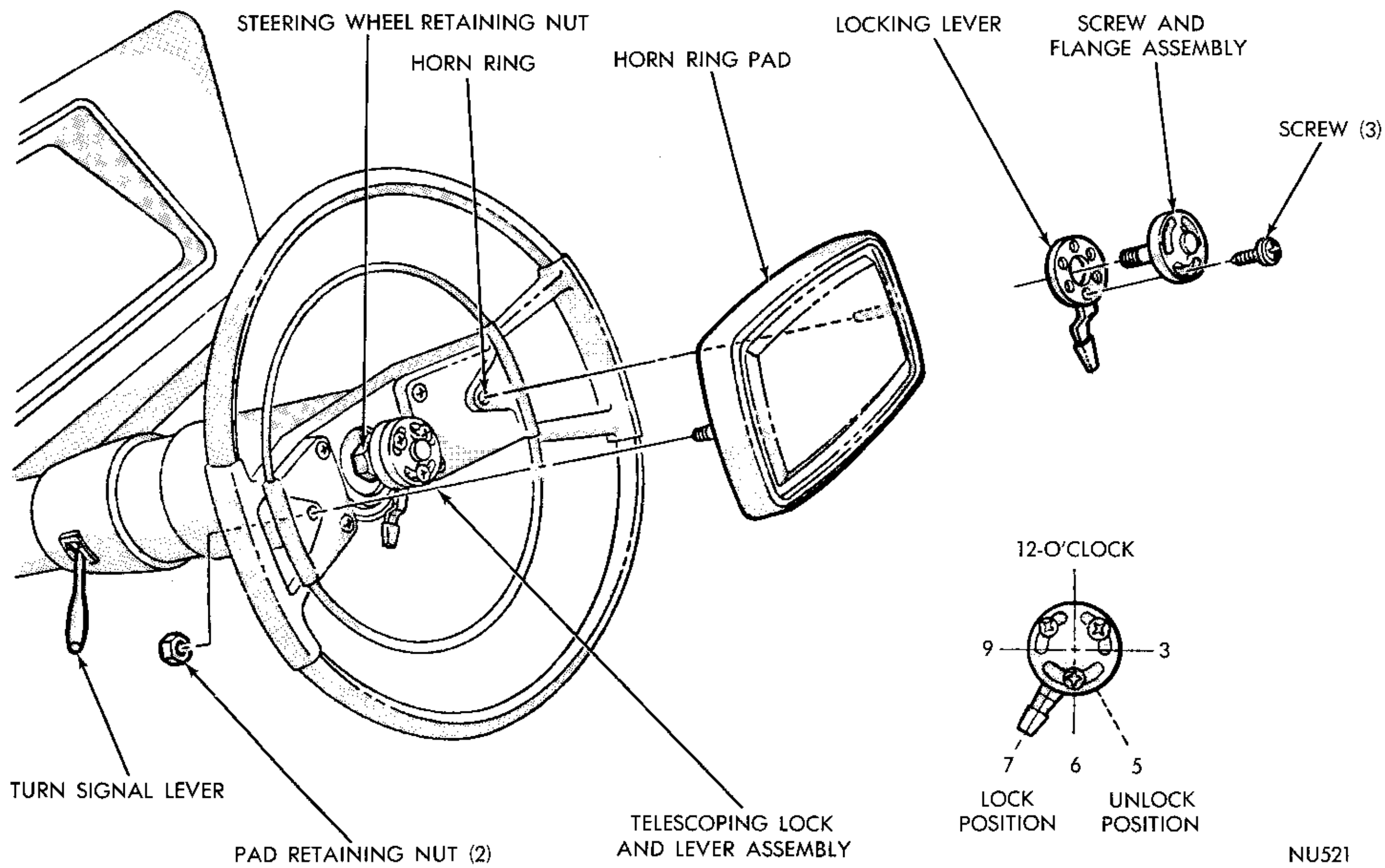


Fig. 12—Telescoping Steering Wheel—Locking Mechanism

"LOCK" position and remove key. Insert key cylinder into housing until contact is made with sector shaft. Place key in cylinder and rotate, while pressing inward, until cylinder slot aligns with shaft. Press key cylinder the remaining way into housing until it's retainer snaps into place in housing slot.

(17) When replacing ignition switch, place the lock in "LOCK" detent position. Place the switch in "LOCK" by the following procedure:

(a) Position the switch as it is shown in (Fig. 6).

(b) Move the slider to the extreme left.

(c) Move the slider back one position to the right to the "LOCK" position.

Fit the actuator rod into the slider hole and assemble to the column with two screws. Push the switch lightly down the column (away from the steering wheel), to take out lash in the actuator rod, and tighten mounting screws. Caution should be exercised to prevent moving the switch out of detent. Use only the correct screws. Tighten to 35 inch-pounds.

(19) Install wire protector over wires on column jacket. Be careful to not pinch any wires.

(20) Remove column from vise and Holding Fixture from column. Position bracket assembly on steering column. Install and torque the four short retaining screws to 120 inch-pounds.

NOTE: If equipped with double coupling install upper coupling and pin on steering shaft (step 21 not necessary).

(21) Reassemble steering shaft coupling (see standard columns). Press shoe pin into steering shaft, **do not hammer.**

Installation (See Standard Columns)

See Brakes, Group 5, for installation of Imperial parking brake vacuum valve.

STEERING WHEEL (Figs. 12 and 13)

Removal

(1) Remove 2 retaining nuts from underside of horn ring and lift off pad.

(2) Move lever to unlock position then remove 3 locking lever retaining screws then remove screw and flange assembly with locking lever.

(3) Remove 4 horn ring retaining screws and bushings then lift off horn ring and spring.

(4) Scribe an alignment mark on steering wheel hub in line with mark on end of steering shaft to aid in reassembly.

(5) Remove steering wheel retaining nut and washer. Remove steering wheel with Tool C-3428A. **Do not bump or hammer on steering shaft to remove wheel.**

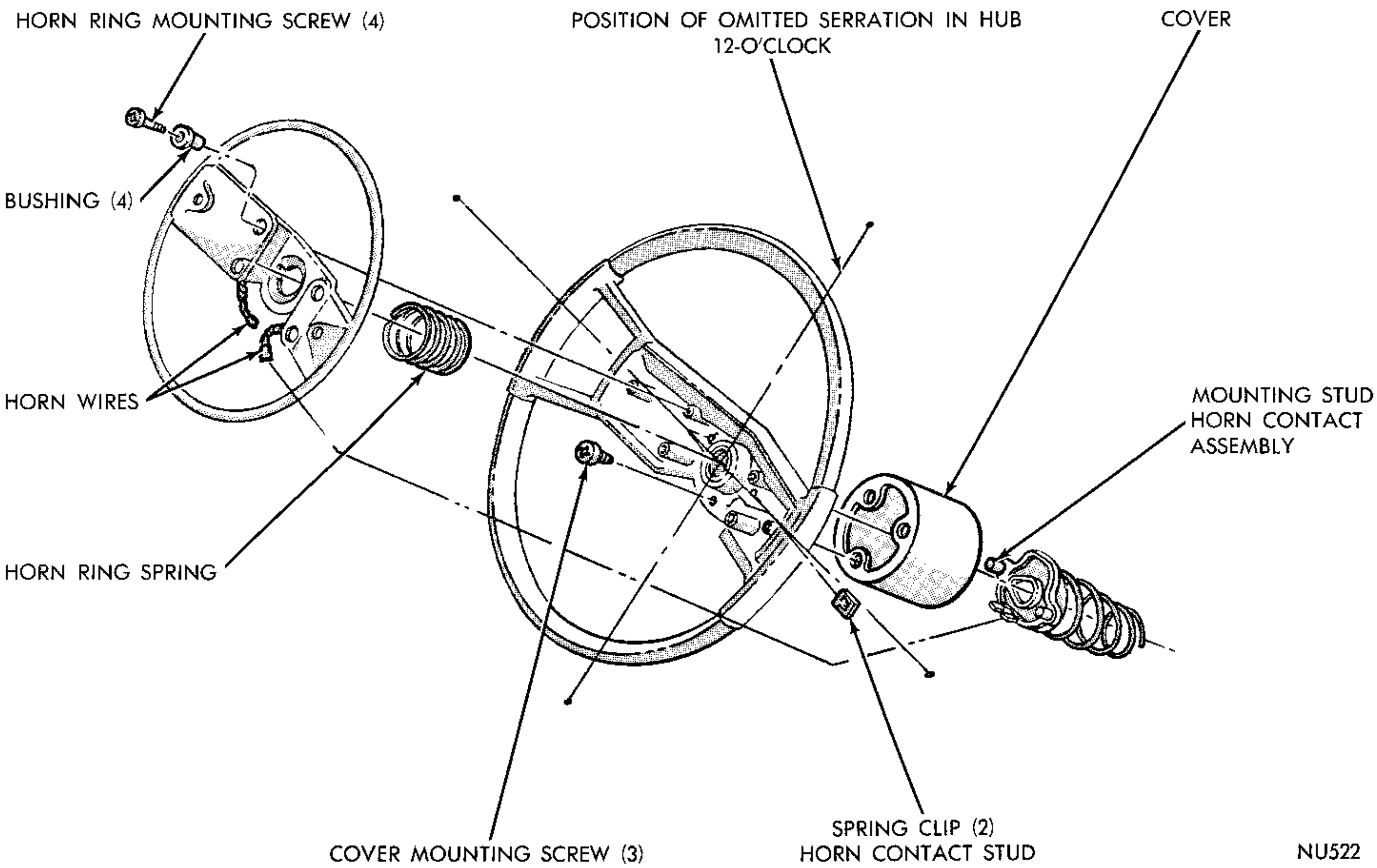


Fig. 13—Telescoping Steering Wheel—Disassembled

Disassembly

Figure 13 shows a disassembled view of the tilting and telescoping steering wheel.

(1) Remove 2 spring clips and remove horn contact and spring assembly.

(2) Remove 3 screws and lift off cover.

Assembly

(1) Place cover on bottom of steering wheel and fasten with 3 screws.

(2) Position horn contact assembly studs through steering wheel and fasten with 2 spring clips. Wire connectors to be in 6 o'clock position.

(3) Place spring and horn ring on steering wheel and attach with 4 bushings and screws.

(4) Attach horn wires to horn contact terminals.

Installation

(1) Install steering wheel with scribed mark on hub aligned with mark on end of steering shaft. Install and tighten retaining nut to 27 foot-pounds.

(2) With steering wheel in normal position place locking lever on steering shaft and tighten screw and flange assembly to 45 inch-pounds to lock telescoping action.

(3) Attach locking lever finger tight to flange with 3 screws (Fig. 12).

(4) Position lever in lock (7 o'clock) position and tighten screws to 24 inch-pounds.

(5) Check operation of telescoping mechanism as follows:

Rotate locking lever counterclockwise to 5 o'clock position. The wheel should be entirely free to telescope.

Rotate locking lever clockwise making certain it secures wheel in any telescoped position.

(6) Place pad on horn ring and tighten two nuts to 35 inch-pounds.

SPECIFICATIONS

MANUAL STEERING GEAR

Type	Recirculating Ball Nut
Ratio	24 to 1
Cross Shaft Bearings	3-Needle Bearings

Wormshaft Bearings	2-Caged Ball Bearings
Cross Shaft Adjusting Screw End Play	.000-.004 Inch
Worm Bearing Preload	1 to 4 in. lbs. to Keep Wheel Moving
Sector Mesh Adjustment Preload Torque—Includes Worm Bearing Preload	8 to 11 in. lbs. Pull through high spot

POWER STEERING GEAR

Type	Constant Control Full Time Power
Ratio	15.7 to 1
Wheel Turns—Stop to Stop	3-1/2
Cross Shaft Bearings	2 Needle Bearings and I Direct Bearing on Grey Iron Cover
Worm Shaft Thrust Bearing Pre-Load	16-24 Ozs.
Cross Shaft Adjustment	Tighten Adjusting Screw 3/8 to 1/2 turn past Zero Back Lash (Center of High Spot)
Fluid Capacity of Hydraulic System	4 Pts. (3-3/4 Imperial Pts.
Type of Fluid	Power Steering Fluid Part No. 2084329 or equivalent

PUMP

Type	Constant Displacement—1.06 Cu. In. per revolution 1200 to 1300 PSI
Maximum Pressure	
.94 Pump	1075 to 1200 PSI
1.06 Pump Chrysler	1100 to 1300 PSI
Imperial	1200 to 1300 PSI
Pump Output	
.94 Pump	2.1 to 2.6 gpm
1.06 Pump	
High level	2.5 to 3.0 gpm
Low level	1.4 to 1.8 gpm
Type of Fluid	Power Steering Fluid—Part No. 2084329 or equivalent—Do Not Use Type "A" Transmission Fluid

TIGHTENING REFERENCE

MANUAL STEERING GEAR

	Foot Pounds
Cross Shaft Adjusting Screw Lock Nut	35
Cross Shaft Cover Bolt	25
Gear Assembly to Frame Bolt	100
Steering Arm Nut	180
Steering Wheel Nut	27

POWER STEERING GEAR

	Foot Pounds
Gear Housing to Frame Bolt	100
Gear Shaft Adjusting Screw Lock Nut	50
Gear Shaft Cover Nut	20
Pump Inlet Fitting	30
Steering Arm Nut	120

	Pounds Foot	Pounds Inch
Steering Column Support Nut		140
Steering Shaft Coupling Bolts		200
Valve Body Attaching Bolts		200
Valve Body End Plug	25	
Steering Wheel Nut	27	

PUMPS

Location	Foot Pounds
High Pressure Hose Fittings	
Gear End	
All Models	12-14
Pump End	
All Models	21-27
Bracket Bolts	
.94 pump	30-40
1.06 pump	18

Location	Foot Pounds
Flow Control Valve Plug	
.94 pump	4
1.06 pump	5-7
Pulley Retaining Nut (.94 pump)	45-55
Bracket Mounting Bolts	25-35
1.06 pump	
1/8 inch pipe clean out plug	7

TRANSMISSIONS

CONTENTS

TORQUEFLITE TRANSMISSION (A-727-B)

INDEX

GENERAL INFORMATION

The TorqueFlite Transmission model identification markings are cast in raised letters about 3/8 inch high on the lower left side of the transmission bell housing.

The A-727-B TorqueFlite Transmission servicing procedures are in general the same for all models. **CAUTION: Transmission operation requirements are different for each vehicle and engine combination and some internal parts will be different to provide for this. Therefore, when replacing parts, refer to the seven digit part number stamped on left side of the transmission oil pan flange.**

The A-727-B transmission (Fig. 1) combines a torque converter and a fully-automatic 3-speed gear system. The converter housing and transmission case are an integral aluminum casting. The transmission consists of two multiple disc clutches, an overrunning clutch, two servos and bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. The common sun gear of the planetary gear sets is connected to the front clutch by a driving shell which is splined to the sun gear and to the front clutch retainer. The hydraulic system consists of an oil pump, and a single valve body which contains all of the valves except the governor valve.

Venting of the transmission is accomplished by a drilled passage through the upper part of the oil pump housing.

The torque converter is attached to the crankshaft through a flexible driving plate. Cooling of the converter is accomplished by circulating the transmission fluid through an oil-to-water type cooler, located in the radiator lower tank. The torque converter assembly is a sealed unit which cannot be disassembled.

The transmission fluid is filtered by an internal "Dacron Type" filter attached to the lower side of the valve body assembly.

Engine torque is transmitted to the torque converter then, through the input shaft to the multiple disc clutches in the transmission. The power flow depends on the application of the clutches and bands. Refer to "Clutch Engagement and Band Application Chart."

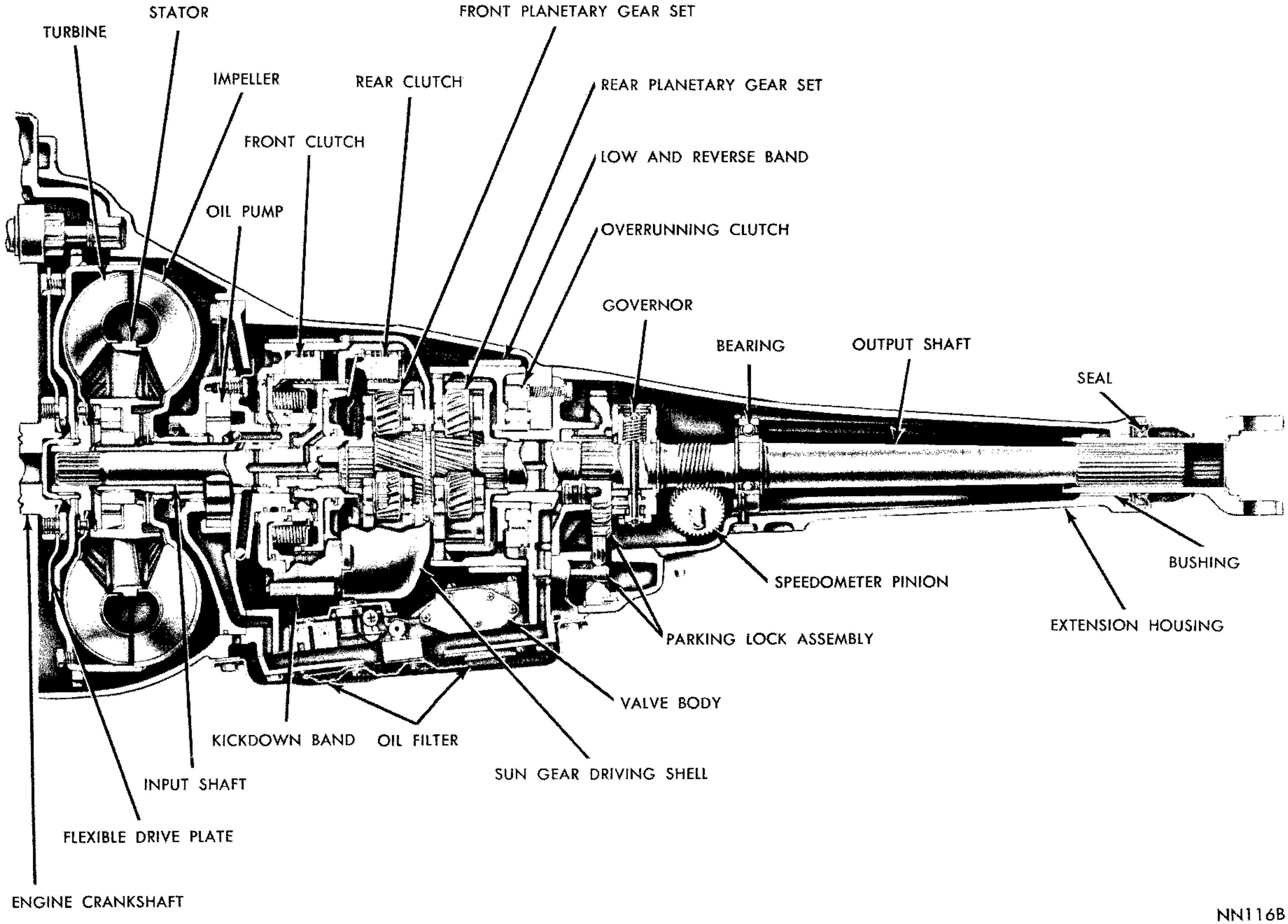
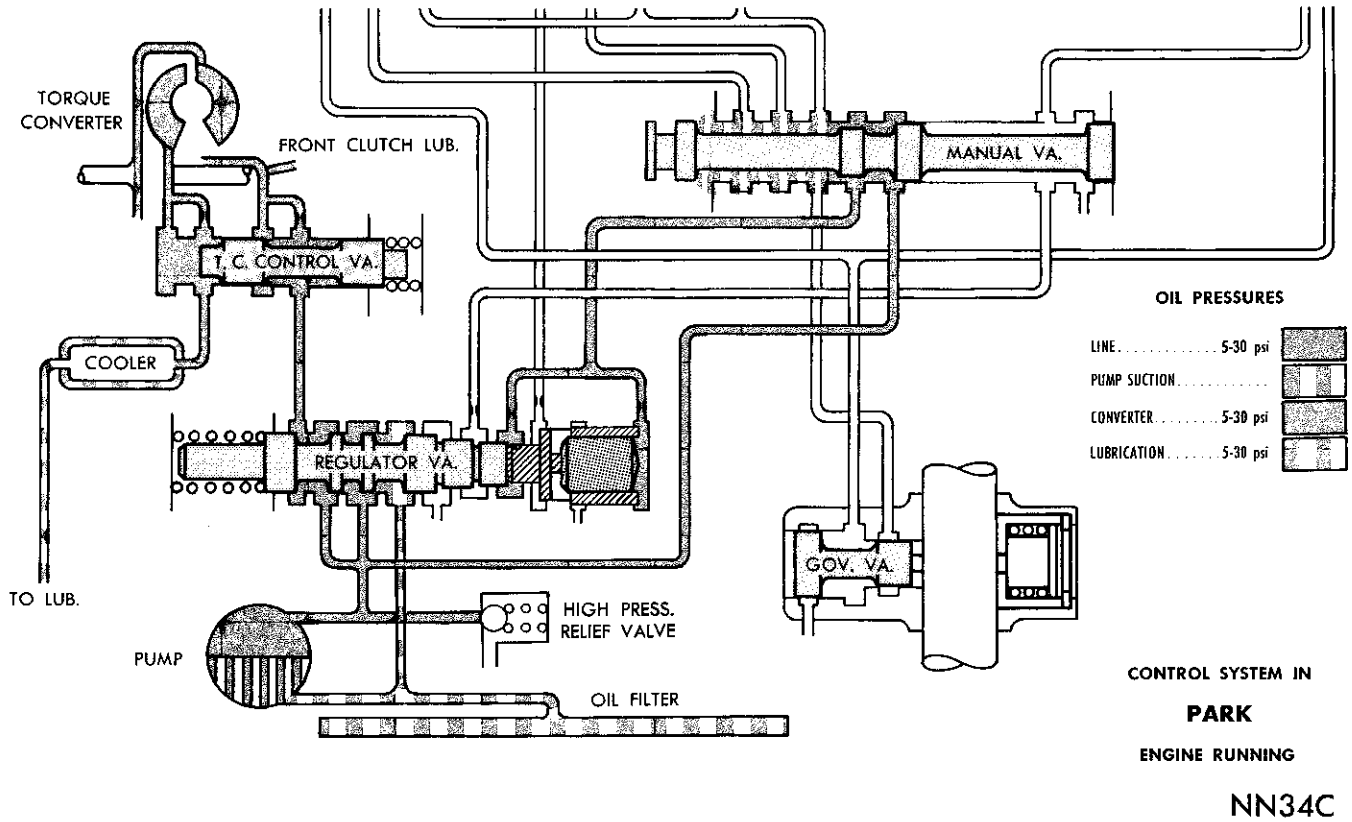
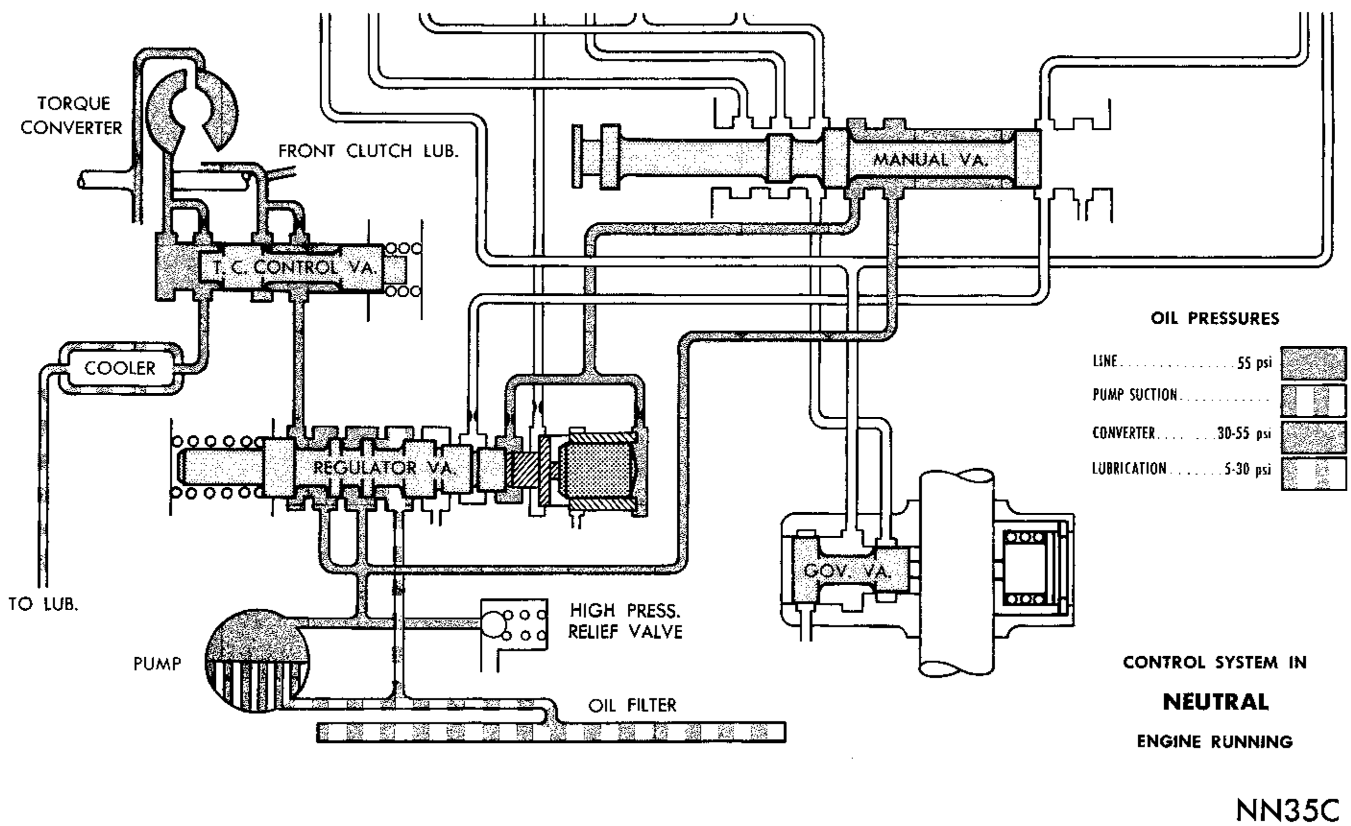


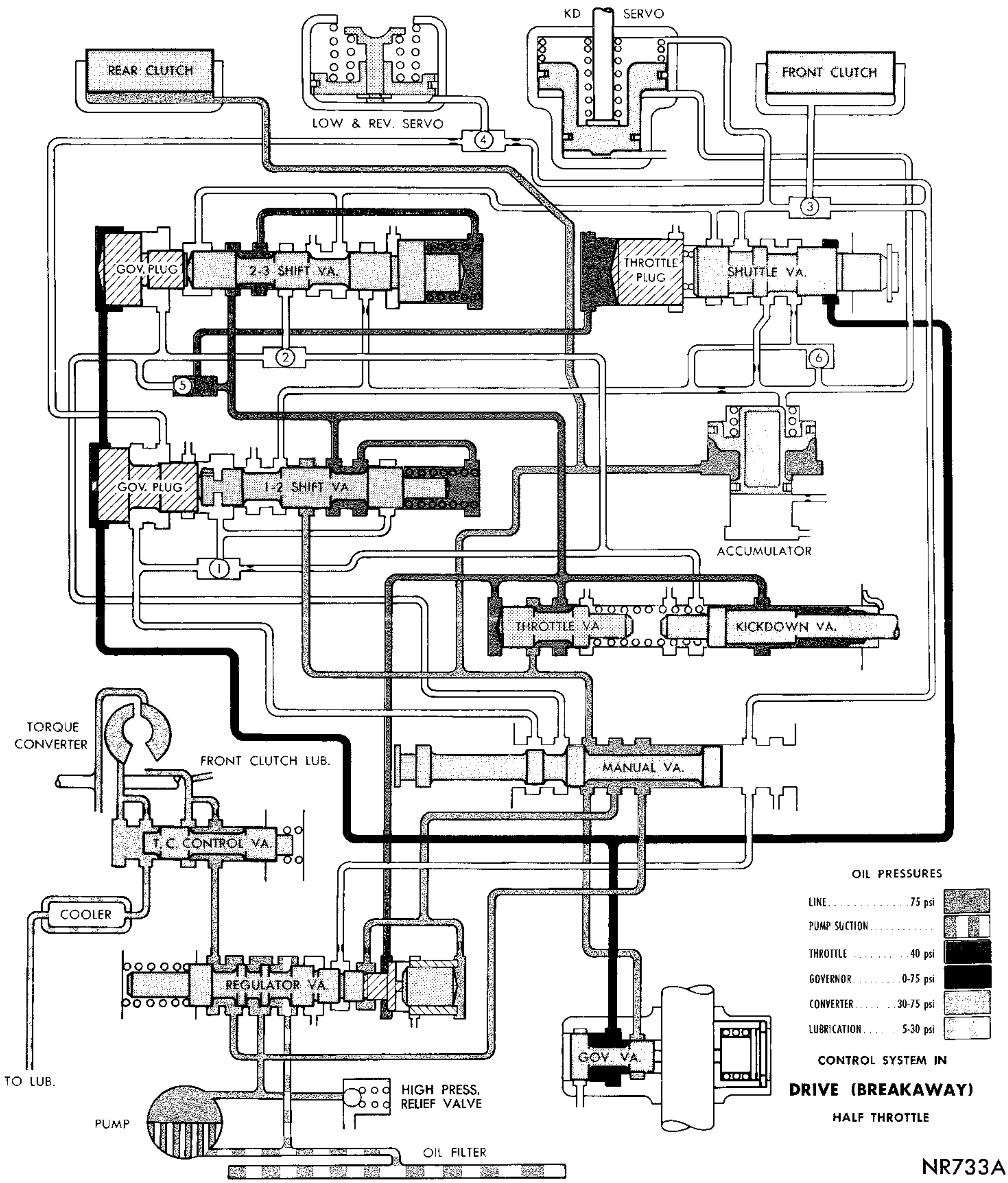
Fig. 1—TorqueFlite Transmission and Torque Converter (A-727)



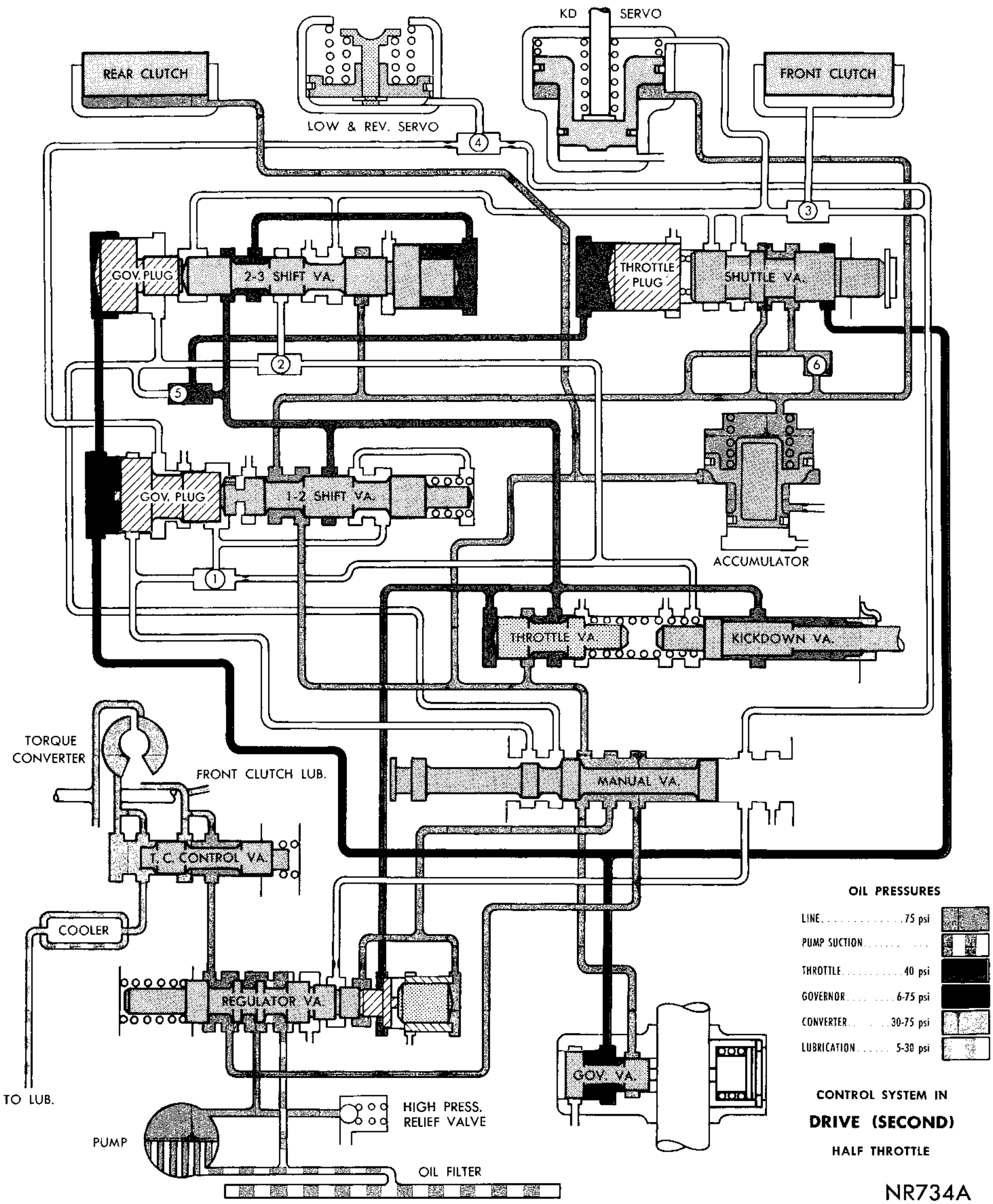
Park Hydraulic Circuits



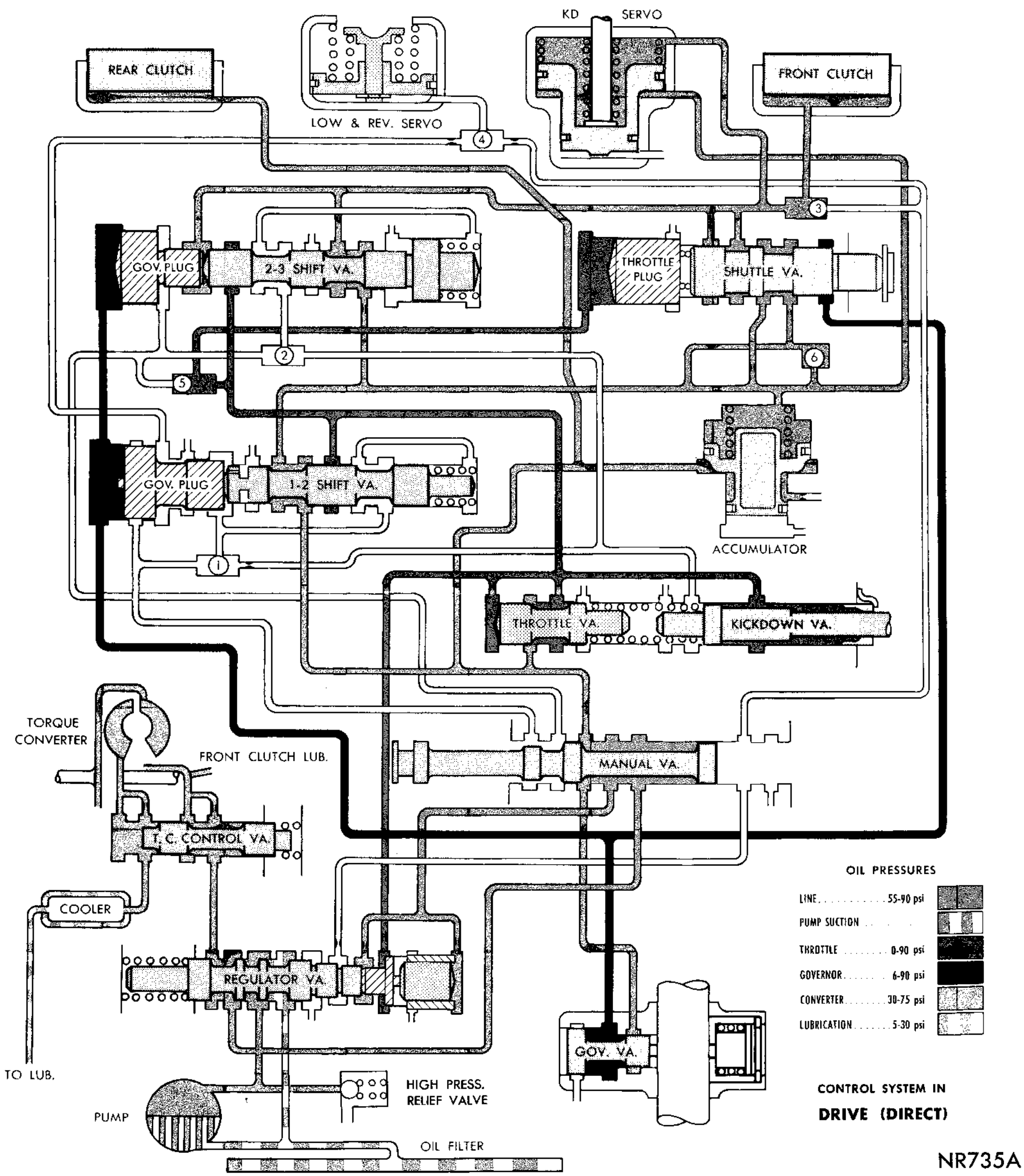
Neutral Hydraulic Circuits



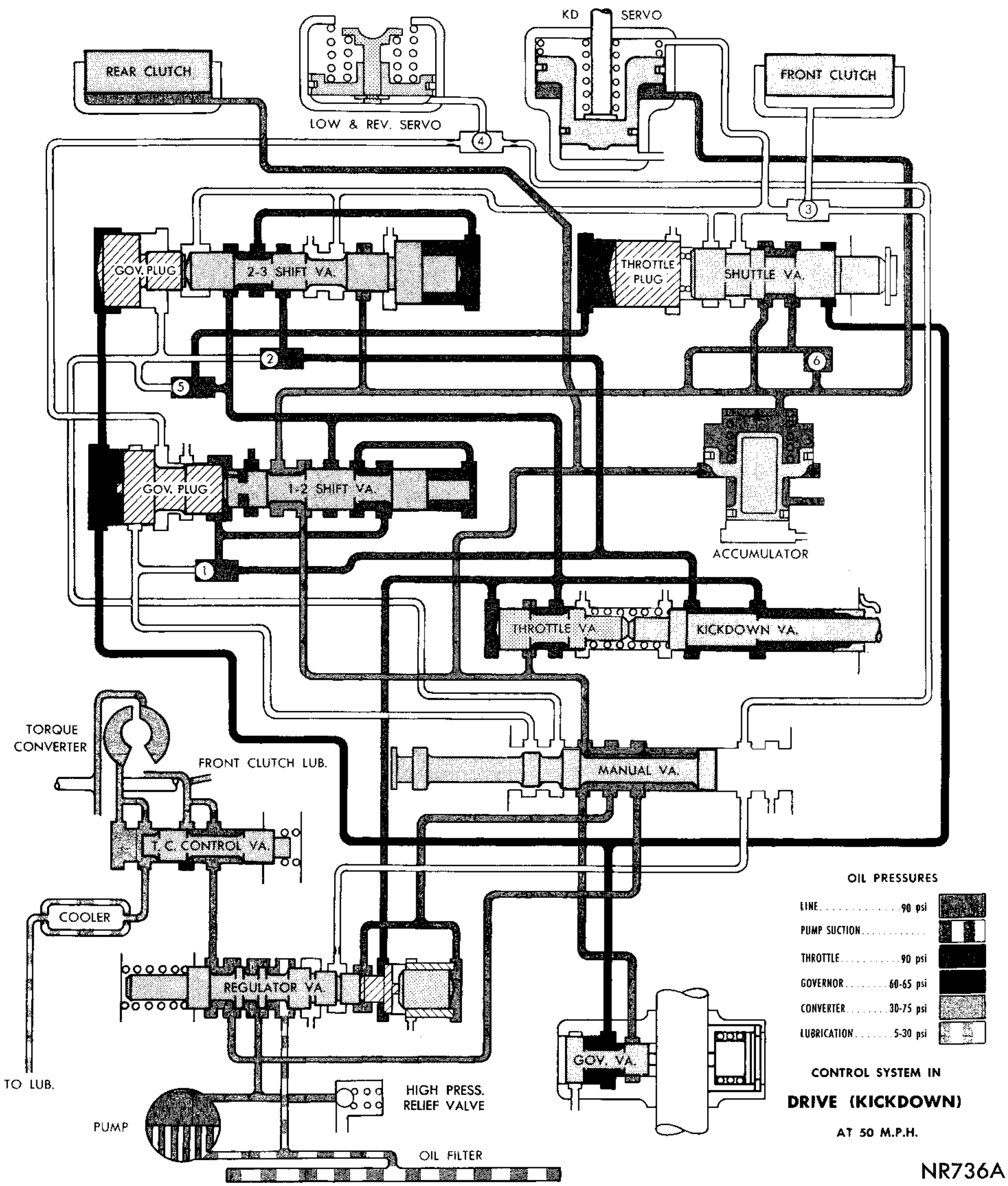
Drive-Breakaway Hydraulic Circuits



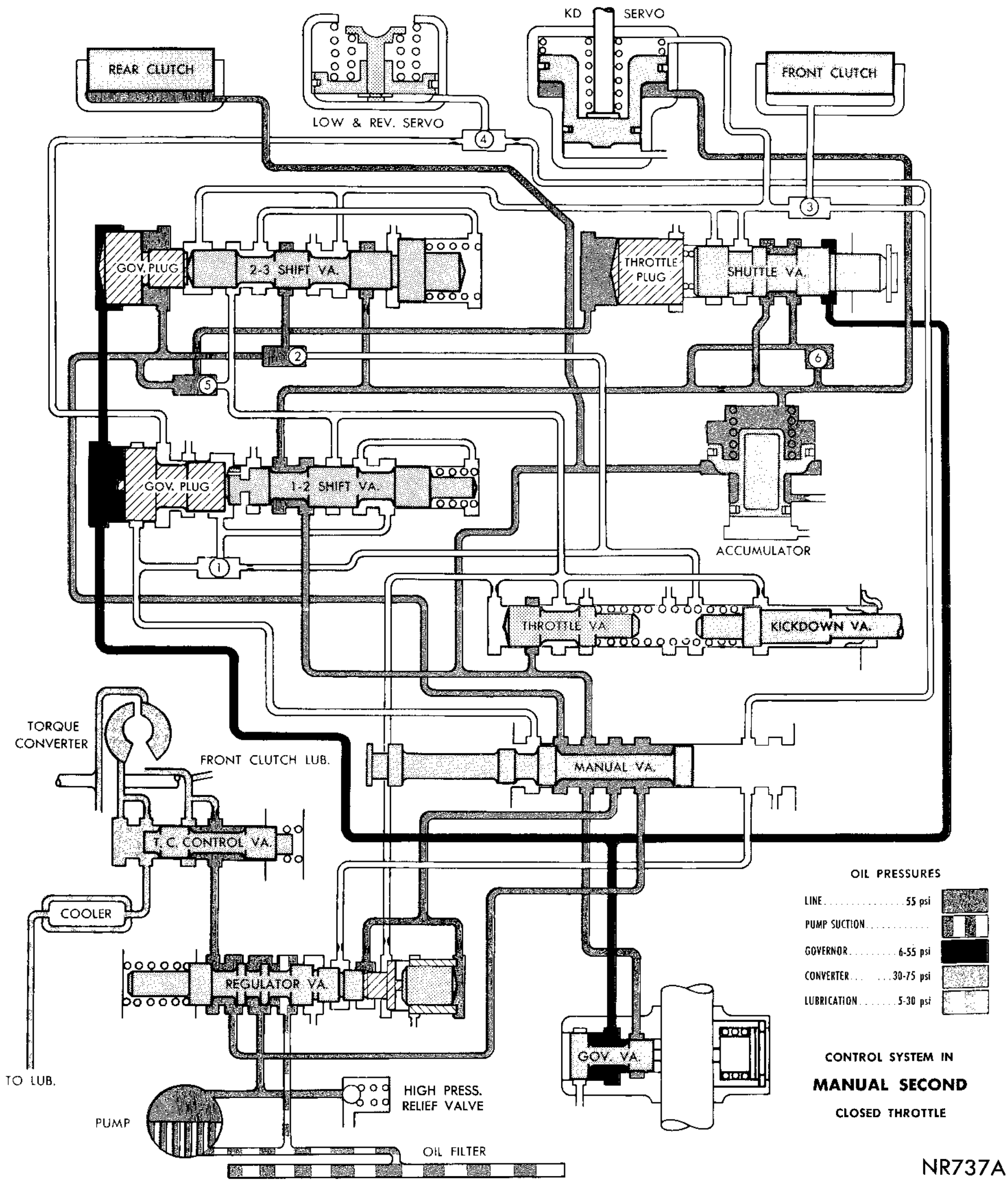
Drive-Second Hydraulic Circuits



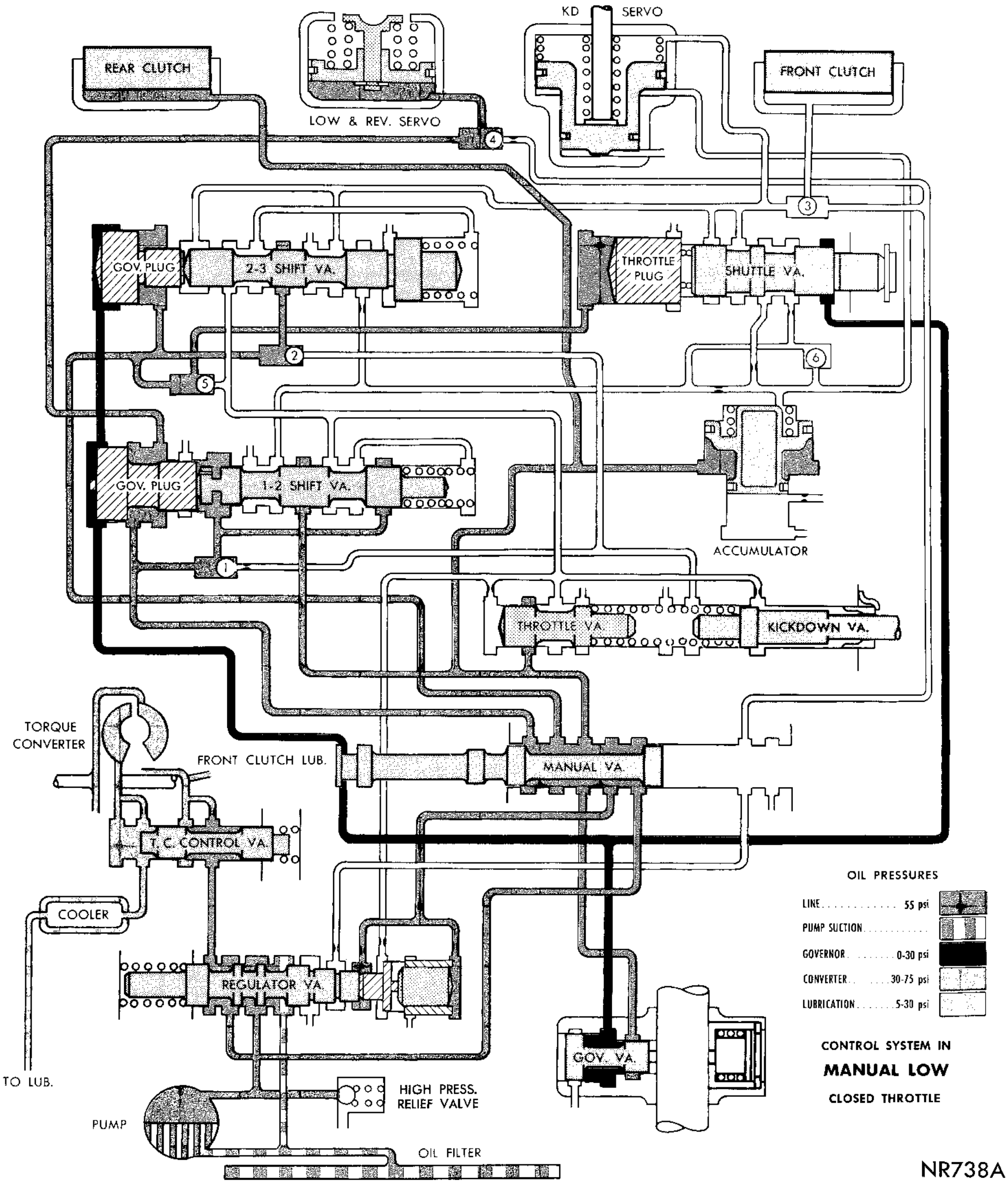
Drive-Direct Hydraulic Circuits



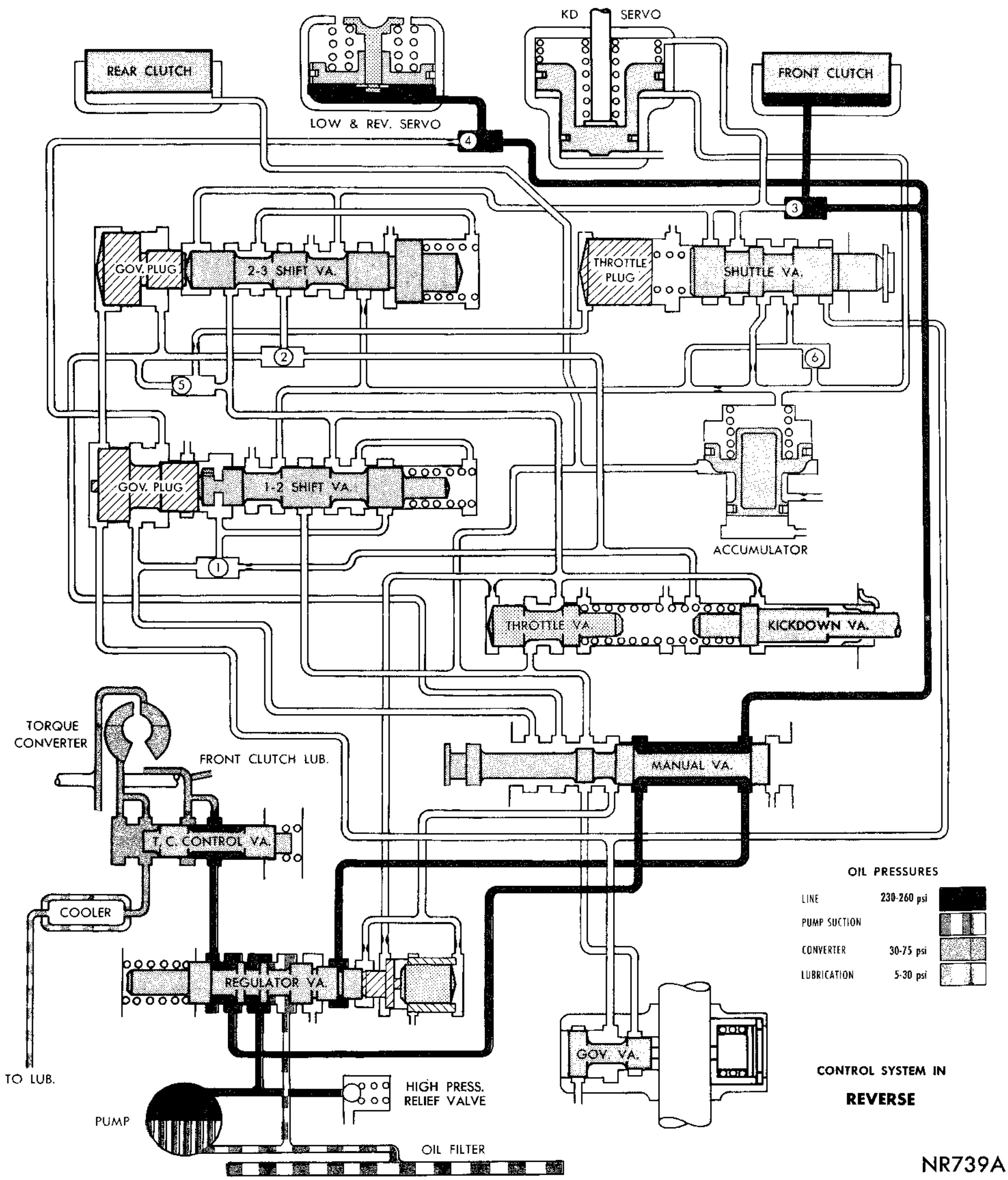
Drive-Kickdown Hydraulic Circuits



Selector Lever Second—Hydraulic Circuits



Selector Lever Low—Hydraulic Circuits



Reverse Hydraulic Circuits

HYDRAULIC CONTROL SYSTEM

The hydraulic control circuits on pages 3 through 10 show the position of the various valves with color coded passages to indicate those under hydraulic pressure for all operations of the transmission.

The hydraulic control system makes the transmission fully automatic, and has four important functions to perform. In a general way, the components of any automatic control system may be grouped into the following basic groups:

The pressure supply system, the pressure regulating valves, the flow control valves, and the clutches and band servos.

Taking each of these basic groups or systems in turn, the control system may be described as follows:

Pressure Supply System

The pressure supply system consists of an oil pump driven by the engine through the torque converter. The single front pump furnishes pressure for all the hydraulic and lubrication requirements.

Pressure Regulating Valves

The pressure regulating valves consist of a regulator valve which controls line pressure at a value dependent on throttle opening.

The torque converter control valve maintains torque converter operating pressure and transmission lubricating pressure.

The governor valve transmits regulated pressure to the transmission (in conjunction with throttle pressure) to control upshift and downshift speeds.

The throttle valve transmits regulated pressure to the transmission (in conjunction with governor pressure) to control upshift and downshift speeds.

Flow Control Valves

The manual valve obtains the different transmission drive ranges as selected by the vehicle operator.

The 1-2 shift valve automatically shifts the transmission from low to second or from second to low depending on the vehicle operation.

The 2-3 shift valve automatically shifts the transmission from second to direct or from direct to second depending on the vehicle operation.

The kickdown valve makes possible a forced downshift from direct to second-second to breakaway or direct to breakaway (depending on vehicle speed) by depressing the accelerator pedal past the detent "feel" near wide open throttle.

The shuttle valve has two separate functions and performs each independently. The first is that of providing fast release of the kickdown band, and smooth front clutch engagement when the driver makes a "lift-foot" upshift from second to direct. The second function of the shuttle valve is to regulate the application of the kickdown servo and band when making direct to second kickdowns.

Clutches, Band Servos and Accumulator

The front and rear clutch pistons, and both servo

CLUTCH ENGAGEMENT AND BAND APPLICATION CHART

Lever Position Drive-Ratio	Front Clutch	Rear Clutch	Front (Kickdown) Band	Rear (Low-Rev) Band	Overrunning Clutch
N-NEUTRAL	DISENGAGED	DISENGAGED	RELEASED	RELEASED	NO MOVEMENT
D-DRIVE (Breakaway) 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	RELEASED	HOLDS
(Second) 1.45 to 1	DISENGAGED	ENGAGED	APPLIED	RELEASED	OVER RUNS
(Direct) 1.00 to 1	ENGAGED	ENGAGED	RELEASED	RELEASED	OVER RUNS
KICKDOWN (To Second) 1.45 to 1	DISENGAGED	ENGAGED	APPLIED	RELEASED	OVER RUNS
(To Low) 2.45 to 1)	DISENGAGED	ENGAGED	RELEASED	RELEASED	HOLDS
2-Second 1.45 to 1	DISENGAGED	ENGAGED	APPLIED	RELEASED	OVER RUNS
1-LOW 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	APPLIED	PARTIAL HOLD
R-REVERSE 2.20 to 1	ENGAGED	DISENGAGED	RELEASED	APPLIED	NO MOVEMENT

SHIFT PATTERN SUMMARY CHART

Condition	Car Speed To Axle Ratios Chrysler 2.76:1	3.23:1	Imperial 2.94:1
Closed Throttle 1-2 Upshift	8-14	7-13	7-12
Closed Throttle 2-3 Upshift	14-19	13-18	12-16
Wide Open Throttle 1-2 Upshift	33-52	31-49	28-44
Wide Open Throttle 2-3 Upshift	77-90	72-85	66-77
3-2 Kickdown Limit	66-31	62-76	56-69
3-1 Kickdown Limit	30-34	28-32	25-29
Closed Throttle Downshift	6-13	6-12	5-11

pistons are moved hydraulically to engage the clutches and apply the bands. The pistons are released by spring tension when hydraulic pressure is released. On the 2-3 upshift, the kickdown servo piston is released by spring tension and hydraulic pressure.

The accumulator controls the hydraulic pressure on the apply side of the kickdown servo during the 1-2 shift; thereby, cushioning the kickdown band application at any throttle position.

OPERATING INSTRUCTIONS

The transmission will automatically upshift and downshift at approximately the miles per hour given in the Shift Pattern Summary Chart. **All shift speeds given in the "Chart" may vary somewhat due to production tolerances and rear axle ratios. The quality of the shifts is very important. All shifts should be smooth, responsive, and with no noticeable engine runaway.**

Gearshift and Parking Lock Controls

The transmission is controlled by a "lever type" gearshift incorporated within the steering column. The control has six selector lever positions: P (park), R (reverse), N (neutral), D (drive), 2 (second) and 1 (low). Some vehicles are equipped with a "lever type" console gearshift which has the same selector lever positions. The parking lock is applied by moving the selector lever past a gate to the P position.

CAUTION: Never apply the parking lock until the vehicle has stopped; otherwise, a severe ratcheting noise will occur.

Starting Engine

The engine will start with the selector lever in either the P (park) or N (neutral) positions.

(1) As a safety precaution when starting in the N (neutral) position, apply the parking or foot brake.

(2) Depress the accelerator pedal one-third of travel to insure proper choke operation.

(3) Turn the ignition key all the way to the right to START position. When the engine starts, release the key and it will return to the ON position.

The TorqueFlite transmission will not permit starting the engine by pushing or towing.

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 requires heavy throttle for 1/2 mile or more. This reduces the possibility of overheating the transmission and converter under these conditions.

Towing Vehicle

Transmission Inoperative: Tow the vehicle with a rear end pickup or remove the propeller shaft.

Transmission Operating Properly: The vehicle may be towed safely in N (neutral) with rear wheels on the ground at a speed not to exceed 30 mph. **If the vehicle is to be towed for extended distances, it should be done with a rear end pickup or the propeller shaft removed.** Because the transmission receives lubrication only when the engine is running, **it is good practice to always tow a disabled vehicle with a rear end pickup** or remove the propeller shaft.

SERVICE DIAGNOSIS

The transmission should not be removed nor disassembled until a careful diagnosis is made, the definite cause determined and all possible external corrections performed. In diagnosing any abnormal shift condition, always make the hydraulic pressure tests before disassembly or replacement of parts.

Condition	Possible Cause	Correction
HARSH ENGAGEMENT IN D, 1, 2 AND R	(a) Engine idle speed too high.	(a) Adjust engine idle speed to specifications. Re-adjust throttle linkage.
	(b) Hydraulic pressures too high or low.	(b) Inspect fluid level, then perform hydraulic pressure tests and adjust to specifications.

Condition	Possible Cause	Correction
	(c) Low-reverse band out of adjustment.	(c) Adjust low-reverse band.
	(d) Valve body malfunction or leakage.	(d) Perform pressure tests to determine cause and correct as required.
	(e) Accumulator sticking, broken rings or spring.	(e) Inspect accumulator for sticking, broken rings or spring. Repair as required.
	(f) Low-reverse servo, band or linkage malfunction.	(f) Inspect servo for damaged seals, binding linkage of faulty band lining. Repair as required.
	(g) Worn or faulty front and/or rear clutch.	(g) Disassemble and inspect clutch. Repair or replace as required.
DELAYED ENGAGEMENT IN D, 1, 2, AND R	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Incorrect gearshift control linkage adjustment.	(b) Adjust control linkage.
	(c) Hydraulic pressures too high or low.	(c) Perform hydraulic pressure tests and adjust to specifications.
	(d) Oil filter clogged.	(d) Replace oil filter.
	(e) Valve body malfunction or leakage.	(e) Perform pressure tests to determine cause and correct as required.
	(f) Accumulator sticking, broken rings or spring.	(f) Inspect accumulator for sticking, broken rings or spring. Repair as required.
	(g) Clutches or servos sticking or not operating.	(g) Remove valve body assembly and perform air pressure tests. Repair as required.
	(h) Faulty oil pump.	(h) Perform hydraulic pressure tests. Adjust and repair as required.
	(i) Worn or faulty front and/or rear clutch.	(i) Disassemble and inspect clutch. Repair or replace as required.
	(j) Worn or broken input shaft and/or reaction shaft support seal rings.	(j) Inspect and replace seal rings as required, also inspect respective bores for wear. Replace parts as required.
	(k) Aerated fluid.	(k) Inspect for air leakage into pump suction passages.
RUNAWAY OR HARSH UPSHIFT AND 3-2 KICKDOWN	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Incorrect throttle linkage adjustment.	(b) Adjust throttle linkage.
	(c) Hydraulic pressures too high or low.	(c) Perform hydraulic pressure tests and adjust to specifications.
	(d) Kickdown band out of adjustment.	(d) Adjust kickdown band.
	(e) Valve body malfunction or leakage.	(e) Perform pressure tests to determine cause and correct as required.
	(f) Governor malfunction.	(f) Inspect governor and repair as required.
	(g) Accumulator sticking, broken rings or spring.	(g) Inspect accumulator for sticking, broken rings or spring. Repair as required.
	(h) Clutches or servos sticking or not operating.	(h) Remove valve body assembly and perform air pressure tests. Repair as required.
	(i) Kickdown servo, band or linkage malfunction.	(i) Inspect servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(j) Worn or faulty front clutch.	(j) Disassemble and inspect clutch. Repair or replace as required.
	(k) Worn or broken input shaft and/or reaction shaft support seal rings.	(k) Inspect and replace seal rings as required, also inspect respective bores for wear. Replace parts as required.

Condition	Possible Cause	Correction
NO UPSHIFT	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Incorrect throttle linkage adjustment.	(b) Adjust throttle linkage.
	(c) Kickdown band out of adjustment.	(c) Adjust kickdown band.
	(d) Hydraulic pressures too high or low.	(d) Perform hydraulic pressure tests and adjust to specifications.
	(e) Governor sticking or leaking.	(e) Remove and clean governor. Replace parts if necessary.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Clutches or servos sticking or not operating.	(g) Remove valve body assembly and perform air pressure tests. Repair as required.
	(h) Faulty oil pump.	(h) Perform hydraulic pressure tests, adjust or repair as required.
	(i) Kickdown servo, band or linkage malfunction.	(i) Inspect servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(j) Worn or faulty front clutch.	(j) Disassemble and inspect clutch. Repair or replace as required.
	(k) Worn or broken input shaft and/or reaction shaft support seal rings.	(k) Inspect and replace seal rings as required, also inspect respective bores for wear. Replace parts as required.
NO KICKDOWN OR NORMAL DOWNSHIFT	(a) Incorrect throttle linkage adjustment.	(a) Adjust throttle linkage.
	(b) Incorrect gearshift control linkage adjustment.	(b) Adjust control linkage.
	(c) Kickdown band out of adjustment.	(c) Adjust kickdown band.
	(d) Hydraulic pressures too high or low.	(d) Perform hydraulic pressure tests and adjust to specifications.
	(e) Governor sticking or leaking.	(e) Remove and clean governor. Replace parts if necessary.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Clutches or servos sticking or not operating.	(g) Remove valve body assembly and perform air pressure tests. Repair as required.
	(h) Kickdown servo, band or linkage malfunction.	(h) Inspect servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(i) Overrunning clutch not holding.	(i) Disassemble transmission and repair overrunning clutch as required.
SHIFTS ERRATIC	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Aerated fluid.	(b) Inspect for air leakage into pump suction passages.
	(c) Incorrect throttle linkage adjustment.	(c) Adjust throttle linkage.
	(d) Incorrect gearshift control linkage adjustment.	(d) Adjust control linkage.
	(e) Hydraulic pressures too high or low.	(e) Perform hydraulic pressure tests and adjust to specifications.
	(f) Governor sticking or leaking.	(f) Remove and clean governor. Replace parts if necessary.
	(g) Oil filter clogged.	(g) Replace oil filter.
	(h) Valve body malfunction or leakage.	(h) Perform pressure tests to determine cause and correct as required.
	(i) Clutches or servos sticking or not operating.	(i) Remove valve body assembly and perform air pressure tests. Repair as required.
	(j) Faulty oil pump.	(j) Perform hydraulic pressure tests, adjust or repair as required.

Condition	Possible Cause	Correction
	(k) Worn or broken input shaft and/or reaction shaft support seal rings.	(k) Inspect and replace seal rings as required, also inspect respective bores for wear. Replace parts as required.
SLIPS IN FORWARD DRIVE POSITIONS	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Aerated fluid.	(b) Inspect for air leakage into pump suction passages.
	(c) Incorrect throttle linkage adjustment.	(c) Adjust throttle linkage.
	(d) Incorrect gearshift control linkage adjustment.	(d) Adjust control linkage.
	(e) Hydraulic pressures too low.	(e) Perform hydraulic pressure tests and adjust to specifications.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Accumulator sticking, broken rings or spring.	(g) Inspect accumulator for sticking, broken rings or spring. Repair as required.
	(h) Clutches or servos sticking or not operating.	(h) Remove valve body assembly and perform air pressure tests. Repair as required.
	(i) Worn or faulty front and/or rear clutch.	(i) Disassemble and inspect clutch. Repair or replace as required.
	(j) Overrunning clutch not holding.	(j) Disassemble transmission and repair overrunning clutch as required.
	(k) Worn or broken input shaft and/or reaction shaft support seal rings.	(k) Inspect and replace seal rings as required, also inspect respective bores for wear. Replace parts as required.
SLIPS IN REVERSE ONLY	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Aerated fluid.	(b) Inspect for air leakage into pump suction passages.
	(c) Incorrect gearshift control linkage adjustment.	(c) Adjust control linkage.
	(d) Hydraulic pressures too high or low.	(d) Perform hydraulic pressure tests and adjust to specifications.
	(e) Low-reverse band out of adjustment.	(e) Adjust low-reverse band.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Front clutch or rear servo, sticking or not operating.	(g) Remove valve body assembly and perform air pressure tests. Repair as required.
	(h) Low-reverse servo, band or linkage malfunction.	(h) Inspect servo for damaged seals, binding linkage or faulty band lining. Repair as required.
	(i) Faulty oil pump.	(i) Perform hydraulic pressure tests, adjust or repair as required.
SLIPS IN ALL POSITIONS	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Hydraulic pressures too low.	(b) Perform hydraulic pressure tests and adjust to specifications.
	(c) Valve body malfunction or leakage.	(c) Perform pressure tests to determine cause and correct as required.
	(d) Faulty oil pump.	(d) Perform hydraulic pressure tests, adjust or replace as required.
	(e) Clutches or servos sticking or not operating.	(e) Remove valve body assembly and perform air pressure tests. Repair as required.
	(f) Worn or broken input shaft and/or reaction shaft support seal rings.	(f) Inspect and replace seal rings as required, also inspect respective bores for wear. Replace parts as required.

Condition	Possible Cause	Correction
NO DRIVE IN ANY POSITION	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Hydraulic pressures too low.	(b) Perform hydraulic pressure tests and adjust to specifications.
	(c) Oil filter clogged.	(c) Replace oil filter.
	(d) Valve body malfunction or leakage.	(d) Perform pressure tests to determine cause and correct as required.
	(e) Faulty oil pump.	(e) Perform hydraulic pressure tests, adjust or repair as required.
	(f) Clutches or servos sticking or not operating.	(f) Remove valve body assembly and perform air pressure tests. Repair as required.
NO DRIVE IN FORWARD DRIVE POSITIONS	(a) Hydraulic pressures too low.	(a) Perform hydraulic pressure tests and adjust to specifications.
	(b) Valve body malfunction or leakage.	(b) Perform pressure tests to determine cause and correct as required.
	(c) Clutches or servos, sticking or not operating.	(c) Remove valve body assembly and perform air pressure tests. Repair as required.
	(d) Worn or faulty rear clutch.	(d) Disassemble and inspect clutch. Repair or replace as required.
	(e) Overrunning clutch not holding.	(e) Disassemble transmission and repair overrunning clutch as required.
	(f) Worn or broken input shaft and/or reaction shaft support seal rings.	(f) Inspect and replace seal rings as required, also inspect respective bores for wear. Replace parts as required.
NO DRIVE IN REVERSE	(a) Incorrect gearshift control linkage adjustment.	(a) Adjust control linkage.
	(b) Hydraulic pressures too low.	(b) Perform hydraulic pressure tests and adjust to specifications.
	(c) Low-reverse band out of adjustment.	(c) Adjust low-reverse band.
	(d) Valve body malfunction or leakage.	(d) Perform pressure tests to determine cause and correct as required.
	(e) Front clutch or rear servo, sticking or not operating.	(e) Remove valve body assembly and perform air pressure tests. Repair as required.
	(f) Low-reverse servo, band or linkage malfunction.	(f) Inspect servo for damaged seals, binding linkage or faulty band lining. Repair as required.
	(g) Worn or faulty front clutch.	(g) Disassemble and inspect clutch. Repair or replace as required.
DRIVES IN NEUTRAL	(a) Incorrect gearshift control linkage adjustment.	(a) Adjust control linkage.
	(b) Valve body malfunction or leakage.	(b) Perform pressure tests to determine cause and correct as required.
	(c) Rear clutch dragging.	(c) Inspect clutch and repair as required.
DRAGS OR LOCKS	(a) Kickdown band out of adjustment.	(a) Adjust kickdown band.
	(b) Low-reverse band out of adjustment.	(b) Adjust low-reverse band.
	(c) Kickdown and/or low-reverse servo, band, linkage malfunction.	(c) Inspect servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(d) Front and/or rear clutch faulty.	(d) Disassemble and inspect clutch. Repair or replace as required.
	(e) Planetary gear sets broken or seized.	(e) Inspect condition of planetary gear sets and replace as required.
	(f) Overrunning clutch worn, broken or seized.	(f) Inspect condition of overrunning clutch and replace parts as required.
GRATING, SCRAPING GROWLING NOISE	(a) Kickdown band out of adjustment.	(a) Adjust kickdown band.
	(b) Low-reverse band out of adjustment.	(b) Adjust low-reverse band.
	(c) Output shaft bearing and/or bushing damaged.	(c) Remove extension housing and replace bearing and/or bushing.

Condition	Possible Cause	Correction
	(d) Governor support binding or broken seal rings.	(d) Inspect condition of governor support and repair as required.
	(e) Oil pump scored or binding.	(e) Inspect condition of pump and repair as required.
	(f) Front and/or rear clutch faulty.	(f) Disassemble and inspect clutch. Repair or replace as required.
	(g) Planetary gear sets broken or seized.	(g) Inspect condition of planetary gear sets and replace as required.
	(h) Overrunning clutch worn, broken or seized.	(h) Inspect condition of overrunning clutch and replace parts as required.
BUZZING NOISE	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Pump sucking air.	(b) Inspect pump for nicks or burrs on mating surfaces, porous casting, and/or excessive rotor clearance. Replace parts as required.
	(c) Valve body malfunction.	(c) Remove and recondition valve body assembly.
	(d) Overrunning clutch inner race damaged.	(d) Inspect and repair clutch as required.
HARD TO FILL, OIL FLOWS OUT FILLER TUBE	(a) High fluid level.	(a) Drain fluid to correct level.
	(b) Breather clogged.	(b) Inspect and clean breather vent opening in oil pump housing.
	(c) Oil filter clogged.	(c) Replace oil filter.
	(d) Aerated fluid.	(d) Inspect for air leakage into pump suction passage.
OIL LEAKAGE	(a) Speedometer Adaptor	(a) Replace rubber "O" ring seal. Inspect for bore porosity
	(b) Speedometer Drive Pinion Seal	(b) Replace rubber seal
	(c) Oil Pan Gasket	(c) Can often be stopped by tightening the attaching bolts to proper torque (150 in-lbs.). If necessary, replace gasket. Inspect oil pan gasket mounting face for flatness. **Caution:** Do not over-torque pan bolts.
	(d) Fluid Filler Tube	(d) Replace "O" ring seal. Inspect for tube damage, and bore porosity.
	(e) Fluid Lines and Fittings	(e) If leakage cannot be stopped by tightening a fitting, replace the defective part.
	(f) Manual Control Lever	(f) Replace either or both the manual lever or throttle lever shaft seal.
	(g) Pipe Plugs	(g) Torque to specified torque. If leak persists, replace plug.
	(h) Rear Extension Seal	(h) Check for O.D. Bore damage and replace seal.
	(i) Rear Bearing Access Plate	(i) Replace gasket
	(j) Extension Bolts	(j) Replace bolt
	(k) Extension Gasket	(k) Replace gasket and check for sealing surface damage on case and extension
	(l) Kickdown Band Adjusting Screw	(l) Apply sealer
	(m) Neutral Switch	(m) Replace switch and/or gasket
	(n) Fluid Leakage in Converter Housing Area	(n) See section on Fluid Leakage
TRANSMISSION OVERHEATS	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, AQ-ATF, Suffix A. or (Dexron).
	(b) Kickdown band adjustment too tight.	(b) Adjust kickdown band.
	(c) Low-reverse band adjustment too tight.	(c) Adjust low-reverse band.
	(d) Faulty cooling system.	(d) Inspect transmission cooling system, clean and repair as required.

Condition	Possible Cause	Correction
	(e) Cracked or restricted oil cooler line or fitting.	(e) Inspect, repair or replace as required.
	(f) Faulty oil pump.	(f) Inspect pump for incorrect clearance, repair as required.
	(g) Insufficient clutch plate clearance in front and/or rear clutches.	(g) Measure clutch plate clearance and correct with proper size snap ring.
STARTER WILL NOT ENERGIZE IN NEUTRAL OR PARK	(a) Incorrect gearshift control linkage adjustment.	(a) Adjust control linkage.
	(b) Faulty or incorrectly adjusted neutral starting switch.	(b) Test operation of switch with a test lamp. Adjust or replace as required.
	(c) Broken lead to neutral switch.	(c) Inspect lead and test with a test lamp. Repair broken lead.

STALL TEST

WARNING: DURING TEST LET NO ONE STAND IN FRONT OF VEHICLE.

The stall test consists of determining the engine speed obtained at full throttle in D position. This test checks the torque converter stator clutch operation, and the holding ability of the transmission clutches. The transmission oil level should be checked and the engine brought to normal operating temperature before stall operation. **Both the parking and service brakes must be fully applied and front wheels blocked while making this test.**

Do not hold the throttle open any longer than is necessary to obtain a maximum engine speed reading, **and never longer than five seconds at a time.** If more than one stall check is required, operate the engine at approximately 1,000 rpm in neutral for 20 seconds to cool the transmission fluid between runs. If engine speed exceeds the maximum limits shown, release the accelerator immediately since transmission clutch slippage is indicated.

STALL SPEED ABOVE SPECIFICATION

If stall speed exceeds the maximum specified in chart by more than 200 rpm, transmission clutch slippage is indicated. Follow the transmission oil pressure and air pressure checks outlined in the Service on Vehicle section to determine the cause of slippage.

STALL SPEED BELOW SPECIFICATION

Low stall speeds **with a properly tuned engine** indicate torque converter stator clutch problems. A road test will be necessary to identify the exact problem.

If stall speeds are 250-350 rpm below specification, and the vehicle operates properly at highway speeds, but has poor through-gear acceleration, the stator overrunning clutch is slipping.

If stall speed and acceleration are normal, but abnormally high throttle opening is required to maintain highway speeds, the stator clutch has seized.

Both of these stator defects require replacement of the torque converter.

NOISE

A whining or siren-like noise due to fluid flow is normal during stall operation with some converters; however, loud metallic noises from loose parts or interference within the assembly indicate a defective torque converter. To confirm that the noise originates within the converter, operate the vehicle at light throttle in D and N on a hoist and listen under the transmission bell housing.

STALL SPEED SPECIFICATION CHART

Engine Model (C.I.D.)	Transmission Type	Engine Speed (RPM)
383-2 BBL.	A727	1850-2100
383-4 BBL.	A727	2350-2650
440-4 BBL.	A727	2000-2300

SERVICE PROCEDURES

SERVICE IN VEHICLE

Various transmission components can be removed for repairs without removing the transmission from vehicle. The removal, reconditioning and installation procedures for these components are covered here, except valve body reconditioning, which is described on Page 34.

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils. Essentially, this repair consists of drilling out the worn or damaged threads, tapping the hole with a special Heli-Coil Tap, and installing a Heli-Coil Insert into the tapped hole. This brings the

Heli-Coil Insert			Drill	Tap	Inserting Tool	Extracting Tool
Thread Size	Part No.	Insert Length	Size	Part No.	Part No.	Part No.
10-24	1185-3	.285″	13/64″ (.203″)	3 CPB	528-3N	1227-6
1/4-20	1185-4	3/8″	17/64″ (.265″)	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32″	Q (.332″)	5 CPB	528-5N	1227-6
3/8-16	1185-6	9/16″	X (.397″)	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32″	29/32″ (.453″)	7 CPB	528-7N	1227-16

hole back to its original thread size.

The chart lists the threaded hole sizes which are used in the aluminum case and valve body, and the necessary tools and inserts for the repair of damaged or worn threads. Heli-Coil tools and inserts are readily available from most automotive parts jobbers. **Some thread drag may occur in screwing a bolt into the installed Heli-Coil insert. Therefore, a torque reading should be taken of the thread drag with an inch-pound torque wrench and added to the specified bolt torque, so that all bolts securing a particular part will be tightened to the same torque.**

LUBRICATION

The transmission fluid and filter should provide satisfactory lubrication and protection to the automatic transmission and no change is recommended in vehicles used in normal service. Regularly scheduled fluid and filter changes, therefore will not be required, except when the operation of the vehicle is classified as severe.

If, for any reason, the factory fill fluid is replaced with another fluid, the fluid must be changed every three years or 36,000 miles in normal service.

Fluid Level

Inspect fluid level every six months with engine and transmission at normal operating temperature. Refer to "Lubrication and Maintenance", Group 0. The transmission should not be idled in gear for long periods.

Trailer Towing Service and Hard Usage

If vehicle is used for trailer towing or is used in hard or severe service, more frequent servicing is required as outlined.

Drain and refill transmission and replace filter initially at 36,000 miles or 3 years and every 12,000 miles or 12 months thereafter.

Drain and Refill

(1) Raise vehicle on a hoist. Place a drain container with a large opening, under the transmission oil pan.

(2) Loosen pan bolts, tap pan to break it loose allowing fluid to drain, then remove the oil pan.

(3) Remove access plate from in front of converter, remove drain plug allowing the fluid to drain (Fig. 2). Install and tighten converter drain plug to 110 inch-pounds, and install the access plate.

(4) If necessary, adjust the reverse band.

(5) Install a new filter on bottom of the valve body, and tighten retaining screws to 35 inch-pounds.

(6) Clean the oil pan, and reinstall using a new gasket. Tighten pan bolts to 150 inch-pounds.

(7) Pour six quarts of Automatic Transmission Fluid, AQ-ATF Suffix "A" (Dexron) into the transmission.

(8) Start engine and allow to idle for at least two minutes. With parking brake on, move selector lever momentarily to each position ending in the neutral position.

(9) Add sufficient fluid to bring fluid level to the "ADD ONE PINT" mark.

(10) Recheck fluid level after transmission is at normal operating temperature. The level should be between the "FULL" mark and "ADD ONE PINT" mark (Fig. 3).

CAUTION: To prevent dirt from entering transmission, make certain that dip stick cap is fully seated onto the filler tube.

GEARSHIFT LINKAGE ADJUSTMENT (Column Shift) (Fig. 4)

(1) Assemble all linkage parts leaving adjustable rod end free.

(2) Place gearshift selector lever in PARK position and lock steering column with ignition key.

(3) Move shift control lever on transmission all the way to rear (in PARK detent) (Fig. 5).

(4) Set adjustable rod to proper length and install with no load in either direction on linkage.

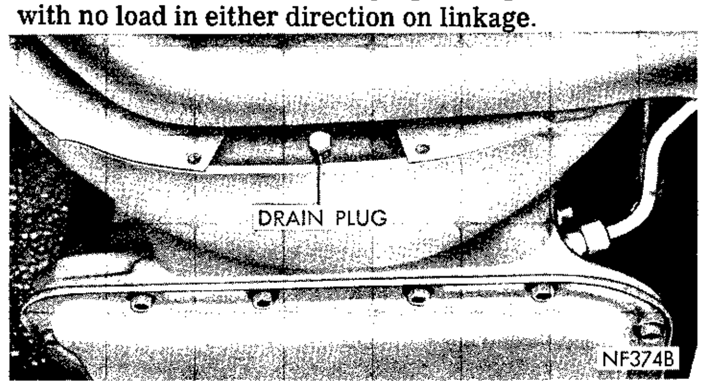


Fig. 2—Converter Drain Plug

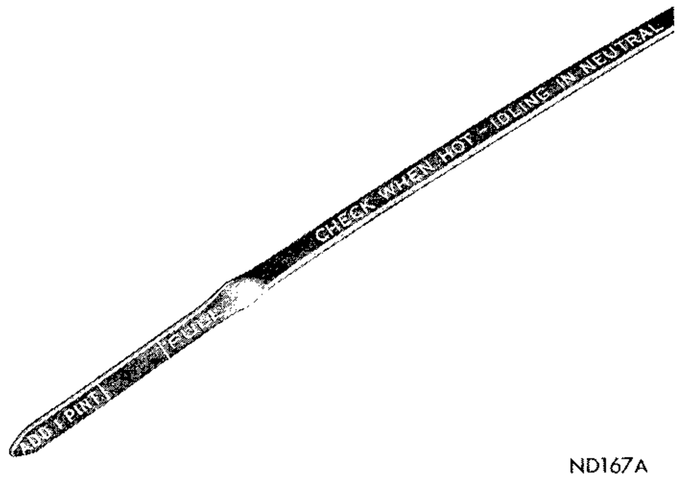


Fig. 3—Dip Stick Markings

(5) Check Adjustment as follows:

(a) Shift effort must be free and detents feel crisp. All gate stops must be positive.

(b) Detent position must be close enough to gate stops in neutral and drive to assure that hand lever will not remain out of detent position when placed against gate and then released.

(c) Key start must occur with shift lever held down against the park gate.

LINKAGE ADJUSTMENT (Console Shift) (Fig. 8)

(1) Assemble all linkage parts leaving adjustable rod ends free.

(2) At steering column upper end, line up locating slots in bottom of shift housing and bearing housing. Install suitable tool to hold this alignment and lock column with ignition key.

(3) Place console lever in PARK and move shift control lever on transmission all the way to the rear (in PARK detent).

(4) Set adjustable rods to proper length with no load applied in either direction on linkage.

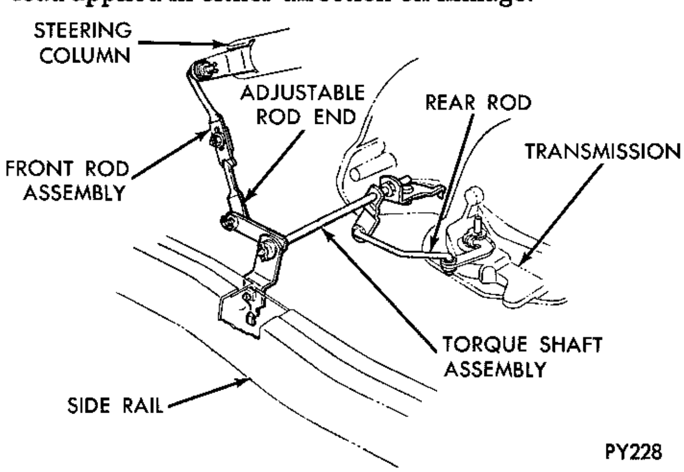


Fig. 4—Gearshift Linkage

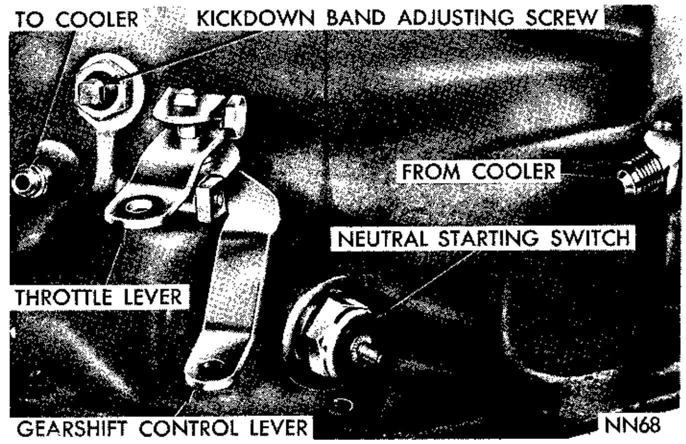


Fig. 5—External Controls and Adjustments

(5) Check adjustment as follows:

(a) Shift effort should be free enough so detents feel crisp.

(b) Detent position must be close enough to gate stops in neutral and drive to assure that hand lever will not remain out of detent position when placed against gate and then released.

(c) Key start and locking must occur with shift lever held back against the park gate.

(6) If console removal is required, disconnect battery ground cable. Remove set screw and shift knob or handle. Proceed as outlined in Body Section 23.

(7) After console is in place, install shift knob as follows: with gearship lever in NEUTRAL, thread button, spring and knob assembly on the cable end until dimension from top of button to top of knob is 13/32" (Fig. 6). Secure knob with set screw.

(8) Connect battery ground cable.

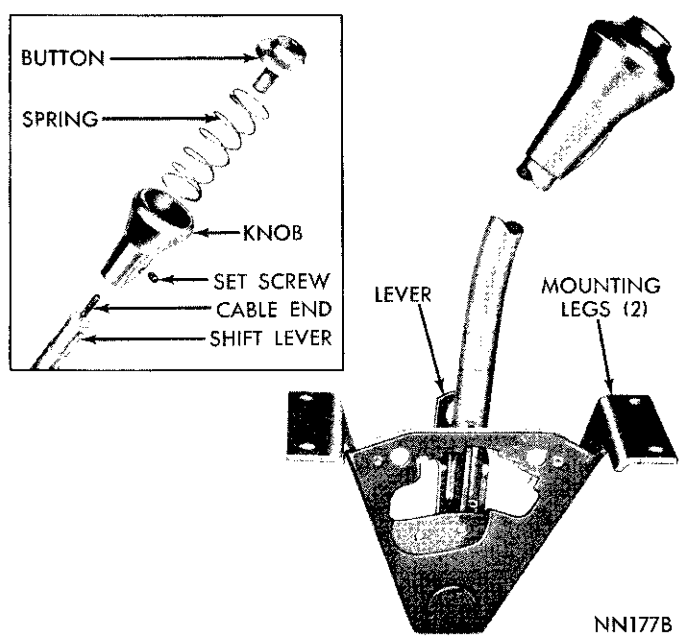


Fig. 6—Console Gearshift Unit

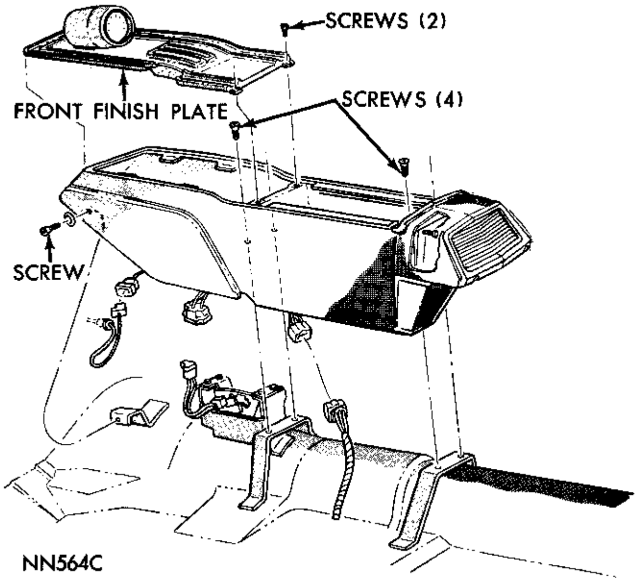


Fig. 7—Removing or Installing Console

BACK-UP LIGHT AND NEUTRAL STARTING SWITCH (Fig. 9 and 10)

Replacement and Test

The **Neutral Starting Switch** is the center terminal of the 3 terminal switch. It provides ground for the starter solenoid circuit through the selector lever

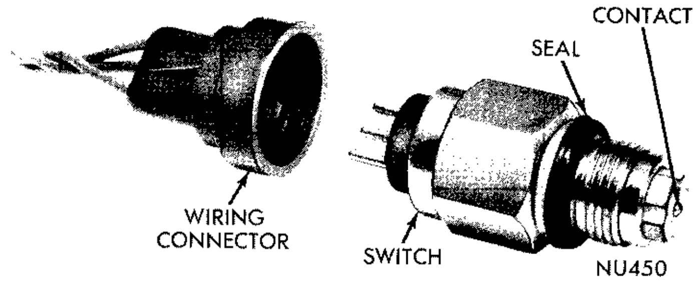


Fig. 9—Neutral-Park Starting Switch and Back-Up Light Switch

cam in only **Park** and **Neutral** positions.

(1) To test switch, remove wiring connector from switch and test for continuity between center pin of switch and transmission case. Continuity should exist only when transmission is in **Park** or **Neutral.**

(2) Check gearshift linkage adjustment before replacing a switch which tests bad.

(3) Unscrew switch from transmission case allowing fluid to drain into a container. Move selector lever to **Park** and then to **Neutral** positions, and inspect to see that the switch operating lever fingers are centered in switch opening in the case.

(4) Screw switch and new seal into transmission case and tighten to 24 foot-pounds. Retest switch with the test lamp.

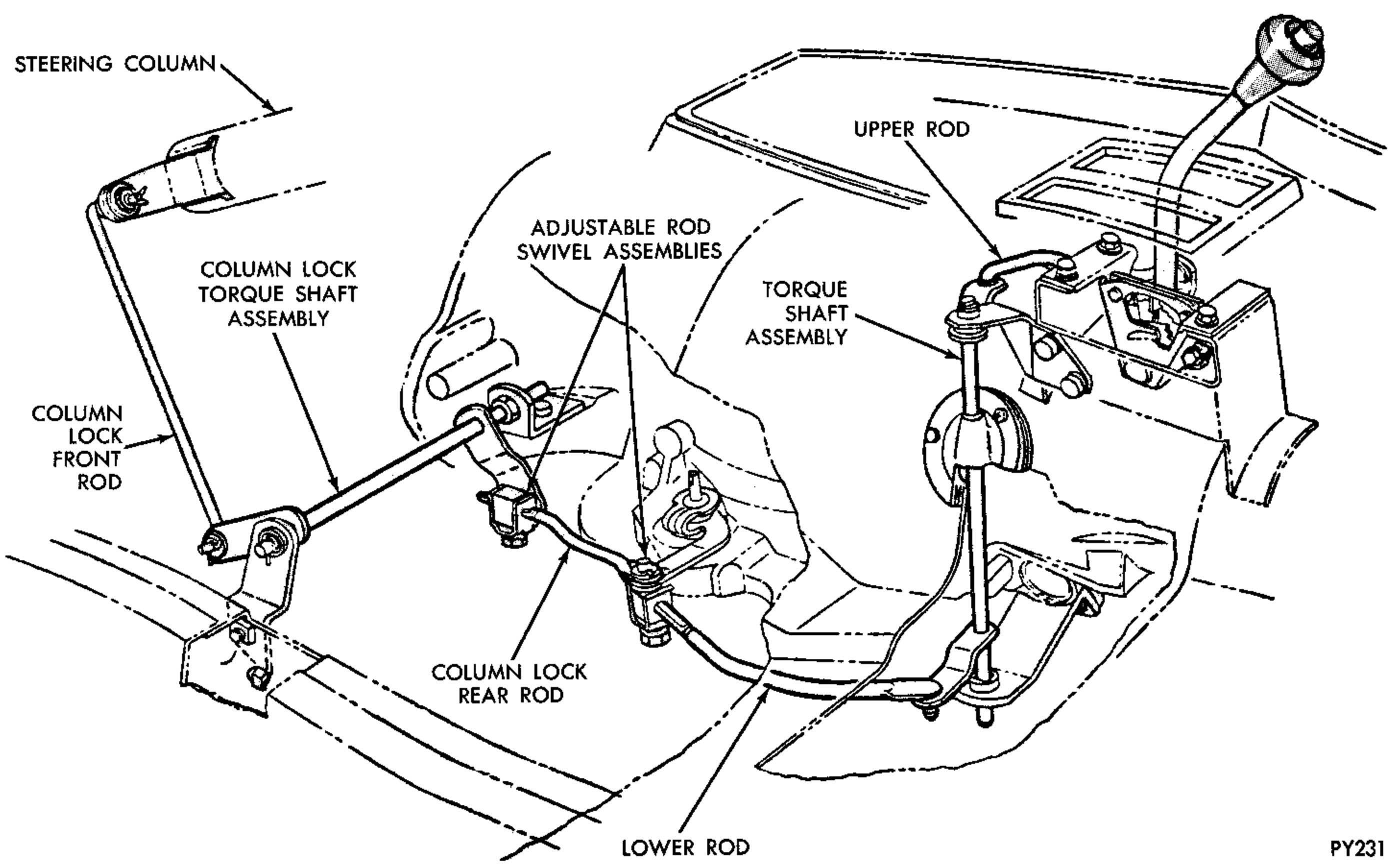


Fig. 8—Console Gearshift Linkage

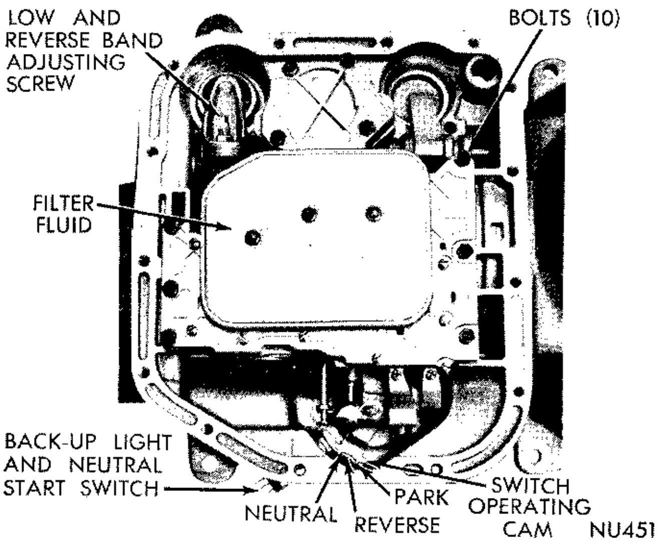


Fig. 10—Bottom View of Transmission (Pan Removed)

(5) Add fluid to transmission to bring up to proper level.

(6) The **Back-Up Light Switch Circuit** is through the two outside terminals of the 3 terminal switch.

(7) To test switch, remove wiring connector from switch and test for continuity between the two outside pins.

(8) Continuity should exist only with transmission in **Reverse** position.

(9) No continuity should exist from either pin to the case.

BAND ADJUSTMENTS

Kickdown Band

The kickdown band adjusting screw is located on left side of transmission case near the throttle lever shaft (Fig. 5).

(1) Loosen lock nut and back off approximately five turns. Inspect adjusting screw for free turning in the transmission case.

(2) Using wrench, Tool C-3380 with adapter C-3705, tighten band adjusting screw 47 to 50 inch-pounds. If adapter C-3705 is not used, tighten adjusting screw to 72 inch-pounds which is the true torque.

(3) Back off adjusting screw 2 turns. Hold adjusting screw in this position and tighten lock nut to 29 foot-pounds.

Low and Reverse Band

(1) Raise vehicle, drain transmission fluid and remove oil pan.

(2) Loosen adjusting screw lock nut and back off nut approximately five turns (Fig. 10). Inspect adjusting screw for free turning in the lever.

(3) Using wrench, Tool C-3380 with adapter C-3705, tighten band adjusting screw to 47 to 50 inch-pounds. If adapter C-3705 is not used, tighten adjusting screw to 72 inch-pounds.

(4) Back off adjusting screw 2 turns. Hold adjusting screw in this position and tighten lock nut to 35 foot-pounds.

(5) Reinstall oil pan using a new gasket. Tighten oil pan bolts to 150 inch-pounds.

(6) Fill transmission with "Automatic Transmission Fluid AQ-ATF Suffix A, (Dexron).

THOTTLE ROD ADJUSTMENT (Fig. 11)

With engine at operating temperature and carburetor off fast idle cam, adjust idle speed of engine using a tachometer. Refer to "Fuel System" Group 14, for idle speed Specifications and carburetor linkage adjustment.

(1) Follow detailed instructions in Lubrication Section for linkage lubrication of all models.

(2) Disconnect choke at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(3) Loosen the transmission throttle rod adjustment lock screw.

(4) Hold the transmission lever forward against its stop while adjusting the transmission linkage. (On engines with solenoid idle stops, the solenoid plunger must also be in its fully extended position).

(5) Adjust the transmission rod by pulling forward on the slotted link with a slight effort so that the rear edge of the slot is against the carburetor lever pin. Tighten transmission rod adjustment locking screw.

Note: The slotted link and transmission lever must be held forward while the locking screw is being tightened.

(6) To check transmission linkage freedom of operation, move slotted link to the full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(7) Loosen carburetor cable clamp nut. Adjust position of cable housing ferrule in the clamp so that all slack is removed from cable with carburetor at curb idle. To remove slack from cable, move ferrule in the clamp in direction away from carburetor lever.

(8) Back off ferrule 1/4". This provides 1/4" free play. Tighten cable clamp nut to 45 inch-pounds.

(9) Connect choke rod or remove blocking fixture.

HYDRAULIC CONTROL PRESSURE TESTS

Line Pressure and Front Servo Release Pressure

Line pressure and front servo release pressure tests must be made in D (drive) position with rear wheels free to turn. The transmission fluid must be at operating temperature (150°F to 200°F).

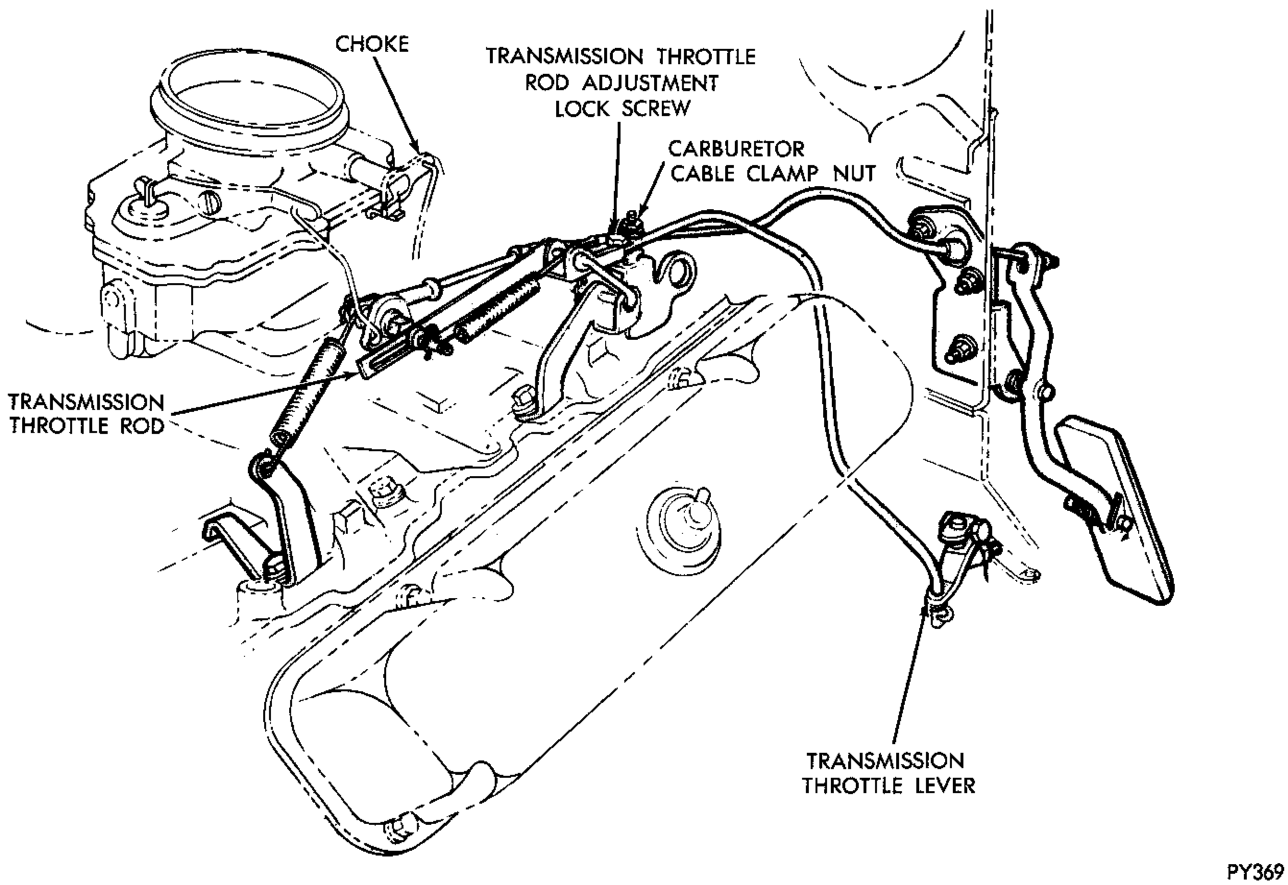


Fig. 11—Throttle Rod Adjustment

(1) Install an engine tachometer, raise vehicle on a hoist and position tachometer so it can be read under the vehicle.

(2) Connect two 0-100 psi pressure gauges, Tool C-3292 to pressure take-off points at side of accumulator and at front servo release (Fig. 12).

(3) With control in D (drive) position, speed up engine slightly until transmission shifts into direct. (Front servo release will be pressurized in direct.) Reduce engine speed slowly to 1,000 rpm. Line pressure at this time (1,000 rpm) must be 54-60 psi, and front servo release pressure must not be more than 3 psi below line pressure.

(4) Disconnect throttle linkage from transmission throttle lever and move throttle lever gradually to full throttle position. Line pressure must rise to a maximum of 90-96 psi just before or at kickdown into low gear. Front servo release pressure must follow line pressure up to the kickdown point and should not be more than 3 psi below line pressure.

If line pressure is not 54-60 psi at 1,000 rpm, see "Hydraulic Control Pressure Adjustments".

If front servo release pressures are less than pressure specified and line pressures are within limits, there is excessive leakage in front clutch and/or front servo circuits. **Always inspect the external transmission throttle lever for looseness on the valve body shaft when making pressure tests.**

Lubrication Pressures

The lubrication pressure test should be made at same time that line pressure and front servo release pressures are tested.

(1) Install a "tee" fitting between cooler return line fitting and fitting hole in transmission case at rear left side of the transmission case (Fig. 13). Connect a

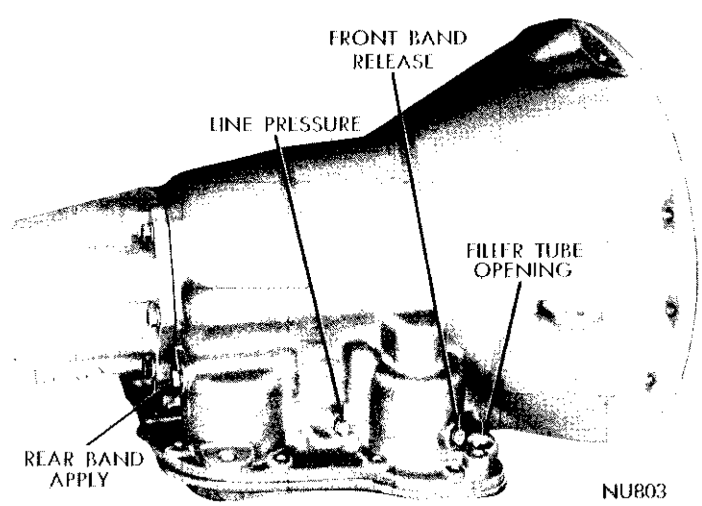


Fig. 12—Pressure Test Locations (Right Side of Case)

0-100 psi pressure gauge, Tool C-3292 to the "tee" fitting.

(2) At 1,000 engine rpm, with throttle closed and transmission in direct, the lubrication pressure should be 5-15 psi. Lubrication pressure will be approximately doubled as throttle is opened to the maximum line pressure.

Rear Servo Apply Pressure

(1) Connect a 0-300 psi pressure gauge, Tool C-3293 to apply pressure take-off point at rear servo (Fig. 13).

(2) With transmission control in R (reverse) position and engine speed set at 1600 rpm, the reverse servo apply pressure should be 230 to 300 psi.

Governor Pressure

(1) Connect a 0-100 psi pressure gauge, Tool C-3292 to governor pressure take-off point, located at lower left side of extension near the mounting flange (Fig. 13).

(2) Governor pressures should fall within the limits given in the "Governor Pressure Chart."

If governor pressures are incorrect at the given vehicle speeds, the governor valve and/or weights are probably sticking.

GOVERNOR PRESSURE CHART

Vehicle Speed To Axle Ratios — Chrysler 2.76:1	Chrysler 3.23:1	Imperial 2.94:1	Pressure Limits* psi
20-22	17-19	19-22	15
48-57	41-49	48-57	50
77-85	66-73	77-85	75

*The governor pressure should respond smoothly to changes in m.p.h. and should return to 0 to 1-1/2 psi when the vehicle is stopped. High pressure at standstill (above 2 psi) will prevent the transmission from downshifting.

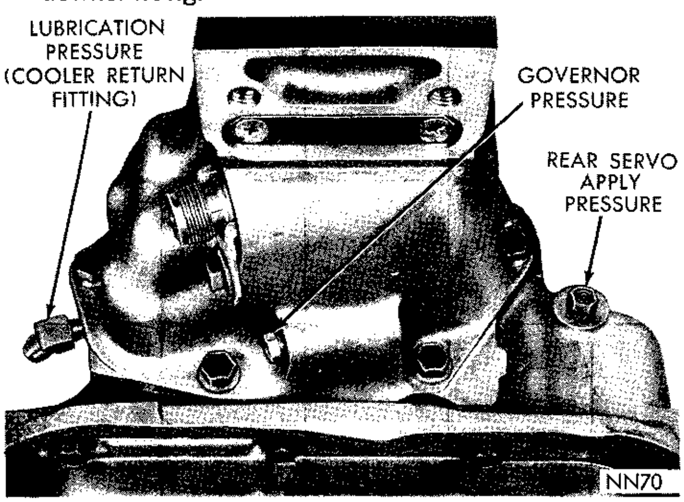


Fig. 13—Pressure Test Locations (Rear End of Case)

Throttle Pressure

No provisions are made to test the throttle pressure. Incorrect throttle pressure should only be suspected if part throttle shift speeds are either very delayed or occur too early in relation to vehicle speeds. In which case, the throttle linkage should be adjusted before throttle pressure setting is adjusted.

HYDRAULIC CONTROL PRESSURE ADJUSTMENTS

Line Pressure

An incorrect throttle pressure setting will cause incorrect line pressure readings even though line pressure adjustment is correct. Always inspect and correct throttle pressure adjustment before adjusting the line pressure. **Before adjusting line pressure, measure distance between the manual valve (valve in 1-low position) and line pressure adjusting screw (Fig. 14). This measurement must be 1-7/8 inches; correct by loosening spring retainer screws and repositioning the spring retainer. The regulator valve may cock and hang up in its bore if spring retainer is out of position.**

If line pressure is not correct, it will be necessary to remove valve body assembly to perform the adjustment.

The approximate adjustment is 1-5/16 inches, measured from valve body to inner edge of the adjusting nut (Fig. 15). However, due to manufacturing tolerances, the adjustment can be varied to obtain specified line pressure.

The adjusting screw may be turned with an Allen wrench. One complete turn of adjusting screw changes closed throttle line pressure approximately 1-2/3 psi. Turning adjusting screw counterclockwise increases pressure, and clockwise decreases pressure.

Throttle Pressure

Throttle pressure cannot be tested accurately:

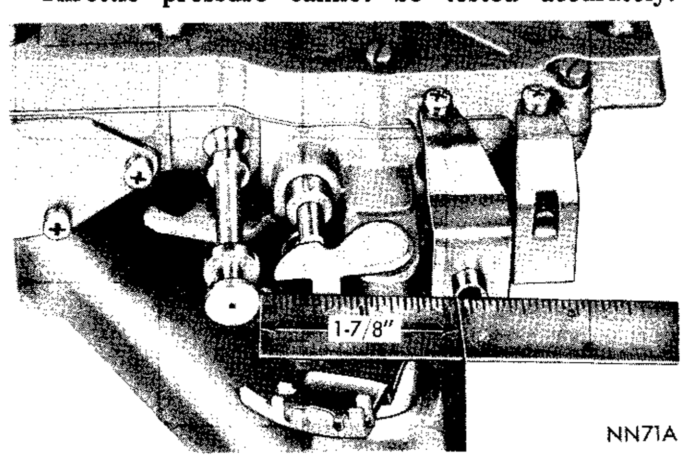


Fig. 14—Measuring Spring Retainer Location

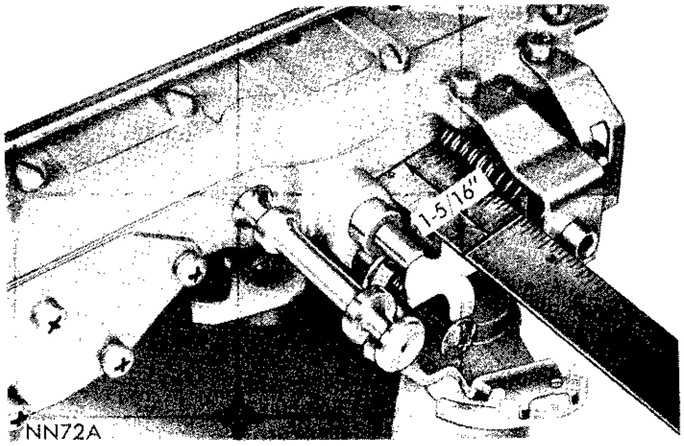


Fig. 15—Line Pressure Adjustment

therefore, the adjustment should be measured if a malfunction is evident.

(1) Remove valve body assembly from transmission to perform adjustment.

(2) Loosen throttle lever stop screw lock nut and back off approximately five turns (Fig. 16).

(3) Insert gauge pin of Tool C-3763 between the throttle lever cam and kickdown valve.

(4) By pushing in on the tool, compress kickdown valve against its spring so throttle valve is completely bottomed inside the valve body.

(5) As force is being exerted to compress spring, tighten throttle lever stop screw finger tight against throttle lever tang with throttle lever cam touching the tool and the throttle valve bottomed. **Be sure adjustment is made with spring fully compressed and valve bottomed in the valve body.**

(6) Remove tool and tighten stop screw lock nut securely.

AIR PRESSURE TESTS

A "NO DRIVE" condition might exist even with

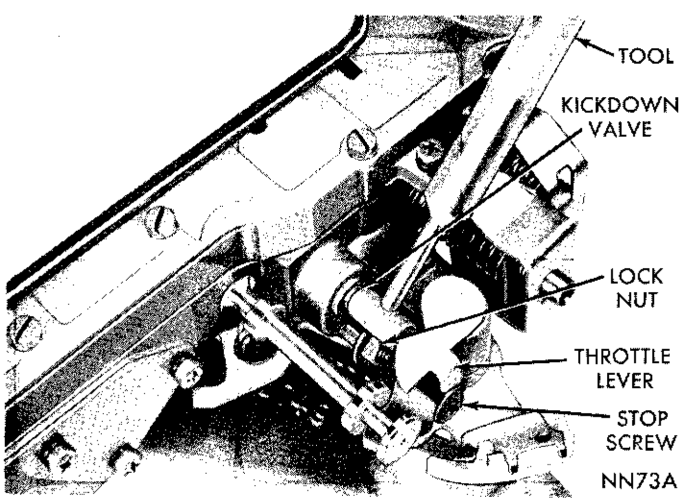


Fig. 16—Throttle Pressure Adjustment

correct fluid pressure, because of inoperative clutches or bands. The inoperative units, clutches, bands and servos can be located through a series of tests by substituting air pressure for fluid pressure (Fig. 17). The front and rear clutches, kickdown servo, and low-reverse servo may be tested by applying air pressure to their respective passage after valve body assembly has been removed. To make air pressure tests, proceed as follows:

CAUTION: Compressed air supply must be free of all dirt or moisture. Use a pressure of 30 to 100 psi.

Front Clutch

Apply air pressure to front clutch "apply" passage and listen for a dull "thud" which indicates that rear clutch is operating. Hold air pressure on for a few seconds and inspect system for excessive oil leaks.

Rear Clutch

Apply air pressure to rear clutch "apply" passage and listen for a dull "thud" which indicates that rear clutch is operating. Also check for excessive oil leaks.

If a dull "thud" cannot be heard in clutches, place finger tips on clutch housing and again apply air pressure. Movement of piston can be felt as clutch is applied.

Kickdown Servo

Direct air pressure into front servo "apply" passage. Operation of servo is indicated by a tightening of the front band. Spring tension on servo piston should release the band.

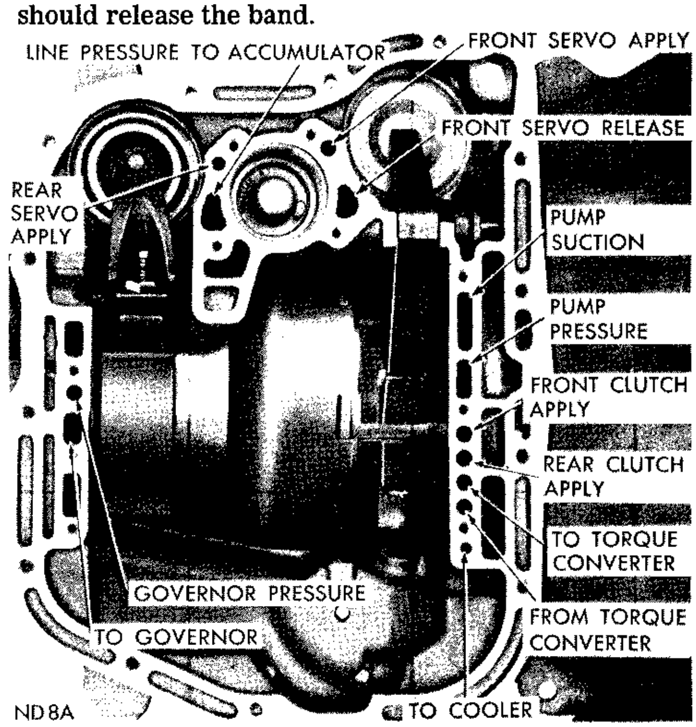


Fig. 17—Air Pressure Tests

Low and Reverse Servo

Direct air pressure into servo "apply" passage. Operation of servo is indicated by a tightening of the rear band. Spring tension on servo piston should release the band.

If clutches and servos operate properly; no upshift or erratic shift conditions indicate that malfunction exists in the valve body.

SPEEDOMETER PINION

Removal and Installation

Rear axle gear ratio and tire size determines pinion gear size requirements. Refer to 'Speedometer Pinion Chart' in Specifications for pinion usage.

(1) Remove bolt and retainer securing speedometer pinion adapter in the extension housing (Fig. 18).

(2) With cable housing connected, carefully work adapter and pinion out of the extension housing.

(3) If transmission fluid is found in cable housing, replace seal in the adapter (Fig. 19). Start seal and retainer ring in the adapter, then push them into adapter with Tool C-4004 until tool bottoms (Fig. 20).

CAUTION: Before installing pinion and adapter assembly make sure adapter flange and its mating area on extension housing are perfectly clean. Dirt or sand will cause mis-alignment resulting in speedometer pinion gear noise.

(4) Note number of gear teeth and install speedometer pinion gear into adapter (Fig. 19).

(5) Rotate the speedometer pinion gear and adapter assembly so that the number on the adapter, corresponding to the number of teeth on the gear, is in the 6 o'clock position as the assembly is installed (Fig. 18).

(6) Install retainer and bolt, with retainer tangs in adapter positioning slots. Tap adapter firmly into the extension housing and tighten retainer bolt to 100 inch-pounds.

EXTENSION HOUSING YOKE SEAL

Replacement

(1) Mark parts for reassembly then disconnect propeller shaft at rear universal joint. Carefully pull shaft

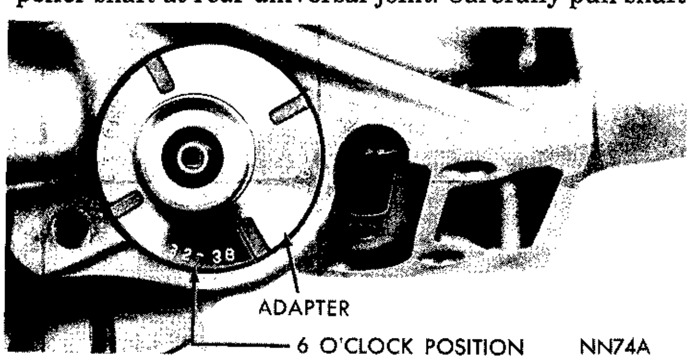


Fig. 18—Speedometer Pinion and Adapter—Installed (Retainer Removed for View)

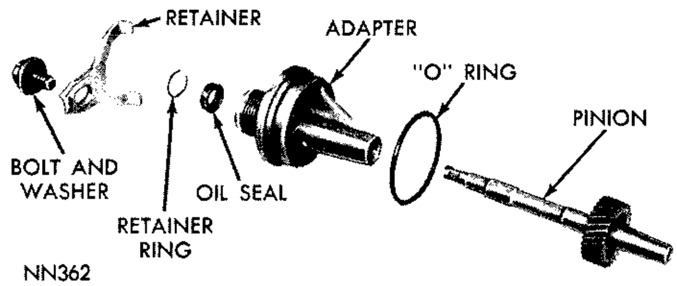


Fig. 19—Speedometer Drive

yoke out of transmission extension housing.

CAUTION: Be careful not to scratch or nick ground surface on sliding spline yoke during removal and installation of the shaft assembly.

(2) Remove the extension housing yoke seal (Fig. 21) with Tool C-3985.

(3) To install a new seal, position seal in opening of extension housing and drive it into housing with Tool C-3972 (Fig. 22).

(4) Carefully guide front universal joint yoke into extension housing and on the output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion shaft yoke.

EXTENSION HOUSING AND OUTPUT SHAFT BEARING

Removal

(1) Mark parts for reassembly then disconnect propeller shaft at rear universal joint. Carefully pull shaft assembly out of the extension housing.

(2) Remove speedometer pinion and adapter as-

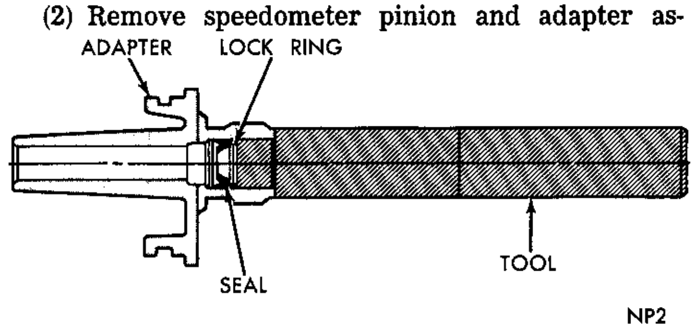


Fig. 20—Installing Speedometer Pinion Seal

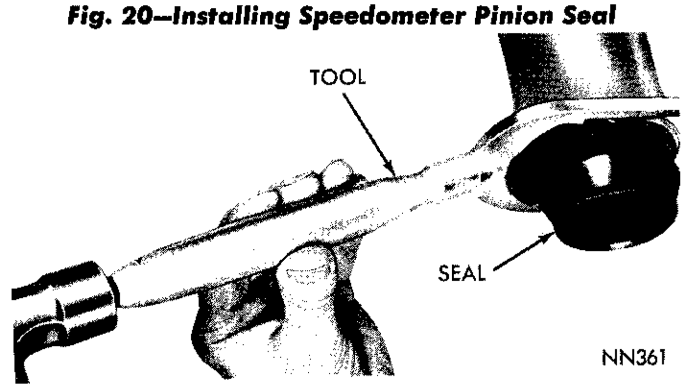


Fig. 21—Removing Extension Housing Yoke Seal

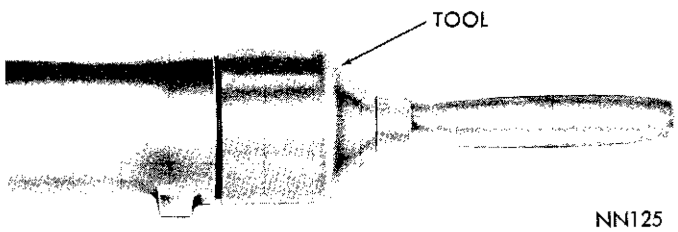


Fig. 22—Installing Extension Housing Yoke Seal

sembly (Fig. 18). Drain approximately two quarts of fluid from the transmission.

(3) Remove bolts securing extension housing to the crossmember. Raise transmission slightly with service jack Tool C-3203A, then remove center crossmember and support assembly.

(4) Remove the extension housing to transmission bolts.

Console Shift: Remove two bolts securing gearshift torque shaft lower bracket to the extension housing. Swing bracket out of way for extension housing removal.

IMPORTANT: In removing or installing the extension housing (step 5), the gearshift lever must in in "1" (low) position. This positions the parking lock control rod rearward so it can be disengaged or engaged with the parking lock sprag.

(5) Remove two screws, plate and gasket from bottom of extension housing mounting pad. Spread large snap ring from output shaft bearing with Tool C-3301A (Fig. 23). With snap ring spread as far as possible, carefully tap extension housing off output shaft bearing. Carefully pull extension housing rearward, to remove parking lock control rod knob past the parking sprag, then remove the housing.

Bearing Replacement

(1) Using heavy duty snap ring pliers C-4020, remove output shaft bearing rear snap ring and remove bearing from the shaft (Fig. 24).

(2) If removed, install snap ring in front groove on output shaft. Install a new bearing on shaft with outer race ring groove toward front (Fig. 24), then install rear snap ring.

NOTE: To replace the extension housing bushing, refer to INDEX.

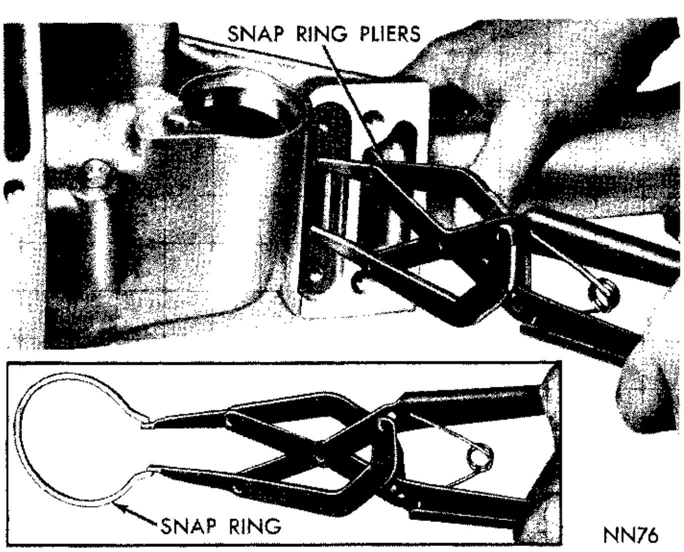


Fig. 23—Removing or Installing Extension Housing

Installation

(1) Place a new extension housing gasket on the transmission case. Position output shaft bearing retaining snap ring in the extension housing. Slide extension housing on output shaft guiding parking lock control rod knob past the parking sprag. While spreading large snap ring in housing with Tool C-3301A (Fig. 23), carefully tap housing into place, then release snap ring. Make sure snap ring is fully seated in bearing outer race ring groove.

(2) Install and tighten extension housing bolts to 24 foot-pounds.

(3) Install gasket, plate and two screws on bottom of extension housing mounting pad.

(4) Install center crossmember and rear mount assembly, tighten retaining bolts to 75 foot-pounds. Lower transmission, install extension housing to support bolts and tighten to 40 foot-pounds.

Console Shift: Align gearshift torque shaft lower bracket with the extension housing. Install the two retaining bolts and tighten securely.

(5) Install the speedometer pinion and adapter.

(6) Carefully guide front universal joint yoke into extension housing and on the output shaft splines. Align marks made at removal and connect propeller shaft to the rear axle pinion shaft yoke.

(7) Add fluid to transmission to bring up to proper level.

GOVERNOR

Removal

(1) Remove extension housing and output shaft bearing.

(2) Carefully pry snap ring from weight end of governor valve shaft (Fig. 25). Slide valve and shaft

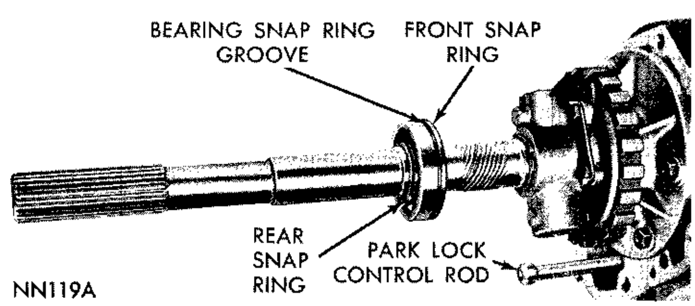


Fig. 24—Output Shaft Bearing

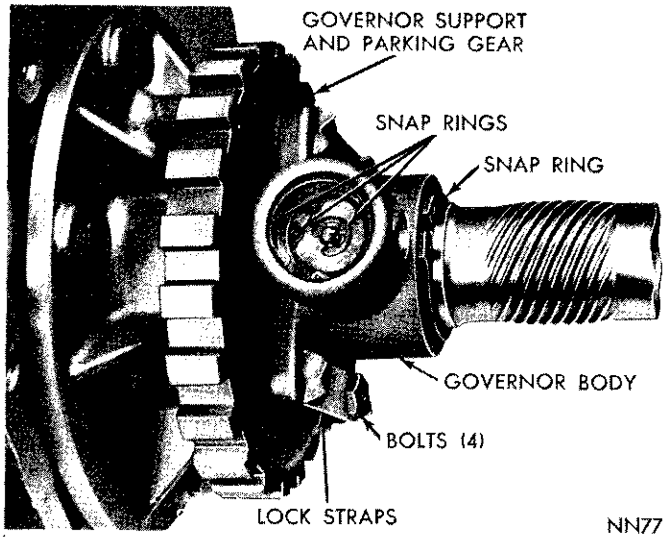


Fig. 25—Governor Shaft and Weight Snap Rings

assembly out of the governor body.

(3) Remove large snap ring from weight end of governor body, lift out governor weight assembly.

(4) Remove snap ring from inside governor weight, remove inner weight and spring from outer weight. Figure 26 shows a disassembled view of the governor assembly.

(5) Remove snap ring from behind governor body, then slide body and support assembly off the output shaft. If necessary, remove four bolts and separate governor from the support.

Cleaning and Inspection

The primary cause of governor operating failure is due to a sticking governor valve or weights. Rough surfaces may be removed with crocus cloth. Thoroughly clean all parts in clean solvent and inspect for free movement before assembly.

Installation

(1) Assemble governor body to the support (if disassembled) and tighten the bolts finger tight. Make sure oil passage of governor body aligns with passage in the support.

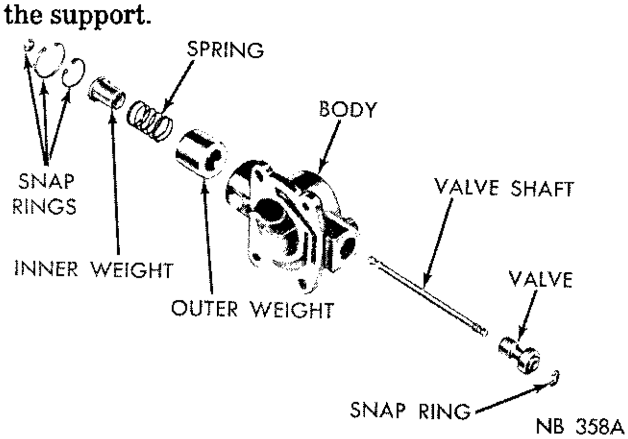


Fig. 26—Governor Assembly

(2) Position support and governor assembly on output shaft. Align assembly so governor valve shaft hole in governor body aligns with hole in the output shaft, then slide assembly into place. Install snap ring behind governor body (Fig. 25). Tighten body to support bolts to 100 inch-pounds. Bend ends of lock straps over the bolt heads.

(3) Assemble governor weights and spring, and secure with snap ring inside large governor weight. Place weight assembly in governor body and install snap ring.

(4) Place governor valve on valve shaft, insert the assembly into body and through governor weights. Install valve shaft retaining snap ring. Inspect valve and weight assembly for free movement after installation.

(5) Install output shaft bearing and extension housing.

PARKING LOCK COMPONENTS

Removal

(1) Remove the extension housing.

(2) To replace the governor support and parking gear, refer to "governor and support".

(3) Slide shaft out of extension housing to remove the parking sprag and spring (Fig. 27). Remove snap ring and slide reaction plug and pin assembly out of the housing.

(4) To replace the parking lock control rod, refer to "Valve Body—Removal and Installation."

Installation

(1) Position sprag and spring in housing and insert the shaft (Fig. 27). Make sure square lug on sprag is toward the parking gear, and spring is positioned so it moves sprag away from the gear.

(2) Install reaction plug and pin assembly in the housing and secure with snap ring.

(3) Install extension housing.

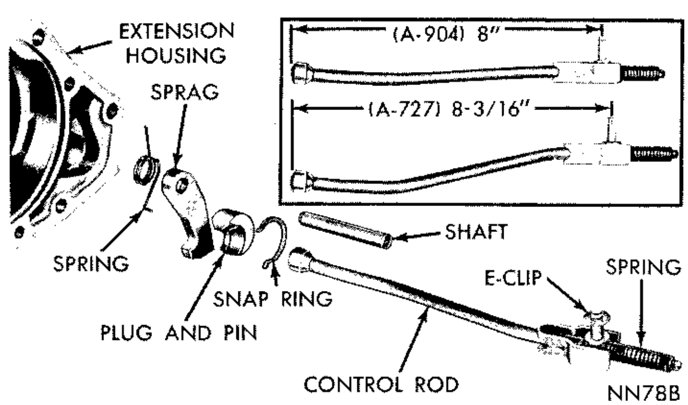


Fig. 27—Parking Lock Components

VALVE BODY ASSEMBLY AND ACCUMULATOR PISTON

Removal

(1) Raise the vehicle on a hoist.

(2) Loosen oil pan bolts, tap pan to break it loose allowing fluid to drain, then remove the oil pan.

(3) Disconnect throttle and gearshift linkage from levers on the transmission. Loosen clamp bolts and remove the levers (Fig. 5).

(4) Remove E-clip (Fig. 28), securing parking lock rod to the valve body manual lever.

(5) Remove Back-Up Light and Neutral Start Switch.

(6) Place a drain pan under transmission, then remove the ten hex-head valve body to transmission case bolts. Hold valve body in position while removing the bolts.

(7) While lowering valve body out of transmission case, disconnect parking lock rod from the lever.

To remove parking lock rod, pull it forward out of the case. If necessary, rotate propeller shaft to align parking gear and sprag to permit knob on end of control rod to pass the sprag.

(8) Withdraw accumulator piston from transmission case. Inspect piston for scoring, and rings for wear or breakage. Replace as required.

(9) If valve body manual lever shaft seal requires replacement, drive it out of the case with a punch.

(10) Drive a new seal into the case with a 15/16 inch socket and hammer (Fig. 29). **Servicing the valve body assembly is outlined under "Recondition—Sub-Assemblies."**

Installation

(1) Make sure Back-Up Light and Neutral Start Switch has been removed. If parking lock rod was removed, insert it through the opening in rear of case with knob positioned against the reaction plug and sprag. Move front end of rod toward center of transmission while exerting rearward pressure on the rod to force it past the sprag. (Rotate propeller shaft if necessary.)

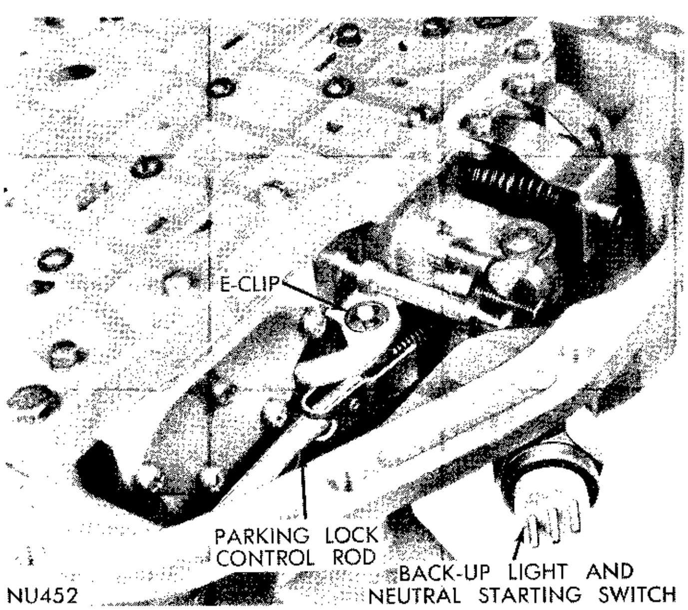


Fig. 28—Parking Lock Control Rod Retainer E-Clip

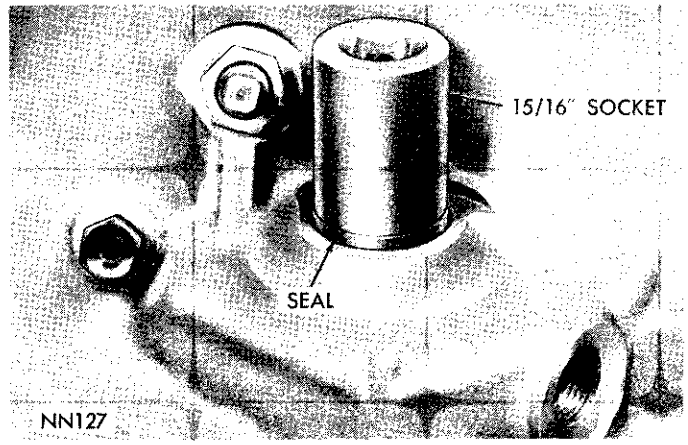


Fig. 29—Installing Valve Body Manual Lever Shaft Oil Seal

(2) Install accumulator piston in the transmission case.

(3) Position accumulator spring on the valve body.

(4) Place the valve body manual lever in **LOW** position. Lift valve body into its approximate position, connect parking lock rod to manual lever and secure with the E-clip. Position valve body in the case, install retaining bolts finger tight.

(5) With neutral starting switch installed, place manual valve in the neutral position. Shift valve body if necessary to center neutral finger over the neutral switch plunger. Snug bolts down evenly, then tighten to 100 inch-pounds.

(6) Install gearshift lever and tighten clamp bolt. Check lever shaft for binding in the case by moving lever through all detent positions. If binding exists, loosen valve body bolts and re-align.

(7) Make sure throttle shaft seal is in place, then install flat washer, lever and tighten the clamp bolt. Connect throttle and gearshift linkage and adjust as required.

(8) Install oil pan, using a new gasket. Add transmission fluid to bring it up to proper level.

SERVICE OUT OF VEHICLE

TRANSMISSION AND CONVERTER REMOVAL

The transmission and converter must be removed as an assembly; otherwise, the converter drive plate, pump bushing, and oil seal will be damaged. The drive plate will not support a load; therefore, none of the weight of the transmission should be allowed to rest on the plate during removal.

(1) Connect a Remote Control Starter Switch, Tool C-763 to starter solenoid and position switch so engine can be rotated from under the vehicle.

(2) Disconnect secondary (high tension) cable, from the ignition coil.

(3) Remove cover plate in front of converter to provide access to converter drain plug and mounting bolts.

(4) Rotate engine with Remote Control Switch to bring drain plug to "6 o'clock " position. Drain torque converter and transmission.

(5) Mark converter and drive plate to aid in reassembly. The crankshaft flange bolt circle, inner and outer circle of holes in drive plate, and four tapped holes in front face of converter all have one hole offset so these parts will be installed in original position. This maintains balance of the engine and converter.

(6) Rotate engine with Remote Control Switch to locate two converter to drive plate bolts at "5 and 7 o'clock" positions. Remove the two bolts, rotate engine with switch and remove the other two bolts. **Do not rotate converter or drive plate by prying with a screw driver or similar tool as the drive plate might become distorted. Also, starter should never be engaged if drive plate is not attached to converter with at least one bolt or if transmission case to engine block bolts have been loosened.**

(7) Disconnect negative (ground) cable from battery.

(8) Remove the starting motor assembly.

(9) Disconnect wire from the neutral starting switch.

(10) Disconnect gearshift rod from the transmission lever. Remove gearshift torque shaft from transmission housing and left side rail.

Console Shift: Remove two bolts securing gearshift torque shaft lower bracket to the extension housing. Swing bracket out of the way for transmission removal. Disconnect gearshift rod from the transmission lever.

(11) Disconnect throttle rod from bellcrank at left side of transmission bell housing.

(12) Disconnect oil cooler lines at transmission and remove oil filler tube. Disconnect the speedometer cable.

(13) Mark parts for reassembly then disconnect propeller shaft at rear universal joint. Carefully pull shaft assembly out of the extension housing.

(14) Remove rear mount to extension housing bolts.

(15) Install engine support fixture, Tool C-3487A and raise engine slightly (Fig. 30).

(16) Remove crossmember attaching bolts and remove the crossmember.

(17) Place a transmission service jack under transmission to support the assembly.

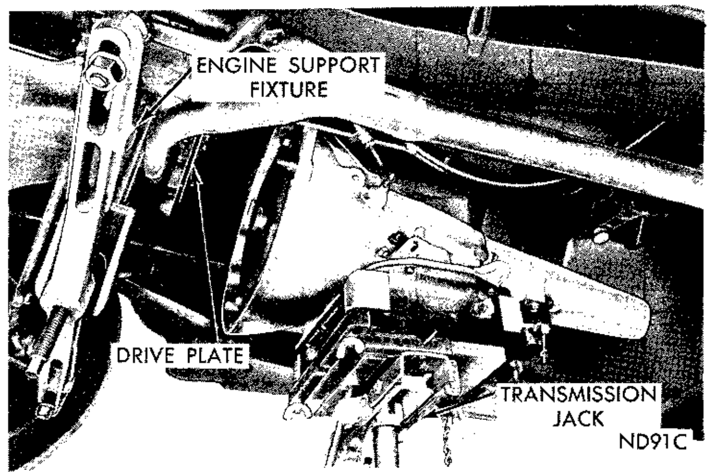


Fig. 30—Engine Lifting Fixture

Imperial Models: Through openings on rear side of torsion bar rear anchor crossmember, remove four large bolts securing rubber isolators to the center crossmember. Remove six additional bolts securing center crossmember, then remove crossmember from the stub frame. **Do not remove rear anchor crossmember from the torsion bars.**

(18) Attach a small "C" clamp to edge of converter housing to hold converter in place during removal of the transmission.

(19) Remove converter housing retaining bolts. Carefully work transmission rearward off engine block dowels and disengage converter hub from end of the crankshaft (Fig. 30).

(20) Lower transmission jack and remove transmission and converter assembly.

(21) To remove converter assembly, remove "C" clamp from edge of the housing, then carefully slide assembly out of the transmission.

STARTER RING GEAR REPLACEMENT

The starter ring gear is mounted directly on outer diameter of the torque converter front cover. With torque converter removed from vehicle, replacement of the gear is as follows:

Removal

(1) Cut through weld material at rear side of ring gear with a hack saw or grinding wheel (Fig. 31). Be careful not to cut or grind into the front cover stamping.

(2) Scribe a heavy line on front cover next to front face of ring gear to aid in locating the new gear.

(3) Support converter with the four lug faces resting on blocks of wood. **The converter must not rest on the front cover hub during this operation.** Using a blunt chisel or drift and hammer, tap downward on ring gear near welded areas to break any remaining weld material (Fig. 31). Tap around ring gear until it comes off the converter.

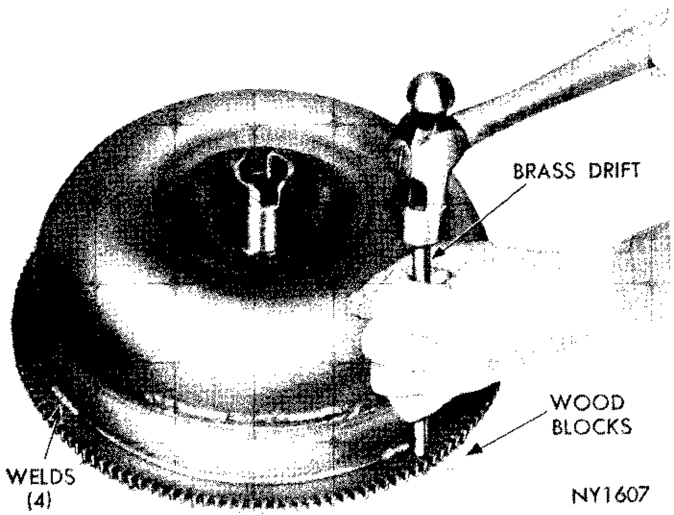


Fig. 31—Removing Starter Ring Gear

(4) Smooth off weld areas on the cover with a file.

Installation

Any of the following methods may be used to heat and expand starter ring gear for installation on the converter.

Oven: Place ring gear in Oven C-794 and set temperature at 200 degrees F. Allow ring gear to remain in oven for 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 a steam flow around gear for approximately two minutes.

Flame: Place ring gear squarely on a flat surface. Using a medium size tip, direct a slow flame evenly around inner rim of the gear. **Do not apply flame to the gear teeth.** Place a few drops of water on face of gear at intervals during heating process. When gear is hot enough to just boil the water, installation of the gear on torque converter can be made.

(1) After ring gear is expanded by heating, place the gear in position on converter front cover. Tap gear on cover evenly with a plastic or rawhide mallet until front face of gear is even with scribed line (made during removal) on the front cover. Make sure gear is even with scribed line around full circumference of the front cover.

(2) Reweld ring gear to torque converter front cover, being careful to place, as nearly as possible, same amount of weld material in exactly same location as was used in the original weld. This is necessary in order to maintain proper balance of the unit. Place welds alternately on opposite sides of converter to minimize distortion.

(3) The following suggestions are offered as an aid in making the weld.

a. **Do not gas weld.**

b. Use a D.C welder that is set at straight polarity or an A.C. welder if proper electrode is available.

c. Use a 1/8 inch diameter welding rod, and a welding current of 80 to 125 amps.

d. Direct the arc at intersection of gear and front cover from an angle of 45 degrees from rear face of the gear.

(4) Inspect gear teeth and remove all nicks where metal is raised, weld metal splatter, etc., in order to ensure quiet starter operation.

TORQUE CONVERTER FLUSHING

When a transmission failure has contaminated the fluid, the torque converter should be flushed to insure that metal particles or sludged oil are not later transferred back into the reconditioned transmission.

HAND FLUSHING

(1) Place converter in horizontal position and pour two quarts of new clean solvent or kerosene into converter through the impeller hub.

(2) Turn and shake converter so as to swirl solvent through the internal parts. **Turn the turbine and stator with transmission input and reaction shafts to dislodge foreign material.**

(3) Position converter in its normal operating position with drain plug at the lowest point. Remove drain plug and drain solvent. Rotate turbine and stator, and shake converter while draining to prevent dirt particles from settling. Tool C-3963-A is available to do this job faster and more effectively.

This tool adapts a drill motor to an input shaft to spin the turbine and includes a drawing for a simple wooden fixture to hold the converter. This fixture will hold the converter upright for the spinning and draining operations.

(4) Repeat flushing operation at least once, or as many times as required until solvent or kerosene drained out is clear.

(5) After flushing, shake and rotate converter several times with drain plug out to remove any residual solvent and dirt. **Flush any remaining solvent from converter with two quarts of new transmission fluid.** This will prevent any adverse effect the solvent may have on the transmission seals. Reinstall drain plug and tighten to 110 inch-pounds.

(6) Flush and blow out the oil cooler and its lines.

MACHINE FLUSHING

Machine cleaning is recommended; using the type which rotates the converter while pumping cleaning fluid through it. The machine automatically adds timed blasts of compressed air to the cleaning fluid as it enters the converter, providing more thorough cleaning than the hand flushing operation.

PUMP OIL SEAL

Replacement

The pump oil seal can be replaced without removing pump and reaction shaft support assembly from the transmission case.

(1) Screw seal remover, Tool C-3861 into the seal (Fig. 32). Tighten screw portion of tool to withdraw the seal.

(2) To install a new seal, place the seal in opening of the pump housing (lip side facing inward). Using Tool C-3860, drive the seal into housing until tool bottoms (Fig. 33).

DISASSEMBLY—SUB-ASSEMBLY REMOVAL

Prior to removing transmission sub-assemblies, plug all openings and thoroughly clean exterior of the unit, preferably by steam. Cleanliness through entire disassembly and assembly cannot be over-emphasized. When disassembling, each part should be washed in a suitable solvent, then dried by compressed air. **Do not wipe parts with shop towels.** All mating surfaces in the transmission are accurately machined; therefore, careful handling of parts must be exercised to avoid nicks or burrs.

Drive Train End Play

Measuring drive train end play before disassembly, will usually indicate when a thrust washer change between the reaction shaft support and front clutch retainer is required, to properly adjust end play during assembly (except when major parts are replaced).

(1) Attach a dial indicator to transmission bell housing with its plunger seated against end of input shaft (Fig. 34).

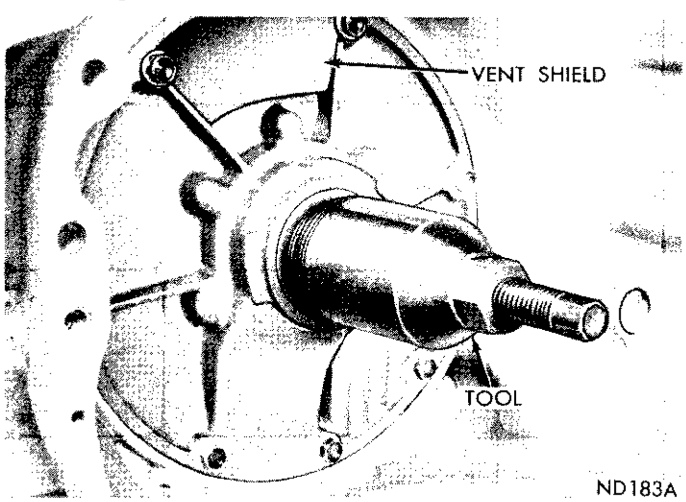


Fig. 32—Removing Pump Oil Seal

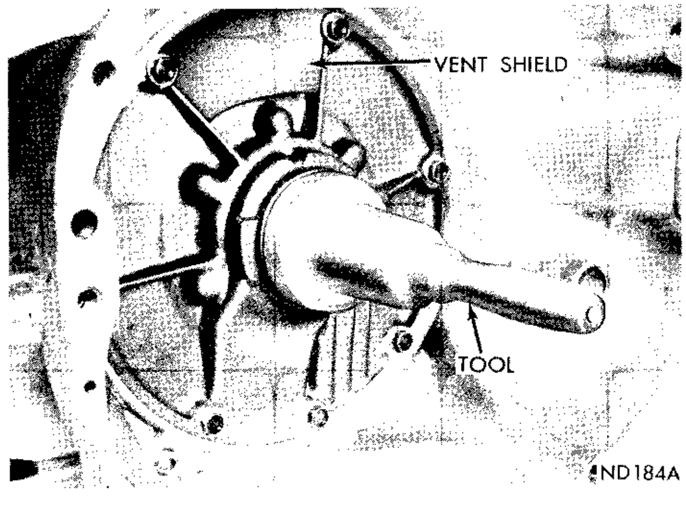


Fig. 33—Installing Pump Oil Seal

(2) Move input shaft in and out to obtain end play reading.

(3) Record the indicator reading for reference when reassembling the transmission. The end play specifications are .037 to .084 inch.

Oil Pan

(1) Place transmission assembly in repair stand, Tool C-3750 with adapter C-3882 (Fig. 35).

If repair stand DD-1014 is available, fabricate two attaching brackets (Fig. 36) and install transmission in the stand (Fig. 37), file out the 7/16 inch holes if necessary to obtain bracket alignment. This stand provides easier disassembly and assembly as transmission can be rotated as desired.

(2) Unscrew oil pan bolts and remove the pan and gasket.

Valve Body Assembly

(1) Loosen clamp bolts and remove throttle and gearshift levers from the transmission.

(2) Remove Back-Up Light and Neutral Start Switch.

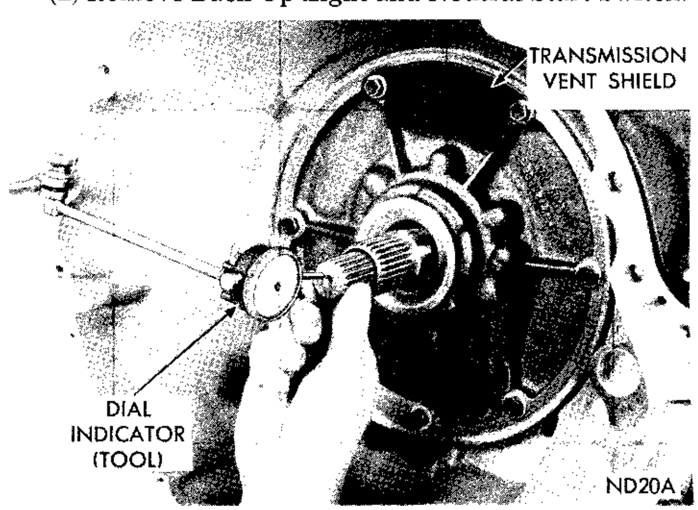


Fig. 34—Measuring Drive Train End Play

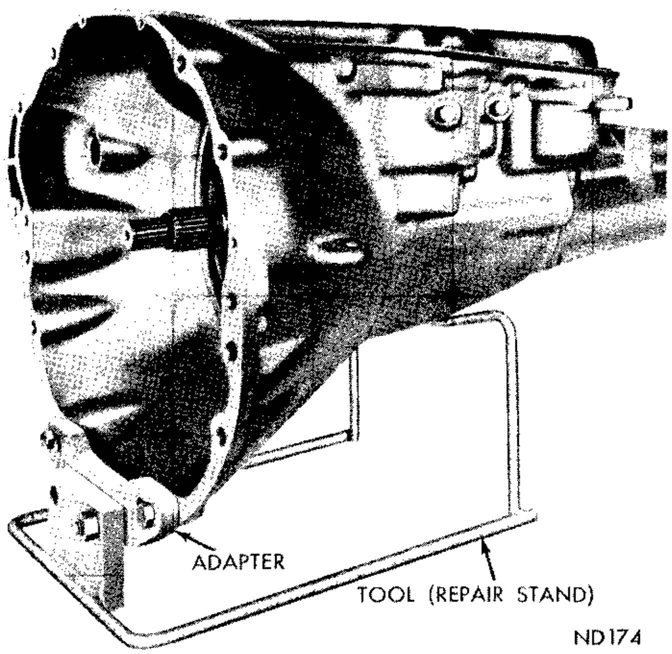


Fig. 35—Transmission Installed in Repair Stand

(3) Remove the ten hex-head valve body to transmission bolts. Remove E-clip securing parking lock rod to valve body manual lever (Fig. 28).

(4) While lifting valve body out of transmission case, disconnect parking lock rod from the lever.

Accumulator Piston and Spring

(1) Lift spring off accumulator piston and withdraw piston from the case.

Extension Housing and Output Shaft Bearing

Before removing extension housing, pull parking

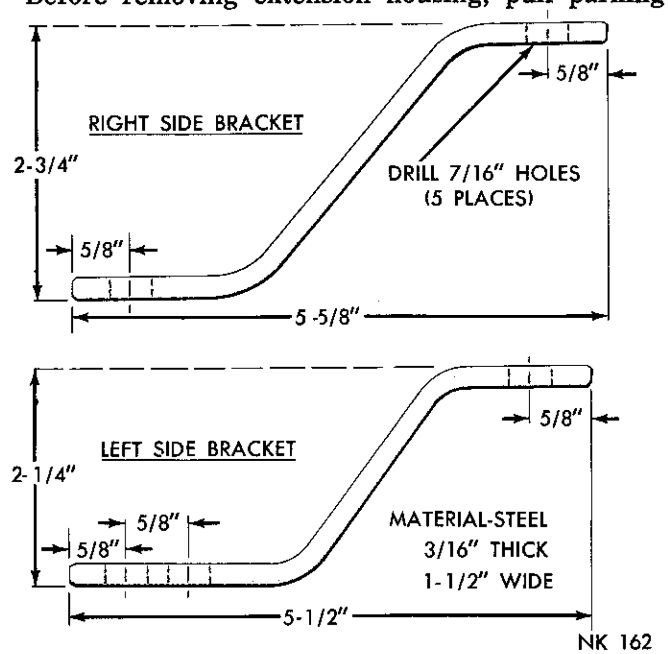


Fig. 36—Repair Stand Bracket Dimensions

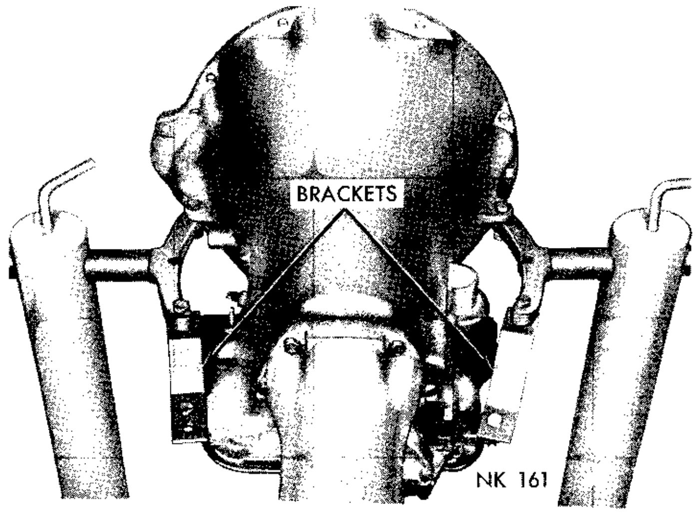


Fig. 37—Transmission Installed in Repair Stand

lock rod forward out of the case. Rotate output shaft if necessary to align parking gear and sprag to permit knob on end of control rod to pass the sprag.

(1) Remove speedometer pinion and adapter assembly.

(2) Remove extension housing to transmission bolts.

(3) Remove two screws, plate and gasket from bottom of extension housing mounting pad. Spread large snap ring from output shaft bearing with Tool C-3301A (Fig. 23). With snap ring spread as far as possible, carefully tap extension housing off the output shaft and bearing.

(4) Using heavy duty snap ring pliers C-4020, remove output shaft bearing rear snap ring. Remove bearing from shaft, then remove front snap ring.

Governor and Support

(1) Carefully pry snap ring from weight end of governor valve shaft (Fig. 27). Slide valve and shaft assembly out of the governor body.

(2) Remove snap ring from behind governor body, then slide governor body and support assembly off the output shaft.

Oil Pump and Reaction Shaft Support

(1) Tighten front band adjusting screw until band is tight on the front clutch retainer. This prevents clutch retainer from coming out with pump which might cause unnecessary damage to the clutches.

(2) Remove oil pump housing retaining bolts.

(3) Attach Tool C-3752 to the pump housing flange (Fig. 38), thread screws of tool into the flange holes at 9 and 3 o'clock locations.

(4) Bump outward evenly on the two "knocker weights" to withdraw pump and reaction shaft support assembly from the case.

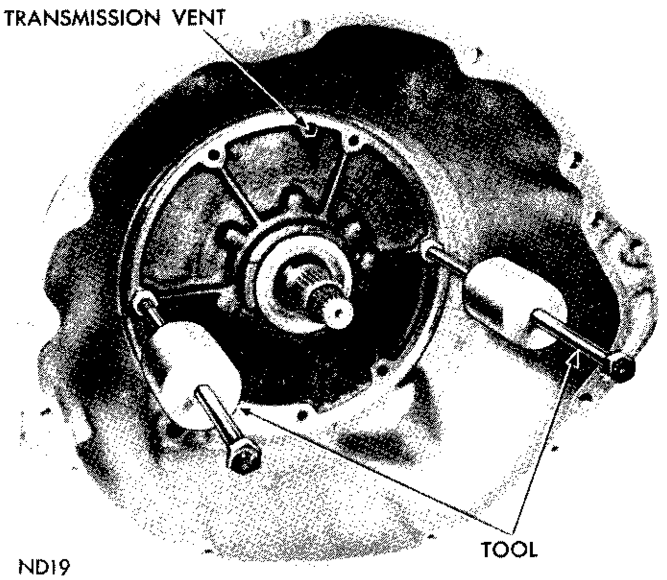


Fig. 38—Removing Pump and Reaction Shaft Support Assembly

Front Band and Front Clutch

(1) Loosen front band adjuster, remove band strut and slide band out of the case.

(2) Slide front clutch assembly out of the case.

Input Shaft and Rear Clutch

(1) Grasp input shaft, and slide input shaft and rear clutch assembly out of the case.

CAUTION: Be careful not to lose thrust washer located between rear end of input shaft and forward end of output shaft.

Planetary Gear Assemblies, Sun Gear, and Driving Shell

(1) While supporting output shaft and driving shell, carefully slide assembly forward and out through the case.

CAUTION: Be very careful not to damage ground surfaces on output shaft during removal.

Rear Band and Low-Reverse Drum

(1) Remove low-reverse drum, then loosen rear band adjuster, remove band strut and then remove band from the case.

Overrunning Clutch

(1) Note position of overrunning clutch rollers and springs before disassembly to assist in reassembly.

(2) Carefully slide out clutch hub and remove the rollers and springs. **If overrunning clutch cam and/or roller spring retainer are found damaged or worn, refer to index for replacement procedures.**

Kickdown Servo

(1) Compress kickdown servo spring by using engine valve spring compressor Tool C-3422, then remove snap ring (Fig. 39).

(2) Remove rod guide, springs and piston rod from the case. Be careful not to damage piston rod or guide during removal.

(3) Withdraw piston from the transmission case.

Low and Reverse Servo

(1) Compress low and reverse servo piston spring by using engine valve spring compressor Tool C-3422, then remove snap ring.

(2) Remove spring retainer, spring, and servo piston and plug assembly from the case.

RECONDITION SUB-ASSEMBLIES

The following procedures cover disassembly, inspection, repair, and assembly of each sub-assembly as removed from transmission.

Heli-Coil inserts are recommended for repairing damaged, stripped or worn threads in aluminum parts. Refer to "Aluminum Thread Repair".

Pre-sized service bushings are available for replacement for most all bushings in the TorqueFlite transmission. The two bushings in sun gear are not serviced because of the low cost of the sun gear assembly. If bushings are found worn or scored, they should be replaced as outlined in the following reconditioning procedures.

The bushing replacement tools listed by "SP" numbers are part of Tool Kit C-3887-A.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on

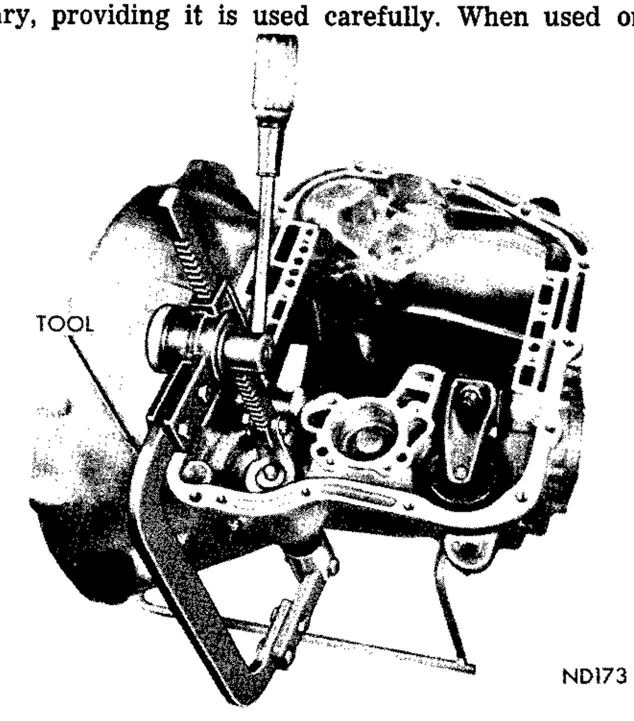


Fig. 39—Compressing Kickdown Servo Spring

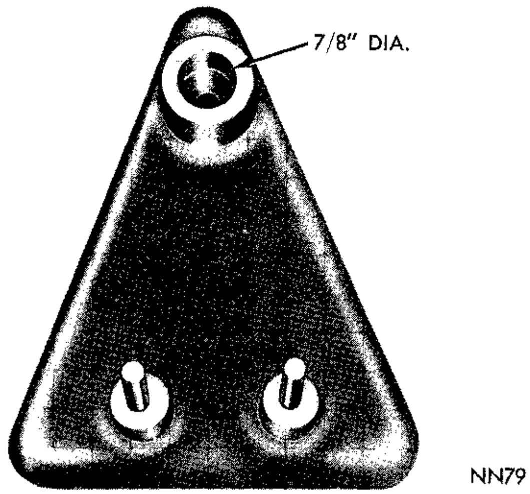


Fig. 40—Rework Valve Body Repair Stand

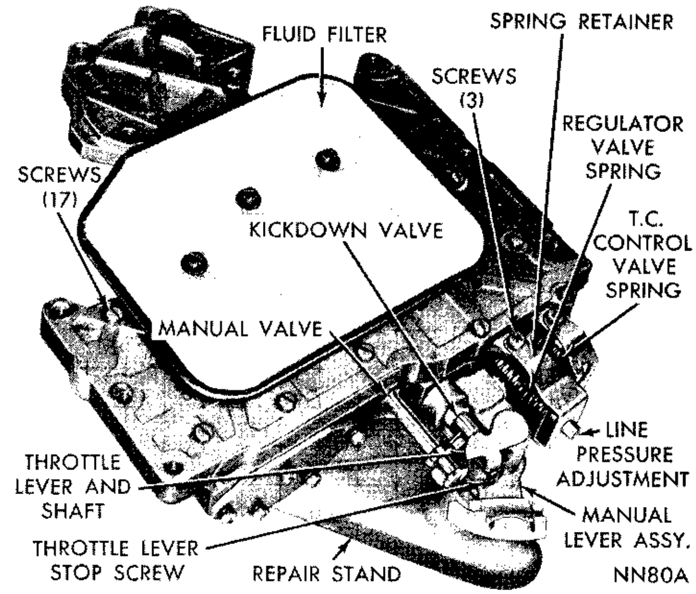


Fig. 41—Valve Body and Control Assembly

valves, use extreme care to avoid rounding off the sharp edges. The sharp edge is vitally important to this type valve. Sharp edges prevent dirt and foreign matter from getting between the valve and body, thus reducing possibility 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. **Coat each part with Automatic Transmission Fluid—AQ-ATF Suffix "A" (Dexron) during assembly.**

VALVE BODY ASSEMBLY

CAUTION: Never clamp any portion of valve body or transfer plate in a vise. Any slight distortion of the aluminum body or transfer plate will result in sticking valves, excessive leakage or both. When removing or installing valve or plugs, slide them in or out carefully. Do not use force.

Rework valve body repair stand, Tool C-3749 by drilling the 5/16 inch diameter hole to 7/8, and 3/4 inch deep (Fig. 40). The stand can then be used with either the old or new type valve bodies.

Disassembly

(1) Place valve body assembly on repair stand, Tool C-3749, (Fig. 41). Remove three screws from fluid filter and lift off the filter.

(2) While holding spring retainer firmly against the spring force, remove the three bracket retaining screws (Fig. 41).

(3) Remove the spring retainer, torque converter control valve spring, and regulator valve spring with line pressure adjusting screw assembly. **Do not alter setting of line pressure adjusting screw and nut. The nut has an interference thread and does not turn easily on the screw.**

(4) Slide regulator valve out of valve body. Slide torque converter control valve out of valve body.

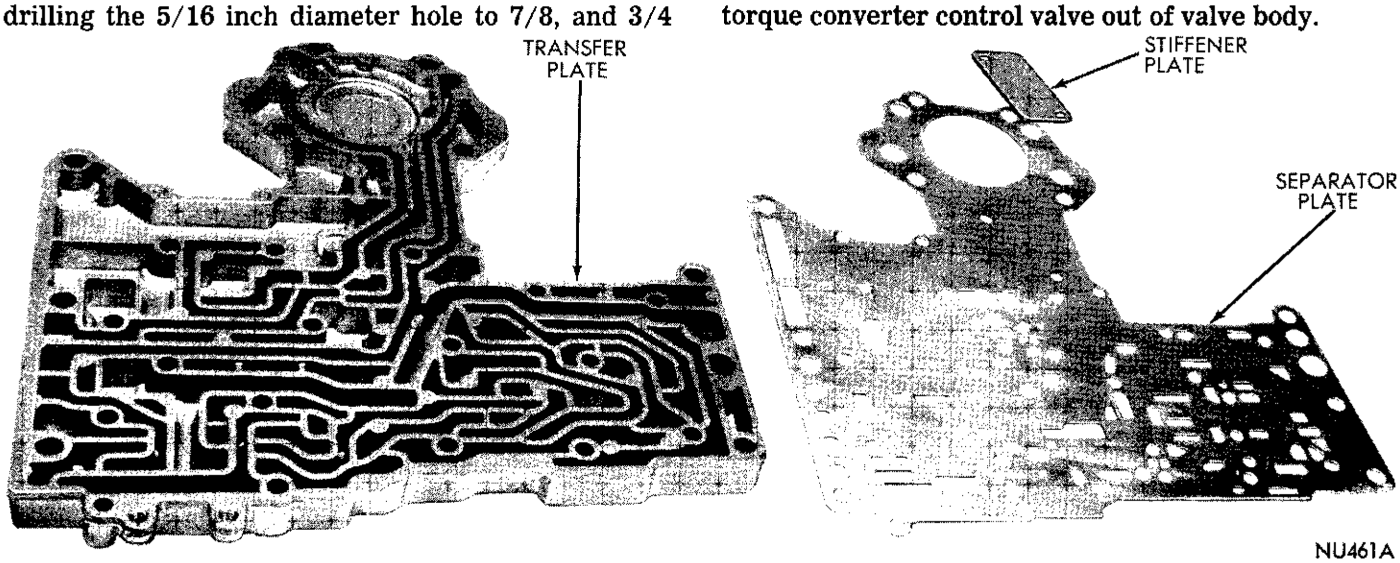


Fig. 42—Transfer and Separator Plate

(5) Remove 17 transfer plate retaining screws. Carefully lift transfer plate and steel separator plate assembly off the valve body.

(6) Invert transfer plate assembly and remove the stiffener plate. Remove remaining screws securing separator plate to the transfer plate, and carefully lift off the separator plate (Fig. 42).

(7) Remove and note location of 7 steel balls and 1 spring in valve body (Fig. 43). **CAUTION: Do Not mix up the two larger balls.** The 3/8 inch diameter ball goes on the spring in the corner and is the high pressure relief valve. The 5/16 diameter ball in the large chamber is the front clutch ball check.

(8) Invert valve body and lay it on a clean cloth or paper. Remove E-clip and washer from throttle lever shaft (Fig. 44). Remove any burrs from shaft, then while holding manual lever detent ball and spring in their bore with Tool C-3765 or similar tool, slide manual lever off the throttle shaft. Remove the detent ball and spring.

(9) Remove manual valve, carefully slide it out of valve body with a rotating motion.

(10) Remove throttle lever and shaft from the valve body.

(11) Remove shuttle valve cover plate (Fig. 44). Remove E-clip from exposed end of the shuttle valve.

(12) Remove throttle lever stop screw assembly (Fig. 45), being careful not to disturb the setting any more than is necessary.

(13) Remove kickdown detent, kickdown valve, throttle valve spring and the throttle valve.

(14) Remove the governor plug end plate (Fig. 45). Tip up valve body to allow shuttle valve throttle plug, spring, shuttle valve, and shift valve governor plugs to slide out into your hand.

Note longer stem on the 1-2 shift valve plug as a means for identification.

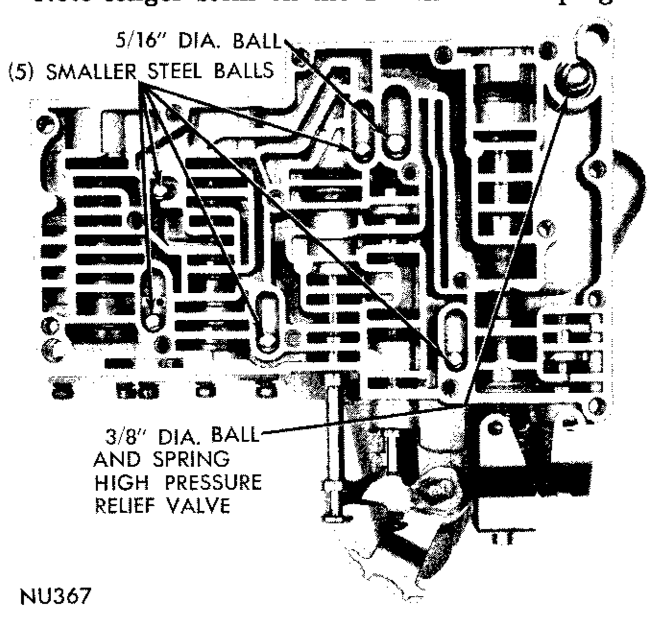


Fig. 43—Steel Ball Locations

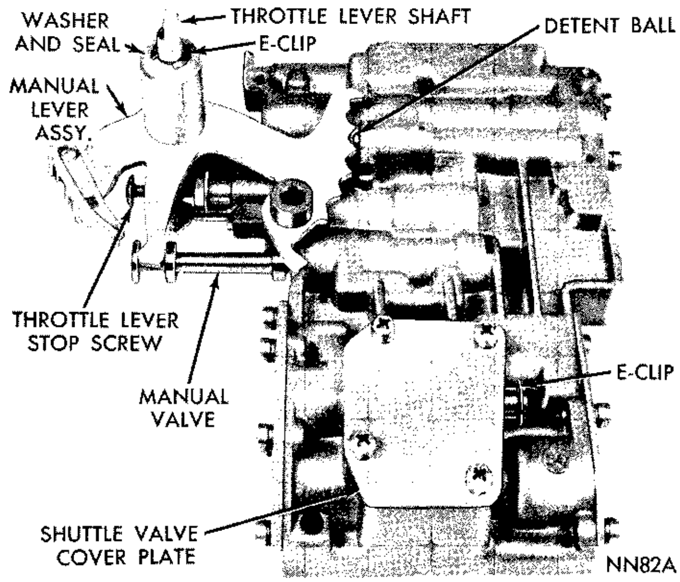


Fig. 44—Valve Body Controls (Assembled View)

(15) Remove shift valve end plate (Fig. 46) and slide out the two springs and valves.

(16) Remove regulator valve end plate. Slide regulator valve line pressure plug, sleeve, and regulator valve throttle pressure plug out of valve body.

Cleaning and Inspection

Allow all parts to soak a few minutes in a suitable clean solvent. Wash thoroughly and blow dry with compressed air. Make sure all passages are clean and free from obstructions.

Inspect manual and throttle valve operating levers and shafts for being bent, worn or loose. If a lever is loose on its shaft, it may be **silver soldered** only, or the lever and shaft assembly should be replaced. **CAUTION: Do not attempt to straighten bent levers.**

Inspect all mating surfaces for burrs, nicks and scratches. Minor blemishes may be removed with crocus cloth, using only a very light pressure. Using a straightedge, inspect all mating surfaces for warpage or distortion. Slight distortion may be corrected, using a surface plate. Make sure all metering holes in the steel plate are open. Using a pen light, inspect bores in the valve body for scores, scratches, pits and irregularities.

Inspect all valve springs for distortion and collapsed coils. Inspect all valves and plugs for burrs, nicks and scores. Small nicks and scores may be removed with crocus cloth, providing extreme care is taken not to round off sharp edges. The sharpness of these edges is vitally important because it prevents foreign matter from lodging between the valve and valve body, thus reducing possibility of sticking. Inspect all valves and plugs for freedom of operation in valve body bores. When bores, valves and plugs are clean and dry, the

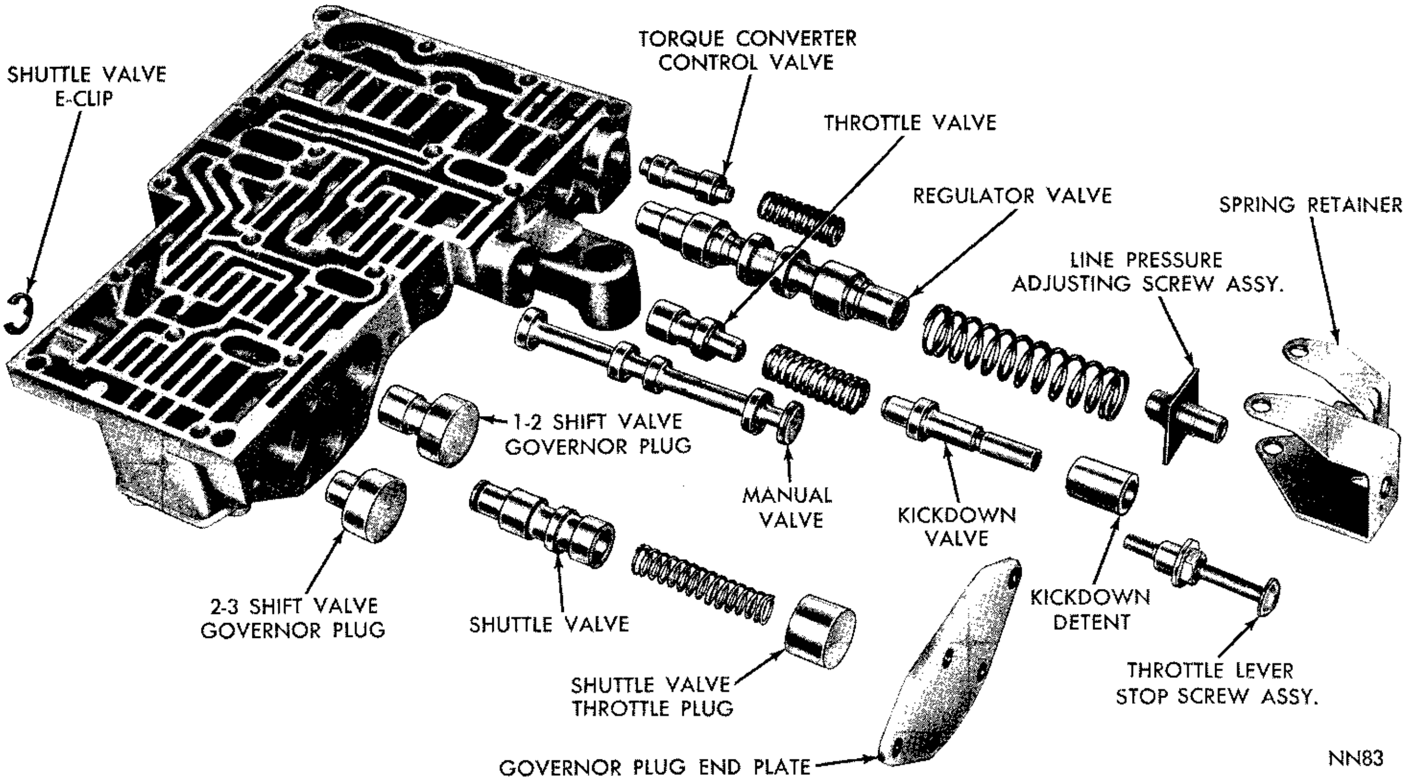


Fig. 45—Valve Body—Lever Side—Disassembled

valve and plugs should fall freely in the bores. **The valve body bores do not change dimensionally with use. Therefore, a valve body that was functioning properly when vehicle was new, will operate correctly if it is properly and thoroughly cleaned. There is no need to replace the valve body unless it is damaged in handling.**

Assembly

(1) Place separator plate on the transfer plate (Fig. 42). **Install stiffener plate and retaining screws exactly as shown.** Make sure all bolt holes are aligned; then tighten stiffener plate screws to 28 inch-pounds.

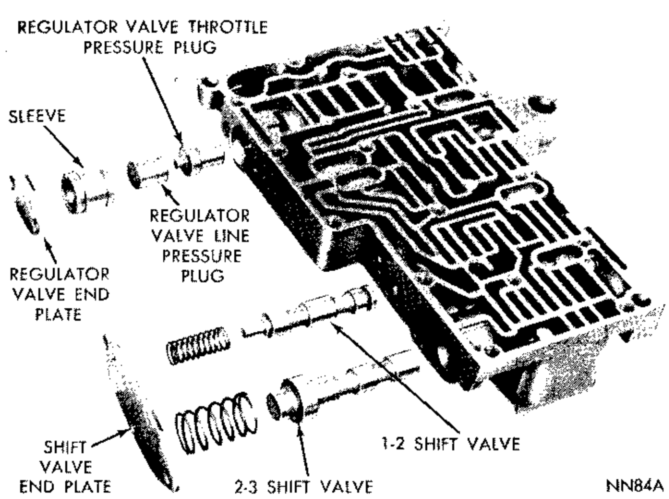


Fig. 46—Valve Body—Shift Valve Side—Disassembled

(2) Place 1-2 and 2-3 shift valve governor plugs in their respective bores (Fig. 45). Install shuttle valve, spring and shuttle valve throttle plug. Install governor plug end plate and tighten the five retaining screws to 28 inch-pounds.

(3) Install E-clip on end of the shuttle valve (Fig. 44). Install shuttle valve cover plate and tighten the four retaining screws to 28 inch-pounds.

(4) Install 1-2 and 2-3 shift valves and springs (Fig. 46). Install shift valve end plate and tighten the three retaining screws to 28 inch-pounds.

(5) Install regulator valve throttle pressure plug, sleeve, and the line pressure plug (Fig. 46). Install regulator valve end plate and tighten the two retaining screws to 28 inch-pounds.

(6) Install throttle valve and spring (Fig. 45). Slide kickdown detent on the kickdown valve (counterbore side of detent toward valve), then install assembly in the valve body.

(7) Install throttle lever stop screw (Fig. 45), and tighten lock nut finger tight.

(8) Install manual valve in the valve body (Fig. 45).

(9) Install throttle lever and shaft on the valve body (Fig. 47). Insert detent spring and ball in its bore in the valve body. Depress ball and spring with Tool C-3765 or similar tool and slide manual lever over throttle shaft so that it engages manual valve and detent ball. Install seal, retaining washer and E-clip on the throttle shaft. (Fig. 44).

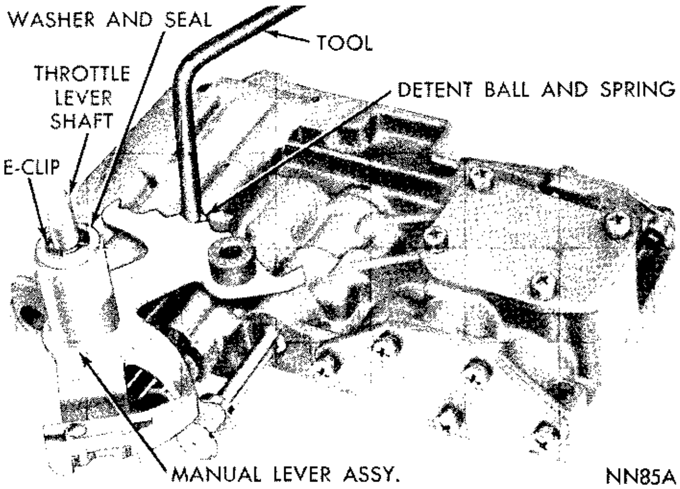


Fig. 47—Installing Detent Ball, Spring and Control Levers

(10) Position valve body assembly on the repair stand.

(11) Place the six steel balls in valve body chambers with large ball in the large chamber (Fig. 43). Install spring and high pressure relief valve ball (3/8" dia.)

(12) Position transfer plate assembly on the valve body. Install the retaining screws, starting at center and working outward, tighten screws to 35 inch-pounds.

(13) Install the torque converter valve and regulator valve (Fig. 45).

(14) Position the torque converter valve spring and regulator valve spring over ends of their respective valves. Place line pressure adjusting screw assembly on end of regulator valve spring with long dimension of nut at right angles to the valve body (Fig. 45).

(15) Install spring retainer, making sure converter valve spring is engaged on the tang and position squarely in the retainer. Tighten the three retaining screws to 28 inch-pounds. **Measure and if necessary, align spring retainer (Fig. 14).**

(16) Install the oil filter and tighten the three retaining screws to 35 inch-pounds.

After valve body has been serviced and completely assembled, adjust the throttle and line pressures. See "Hydraulic Control Pressure Adjustments". However, if pressures were satisfactory prior to disassembly, use original settings.

ACCUMULATOR PISTON AND SPRING

Inspection

Inspect the two seal rings for wear and make sure they turn freely in piston grooves. It is not necessary to remove rings unless condition warrants. Inspect piston for nicks, burrs, scores and wear. Inspect piston bore in the case for scores or other damage and piston spring for distortion. Replace parts as required.

EXTENSION HOUSING BUSHING REPLACEMENT

(1) Remove the extension housing yoke seal (Fig. 21) with Tool C-3985.

(2) Press or drive out bushing with Tool C-3974 (Fig. 48).

(3) Slide a new bushing on installing end of Tool C-3974. Align oil hole in bushing with oil slot in the housing, then press or drive bushing into place (Fig. 48).

(4) Position a new seal in opening of extension housing and drive it into the housing with Tool C-3972 (Fig. 22).

PARKING LOCK SPRAG

Disassembly

(1) Slide shaft out of extension housing to remove parking sprag and spring (Fig. 27). Remove snap ring and slide reaction plug and pin assembly out of the housing.

Inspection

Inspect sprag shaft for scores and free movement in the housing and sprag. Inspect sprag and control rod springs for distortion and tension. Inspect square lug on the sprag for broken edges, also lugs on the parking gear for damage. Inspect knob on end of control rod for nicks, burrs and free turning.

To replace the parking gear, refer to "Governor and Support-Disassembly and Assembly."

Assembly

(1) Install reaction plug and pin assembly in the housing and secure with snap ring (Fig. 27).

(2) Position sprag and spring in the housing and insert the shaft. Make sure square lug on sprag is toward parking gear and spring is positioned so it moves sprag away from the gear.

GOVERNOR AND SUPPORT

Disassembly

(1) Remove large snap ring from weight end of

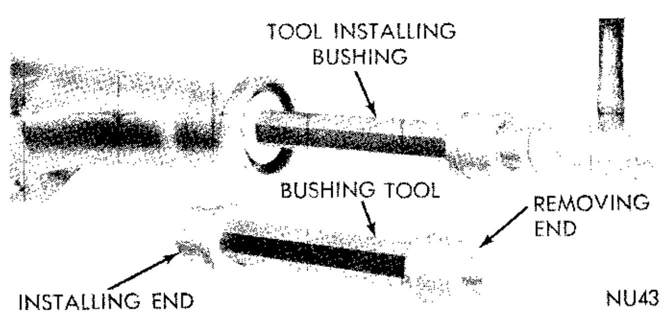


Fig. 48—Replacing Extension Housing Bushing

governor body and lift out the weight assembly.

(2) Remove snap ring from inside governor weight, remove inner weight, and spring from the outer weight.

(3) If the lugs on parking gear are damaged, removed the four bolts and separate support from the governor body.

Cleaning and Inspection

Figure 26 shows a disassembled view of the governor assembly.

Inspect all parts for burrs and wear. Inspect inner weight for free movement in the outer weight, and outer weight for free movement in the governor body. Inspect valve for free movement in the governor body. The weights and valve should fall freely in the bores when clean and dry. Rough surfaces may be removed with crocus cloth.

Inspect the governor weight spring for distortion. Inspect the lugs on parking gear for broken edges or other damage. Thoroughly clean all governor parts in clean solvent and inspect for free movement before assembly.

Assembly

(1) If the support was separated from governor body, assemble and tighten the bolts finger tight.

(2) Assemble governor weights and spring, and secure with snap ring inside of large governor weight. Place weight assembly in governor body and install snap ring.

OIL PUMP AND REACTION SHAFT SUPPORT

Disassembly

Figure 49 shows the oil pump and reaction shaft support disassembled.

(1) Remove bolts from rear side of reaction shaft support, remove vent baffle and lift the support off the pump.

(2) Remove rubber seal ring from pump body flange.

(3) Drive out the oil seal with a blunt punch.

Inspection

Inspect interlocking seal rings (Fig. 49) on reaction shaft support for wear or broken locks, make sure they turn freely in the grooves. Do not remove rings unless conditions warrant. Inspect pump body and reaction shaft support bushings for wear or scores. Inspect machined surfaces on pump body and reaction shaft support for nicks and burrs. Inspect pump rotors for scoring or pitting. With rotors cleaned and installed in the pump body, place a straightedge across face of rotors and pump body. Using a feeler gauge, measure clearance between straight edge and face of the rotors. Clearance limits are from .0015 to .003 inch. Also, with a feeler gauge, measure rotor tip clearance between inner and outer rotor teeth. Clearance limits are from .005 to .010 inch.

Clearance between outer rotor and its bore in oil pump body should be .004 to .008 inch.

Pump Bushing Replacement

(1) Place pump housing on a clean smooth surface

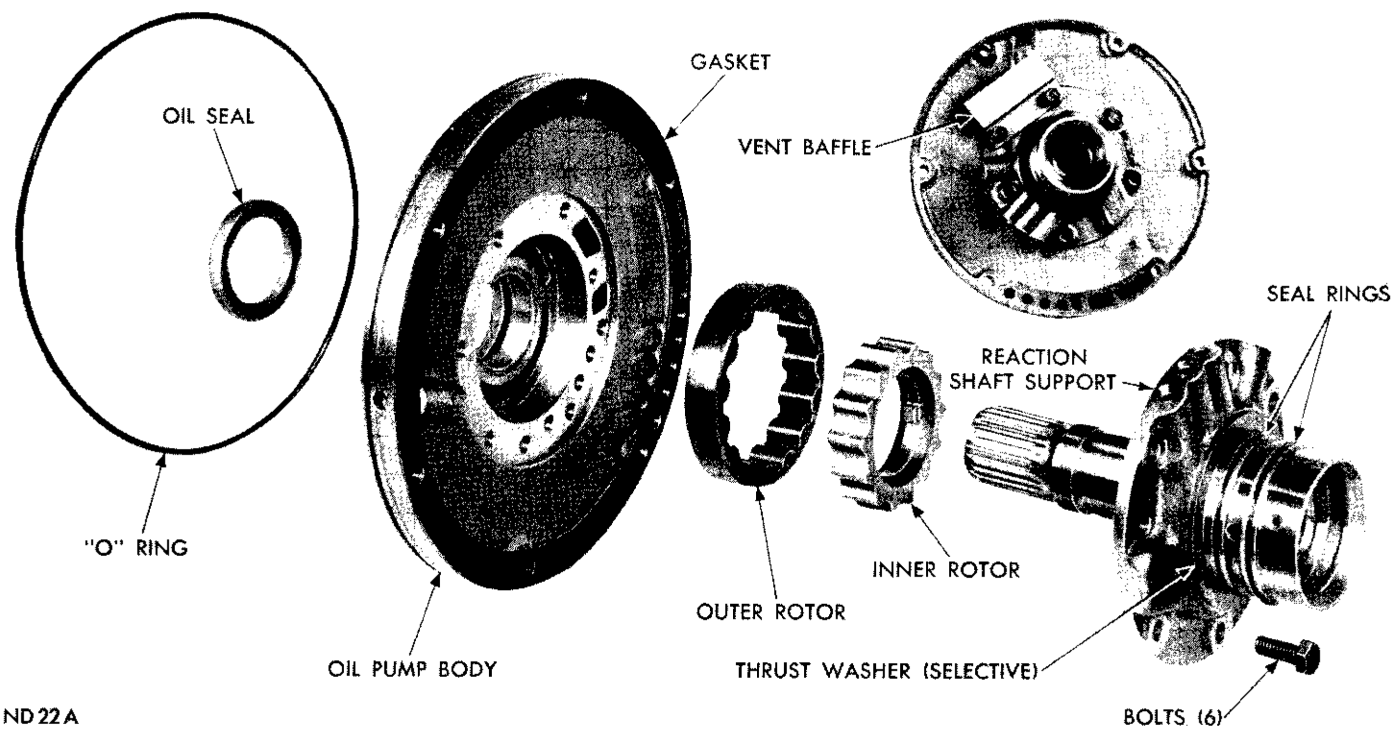


Fig. 49—Oil Pump and Reaction Shaft Support (A-727)

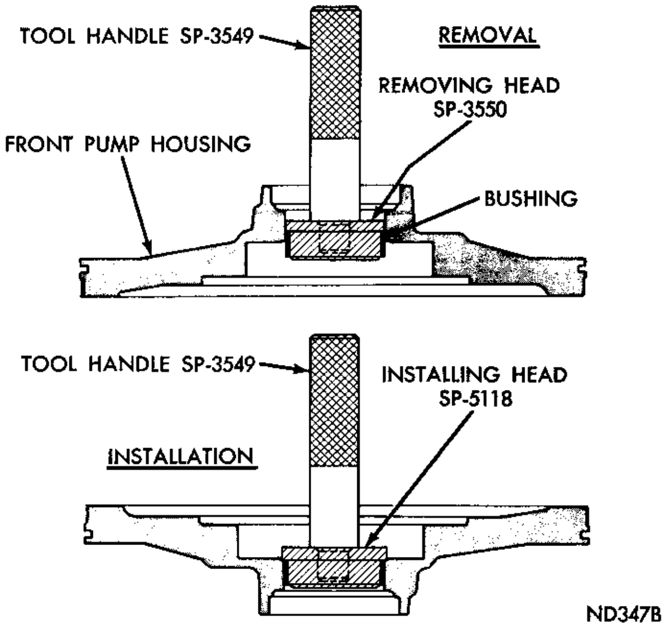


Fig. 50—Replacing Pump Bushing (A-727)

with the rotor cavity down.

(2) Place removing head Tool SP-3550 in the bushing, and install handle Tool SP-3549 in the removing head (Fig. 50).

(3) Drive bushing straight down and out of the bore. Be careful not to cock tool in the bore.

(4) Position a new bushing on the installing head Tool SP-5118.

(5) With pump housing on a smooth clean surface (hub end down), start bushing and installing head in the bushing bore. Install handle Tool SP-3549 in the installing head (Fig. 50).

(6) Drive bushing into housing until tool bottoms in the pump cavity. Be careful not to cock tool during installation.

(7) Stake bushing in place by using a blunt punch or similar tool (Fig. 51). A gentle tap at each stake slot location will suffice.

(8) Using a narrow-bladed knife or similar tool, remove high points or burrs around the staked area (Fig. 51). Do not use a file or similar tool that will remove more metal than is necessary.

(9) Thoroughly clean pump housing before installation.

Reaction Shaft Bushing Replacement

(1) Assemble remover Tool SP-5301, cup Tool SP-3633, and hex nut Tool SP-1191.

CAUTION: Do not clamp any part of reaction shaft or support in a vise.

(2) With cup held firmly against the reaction shaft, thread remover into bushing as far as possible by hand (Fig. 52).

(3) Using a wrench, screw remover into bushing 3 to 4 additional turns to firmly engage threads in the

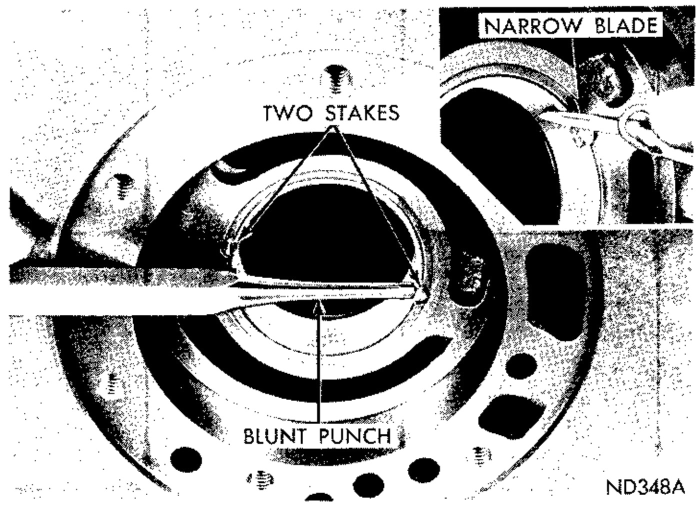


Fig. 51—Staking Pump Bushing (A-727)

bushing.

(4) Turn hex nut down against the cup to pull bushing from the reaction shaft. Thoroughly clean reaction shaft to remove chips made by the remover threads.

(5) Lightly grip bushing in a vise or with pliers and back tool out of the bushing. Be careful not to damage threads on the bushing remover.

(6) Slide a new bushing (chamfered end first) on installing head Tool SP-5302, and start them in bore of the reaction shaft.

(7) Support reaction shaft upright on a clean smooth surface and install handle Tool SP-3549 in the installing head (Fig. 52). Drive bushing into the shaft until tool bottoms.

(8) Thoroughly clean reaction shaft support assembly before installation.

Assembly

(1) Assemble pump rotors in the pump housing (Fig. 49).

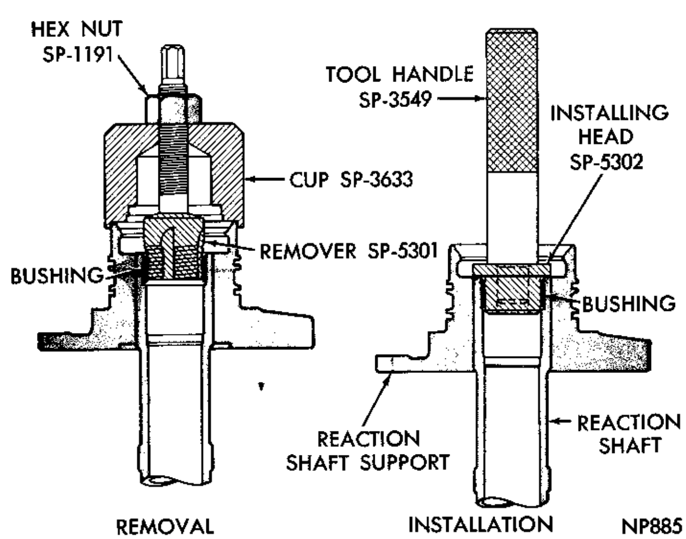


Fig. 52—Replacing Reaction Shaft Bushing (A-727)

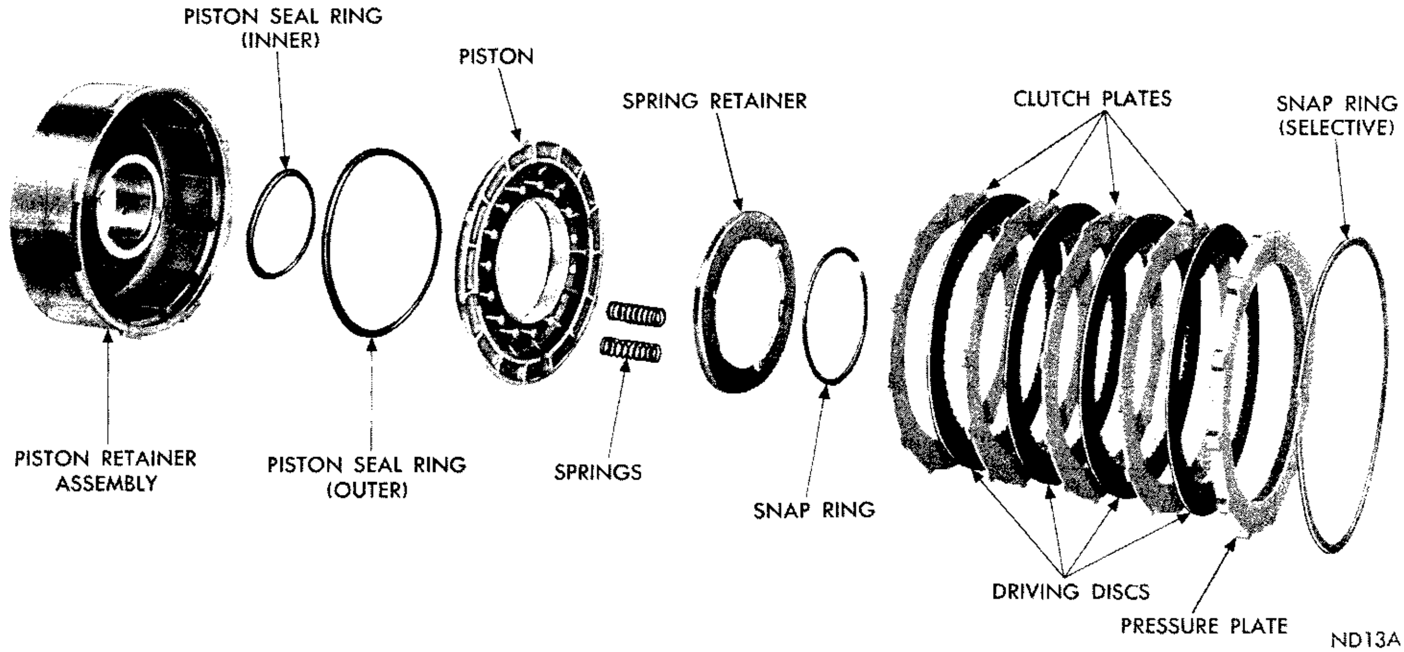


Fig. 53—Front Clutch Disassembled (A-727)

(2) Install reaction shaft support and position vent baffle over the vent opening. Install retaining bolts and tighten to 150 inch-pounds.

(3) Place a new oil seal in opening of pump housing (lip of seal facing inward) using Tool C-3860 drive seal into housing until tool bottoms.

FRONT CLUTCH

Disassembly

Figure 53 shows a disassembled view of the front clutch assembly.

(1) Remove large selective snap ring that secures pressure plate in the clutch piston retainer. Lift pressure plate and clutch plates out of the retainer.

(2) Install compressor, Tool C-3863 over the piston spring retainer (Fig. 54). Compress springs and remove snap ring, then slowly release tool until spring retainer is free of the hub. Remove tool, retainer and springs.

(3) Invert clutch retainer assembly and bump on a wood block to remove piston. Remove seals from piston and clutch retainer hub.

Inspection

Inspect facing material on all driving discs. Replace discs that are charred, glazed or heavily pitted. Discs should also be replaced if they show evidence of material flaking off or if the facing material can be scraped off easily. Inspect driving disc splines for wear or other damage. Inspect steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs. Replace if necessary.

Inspect steel plate lug grooves in clutch retainer for smooth surfaces, plates must travel freely in the grooves. Inspect band contacting surface on clutch retainer for scores. Note ball check in clutch retainer, make sure ball moves freely. Inspect seal surfaces in clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of neoprene rings. Inspect clutch retainer bushing for wear or scores.

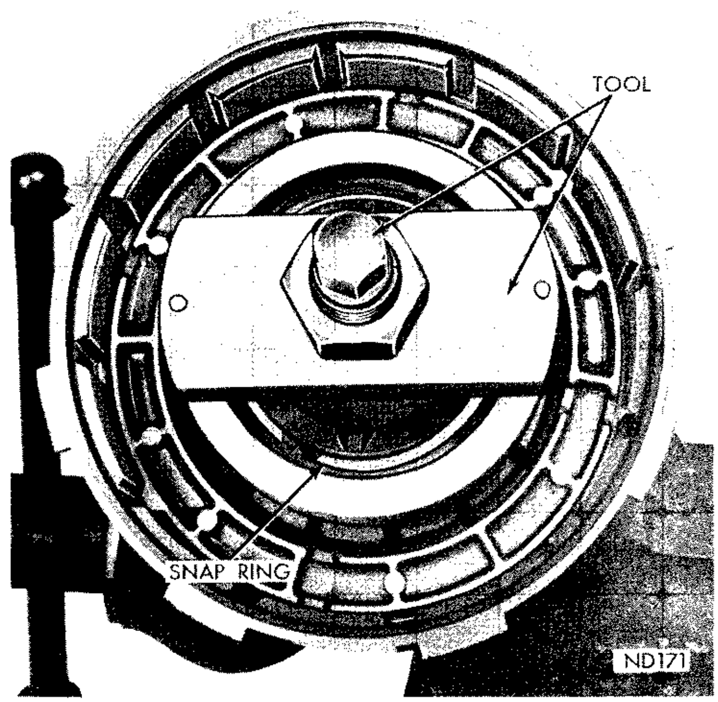


Fig. 54—Removing or Installing Front Clutch Retainer Snap Ring (A-727)

Inspect inside bore of piston for score marks, if light, remove with crocus cloth. Inspect seal grooves for nicks and burrs. Inspect neoprene seals for deterioration, wear, and hardness, and the piston springs, retainer and snap ring for distortion.

Front Clutch Retainer Bushing Replacement

(1) Lay clutch retainer (open end down) on a clean smooth surface and place removing head Tool SP-3629 in the bushing. Install handle Tool SP-3549 in removing head (Fig. 55).

(2) Drive bushing straight down and out of clutch retainer bore. Be careful not to cock tool in the bore.

(3) Lay clutch retainer (open end up) on a clean smooth surface. Slide a new bushing on installing head Tool SP-3628, and start them in clutch retainer bore.

(4) Install handle Tool SP-3549 in the installer (Fig. 55. Drive bushing into clutch retainer until tool bottoms.

(5) Thoroughly clean clutch retainer before assembly and installation.

Assembly

(1) Lubricate and install inner seal on hub of the clutch retainer. Make sure lip of seal faces down and is properly seated in the groove (Fig. 53).

(2) Install outer seal on the clutch piston, with lip of seal toward bottom of the clutch retainer. Apply a coating of wax type lubricant or Door Ease to outer edge of seal for easier installation of the piston assembly. Place piston assembly in retainer and carefully seat piston in bottom of the retainer.

(3) Install springs as shown in Figures 56, 57 or 58.

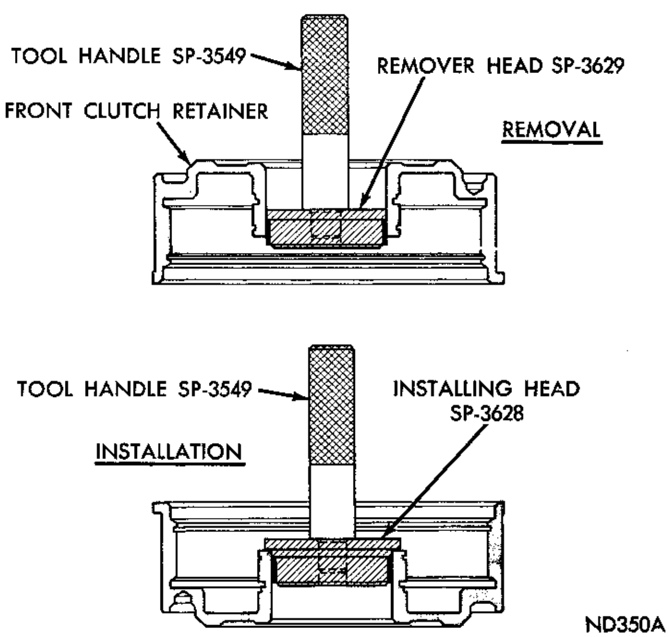


Fig. 55—Replacing Front Clutch Retainer Bushing (A-727)

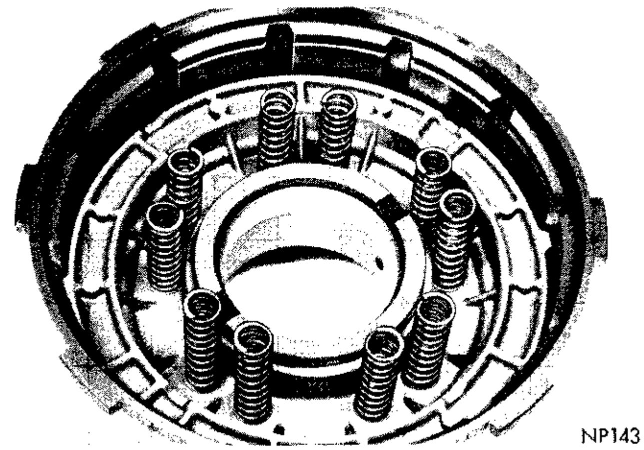


Fig. 56—Front Clutch Piston Return Spring Location (10 Springs)

Position spring retainer and snap ring over springs. Compress springs with Tool C-3863 (Fig. 54), and seat snap ring in the hub groove.

(4) Lubricate all clutch plates, install one steel plate followed by a lined plate until all plates are installed. Install pressure plate and selective snap ring. Make sure snap ring is properly seated.

(5) With front clutch completely assembled, insert a feeler gauge between pressure plate and snap ring (Fig. 59). The clearance should be .024 to .125 inch for 383 and 440 Cu. In. Eng. or .066 to .123 inch for 440 High Performance Engine. Install a snap ring of proper thickness to obtain specified clearance. **Snap**

FRONT CLUTCH CHART (A-727)

Engine Type	Clutch Discs	Plate Clearance	Piston Springs
383 Cu. In.	4	.024 to .125″	8
(High. Perf.)	4	.024 to .125″	6
440 Cu. In.	4	.024 to .125″	6
(High Perf.)	4	.066 to .123″	10

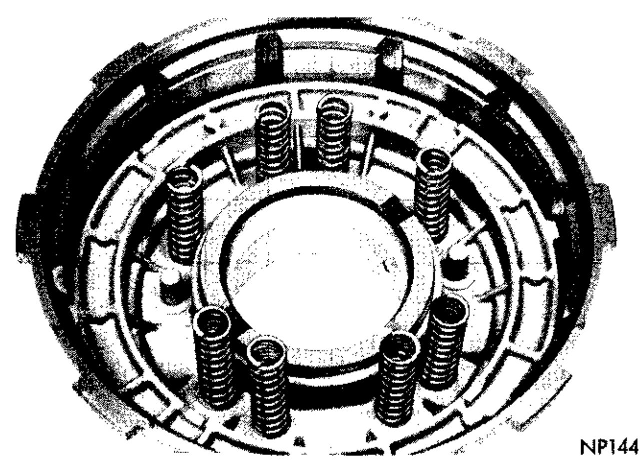


Fig. 57—Front Clutch Piston Return Spring Location (8 Springs)

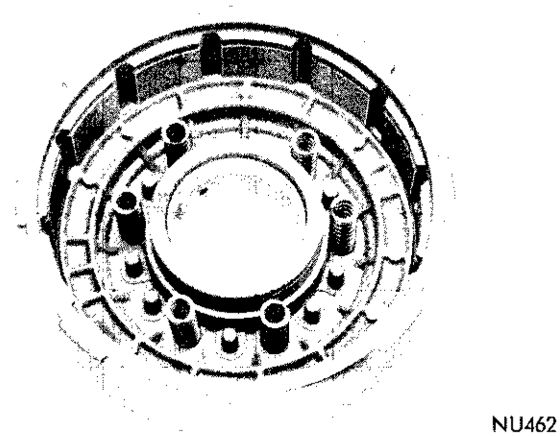


Fig. 58—Front Clutch Piston Return Spring Location (6 Springs)

rings are the same as that used in rear clutch and are available in .060-.062, .074-.076 and .088-.090 inch thickness.

REAR CLUTCH

Disassembly

Figure 60 shows a disassembled view of the rear clutch assembly.

(1) Remove large selective snap ring that secures pressure plate in the clutch retainer. Lift pressure plate, clutch plates, and inner pressure plate out of the retainer.

(2) Carefully pry one end of wave spring out of its groove in the clutch retainer, then remove wave spring, spacer ring and clutch piston spring.

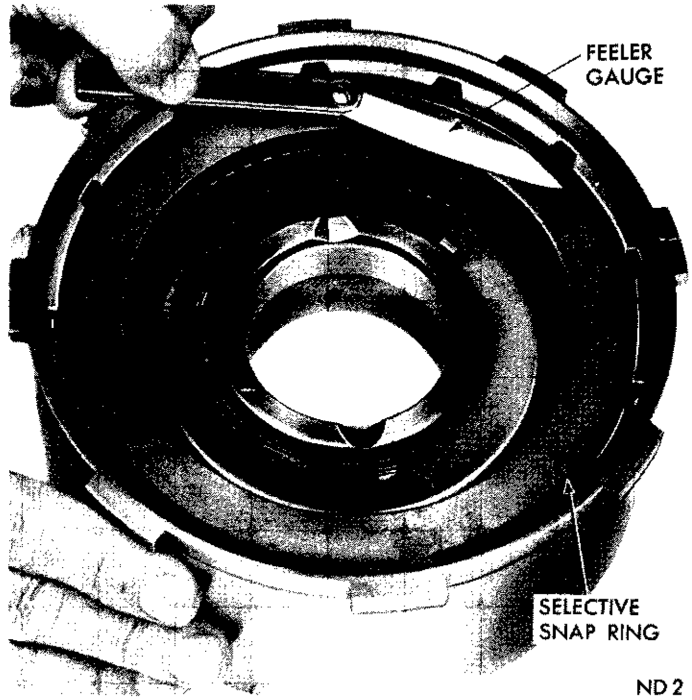


Fig. 59—Measuring Front Clutch Plate Clearance

(3) Invert clutch piston retainer assembly and bump on a wood block to remove the piston. Remove seals from the piston.

(4) If necessary, remove snap ring and press input shaft from the clutch piston retainer.

Inspection

Inspect facing material on all driving discs. Replace discs that are charred, glazed or heavily pitted. Discs

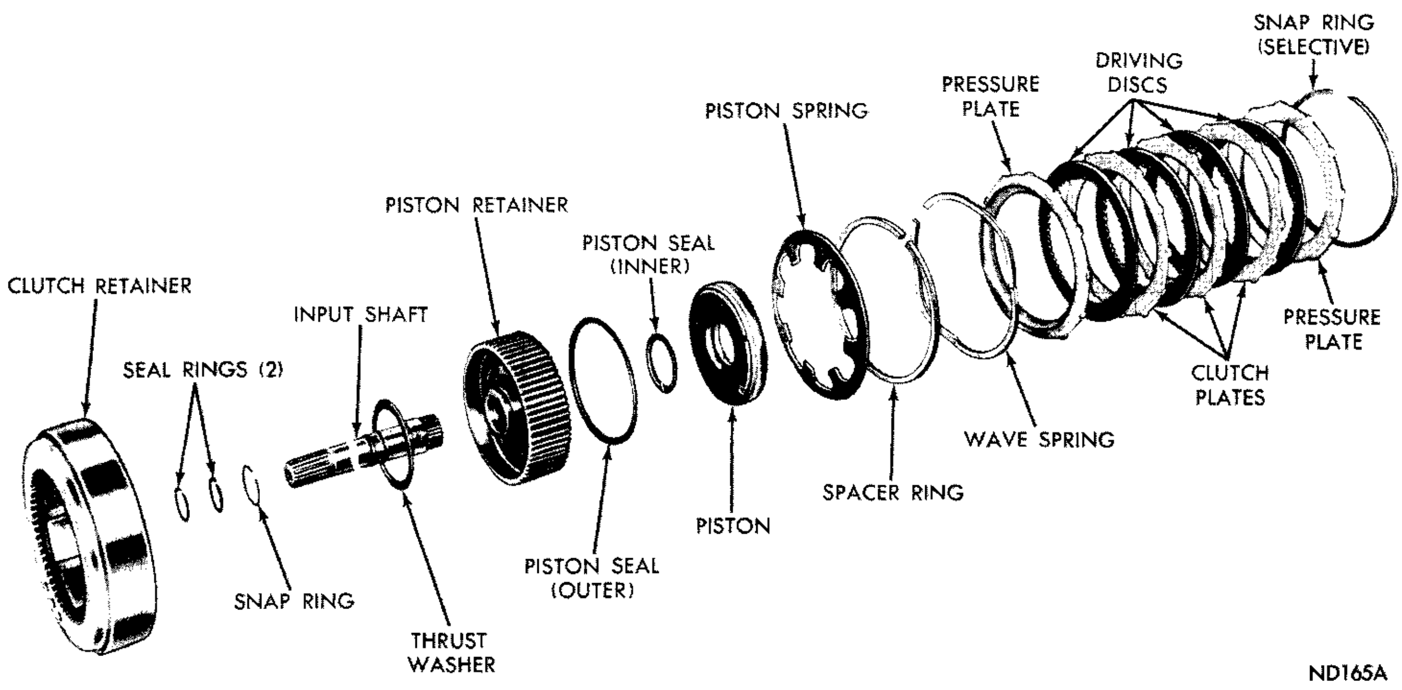


Fig. 60—Rear Clutch Disassembled (A-727)

should also be replaced if they show evidence of material flaking off or if facing material can be scraped off easily. Inspect driving disc splines for wear or other damage. Inspect steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs. Replace if necessary.

Inspect steel plate lug grooves in clutch retainer for smooth surfaces, plates must travel freely in grooves. Note ball check in the piston, make sure ball moves freely. Inspect seal surfaces in clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of neoprene seals. Inspect neoprene seals for deterioration, wear, and hardness. Inspect piston spring, wave spring, and spacer for distortion or breakage.

Inspect interlocking seal rings (Fig. 60) on input shaft for wear or broken locks, make sure they turn freely in the grooves. Do not remove rings unless conditions warrant. Inspect bushing in the input shaft for wear or scores. Inspect rear clutch to front clutch thrust washer for wear. Washer thickness should be .061 to .063 inch, replace if necessary.

Input Shaft Bushing Replacement

(1) Clamp input shaft in a vise with soft jaws, being careful not to clamp on seal ring lands or journals.

(2) Assemble remover Tool SP-3630, cup Tool SP-3633, and hex nut Tool SP-1191.

(3) With cup held firmly against clutch piston retainer, thread remover into bushing as far as possible by hand (Fig. 61).

(4) Using a wrench, screw remover into bushing 3 to 4 additional turns to firmly engage threads in the bushing.

(5) Turn hex nut down against cup to pull bushing from the input shaft.

(6) Thoroughly clean input shaft to remove chips made by remover threads. Make certain small lubrication hole next to ball in end of shaft is not plugged with chips. Be sure no chips are lodged next to the steel ball.

(7) Slide a new bushing on installing head Tool SP-3636, and start them in bore of the input shaft.

(8) Stand input shaft upright on a clean smooth surface and install handle Tool SP-3549 in the installing head (Fig. 61). Drive bushing into shaft until tool bottoms.

(9) Thoroughly clean input shaft and clutch piston retainer before assembly and installation.

Assembly

(1) If removed, press input shaft into clutch piston retainer and install snap ring.

(2) Lubricate and install inner and outer seal rings on the clutch piston. Make sure lip of seals face toward head of clutch retainer, and are properly seated in the piston grooves (Fig. 60).

(3) Place piston assembly in retainer and, with a twisting motion, seat piston in bottom of the retainer.

(4) Position clutch retainer over piston retainer splines and support the assembly so clutch retainer remains in place.

(5) Place clutch piston spring and spacer ring on top of piston in clutch retainer, make sure spring and spacer ring are positioned in retainer recess. Start one end of wave spring in the retainer groove (Fig. 62), then progressively push or tap spring into place making sure it is fully seated in the groove.

(6) Install inner pressure plate in clutch retainer with raised portion of plate resting on the spring.

(7) Lubricate all clutch plates, install one lined plate followed by a steel plate until all plates are installed. Install outer pressure plate and selective snap ring.

(8) Measure rear clutch plate clearance by having an assistant press downward firmly on the outer pressure plate, then insert a feeler gauge between

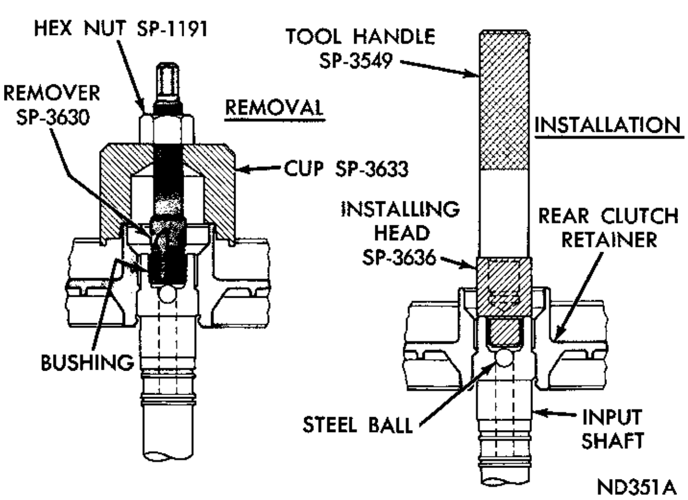


Fig. 61—Replacing Input Shaft Bushing (A-727)

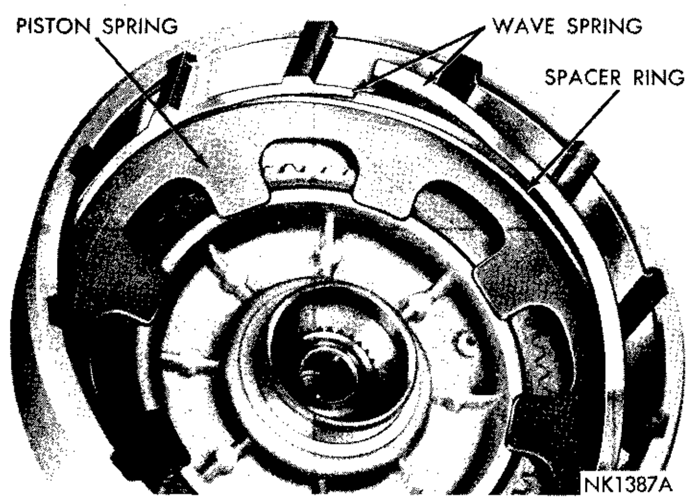


Fig. 62—Installing Rear Clutch Spring, Spacer Ring and Wave Spring

plate and snap ring (Fig. 63). The clearance should be between .025 to .045 inch. If not, install a snap ring of proper thickness to obtain specified clearance. Low limit clearance is desirable. **Rear clutch plate clearance is very important in obtaining proper clutch operation. The clearance can be adjusted by the use of various thickness outer snap rings. Snap rings are available in .060-.062, .074-.076, .088-.090 and .106-.108 inch thickness.**

PLANETARY GEAR TRAIN

Measure end play of planetary gear assemblies, sun gear and driving shell before removing these parts from the output shaft. With the assembly in an upright position, push rear annulus gear support downward on the output shaft. Insert a feeler gauge between rear annulus gear support hub and shoulder on the output shaft (Fig. 64). The clearance should be .010 to .037 inch. If clearance exceeds specifications, replace thrust washers and/or necessary parts.

Disassembly

(1) Remove thrust washer from forward end of the output shaft (Fig. 65).

(2) Remove selective snap ring from forward end of output shaft, then slide front planetary assembly off the shaft.

(3) Slide front annulus gear off the planetary gear set (Fig. 65). Remove thrust washer from rear side of the planetary gear set.

(4) Slide sun gear, driving shell and rear planetary assembly off the output shaft.

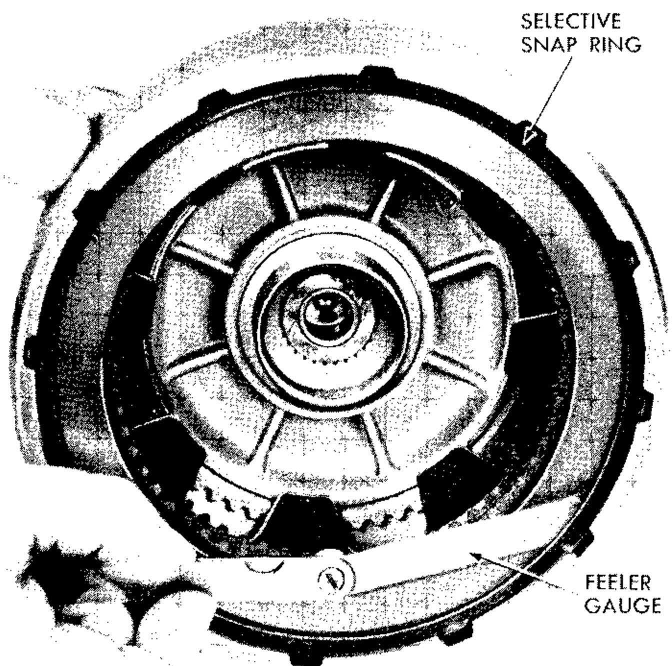


Fig. 63—Measuring Rear Clutch Plate Clearance

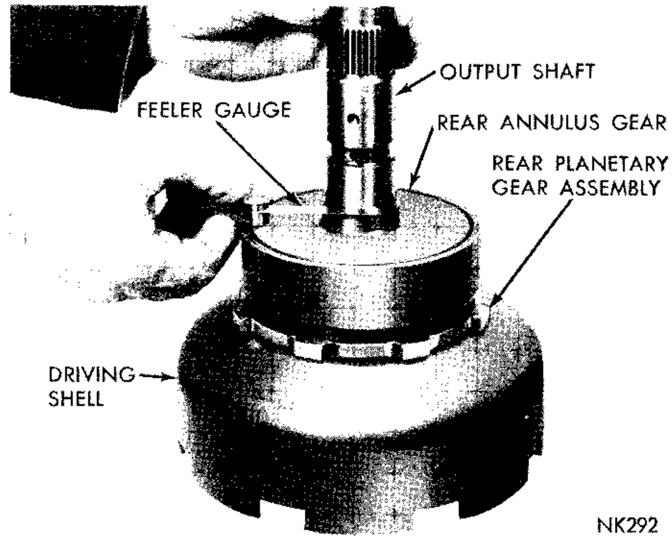


Fig. 64—Measuring End Play of Planetary Gear Assemblies

(5) Lift sun gear and driving shell off rear planetary gear assembly. Remove thrust washer from inside the driving shell. Remove snap ring and steel washer from sun gear (rear side of driving shell) and slide sun gear out of the shell. Remove front snap ring from the sun gear if necessary. Note that front end of sun gear is longer than the rear.

(6) Remove thrust washer from forward side of rear planetary gear assembly, remove planetary gear set and thrust plate from the rear annulus gear.

Inspection

Inspect bearing surfaces on output shaft for nicks, burrs, scores or other damage. Light scratches, small nicks or burrs can be removed with crocus cloth or a fine stone. Inspect speedometer drive gear for any nicks or burrs, and remove with a sharp edge stone. Make sure all oil passages in the shaft are open and clean.

Inspect bushings in sun gear for wear or scores, replace sun gear assembly if bushings are damaged. Inspect all thrust washers for wear and scores, replace if damaged or worn below specifications. Inspect thrust faces of planetary gear carriers for wear, scores or other damage, replace as required. Inspect planetary gear carrier for cracks and pinions for broken or worn gear teeth and for broken pinion shaft lock pins. Inspect annulus gear and driving gear teeth for damage. Replace distorted lock rings.

Assembly

Refer to Figure 65 for parts references.

(1) Install rear annulus gear on the output shaft. Apply a thin coat of grease on thrust plate, place it on the shaft and in the annulus gear making sure teeth are over the shaft splines.

(2) Position rear planetary gear assembly in rear

annulus gear. Place thrust washer on front side of the planetary gear assembly.

(3) Install snap ring in front groove of sun gear (long end of gear). Insert sun gear through front side of driving shell, install rear steel washer and snap ring.

(4) Carefully slide driving shell and sun gear assembly on the output shaft, engaging sun gear teeth with rear planetary pinion teeth. Place thrust washer inside front of the driving shell.

(5) Place thrust washer on rear hub of front planetary gear set, then slide assembly into front annulus gear.

(6) Carefully work front planetary and annulus gear assembly on the output shaft, meshing planetary pinions with the sun gear teeth.

(7) With all components properly positioned, install selective snap ring on front end of the output shaft. Re-measure end play of the assembly. **The clearance can be adjusted by the use of various thickness snap rings. Snap rings are available in .048-.052, .055-.059 and .062-.066 inch thickness.**

OVERRUNNING CLUTCH

Inspection

Inspect clutch rollers for smooth round surfaces, they must be free of flat spots and chipped edges. Inspect roller contacting surfaces in the cam and race for brinelling. Inspect roller springs for distortion, wear or other damage. Inspect cam set screw for tightness. If loose, tighten and restake case around the screw.

Overrunning Clutch Cam Replacement

If overrunning clutch cam and/or roller spring retainer are found damaged, replace cam and spring

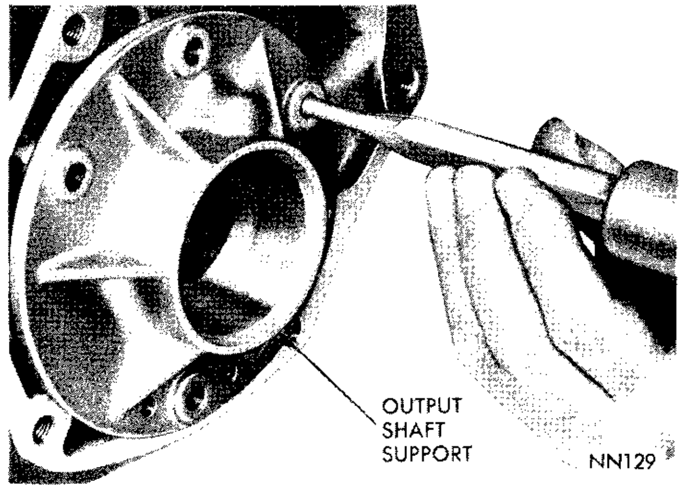


Fig. 66—Removing Overrunning Clutch Cam (A-727)

retainer in the following manner:

(1) Remove set screw from case below the clutch cam.

(2) Remove four bolts securing output shaft support to rear of the transmission case. Insert a punch through the bolt holes and drive cam from the case (Fig. 66). Alternate the punch from one bolt hole to another so cam will be driven evenly from the case.

IMPORTANT: The output shaft support must be in the case to install the overrunning clutch cam.

If the support requires replacement, drive it rearward out of the case with a wood block and hammer. To install, screw two C-3288 pilot studs into the case (Fig. 67). Chill the support with ice (preferably dry ice). Quickly position support over the pilot studs, and drive it firmly into the case with a wood block and hammer.

(3) Clean all burrs and chips from cam area in the case.

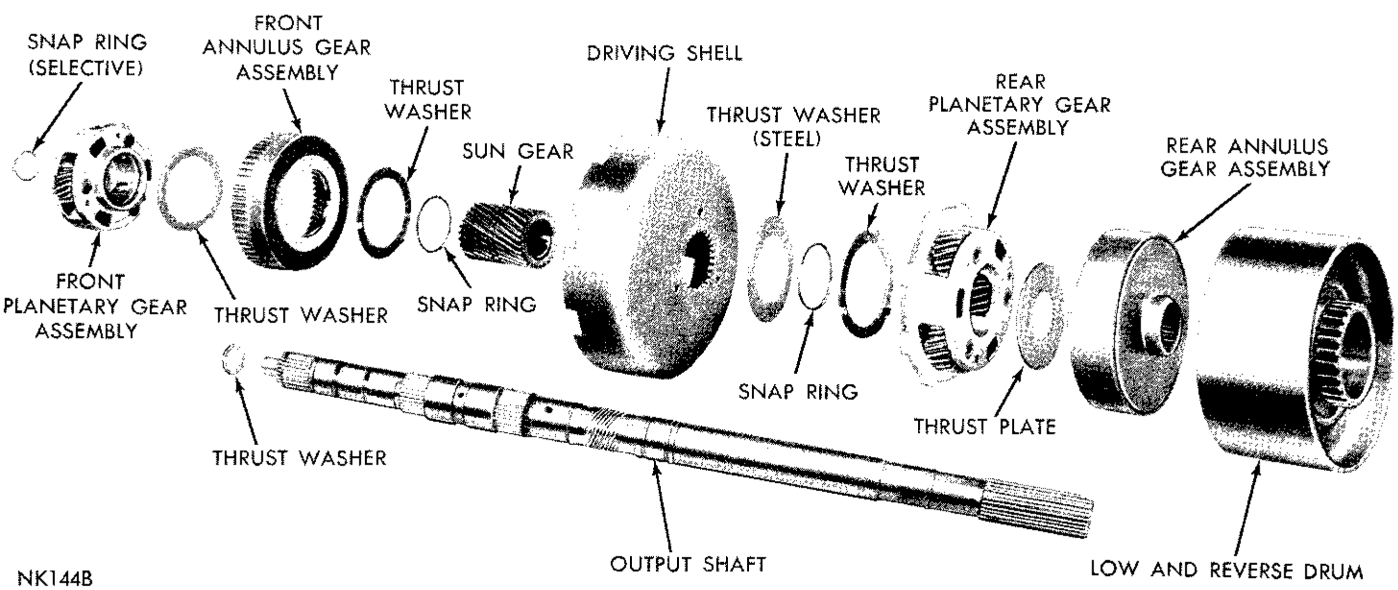


Fig. 65—Planetary Gear Train and Output Shaft Disassembled (A-727)

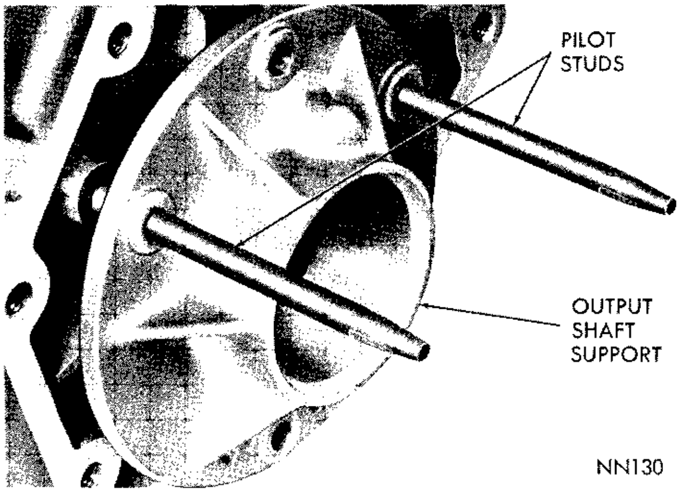


Fig. 67—Installing Output Shaft Support (A-727)

(4) Place spring retainer on the cam, making sure retainer lugs snap firmly into notches on the cam.

(5) Position cam in the case with cam serrations aligned with those in the case. Tap cam **evenly** into the case as far as possible with a soft mallet.

(6) Install Tool C-3863 and Adapter SP-5124 as shown in Figure 68, tighten nut on tool to seat cam into the case. Make sure cam is firmly bottomed, then install cam retaining set screw. Stake case around set screw to prevent it coming loose.

(7) Remove cam installing tool. Install and tighten support retaining screws to 150 inch-pounds. Stake case around the cam in twelve places with a blunt chisel (Fig. 69).

KICKDOWN SERVO AND BAND

Inspection

Figure 70 shows a disassembled view of the kickdown servo assembly. **The large outer spring shown in Figure 70 is not used in transmissions with "Hi-Performance" engines.**

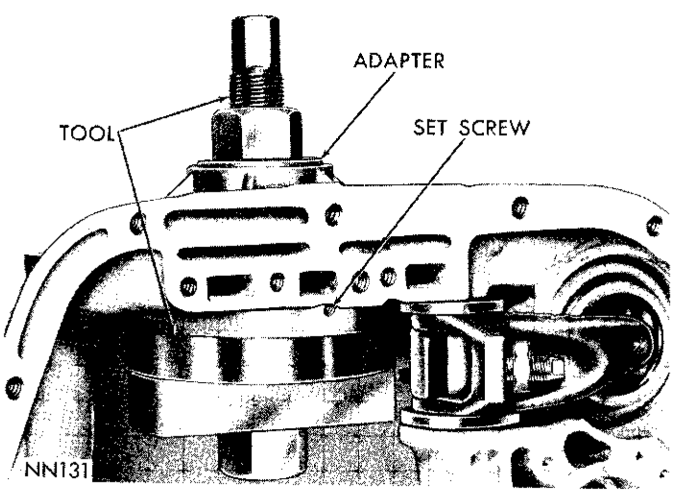


Fig. 68—Installing Overrunning Clutch Cam (A-727)

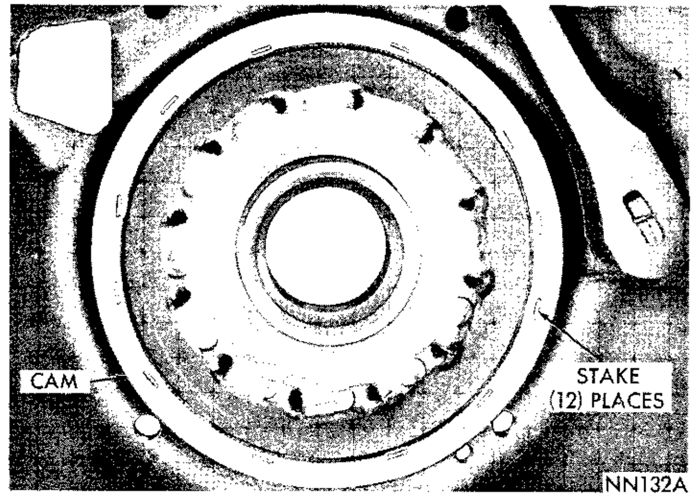


Fig. 69—Overrunning Clutch Cam Staked (A-727)

Inspect piston and guide seal rings for wear, and make sure they turn freely in the grooves. It is not necessary to remove seal rings unless conditions warrant. Inspect piston for nicks, burrs, scores and wear and piston bore in the case for scores or other damage. Inspect fit of guide on piston rod and piston spring for distortion.

Inspect band lining for wear and bond of lining to band and lining for black burn marks, glazing, non-uniform wear pattern and flaking. If lining is worn so grooves are not visible at ends or any portion of band, replace the band. Inspect band for distortion or cracked ends.

LOW—REVERSE SERVO AND BAND

Disassembly

(1) Remove snap ring from piston plug and remove plug and spring from the piston (Fig. 71).

Inspection

Inspect seal for deterioration, wear and hardness. Inspect piston and piston plug for nicks, burrs, scores and wear; piston plug must operate freely in the piston. Inspect piston bore in the case for scores or other damage and springs for distortion. Inspect band lining for wear and bond of lining to the band. If

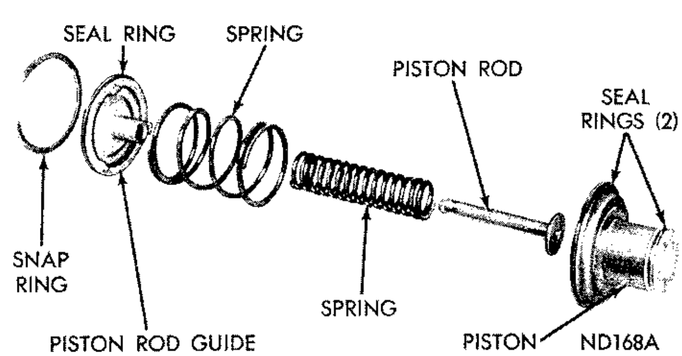


Fig. 70—Kickdown Servo

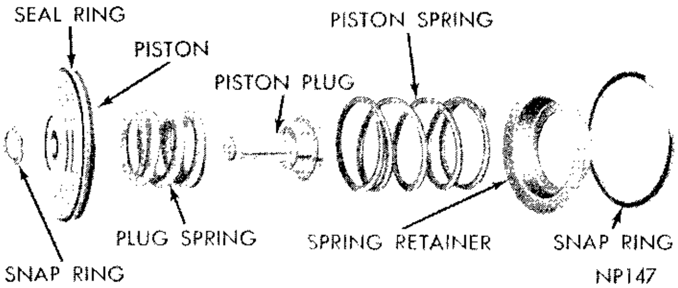


Fig. 71—Low and Reverse Servo

lining is worn so grooves are not visible at ends or any portion of band, replace the band. Inspect band for distortion or cracked ends.

Assembly

(1) Install piston plug and spring in the piston and secure with snap ring.

ASSEMBLY—SUB-ASSEMBLY INSTALLATION

The assembly procedures given here include installation of sub-assemblies in the transmission case and adjusting drive train end play. Do not use force to assemble mating parts. If parts do not assemble freely, investigate cause, and correct the trouble before proceeding with assembly procedures. Always use new gaskets during assembly operations.

IMPORTANT: Use only Automatic Transmission Fluid AQ-ATF Suffix "A" (Dexron) to lubricate transmission parts during assembly.

Overrunning Clutch

(1) With transmission case in an upright position, insert clutch hub inside the cam. Install overrunning clutch rollers and springs exactly as shown in Figure 72.

Low—Reverse Servo and Band

(1) Carefully work servo piston assembly into the case with a twisting motion. Place spring, retainer and snap ring over the piston (Fig. 71).

(2) Compress low and reverse servo piston spring by using engine valve spring compressor Tool C-3422, then install snap ring.

(3) Position rear band in the case, install short strut, then connect long link and anchor to the band (Fig. 73). Screw in band adjuster just enough to hold strut in place. Be sure long link and anchor assembly is installed, as shown in Figure 72 to provide a running clearance for the low and reverse drum. Install the low-reverse drum.

Kickdown Servo

(1) Carefully push servo piston into the case bore. Install piston rod, two springs and the guide (Fig. 70). **The transmission used with "HI-Performance" engines, use only one small inner spring in the kickdown servo.**

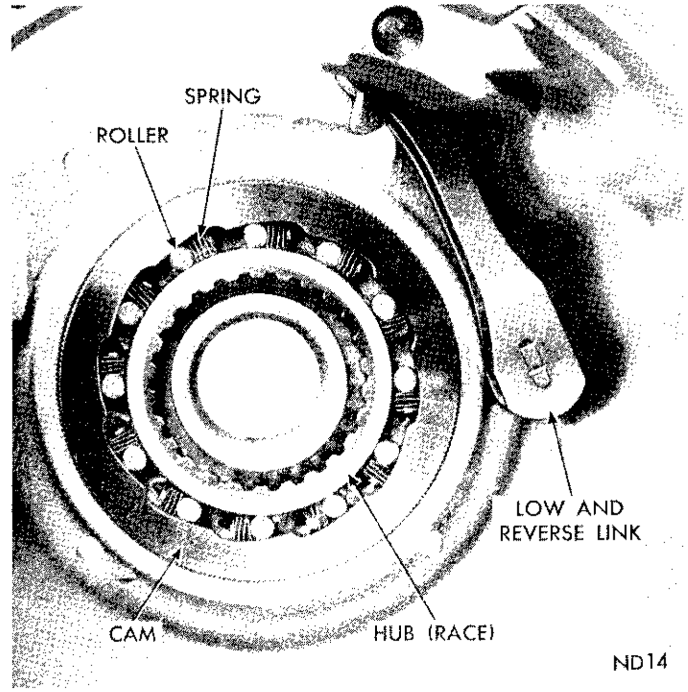


Fig. 72—Overrunning Clutch, Low and Reverse Band Link

(2) Compress kickdown servo springs by using engine valve spring compressor Tool 3422, then install snap ring.

Planetary Gear Assemblies, Sun Gear and Driving Shell

(1) While supporting assembly in the case, insert output shaft through the rear support. Carefully work assembly rearward engaging rear planetary carrier

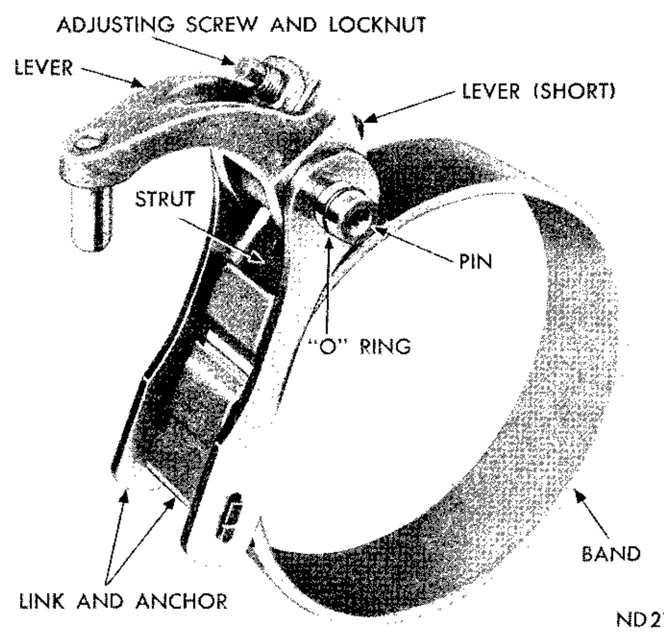


Fig. 73—Low-Reverse Band and Linkage

lugs into the low-reverse drum slots.

CAUTION: Be very careful not to damage ground surfaces on output shaft during installation.

Front and Rear Clutch Assemblies

The front and rear clutches, front band, pump and reaction shaft support are more easily installed with transmission in an upright position.

If transmission repair stand DD-1014 was not available to support transmission, an alternate method is outlined in Steps 1 and 2.

(1) Cut a 3-1/2 inch diameter hole in a bench, in the end of a small oil drum or a large wooden box strong enough to support transmission. Cut or file notches at the edge of the 3-1/2 inch hole so output shaft support will fit and lay flat in the hole.

(2) Carefully insert output shaft into the hole to support the transmission upright, with its weight resting on flange of the output shaft support.

(3) Apply a coat of grease on the input to output shaft thrust washer (Fig. 65), and install the washer on front end of the output shaft.

(4) Align front clutch plate inner splines, and place assembly in position on the rear clutch. Make sure front clutch plate splines are fully engaged on the rear clutch splines.

(5) Align rear clutch plate inner splines, grasp input shaft and lower the two clutch assemblies into the transmission case.

(6) Carefully work clutch assemblies in a circular motion to engage rear clutch splines over splines of the front annulus gear. Make sure front clutch drive lugs are fully engaged in slots in the driving shell.

Front Band

Figure 74 shows disassembled view of the kickdown band assembly.

(1) Slide the band over front clutch assembly.

(2) Install the band strut, screw in adjuster just enough to hold strut and anchor in place.

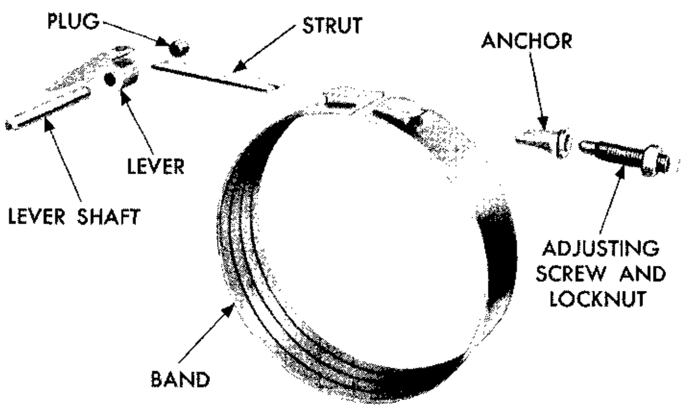


Fig. 74—Kickdown Band and Linkage

Oil Pump and Reaction Shaft Support

If difficulty was encountered in removing the oil pump assembly due to an exceptionally tight fit in the case, it may be necessary to expand the case with heat during pump installation. Using a suitable heat lamp, heat the case in area of the pump for a few minutes prior to installing pump and reaction shaft support assembly.

If drive train end play was not within specifications .037-.084 inch) when measured, replace the thrust washer on reaction shaft support hub with one of proper thickness (Fig. 49).

The following selective thrust washers are available:

Thickness	Color
.061-.063 inch	Green
.084-.086 inch	Red
.102-.104 inch	Yellow

(1) Screw two pilot studs, Tool C-3288 in oil pump opening in the case (Fig. 75). Install a new gasket over the pilot studs.

(2) Place a new rubber seal ring in the groove on outer flange of pump housing. Make sure seal ring is not twisted. Coat seal ring with grease for easy installation.

(3) Install pump assembly in the case, tap it lightly with a soft mallet if necessary. Place the deflector over vent opening and install four pump body bolts. Remove pilot studs, install remaining bolts and snug all bolts down evenly.

Rotate input and output shafts to see if any binding exists, then tighten bolts to 175 inch-pounds. Check shafts again for free rotation.

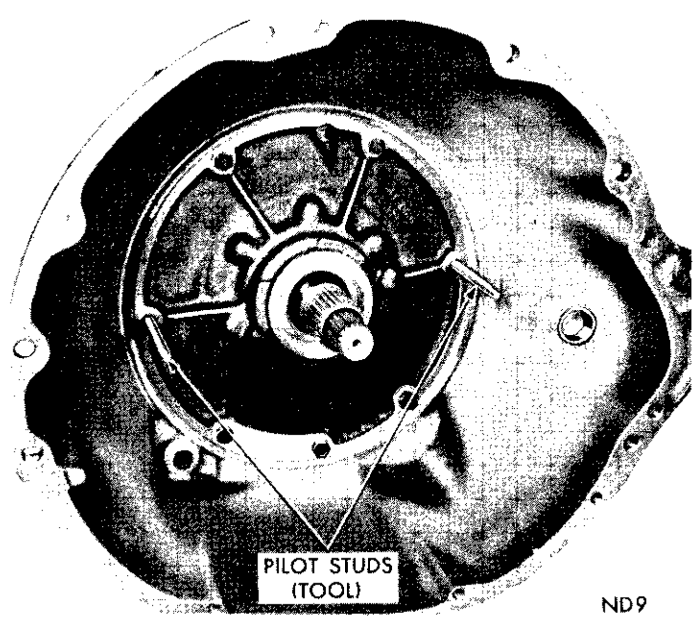


Fig. 75—Installing Pump and Reaction Shaft Support Assembly

Governor and Support

(1) Position support and governor body assembly on the output shaft. Align assembly so governor valve shaft hole in governor body aligns with hole in the output shaft, then slide assembly into place. Install snap ring behind the governor body. Tighten housing to support bolts to 100 inch-pounds. Bend ends of lock straps against the bolt heads.

(2) Place governor valve on valve shaft, insert the assembly into the body and through governor weights. Install valve shaft retaining snap ring.

Output Shaft Bearing and Extension Housing

(1) Install a snap ring in the innermost groove on the output shaft. Install bearing on the shaft with its outer race ring groove toward the front (Fig. 24). Press or tap bearing tight against front snap ring, then install rear snap ring.

(2) Place a new extension housing gasket on the transmission case. Position output shaft bearing retaining snap ring in the extension housing. Spread snap ring as far as possible (Fig. 23), then carefully tap extension housing into place. **Make sure snap ring is fully seated in the bearing groove.**

(3) Install and tighten extension housing bolts to 24 foot-pounds.

(4) Install gasket, plate and two screws on bottom of extension housing mounting pad.

(5) Install speedometer pinion and adapter assembly. **IMPORTANT: Measure drive train end play as described under "Disassembly—Sub-Assembly Removal". Correct if necessary.**

Valve Body Assembly and Accumulator Piston

(1) Clean mating surfaces and inspect for burrs on both the transmission case and valve body steel plate.

(2) Install accumulator piston in transmission case and place piston spring on the accumulator piston (Fig. 76). Make sure Back-Up Light and Neutral Start Switch has been removed.

(3) Insert parking lock rod through opening in rear of case with knob positioned against the reaction plug and sprag. Move front end of rod toward center of transmission while exerting rearward pressure on rod to force it past the sprag (rotate output shaft if necessary).

(4) Place valve body manual lever in **LOW** position. Place valve body in its approximate position in the case, connect parking lock rod to the manual lever and secure with the E-clip. Align valve body in the case, install retaining bolts finger tight.

(5) With neutral starting switch installed, place manual valve in the neutral position. Shift valve body if necessary to center the neutral finger over the neutral switch plunger. Snug bolts down evenly, then tighten to 100 inch-pounds.

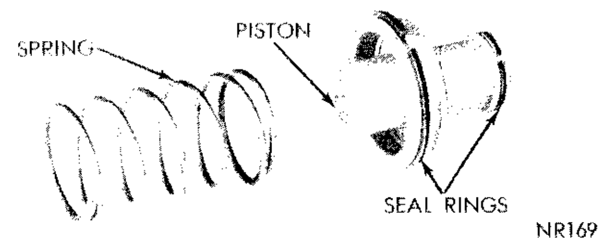


Fig. 76—Accumulator Piston and Spring

(6) Install gearshift lever and tighten clamp bolt. Check lever shaft for binding in the case by moving lever through all detent positions. If binding exists, loosen valve body bolts and re-align.

(7) Install flat washer and throttle lever, then tighten lever clamp bolt.

(8) Adjust the kickdown, and low-reverse bands.

(9) Install oil pan, using a new gasket. Tighten pan bolts to 150 inch-pounds.

TRANSMISSION—CONVERTER AND DRIVE PLATE INSTALLATION

The transmission and converter must be installed as an assembly; otherwise, the converter drive plate, pump bushing, and oil seal will be damaged. The drive plate will not support a load; therefore, none of the weight of the transmission should be allowed to rest on the plate during installation.

(1) Rotate pump rotors with Tool C-3881 until the two small holes in handle of Tool are vertical (Fig. 77).

(2) Carefully slide converter assembly over the input shaft and reaction shaft. Make sure converter impeller shaft slots are also vertical and fully engage the pump inner rotor lugs.

Inspect for full engagement by placing a straightedge on face of the case (Fig. 78). The surface of

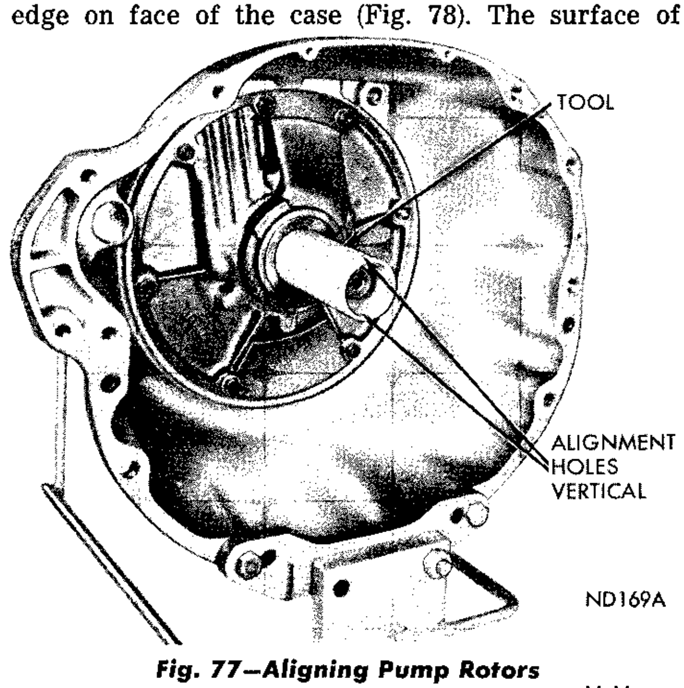


Fig. 77—Aligning Pump Rotors

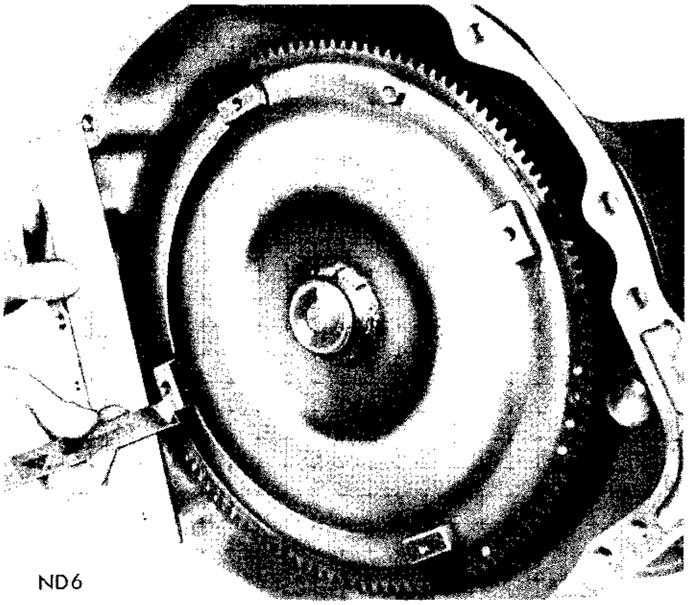


Fig. 78—Measuring Converter for Full Engagement in Transmission

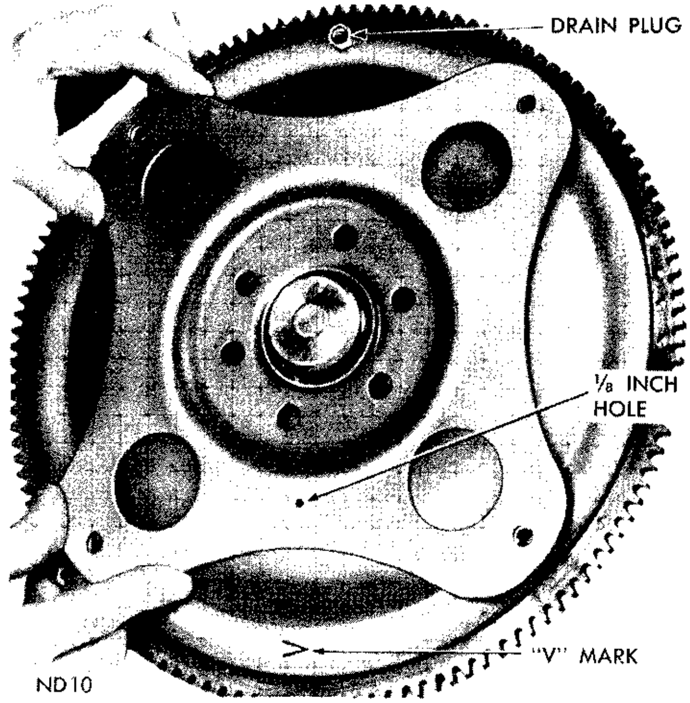


Fig. 79—Converter and Drive Plate Markings

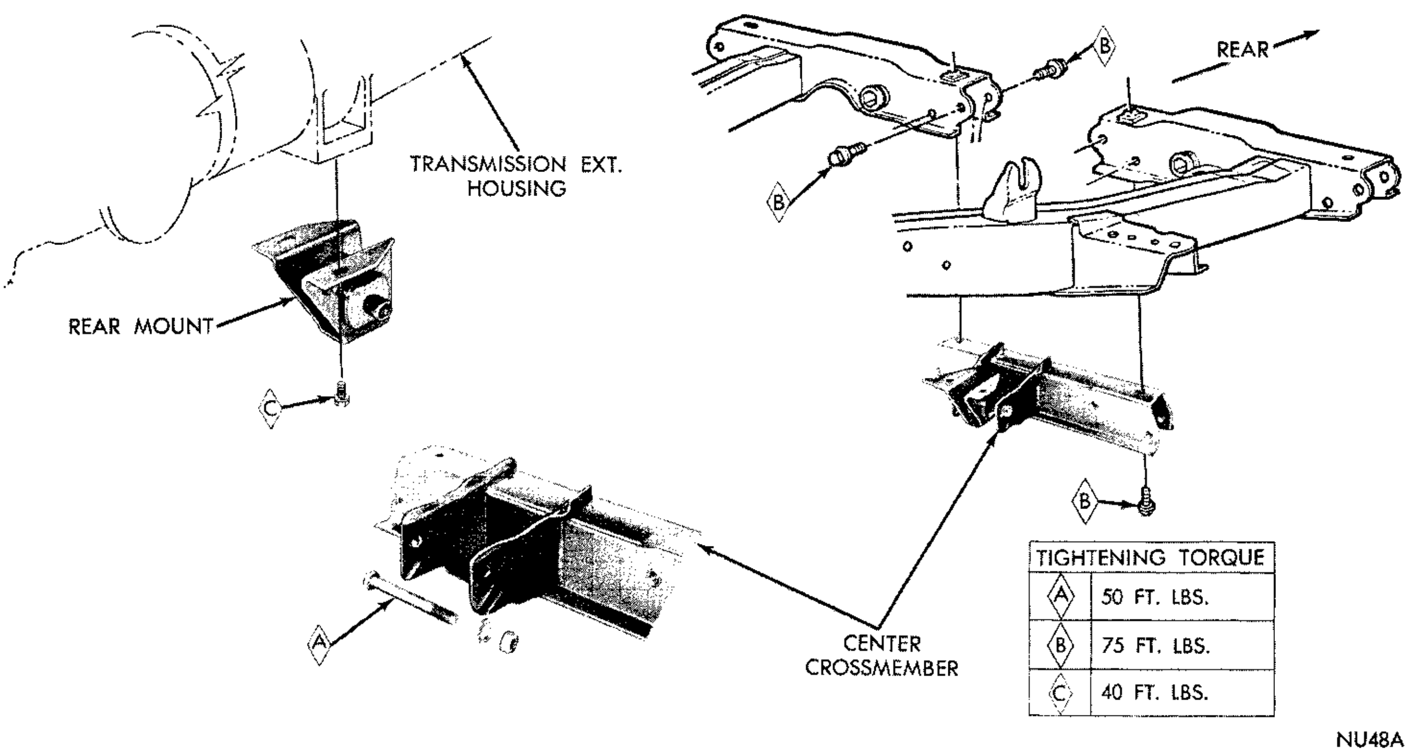
converter front cover lug should be at least 1/2 inch rear of straightedge when converter is pushed all way into the transmission.

(3) Attach a small "C" clamp to edge of converter housing to hold converter in place during transmission installation.

(4) Inspect converter drive plate for distortion or cracks and replace if necessary. Torque Drive Plate to Crankshaft bolts to 55 foot pounds. **When Drive Plate replacement has been necessary, make sure transmission dowel pins are in engine block and protruding far enough to hold transmission in alignment.**

(5) Coat converter hub hole in crankshaft with wheel bearing lubricant. Place transmission and converter assembly on a service jack and position assembly under vehicle for installation. Raise or tilt as necessary until transmission is aligned with the engine.

(6) Rotate converter so mark on converter (made during removal) will align with mark on drive plate.



TIGHTENING TORQUE	
A	50 FT. LBS.
B	75 FT. LBS.
C	40 FT. LBS.

Fig. 80—Center Crossmember and Rear Engine Mount

The offset holes in plate are located next to the 1/8 inch hole in the inner circle of the plate. A stamped V mark identifies offset hole in the converter front cover (Fig. 79). Carefully work transmission forward over engine block dowels with converter hub entering the crankshaft opening.

(7) After transmission is in position, install converter housing bolts and tighten to 28 foot-pounds.

(8) Install two lower drive plate to converter bolts and tighten to 270 inch-pounds.

(9) Install starting mtotor and connect battery ground cable.

(10) Rotate engine with Remote Control Switch and install the other two drive plate to converter bolts. Tighten bolts to 270 inch-pounds.

(11) Install crossmember and tighten attaching bolts to 75 foot-pounds.

Imperial Models: Position center crossmember in the stub frame. Start all retaining bolts including the four rubber isolator bolts, then tighten all bolts to 75 foot-pounds.

(12) Lower transmission so extension housing is aligned and rests on rear mount. Install bolts and tighten to 40 foot-pounds (Fig. 80). Engine mount to center crossmember bolt and nut, loose assembled to this point, should now be torqued to 50 foot-pounds.

(13) Install gearshift torque shaft and connect gearshift rod to the transmission lever.

Console Shift: Align gearshift torque shaft lower bracket with the extension housing. Install the two retaining bolts and tighten securely. Connect gearshift rod to the transmission lever.

(14) Carefully guide sliding yoke into extension housing and on the output shaft splines. Align marks made at removal then connect propeller shaft to the rear axle pinion shaft yoke.

(15) Connect oil cooler lines to the transmission. Install the oil filler tube. Connect the speedometer cable.

(16) Connect throttle rod to bellcrank at left side of transmission bell housing.

(17) Connect wire to the back-up light and neutral starting switch.

(18) Install cover plate in front of the converter assembly.

(19) Refill transmission with Automatic Transmission Fluid, AQ-ATF Suffix "A" (Dexron).

(20) Adjust throttle and gearshift linkage.

FLUID LEAKAGE—TRANSMISSION CONVERTER HOUSING AREA

(1) **Check for Source of Leakage**

Since fluid leakage at or around the converter area may originate from an engine oil leak, the area should be examined closely. Factory fill fluid is dyed red and, therefore, can be distinguished from engine oil.

(2) Prior to removing the transmission, perform the following checks:

When leakage is determined to originate from the transmission, check fluid level and torque converter drain plug torque prior to removel of the transmission and torque converter.

High oil level can result in oil leakage out the vent located at the top of the front pump housing. If the fluid level is high, adjust to proper level.

Oil leakage can also occur at the torque converter drain plug. Torque the drain plug to 110 inch-pounds.

After performing these two operations, re-check for leakage. If a leak persists, perform the following operation on the car to determine whether it is the **converter** or **transmission** that is leaking.

LEAKAGE TEST PROBE

(1) Remove converter housing dust shield.

(2) Position vehicle with front lower than back so that accumulated fluid in converter housing will drain out. Wipe bottom inside of converter housing as dry as possible. A solvent spray followed by compressed air drying is preferable.

(3) Fasten test probe (Fig. 1) securely to convenient dust shield bolt hole. Make certain converter is cleared by test probe. Tool must be clean and dry.

(4) Run engine at approximately 2,500 rpm with transmission in neutral, for about 2 minutes. Transmission must be at operating temperature.

(5) Stop engine and carefully remove tool.

(6) If upper surface of test probe is dry, there is no converter leak. A path of fluid across probe indicates a converter leak. Oil leaking under the probe is coming from the transmission converter area (Fig. 2).

(7) Remove transmission and torque converter assembly from vehicle for further investigation. The fluid should be drained from the transmission and converter. Re-install converter drain plug and oil pan (with new gasket) at specified torque.

Possible sources of transmission converter area fluid leakage shown in (Fig. 2) are:

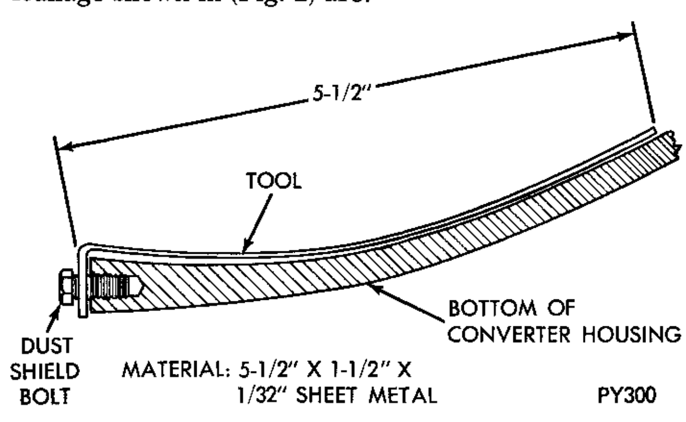


Fig. 1—Leak Locating Test Probe Tool

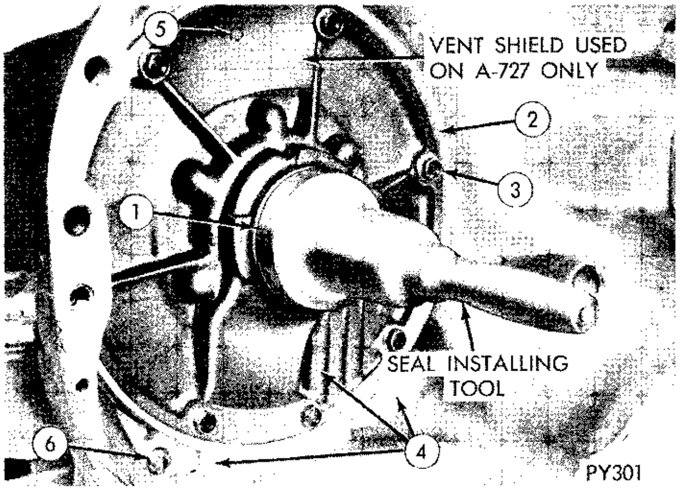


Fig. 2—Transmission Converter Area

(1) **Converter Hub Seal**
  (a) Seal lip cut, check converter hub finish.
  (b) Bushing moved and/or worn.
  (c) Oil return hole in front pump housing plugged or omitted.
  (d) Seal worn out (high mileage cars).

(2) Fluid leakage at the outside diameter from pump housing "O" ring seal.

(3) Fluid leakage at the front pump to case bolts.

(4) Fluid leakage due to case or front pump housing porosity.

(5) Oil leakage out the vent.

(6) Kickdown lever shaft access plug.

Possible sources of converter leakage shown in (Fig. 3) are:

(1) Torque converter weld leaks at the outside diameter (peripheral) weld.

(2) Front pump hub weld.

(3) Crankshaft pilot weld.

(4) Fluid leakage from the converter drain plug. These leaks appear at the outside diameter of the converter on the engine side.

AIR PRESSURE TEST OF TRANSMISSION

The transmission should be prepared for pressure test as follows after removal of the torque converter:

(1) Install filler tube bore plug, propeller shaft yoke (tie in with cord or wire), flared tube fitting cap (on

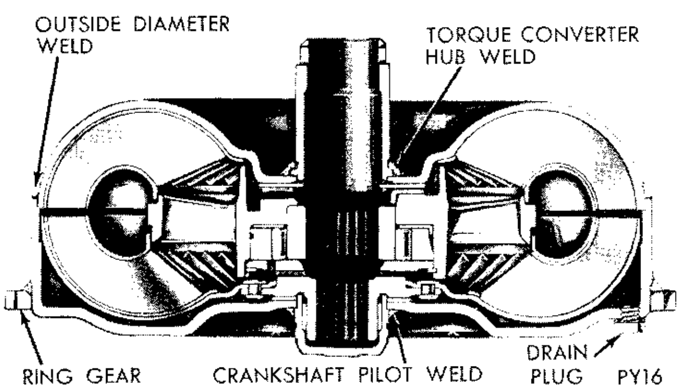


Fig. 3—Torque Converter Cross Section

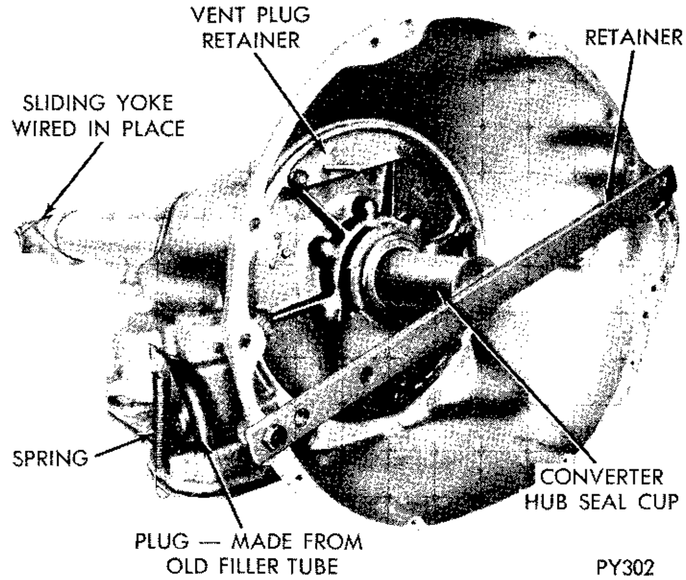


Fig. 4—Transmission Prepared for Test

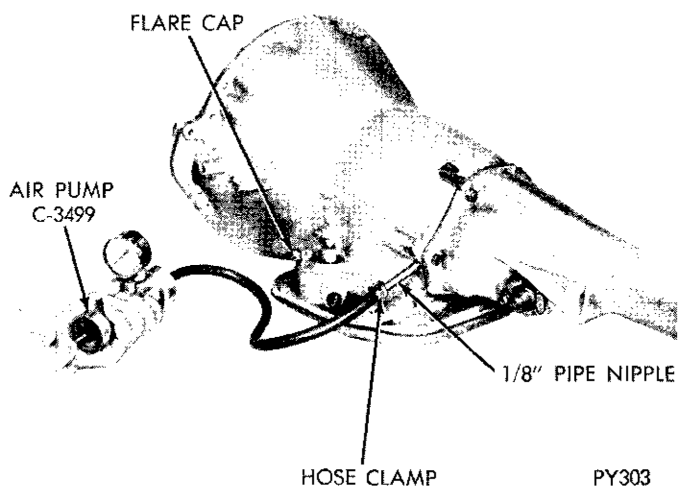


Fig. 5—Pressurizing Transmission

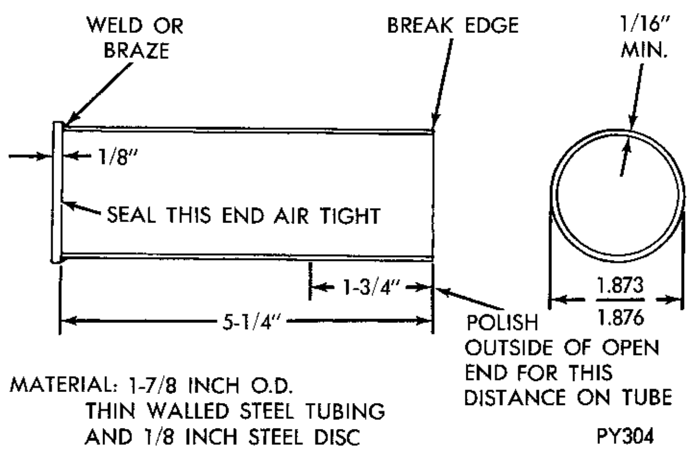


Fig. 6—A-727—Converter Hub Seal Cup

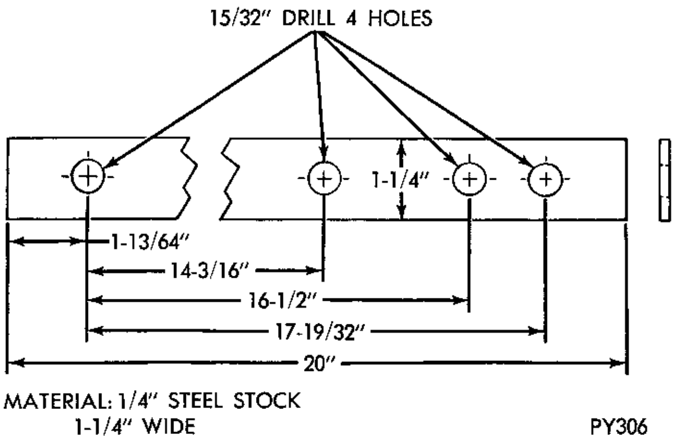


Fig. 7—Hub Seal Cup Retaining Strap

front cooler line fitting), and pipe nipple (in case at rear cooler line fitting) (Fig. 4 and 5).

(2) Remove necessary front pump housing bolts, and vent shield (in A-727 transmission). Install vent plug (rubber stopper), and vent plug retainer (Fig. 4) preferably using longer bolts than those removed.

(3) With rotary motion, install converter hub seal cup (Fig. 4), over input shaft, and through the converter hub seal until the cup bottoms against the pump rotor lugs. Secure with cup retainer strap (Fig. 4), using converter housing to engine block retaining bolts.

(4) Attach and clamp hose from nozzle of Tool C-3499 to pipe nipple, which is in rear cooler line fitting position in case (Fig. 5).

(5) Pressurize the transmission using Tool C-3499, until the pressure gage reads 8 psi. Position transmission so that pump housing and case front may be covered with soapy solution or water. Leaks are sometimes caused by porosity in the case or pump housing. **CAUTION:** Do not, under any circumstances, pressurize a transmission to more than 10 psi.

If a leak source is located, that part and all associated seals and gaskets should be replaced with new parts.

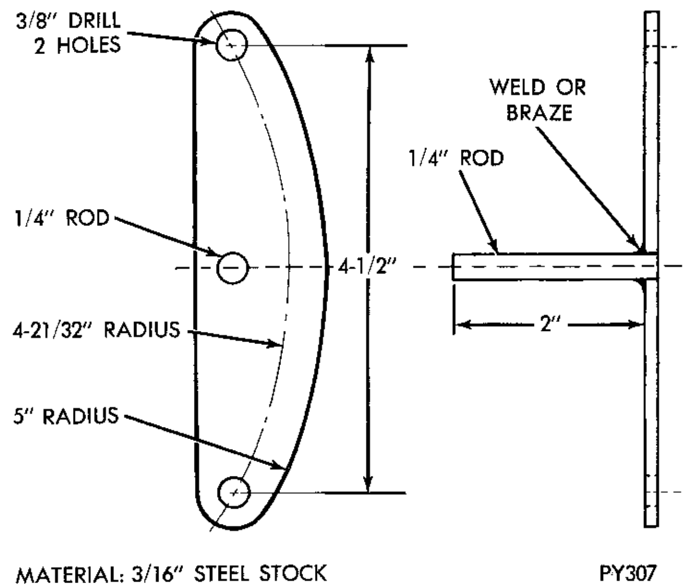


Fig. 8—A-727—Vent Plug Retainer

Fabricate equipment needed for test as shown in (Figs. 1, 6, 7, & 8).

TORQUE CONVERTER PRESSURE TEST

If fluid leakage has occurred in the bell housing area, the torque converter can be leak checked as follows after removal from the transmission:

(1) Drain all oil from the converter. If flushing is required, flush before checking for leakage.

(2) Install tool C-4102 and tighten.

(3) Apply a maximum of 100 psi air pressure to the converter.

(4) Submerge the converter in a tank of water and observe the hub, cup, ring gear, and seam welds for bubbles. Five to ten minutes may be required for bubbles to develop from small leaks.

If no bubbles are observed, it can be assumed that the welds are not leaking. If leakage occurs, the converter should be replaced.

MANUAL TRANSMISSION—(A-230)

THREE SPEED

INDEX

GENERAL INFORMATION

The A-230 three speed transmission (Fig. 1) has two synchronizer units, providing clash free shifting in all forward gears.

A pad has been provided on the right side of the transmission (Fig. 2) for identification numbers.

Sample Number: PP 230 3262 2220

The first two letters identify the manufacturing plant. The next three numbers are the transmission model number. The following four numbers are a date of manufacture code. The last four numbers are a sequence number.

The main drive pinion (input shaft) is supported by a ball bearing in the transmission case and an olite bushing pressed in the end of the crankshaft.

The mainshaft (output shaft) front end is supported by roller bearings in the end of the main drive pinion and a ball bearing retainer in the front of the extension housing. The output end of the mainshaft is splined to the sliding universal joint yoke, which is supported by a bushing in the extension housing.

The countershaft gear is supported by a double row of needle type roller bearings at each end and the thrust is taken on thrustwashers between the ends of the gear and the transmission case. The alignment of the needle type roller bearings within the gear is maintained by six thrust washers (one being used between the rows of roller bearings and one at each end).

The reverse idler gear is also supported on needle type roller bearings.

The gearshifting is manually operated through shift control rods to the transmission. Any forward gear may be engaged while the vehicle is in motion through the use of synchronizing clutches.

The transmission may be used as an aid to deceleration by downshifting in sequence without double clutching or gear clashing, due to the fact that all forward speeds are synchronized. The service procedures covering the A-230 transmission used on all vehicles so equipped is identical to the following service procedures except where noted.

IMPORTANT: Some internal transmission parts are different from standard on vehicles with high performance engines. These "special" parts are listed in applicable Parts Catalog; therefore, be sure they are used when replacement is necessary.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HARD SHIFTING	(a) Incorrect clutch adjustment.	(a) Refer to Clutch Group for corrections.
	(b) Improper linkage adjustment.	(b) Perform linkage adjustment as outlined in "Gearshift Linkage Adjustments."
	(c) Synchronizer clutch sleeve damaged. (d) Synchronizer spring improperly installed. (e) Broken or worn synchronizer stop rings.	(c-d-e) Causes noted can only be corrected by disassembling transmission and replacing damaged or worn parts.

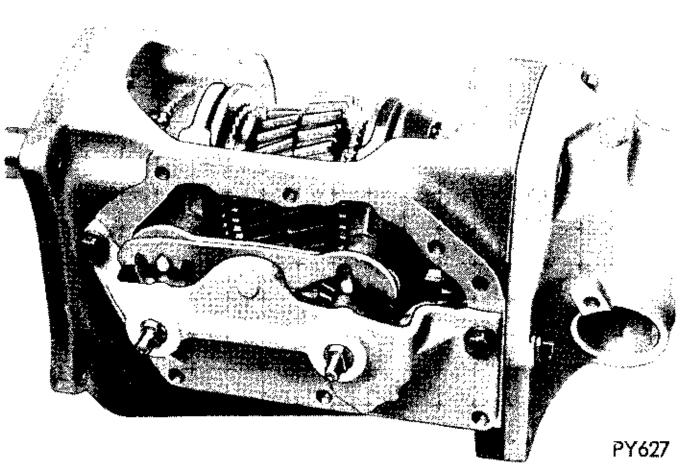


Fig. 1—A-230 Transmission Cutaway

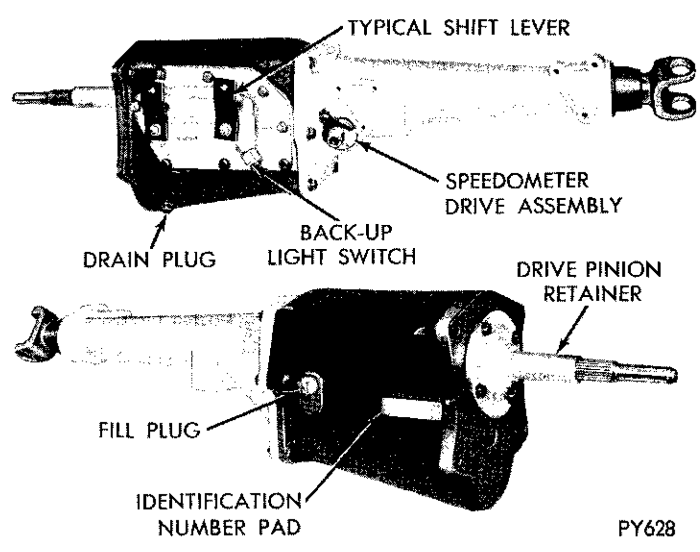


Fig. 2—A-230 Transmission—Left and Right Sides

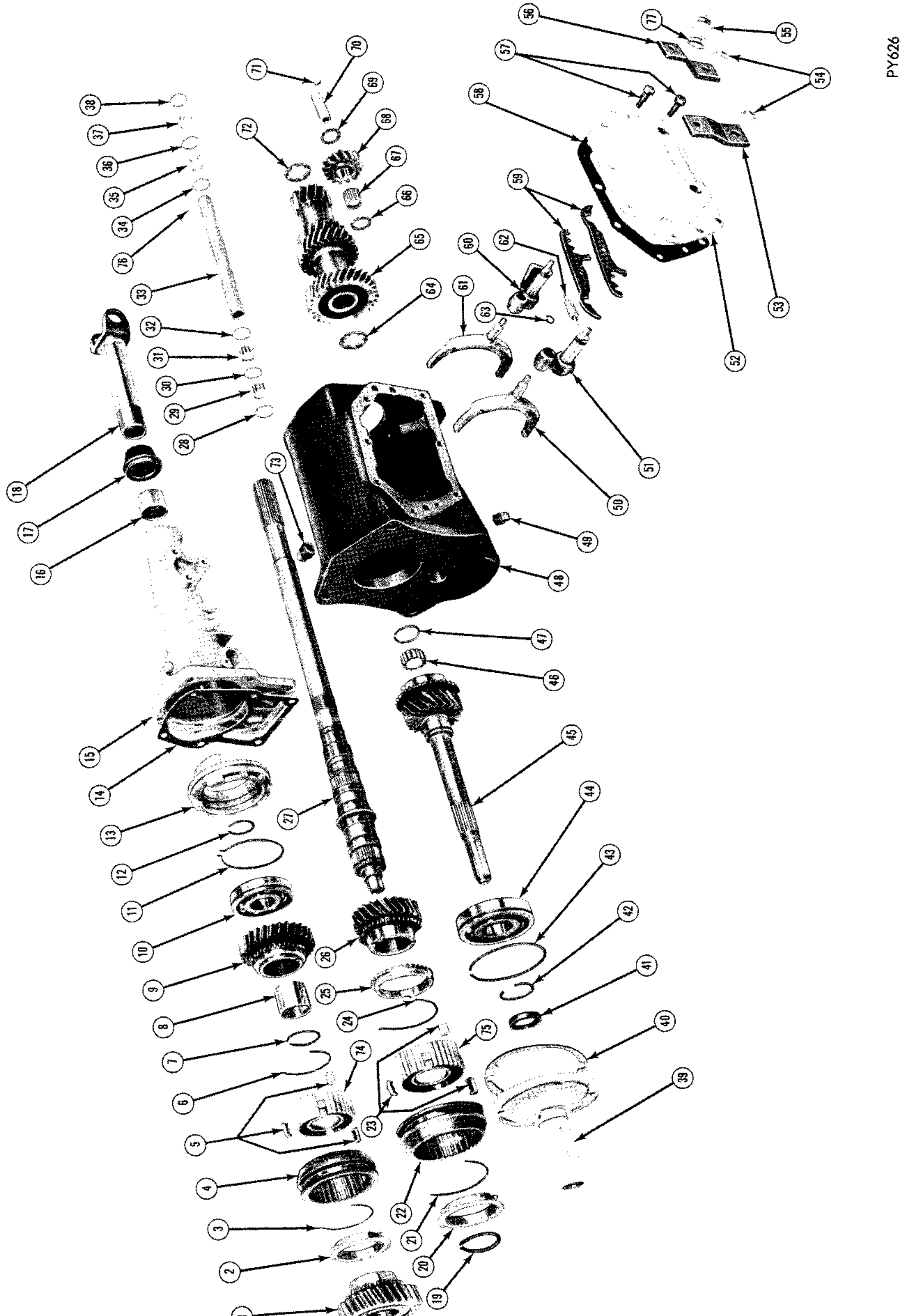


Fig. 3—A-230 Transmission—Disassembled

Ref. No. Name	Ref. No. Name	Ref. No. Name	Ref. No. Name	Ref. No. Name	Ref. No. Name
1. Gear, First	14. Gasket	27. Shaft, Output	40. Gasket	53. Lever	66. Washer
2. Ring	15. Extension	28. Washer	41. Seal	54. Nut Locking	67. Roller
3. Spring	16. Bushing	29. Roller	42. Snap Ring	55. Switch	68. Gear, Idler
4. Sleeve	17. Seal	30. Washer	43. Snap Ring	56. Lever	69. Washer
5. Struts (3)	18. Yoke	31. Roller	44. Bearing	57. Bolt	70. Shaft
6. Soring	19. Snap Ring	32. Washer	45. Pinion, Drive	58. Gasket	71. Key
7. Snap Ring	20. Ring	33. Countershaft	46. Roller	59. Lever, Interlock	72. Washer
8. Bushing	21. Spring	34. Washer	47. Snap Ring	60. Lever	73. Plug, Filler
9. Gear, Reverse	22. Sleeve	35. Roller	48. Case	61. Fork	74. Gear, Clutch
10. Bearing	23. Struts (3)	36. Washer	49. Plug, Drain	62. Spring	75. Gear, Clutch
11. Snap Ring	24. Spring	37. Roller	50. Fork	63. Snap Ring	76. Key
12. Snap Ring	25. Ring	38. Washer	51. Lever	64. Washer	77. Gasket
13. Retainer	26. Gear, Second	39. Retainer	52. Housing	65. Gear, Countershaft	

LEGEND FOR FIGURE 3

Condition	Possible Cause	Correction
TRANSMISSION SLIPS OUT OF GEAR	(a) Linkage interference.	(a) Inspect and remove all linkage interferences.
	(b) Gearshift rods out of adjustment.	(b) Adjust gearshift rods as outlined in "Gearshift Linkage Adjustments."
	(c) Synchronizer clutch teeth worn.	(c) Disassemble transmission and replace parts as necessary.
	(d) Clutch housing bore or face out of alignment.	(d) Refer to Clutch Group for correction procedure.
TRANSMISSION NOISES	(a) Excessive end play in countershaft gear.	(a) Replace thrust washers.
	(b) Loose synchronizer hub spline fit on mainshaft.	(b) Inspect mainshaft and synchronizer hub and replace parts as necessary.
	(c) Damaged, broken or excessively worn gear teeth.	(c) Replace worn gears.
	(d) Rough or pitted bearing races or balls.	(d) Replace worn bearing.

SERVICE PROCEDURES

TRANSMISSION REMOVAL

(1) Remove shift rods from transmission levers.

(2) Drain fluid from transmission.

(3) Disconnect propeller shaft at rear universal joint. Mark both parts to reassemble in same position. Carefully pull shaft yoke out of transmission extension housing.

CAUTION: Be careful not to scratch or nick ground surface on sliding spline yoke during removal and installation of the shaft assembly.

(4) Disconnect speedometer cable and back-up light switch leads.

(5) Some models have exhaust systems which will have to be partially removed for clearance. See Exhaust Systems, Section 11.

(6) Install engine support fixture C-3487A, engaging the hooks in holes in frame side member. Be sure support ends are up against underside of oil pan flange.

(7) Raise engine slightly with support fixture. Disconnect extension housing from removable center crossmember.

(8) Support transmission with a suitable jack and remove center crossmember.

(9) Remove transmission to clutch housing bolts. Slide transmission toward rear until drive pinion shaft clears clutch disc, before lowering transmission.

(10) Lower transmission and remove from under vehicle. Thoroughly clean exterior of unit.

DISASSEMBLING TRANSMISSION (Fig. 3)

Gearshift Housing and Mechanism

(1) Shift transmission to second gear for shift fork clearance.

(2) Remove housing retaining bolts and lift shift mechanism from case (Fig. 4).

(3) If shaft "O" ring seals need replacement, proceed as follows: Pull shift forks out of shafts.

(4) Remove nuts attaching operating levers to the shafts. Disengage levers from flats on shafts and remove.

(5) Remove burrs from shafts before removal from housing to avoid scoring the bores which would cause leakage after reassembly.

(6) Push gearshift lever shafts through housing bores and remove.

Drive Pinion Retainer and Extension Housing

(1) Remove bolts holding drive pinion bearing retainer to front of transmission case.

(2) Slide retainer and gasket forward off the drive pinion. Pry pinion oil seal from bearing retainer. To avoid leakage around the new seal, do not nick or scratch the bore in which the seal is pressed, or the surface on which seal bottoms.

(3) Tap drive pinion forward carefully with a brass

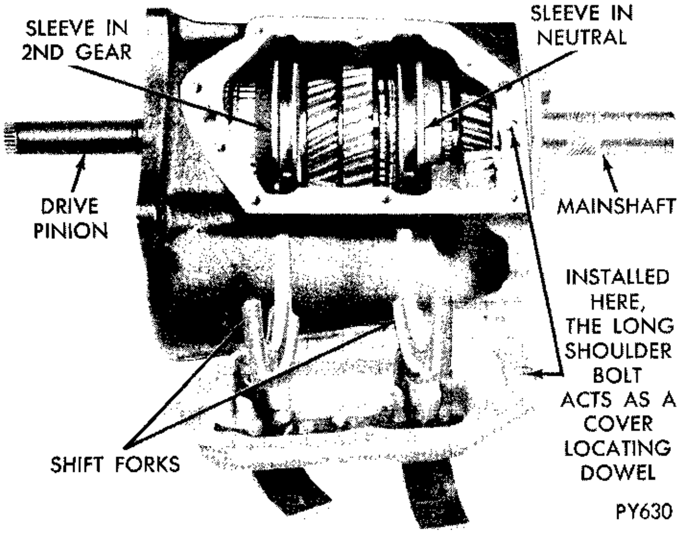


Fig. 4—A-230 With Shift Mechanism Assy., Pinion Bearing Retainer, and Extension Housing—Removed

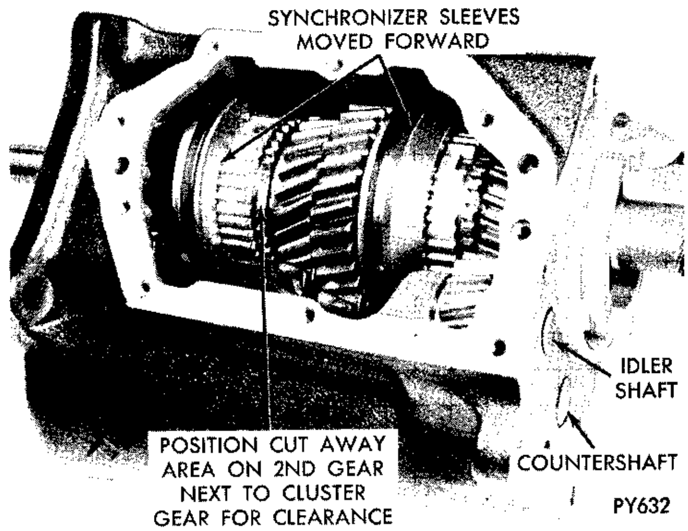


Fig. 6—Position 2nd Gear and Shift Sleeves for Clearance

drift, as far as possible to provide maximum disassembly clearance for mainshaft removal (Fig. 5).

(4) Rotate cut away part of second gear next to countershaft gear for mainshaft removal clearance (Fig. 6).

(5) Also shift 2nd-3rd synchronizer sleeve forward for the same reason.

(6) Remove bolt and retainer securing speedometer pinion adapter in extension housing (Fig. 2). Carefully work adapter and pinion out of extension housing.

(7) Remove bolts that attach extension housing to rear of transmission case.

(8) Tap with plastic hammer to break gasket seal and carefully guide housing off rear of mainshaft.

Idler Gear and Mainshaft (Fig. 7)

(1) Insert arbor tool C-464 in case to push reverse idler shaft and key out of case (Fig. 7).

(2) Remove idler gear with arbor in place to retain rollers.

(3) Remove both thrust washers (Fig. 8).

(4) Grasp mainshaft assembly and remove through rear of case (Fig. 8).

Countershaft Gear and Drive Pinion

(1) Using a mallet and arbor Tool C-4112 tap countershaft rearward and remove key. Continue to drive countershaft out of case, maintaining contact between shaft and arbor so that washers will not drop between them (Fig. 9).

(2) Lower countershaft gear to bottom of case to permit removal of main drive pinion.

(3) Remove snap ring from pinion bearing outer race (Fig. 10).

(4) Using a plastic hammer, drive the pinion into

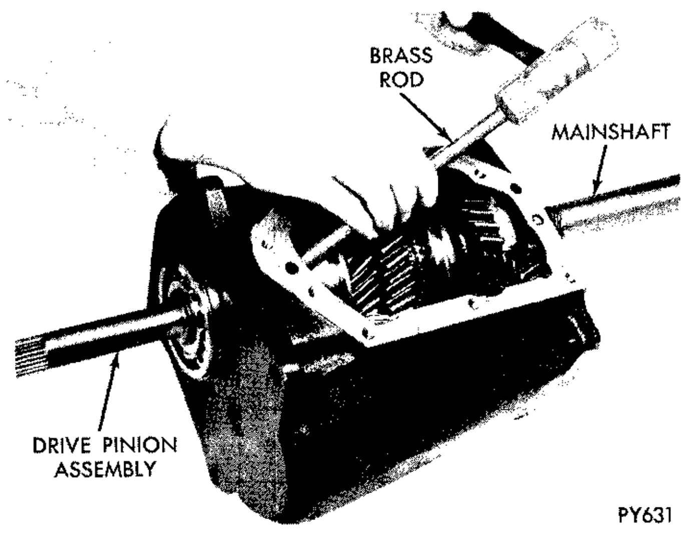


Fig. 5—Tap Drive Pinion Forward for Mainshaft Pilot Clearance

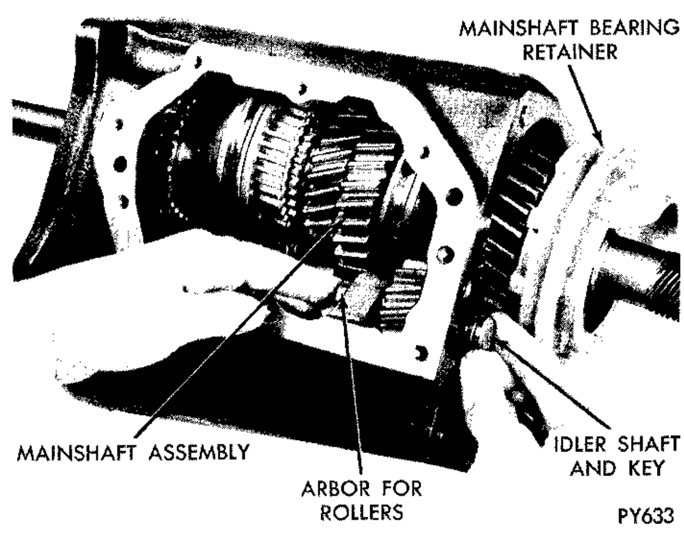


Fig. 7—Reverse Idler Gear—Removal or Installation

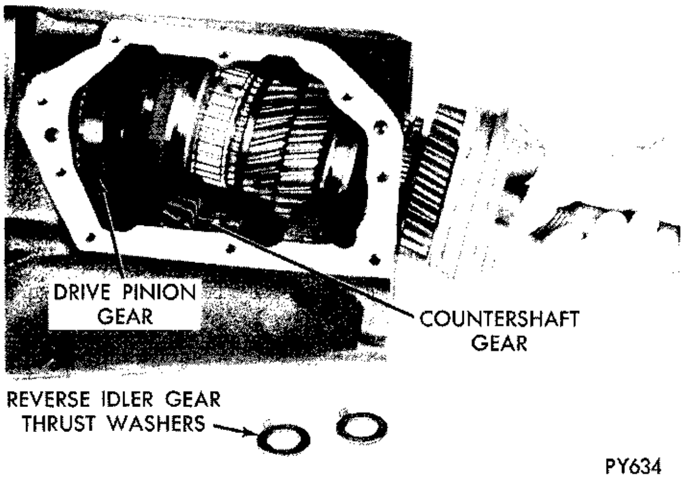


Fig. 8—Mainshaft Assembly—Removal or Installation

case and remove through rear (Fig. 11).

(5) If bearing is to be replaced, remove snap ring and press bearing off the pinion gear shaft (Fig. 12).

(6) Lift countershaft gear and arbor assembly out through rear of case (Fig. 13).

Mainshaft Disassembly

(1) Remove the snap ring from front end of mainshaft which retains the 2nd-3rd synchronizer clutch gear (Fig. 14).

(2) Slide the 2nd-3rd synchronizer assembly off end of mainshaft along with the 2nd gear stop ring (Fig. 15).

(3) Remove 2nd gear from mainshaft (Fig. 16).

(4) Spread snap ring in mainshaft bearing retainer to disengage it from bearing groove and slide retainer off the bearing race (Fig. 17).

(5) Remove snap ring securing bearing to mainshaft (Fig. 18).

(6) Set up parts in arbor press to force bearing off

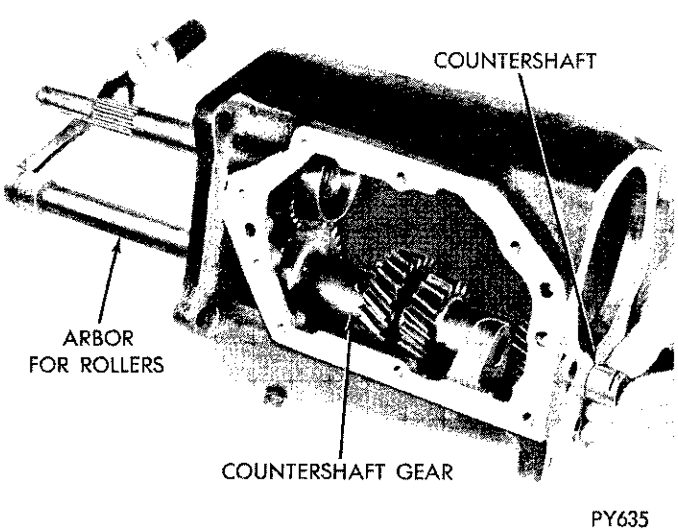


Fig. 9—Countershaft Removal

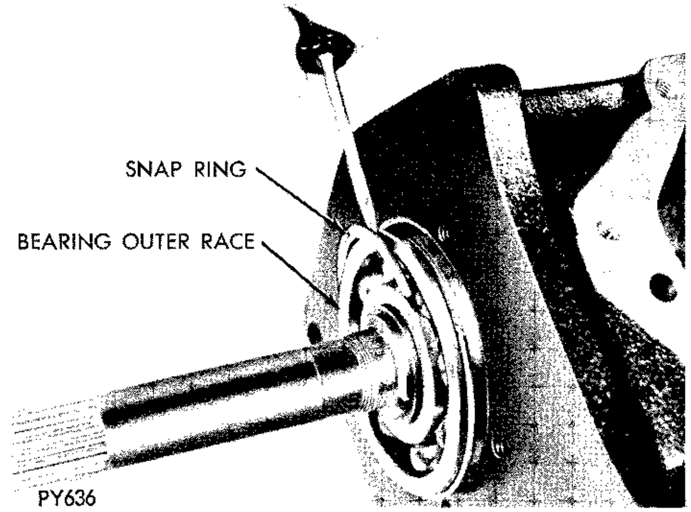


Fig. 10—Snap Ring on Pinion Gear Bearing—Removal

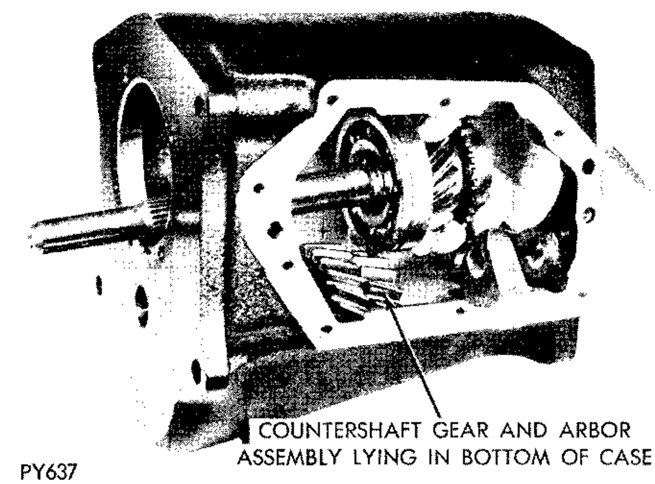


Fig. 11—Drive Pinion and Bearing Assembly—Removal or Installation

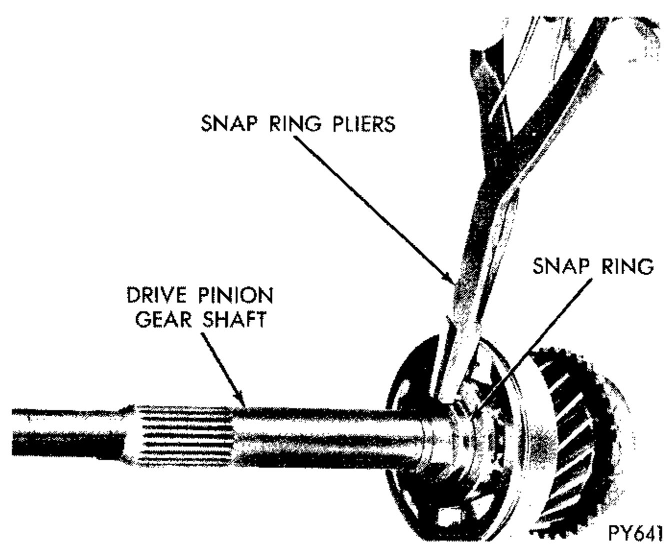


Fig. 12—Snap Ring, Pinion Shaft to Bearing—Removal or Installation

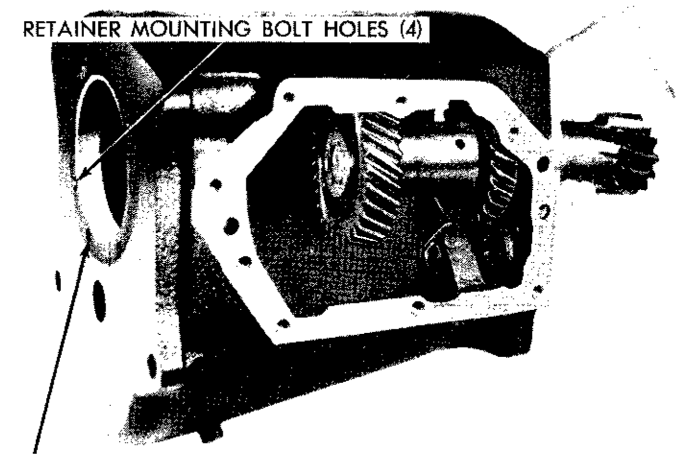


Fig. 13—Countershaft Gear and Arbor Assembly—Removal or Installation

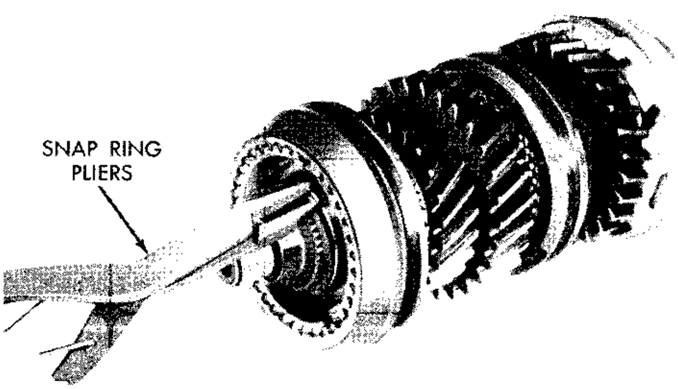


Fig. 14—Snap Ring—2nd-3rd Synchronizer Clutch Gear to Mainshaft—Removal or Installation

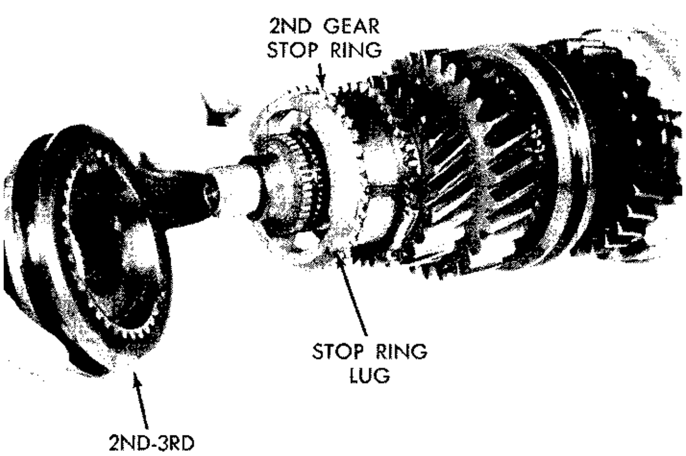


Fig. 15—2nd-3rd Synchronizer Assembly and Stop Ring—Removal or Installation

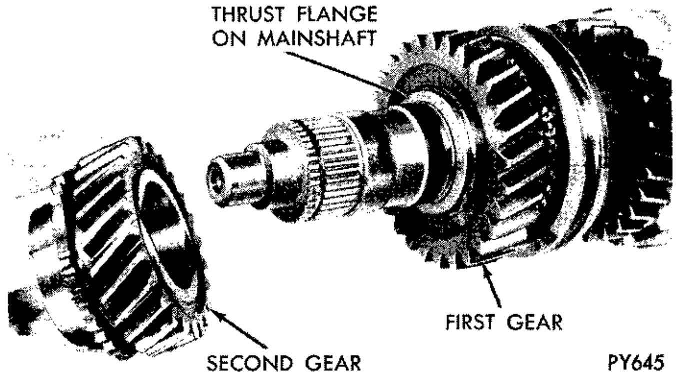


Fig. 16—2nd Gear—Removal or Installation

mainshaft. By supporting front side of reverse gear it can push the bearing off shaft as pressure is applied to shaft (Fig. 19). When bearing clears shaft, don't let parts drop through.

(7) Remove from press and slip off the end of shaft, the mainshaft bearing and reverse gear (Fig. 20).

(8) Remove from mainshaft the snap ring which retains the 1st-Reverse synchronizer clutch gear (Fig. 21).

(9) Slide 1st-Reverse synchronizer assembly off

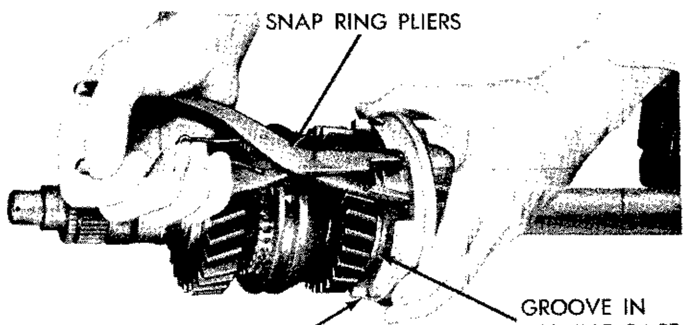


Fig 17—Snap Ring Spread, to Remove or Install Retainer on Mainshaft Bearing

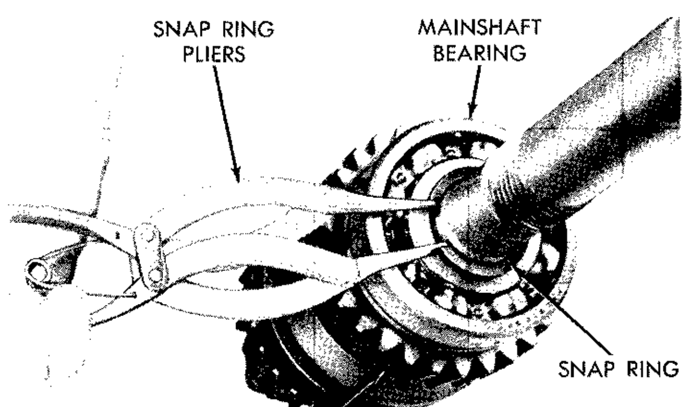


Fig. 18—Snap Ring—Mainshaft Bearing to Shaft—Removal or Installation

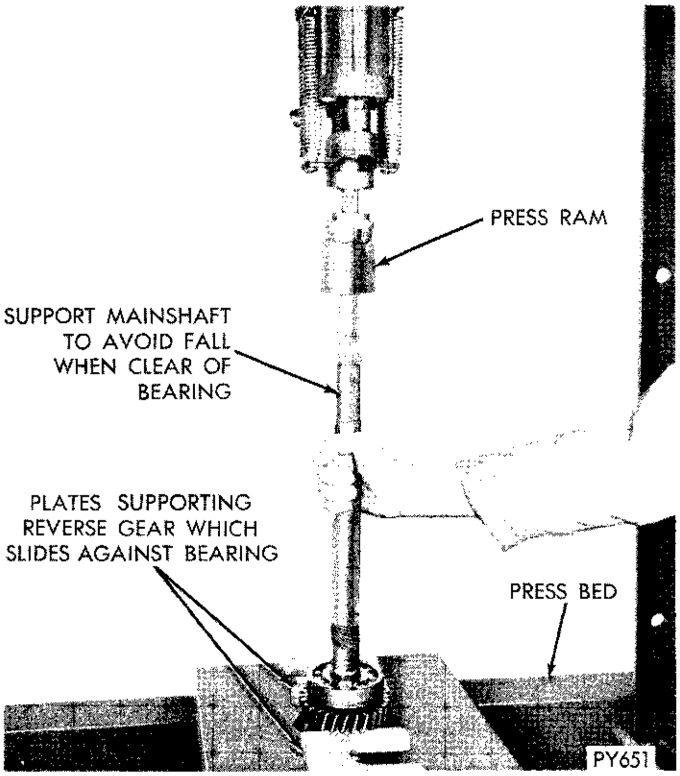


Fig. 19—Using Press to Remove Mainshaft Bearing

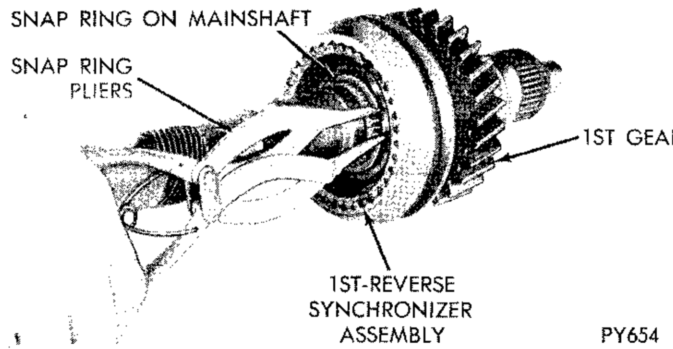


Fig. 21—Snap Ring—1st-Reverse Synchronizer Clutch Gear—Removal or Installation

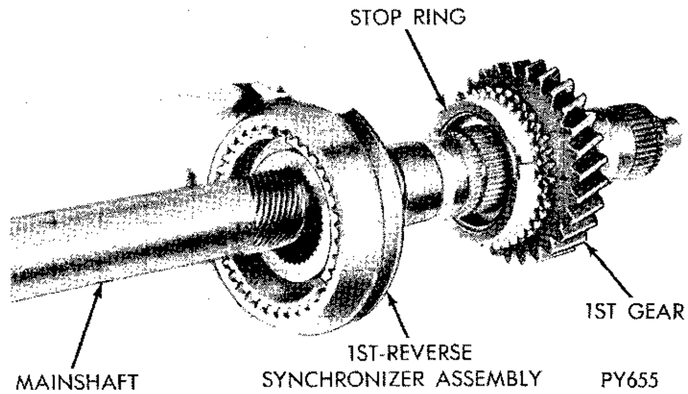


Fig. 22—1st-Reverse Synchronizer Assembly—Removal or Installation

splines and remove from mainshaft (Fig. 22).

(10) Remove 1st gear and its stop ring from mainshaft (Fig. 23).

CLEANING AND INSPECTION

Clean transmission case thoroughly, using a suitable solvent, dry with compresesd air. Inspect case for cracks, stripped threads in various bolt holes and machined mating surfaces for burrs, nicks or any condition that would render the case unfit for further service. The front mating surface should be smooth; if any burrs are present, dress them off with a fine mill file. If threads are stripped, install Helicoil inserts.

Ball Bearings

Wash ball bearings, using a clean solvent and blow dry with compressed air.

CAUTION: Do not spin bearings with air pressure; turn slowly by hand. Spinning unlubricated bearings may cause damage to races and balls.

Be sure ball bearings are clean, then lubricate them with light grade engine oil. Inspect bearings for pitting. This can best be determined by slowly turning outer race by hand. Measure fit of bearings on their respective shafts.

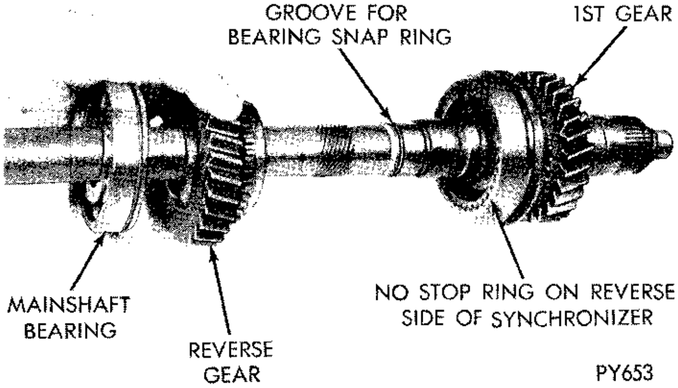


Fig. 20—Reverse Gear and Mainshaft Bearing—Removal or Installation

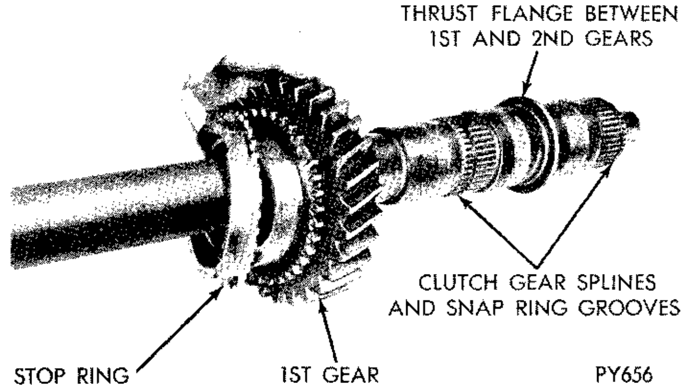


Fig. 23—1st Gear and Stop Ring—Removal or Installation

Needle Type Bearing Rollers and Spacers

Inspect all bearing rollers for flat spots or brinelling. Inspect all bearing roller spacers for signs of wear or galling. Install new parts as required.

Gears

Inspect gear splines on synchronizer clutch gears and stop rings. If there is evidence of chipping or excessively worn teeth, install new parts at reassembly. Be sure clutch sleeve slides easily on the clutch gear. Inspect countershaft gear and all gear teeth for chipped or broken teeth, or showing signs of excessive wear. Small nicks or burrs must be stoned off.

Inspect teeth on main drive pinion. If excessively worn, broken or chipped, a new pinion should be installed. If the oil seal contact area on drive pinion shaft is pitted, rusted or scratched, a new pinion is recommended for best seal life.

Synchronizer Stop Rings

Inspect stop rings for cracks and wear. If rings are cracked or show signs of extreme wear on threaded bore, install new rings at reassembly. Test new rings for good fit on gear cones with minimum wobble.

Mainshaft

Inspect mainshaft gear and bearing mating surfaces. If gear contact surfaces show signs of galling or are excessively worn, a new mainshaft should be installed.

Inspect snap ring grooves for burred edges. If rough or burred, remove condition using a fine file or crocus cloth. Inspect synchronizer clutch gear splines on shaft for burrs.

ASSEMBLING TRANSMISSION

Countershaft Gear

(1) Slide assembly arbor, Tool C-4112, into countershaft gear.

(2) Slide one roller thrust washer over arbor and into gear, followed by 22 Greased Rollers (Fig. 24).

(3) Repeat Step 2, adding one roller thrust washer on end.

(4) Repeat Steps 2 and 3 at other end of countershaft gear. (Total of 88 Rollers and 6 thrust washers).

(5) Place greased front thrust washer on arbor against gear with tangs forward.

(6) Coat rear thrust washer with heavy grease and stick it in place in the transmission case, with tangs rearward.

(7) Carefully place countershaft gear assembly in position in bottom of transmission case (Fig. 13). **Do not finish installation with countershaft and key until drive pinion is installed.**

Pinion Gear

(8) Press new bearing on pinion with snap ring groove forward. Install snap ring on shaft (Fig. 12).

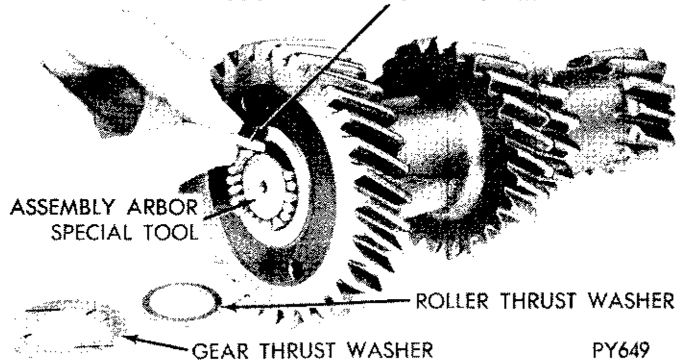


Fig. 24—Countershaft Gear—Roller Bearing Assembly

(9) Install 15 rollers and retaining ring in gear (Fig. 25).

(10) Install drive pinion and bearing assembly into case (Fig. 11).

(11) Now finish installation of countershaft gear assembly by positioning it and the thrust washers so that the countershaft can be tapped into position (Fig. 26). **Be careful to keep the arbor in contact with the countershaft to avoid parts dropping out of position and blocking the installation.** Install key in countershaft as installation is finished.

(12) Carefully tap drive pinion forward to provide maximum clearance for mainshaft installation (Fig. 5).

Mainshaft (Fig. 27)

(13) Sub assemble the synchronizer parts in the order shown in (Figs. 28, 29 and 30) as follows: Place a stop ring flat on the bench followed by the clutch gear and sleeve. Drop the struts in their slots and snap in a strut spring placing the tang inside one strut. Turn the assembly over on the stop ring and install second strut spring with tang in a different strut.

(14) Slide 1st gear and stop ring over rear end of mainshaft and against flange which separates 1st and 2nd gears (Fig. 23).

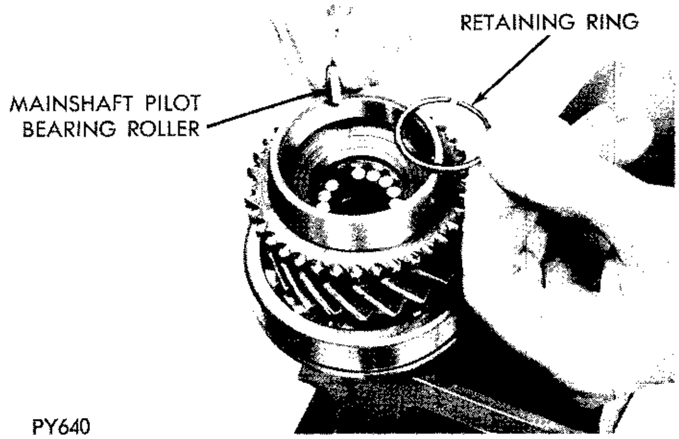


Fig. 25—Installing Rollers in Drive Pinion Gear

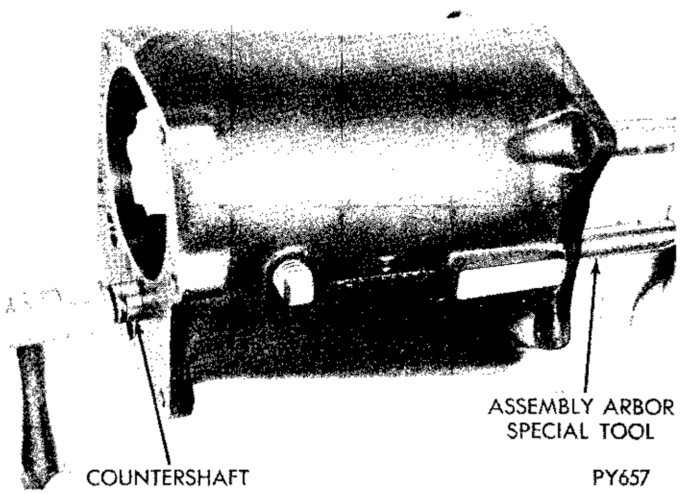


Fig. 26—Countershaft—Installation

(15) Slide 1st-Reverse synchronizer assembly over mainshaft, indexing the hub slots to 1st gear stop ring lugs (Fig. 22).

(16) Install clutch gear snap ring on mainshaft (Fig. 21).

(17) Slide reverse gear and mainshaft bearing in place and take to press, to force bearing on shaft (Fig. 20).

(18) Support inner race of bearing and press shaft through to shoulder (Fig. 31).

Be sure snap ring groove on outer race is forward.

(19) Install bearing retaining snap ring on mainshaft (Fig. 18).

(20) Spread snap ring in mainshaft bearing retainer groove and slide it over the bearing. Be sure snap ring seats in bearing groove (Fig. 17).

(21) Place second gear over front of mainshaft with thrust surface against flange (Fig. 16).

(22) Install properly indexed stop ring and 2nd-3rd synchronizer assembly against second gear (Fig. 15).

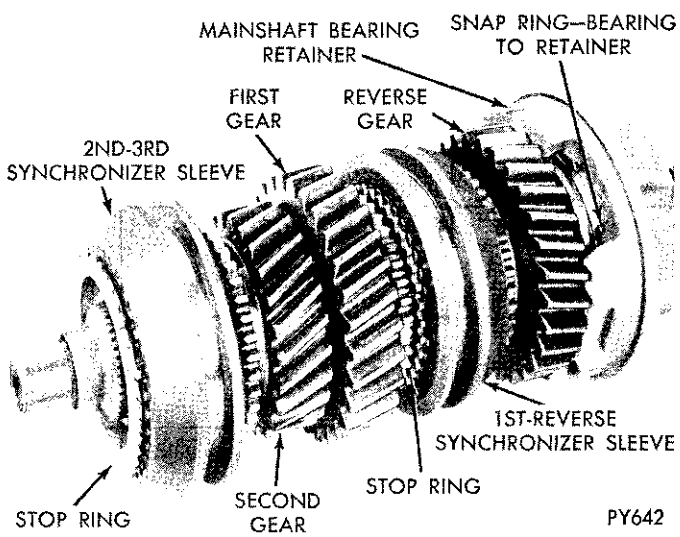


Fig. 27—Mainshaft Assembled

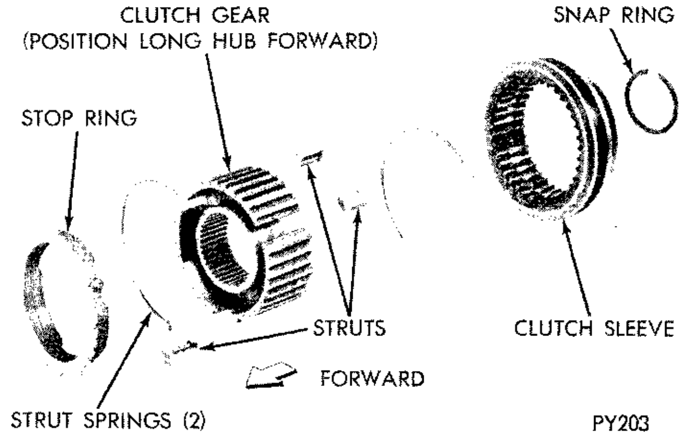


Fig. 28—1st-Reverse Synchronizer—Disassembled

(23) Install 2nd-3rd clutch gear snap ring on shaft (Fig. 14).

(24) Move 2nd-3rd synchronizer sleeve forward as far as practical (limited by need to retain struts in place) and install front stop ring (coated with grease to hold it in position) inside sleeve with lugs indexed to struts.

(25) Rotate cut out on second gear so it is toward countershaft gear for clearance (Fig. 6).

(26) Now slowly insert mainshaft assembly into case (Fig. 8) tilting it as required to clear cluster gears and finally entering the pilot rollers in the drive pinion gear.

If everything is in proper position the bearing retainer will bottom to the case without force. If not, check to see if a strut, pinion roller, or stop ring is out of position.

Reverse Idler Gear

(27) Place assembly arbor, Tool C-464 into idler gear along with 22 greased rollers (Fig. 32).

(28) Position reverse idler thrust washers in case with grease to retain them.

(29) Now position reverse idler gear with arbor and

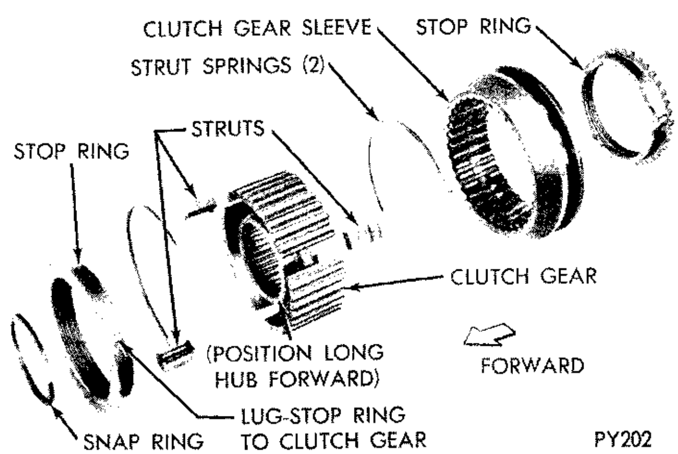


Fig. 29—2nd-3rd Synchronizer—Disassembled

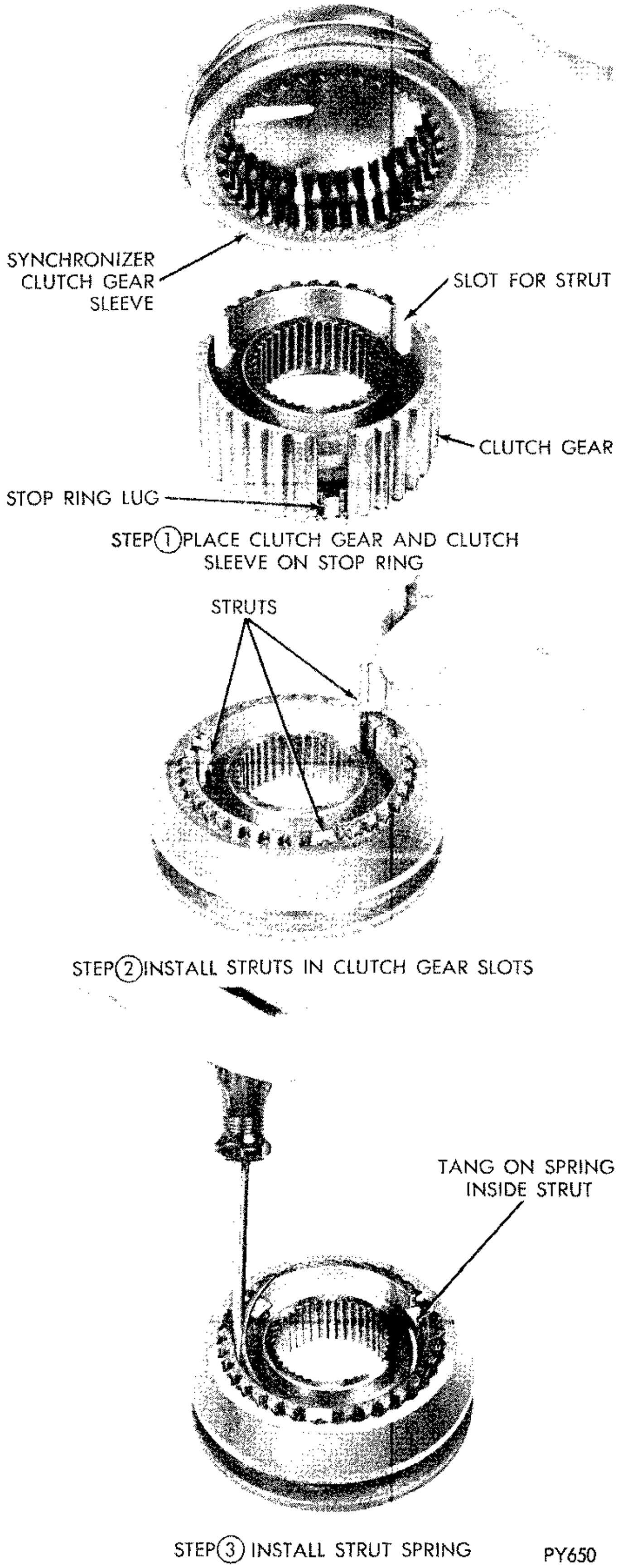


Fig. 30—Assembling Synchronizer Parts

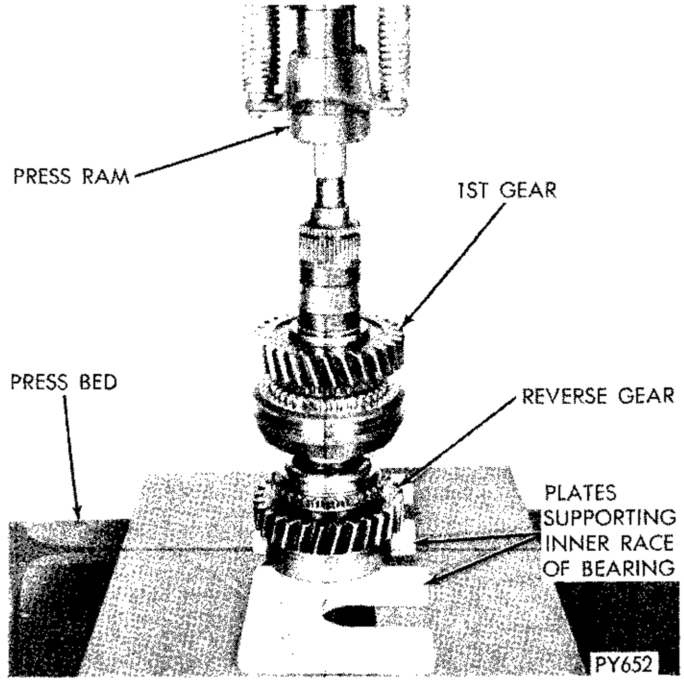


Fig. 31—Using Press to Install Mainshaft Bearing

rollers in the case (Fig. 7) while installing idler shaft and key.

(30) Install extension housing and gasket now, to hold mainshaft and bearing retainer in place (Fig. 33). First, replace bushing and seal, if necessary.

Extension Housing Bushing Replacement

(a) Remove extension housing yoke seal (Fig. 34) with Tool C-3985.

(b) Drive the bushing out of housing (Fig. 35) with Tool C-3974.

(c) Slide a new bushing on installing end of Tool C-3974. Align oil hole in bushing with oil slot in housing, then drive bushing into place (Fig. 35).

(d) To install a new seal, position seal in opening of

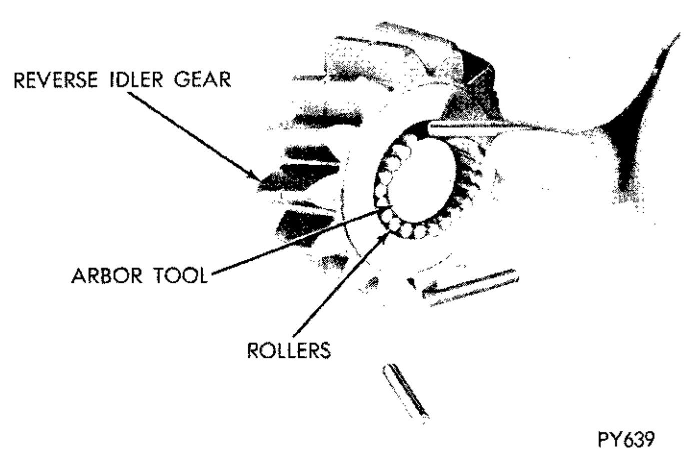


Fig. 32—Reverse Idler Gear—Roller and Arbor Assembly

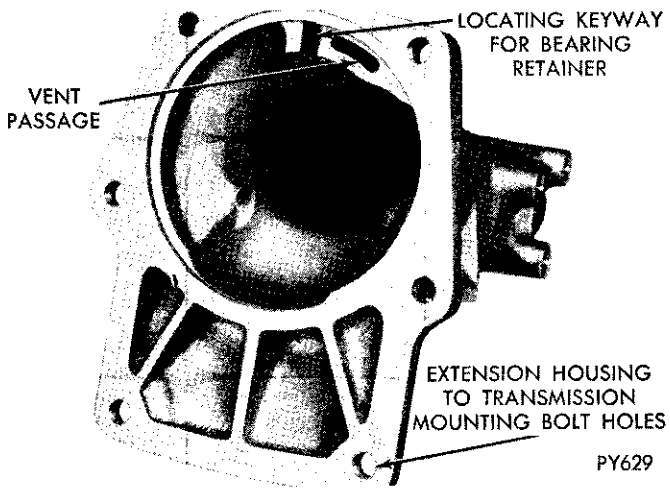


Fig. 33—Extension Housing—Front View

extension housing and drive it into housing with Tool C-3972 (Fig. 36).

Drive Pinion Bearing Retainer

(31) Install the outer snap ring on the drive pinion bearing and tap the assembly back until the snap ring contacts case.

(32) Using Tool C-3789 (Fig. 37), install a new oil seal in retainer bore. Position main drive pinion bearing retainer and gasket on front of case. Coat threads with sealing compound, then install attaching bolts and tighten to 30 foot-pounds (Fig. 2).

Gearshift Mechanism and Housing (Fig. 38)

(33) If removed, place the two interlock levers on

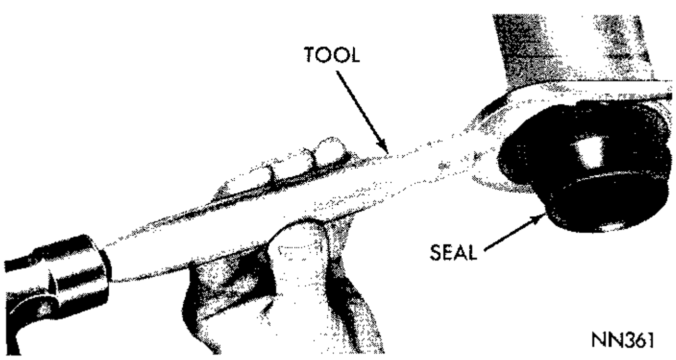


Fig. 34—Removing Extension Housing Seal

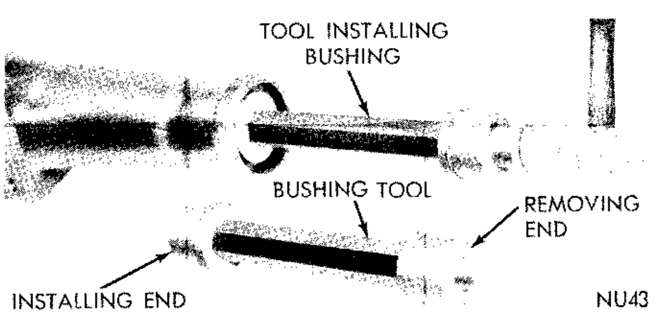


Fig. 35—Replacing Bushing in Extension Housing

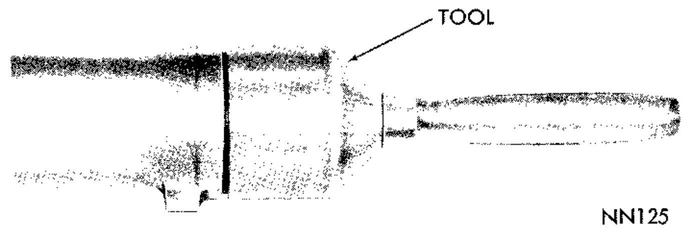


Fig. 36—Installing Extension Housing Seal

the pivot pin with the spring hangers offset toward each other so the spring will install in a straight line, and secure with "E" clip on Pivot pin.

(34) Grease and install new "O" ring oil seals on both shift shafts. Grease housing bores and push each shaft into its proper bore.

(35) With pliers install the spring on interlock lever hangers.

(36) Rotate each shift shaft fork bore, to neutral position (straight up) and install shift forks through bores and under both interlock levers.

Install Gearshift Mechanism

(37) Position the 2nd-3rd Synchronizer sleeve in transmission to rear (in 2nd gear). Position the 1st-reverse synchronizer sleeve to middle of travel (in neutral) (Fig. 4). Place the shift forks in the gearshift mechanism in the same positions.

(38) Install gasket and gearshift mechanism on transmission using special shoulder bolts. One bolt has an extra long shoulder which enters the transmission case acting as a locating dowel pin. This hole is at center rear of case (Fig. 4). Tighten bolts evenly to 15 foot-pounds.

(39) Install speedometer drive pinion gear and adapter being sure range number, stamped on outside of adapter, representing number of teeth on gear, is in 6 "O" clock position (Fig. 40).

TRANSMISSION INSTALLATION

Place a small amount of Multi-Purpose lubricant around inner end of pinion shaft pilot bushing in flywheel and on pinion bearing retainer pilot, for clutch

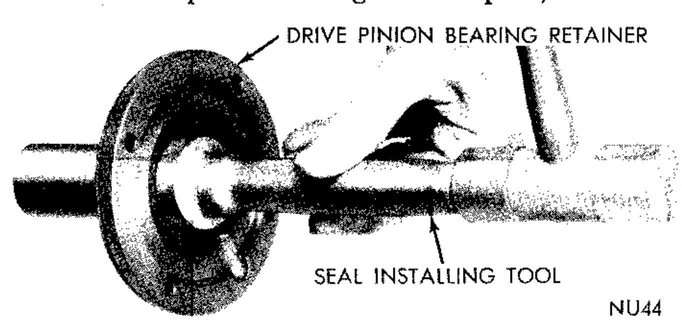


Fig. 37—Installing Seal in Drive Pinion Bearing Retainer

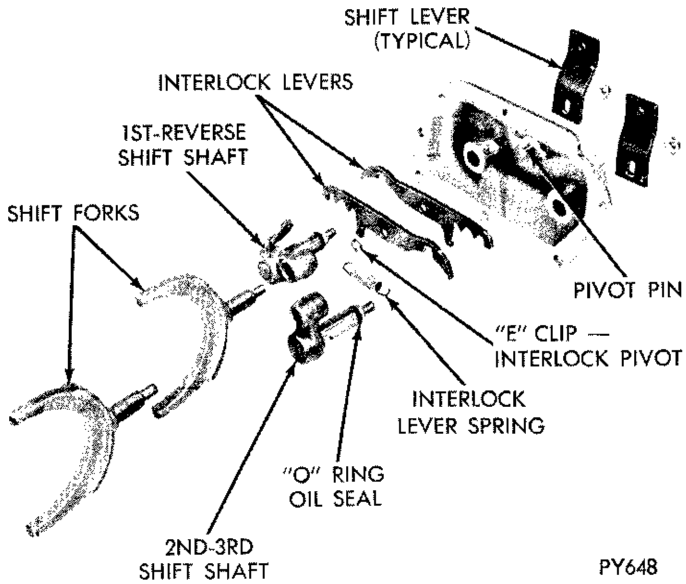


Fig. 38—Gearshift Mechanism and Housing—Disassembled

release sleeve. **Do not lubricate end of pinion shaft, clutch disc splines or clutch release levers.**

(1) With transmission on a suitable jack, slide assembly under vehicle.

(2) Raise transmission until drive pinion is centered in clutch housing bore.

(3) Roll transmission slowly forward until pinion shaft enters clutch disc. Turn pinion shaft until splines are aligned, then work transmission forward until seated against clutch housing. **Do not allow transmission to "hang" after pinion shaft has entered the clutch disc.**

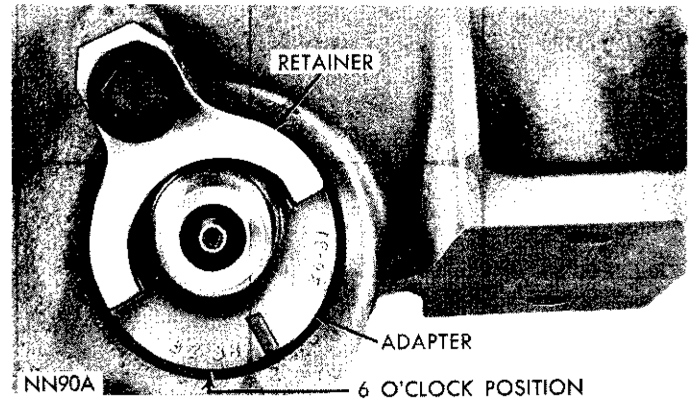


Fig. 40—Speedometer Pinion and Adapter—Installed in Extension Housing

(4) Install transmission to clutch housing bolts and tighten to 50 foot-pounds.

(5) Using a pointed drift, align crossmember bolt holes, then install attaching bolts. Tighten to 75 foot-pounds (Fig. 39).

(6) Remove engine support fixture and disengage hooks from holes in the frame side rails. Install extension housing to rear engine mount bolts and tighten to 40 foot-pounds. Engine mount to center crossmember bolt and nut, loose assembled to this point, should now be torqued to 50 foot-pounds.

(7) Referring to "Gearshift Linkage Adjustment", conenct shift control rods to transmission levers and connect speedometer cable.

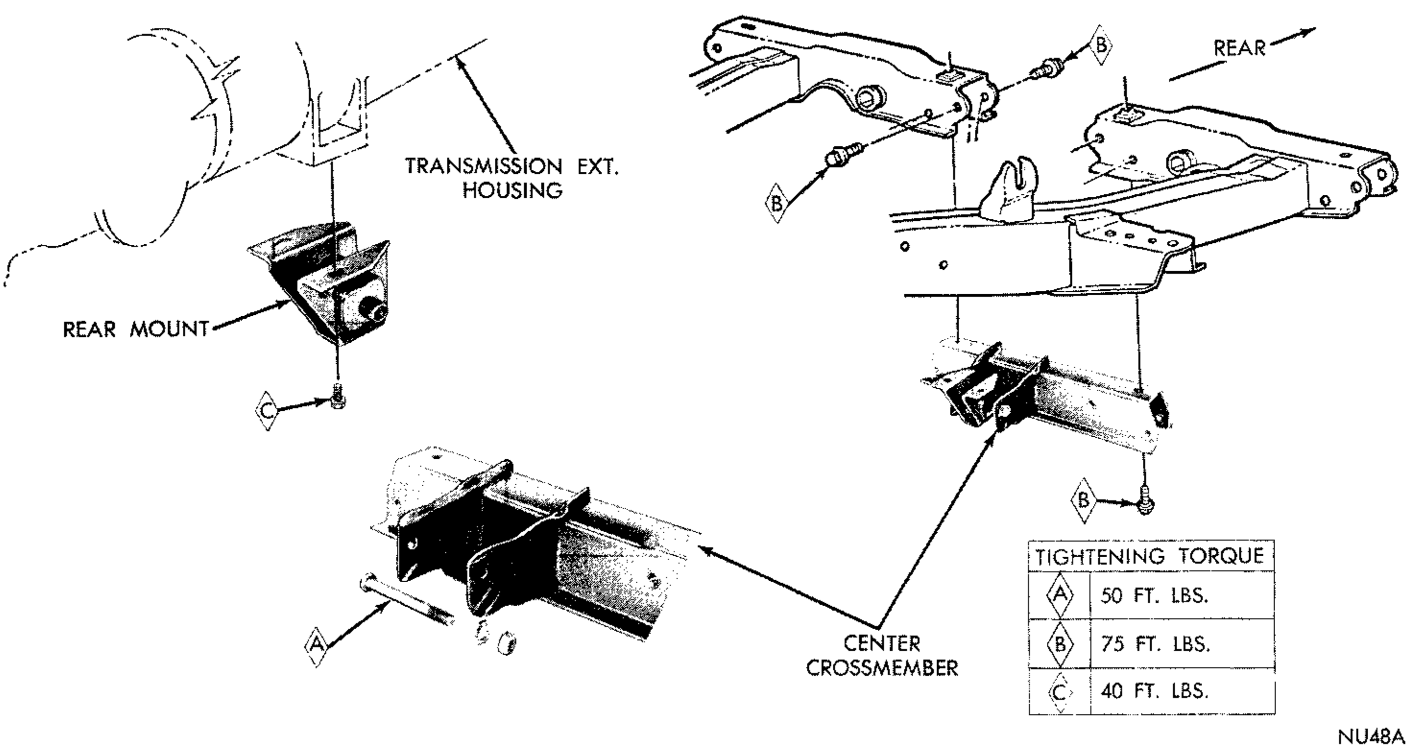


Fig. 39—Center Crossmember and Rear Engine Mount

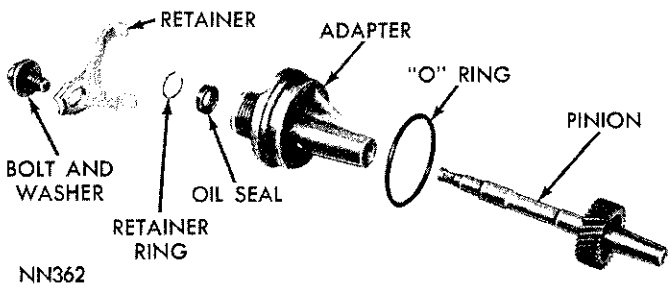


Fig. 41—Speedometer Pinion and Adapter—Disassembled

(8) Carefully guide front universal joint yoke into extension housing and onto mainshaft splines. Connect propeller shaft to rear axle pinion yoke aligning the marks made at removal.

(9) Reconnect exhaust pipes (if removed). Tighten bolts securely.

(10) Fill transmission. See Lubrication Section for detailed recommendations.

(11) Road test vehicle to make sure transmission shifts smoothly and operates quietly.

SPEEDOMETER PINION GEAR

Removal and Installation

Rear axle gear ratio and tire size determines pinion gear size requirements. Refer to "Speedometer Pinion Gear Chart" in Specifications for pinion usage.

(1) Place drain pan under adapter or drain transmission.

(2) Remove bolt and retainer securing speedometer pinion adapter to extension housing (Fig. 40).

(3) With cable housing connected, carefully work adapter and pinion out of extension housing.

(4) If transmission fluid is found in cable housing, replace seal in the adapter (Fig. 41). Start seal and retainer ring in adapter, then push them into adapter with Tool C-4004 until tool bottoms (Fig. 42).

(5) Note number of gear teeth and install speedometer pinion gear into adapter (Fig. 41).

CAUTION: Before installing pinion and adapter assembly, make sure adapter flange and its mating area on extension housing are perfectly clean and lubricated. Dirt or sand will cause mis-alignment resulting in speedometer pinion gear damage.

(6) Rotate the speedometer pinion gear and adapter assembly so that the number on the adapter, corresponding to the number of teeth on the gear, is in the 6 o'clock position as the assembly is installed (Fig. 40).

(7) Install retainer and bolt, with retainer tangs in adapter positioning slots. Tap adapter firmly into extension housing and tighten retainer bolt to 100 inch-pounds.

(8) Fill transmission to level of fill plug (Refer to Lubrication Section).

EXTENSION HOUSING YOKE SEAL

Replacement

(1) Place drain pan under yoke seal.

(2) Disconnect propeller shaft at rear universal joint. Mark both parts to reassemble in same position. Carefully pull shaft yoke out of transmission extension housing.

CAUTION: Be careful not to scratch or nick ground surface on sliding spline yoke during removal and installation of the shaft assembly.

(3) Remove extension housing yoke seal (Fig. 34) with Tool C-3985.

(4) To install a new seal, position seal in opening of extension housing and drive it into housing with Tool C-3972 (Fig. 36).

(5) Carefully guide front universal joint yoke into extension housing and on mainshaft splines. Connect propeller shaft to rear axle pinion shaft yoke aligning the marks made at removal.

(6) Fill transmission to level of fill plug (Refer to Lubrication Section).

GEARSHIFT LINKAGE ADJUSTMENT

A-230 Column Shift

(1) Remove both shift rod swivels from transmission shift levers (Fig. 43).

(2) Make sure transmission shift levers are in neutral (middle detent) position.

(3) Move shift lever to line up locating slots in bottom of steering column shift housing and bearing housing. Install suitable tool in slot and lock ignition switch.

(4) Place screwdriver or suitable tool between cross-over blade and 2nd-3rd lever at steering column so that both lever pins are engaged by cross-over blade (Fig. 44).

(5) Set 1st-Reverse lever on transmission to reverse position (rotate clockwise).

(6) Adjust 1st-reverse rod swivel by loosening clamp bolt and sliding swivel along rod so it will enter 1st-reverse lever at transmission. Install washers and

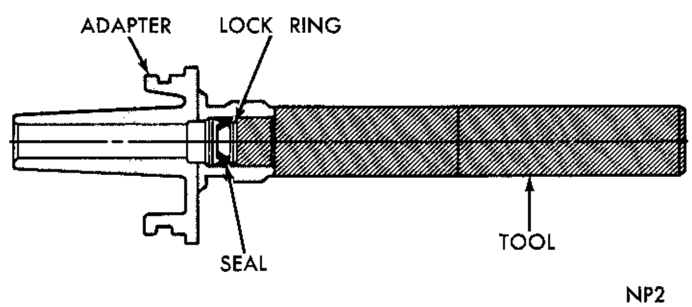


Fig. 42—Installing Speedometer Pinion Seal in Adapter

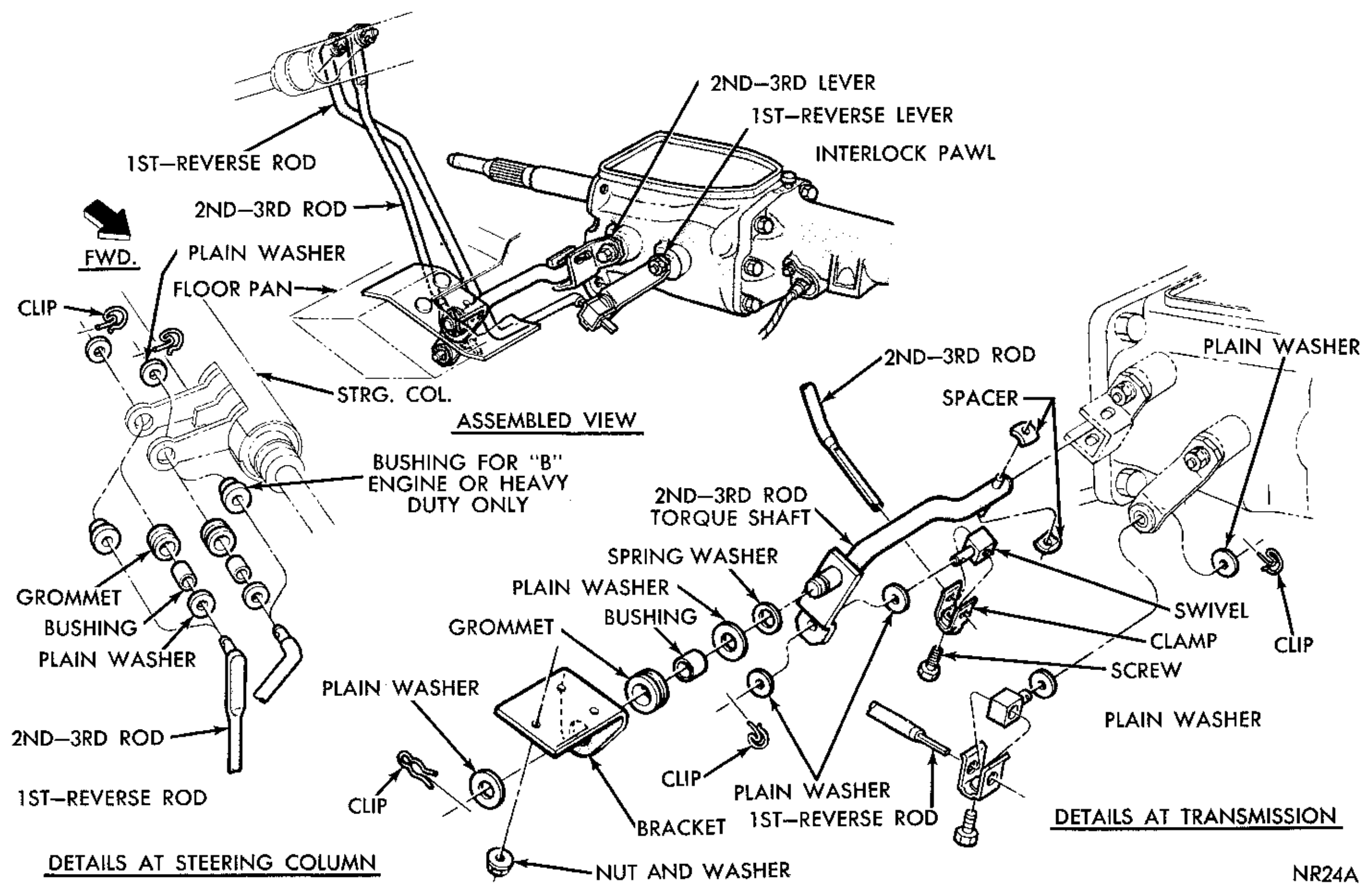


Fig. 43—Column Gearshift Linkage

clip. Tighten swivel bolt to 100 inch-pounds.

(7) Remove gearshift housing locating tool, unlock ignition switch and shift column lever to neutral position.

(8) Adjust 2nd-3rd rod swivel by loosening clamp bolt and sliding swivel along rod so it will enter 2nd-3rd lever at transmission. Install washers and clip. Tighten swivel bolt to 100 inch-pounds.

(9) Remove tool from cross-over blade at steering column and shift through all gears to check adjustment and cross-over smoothness.

(10) Check for proper operation of steering column lock in reverse and second gear positions. With proper linkage adjustment, column should lock in reverse position and should not lock in second position.

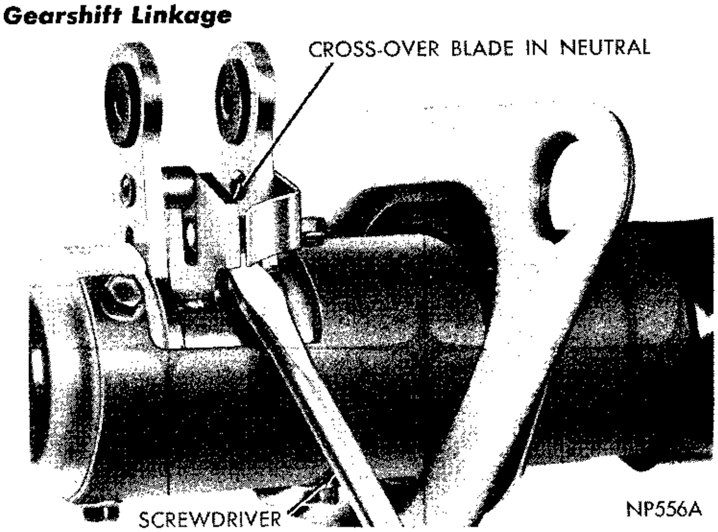


Fig. 44—Holding Crossover Blade in Neutral Position

SPECIFICATIONS

3-SPEED TRANSMISSION

(A-230 ALL SYNCHRONIZED)

Engine Displacement (Cu. In.)	**383**	
Gear Ratio		
First	2.55	
Second	1.49	
Third	1.00	
Reverse	3.34	
Downshift Speed Limits		
3rd to 2nd	45 to 15 M.P.H.	
2nd to 1st	25 to 0 M.P.H.	
Lubricant		
Capacity	U.S. Pints	IMP. Pints
	5	4-1/4
Type	Auto Trans. Fluid AQ-ATF Suffix "A" or "Dexron"	
Gear Type	Helical	
Tolerances		
Clutch Housing Face Squareness	.006 Max.	
Clutch Housing Bore Run-Out	.008 Max.	

SPEEDOMETER PINION GEAR CHART

ALL TRANSMISSIONS

NUMBER OF TEETH ON PINION GEAR LISTED UNDER EACH AXLE RATIO

Tire Size	Tire Size	2.45:1	2.71:1	2.76:1	2.93:1	2.94:1	3.23:1	3.54:1	3.55:1	3.91:1	4.10:1
	F78 x 15					29	31		35		
7.75 x 15		24	27	27	29	29	32		35	38	
8.25 x 15		24	26	27	28	28	31		34	38	
	G78 x 15		26	26		28	31		34		
8.55 x 15			26	26		28	31		34		
8.85 x 15			25	26		27	30		33		
9.15 x 15			25	26		27	30		33		
	H78 x 15		25	26		27	30		33		
	J78 x 15		25	26		27	30		33		
G70 x 15			26	27		29	31		35		
E60 x 15				29			34	37	37	41	43
F60 x 15		25	28	28		30	33		36	40	42

TORQUEFLITE TRANSMISSION

TRANSMISSION MODEL	**A-727-B**
TYPE	Automatic Three Speed with Torque Converter
TORQUE CONVERTER	
Diameter (Std.)	11-3/4"
(High Perf.)	10-3/4"
OIL CAPACITY—TRANSMISSION AND TORQUE CONVERTER ... Use Automatic Transmission Fluid labeled Type AQ-ATF, Suffix "A" or "Dexron". (Std.)	U.S. Measure 19 pts. Imp. Meas. 16 pts.
(High Perf.)	U.S. 16-1/2 pts. Imp. Meas. 13-1/2 pts.
COOLING METHOD	Water-Heat Exchanger
LUBRICATION	Pump (Rotor Type)
CLUTCHES	
Number of Front Clutch Plates	4

Number of Front Discs	4
Number of Rear Clutch Plates	3
Number of Rear Discs	4
GEAR RATIOS	
1—First	2.45 to 1
2—Second	1.45 to 1
D—Third	1 to 1
R—Reverse	2.20 to 1
PUMP CLEARANCES	
Outer Rotor to Case Bore	.004 to .008 inch
Outer to Inner Tip	.005 to .010 inch
End Clearance—Rotors	.0015 to .003 inch
Planetary Assy. End Play	.010 to .037 inch
Drive Train End Play	.037 to .084 inch
CLUTCH PLATE CLEARANCE	
Front Clutch	
383 & 440 Cu. In. Engine	.024 to .125 inch
440 High. Perf. Engine	.066 to .123 inch
Rear Clutch	.025 to .045 inch
SNAP RINGS	
Front and Rear Clutches	
Rear Snap Ring (Selective)	.060 to .062 inch .074 to .076 inch .088 to .090 inch
Output Shaft (Forward End)	.048 to .052 inch .055 to .059 inch .062 to .066 inch
BAND ADJUSTMENTS	
Kickdown Band (Front)	2 Turns*
Low-Reverse Band (Internal)	2 Turns*
THRUST WASHERS	
Reaction Shaft Support to Front Clutch Retainer (Selective)	.061 to .063 inch (Green) .084 to .086 inch (Red) .102 to .104 inch (Yellow)
Output Shaft to Input Shaft	.062 to .064 inch
Driving Shell Thrust Plate—Steel (1)	.034 to .036 inch
Rear Planetary Gear to Driving Shell	.062 to .064 inch
Front Planetary Gear to Annulus Gear Support	.062 to .064 inch
Front Annulus Gear to Driving Shell	.062 to .064 inch
Front Clutch to Rear Clutch	.061 to .063 inch
Rear Planetary Gear to Annulus Gear	.034 to .036 inch

* Backed off from 72 inch-pounds.

TIGHTENING REFERENCE

Manual A-230 3-Speed	**Foot Pounds**
Back Up Light Switch	15
Extension Housing Bolts	50
Drive Pinion Bearing Retainer Bolts	30
Gearshift Operating Lever Nuts	18
Transmission to Clutch Housing Bolts	50
Transmission Cover Retaining Bolts	12
Transmission Drain Plug	25

Torqueflite A-727-B	**Pounds Foot**	**Pounds Inch**
Cooler Line Fitting	—	110
Cooler Line Nut	—	85
Converter Drain Plug	—	110
Converter Drive Plate to Crankshaft Bolt	55	—
Converter Drive Plate to Torque Converter Bolt	—	270
Extension Housing to Transmission Case Bolt	24	—
Extension Housing to Insulator Mounting Bolt	40	—
Extension Housing—Crossmember to Frame Bolt	75	—
Governor Body to Support Bolt	—	100
Kickdown Band Adjusting Screw Lock Nut	29	—
Kickdown Lever Shaft Plug	—	150
Neutral Starter Switch	24	—
Oil Pan Bolt	—	150
Oil Pump Housing to Transmission Case Bolt	—	175
Output Shaft Support Bolt	—	150
Overrunning Clutch Cam Set Screw	—	40
Pressure Test Take-off Plug	—	75
Reaction Shaft Support to Oil Pump Bolt	—	160
Reverse Band Adjusting Screw Lock Nut	35	—
Speedometer Drive Clamp Screw	—	100
Transmission to Engine Bolt	28	—
Valve Body Screw	—	35
Valve Body to Transmission Case Bolt	—	100

WHEELS—BEARINGS—TIRES

CONTENTS

GENERAL INFORMATION

The original equipment Load Range B (4) ply rating bias belted factory installed tires on your vehicle are designed and tested to meet all normal operating requirements. These tires are superior tires for the vehicle and provide the best overall performance for normal operation; furthermore, the ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction skid resistance and tread life.

The bias belted (bias breaker) represents a complete departure in tire design. This type of tire construction has the body plies, or layers of cords, running at a bias or criss-crossed angle to the circumference (Fig. 1). In addition, a rugged two-ply glass fiber circumferencial belt is added directly under the tread.

The advantages of bias belted tires which are most important to the owner are: Superior ride and handling, improved tread life, improved traction and skid resistance and improved high speed durability because of cooler operating temperatures.

Tire wear and vehicle stability are affected greatly by tire size, tire pressures, wheel rim size, distribution of load within the vehicle, wheel alignment, road surface conditions, and driver operating habits.

Tires used at low speeds, in cool climates, and with light loads will have longer life than tires used for high speed driving in hot climates with heavy loads. Abrasive road surfaces will accelerate tire wear.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe or careless drivers. Rapid acceleration and deceleration, severe application of brakes, high speed driving, taking turns at excessive speeds, striking curbs and other obstacles are just a few of the driving habits which will shorten the life of any tire.

To obtain maximum vehicle stability and tire life the vehicle should be equipped with the recommended suspension application including the proper tire size and the recommended full rated load should not be exceeded. See Minimum Tire Size—Tire Pressure and Vehicle Load Chart in this section.

SERVICE PROCEDURES

TIRES

Care of Tires—Cleaning

Some white side wall tires have a colored protective coating that should be removed from the tires before delivery of the car. This protective coating is not as flexible as rubber and will crack. This may introduce sidewall checking if not removed. In no case should the tires be driven more than 50 miles before this coating is removed.

To remove this coating, wet the tire surface thoroughly with warm water and allow it to soak for one minute. Using a soft bristle brush or sponge, wash the protective coating from the tire. This coating may also be removed by steam cleaning. DO NOT USE GASOLINE OR OTHER SOLVENTS. DO NOT USE A WIRE BRUSH.

After the car is in service, ordinary road dirt that

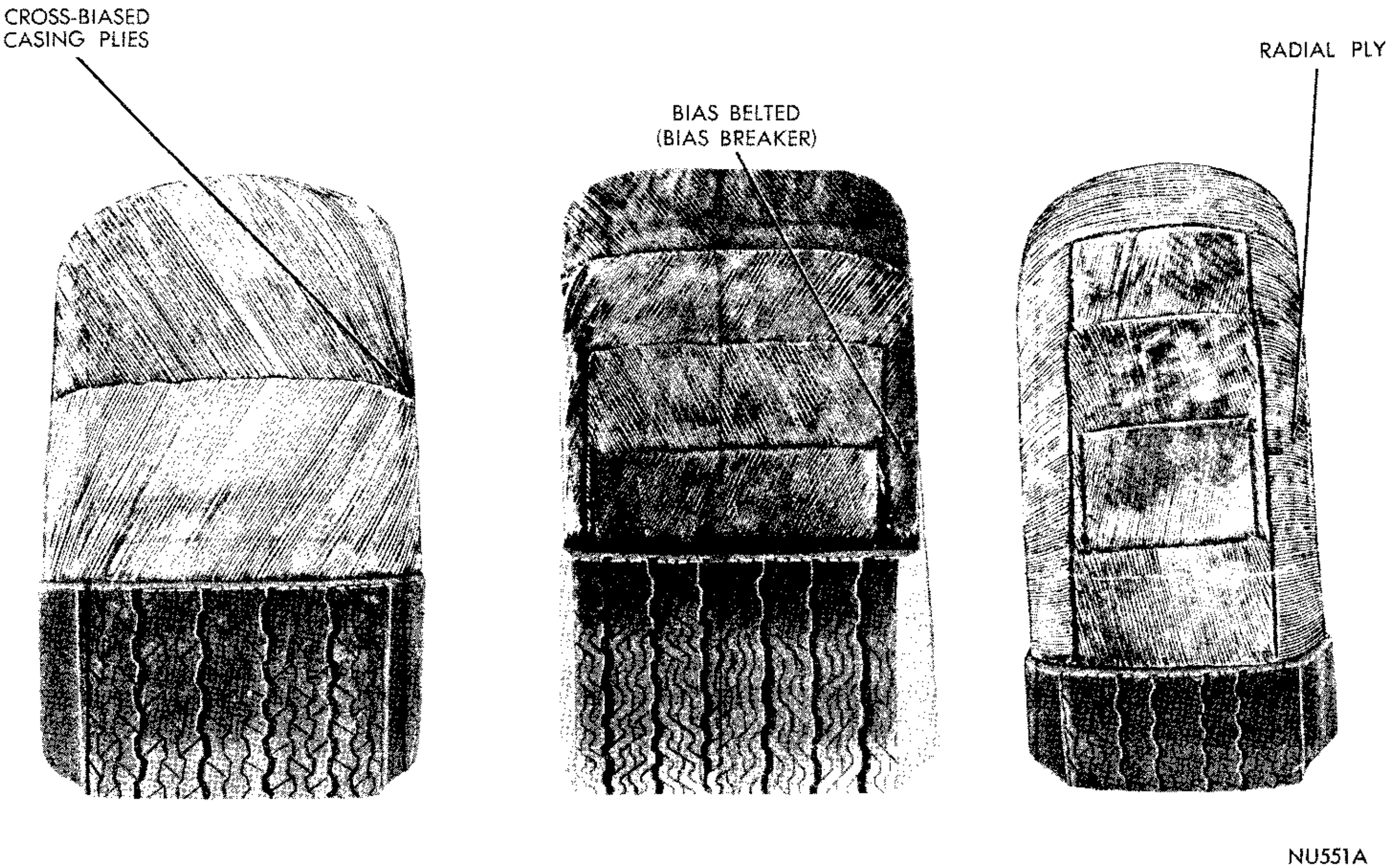


Fig. 1—Tire Cord Angles

collects on white side wall tires may be cleaned with soap or a non-abrasive cleaner and (if necessary) a soft bristle brush. Under no circumstances should gasoline, kerosene, or any cleaning fluid containing a solvent derived from oil be used to clean white sidewall tires. Mineral oil in any form is detrimental to rubber, and a cleaner with an oil base solvent will discolor or injure any tires.

Inflation of Tires

Tire inflation pressure is one of the most important elements of tire care. Inflation pressures recommended for all vehicle models have been carefully selected to provide a proper balance between ride handling, and tire life. See Tire Inflation Pressure Chart (Rear of this section) or the placard located on the latching pillar of the driver's door.

Tire pressures should be checked at least once a month and should be checked and adjusted before any long trips. **Check and adjust tire pressures with the tires cold if possible.** It is normal for tire air pressure to increase (2-6 psi) due to temperature increases caused by tire flexing. **Under no circumstances should inflation pressure of warm tires be reduced.**

When it is not possible to check tire air pressure cold, assume a (2-6 psi) increase over cold pressures. **It may be recognized that this method is not as accurate as checking pressures when the tires are cold. Always check tire pressure with an accurate gauge.**

Higher inflation pressures than shown on the chart can cause deterioration in ride quality, less resistance to various types of impact bruises, rapid wear at the center of tire treads and poor steering returnability.

Lower tire pressures than those recommended on the chart can result in greater gasoline consumption, rapid wear toward the edges of tire tread, less resistance to rim bruises and various types of ply and tread separation, cord fatigue or breakage and increased steering effort.

Tire valve caps (or valve extensions) should always be reinstalled on the valve and tightened finger tight. They assist in retaining air and also keep foreign material out of the valve.

Tire Rotation

Under normal operating conditions it is recommended that all tires, especially the wide tread 70 series and fiberglass belted type, should be rotated **no later** than every second oil change and should be in correct balance to obtain the most uniform tread wear. Tire inspection at every oil change is recommended and if irregular tread wear is evident, rotation of tires is suggested at that time. Be sure to always adjust tire pressures properly after rotation, especially on station wagons. If vehicle is equipped with styled wheels or a collapsible spare tire, follow

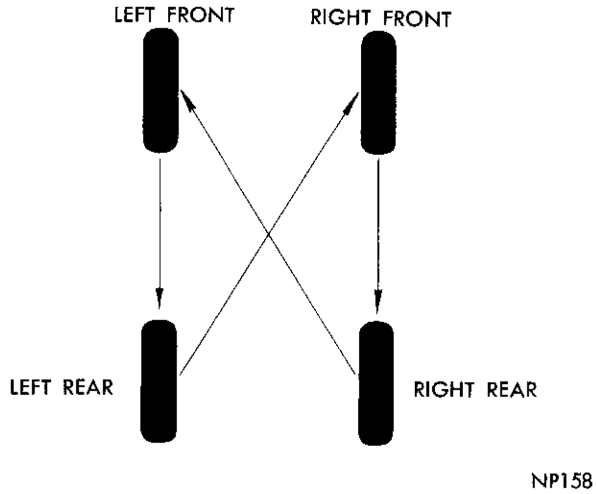


Fig. 2—Tire Rotation Diagram—4 Tires

the 4 tire rotation illustration. Proper tire rotation at the recommended intervals reduces the possibility of tire noise and equalizes tire wear. Figures 2 and 3 are the recommended sequence for the rotation of tires. Under conditions of severe service (trailer towing) they should be rotated more frequently.

Uneven tire wear is frequently the cause of tire induced noises which are attributed to rear axle gears, bearings etc. Unnecessary work is often performed on other chassis components in an effort to correct tire noises.

Radial Ply Tires

Your vehicle is designed for bias belted or cross bias tires of the sizes indicated. The use of radial tires is not recommended particularly on station wagons. Should these radial tires be desired then tire sizes and road wheel diameters must be selected to maintain ground clearance and load capacity equivalent to the minimum specified tires. **Radial ply tires must be used in sets of five (5), and under no circumstances should they be used on the front only. If snow tires are installed on the rear wheels bias belted or cross bias tires must be mounted on the front wheels. Not doing this will result in oversteer and could possibly cause spins on wet or icy roads. The safest policy is never intermix radial ply tires with bias belted or cross bias tires.**

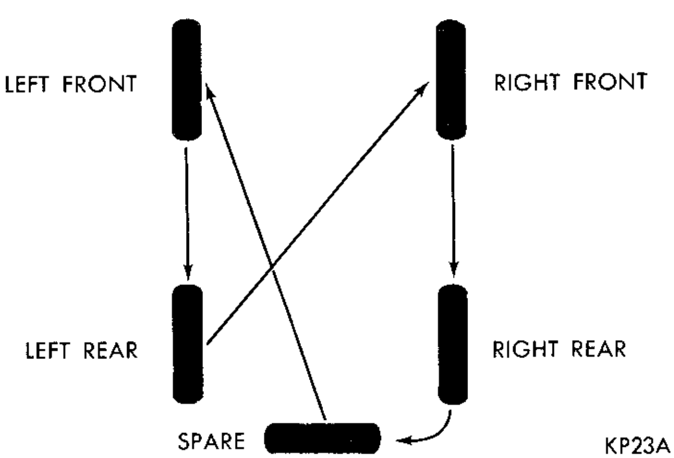


Fig. 3—Tire Rotation Diagram—5 Tires

Wide Tread 70 Series Tires

The use of 70 Series wide tread bias belted or cross bias (again radial not recommended) tires is acceptable on your vehicle if the size is listed in the specification charts. The use of oversize tires of this construction (that are not listed in the specification charts) may cause interference with vehicle components under extremes of suspension and steering travel and may cause tire damage. For maximum satisfaction these tires should be used only in sets of five and under no circumstances should they be used on the front only. If snow tires are used they must also be of the same wide tread—low profile 70 Series design.

REPAIRING LEAKS

Leaks between the tire and wheel require the removal of the tire. Leaks in the tire can often be repaired without removing the tire. Always follow the equipment manufacturers recommendations.

Tools used for dismounting and mounting tires must be smooth, free from sharp edges or burrs which could damage the tire or wheel rim.

The tire must be **completely** deflated before the tire beads are removed from the seats. Before mounting the tire on the wheel, make sure all rust scale is removed from the wheel rim. A mild soap solution applied to both tire bead surfaces will aid in installation. Either a commercial type bead expander or a rope tourniquet can be used to seat the tire beads.

When installing wheels on the vehicle, progressively tighten wheel nuts in sequence shown in (Fig. 4) to proper torque specifications, 65 foot-pounds all models.

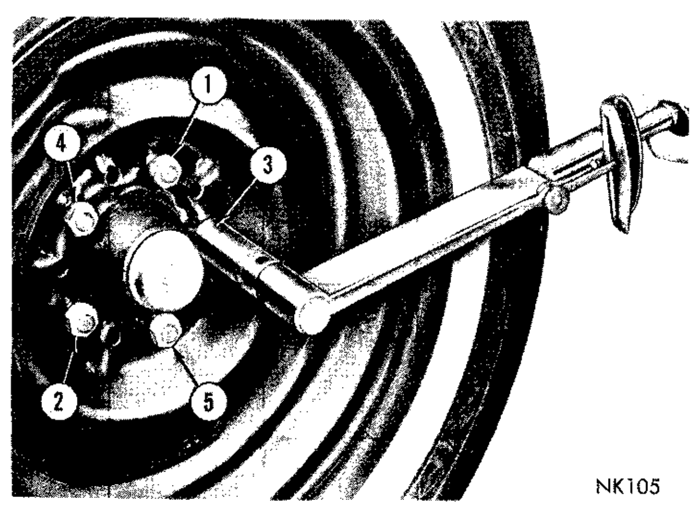


Fig. 4—Wheel Stud Nut Tightening Sequence

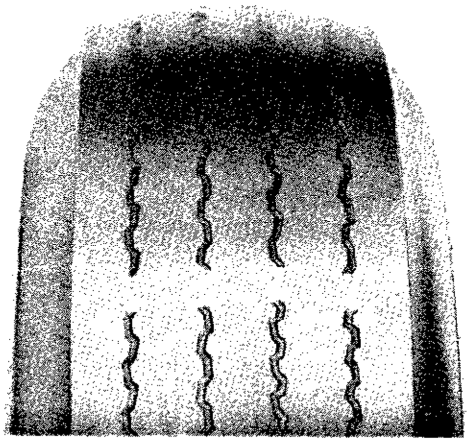

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Fig. 5—Tire Tread Wear Indicator

Tire Tread Wear Indicators

Your potential driving, cornering and braking traction decreases as your tires wear. Furthermore, as the tread depth is decreased the tires have less resistance to road hazards and are more likely to hydroplane on wet pavement. Tread wear indicators have been provided to assist you in determining when your tires are worn so as to require replacement. These indicators are molded into the bottom of the tread grooves and will appear as approximately 1/2 inch wide bands when this tread depth has been reduced to 1/16 inch (Fig. 5). Tire replacement due to tread wear is necessary when these indicators appear in two or more adjacent grooves or a localized worn spot eliminates all the tread.

Tire Noise or Vibration Complaints

To determine whether tires are causing the noise or vibration drive the car over a smooth portion of highway at various speeds and note the effect of acceleration and deceleration on noise level. Axle and exhaust noise change in intensity under these conditions, while tire noise will usually remain constant. If after road testing the vehicle it was determined that tires may be causing the noise, balance all tires very carefully and inflate to 50 psi. Drive the car over the same route at the same speeds as before to determine whether the disturbance has been changed. If the disturbance is changed or eliminated by overinflating the tires, continue the road test by deflating one tire at a time to normal pressure. When the disturbance returns, the last tire deflated will usually be the offender. Tire thump (sometimes referred to as "tramp") usually occurs in the speed range of 20-40 MPH and can usually be located this way. If you have a "thumper", replace the tire.

Tire roughness can be caused by a single tire with two or more "thump" spots in it, or by two or more thumping tires at speeds of 40-70 MPH. To isolate the cause of this condition, you may have to substitute the spare for each of the four tires, with all tires inflated to normal pressure. Tire roughness is recognized as a low-frequency rumble or vibration and is very similar to driveline vibration. Positive separation of the two disturbances can only be accomplished by using a known set of good tires or by towing the vehicle with the propeller shaft removed. To correct tire roughness, replace the offending tires.

Tire Wear Patterns

An inspection of the tires, together with information as to locality of vehicle operation will usually indicate whether abnormal wear is due to operating conditions or to mechanical faults which should be corrected. Various types of abnormal tire wear with their causes and corrective action are shown in (Fig. 6).

CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS
CAUSE	UNDER INFLATION	OVER INFLATION	UNDER-INFLATION OR EXCESSIVE SPEED	EXCESSIVE CAMBER	INCORRECT TOE	WHEEL UNBALANCED
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL			ADJUST CAMBER TO SPECIFICATIONS	ADJUST FOR TOE-IN 1/8 INCH	DYNAMIC OR STATIC BALANCE WHEELS

NN2

Fig. 6—Tire Wear Patterns

Underinflation

For the maximum results in stability and handling, ride quality and tire life, tire inflation pressures should not be allowed to go below the recommended inflation pressures. When a tire is underinflated, this results in much faster wear of the shoulders than of the center of tread.

Overinflation

When tire inflation pressures are maintained within the specifications the tire will wear evenly over the entire tread. A tire that is overinflated wears much faster in the center of the tread.

Cracked Treads

This is the result of alternate under and over inflation, exceeding the recommended full rated load, high temperature and high speed driving.

Excessive Camber Wear

Excessive wheel camber, either positive or negative causes the tire to run at an angle to the road. One side of the tread wears much more than the other. For best corrective results have the front wheel camber adjusted to specifications.

Toe-in or Toe-out Tread Wear

Excessive toe-in or toe-out causes wear on the edges of the front tires. An excessive amount of either toe-in or toe-out actually drags the tire instead of letting the tire roll true. This wear condition will usually produce a tapered or feathered edge on the outside ribs. Have the toe-in or toe-out adjusted to specifications to correct.

Bald Spot, Cupped or Scalloped Tire Tread Wear

Cupping, scalloping and bald spotting of tires is associated with wear on a car driven mostly at highway speeds without the recommended tire rotation and with unbalance conditions. Regardless of the cause of cupped wear on either front tire, no alignment or balance job can prevent future excessive wear of the spots. Once a front tire acquires flat or cupped spots additional wear will continue at a rapid rate. To correct this condition, tire rotation and wheel balance are necessary. A cupped tire will partially true itself up on a rear wheel.

WHEELS

All models use steel drop center wheels. The safety rim wheel (Fig. 7) has raised sections between the rim flanges and the rim well. Initial inflation of the tire forces the bead over these raised sections. Tire-wheel separation under extreme hard cornering is prevented by air pressure and these safety humps. Furthermore, in case of a tire failure, the raised sections help hold the tire in position on the wheel until the car can be brought to a safe stop.

TIRE-WHEEL BALANCE

The need for tire and wheel assembly balancing is indicated by heavy vibration of the steering wheel when driving at speeds above 40 miles an hour.

Static (still) balance is equal distribution of the weight of the wheel and tire around the spindle, so that the assembly has no tendency to rotate by itself. An assembly that has a heavy spot is statically out of balance and can produce a bouncing motion.

Correction for static unbalance is made by first finding the location of the heavy spot, then adding sufficient weight to counterbalance it (follow the equipment manufacturers recommendations.) Half the balance weight should be added to the inside of the wheel and the other half to the outside to prevent excessive dynamic unbalance.

A wheel and tire, to be in dynamic balance, must first be in static balance and also be in balance from inside to outside. A wheel not in dynamic balance can produce wobble or shimmy.

TIRE AND WHEEL RUNOUT

Wheels and tires may be measured for both radial and lateral runout. Radial runout (eccentricity) is the difference between the high and low points on the tread of the tire; lateral runout is the "wobble" of the wheel and/or tire.

Prior to measuring the wheel or tire for runout, the accuracy of the drum at the mounting bolts

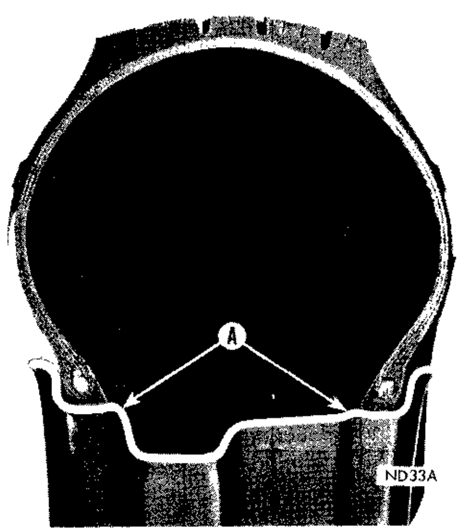


Fig. 7—Safety Type Rim

should be determined. The car should be driven a short distance and immediately lifted off the ground before the measurement is made so that "flat-spotting of the tire (from being parked) does not affect the runout measurement.

(1) Attach dial indicator C-3339 to a firm base so it will be held steady while taking the runout readings.

(2) Place plunger of dial indicator against one of the center ribs of the tire tread and rotate the assembly slowly to measure radial runout. This measurement should not exceed .080 inch.

(3) To measure lateral runout, position the dial indicator against the side of the tire. This measurement should not exceed .105 inch.

Rotating the tire on the wheel may reduce runout or it may be necessary to take dial indicator measurements of the wheel itself in order to determine which unit has the excessive runout. Measure runout at the protected areas "A" and "B" (Fig. 8), where the tire bead pilots. The radial runout, "A" should not exceed .035 inch. The lateral runout "B", should not exceed .045 inch. **Under no circumstances should point indicated by "C" be used for measuring wheel runout as this metal has been sheared in the manufacturing process and is not an even surface.**

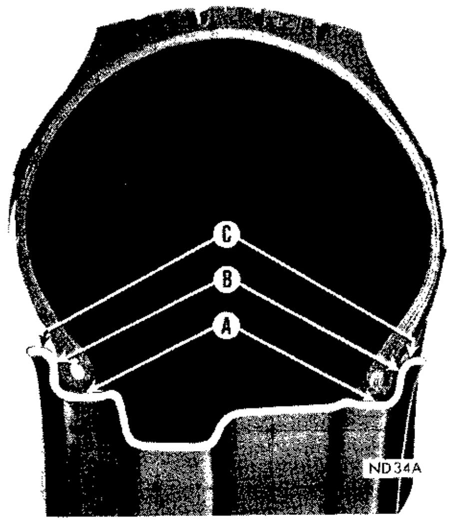


Fig. 8—Runout Checking Area

WHEEL COVERS

To avoid damaging the wheel covers during removal and installation, care should be used to be sure the forces are applied to the correct area of the covers. To install the wheel covers, insert the tire valve through the cover valve hole and seat this portion of the cover **completely.** Apply force 180° from the valve hole to complete the installation. When removing the wheel covers, pry completely loose 180° from the valve hole first. Continue prying toward the valve hole until covers are loose. **Do not remove the wheel cover at the valve stem hole.** The covers are structurally stronger at the outer circumference to withstand the force required for removal and installation. Use a rubber end mallet when installing the covers.

BEARINGS

FRONT WHEEL BEARING LUBRICATION

Front wheel bearing lubricant should be changed at the recommended intervals or at the time of normal brake reline. Lubricant should not be added to that already in the bearings.

Removal (without Disc Brakes)

(1) Raise vehicle so front wheels are free of the floor.

(2) Remove wheel cover, grease cap, cotter pin, nut lock and bearing adjusting nut.

(3) Remove thrust washer and outer bearing cone.

(4) Slide wheel, hub and drum assembly off the spindle.

(5) Drive out inner oil seal and remove bearing cone.

Removal (with Disc Brakes)

(1) Raise vehicle so front wheels are free of floor.

(2) Remove wheel cover and loosen and remove wheel nuts and remove wheel and tire assembly.

(3) Remove grease cap, cotter pin, nut lock and bearing adjusting nut.

(4) Remove bolts that attach disc brake caliper assembly to steering knuckle.

(5) Slowly slide caliper assembly up and away from brake disc and support caliper assembly on steering knuckle arm. CAUTION: **Do not leave caliper assembly hang by brake hose, as possible brake hose damage may result.**

(6) Remove thrust washer and outer bearing cone.

(7) Slide wheel hub and disc assembly off the spindle.

(8) Drive out inner seal and remove bearing cone.

Cleaning and Inspection

(1) Clean the hub and drum assembly and the bearings in kerosene, mineral spirits or other similar cleaning fluids. **Do not dry the bearings by air spinning.**

(2) Examine bearing cups for pitting, brinnel marks or other imperfections. If cups are damaged, remove them from the hub with a soft steel drift positioned in the slots in the hub.

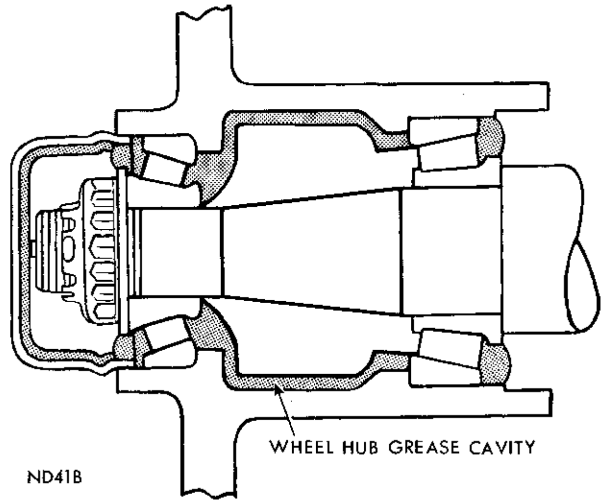


Fig. 9—Wheel Hub Grease Cavity

(3) Bearing cup areas in the hub should be smooth without scored or raised metal which could keep the cups from seating against shoulders in hub.

(4) The bearing cones and rollers should have smooth, unbroken surfaces without brinnel marks.

The ends of the rollers and both cone flanges should also be smooth and free from chipping or other damage.

Installation (without Disc Brakes)

(1) If the bearing cups were removed, start the new cups into hub evenly, driving them flush with hub using a soft steel block and hammer. Seat cups against shoulders of hub, using a soft steel drift and hammer.

(2) Fill hub grease cavity (Fig. 9) with recommended wheel bearing lubricant. Lubricant should be even with inner diameter of bearing cups.

(3) Force lubricant between bearing cone rollers or repack using a suitable bearing packer.

(4) Install inner cone and a new seal, with lip of seal facing inward. Using Tool C-3893, position seal flush with end of hub. The seal flange may be damaged if tool is not used.

(5) Clean the spindle and apply a light coating of wheel bearing lubricant over the polished surfaces.

(6) Install wheel tire and drum assembly on spindle.

(7) Install outer bearing cone, thrust washer and adjusting nut.

Installation (with Disc Brakes)

(1) If bearing cups were removed, start new cup into hub evenly, driving them flush with hub using a soft steel block and hammer. Seat cups against shoulders of hub, using a soft steel drift and hammer.

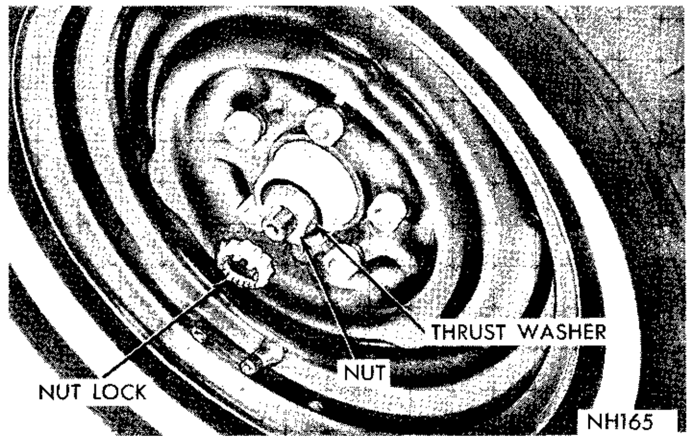


Fig. 10—Front Wheel Bearing Adjustment

(2) Fill hub grease cavity (Fig. 9) with recommended bearing lubricant, see Lubrication Group 0. Lubricant should be even with inner diameter of bearing cups.

(3) Force lubricant between bearing cone rollers or repack using a suitable bearing packer.

(4) Install inner cone and a new seal with lip of seal facing inward. Using Tool C-3893, position seal flush with end of hub. The seal flange may be damaged if tool is not used.

(5) Clean the spindle and apply a light coating of wheel bearing lubricant over the polished surfaces.

(6) Install hub and braking disc assembly on spindle and install outer bearing cone, thrust washer and adjusting nut.

(7) Slowly slide caliper assembly down on brake disc assembly and position correctly.

(8) Install caliper assembly over disc and align mounting holes. Install mounting bolts and tighten to 45 to 60 foot-pounds.

(9) Install tire and wheel and tighten wheel nut to specifications.

Adjustment

(1) Tighten wheel bearing adjusting nut to 90 inch-pounds while rotating wheel.

(2) Position nut lock (Fig. 10) on nut with one pair of slots in line with cotter pin hole.

(3) Back off adjusting nut lock assembly one slot and install cotter pin. **The resulting adjustment should be zero (no preload) to .003 inch end play.**

(4) Clean the grease cap, coat inside with wheel bearing lubricant (do not fill) and install.

(5) Install wheel covers and lower vehicle to floor.

SPECIFICATIONS

MINIMUM TIRE SIZE AND INFLATION PRESSURES—CHRYSLER-IMPERIAL

Your vehicle, when equipped with the minimum specified tire size shown in the Minimum Tire Size Chart and inflated to the corresponding maximum vehicle capacity pressure listed in Tire Pressure Chart, is designed to operate at any load up to and including the maximum vehicle capacity at all normal highway speeds (up to 75 mph). Owners who prefer a softer ride may use the optional reduced inflation pressure if the load carried is five passengers or less (750 pounds maximum) and the vehicle speed does not exceed 75 mph.

Model & Body Style	Minimum Tire Size	Standard Wheel Size	Maximum Vehicle Capacity (Pounds)	Inflation Pressure—Cold				Tire Load Range	Optional Allowable Tire and Wheel Size
				Maximum Vehicle Capacity		5 Passengers or less			
				Front	Rear	Front	Rear		
Newport-300 Sedans-Hardtops	H78-15	5-1/2 JJ**	1100 Lbs.	26	26	24	24	B	J78-15* or H70-15* or L78-15* with 6JJ Wheel
New Yorker Sedans-Hardtops	J78-15*	6 JJ	1100 Lbs.	24	24	—	—	B	L78-15* with 6JJ Wheel
Town & Country Wagon	L78-15* with dual air-conditioning. J78-15* w/o dual air-conditioning	6-1/2 JJ	1200 Lbs.	22	32	—	—	B	————
Imperial All Models	L78-15*	6 JJ	1100 Lbs.	24	24	—	—	B	————

**Chrysler 300 equipped with 6JJ Wheel

(1) For All Load Conditions Up To And Including Vehicle Maximum Capacity. Vehicle Maximum Capacity—Sedans, Hardtops, Convertibles; Front Seat—3 passengers; Rear seat—3 passengers; Luggage 200 Lbs.; Total 1100 Lbs. Vehicle Maximum Capacity Town and Country Wagons; Front seat—3 passengers; Rear seat—3 passengers; Third seat—2 passengers or 300 Lbs. luggage; Total 1200 Lbs.

(2) Optional Reduced Vehicle Loading for Improved Ride—Sedans, Hardtops, Convertibles; Front seat—2 passengers; Second seat—3 passengers; Luggage 0; Total 750 Lbs.

(3) The indicated pressures are essential to provide optimum station wagon directional stability. Under all loading conditions the 10 psi tire pressure difference, 22 psi front—32 psi rear, as shown on the tire pressure charts and placard, must be maintained. The low front tire pressure is practical because of the large tires installed on these vehicles to insure proper capacity for the more heavily loaded rear cargo area.

* **Chain Clearance**
Tire snow chains are not recommended for use with some tire sizes, as indicated on the Tire Size Chart by the symbol*, because of possible fender interferences. In an **emergency,** chains may be used on these tires if the vehicle is moderately loaded and driven cautiously.

TRAILER TOWING TIRE SIZE AND INFLATION PRESSURES

Model & Body Style	Tire Size	Wheel Size	Tire Load Range	Inflation Pressure Cold	
				Front	Rear
Newport-300 Sedans-Hardtop-Convertible	H78-15	6JJ	B	28	28
New Yorker Sedans-Hardtops	J78-15	6JJ	B	28	28
Town & Country Wagon	L78-15	6-1/2 JJ	B	22	32
Imperial (All)	L78-15	6JJ	B	26	26

1. Cold inflation pressures must not exceed 32 pounds per square inch (PSI) for load range B (4 ply rating) and 40 psi for load range D (8 ply rating) tires. These tire pressures may increase as much as 6 psi when hot. Do not reduce this normal pressure buildup. Cold tire inflation is defined as the pressure after the vehicle has been inoperative for at least three hours and driven less than one mile.

2. All tires must be inflated 4 psi more than specified in the chart but not to exceed pressures indicated above in note No. 1 for sustained speeds above 75 mph. Sustained speeds above 75 mph are not recommended when the 4 psi pressure adjustment would require pressures greater than the allowed maximum indicated on the tire sidewall.

Load Range D (eight ply rating) tires inflated an additional 6 psi, but not to exceed 40 psi, are required for these instances where maximum vehicle capacity is carried above 75 mph and maximum allowable load range B (4 ply rating) tire pressures would be exceeded.

We strongly discourage excessive speed, however, if the vehicle must be driven at sustained speeds over 90 mph special high speed tires inflated to maximum vehicle capacity pressures are required.

3. The use of tires smaller than the specified minimum or larger than the specified maximum could constitute a safety hazard.

4. Cargo loads, particularly in station wagon models, should be distributed as far forward as possible.

5. Vehicles with luggage racks do not have a maximum vehicle capacity greater than indicated in chart.

6. Vehicles with trailer towing packages do not have increased maximum capacity. The allowable passenger and cargo load must be decreased an amount equal to the trailer tongue load on the trailer hitch.

7. Because of vehicle limitations, oversize, 70 Series or load range D (8 ply rating) tires do not provide increased vehicle capacity. They do, however, provide an extra margin of tire service (tread life, etc.). Do not exceed the maximum tire size stated in chart.

8. Snow tires should not be operated at sustained speeds over 70 mph. These tires should be operated at maximum vehicle capacity pressures under all load conditions.

9. All tires and especially the wide tread 70 Series, bias breaker and radial types must be rotated no later than every second oil change and should be in correct balance to obtain the most uniform tread wear. Tire rotation at shorter intervals is recommended if irregular tread wear develops.

	Newport	300	New Yorker	Imperial
WHEELS				
Type	Steel Disc			
Rim	Drop Center—Safety Wheel			
Size—Standard	15 x 5-1/2 JJ	15 x 6JJ	15 x 6JJ	15 x 6JJ
—Station Wagon	—	—	15 x 6-1/2 JJ	—
No. of Wheel Nuts	5	5	5	5
Stud Size	1/2"-20	1/2"-20	1/2"-20	1/2"-20
Stud Hole Circle	4-1/2"	4-1/2"	4-1/2"	5"
Wheel Nut Torque	65 ft-lbs.	65 ft-lbs.	65 ft-lbs.	65 ft-lbs.
Bearing Nut Torque (Wheel Spinning)	90 in-lbs.	90 in-lbs.	90 in-lbs.	90 in-lbs.
TIRES				
Type	Tubeless			
Size	(See Minimum Tire Size Chart in this Section)			

TIGHTENING REFERENCE

	Pounds Foot	Pounds Inch
Wheel Bearing Nut (With Wheel Spinning)		90
Wheel Stud Nut	65	

BODY AND FRAME

CONTENTS

GENERAL INFORMATION

"Unibody" Construction

The featured "Unibody" construction is one in which the body shell and underbody (frame) are welded into one unit.

To achieve rigidity and strength of the body-shell, two additional heavy-duty crossmembers, one under the rear seat and the other at the extreme rear of the body are welded to the box side rails.

Heavy duty roof bows are used providing greater strength to the roof panel. The front door hinge pillar is one continuous piece from the roof rail to the body sill. Sheet metal seams overlap for improving sealing. Metal cages, welded to the outside of the cowl side panels, enclose the retaining nuts for attaching fenders and hood hinge supports. Inner hinge reinforcements assure door alignment and maintain proper door adjustment.

The radiator support, fender wheelhousings and cowl panels are attached to the body, adding structural strength to the fore-structure and the body.

MAINTENANCE AND CARE

INDEX

GENERAL INFORMATION

The procedures for maintaining "new car" appearance of material covered in the APPEARANCE section are those most generally used. The final results may vary due to application of agents by persons inexperienced at this work and also from the type of foreign element on the material. **For satisfactory results, appearance maintenance should be performed by qualified experienced personnel using the recommended agents and established service procedures.**

APPEARANCE

CONVERTIBLE

Never lower a wet top. Dampness may cause formation of mildew, and damage to the fabric will result.

Top—Frequent brushing and vacuuming will keep the top free of abrasive dust and dirt. When washing, the top material should be thoroughly wet.

For scrubbing, use only a soft, natural bristle hand scrub brush. Use warm water and naphtha bar type soap as the cleaning agent. Do not wash in direct sunlight. Scrub with soap suds, starting in the center and gradually working toward the edges. Rinse with clean water to remove all traces of soap. Allow to dry completely before lowering.

Backlight—The backlight (rear window) is a solid tempered glass.

Top Boot and Well—Remove all abrasive dust and dirt from boot and well by brushing or vacuuming. For scrubbing, use only a soft, natural bristle hand scrub brush. Use warm water and naphtha type bar soap. Rinse with clean water. Use a soft absorbent cloth to dry.

VINYL ROOF COVERING

In a well ventilated area, saturate a clean cloth with recommended Vinyl Roof Cleaner and Conditioner. Wipe surface using a circular motion. With another clean cloth, wipe excess material from top. Allow to dry for ten minutes.

INTERIOR TRIM

Most stains can be removed 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 helpful, to know the nature of the staining matter so the correct cleaning agent may be used.

General Instructions: Use a piece of clean cotton cheesecloth approximately 3″ x 3″. Squeeze most of the liquid from the fabric and it is less likely to leave a ring. Wipe the soiled fabric very lightly with a lifting motion. Always work from the outside toward the center of the spot. Turn the cheesecloth over as soon as one side becomes stained to prevent working the stain matter back into the cleaned portion. Use clean cheesecloth as soon as both sides become stained.

Testing For Type of Material—Natural cloth will burn like string, slow and smoky. Synthetic material such as nylon, burns fast and "balls up" into a hard mass. Sample material for testing can be found under the seat cushion, sun visor and dome light brackets, or back of the trim panels. Another method of testing is to rub the back of a fingernail over the surface of the material. Synthetic materials appear to "whistle" when this is done.

Body Cloth — Knit Type Insert — Spot Cleaning — (Grease, oil, adhesive, crayon, lipstick, similar stains and any stains of undetermined origin). Wipe off as much of the staining material as possible with clean cheesecloth. Using K2R aerosol spotlifter, or equivalent, spray stained area from a distance of 8 to 10 inches. Allow to dry (a white powder will form). Brush or vacuum powder from surface. Repeat operation should any stain remain.

Entire Insert—Cleaning Only—(Waterspots, dirt, foodstains, coffee and other water borne stains). Vacuum or brush off as much of the staining material as possible. Shield adjacent cushion or back (not to be cleaned) to prevent wetting. Use a wiping motion outward from the contaminated area to the edges of the insert with clean lukewarm water and clean cheesecloth. Rub with water until entire insert is wet. **Do not soak insert.** If clear water did not remove soil, use cleaner D-5, or equivalent, diluted one part cleaner to one part water and again clean entire insert.

Entire Insert or Pipe—Cleaning Only—(Grease, oil, adhesive, crayon, lipstick and similar stains). Wipe off as much of staining material with clean cotton cheesecloth. Wet another piece of clean cheesecloth with the recommended spot remover and fabric cleaner, or equivalent and squeeze out excess cleaner until cheesecloth is drip free. Use a wiping motion outward from the stained area to the edges of the pipe or bisquit and clean complete area. Unfold cheesecloth to expose clean areas frequently so staining material being removed is not re-deposited on fabric. Continue until foreign matter is no longer visible and entire fabric cover or individual pipe or bisquit is dampened. In cases of severe staining, a second cleaning may be required. Be sure to use the minimum amount of solvent required to clean affected area. **Excessive solvent may damage the foam underpadding.**

Oil and Water Repellent Application—The cleaned area must be completely dried before applying repellent. **Perform following operation only in a well ventilated area. Avoid prolonged breathing of vapors or contact with eyes.** Using Scotchgard Fabric Protector, or equivalent, hold spray can 6 to 8 inches from fabric and with slow back and forth sweeping motions, spray fabric until evenly wet. **Be sure to overlap spray patterns.** Repeat spraying operation with a spray pattern perpendicular (at 90 degrees) to the first application. Allow to dry for a minimum of one hour before fabric is sat on.

Spots and Stains—When using water to remove a spot, be sure to wash entire section after spot has been removed to avoid water stains. Before cleaning seats, door panels, headliners, etc., remove as many spots as possible.

Use a putty knife to break up and remove encrusted foreign matter. Vacuum thoroughly.

Apply the recommended spot removing agent with a clean cloth or sponge. Work in a wide circle to prevent making a ring and work toward center.

Surface Spots—Brush out with a small hand brush, using care not to damage fabric when brushing.

Deep Penetrating Spots—Apply the spot removing agent by brushing. When spot is thoroughly worked and saturated, use high air pressure to blow dirt down through material. Occasionally the entire spot may not be removed and it will then be necessary to cover the area with a light application of dye.

Water Stains—Water stains in fabric materials can be removed with a cleaning solution made from one cup of ordinary table salt and one quart of water. Vigorously scrub solution into stain and rinse with clean water. Water stains in nylon and other synthetics should be removed with a commercial type spot remover compounded for the specific material being cleaned.

Mildew—Clean area around mildew with warm suds. Rinse with cold water, soak mildew area with solution of one part common table salt and two parts water, then wash with the recommended upholstery cleaner.

Rust Stains—Keep rust remover solution away from your skin. Wash hands immediately if exposed. Clean extra well under fingernails. Read instructions on the bottle before using. Wrap a small strip of cloth around each button to avoid leaving a ring on upholstery material.

Dampen the stained area with water. Apply a commercial rust remover solution. Sponge with clean water to clean rust from upholstery buttons. Moisten buttons with a few drops of water applied with a small piece of sponge or cloth. Apply one or more drops of rust remover. Fast dry clean areas with heat lamps.

Chewing Gum and Tar—Avoid using spotting or cleaning solution that will dissolve or soften gum or tar. Place a cube of ice on gum or tar to harden it. Remove as much as possible with a dull knife when it is in this hardened state. Moisten remainder with cleaning fluid and scrub clean. In some cases soak with cleaning fluid and blow the stain through using high air pressure.

Ice Cream and Candy—Use a putty knife to remove as much substance as possible. Use care not to damage fibers of upholstery. Most candy has a sugar base and can be removed by rubbing area with a cloth wrung out in warm water. An **oily type of candy,** after using warm water, should be cleaned with an upholstery type cleaner that will emulsify with the oil. Rinse with water and remove remaining stains with cleaning fluid.

Bloodstains—Never use warm or hot water. Use a clean cloth wrung out in cold water and rub the stain. If stain is not completely removed use spot remover or vinyl cleaner and apply with a brush.

Wine or Alcohol—Avoid use of soap. Scrub stain with a cloth moistened in luke warm water. Remove remaining stains with a regular cleaning solution.

Shoe Polish—Scrub area with a cloth saturated with cold water. Remove wax base polishes by sponging with spot remover.

Grease, Oil, Lipstick and Related Stains—Use spot remover to avoid leaving a ring. Cleaning from outside of spot and work toward center. When spot has been removed, dry fabric with a clean cloth.

Urine—Sponge the stain with a clean cloth saturated with lukewarm soapsuds (mild neutral soap) and then rinse well by rubbing the stain with a clean cloth dipped in cold water. Then saturate a clean cloth with a solution of one part household ammonia water and five parts water. Apply the cloth to the stain and allow solution to remain on affected area for one minute; then, rinse by rubbing with a clean wet cloth.

Nausea—Sponge with a clean cloth, dipped in clear cold water. After most of the stain has been removed in this way, wash lightly with soap (mild neutral), using a clean cloth and lukewarm water. Then rub with another clean cloth dipped in cold water. If any of the stain remains after this treatment, gently rub clean with a cloth moistened with a volatile cleaner.

Headliners—Cloth Type—Mix a solution of water and a foaming type upholstery cleaner (as shown on the container) to produce thick suds. Use **only** foam when cleaning, as saturation with liquids may result in streaks, spots or shrinking.

On nap type, lay down nap, usually left to right. Do not stop, when washing a headliner. Complete the entire operation at one time using the same cleaning solution.

Starting in a rear corner, clean only one or two sections at a time. Thoroughly work suds into cloth with a natural sponge. Use circular or short back and forth strokes to remove all dirt. When the sponge glides easily, leaving an even distribution of foam and headliner appears clean, finish cleaning with sweeping motions in one direction.

Hard Board Type—Apply a solution of upholstery cleaner and water with a sponge. Use circular or short back and forth stroke and wipe with a dry clean cloth. If headliner is extremely dirty, wash with vinyl cleaner using the same procedure.

Vinyl Type—Apply vinyl cleaner with a sponge (or if extremely dirty scrub with a brush) wipe clean with a dry clean cloth.

Seats and Door Panels—Mix one pint upholstery cleaner to one gallon of water. If extremely dirty, add more cleaner to solution.

Do not soak around buttons. Scrub thoroughly with a brush or sponge. **Avoid over soaking the material,** do one section at a time only. Frequently stains will be evident when material is damp but will disappear when dry. Use care not to damage fabric by attempting to brush out "stubborn" spots. Spots should be removed before washing. After part has been scrubbed, remove loosened dirt by rubbing area briskly with a clean cotton towel or soft rag. Make final strokes on one direction.

Nylon or Synthetic Fabrics—For average conditions use methods and materials used in washing cloth upholstery. When material is extremely dirty, use multipurpose cleaner full strength and a stiff scrub brush. Scrub thoroughly in all directions. Wipe off dirt and excess cleaner with a clean cotton towel or soft rags.

Leather, Leatherette or Vinyl Fabric—Use multipurpose cleaner full strength and a stiff scrub brush. Apply to surface and let set for two (2) minutes then scrub thoroughly. Clean between all seams and in all cracks and underneath beading. Wipe off dirt and excess material with a clean cotton towel or soft rag.

Package Shelf-Hard Board Type—Clean using a solution of upholstery cleaner. **Avoid water logging the backing, dry immediately.**

Vinyl Type—Clean using multi-purpose cleaner. Dry with clean toweling or rags.

Side Cowl Trim Panels—Leather—Vinyl—Metal Types—Use multi-purpose cleaner full strength. Use a stiff brush and apply to surface, let set (2) two minutes then scrub thoroughly. Clean seams, cracks and beneath beading. Dry with a clean soft towel or rag.

Glove Compartment—Some glove compartments are made of a cardboard type material. Do not waterlog. Vacuum thoroughly. Clean with upholstery cleaner or vinyl cleaner.

Rubber Mat—Vacuum thoroughly and clean with upholstery cleaner or multi-purpose cleaner. Use toweling or rags to remove dirt and excess cleaner.

Carpeting—Thoroughly vacuum. Mix one pint of upholstery cleaner to one gallon of water. If carpet is faded, discolored or spotted, add upholstery tint to this solution. To determine the right color shade, add tint in small quantities only. Test by dipping a white rag into solution, wring out and inspect shade. **The dye will dry a shade or two darker.** With a stiff brush apply solution and scrub carpet vigorously. Lay nap down in one direction. When dry, fluff carpets by rubbing with a dry brush.

Salt Stains—Vacuum carpet thoroughly. Use a solution made from water and a heavy concentration of ordinary table salt. Soak the stained area to loosen embedded salt (use a wire brush, if necessary). Wash entire carpet with the recommended cleaner. Additional washing may be necessary for satisfactory results.

Luggage Compartment—Remove all items from compartment. Use a steel brush to loosen rust and caked dirt and vacuum thoroughly. Wash with upholstery cleaner or multi-purpose cleaner and dry with clean toweling or rags.

Cargo-Area (Station Wagon)—Follow same procedure used for Luggage Compartment.

Color Restoration or Change—Tints and dyes should be applied by reliable experienced personnel. Dyes or tints can be applied when stains persist, after cleaning, or a change in color is desired. **The instructions for mixing and applying the color must be followed precisely.** Use only those recommended for the exact material being worked on.

Leather and Vinyl Sealers—To repair holes cut material about 1/2 inch larger than area being repaired. Position patch under hole and apply sealer to contacting areas. Apply masking tape over tear to hold edges in place until sealer dries. After sealer has dried, remove tape and trim all rough edges. Fill visible cracks with sealer. **Use a step application procedure in filling deep cracks.** After sealer has thoroughly dried, sand lightly with #400 grade sandpaper until smooth. Apply color to repaired area.

POLISHING—Acrylic Finishes—Polish at least twice a year to remove all foreign film. When polishing use one pad, made from cheesecloth or an old "turkish" towel, to apply polish and another to remove dried film. Test area by rubbing fingers over polished surface. If not thoroughly cleaned, smears of polish will show.

Sand Scratches—Overspray—Foreign Material—Minor conditions can be removed using the following procedure:

(1) Using oleum spirits, mineral spirits or kerosene, hand sand affected surface with No. 600 paper.

(2) Remove all sanding sludge.

(3) Machine polish the sanded surface using rubbing compound until the surface is completely free of scratch marks. Blend with adjacent areas.

(4) Buff surface with a clean lambs wool pad using a liquid type final polish. If the appearance of the polished area is noticeably different than adjacent areas, completely buff the adjacent panels. If necessary, polish complete side or horizontal surfaces to assure uniform appearance.

(5) Use a clean, soft, cotton cloth, **do not use cheesecloth,** to hand clean all inaccessible areas.

(6) Remove all polish or rubbing compound from mouldings, medallions, name plates or any other exterior ornamentation.

Bright Metals—When cleaning anodized aluminum, use care not to rub through the anodized coating. All bright metal should be thoroughly cleaned at least twice a year.

The product manufacturer recommendations should always be followed. Clean thoroughly, removing all traces of cleaner from corners. Apply and rub out a coat of good body wax. During winter months and in areas in which salt is used, do not rub out wax.

Frequent washing of bright metals by steam necessitate more frequent applications of wax.

TIRES

Do not clean tires with scouring powder, steel wool or other abrasive type cleaners. Clean white sidewall tires with a stiff bristle brush and white sidewall cleaner, or multi-purpose cleaner and rinse with clean water. Scuff marks can be dressed down by sanding lightly with #400 sandpaper.

GLASS

Do not use putty knives, razor blades, steel wool, or other metal objects to remove deposits from glass.

Interior glass surfaces, including convertible backlight, should be thoroughly cleaned weekly to remove all traces of smoke and other films.

Exterior glass surfaces, including convertible backlight, are best cleaned with the use of a commercially made cleaner. **Do not** scrape off smears from bugs, road tars or other similar objects, use warm water or the recommended solvents to remove.

During the winter months, snow, ice and frost can be removed with a plastic or rubber type scraper, or with a commercially made solvent. **Do not use metal objects to remove deposits from glass.**

DRAIN HOLES

The drain holes, in the bottom of cowl plenum chamber, doors and floor sills (rocker panels) should be inspected regularly to insure unobstructed drainage. Remove road tars, mud and other foreign matter immediately. Should bare metal be exposed, surface treat metal and refinish.

The drain holes in the quarter panel well areas are sealed with a removable plastic plug. The plugs should only be removed whenever it is necessary to clean or drain fluids from the well area.

LUBRICATION

To maintain ease of operation, the hood, door, deck lid and tail gate hinges should be lubricated with the recommended lubricants at the recommended intervals. Refer to the Lubrication and Maintenance Group for type of lubricant and lubrication points.

SHEET METAL—DOORS

INDEX

SERVICE PROCEDURES

COWL TOP PANEL SEAL

The cowl top panel seal (Fig. 1) is fastened to the panel by retainers moulded into the seal.

SIDE COWL TRIM PANEL

The side cowl inner trim panel (Fig. 2) is attached to the panel with screws and at the rear lower edge under the floor sill step plate. A silencer pad is used between the trim panel and cowl panel.

Build-Up and Installation

(1) Position cowl side trim panel extension under windshield garnish moulding and install screw.

(2) Apply cement to trim panel and position insulation on cemented area. Hand press to assure positive adhesion and position spring nut on panel.

(3) Position trim panel under clip at upper front and to cowl side inner panel. Install retaining screws.

(4) Install floor sill inner moulding over panel end and install screws.

FRESH AIR VENT CONTROL CABLE

Replacement

The fresh air inlet vent control cable, housing and knob (Fig. 3) is serviced as an assembly. The cable housing shank has two flat edges, indexing with corresponding edges in the panel and is retained on the panel with a nut at the rear. The housing is attached to the vent door bracket with a clip and the coiled cable end is positioned over a pin on the door.

Adjustment

Door adjustment is controlled by the cable housing attachment at the door bracket (Fig. 3). Loosen clip screw attaching the housing to the door bracket and

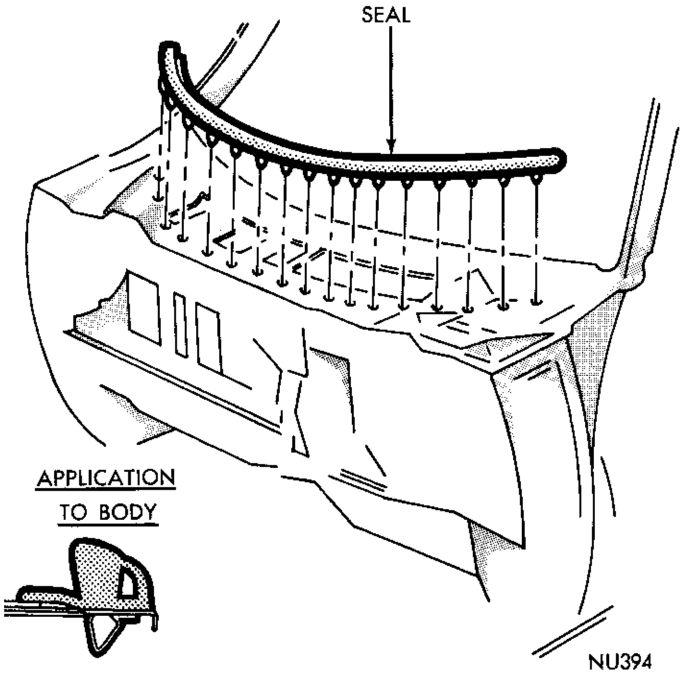


Fig. 1—Cowl Top Panel Seal

push control cable knob to the fully closed position. Holding vent door closed, pull cable housing slack out of door flange. Tighten clip screw and test operation of cable and door.

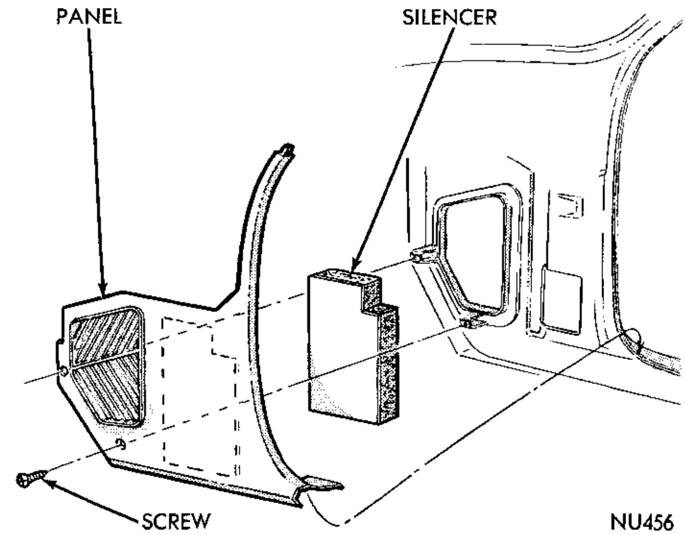


Fig. 2—Side Cowl Trim Panel

VENT DOOR

Removal (Fig. 3)

(1) Remove cowl side trim panel and silencer.

(2) Remove actuator cable housing to door bracket clip.

(3) Slide cable off of pin on door and out of door frame flange.

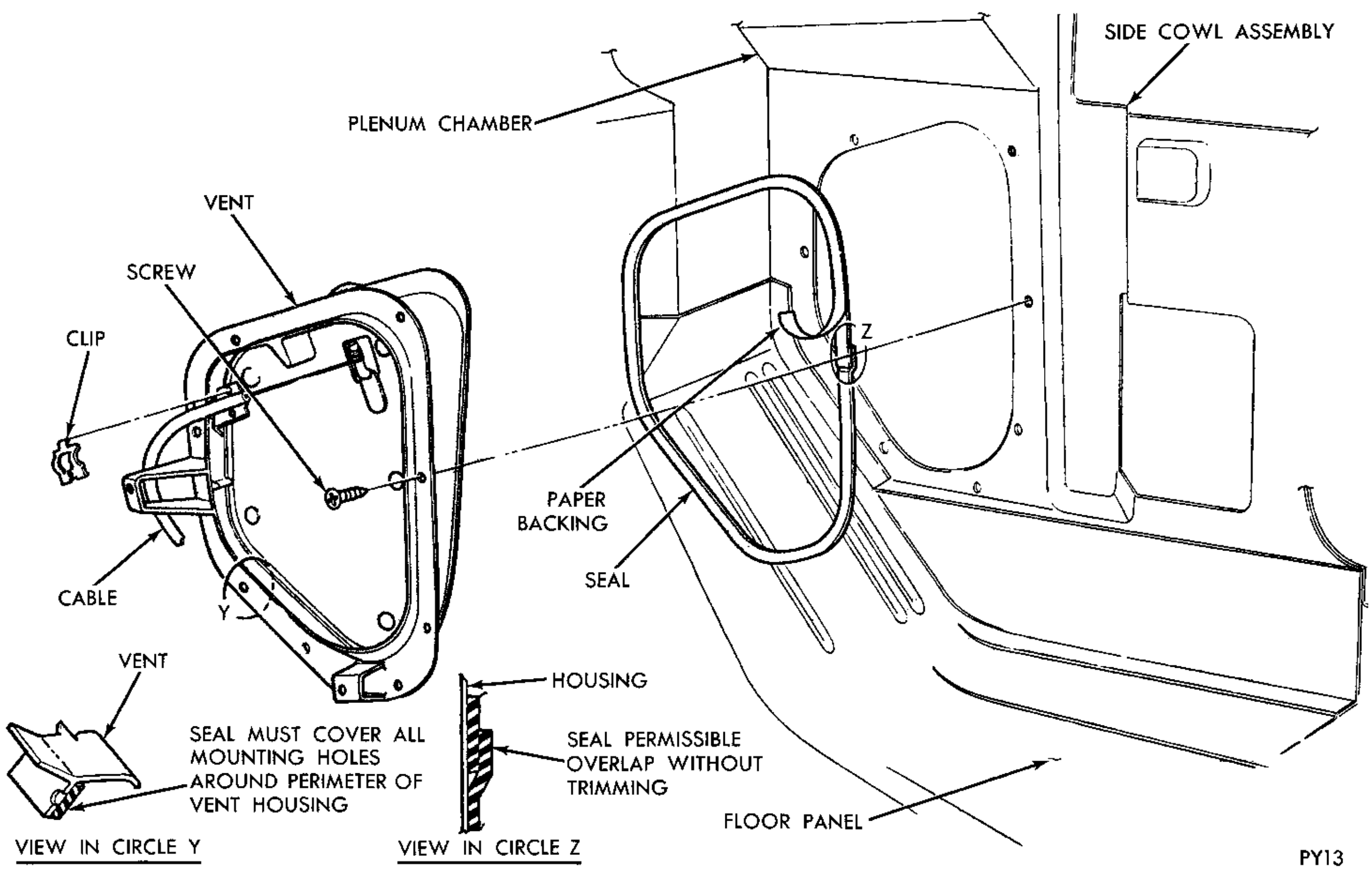


Fig. 3—Side Cowl Fresh Air Vent

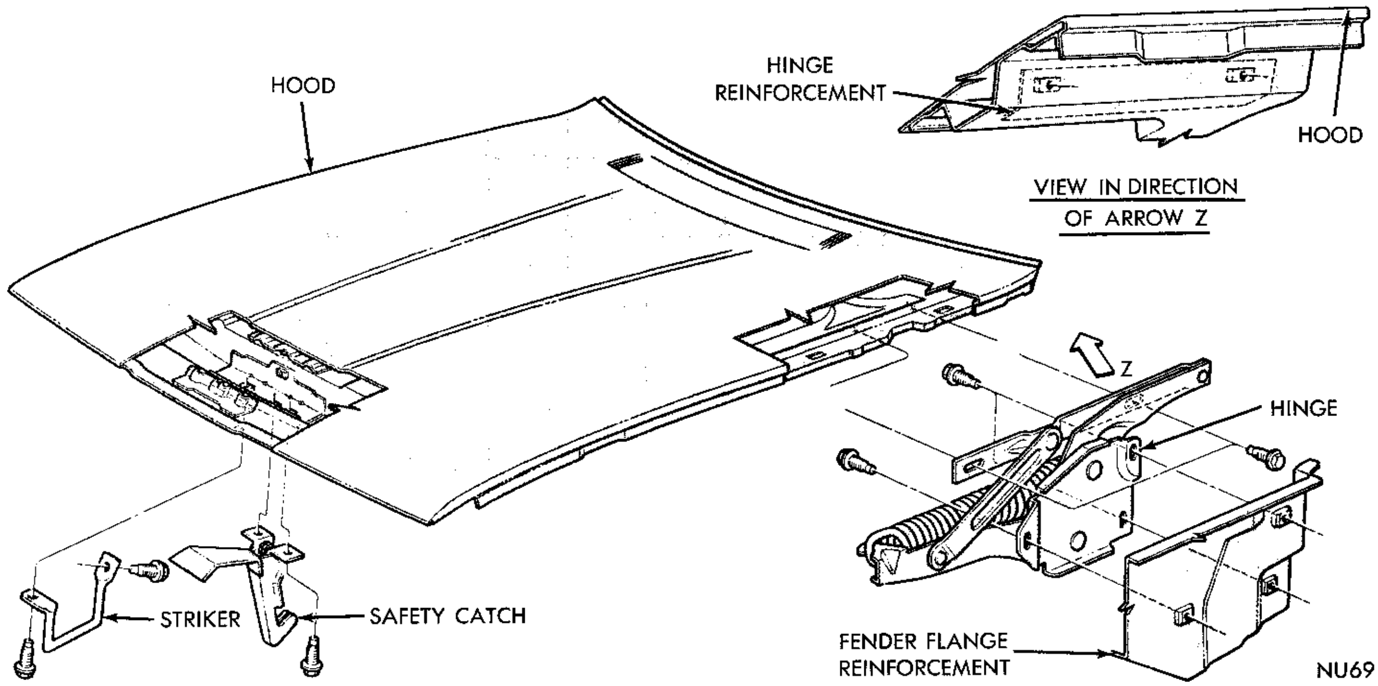


Fig. 4—Hood Application

(4) Remove door to cowl side panel screws.

(5) Remove door and seal assembly and inspect seal for damage.

Installation

(1) Install spring nut to bottom of fresh air door housing, if removed.

(2) Position seal in line with outer edge of housing flange (Fig. 3).

(3) Position fresh air door on cowl side panel, align attaching holes, install attaching screws and tighten progressively.

(4) Insert actuator cable assembly, through hole in door frame flange and install coiled end of cable over pin on door.

(5) Position clip over cable and attach to door bracket.

(6) Adjust vent door cable housing and install trim panel and silencer. (Right side vent **not** available on cars with automatic temperature control).

HOOD

ALIGNMENT

Prior to making any adjustment inspect clearances and alignment of hood sides in relation to cowl, fenders and grille. The cowl adjustment must be made first. Elongated holes in the hinge (Fig. 4) permit the hood to be moved up, down, fore and aft.

REPLACEMENT

Removal

(1) Place a protective covering over cowl and fender area.

(2) Mark outline of hinges on hood to aid in installation.

(3) Use extreme care not to permit hood to slide rearward and damage painted surfaces of the cowl and fender areas when removing hood bolts.

Installation

(1) With an assistant, position hood on hinges and install bolts loosely.

(2) Align scribe markings on hood with hinge and tighten screws lightly.

(3) Close hood and inspect hood alignment.

(4) Adjust alignment and tighten bolts 180 inch-pounds.

(5) Remove protective coverings.

LOCK

To adjust lock (Figs 5 or 6), loosen attaching screws and raise or lower until correct adjustment has been obtained. After making any adjustment requiring shifting of hood, always inspect hood striker and lock for alignment.

HINGE REPLACEMENT

The hood hinge (Fig. 4) is attached to the hood and to the fender splash shield. Prior to removing the hinge mounting screws, prop the hood into the wide opening position. The prop should be positioned so the hood cannot move rearward.

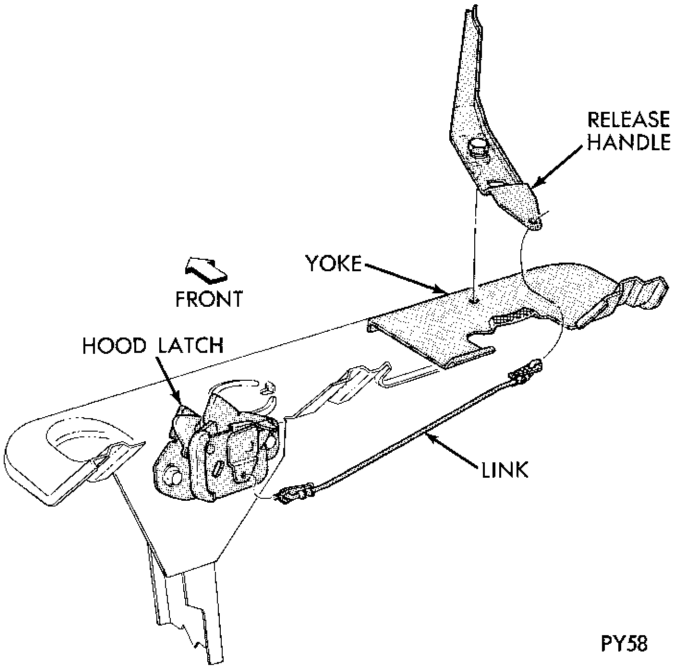


Fig. 5—Hood Latch and Release (Chrysler)

FENDERS

ALIGNMENT

The fender should be adjusted to provide for equal spacing at the cowl, door front edge and door panel top edge. Alignment should be made at bottom of floor sill panel, front of hood and door outer panel upper edge.

REPLACEMENT

Removal

(1) Disconnect battery ground strap.

(2) Tape leading edge of front door and cowl to fender area to avoid damaging paint.

(3) Remove front bumper assembly.

(4) Disconnect head lamp wires and remove grille extension to fender nuts.

(5) Remove fender to cowl, floor sill, wheelhouse and radiator yoke nuts and screws (Figs. 7 and 8).

(6) Remove fender assembly and if necessary, mouldings, ornamentation and headlamp assemblies.

Installation

(1) Install head lamps, mouldings and ornamentation.

(2) Carefully position fender on studs at cowl side area and align fender with mounting holes in radiator yoke. Install all retainer screws and nuts.

(3) With fender correctly positioned, tighten screws and nuts securely.

(4) Connect head lamp wires and install grille to fender nuts. Connect battery ground strap.

FENDER SIDE REFLECTOR

The Chrysler fender side reflector and bezel assembly (Fig. 9) is attached to a recessed area with sealing type screws.

WHEELHOUSE (CHRYSLER)

Remove wheelhouse assembly (Fig. 10).

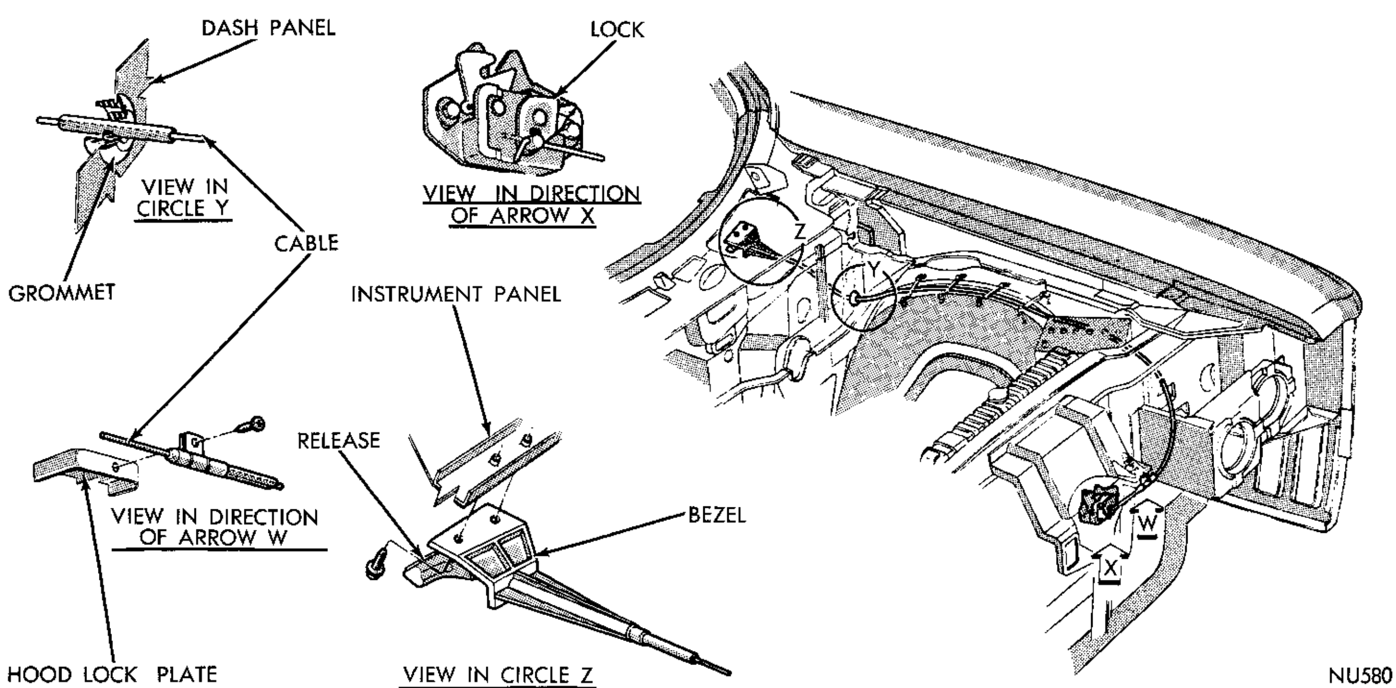


Fig. 6—Hood Latch and Release (Imperial)

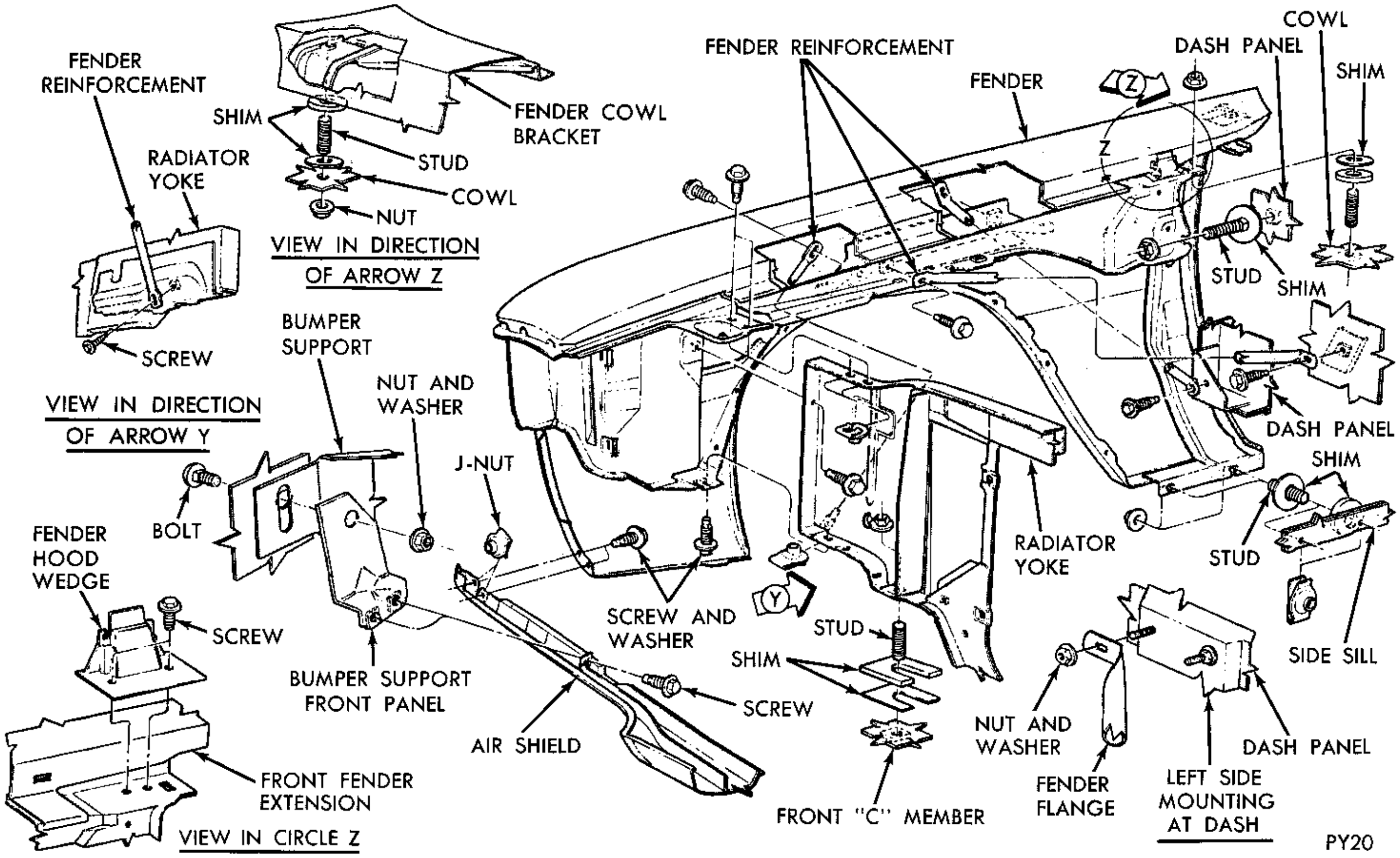


Fig. 7—Fender Application (Chrysler)

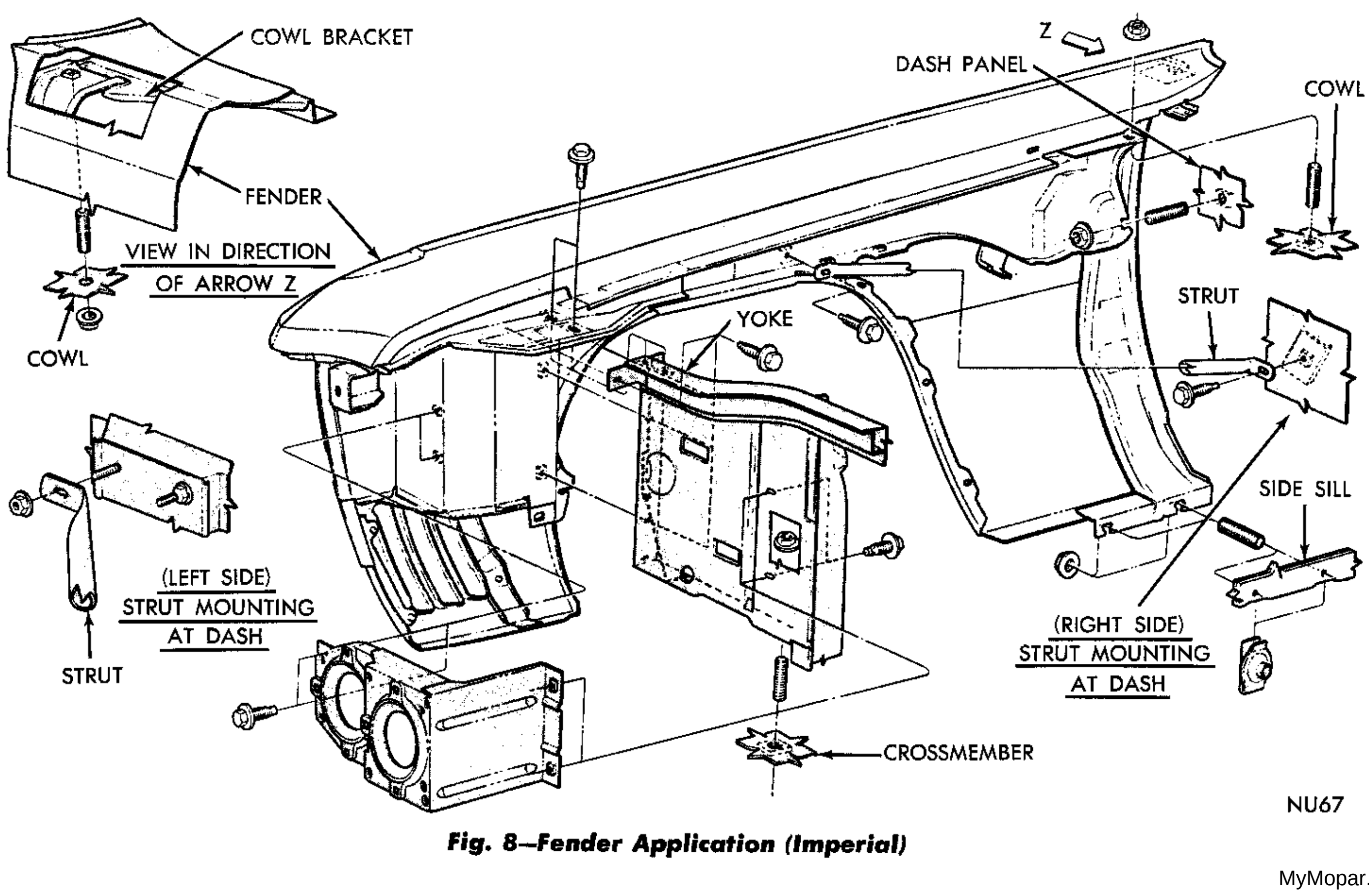


Fig. 8—Fender Application (Imperial)

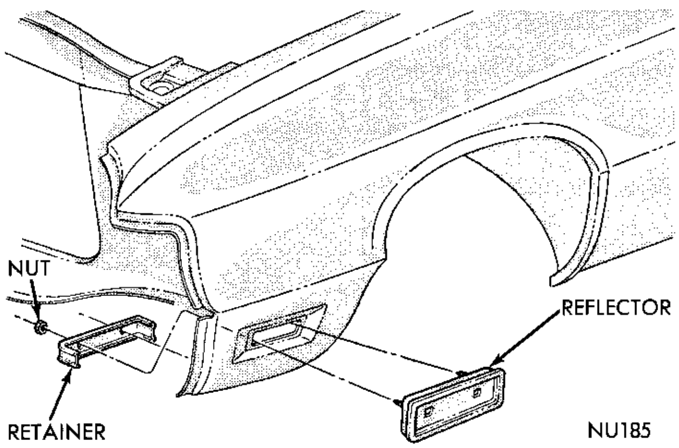


Fig. 9—Fender Side Reflector (Chrysler)

(1) Raise hood and disconnect all brackets and clips attached to the wheelhouse in engine compartment.
(2) Raise front end of car and remove wheel assembly.
(3) From underside of fender, remove all wheelhouse mounting bolts.
(4) Remove wheelhouse from car.

Replacement

(1) Place housing in position under fender.
(2) Install mounting bolts loosely.
(3) Line housing up correctly and tighten mounting

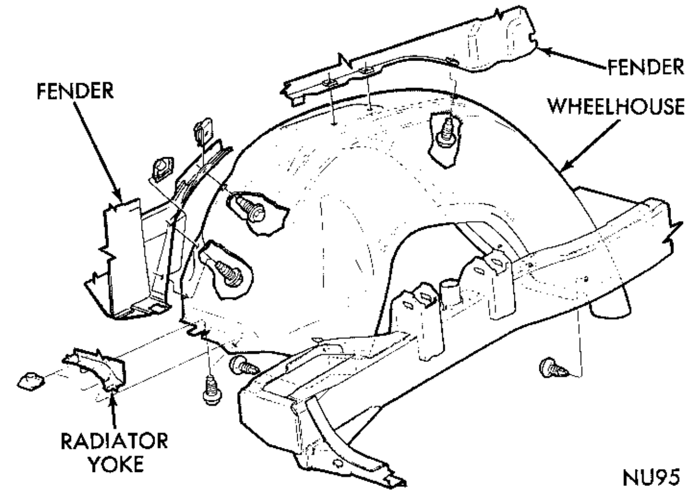


Fig. 10—Wheelhouse Application (Chrysler)

bolts.
(4) Replace wheel assembly.
(5) Lower front end of car.
(6) Connect all brackets and clips in their proper position on wheelhouse in engine compartment.

WHEELHOUSE (IMPERIAL)

Remove Two Piece Wheelhouse (Fig. 11)

(1) Disconnect brackets, clips and wiring on wheelhouse in engine compartment.

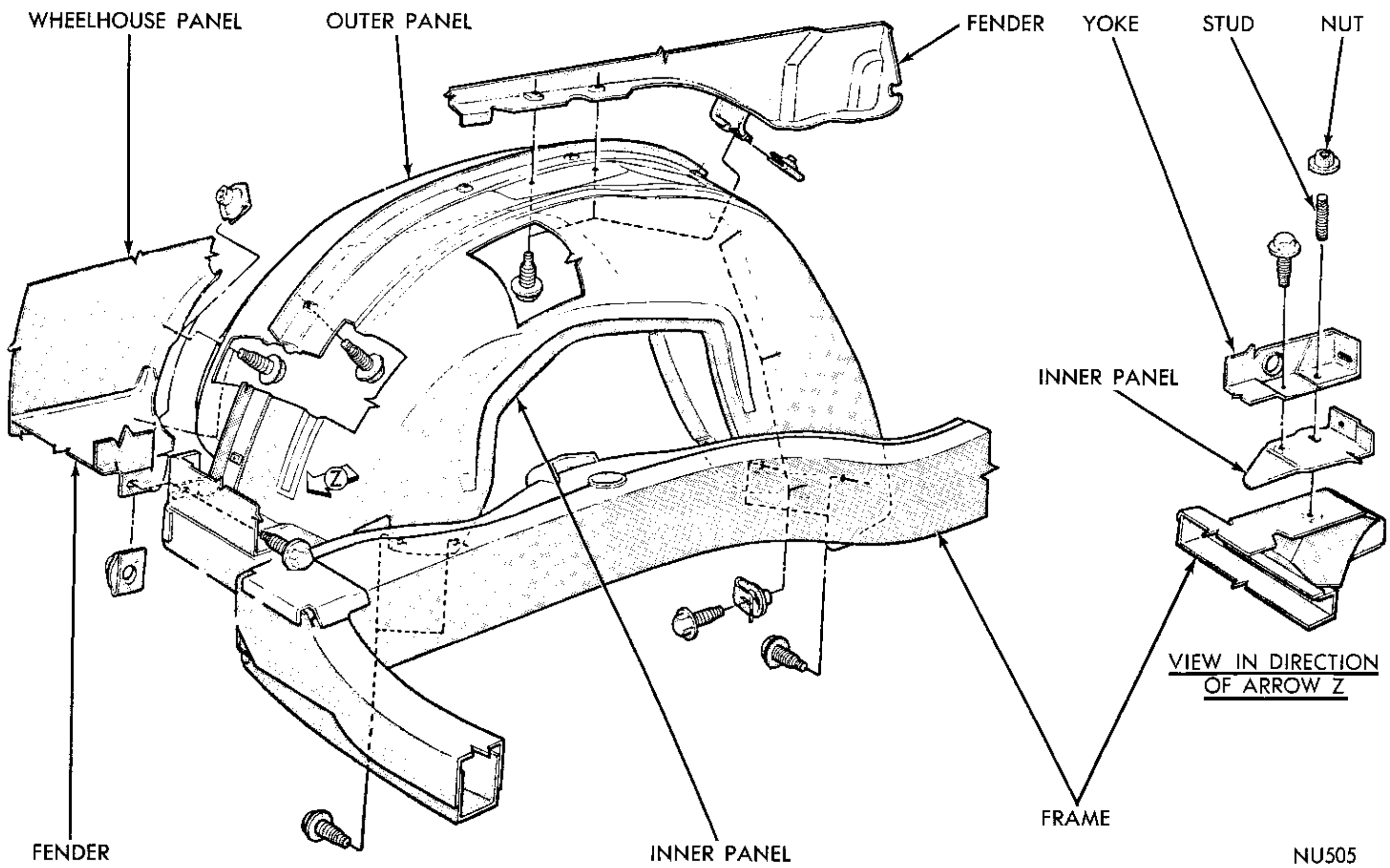


Fig. 11—Wheelhouse Application (Imperial)

(2) Remove one stud located in the lower front of the yoke assembly.

(3) Raise car and remove wheel assembly.

(4) From under fender, remove outer wheelhouse assembly mounting bolts and remove outer wheelhouse.

(5) Remove inner wheelhouse mounting bolts and remove inner wheelhouse assembly.

Installation

(1) Place inner wheelhouse assembly in position and install mounting bolts loosely.

(2) Place outer wheelhouse assembly in position and install mounting bolts.

(3) Tighten all mounting bolts.

(4) Install wheel assembly and lower car.

(5) Working in the engine compartment install the stud and tighten all nuts on yoke assembly.

(6) Install bracket, clips and wiring to wheelhouse assembly.

RADIATOR YOKE SUPPORT

REPLACEMENT

Removal

(1) Remove radiator assembly.

(2) Remove hood lock striker bar, horn and head lamp wiring from yoke support.

(3) From under the fenders remove wheelhouse to yoke support screws (Figs. 12 and 13).

(4) Remove support to frame screws and support.

Installation

(1) Position yoke support on frame and install frame to support screws finger tight.

(2) From under the fenders, install splash shield to support screws finger tight only.

(3) When all screws have been installed, tighten progressively.

(4) Attach horn and light wires to the yoke support with plastic straps.

(5) Install radiator and hoses, fill cooling system and inspect for leaks.

AIR SHIELD AND CROSS BAR

Refer to (Figs. 12 and 13) for air shield and cross bar attaching points.

BUMPERS

FRONT AND REAR BUMPERS

Refer to (Figs. 14 and 15) for front and rear bumper attaching points.

To facilitate installation of the Imperial rear bumper, remove and discard the original impact pad mounting bolts, nuts, washers and reinforcements. Using 3/8-16 x 2-1/2 inch bolts and 1.38 O.D. plain washers insert bolts through holes in frame rear section. Place sealing washers and impact pads on bolts. With an assistant, raise bumper into mounting position and install impact pad bolts into weld nuts of bumper support (Fig. 16).

Imperial Rear Bumper

After the sub-assembly of the various components to the bumper is completed, secure the impact pad

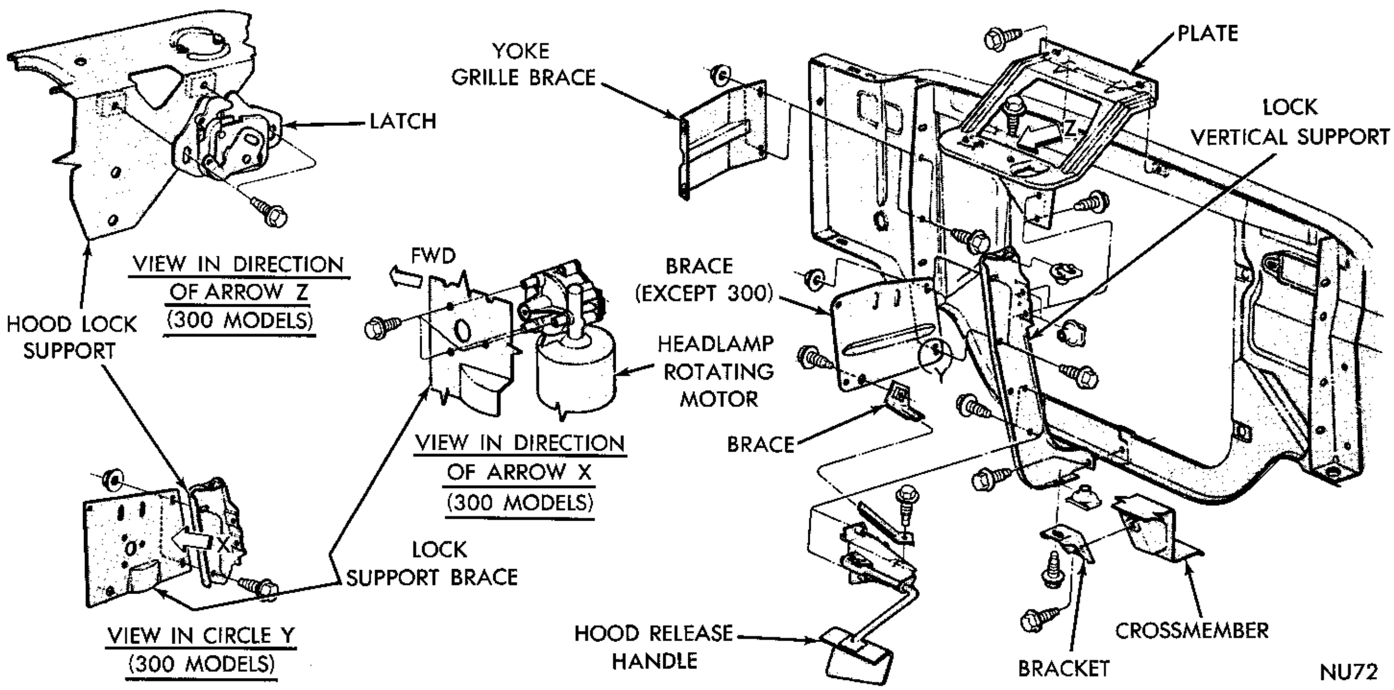


Fig. 12—Radiator Yoke Support (Chrysler)

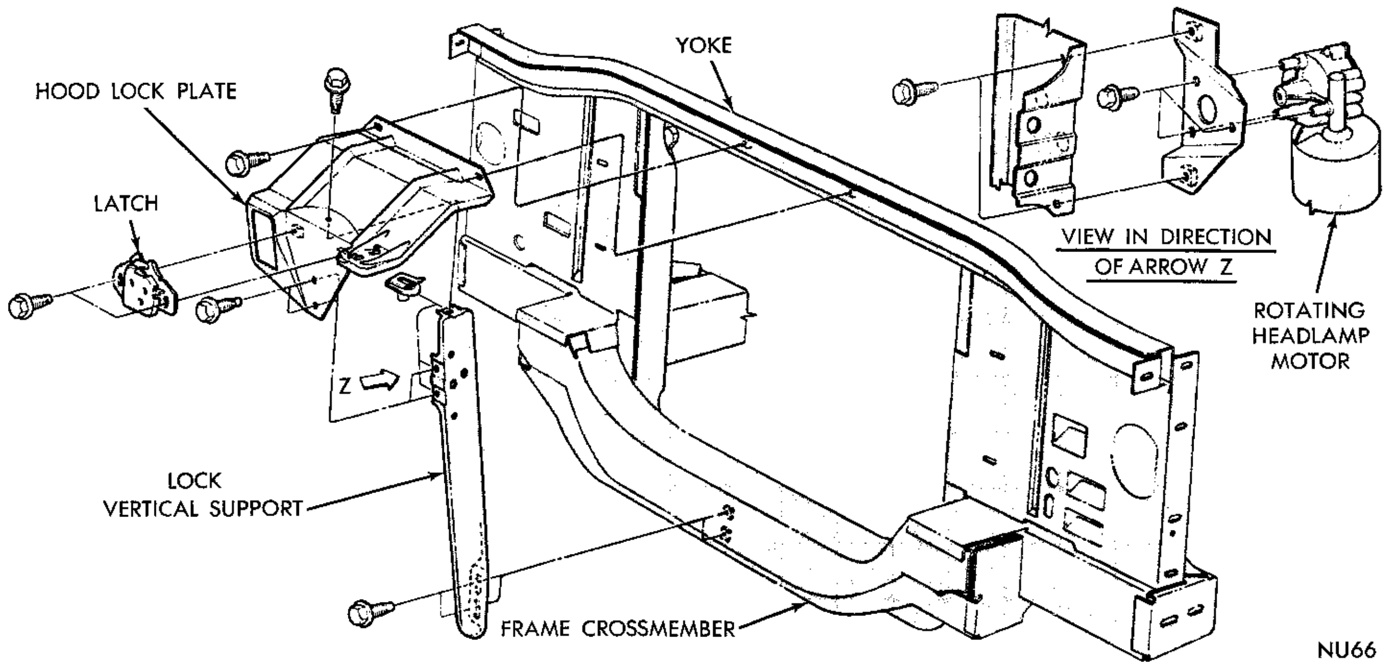


Fig. 13—Radiator Yoke Support (Imperial)

(2931526) to the bumper using masking tape or a rubber adhesive. Position the pad so the weldnut in the bumper will be accessible. After placing the bumper sub-assembly on the car, loose assemble the attachments through the upper and lower impact pads. First, secure the upper attachment, compressing the pad to the height determined by the spacer tube. This will align the top portion of the bumperette relative to the quarter panel. Then tighten the 3/8-16 bolt compressing the lower impact pad until a uniform gap is obtained between the bumper and body sheet metal. Once the side alignment has been established, the supports bars can be secured to the longitudinals.

GRILLE

ALIGNMENT AND REPLACEMENT

The grille assembly (Figs. 17, 18 and 19) must be held against the vertical lock support and pushed back against the fenders before securing, in order to avoid stressing and possible fracturing of the die cast metal, or textured bezels.

ELECTRIC OPERATED HEADLAMP DOOR

Refer to the Electrical Group for complete servicing procedures of the headlamp doors.

DOORS

Service procedures for internal door components do not include obvious operations, such as removing door or quarter panel trim panels, testing operation of windows or inspecting glass fit after adjustments or replacements have been performed.

ALIGNMENT

Up and Down

Adjustment of the door can be made at either the pillar or door hinge halfs (Fig. 20).

Fore and Aft

Adjustment is made at the door hinge half. **Adjust only one hinge at a time.** Raising outer end of door moves upper part of door forward, when in closed position. Lowering lower part of door moves lower part forward when in closed position.

In and Out

Adjustment is made at the pillar hinge half. **Adjust only one hinge at a time.** Raising outer end of door moves upper part of door into door opening. Lowering outer end of door, moves lower part of door into door opening.

DOOR LATCH AND STRIKER PIN

The front door cannot be locked until the door is completely closed. The silent type door latch (Fig. 21) features a rubber isolation of the round striker pin on the door frame and those surfaces acting as stops inside the latch. The latch assembly is built into a sheet metal pocket on the door face. The striker pin is attached by a single screw which also allows for adjusting. Torque the striker pin screw 30-70 foot-pounds.

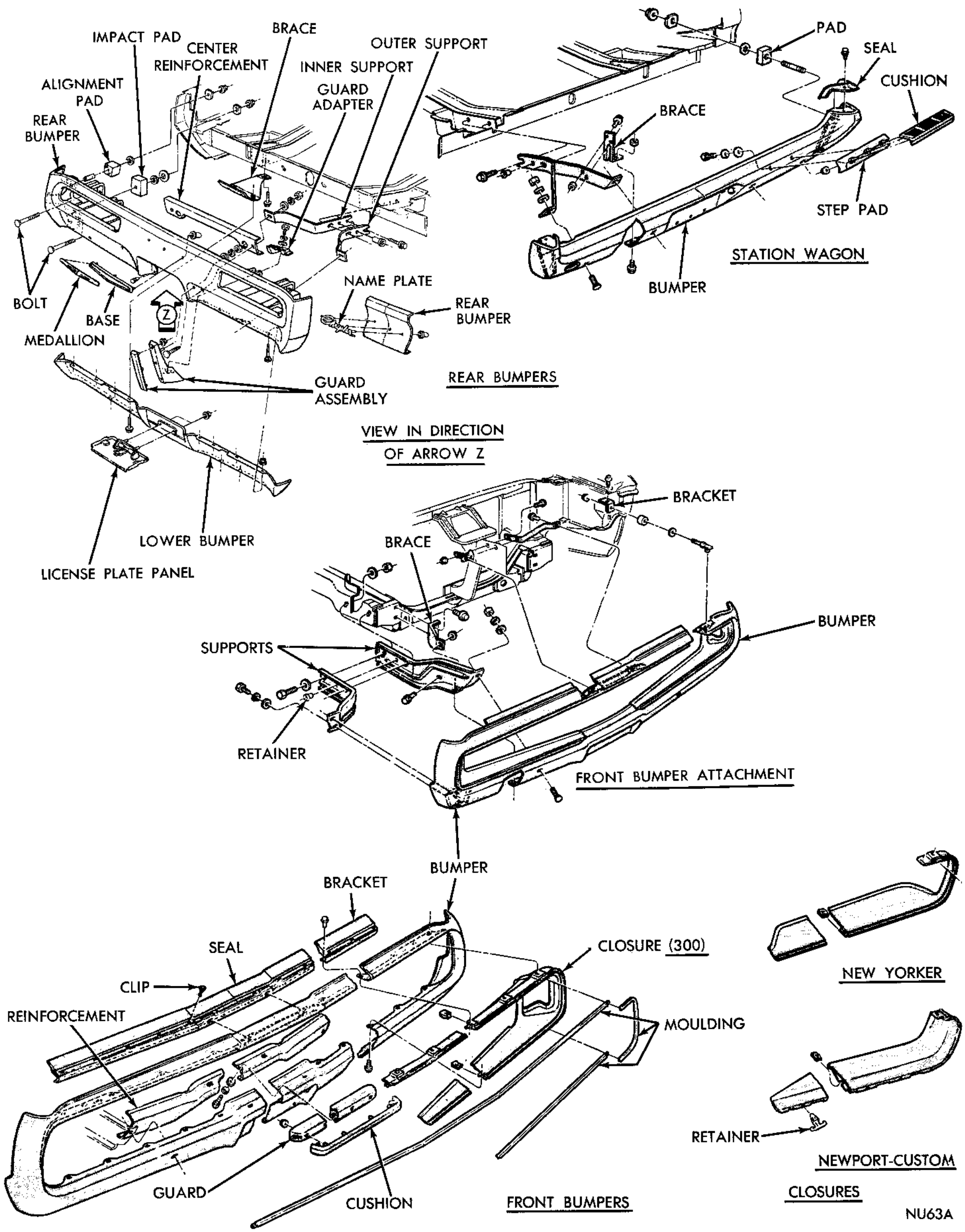


Fig. 14—Bumper Application (Chrysler)

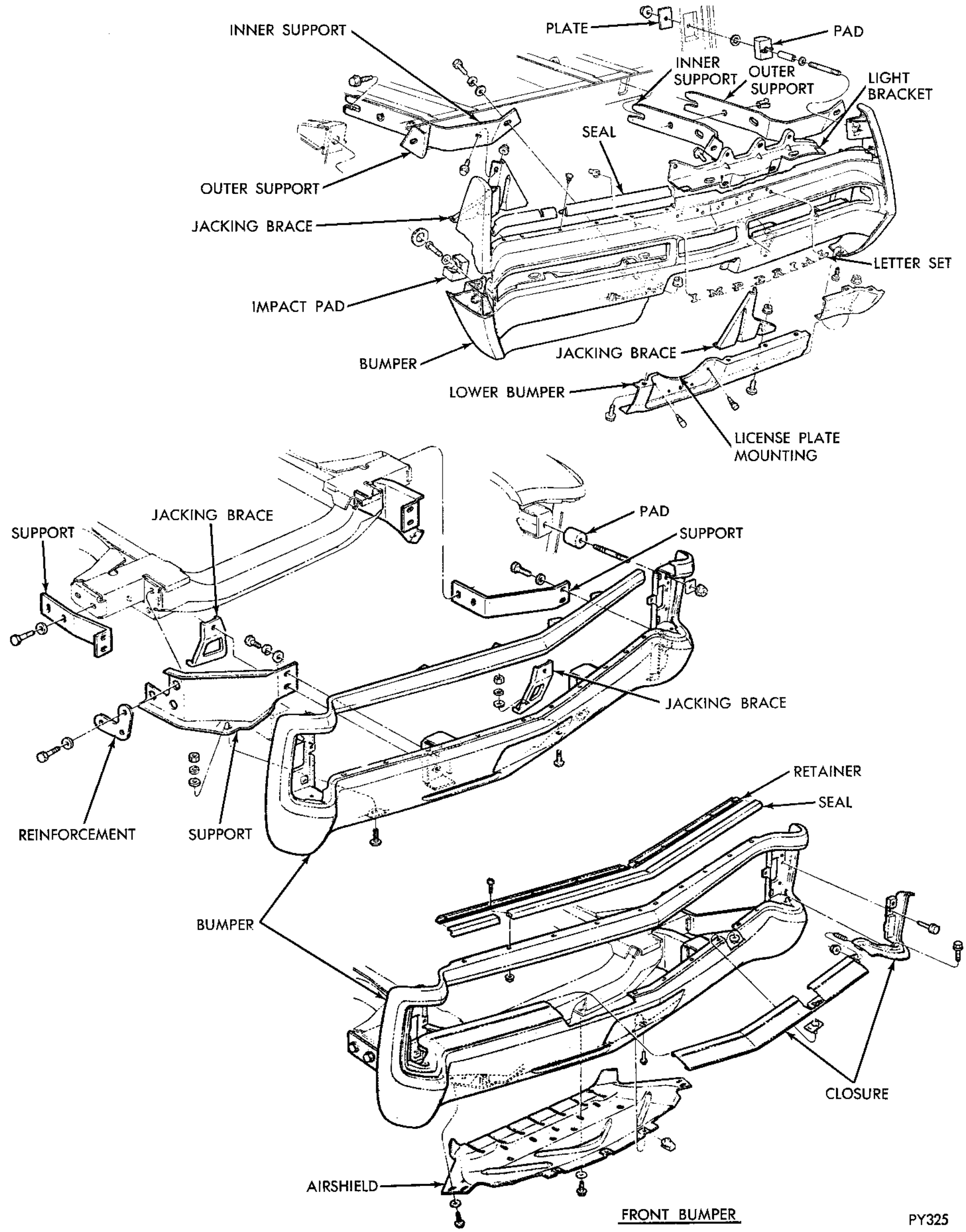


Fig. 15—Bumper Application (Imperial)

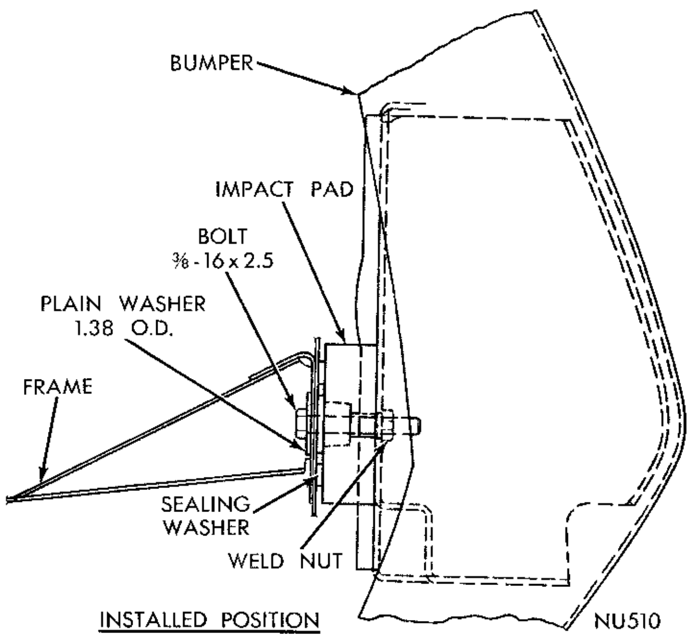


Fig. 16—Impact Pad Attachment (Imperial)

DOOR REPLACEMENT

Front Door (All Models)

Removal

(1) With door wide open, place a jack, with a block of wood on lifting plate of jack, as near hinge as possible.

(2) Remove door interior trim and hardware.

(3) Scribe a line around upper and lower hinge plates on door panel.

On vehicles with electric windows, disconnect the wires from window regulator motor and remove from door assembly.

(4) Remove hinge screws from door and remove door for further disassembly if necessary.

Installation

(1) With door hardware installed, place door, supported by a padded jack, in position in door opening.

(2) Position hinge plates on door panel and install screws finger tight only.

(3) Adjust jack to align hinge plate scribe marks and tighten screws.

Prior to this installation, on electric window lifts, install wiring in doors and attach to motor and control switch.

(4) Complete door aligning procedure, and install interior trim and hardware.

REAR DOOR (All Models)

Removal

(1) Open door and place a padded jack under door near the hinges.

(2) Remove door interior trim and hardware.

(3) Scribe aligning marks around hinge plates on door frame.

On vehicles with electric window lifts disconnect wires from motor and switch and remove from door.

(4) Remove the hinge screws from door and remove door.

Installation

On vehicles with electric window lift, attach wiring

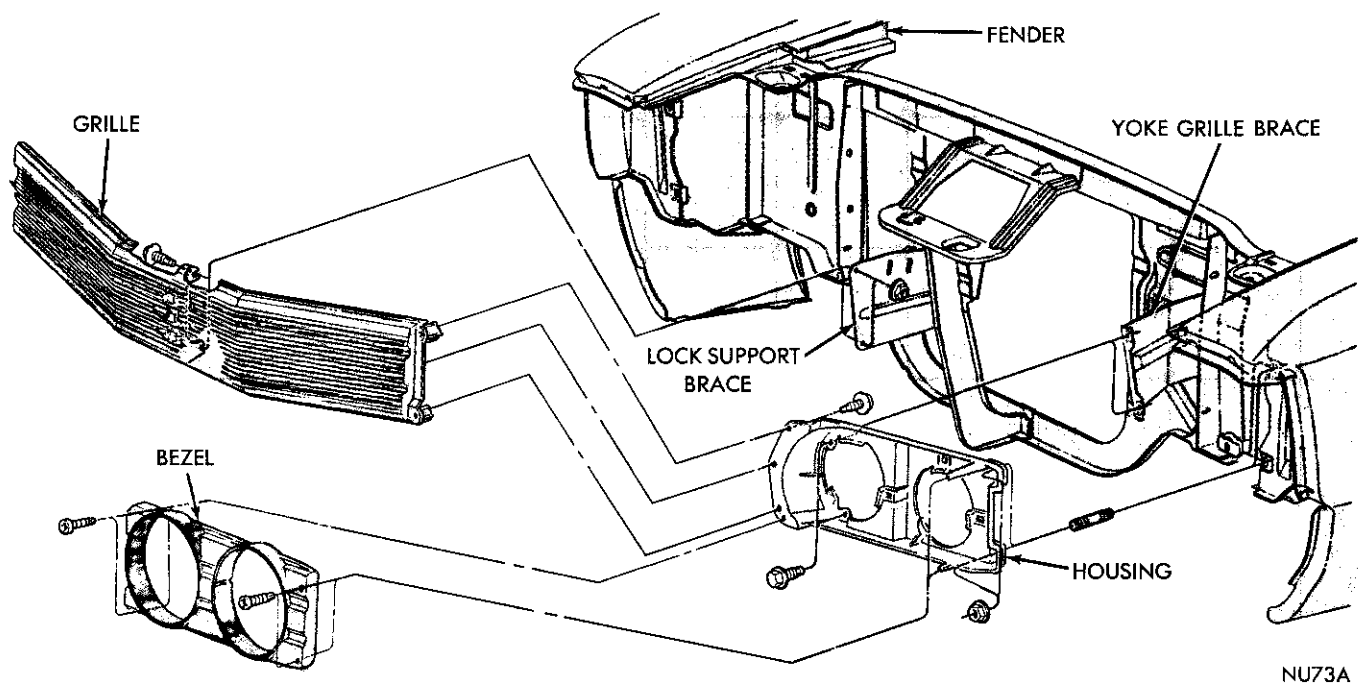


Fig. 17—Grille Attachment (Newport and Custom)

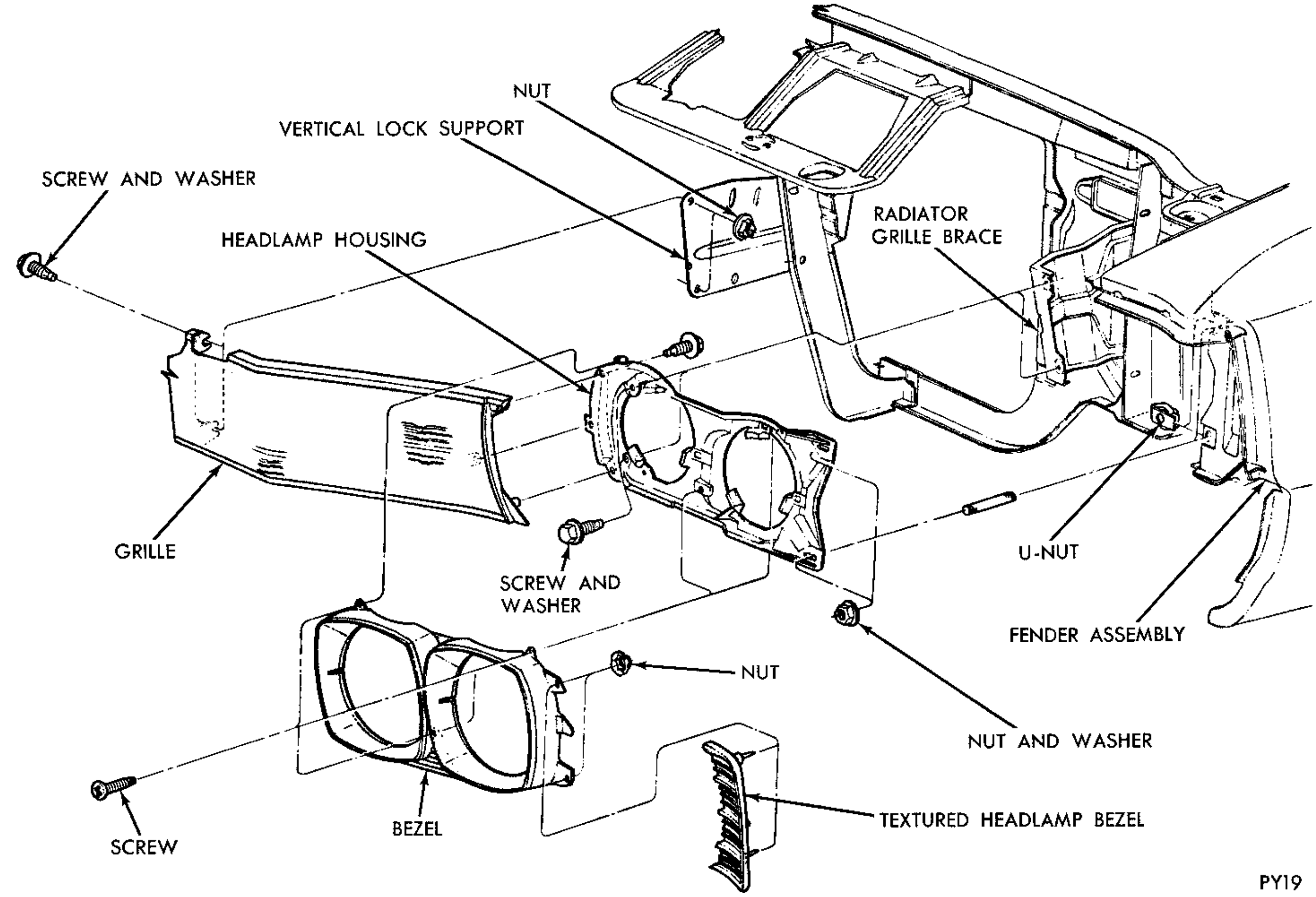


Fig. 18—Grille Attachment (300 and New Yorker)

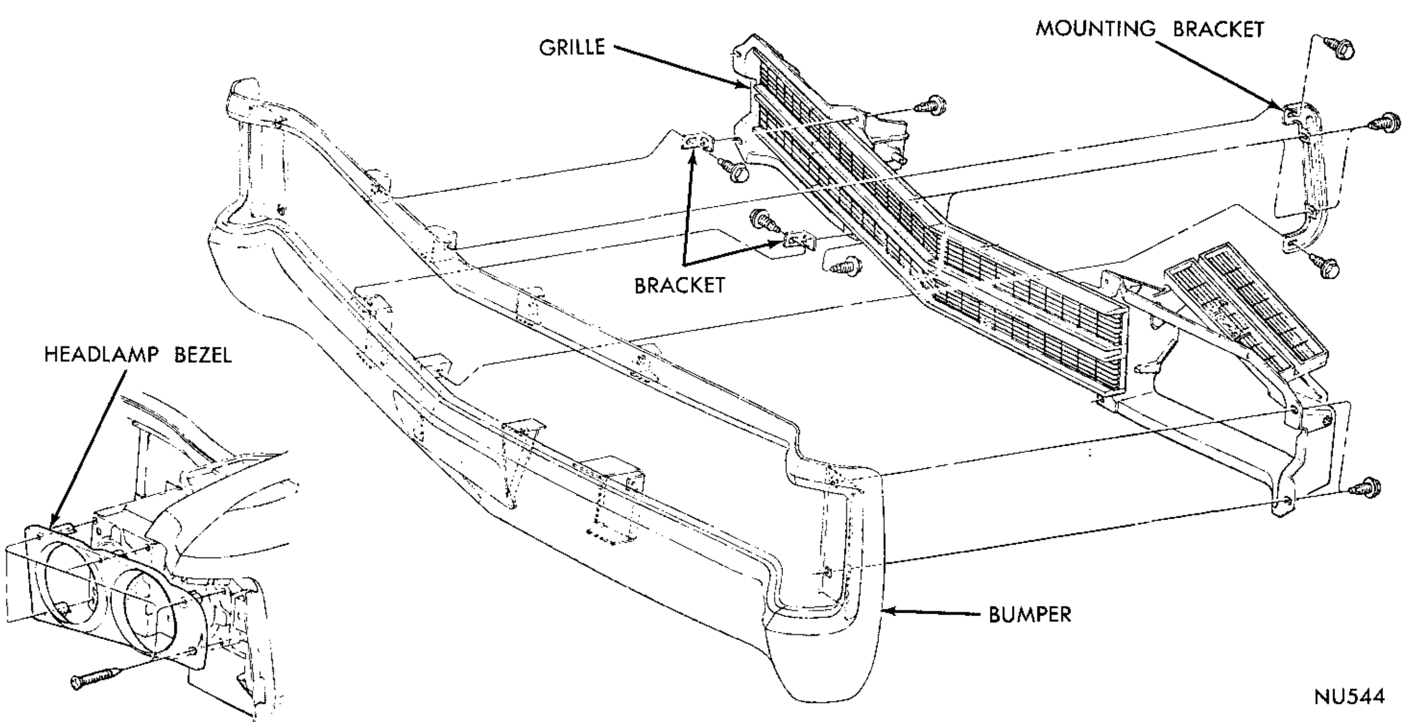


Fig. 19—Grille Attachment (Imperial)

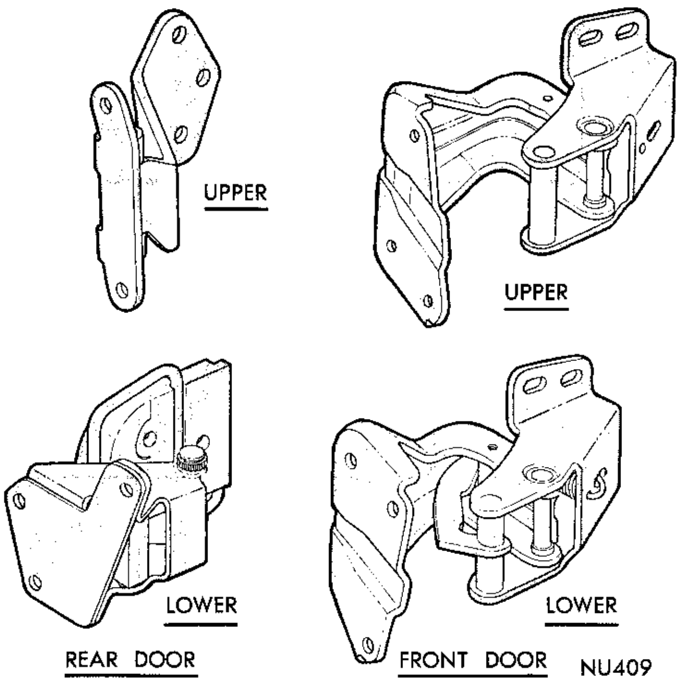


Fig. 20—Door Hinges

to motor and switch prior to installation of trim panel.

(1) With inner hardware installed and supported on a padded jack, position door on hinges.

(2) Install attaching bolts finger tight.

(3) Align hinges with scribe marks and tighten screws.

(4) Test door for alignment and install trim and hardware.

HINGE REPLACEMENT

The door hinges (Fig. 21) are attached to the doors by screws accessible from outside. The front door hinges are each attached to the "A" post by three screws.

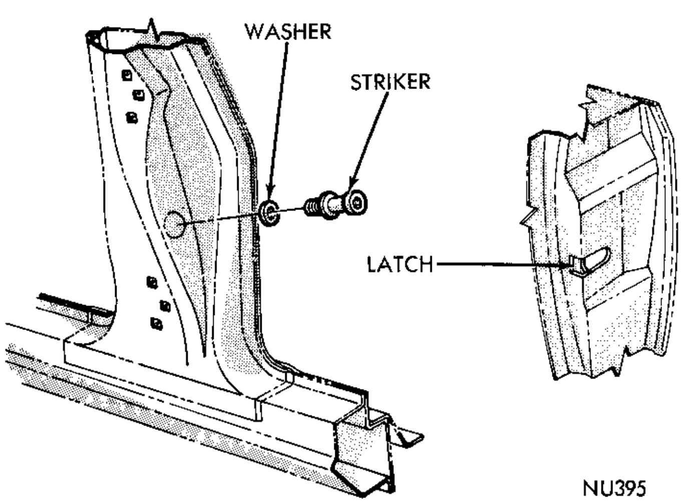


Fig. 21—Door Latch and Striker Pin

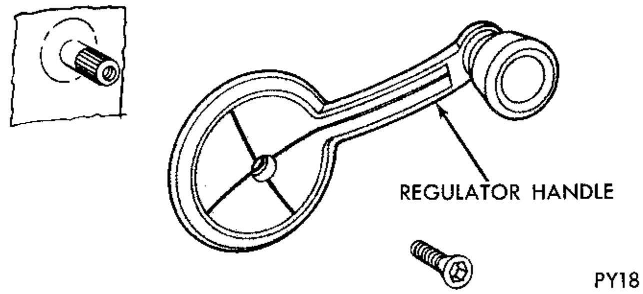


Fig. 22—Window Regulator Handle

The rear door upper hinges (on hardtop and station wagon models), are attached to the "B" post by three screws accessible from the outside. On sedan models, the screws are accessible through an access hole in the "B" post.

INSIDE HANDLES

Window Regulator Handle

The window regulator handles are retained on the shaft with an allen set screw (Fig. 22).

The handles should be placed in approximately a horizontal position with the knobs facing forward on the doors and rearward on the quarter panel.

Remote Control Handle

The remote control handle (Fig. 23) is attached to the control unit with a screw at the rear inner end.

ARM RESTS

The arm rests are retained by two metal screws inserted at the bottom of the arm rest base. The pad and base can be separated and if necessary, the pad may be retrimmed.

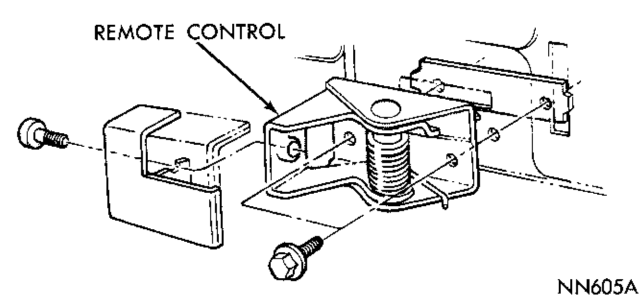


Fig. 23—Remote Control Handle

TRIM PANELS

Door Trim Panel Replacement

(1) Remove inside handles and arm rests.

(2) Remove screws attaching trim panel to door inner panel.

(3) Insert a wide blade screw driver next to the retaining clips between trim panel and door frame. Snap retaining clips out of door panel and remove panel.

(4) Before installing trim panel, inspect condition of watershield (Fig. 24).

(5) Align trim panel retaining clips with holes of door frame and bump into place with heel of hand.

(6) Install trim panel to door screws, escutcheon washer, handles and arm rest.

WATERSHIELDS

Refer to Figure 24 for sealing areas and applications of watershields. The lower edge of shield must be inserted into the slots in bottom of inner panels.

LOCK ASSEMBLY (Manual)

Remote Control

Removal

(1) Raise door glass.

(2) Remove remote control base to door panel screws (Fig. 23).

(3) Remove link from remote control lever.

(4) Remove control through large opening in door.

Installation

(1) Apply lubriplate to sliding and contact areas.

(2) Install assembly through door opening and connect link to control lever.

(3) Install attaching screw and test operation of control.

LATCH RELACEMENT

Removal

(1) Disconnect handle to latch link (Fig. 25), from latch by pulling link outward.

(2) Disconnect locking lever rod (front door only) from latch.

(3) Disconnect control rod from latch.

(4) Remove latch to door screws.

(5) Rotate latch and disconnect remote control link when removing.

(6) Lubricate all moving parts of latch.

Installation

(1) Position lock in door, connect remote control link to lock lever and install retaining screws.

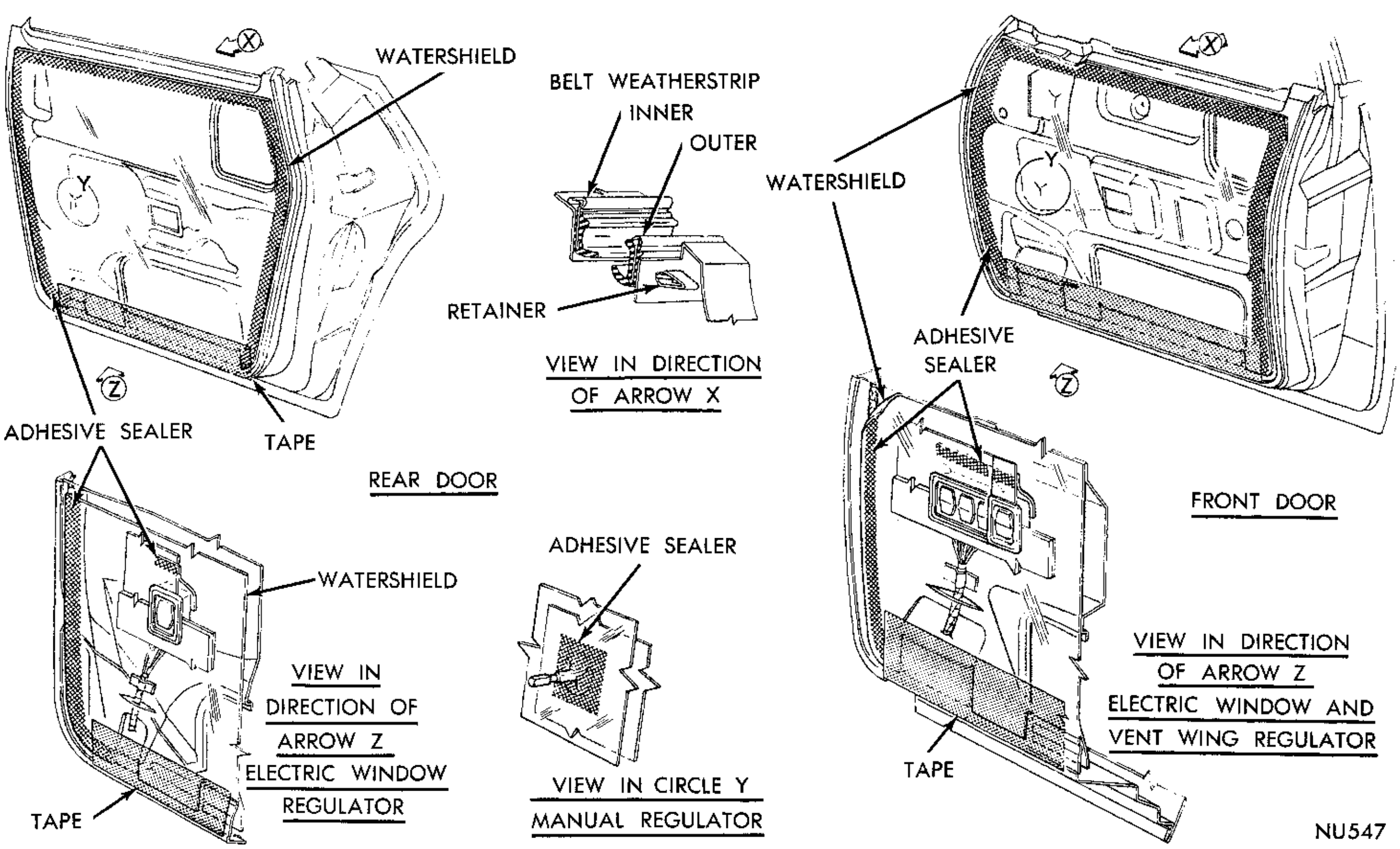


Fig. 24—Door Watershields

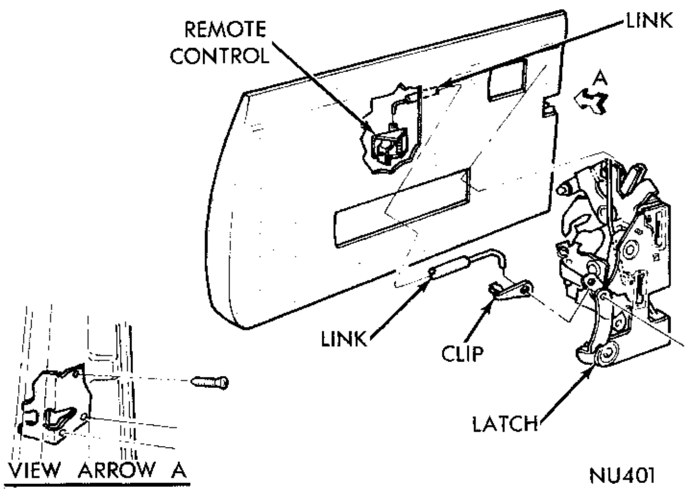


Fig. 25—Latch Control

(2) Connect handle to lock link and locking lever rod (front door only) to lock assembly.

(3) Connect locking lever rod and remote control link to lock.

LOCK CYLINDER

Removal

(1) With window in up position, disconnect cylinder link (Fig. 26) from clip on lock lever and from cylinder.

(2) Remove retainer from cylinder body and cylinder from door.

Installation

(1) Position cylinder in door and install retainer.

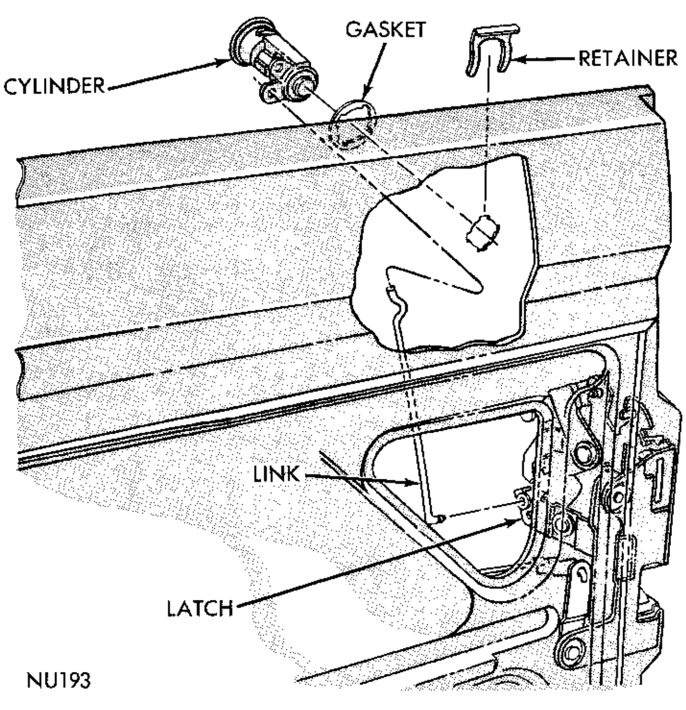


Fig. 26—Lock Cylinder

(2) Connect cylinder link to cylinder arm and to clip on lock lever.

Latch Push Rod

The latch push rod (Fig. 27) is positioned through an opening in the door belt area approximately at the front end of the arm rest position on 2 door models. On four door models the push rod is located approximately above the latch (Fig. 27).

ELECTRIC DOOR LOCKS

All doors may be locked or unlocked electrically. **Refer to the Electrical Group for test procedures and wiring diagrams.**

SOLENOID

Adjustment

(1) Loosen solenoid to mounting bracket screws (Fig. 28).

(2) Push lock lever to down position and slide solenoid to full down position in mounting bracket.

(3) Raise lock lever to up position, extending solenoid rod to maximum up position.

(4) Tighten solenoid to mounting screws and test operation of lock.

REPLACEMENT

Removal

(1) Disconnect solenoid link at solenoid (Fig. 28).

(2) Remove solenoid lead wires.

(3) Remove solenoid to door panel screws and remove solenoid assembly.

Installation

(1) Position solenoid on door panel and install

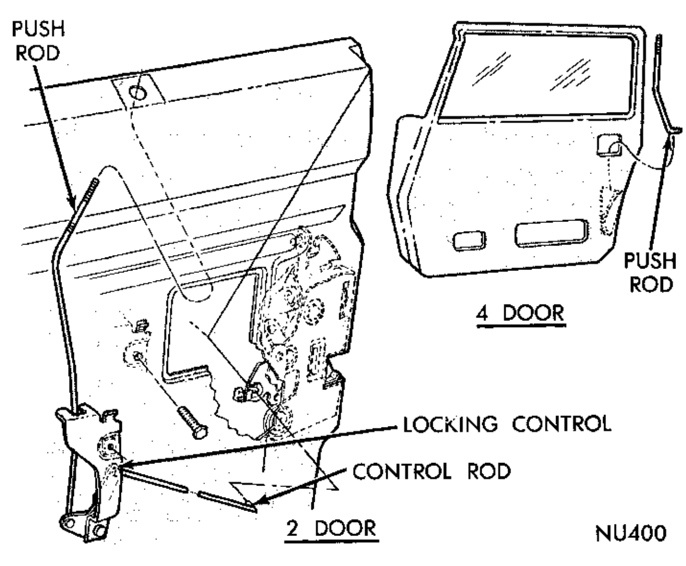


Fig. 27—Latch Push Rod

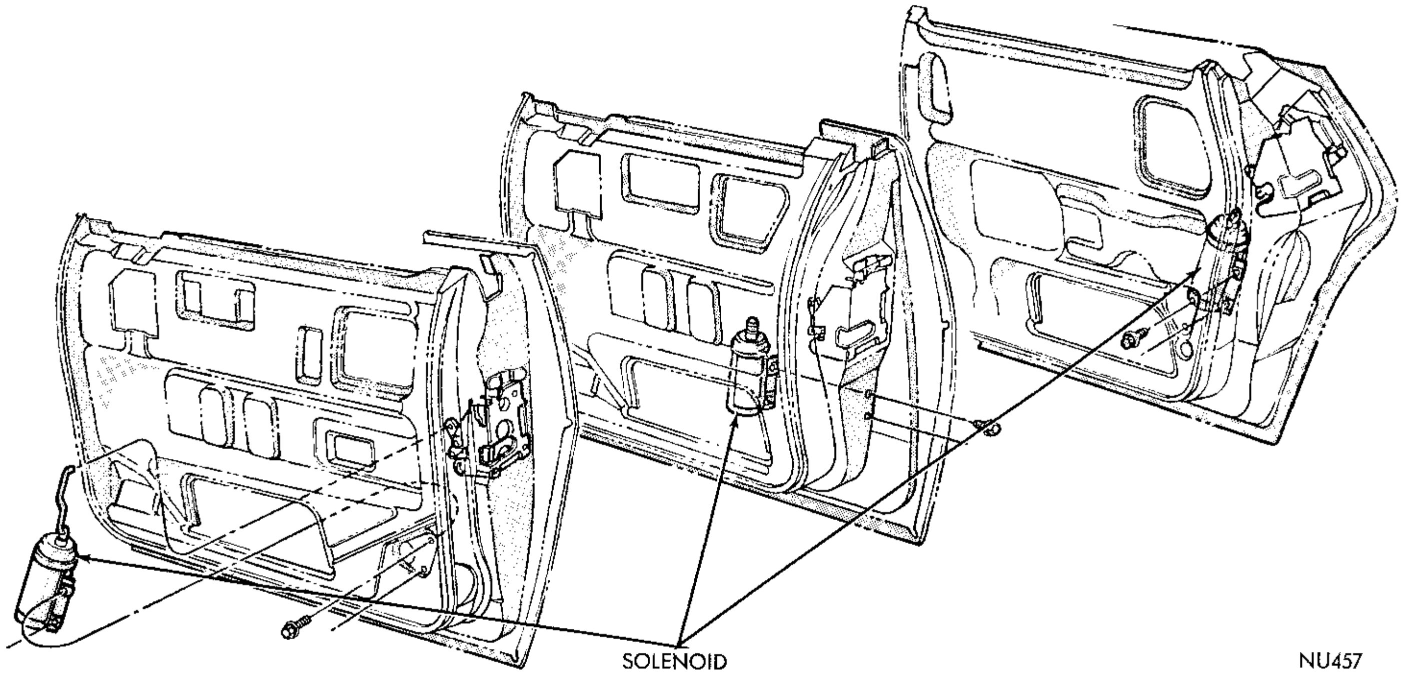


Fig. 28—Solenoid Attachment

mounting screws. DO NOT TIGHTEN.

(2) Connect link to solenoid rod and connect wires.

(3) Adjust lock assembly.

Lock and Switch Replacement

(1) Disconnect lock switch wires (front door only).

(2) Disconnect solenoid link at lock lever.

(3) Remove screws attaching lock and switch assembly to door and remove from door.

(4) Remove switch from lock assembly.

Installation

(1) Position key actuated switch on lock assembly and install screw.

(2) Position lock and switch assembly on door inner face and install screws.

(3) Connect solenoid link to lock lever.

(4) Connect lock switch wires (front door only) and test lock operation.

Remote Control Switch Replacement

The remote control switch (front doors only) (Fig. 27) is attached to the door inner face with one screw. The remote control push rod is attached to the switch with a "push-on" type retainer.

OUTSIDE HANDLE—FRONT DOOR

Removal

(1) With door glass in up position, remove handle attaching nuts from mounting studs (Fig. 29) and link from handle to lock.

(2) Lift handle up and remove from door.

Installation

(1) Position handle into door opening and engage handle to lock link.

(2) Attach retaining nuts and test handle operation.

OUTSIDE HANDLE—REAR DOOR

Removal

(1) With door open and glass in up position, remove link retainer at handle connector (Fig. 29).

(2) Depress outside handle release button and remove link from handle connector.

(3) Remove handle to door nuts.

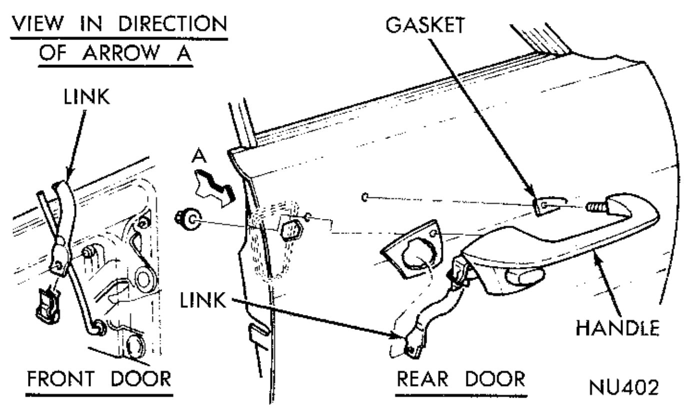


Fig. 29—Outside Door Handle

Installation

(1) Position handle in door and install mounting nuts.

(2) Depress handle button and position link over connector on handle.

(3) Install retainer over link and connector.

WEATHERSTRIPS AND WINDCORDS

Door Weatherstrips

Make sure all old weatherstrip particles and cement are removed. **Avoid puckering or stretching of weatherstrip.**

Sedan and Station Wagon Models

(1) Apply lower half of weatherstrip, starting at number one index hole and using fasteners for locating and ending at number 2 index hole.

(2) Apply a 1/8 inch bead of cement to weatherstrip seating area on door upper half.

(3) Install upper half of weatherstrip on door, indexing at the upper corners.

(4) Work weatherstrip from index points to a point midway between them.

HARDTOP—CONVERTIBLE

Front Door

(1) Apply a 1/8 inch bead of cement on weatherstrip.

(2) Position and attach moulded end of weatherstrip with fasteners.

(3) Index and install weatherstrip on door, using fasteners as a locating point and working from hinge pillar side of door completely around to lock pillar.

(4) Make sure lip of weatherstrip dovetails into groove of lock pillar seal and install seal on lock pillar.

Hardtop Rear Door

(1) Index and install weatherstrip on door by inserting fasteners in door and install from top of hinge pillar side of door completely around to lock pillar.

(2) Make sure lip of weatherstrip dovetails into groove of hinge pillar seal and install seal.

(3) Make sure lip of weatherstrip dovetails into groove of door upper ornament seal and install seal.

Roof Rail Weatherstrip

Refer to Figure 30 for attaching points and methods of cementing.

The weatherstrip retainers are adjustable through use of elongated attaching holes. The weatherstrip can be moved in or out for the best possible fit and seal along the top edge of the vent frame, door and quarter glass.

The glass up-stop must be adjusted so a fully

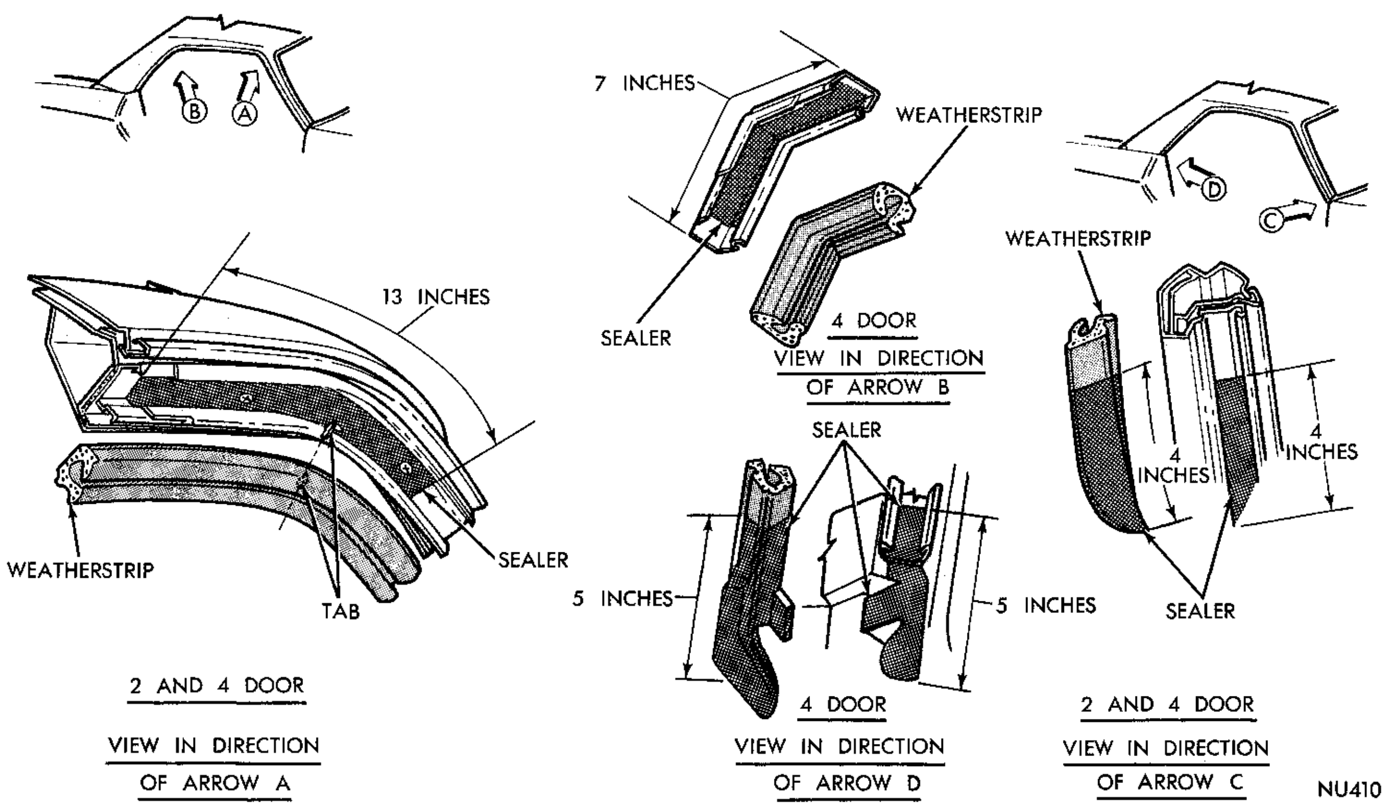


Fig. 30—Roof Rail Weatherstrips

raised glass just curls the outer lip of weatherstrip against the inner lip.

When the up-stop, roof rail weatherstrip and glass are properly adjusted, the outer lip of weatherstrip will seal along the top edge of the glass and the inner lip of weatherstrip will seal along the upper inside edge of glass.

Outer Belt Weatherstrip

The door outer belt weatherstrips are retained in the door panel with spring type retainers.

Windcords

Refer to Figure 31 for windcord starting points and method of attachment.

GLASS ADJUSTMENTS

The circled numbers shown on the glass adjustment reference illustrations indicate the particular step number being read in the adjustment procedure.

Prior to adjusting glass, all doors must be correctly fitted in their opening and the weatherstrips at the "A" post and roof rails must be properly installed.

Refer to the adjustment illustration and loosen the attaching screws and nuts of the various door components affecting glass adjustment.

Service procedures for components related to the door or vent wing glass follow the glass adjustment procedures.

GLASS ADJUSTMENTS—HARD TOP

Adjustments-Ventless Door (Fig. 32)

Fore and Aft

(1) Raise glass completely.

(2) Move glass fore or aft to set glass to belt line weatherstrip.

(3) Tighten glass track upper bracket at belt line.

Parallelism of Glass to Primary Seal

(4) Move pivot bracket fore or aft and set glass parallel to weatherstrip locating bead at primary sealing lip.

(5) Tighten pivot bracket and support screw assemblies.

(6) Set front up-stop down against bumper on glass.

(7) Tighten up-stop bracket screw on inner panel (Fig. 33).

(8) Set rear channel up-stop wedge down against stop in rear frame.

(9) Tighten rear channel and bracket upper attachment screw.

In-Out and Secondary Seal

(10) Move bottom of front track to create an effective glass to weatherstrip secondary seal.

(11) Tighten glass track to lower bracket screw.

(12) Tighten track lower bracket and retainer to inner panel nut assembly.

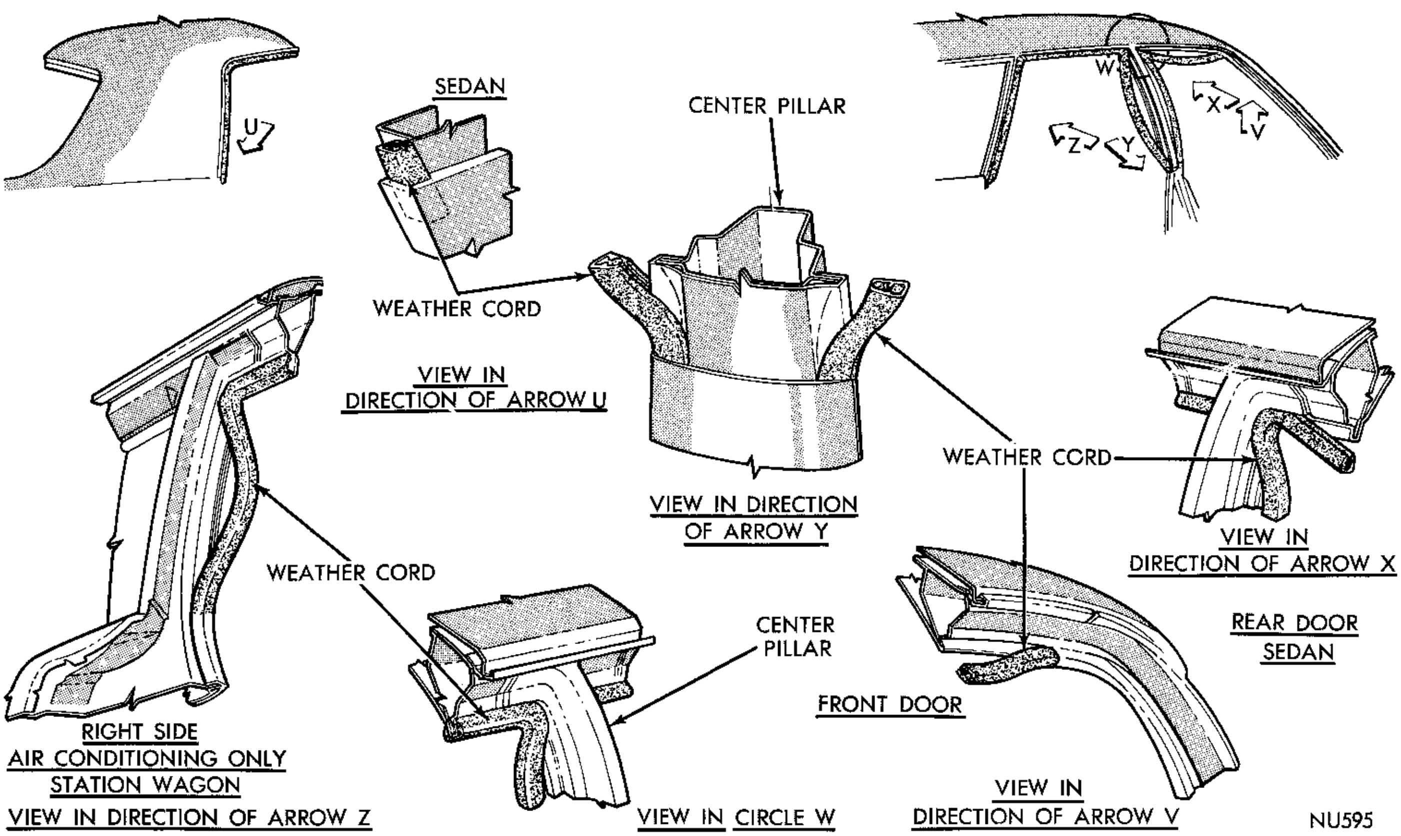


Fig. 31—Door Windcords

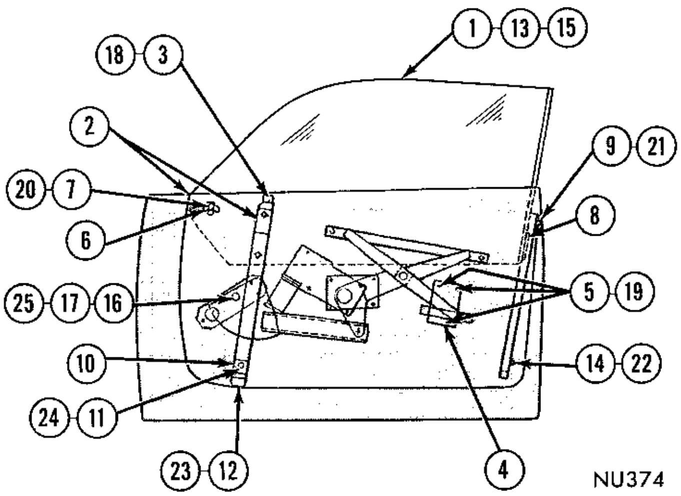


Fig. 32—Glass Adjustments 2 Door Hardtop—Ventless

Front and Rear Track Parallelism

(13) Run glass approximately 2/3 way down.

(14) Tighten glass run rear channel and bracket assembly lower bracket nut assembly.

Down Stop-Manual

(15) Lower glass until top edge of glass is even with or slightly below belt line of door outer panel. **Do not allow glass to drop below weatherstrip on door outer panel.**

(16) Position stop on regulator plate against stop on sector.

(17) Tighten regulator plate stop locknut.

Tighten following callouts to torques specified:

(18), (21), (22), (23) and (24), 170-230 inch pounds, (19) and (20), 75 to 115 inch-pounds and (25), 45 to 75 inch-pounds.

GLASS REPLACEMENT

Removal

(1) Remove door belt line weatherstrips.

(2) With regulator arms in the full down position, remove screws attaching lift bracket to glass (Fig. 34).

(3) Remove front track upper and lower bracket attaching screws.

(4) Raise door glass and front track assembly out of door (Fig. 35).

(5) Remove front track from glass guide and guide from glass (Fig. 36).

(6) Remove fasteners and up-stop from glass (Fig. 36).

Installation

(1) Place glass on table with outside of glass facing upward.

(2) Install fasteners and up-stop in glass (Fig. 36).

(3) Position track guide over fasteners and secure with screw.

(4) Slide front track lower end flanges through guide grooves.

(5) With regulator arms in the full down position insert door glass and front track assembly into door.

(6) Allow track to slide down to bottom of door panel.

(7) After up-stop bumper has cleared through glass opening, engage glass rear frame in rear channel run and lower glass to bumper of lower adjusting bracket.

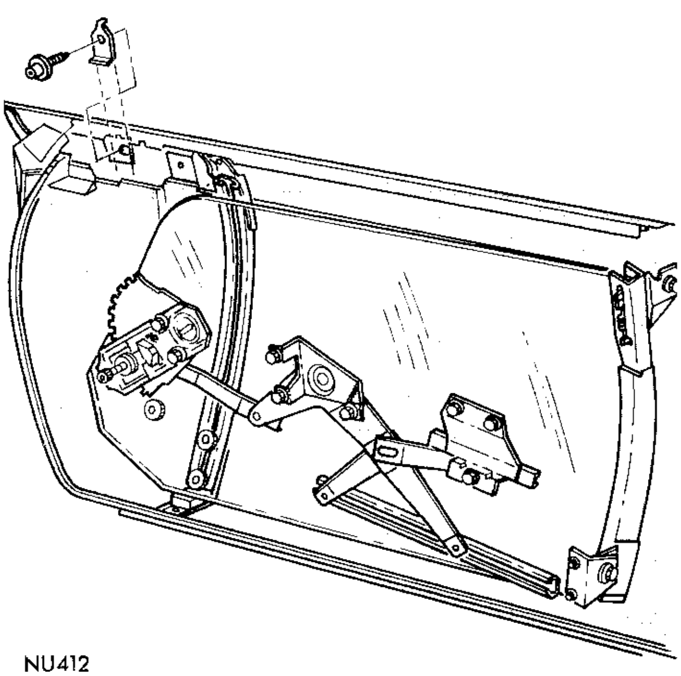


Fig. 33—Glass Up-Stops

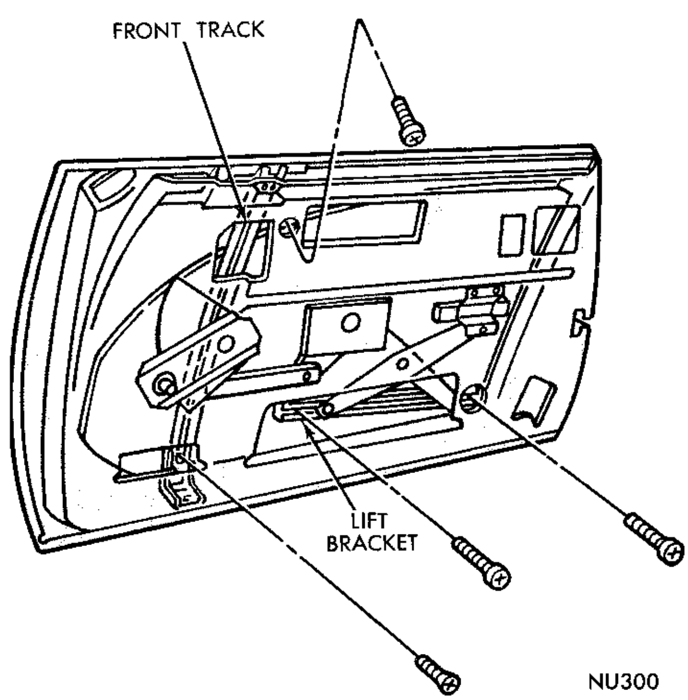


Fig. 34—Lift Bracket

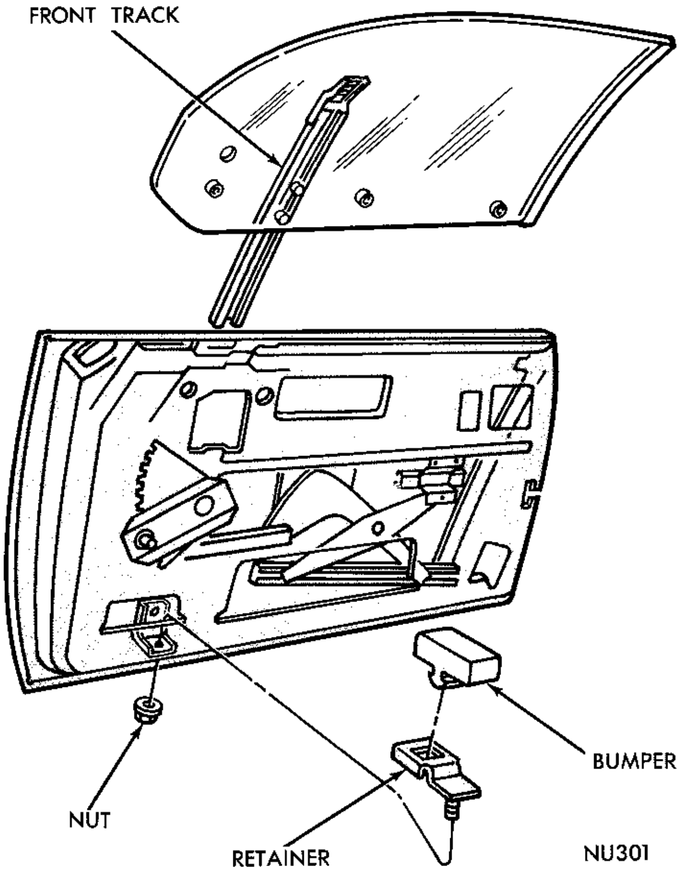


Fig. 35—Glass Replacement

(8) Secure front track upper and lower mounting brackets with screws.

(9) Align holes in lift bracket with fasteners in glass and secure with screws.

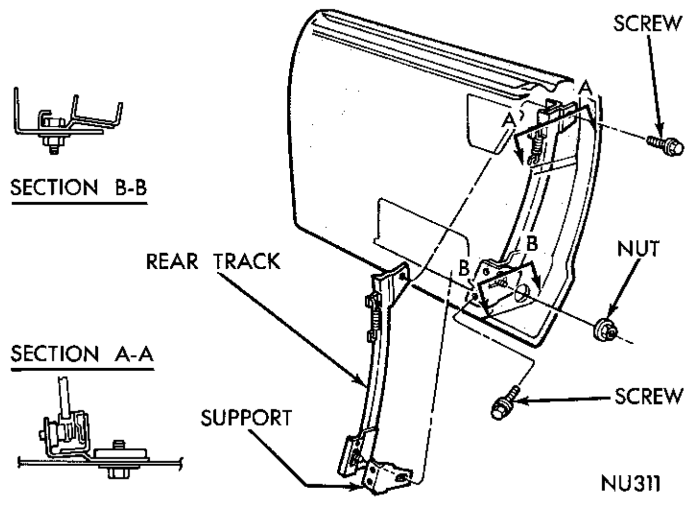


Fig. 37—Glass Rear Track

Glass Rear Track

Removal

(1) Remove the door glass and front track assembly.

(2) Remove screw attaching track upper bracket to door lock face and nut attaching track lower bracket to lower support (Fig. 37).

(3) Remove track assembly through large access hole in door panel.

Installation

(1) Position track assembly into door through large access hole.

(2) Align track upper bracket to hole in door lock face and install screw loosely.

(3) Insert track bottom bracket adjustment stud in

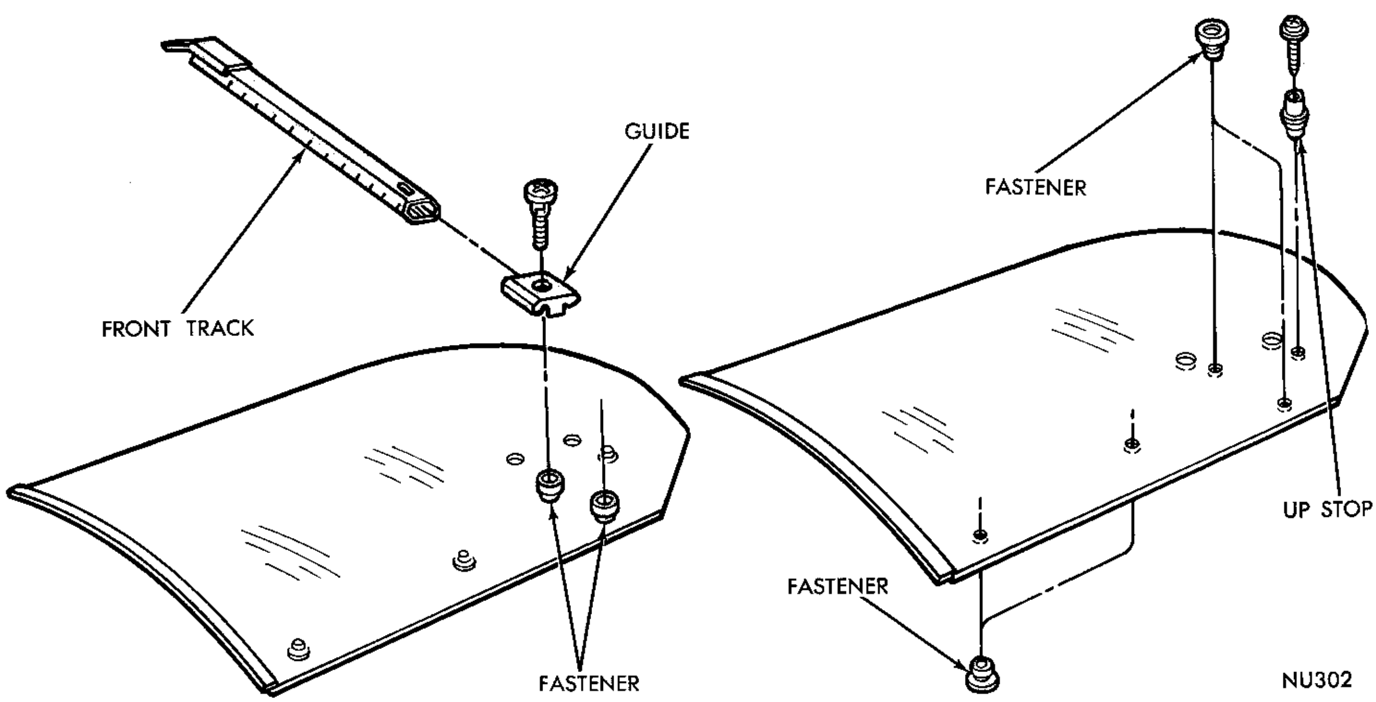


Fig. 36—Glass Assembly

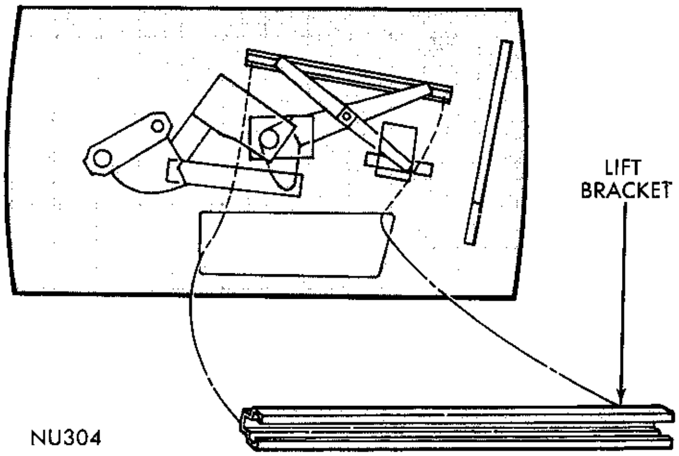


Fig. 38—Glass Lift Bracket

slot of lower support bracket and install nut loosely.

(4) Install door glass assembly and tighten rear track screw and nut after adjusting glass.

UP-STOP

The glass up-stop (Fig. 33) is attached to the door outside panel belt reinforcement with a screw and washer assembly. Engage tab on stop with slot in reinforcement.

Glass Lift Bracket

The glass lift bracket (Fig. 38) is positioned over sliding blocks on the regulator arms. Screws are used to secure the lift channel to the glass fasteners. Lubricate the sliding block contact areas of the lift channel sparingly.

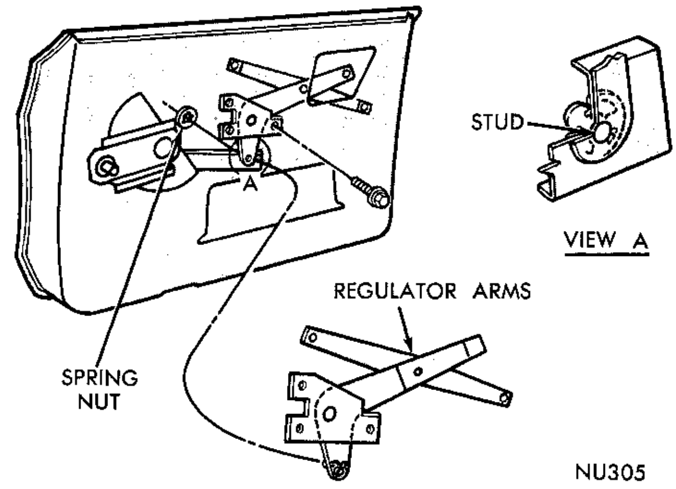


Fig. 39—Regulator Arms

Regulator Arms—Manual

The manually operated regulator incorporates a replaceable type arms assembly (Fig. 39). The arms assembly is retained on the inner door panel with screws and to the regulator connector link of the regulator with a spring nut. The door glass assembly should be removed when replacing the arms assembly.

Regulators

The manual and electric operated regulators (Fig. 40) are attached to the door inner panel with screws.

Refer to the Electrical Group for test procedures and wiring diagrams for electric operated regulators.

Pivot Bracket

The pivot bracket and support assembly (Fig. 41) is

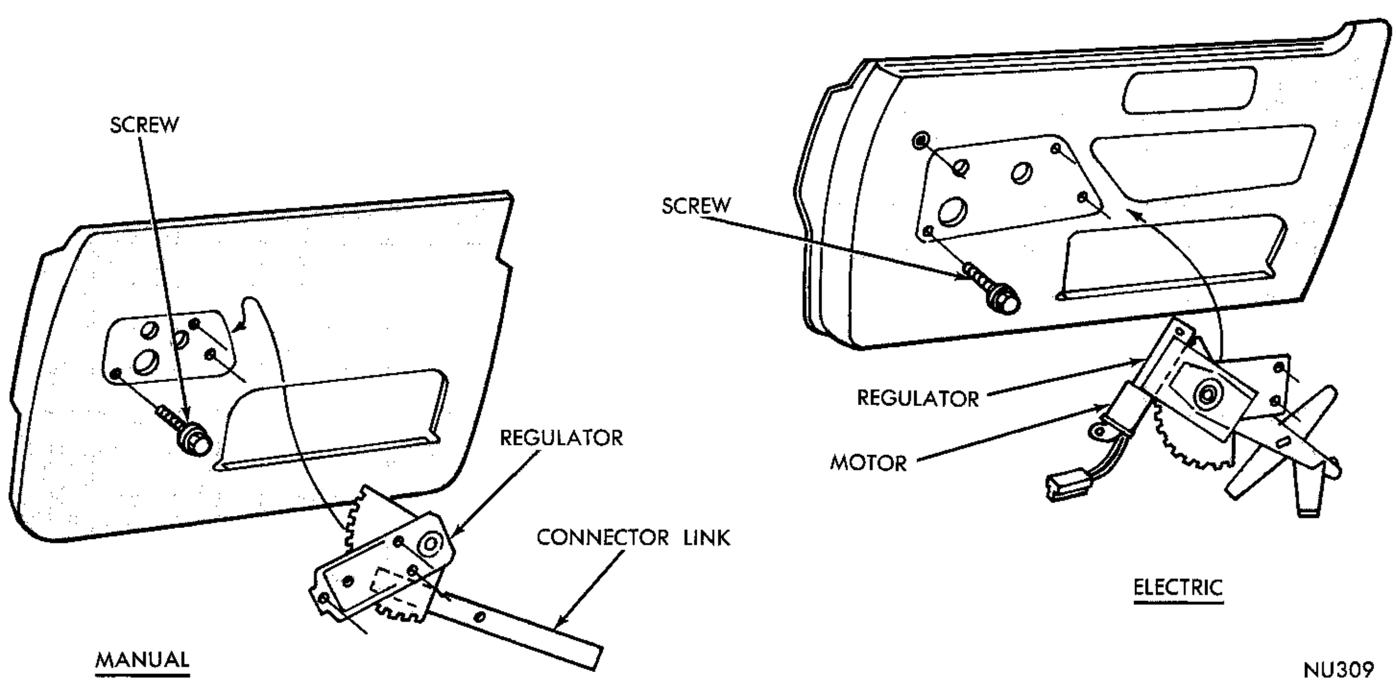


Fig. 40—Regulator Assemblies

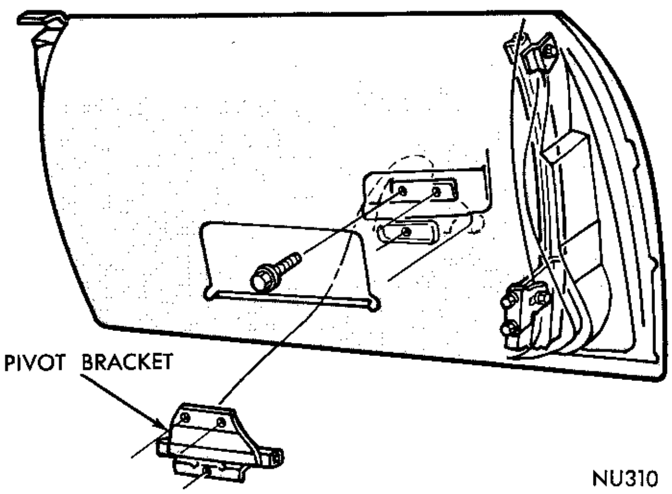


Fig. 41—Pivot Bracket

secured with screws to the electric regulator idler arm slide and to the door inner panel with the manual regulator.

Regulator Motor Replacement

When necessary to remove motor from regulator, it is imperative the linkage be securely clamped in a vise to lock it in place. Failure to do this allows the assist spring to drive the mounting bracket around the lift pivot.

Window Lift Switch

Slide a thin blade behind the switch housing (front and back) to depress retaining clips and pull switch out from panel. Carefully separate multiple terminal block from switch body and remove switch from panel.

2 DOOR MODELS and 4 DOOR HARD TOP

Adjustments (With Vent Wing) (Fig. 42)

Primary Seal Adjustment (Fore-Aft-Up-Down)

(1) Lower glass fully and loosen vent wing screw on hinge face at belt line.

(2) Align and set vent wing to "A" post and roof rail weatherstrip.

(3) Snug secure vent wing screw at belt rear attachment and raise glass fully.

(4) Set top edge of glass parallel to line up bead on roof rail weatherstrip.

(5) Snug secure vent wing screw on hinge at belt line.

Parallelism to Belt Outer Weatherstrip

(6) Run glass approximately 1/3 way down.

(7) Adjust rear run channel upper attachment so glass lightly touches on outer weatherstrip and up-stop bracket on rear channel is in full up position.

(8) Snug secure rear run channel upper attachment screw.

In-Out Adjustment at Top of Glass and Secondary Seal

(9) Raise glass fully.

(10) Back out adjusting stud on vent wing leg until shoulder bottoms out against door panel reinforcement and a parallelism exists between glass edge and roof rail weatherstrip.

(11) Loosen nut assembly on vent wing leg adjusting stud.

(12) Force vent wing leg outboard until secondary

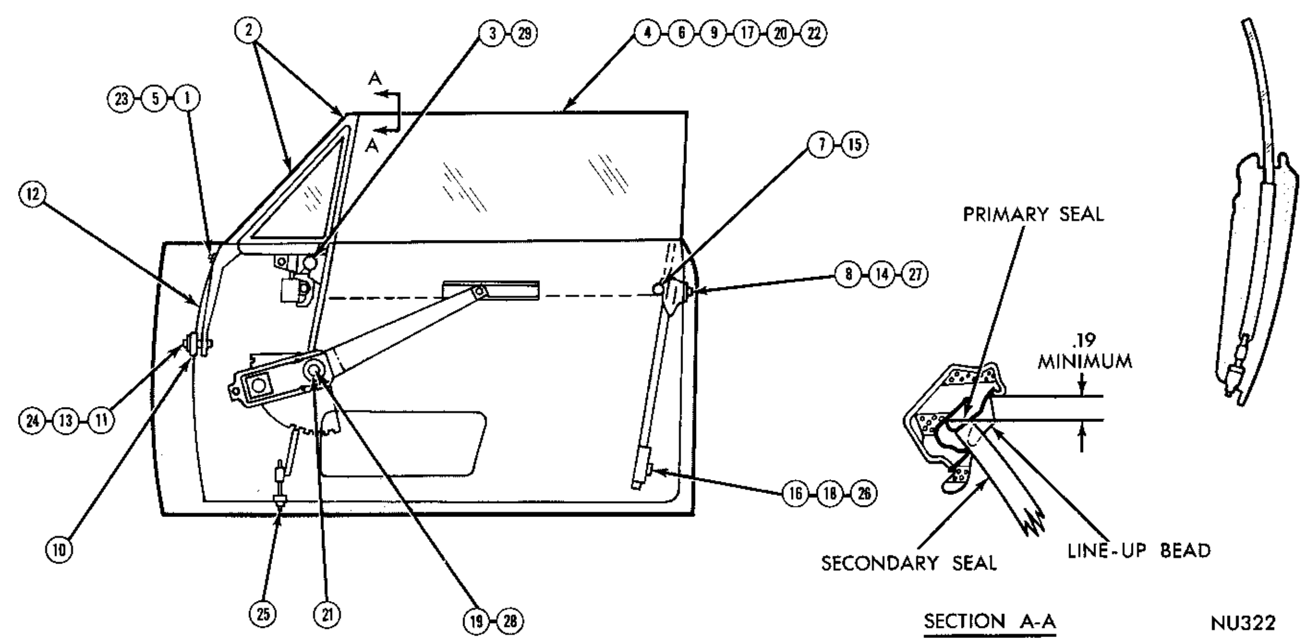


Fig. 42—2 Door Models and 4 Door Hardtops—Glass Adjustments

seal is accomplished between glass and roof rail weatherstrip.

(13) Snug secure nut assembly and screws loosen to perform adjustment.

(14) Loosen rear channel upper bracket screw assembly.

(15) Position up-stop on rear channel down against plastic bumper on glass and snug secure screw assembly.

Division and Rear Channel Parallelism

(16) Loosen rear channel lower attachment nut assembly.

(17) Run glass approximately 3/4 way down.

(18) Snug secure channel lower bracket nut assembly.

Manual Down Stop

(19) Loosen stop lock nut on regulator plate.

(20) Lower glass until top of glass is even with or slightly below door outer panel belt line. **Do not allow glass to drop below outer weatherstrip.**

(21) Position regulator plate stop against stop on sector snug secure nut assembly.

(22) Operate window up and down testing for ease of operation and inspecting alignment.

Cranking effort at the regulator handle should not exceed 30 inch-pounds with door closed and all glass in the up position.

Torque Specifications

Callouts 23, 24, 25, 26 and 27 should be tightened 170-230 inch-pounds.

Callout 28 should be tightened 45-75 inch-pounds.

Callout 29 should be tightened 75-115 inch-pounds.

DOOR GLASS AND VENT WING REPLACEMENT

Removal

(1) Remove nut and washer from end of division bar adjusting rod (Fig. 43).

(2) Remove vent frame to belt spacer reinforcement screw.

(3) Remove vent wing adjusting stud to upper hinge nut assembly and vent wing to belt attaching screw.

(4) Remove lift channel to door glass fastener screws (Fig. 44).

(5) Tilt top of glass inward and remove door glass and vent wing assembly.

Disassembly

(1) Invert door glass and vent wing assembly.

(2) Remove vent wing adjusting stud at hinge reinforcement (Fig. 45).

(3) Remove lower adjusting stud and anti-rattle from division channel.

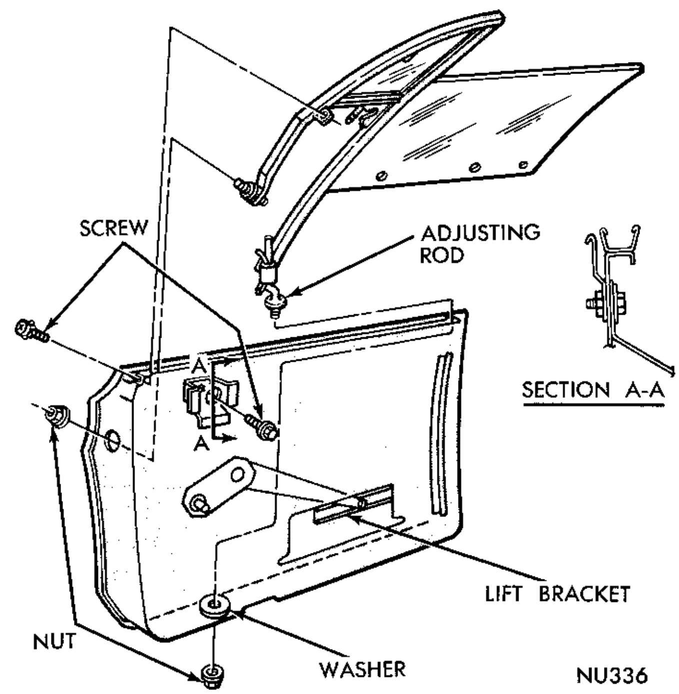


Fig. 43—Glass Replacement

(4) Slide door glass assembly out of vent wing division channel.

(5) Remove slide assembly from glass and weatherstrip (Fig. 34) by pulling slide halves apart.

(6) Remove weatherstrip from glass.

(7) Push lift channel fasteners out of glass.

Assembly

(1) Insert lift channel fasteners into glass from concave side (Fig. 45).

(2) Position weatherstrip on glass front edge with notched end in up position.

(3) Raise edge of weatherstrip and insert slide at attaching in glass. Secure by pressing together.

(4) With glass and vent wing in inverted position

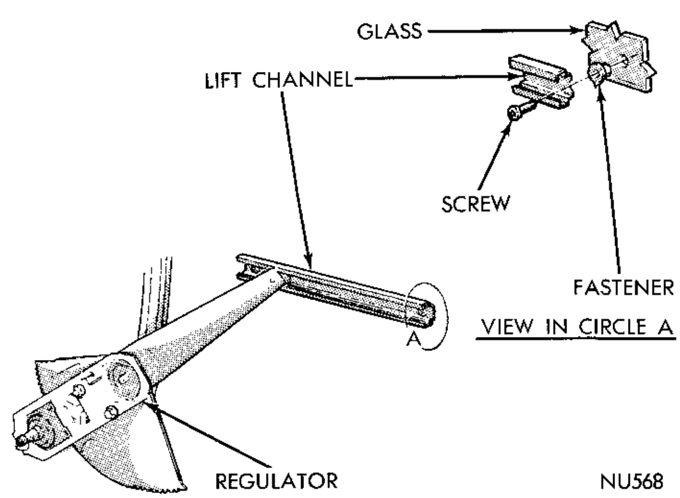


Fig. 44—Lift Bracket

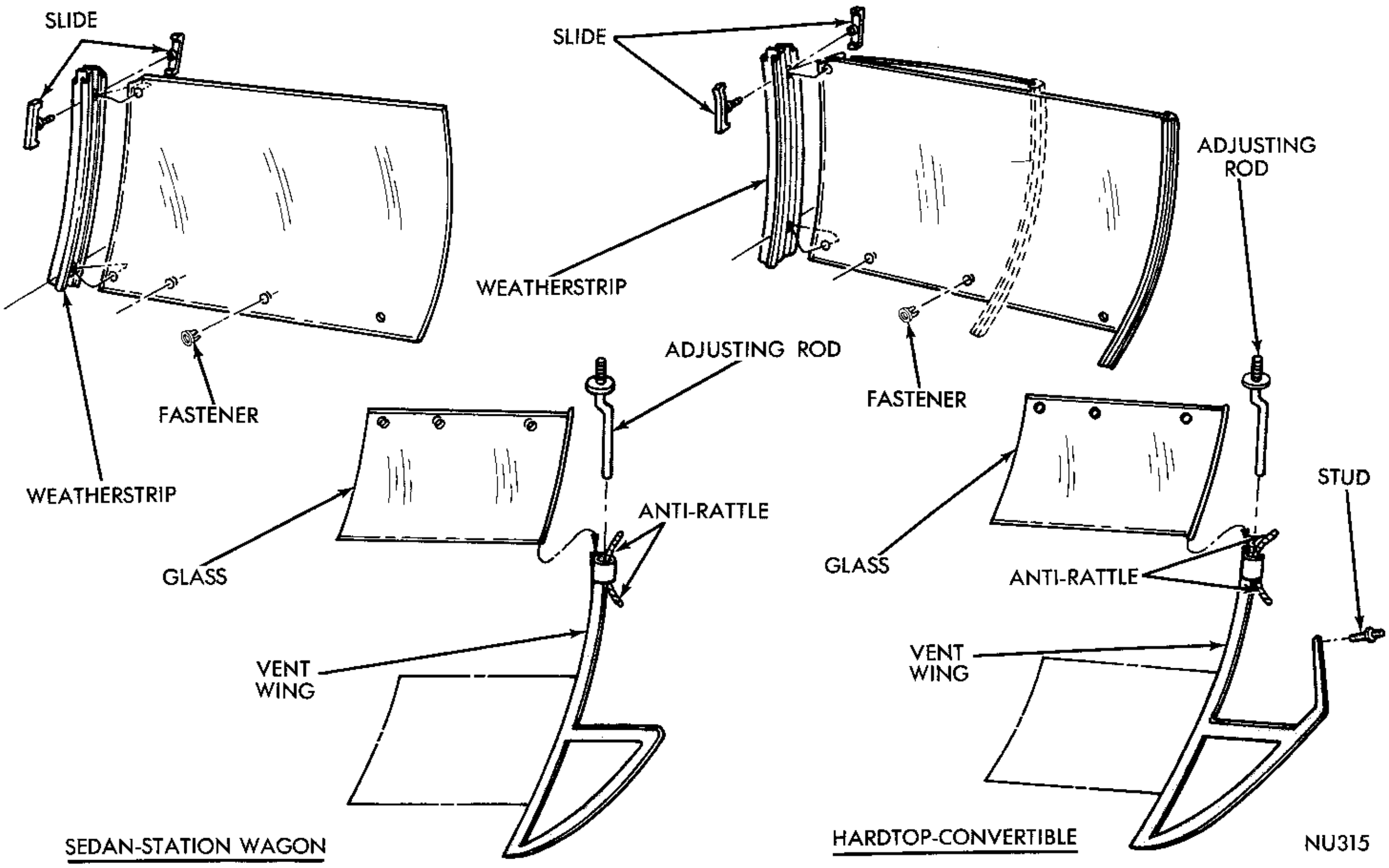


Fig. 45—Glass Assembly

(Fig. 34) insert slides on glass assembly into vent wing division channel.

(5) Insert anti-rattle into division channel adjusting bracket loop opposite loop joint.

(6) Insert smooth end of adjusting rod into bracket loop between anti-rattle and loop joint.

(7) Install adjusting stud to vent wing hinge loosely.

(8) Apply rubber lubricant sparingly to each side

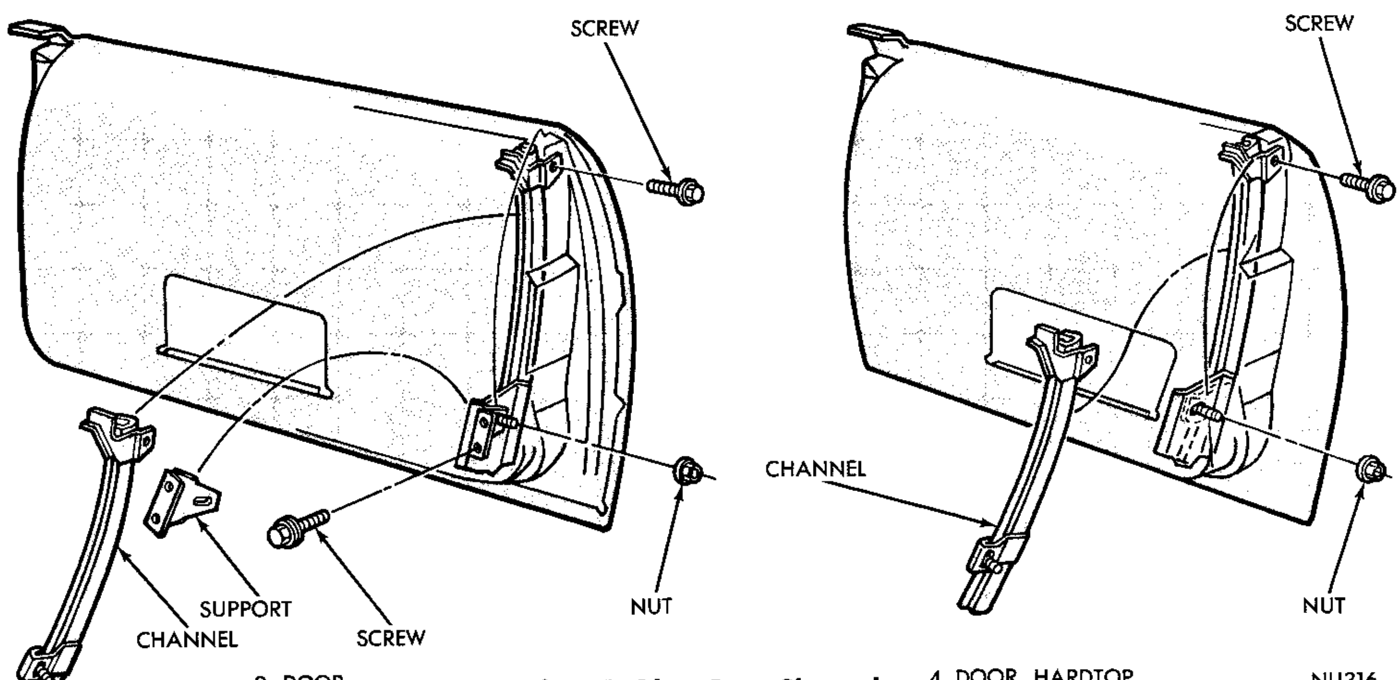


Fig. 46—Glass Rear Channel

of vent wing belt weatherstrip lip for entire length.

Installation

(1) Insert division channel through upper lock face corner, turn as necessary and move assembly forward.

(2) Tilt glass top inward, raising the off-set front lower leg to clear spacer bracket at belt.

(3) Insert lowest point of front leg and adjusting stud and lower assembly into door, with the pivot assembly mounting plate between the spacer bracket and door outside panel reinforcement.

(4) Position adjusting stud on lower off-set leg to hole in door hinge pillar and push through to stud shoulder.

(5) Fit rear edge of glass in run channel.

(6) Align vent wing lower pivot plate slot with access hole in inner panel and spacer bracket and with attaching hole in spacer bracket. Secure with screw.

(7) Position washer on division bar adjusting rod and insert adjusting rod into lower support.

(8) Install nut assembly on adjusting rod.

(9) Position and secure vent wing at front belt attachment with a screw and adjusting stud with a nut and washer assembly.

(10) Align glass fasteners with holes in lift channel and secure with screws.

REAR CHANNEL AND UP-STOP

Removal

(1) Remove up-stop at rear channel.

(2) Remove the door glass and vent wing assembly.

(3) Remove channel upper support retaining screw at door lock face, inner panel support and lower support retaining nut (Fig. 46) at door.

(4) Remove channel assembly through large access hole.

Installation

(1) Position rear channel assembly into door through large access hole.

(2) Align upper support to hole in door lock face and install screw loosely (Fig. 46).

(3) Insert channel lower stud into slot of support assembly and secure with nut.

(4) Tighten upper support screw.

(5) Install door glass.

(6) Install up-stop at rear channel.

DOOR GLASS REGULATOR

The manual and electric operated regulators (Fig. 47) are attached to the door inner panel with screws. **Refer to the Electrical Group for test procedures and wiring diagrams for electric operated regulators.**

Glass Lift Bracket

The glass lift bracket (Fig. 48) is positioned over sliding blocks on the regulator arms. Screws are used to secure the lift channel to the glass fasteners. Lubricate the sliding block contact areas of the lift channel sparingly.

Regulator Motor Replacement

When necessary to remove motor from regulator, it is imperative the linkage be securely clamped in a vise to lock it in place. Failure to do this allows the

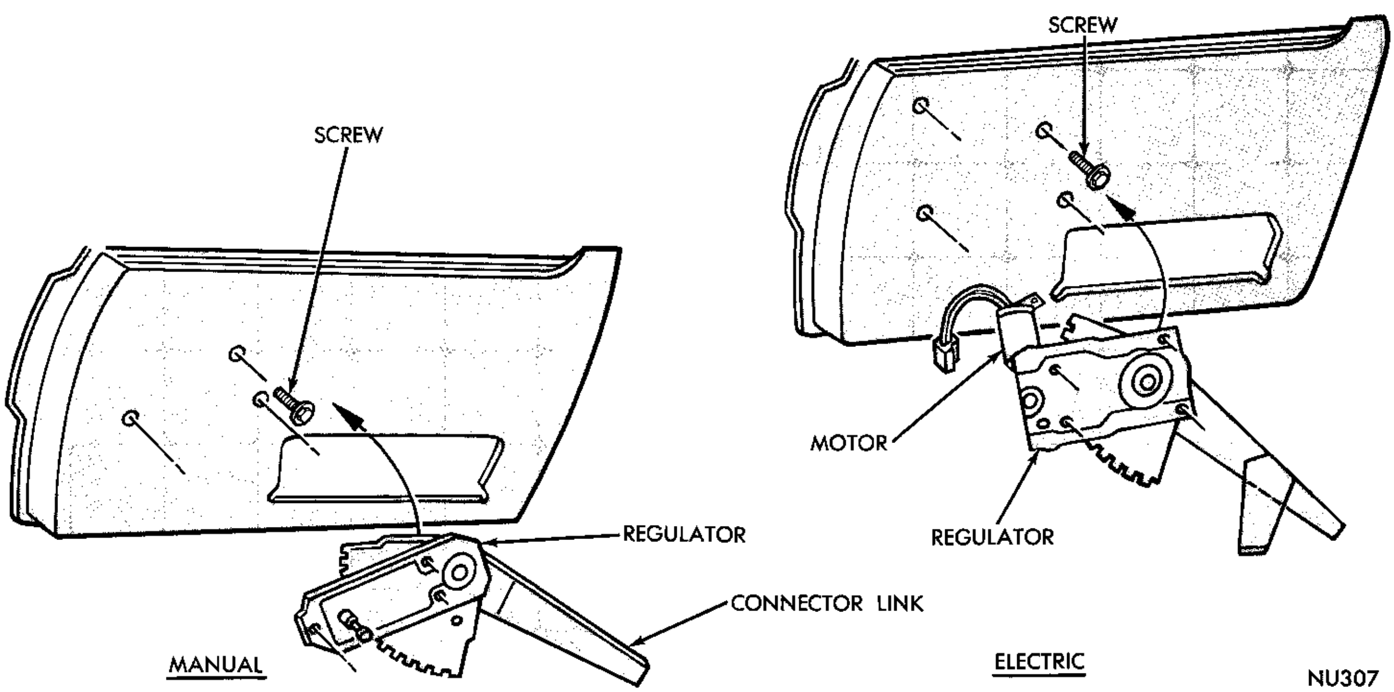


Fig. 47—Regulator Assemblies

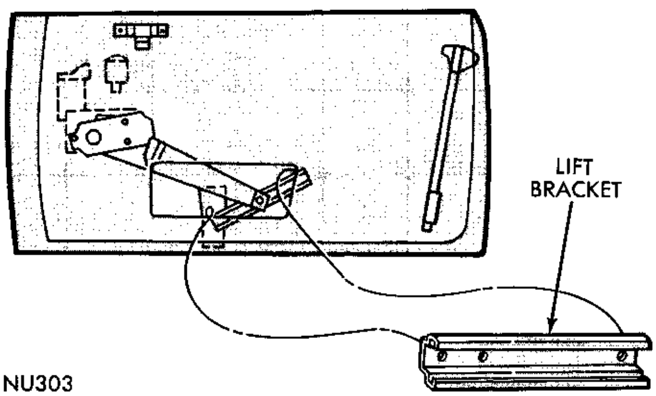


Fig. 48—Lift Bracket

assist spring to drive the mounting bracket around the lift pivot.

Window Lift Switch

Slide a thin blade behind the switch housing (front and back) to depress retaining clips and pull switch out from panel. Carefully separate multiple terminal block from switch body and remove switch from panel.

VENT WING REGULATOR

Removal

(1) With vent wing open, remove screws attaching regulator to door inner panel belt reinforcement (Fig. 49).

(2) Remove shaft to coupling screw.

(3) Move regulator off of vent wing pivot shaft.

(4) Remove regulator through large access hole in door panel.

Installation

(1) Through large access hole, position and align sleeve on regulator coupling over vent wing pivot shaft.

(2) Position and align regulator body to attaching slots in door inner panel belt reinforcement and install attaching screws.

(3) Install regulator coupling to vent wing pivot shaft screw.

4 DOOR SEDAN and STATION WAGON

Adjustments (Fig. 50)

(1) Run glass approximately 2/3 way down.

(2) Tighten vent wing lower adjusting rod to inner panel screw assembly.

(3) Lower glass until top edge is even with or slightly below top of door at outer panel.

(4) Position stop on regulator plate against stop on sector and snug tighten locknut.

(5) Test operation and inspect alignment of glass.

(6) Tighten lower adjusting stud nut 170-230 inch-pounds.

(7) Tighten locknut on regulator plate 45-75 inch-pounds.

DOOR GLASS AND VENT WING REPLACEMENT

Removal

(1) Move glass run forward, four inches at upper corner.

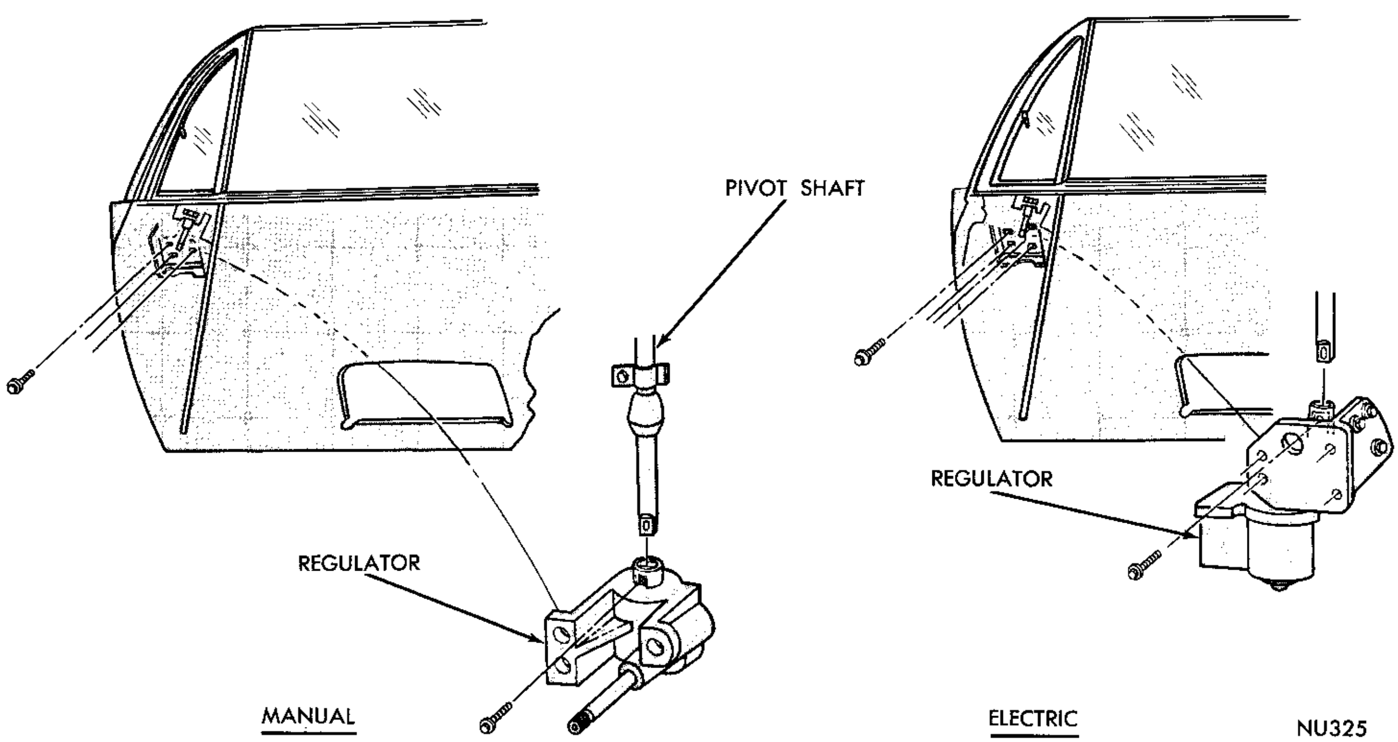


Fig. 49—Vent Wing Regulator

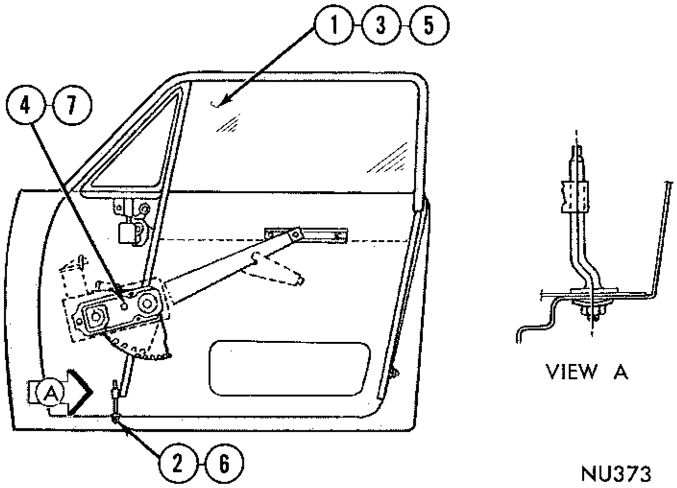


Fig. 50—4 Door Sedan and Station Wagon Glass Adjustments

(2) Remove division bar adjusting rod nut and washer (Fig. 51).

(3) Remove screw assembly attaching vent wing frame to outside belt reinforcement.

(4) Remove vent wing frame to door frame screws.

(5) Remove lift channel to door glass fastener screws.

(6) Lift vent wing and door glass out of panel.

Installation

(1) Inspect seal on vent wing upper surface.

(2) With regulator arms in the down position, lower vent wing and door glass assembly fully into door.

(3) Move glass assembly rearward into glass run.

(4) Position washer on division channel lower adjusting rod and insert adjusting rod into opening in support bracket.

(5) Position vent wing frame to door upper frame, aligning notch in lower pivot to hole in spacer bracket.

(6) Install retaining screw at spacer bracket.

(7) Starting at bottom attaching hole, secure vent wing frame to door frame with screws.

(8) Install lower adjusting rod nut and washer.

(9) Install lift channel to door glass fastener screw.

(10) Position loose 4 inches of upper run channel and fully seat in channel.

GLASS RUN

The glass run (Fig. 52) is a press fit in the door frame. Position run to door frame by inserting lower leg between inner and outer door panels. Index molded corner to upper rear corner of frame and press firmly into place. Press run into upper door frame leaving forward four inches out of retainer to facilitate vent wing installation.

Glass Lift Bracket

The glass lift bracket (Fig. 48) is positioned over sliding blocks on the regulator arms. Screws are used to secure the lift channel to the glass fasteners. Lubricate the sliding block contact areas of the lift channel sparingly.

DOOR GLASS REGULATOR

The manual and electric operated regulators (Fig. 47) are attached to the door inner panel with screws.

Refer to the Electrical Group for test procedures and wiring diagrams for electric operated regulators.

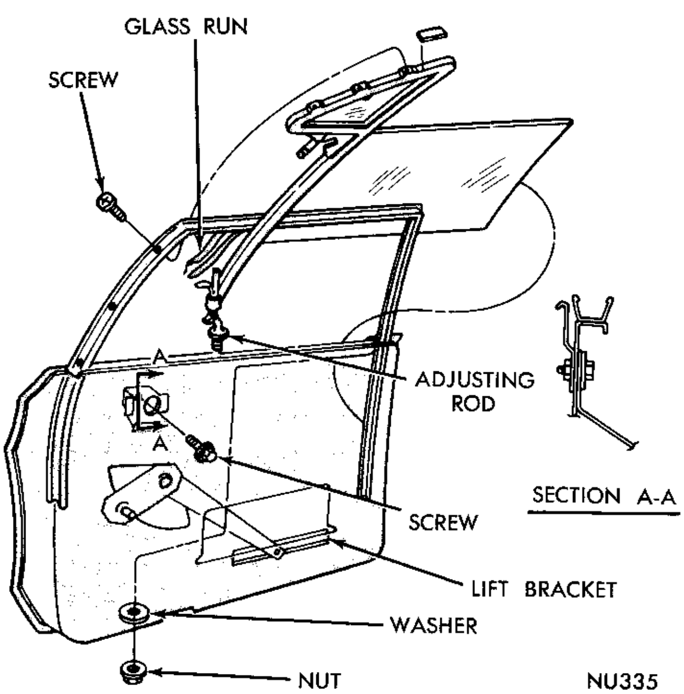


Fig. 51—Glass Replacement

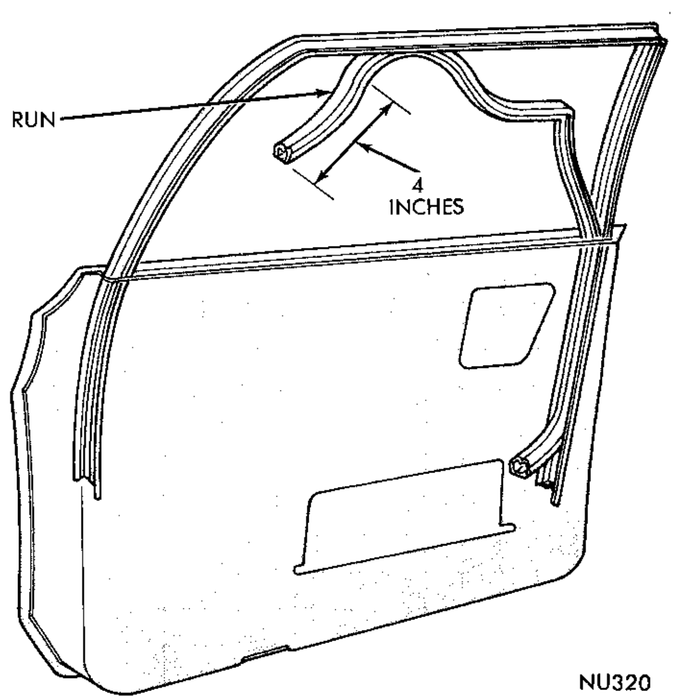


Fig. 52—Glass Run

Regulator Motor Replacement

When necessary to remove motor from regulator, it is imperative the linkage be securely clamped in a vise to lock it in place. Failure to do this allows the assist spring to drive the mounting bracket around the lift pivot.

Window Lift Switch

Slide a thin blade behind the switch housing (front and back) to depress retaining clips and pull switch out from panel. Carefully separate multiple terminal block from switch body and remove switch from panel.

VENT WING REGULATOR

Removal

(1) With vent wing open, remove screws attaching regulator to door inner panel belt reinforcement (Fig. 49).

(2) Remove shaft to coupling screw.

(3) Move regulator off of vent wing pivot shaft.

(4) Remove regulator through large access hole in door panel.

Installation

(1) Through large access hole, position and align sleeve on regulator coupling over vent wing pivot shaft.

(2) Position and align regulator body to attaching slots in door inner panel belt reinforcement and install attaching screws.

(3) Install regulator coupling to vent wing pivot shaft screw.

REAR DOORS

Adjustments—Sedan (Fig. 53)

(1) Raise window to approximately 1/8 inch below door frame.

(2) Adjust regulator pivot bracket so gap between top of glass and door frame is constant. Snug tighten attaching nuts.

(3) Lower glass until top edge is even with or slightly below outer panel belt weatherstrip.

(4) Position stop on regulator plate against sector stop and snug tighten nut.

(5) Test operation and inspect alignment of glass.

(6) Tighten pivot bracket nuts 75-115 inch-pounds.

(7) Tighten regulator plate stop locknut 45-75 inch-pounds.

GLASS REPLACEMENT

Removal

(1) Remove lift channel to door glass fastener screws (Fig. 54).

(2) Rotate front edge of glass rearward and up to disengage ends of glass from run channels.

(3) Lift glass assembly out of door.

(4) Remove lift fasteners from glass (Fig. 54).

Installation

(1) Position lift fasteners into glass from glass inner surface (Fig. 54).

(2) With bottom of glass in forward position, lower glass into door.

(3) Rotate front edge of glass forward and down, engaging glass ends into the front and rear glass runs.

(4) Align glass fasteners with holes in lift channel and secure with screws.

Glass Run

The rear door glass run (Fig. 55) is a press fit in

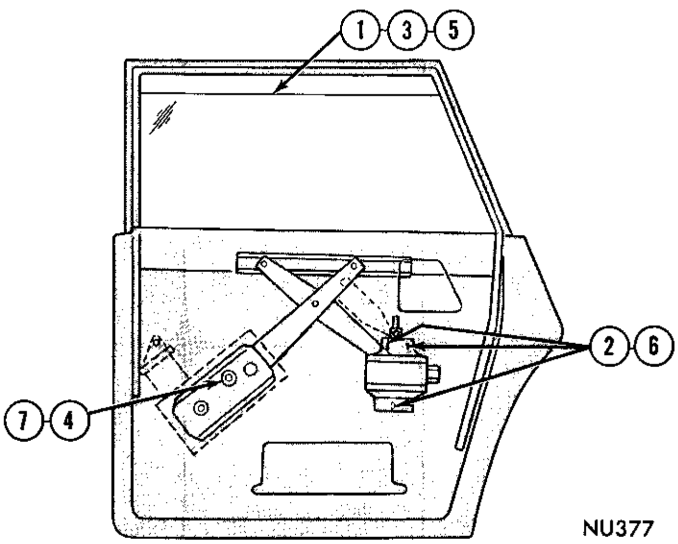


Fig. 53—Sedan Rear Door Glass Adjustment

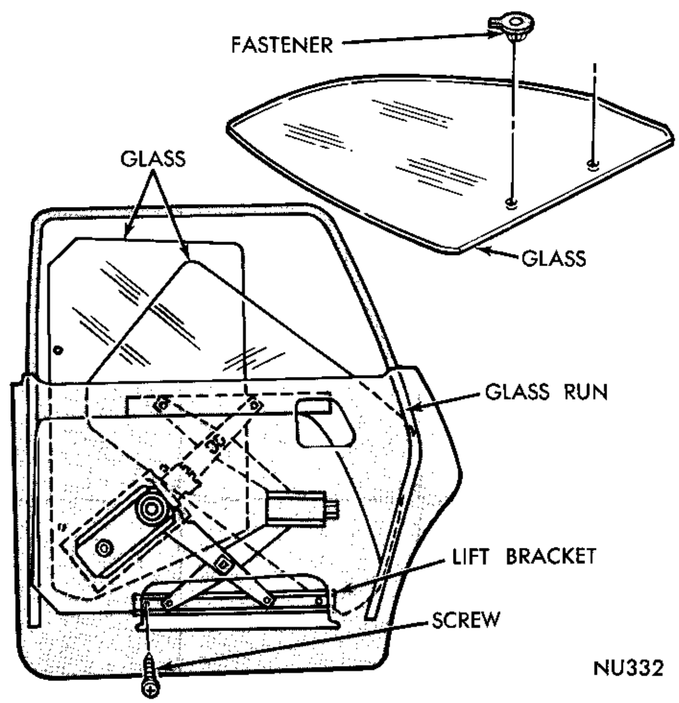


Fig. 54—Glass Replacement

the door frame. Index the front notch into upper front corner of door frame and press entire front leg of run secure. Position rear notch in run to upper rear corner of door frame and press entire top and rear leg securely in channel.

Pivot Bracket

Removal

(1) Remove the rear door glass.

(2) Remove pivot support bracket to door inner panel screw assemblies (Fig. 56).

(3) Slide pivot channel off of regulator arm slide and remove pivot bracket through large access hole.

Installation

(1) Apply lubricant to sliding contact surfaces of pivot channel.

(2) Through large access hole, position pivot channel over slide on regulator idler arm.

(3) Align pivot bracket mounting holes with holes in door inner panel and secure with screws.

(4) Install rear door glass.

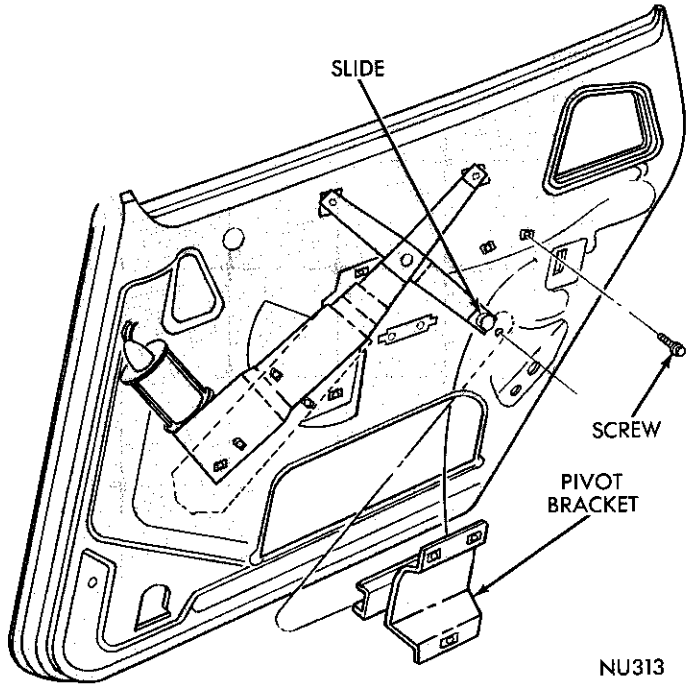


Fig. 56—Pivot Bracket

Glass Lift Bracket (Fig. 57)

Removal

(1) Remove rear door glass to lift bracket screws.

(2) Move lift bracket forward on front slide to disengage bracket from rear slide.

(3) Move bracket rearward to remove from front slide.

Installation

(1) Apply lubricant to channel of lift bracket.

(2) Position bracket channel to regulator arm front slide first, then move rearward to engage rear slide.

(3) Install rear door glass to lift bracket screws.

Regulators

The manual and electric operated regulators (Fig. 58) are attached to the door inner panel with screws.

Refer to the Electrical Group for test procedures and wiring diagrams for electric operated regulators.

Regulator Motor Replacement

When necessary to remove motor from regulator, it is imperative the linkage be securely clamped in a vise to lock it in place. Failure to do this allows the assist spring to drive the mounting bracket around the lift pivot.

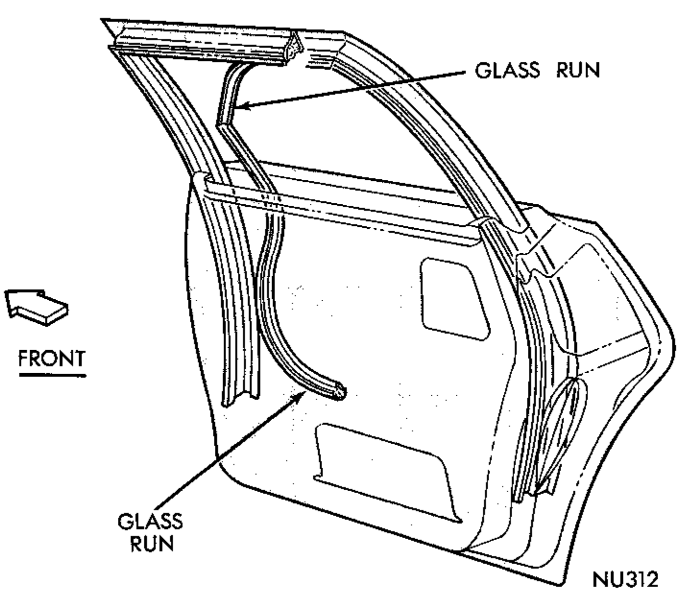


Fig. 55—Glass Run

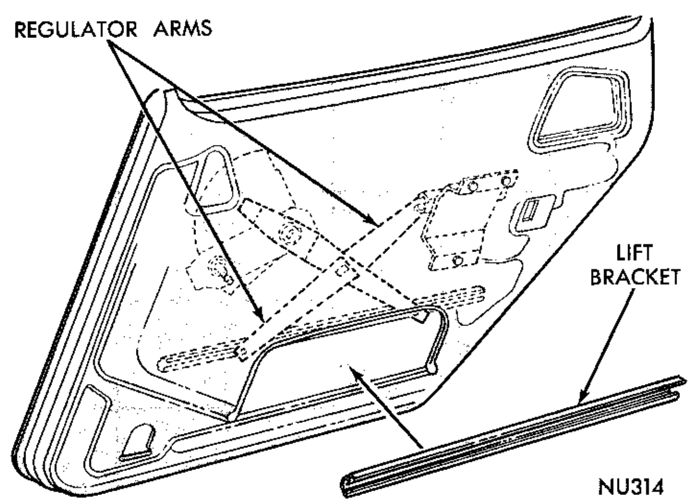


Fig. 57—Lift Bracket

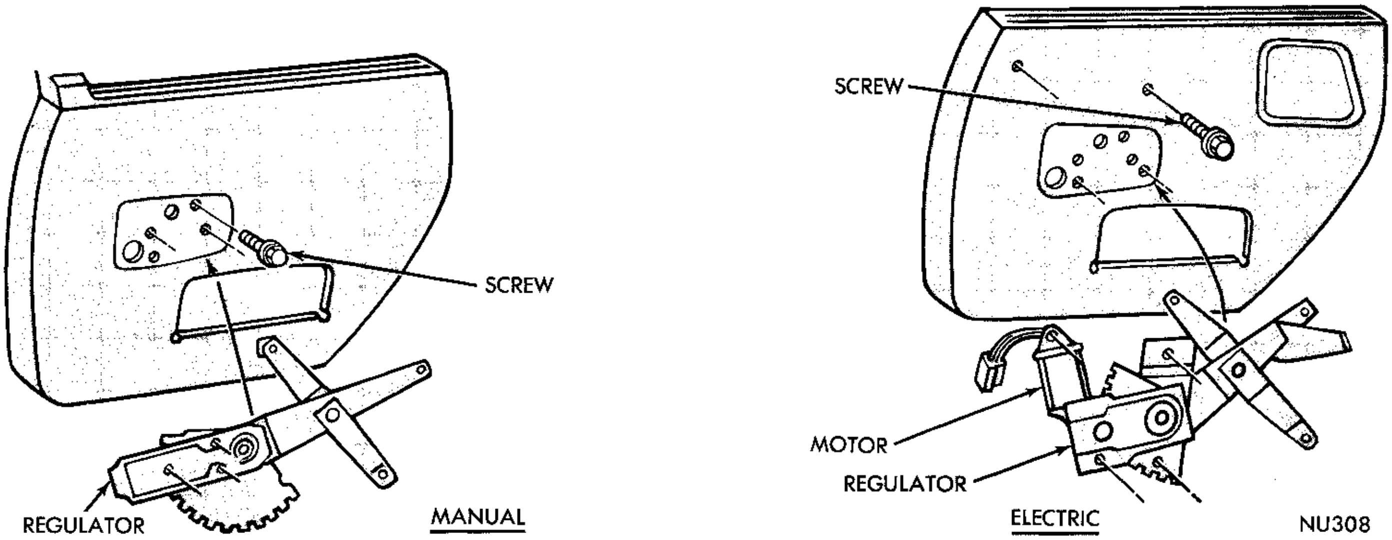


Fig. 58—Regulator Assemblies

Window Lift Switch

Slide a thin blade behind the switch housing (front and back) to depress retaining clips and pull switch out from panel. Carefully separate multiple terminal block from switch body and remove switch from panel.

HARD TOP MODELS

Adjustments (Fig. 59)

Parallelism and Primary Seal

(1) Raise window completely.

(2) Line up rear door glass upper front frame with upper rear edge of front door glass rear frame.

(3) Snug tighten track panel to reinforcement front screw.

(4) Set rear glass front frame parallel to rear frame of front door glass by lifting track panel bottom edge.

(5) Snug tighten rear and center floating screws in cage nuts.

In-Out and Secondary Seal

(6) Force bottom of track panel in or out for secondary seal with roof weatherstrip.

(7) Snug tighten adjusting bracket to track panel screws.

(8) Snug tighten adjusting bracket to track panel nut assembly on bottom of door panel outside surface.

(9) Tighten track panel upper attaching screws.

Parallelism to Front Glass Frame and Roof Rail Weatherstrips

(10) Adjust pivot bracket to bring upper front corner of rear glass parallel between front and rear glass frames and between glass and roof rail weatherstrips.

(11) Snug tighten the pivot bracket screw assemblies.

Up-Stops

(12) Adjust up-stops by forcing them down against plastic up-stop bumpers on glass.

(13) Snug tighten screws on hinge and lock faces. **Tighten callouts 14, 15, 16, 17 and 18 securely.**

GLASS—TAIL GATE

Adjustments

The circled numbers shown on the glass adjustment reference illustration (Fig. 89) indicate the particular step number being read in the adjustment procedure.

Prior to adjusting glass, the tail gate must be correctly fitted to its opening, the inner belt weatherstrip installed and all glass and related hardware component attaching screws and nuts loosened.

(1) With tail gate opened in tail gate position, push glass against belt inner weatherstrip and snug secure upper screws of lower glass run channel.

(2) With tail gate closed, from inside body, run

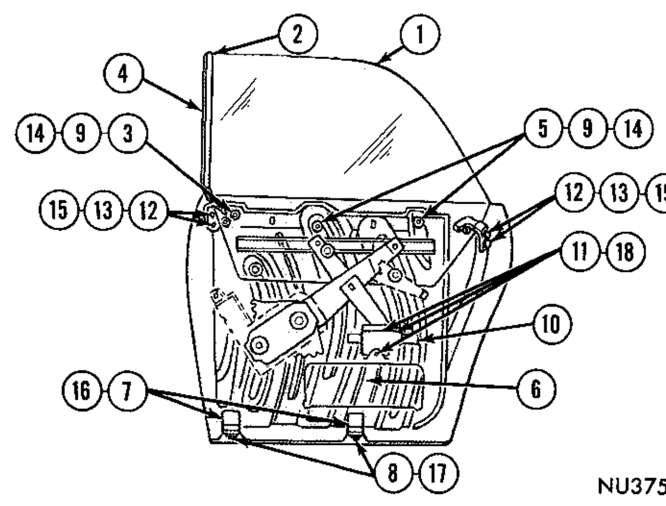


Fig. 59—Hardtop Rear Door Glass Adustments

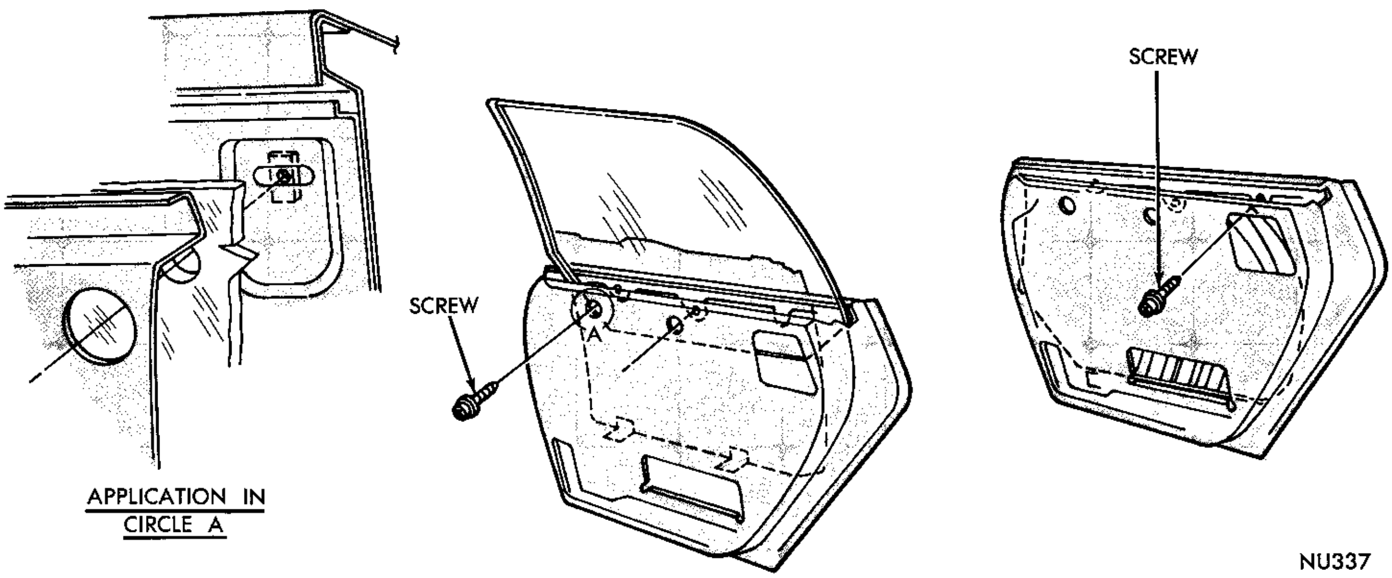


Fig. 60—Track Panel Upper Attachment

glass up far enough to engage and align lower end of upper run channel. Snug secure bottom screw in upper run channel.

(3) Align top end of upper run channel with tail gate header run retainer and snug secure screws.

(4) Raise glass to approximately 1/8 inch below roof rear glass run and adjust regulator so top of glass is parallel to roof glass run. Snug secure regulator attaching nuts.

(5) Open tail gate to gate position and secure lower nut on glass run of tail gate.

(6) Close tail gate, test for ease of operation and inspect alignment.

Tighten callouts 7, 8 and 9 securely.

GLASS REPLACEMENT

The rear door incorporates a track panel assembly to which the door glass is attached. When necessary to remove or install either the glass or track panel, the panel and glass must be removed or installed as an assembly.

Removal

(1) Remove track panel to door panel upper screws (Fig. 60).

(2) Remove down-stop adjusting bracket to track panel screws.

(3) Remove up-stop adjusting brackets from door panel (Fig. 61).

(4) Remove glass lift bracket to glass fastener screws (Fig. 62).

(5) Move track panel rearward, approximately four inches, and raise door glass to the full-up position.

(6) Raise track panel slowly until up-stop on glass (Fig. 63) are cleared through door.

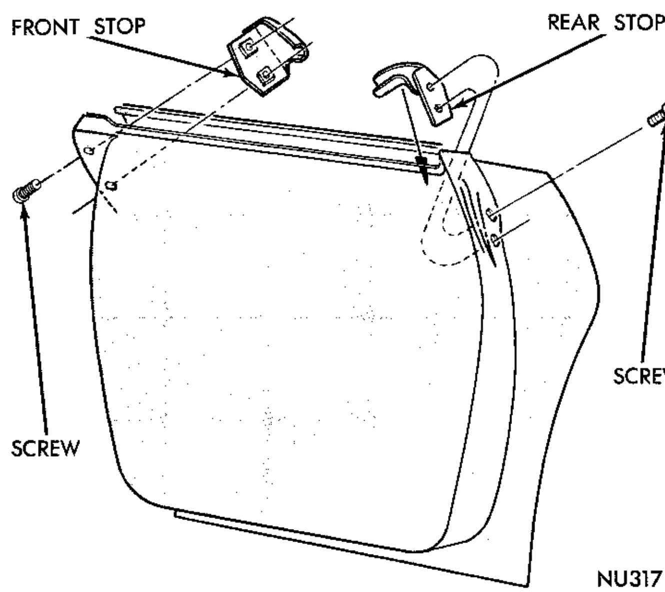


Fig. 61—Up-Stop Brackets

(7) Raise track panel completely and remove glass and panel assembly (Fig. 64).

(8) Place track panel and glass assembly on a protected surface with the glass facing downward.

(9) Remove track stabilizer guide screws (Fig. 65) and remove guides from track panel.

(10) Remove U-nuts from outer side of track panel and bumpers from top inner side (Fig. 66).

Installation

(1) Insert U-nuts into outer side of track and bumpers into top inner side.

(2) With glass assembly inner surface positioned downward on a protected surface, place track panel on glass aligning fasteners in glass with channels in panel.

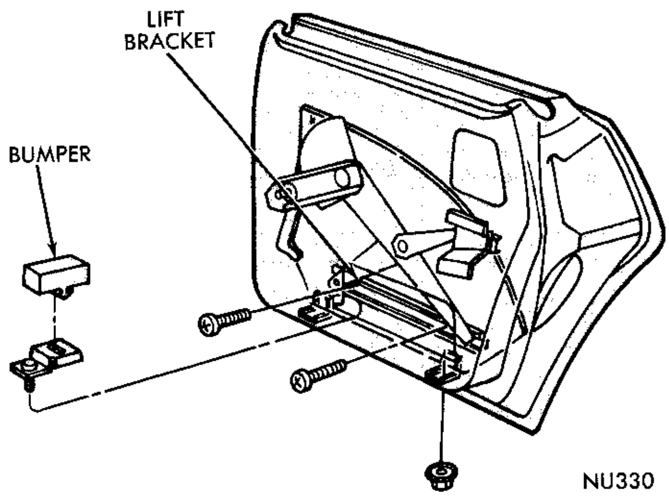


Fig. 62—Lift Bracket

(3) Position stabilizer guides in track panel, align with fasteners in glass and install screws.

(4) Insert glass and track panel into door, sliding assembly rearward approximately four inches, to allow clearance for the U-nuts.

(5) Slide track panel off of glass, until up-stops on glass find clearance to enter door opening.

(6) Slowly lower track panel completely to bottom of door, moving it forward approximately four inches, at the same time and positioning behind the down-stop brackets.

(7) Slowly lower the glass assembly until it is positioned on down-stop bumpers.

(8) Raise glass sufficiently to allow installing the down-stop to track panel screws.

(9) Install track panel to door panel screws, screws at panel top edge.

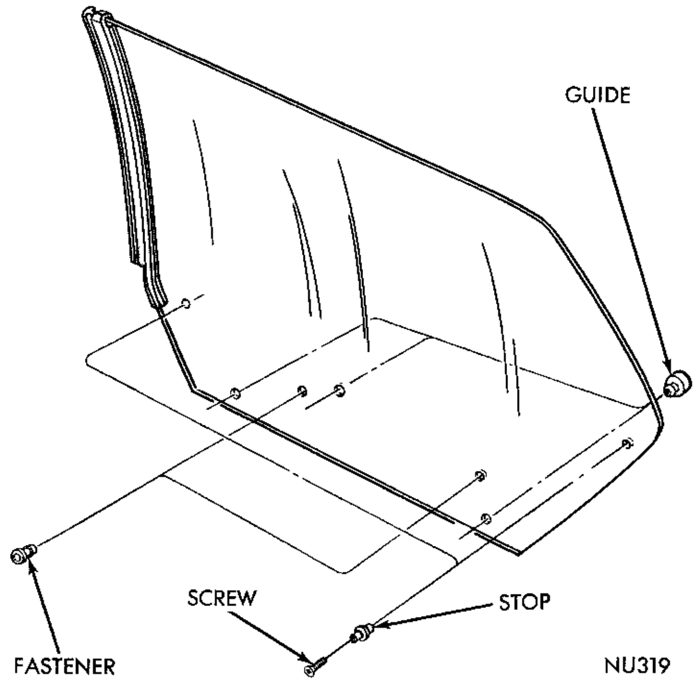


Fig. 63—Door Glass Assembly

(10) Align holes in glass lift bracket with fasteners in glass and install screws.

(11) Install up-stop brackets on door inner panel.

UP-STOPS

The rear up-stop (Fig. 61) is attached to slotted areas in the door shut face between the inner and outer panels. The front up-stop (Fig. 61) is attached to slotted areas of the inside panel through the glass

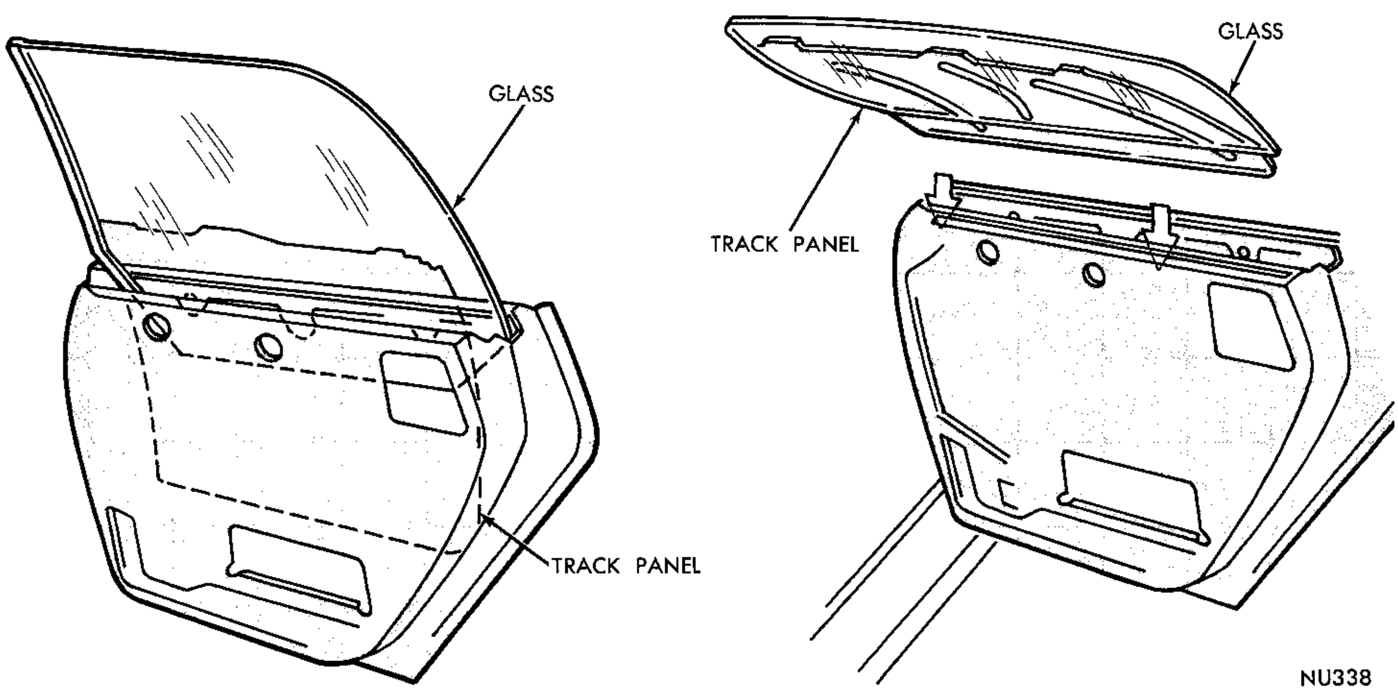


Fig. 64—Glass Replacement

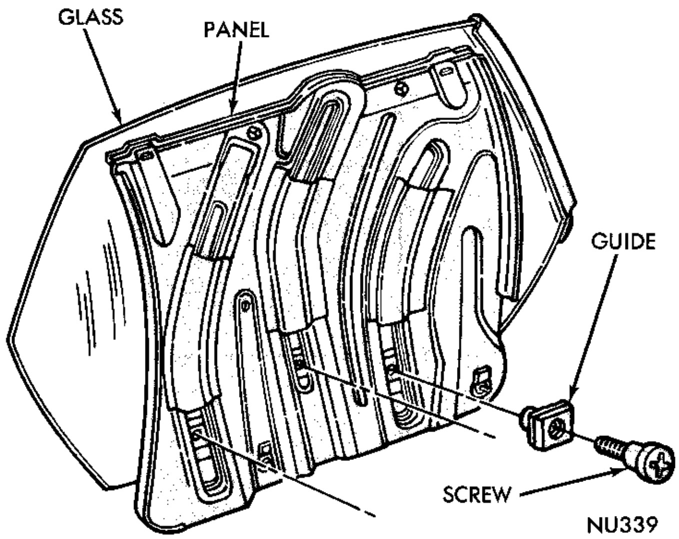


Fig. 65—Track Panel Stabilizer Guides

opening between inner and quarter panel at upper front corner.

GLASS ASSEMBLY

The door glass to lift channel fasteners are a press fit in the glass (Fig. 63) as are the glass to track and guide fasteners. The glass up-stops are retained in the glass with screws.

Glass Lift Bracket

The glass lift bracket (Fig. 62) is positioned over sliding blocks on the regulator arms. Screws are used to secure the lift channel to the glass fasteners. Lubricate the sliding block contact areas of the lift channel sparingly.

Regulators

The manual and electric operated regulators (Fig. 58) are attached to the door inner panel with screws.

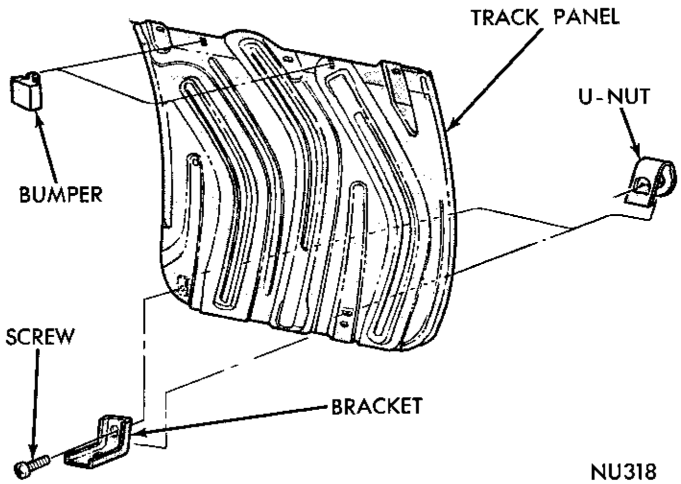


Fig. 66—Track Panel Assembly

Refer to the Electrical Group for test procedures and wiring diagrams for electric operated regulators.

Regulator Motor Replacement

When necessary to remove motor from regulator, it is imperative the linkage be securely clamped in a vise to lock it in place. Failure to do this allows the assist spring to drive the mounting bracket around the lift pivot.

Window Lift Switch

Slide a thin blade behind the switch housing (front and back) to depress retaining clips and pull switch out from panel. Carefully separate multiple terminal block from switch body and remove switch from panel.

QUARTER PANELS

GARNISH MOULDING

The garnish mouldings should be aligned and held in position to assure satisfactory alignment. Do not over-tighten screws, or moulding will become damaged at screw hole area.

TRIM PANELS

To remove quarter window trim panel it is first necessary to remove the rear seat cushion and back. Quarter window trim panels are retained with screws and clips. When installing trim panel, make certain watershield (Fig. 67) is properly cemented and positioned.

HANDLES

The regulator handle is attached with an allen screw.

WATERSHIELDS

Refer to Figure 67 for sealing and application areas of the watershield.

BELT LINE WEATHERSTRIP

The belt line weatherstrip is retained on the outer panel with spring type retainers.

GLASS ADJUSTMENTS

The circled numbers shown on the glass adjustment reference illustrations indicate the particular step number being read in the adjustment procedure.

Prior to adjusting glass, all doors must be correctly fitted in their opening and the weatherstrips at the "A" post and roof rails must be properly installed.

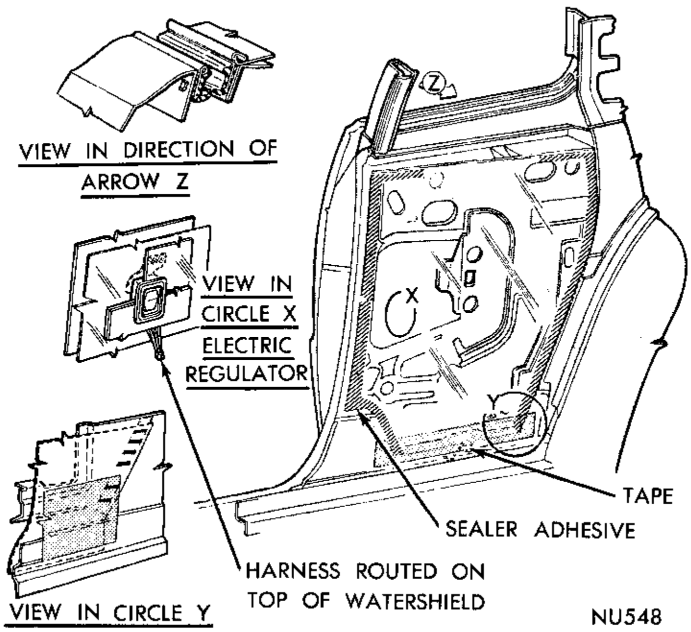


Fig. 67—Quarter Panel Watershields

Refer to the adjustment illustration and loosen the attaching screws and nuts of the various components affecting glass adjustment.

QUARTER WINDOW

Adjustments (Fig. 68)

(1) Adjust upper rear track so rear of glass lightly touches outer panel belt weatherstrip.

(2) Raise glass fully so top of glass is seated fully against roof rail weatherstrip and flushing front of glass with top of front door glass.

(3) Adjust upper front track attachment so front of glass is aligned with rear of front door glass at belt line and snug secure nut.

(4) Adjust lower front track attachment so front of glass is aligned with rear of front door glass at roof rail and snug secure screw.

(5) Adjust pivot bracket so top of glass is fully against and parallel to adjusting bead on roof rail weatherstrip. Snug secure nuts.

(6) Loosen sleeve nut and move upper rear track attachment forward so weatherstrip and front of glass is against front door glass. Snug secure nut.

(7) Loosen pivot bracket nuts, adjust pivot bracket and snug secure nuts.

(8) Position front and rear up-stops down against glass lower frame and snug secure screws.

(9) Lower glass until glass top edge is even with or slightly below belt line of outer panel.

(10) Snug secure lower rear track adjusting screw.

(11) Position stop on regulator plate against stop on sector and snug secure nut.

(12) Position down stops against bumpers and snug secure screws.

(13) Operate window and inspect alignment. Tighten callouts 14 through 21 securely.

GLASS REPLACEMENT

Removal

(1) Align glass lower frame to glass attaching screws with access holes in quarter inner panel (Fig. 69).

(2) Support glass, remove lower frame to glass at-

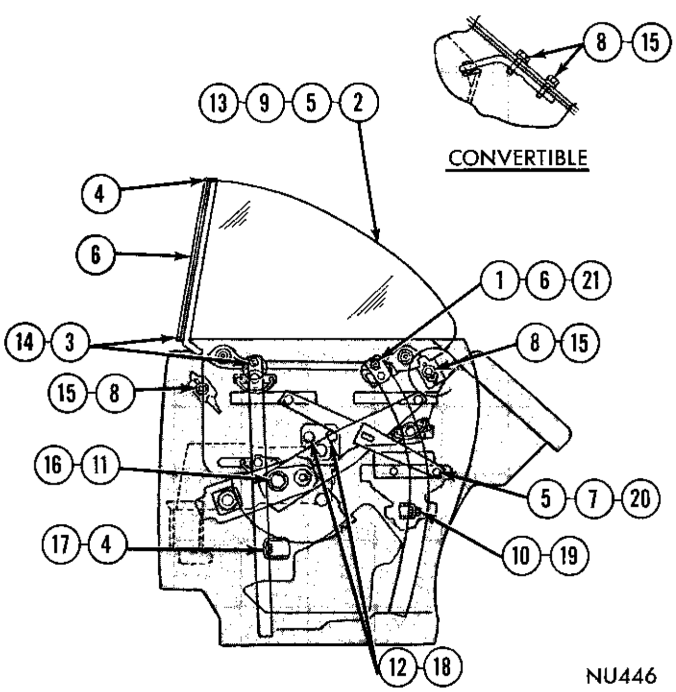


Fig. 68—Quarter Window Adustments

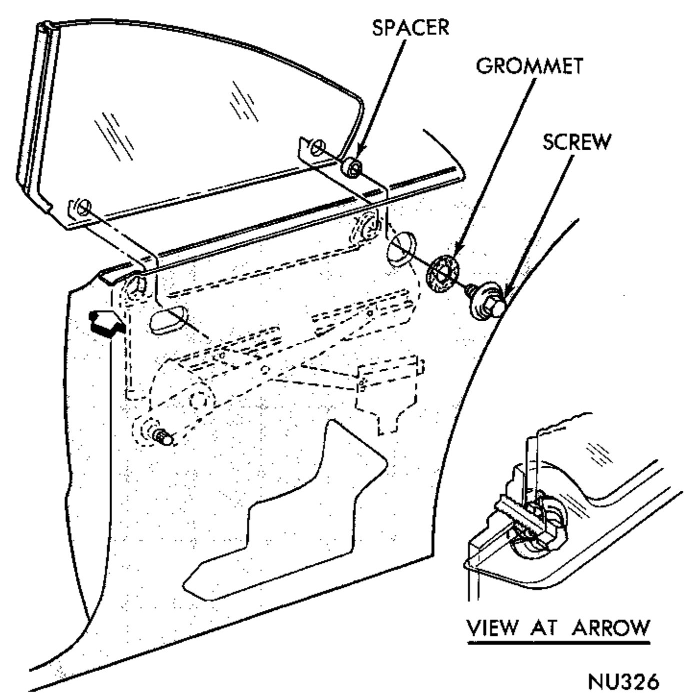


Fig. 69—Glass Replacement

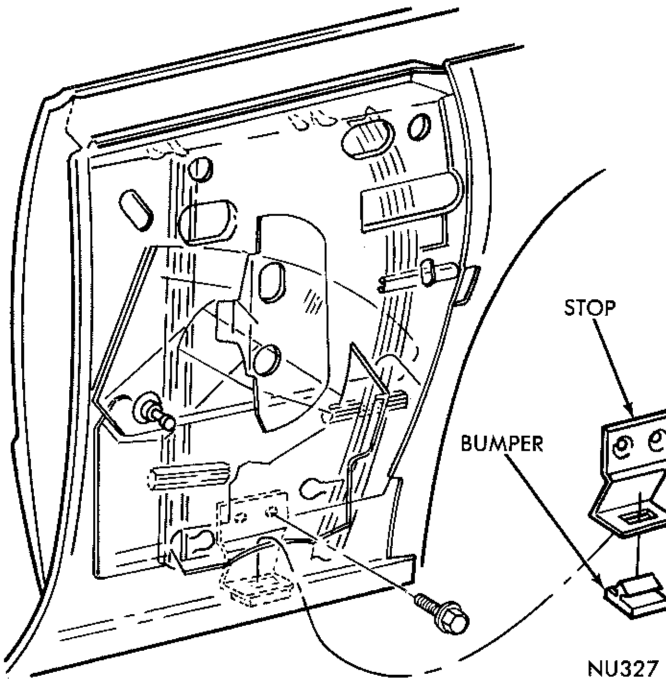


Fig. 70—Down Stops

taching screws and remove glass assembly from panel.

(3) Remove spacers from openings in glass.

Installation

(1) Position spacers in openings of glass lower frame.

(2) Install grommets on glass retaining screws.

(3) Align glass lower frame attaching holes with access openings in quarter inner panel.

(4) Lower glass into quarter panel, align openings in glass with holes in lower frame and install screw and grommet assemblies.

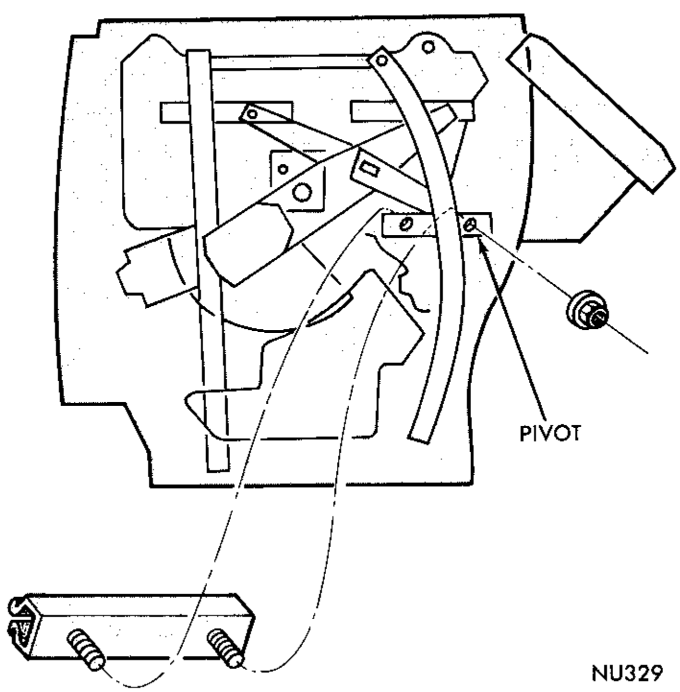


Fig. 71—Pivot Bracket

DOWN STOP

The down stop bracket and bumper (Fig. 70) is attached to the outboard side of the glass lower frame assembly with screws.

PIVOT BRACKET

The pivot bracket assembly (Fig. 71) is positioned to the roller slide on the regulator idler arm. The bracket weld screws are inserted through a support welded to the quarter inner panel and retained with nut assemblies.

UP-STOPS

The up-stops (Fig. 72) are attached to slotted areas on the quarter inner panel with screws. An anti-rattle type grommet is positioned over each up-stop flange.

FRONT TRACK

Removal

(1) Remove nut and washer from sleeve nut at upper end of track (Fig. 73).

(2) Remove track lower plate to support screw.

(3) Push track inward and move track and roller assemblies rearward to disengage rollers from glass lower frame.

(4) Remove track and rollers out of panel through large access hole.

(5) Remove roller assemblies from track (Fig. 74).

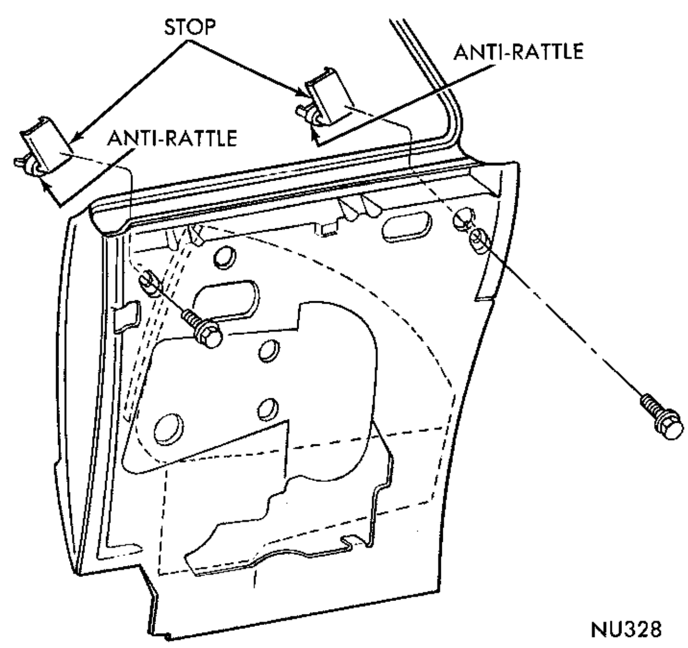


Fig. 72—Up-Stops

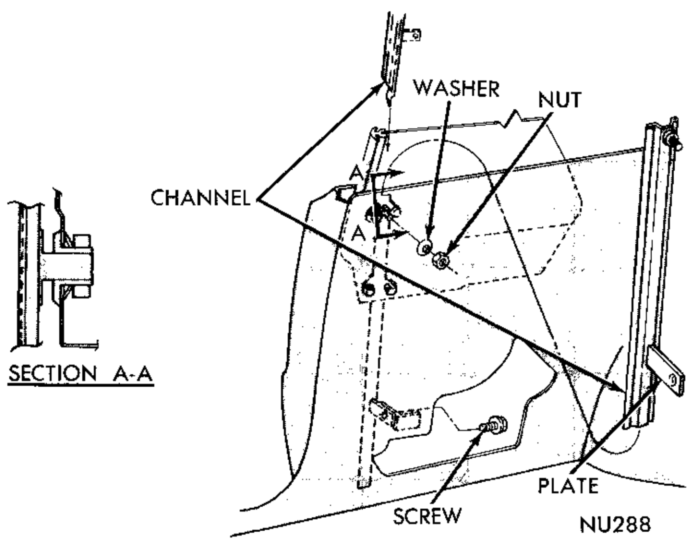


Fig. 73—Front Track Assembly

Installation

(1) Position roller and guide assemblies on track.

(2) Insert track assembly in quarter panel.

(3) Position roller assemblies into slots of glass lower frame (Fig. 74).

(4) Insert sleeve nut on upper end of track into hole of inner panel (Fig. 73).

(5) Align track lower plate to support and secure with screw.

(6) Place spring washer, concave side facing outboard, on track upper sleeve nut and install retaining nut.

REAR TRACK

(1) Remove nut and washer from track upper sleeve nut (Fig. 75).

(2) Remove track lower plate to support screw.

(3) Push track inward and move track and roller assembly forward to disengage roller from slot in glass lower frame.

(4) Remove track and roller assembly out of panel through large access opening.

(5) Remove roller assembly from track.

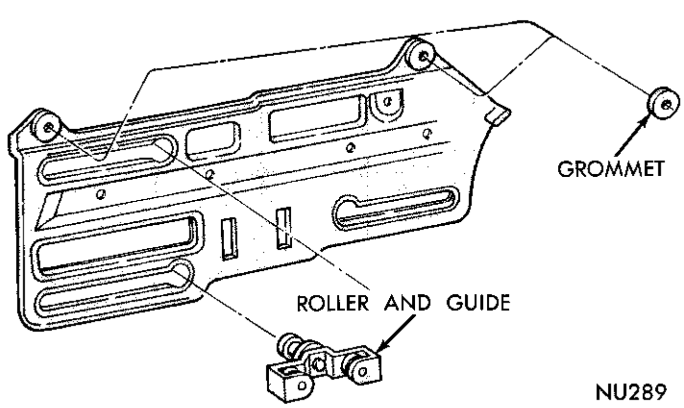


Fig. 74—Glass Lower Frame Assembly

Installation

(1) Position roller assembly on track and insert assembly into quarter panel through large access opening.

(2) Position roller assembly into slot of glass lower frame (Fig. 74).

(3) Insert track upper sleeve into hole of inner panel (Fig. 75).

(4) Align track lower plate on support and secure with screw.

(5) Place spring washer, concave side facing outboard, on sleeve nut and install retaining nut.

GLASS LOWER FRAME

(1) Remove quarter glass assembly.

(2) Remove rear track upper and lower attachments and move track and roller assembly forward to disengage roller assembly from glass lower frame.

(3) Move lower frame assembly to disengage channel from regulator arm rear slide.

(4) Raise rear of lower frame and remove from quarter panel.

(5) Remove roller and guide assemblies from lower frame.

Installation

(1) Inspect glass lower frame to be sure grommets are installed at the upper outer holes (Fig. 74).

(2) Insert roller and guide assemblies into lower frame front upper and lower slots.

(3) Slide front end of lower frame into panel and engage front of lift channel to slide of regulator front arm (Fig. 76).

(4) Turn frame to normal position and engage rear channel to regulator rear arm slide.

(5) Position roller and guide assembly, on rear track, into rear slot of lower frame.

(6) Install rear track assembly on inner panel.

(7) Install glass assembly.

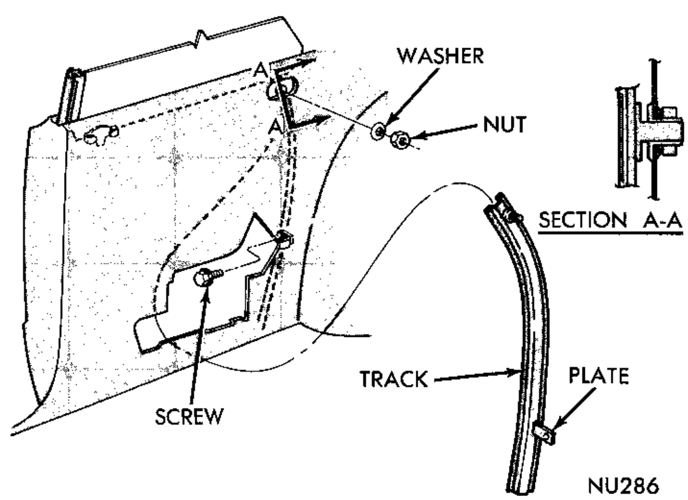


Fig. 75—Rear Track

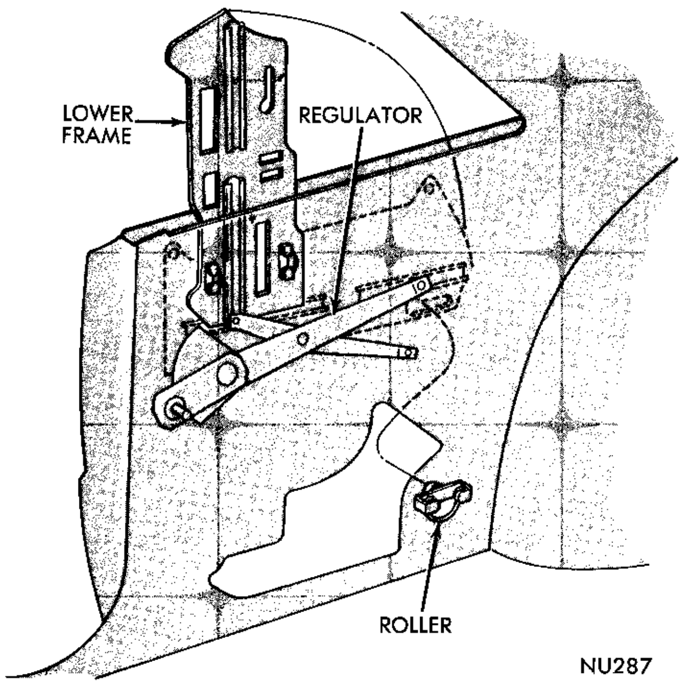


Fig. 76—Glass Lower Frame Replacement

Regulators

The manual and electric operated regulators (Fig. 77) are attached to the door inner panel with screws.

Refer to the Electrical Group for test procedures and wiring diagrams for electric operated regulators.

Regulator Motor Replacement

When necessary to remove motor from regulator, it is imperative the linkage be securely clamped in a vise to lock it in place. Failure to do this allows the assist spring to drive the mounting bracket around the lift pivot.

Window Lift Switch

Slide a thin blade behind the switch housing (front and back) to depress retaining clips and pull switch out from panel. Carefully separate multiple terminal block from switch body and remove switch from panel.

STATION WAGON

GLASS REPLACEMENT

Removal

(1) Remove spare tire cover assembly (Fig. 78).

(2) Remove garnish mouldings at quarter window (Fig. 79).

(3) Unlock weatherstrip by inserting a fiber stick into locking groove of weatherstrip and forcing locking tab out of groove.

(4) Remove glass from weatherstrip from inside of vehicle and weatherstrip from fence.

Installation

(1) Inspect sealing areas of quarter window to ascertain sealer is applied at areas indicated in Figure 80.

(2) Apply a bead of sealer, starting at front and top sections of weatherstrip (Fig. 81).

(3) Apply a small bead of cement to each lip of glass groove, completely around weatherstrip.

(4) Position weatherstrip on fence with locking edges facing inboard.

(5) From inside of vehicle, insert bottom of glass

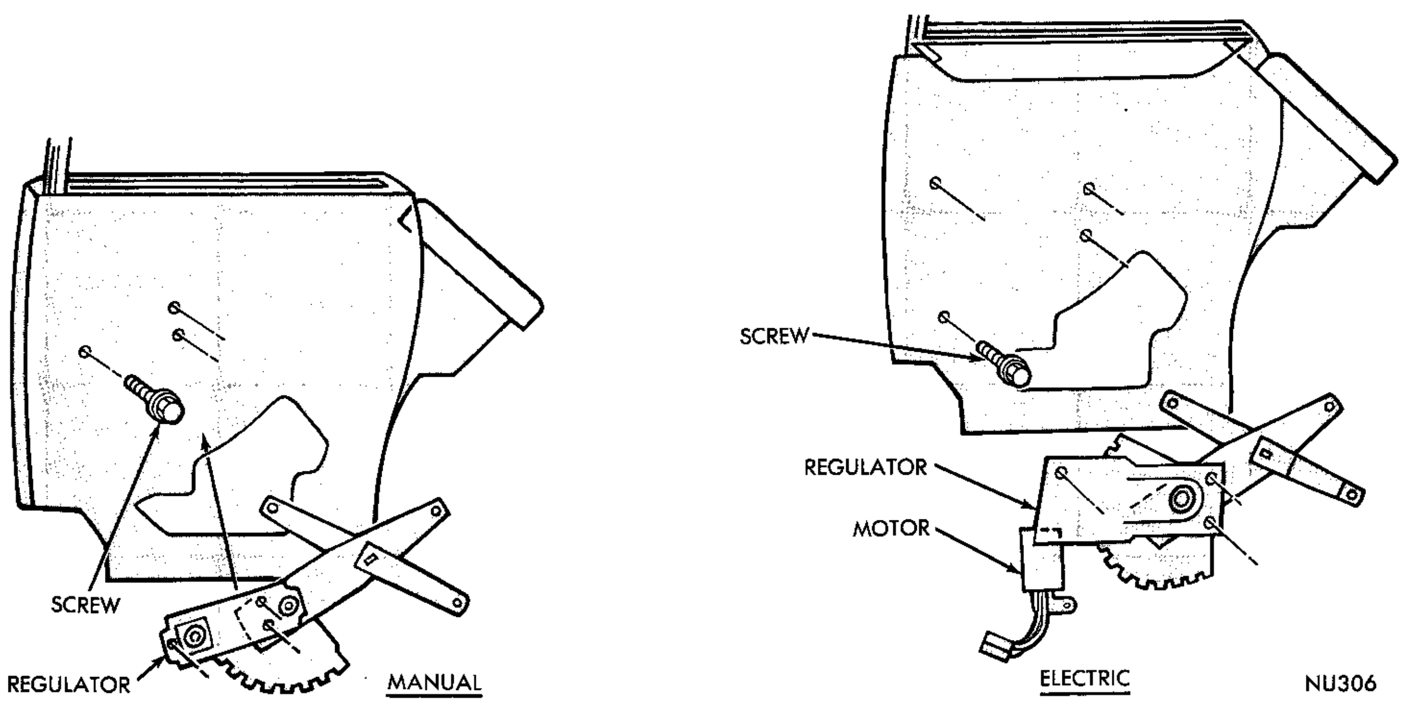


Fig. 77—Regulator Assemblies

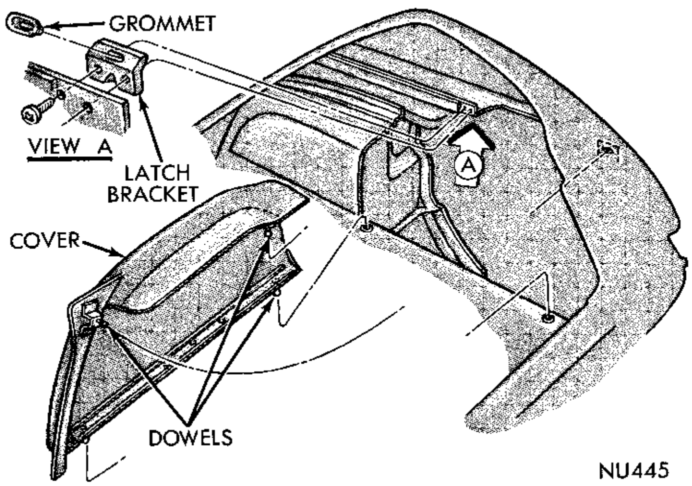


Fig. 78—Spare Tire Cover Assembly

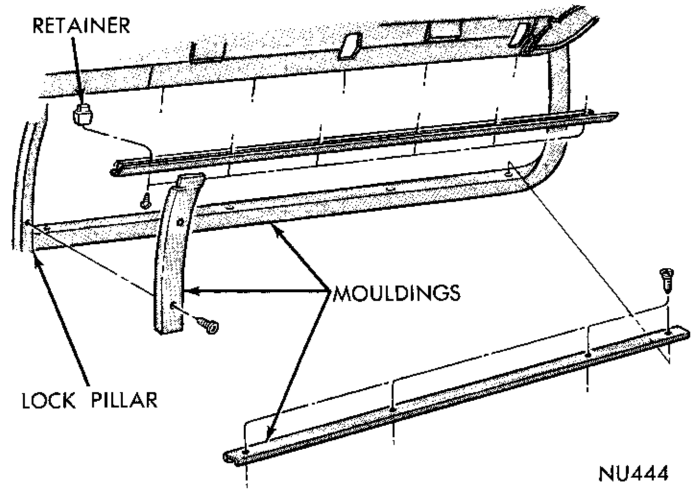


Fig. 79—Quarter Window Garnish Mouldings

into weatherstrip and using a fiber stick, pull lip of weatherstrip over glass (Fig. 82).

(6) Seat glass in weatherstrip using hand pressure.

(7) Apply rubber lubricant to weatherstrip locking tab and insert locking tab into weatherstrip groove using a fiber stick.

(8) Apply and press secure, sealer to joint of weatherstrip, body lock upper pillar and roof side rail outer front area (Fig. 83).

(9) Apply and press secure, sealer to joint of glass weatherstrip, outer panel weatherstrip retainer and rear body lock pillar.

(10) Install garnish mouldings and spare tire cover.

QUARTER PANEL EXTENSIONS

Refer to Figures 84, 85 and 86 for attachment applications of the quarter panel extensions.

PANEL SIDE REFLECTOR

The quarter panel side marker reflector and bezel

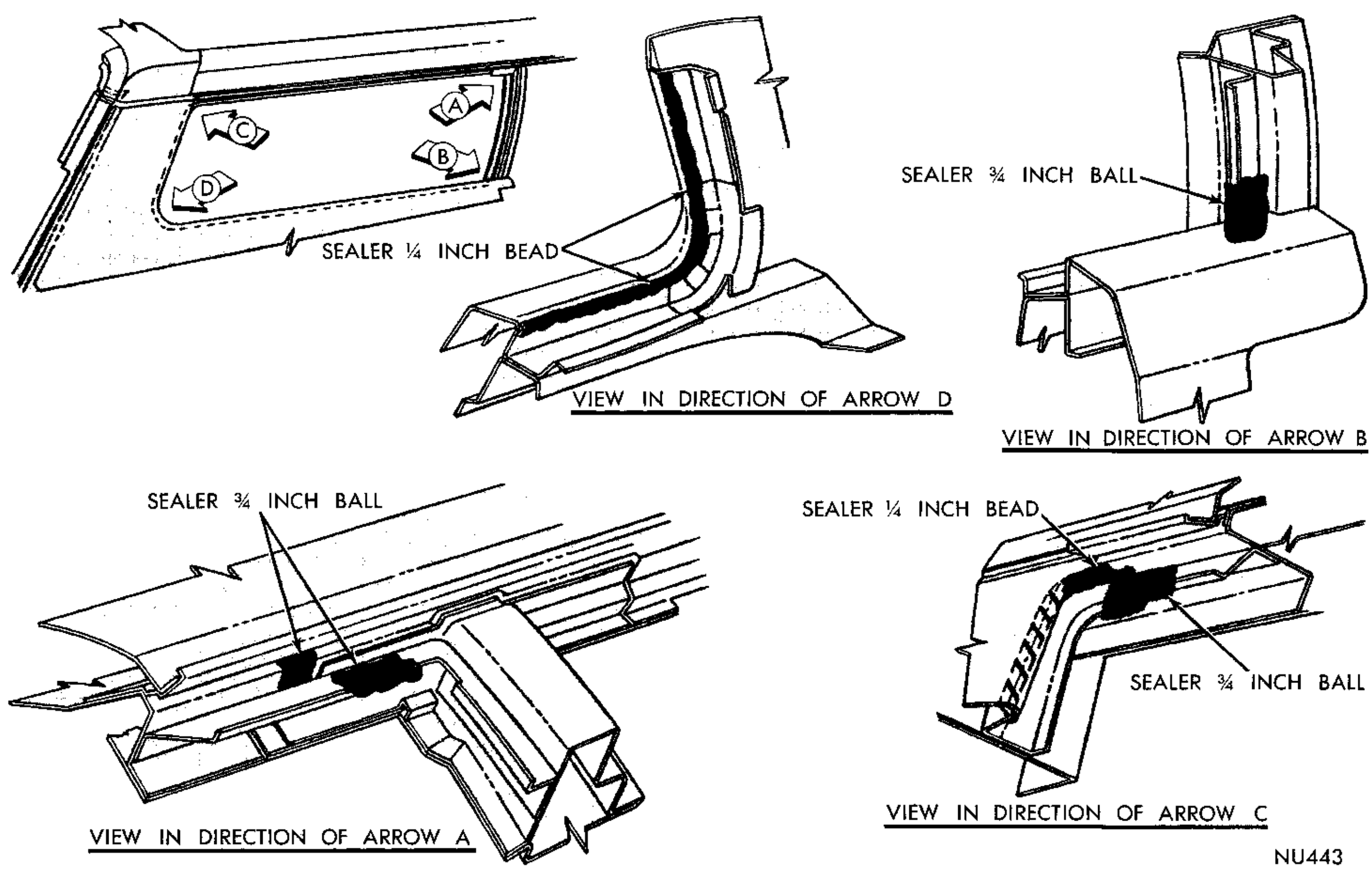


Fig. 80—Quarter Window Sealing Areas

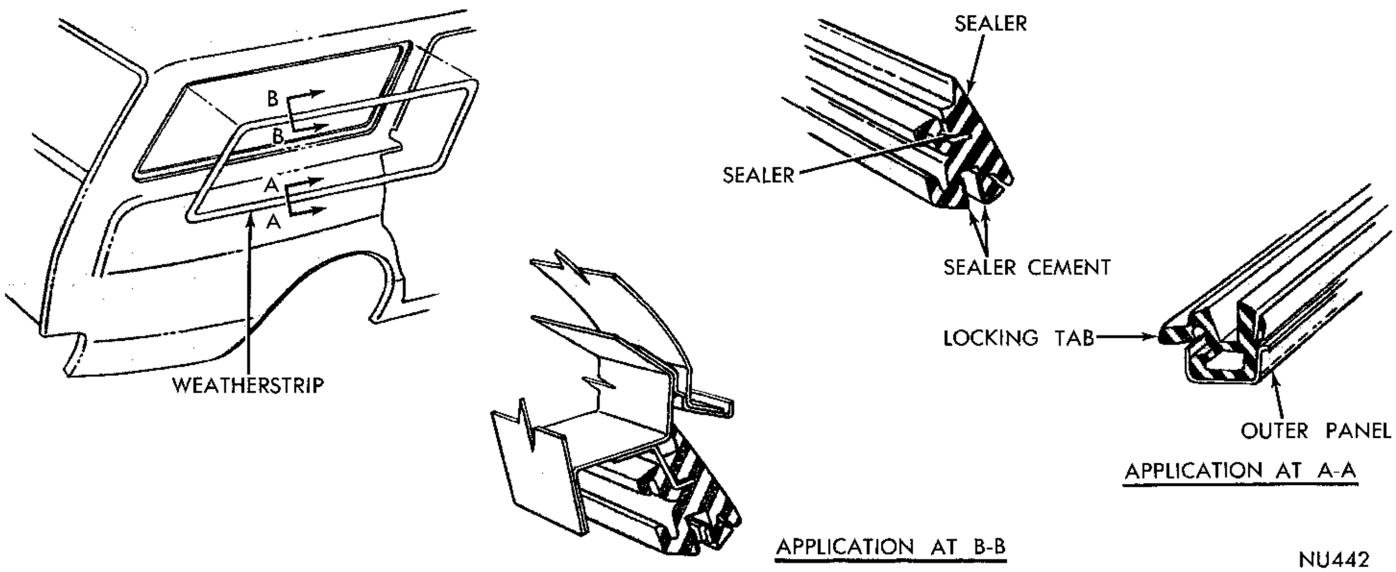


Fig. 81—Weatherstrip Replacement

assembly (Fig. 87) is attached with sealer nuts from within the luggage compartments.

WINDOW WASHER SYSTEM

Refer to the Accessory Group for Service Procedures, Tests and Wiring Diagrams.

TAIL GATE

Station Wagon Models are equipped with a "two-way" tail gate that can be opened as a swing-out type door or in the conventional tail gate manner. The sequence of adjusting the linkage should be followed, as outlined in this service manual, to ascertain correct locking and releasing operations.

ALIGNMENT (Fig. 88)

Lower window before making any adjustments.

Vertical Adjustment

1. Hinge Pin Adjustment
   A. From underside of body on left side loosen the pin lock nut.
   B. At the top of the pin, just under the hinge pivot, adjust the pin to proper height then tighten lock nut. Proper adjustment is obtained when bushings on the body and gate halves of upper hinge are just touching.
2. Striker Adjustment
   A. Loosen the plate screws and striker so the plate can be moved up or down.
   B. Tighten plate and striker at desired position. **Both the upper and lower strikers should be ad-**

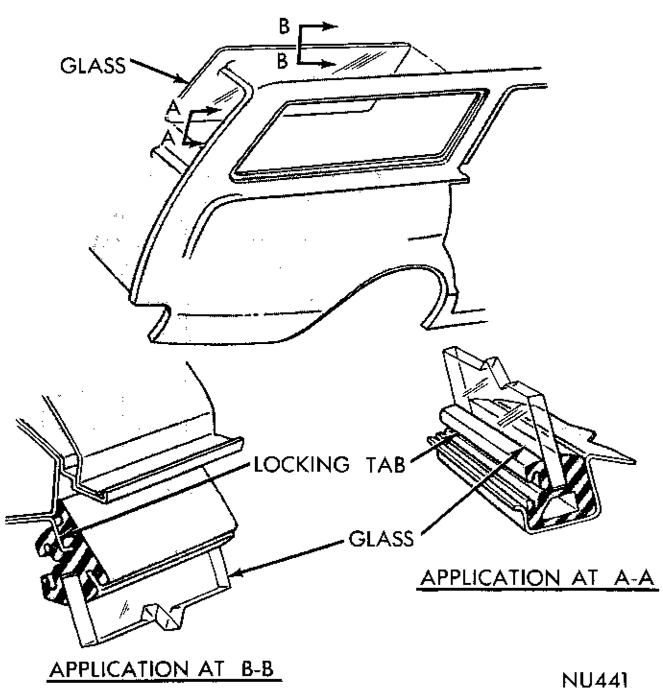


Fig. 82—Glass Replacement

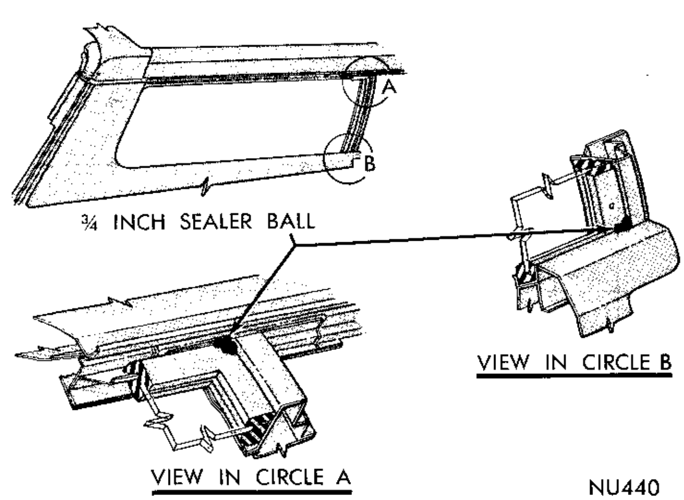


Fig. 83—Sealing Weatherstrip

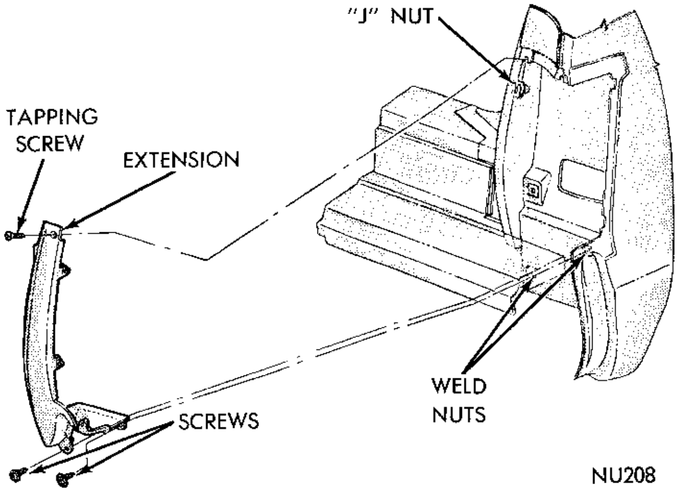


Fig. 84—Quarter Panel Extension—Station Wagon

justed to carry equal weight of the tail gate.

In and Out Adjustment

1. Lower Hinge Support Plate
   A. Loosen three bolts from the left underside of the body.
   B. Adjust the tail gate to desired position and tighten bolts.
   There isn't any in and out adjustment for the upper hinge.
2. Upper and Lower Striker Adjustment
   A. Follow procedure outline used in vertical adjustment.

Lateral Adjustment

1. Upper Hinge Body Half
   A. Remove bottom trim strip from left rear window.
   B. Remove left rear floor trim and cover.
   C. Lower left rear quarter trim.
   D. Reaching through opening in body pillar loosen four bolts on the upper hinge (body half).
   E. Adjust upper hinge to desired position.
   F. Tighten bolts and replace cover, lower quarter trim and window trim.
2. Lower Hinge Support Plate
   A. Use in and out adjustment procedure.

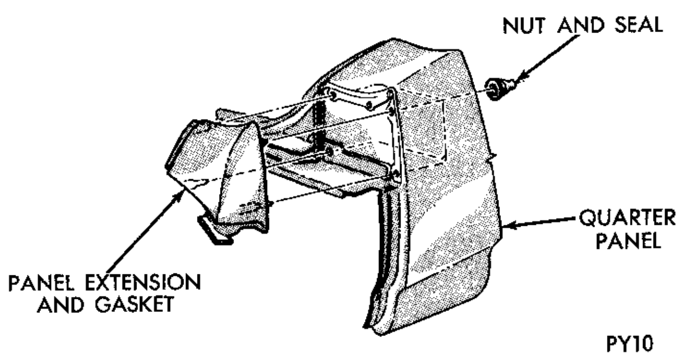


Fig. 85—Quarter Panel Extension—Except Station Wagon

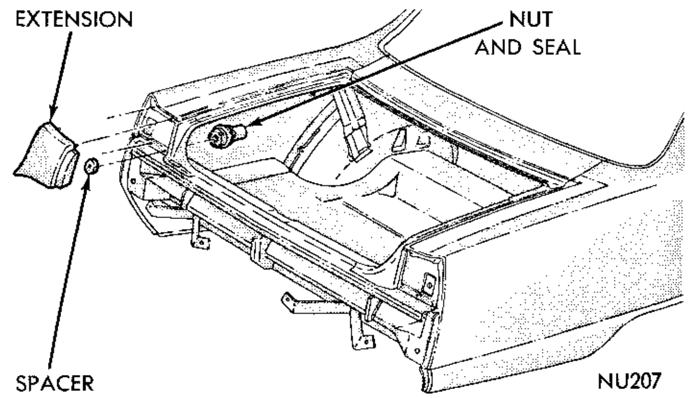


Fig. 86—Quarter Panel Extension—Imperial

Door Sag Compensation

Care must be taken in making this adjustment to avoid the outer edges of the tail gate rubbing against the body.

This can be accomplished by moving the upper hinge (body half) laterally closer to the body pillar and by moving the lower hinge support plate laterally towards the center of the body. (See lateral adjustment procedure to accomplish this.)

REPLACEMENT

Removal

Remove trim panel and disconnect terminals at control switch. Disconnect wiper and washer electrical leads.

(1) Remove check arm and torsion bar guide from pillar guide plates.

(2) Support tail gate on jacks or stands.

(3) Loosen hinge pivot pin locking screws (Fig. 88).

(4) Use a pencil and outline hinge plate position on pillar post for future assembly.

(5) Remove hinge plate attaching bolts from pillar post.

(6) Slide hinge plate and torsion bar in through guide toward center of tail gate.

(7) Lower tail gate down and out of body opening.

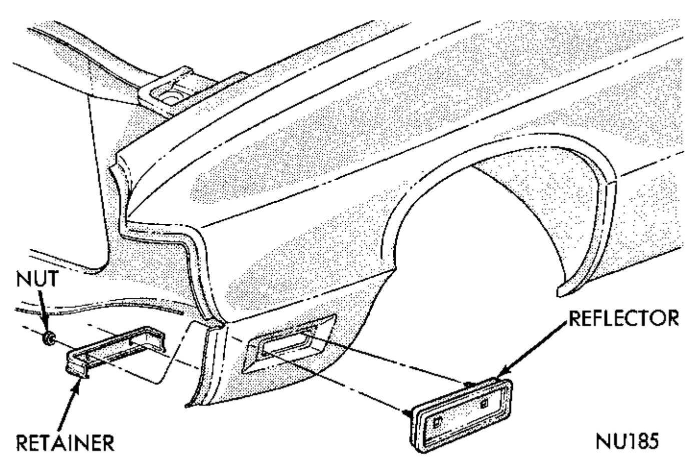


Fig. 87—Panel Side Reflector

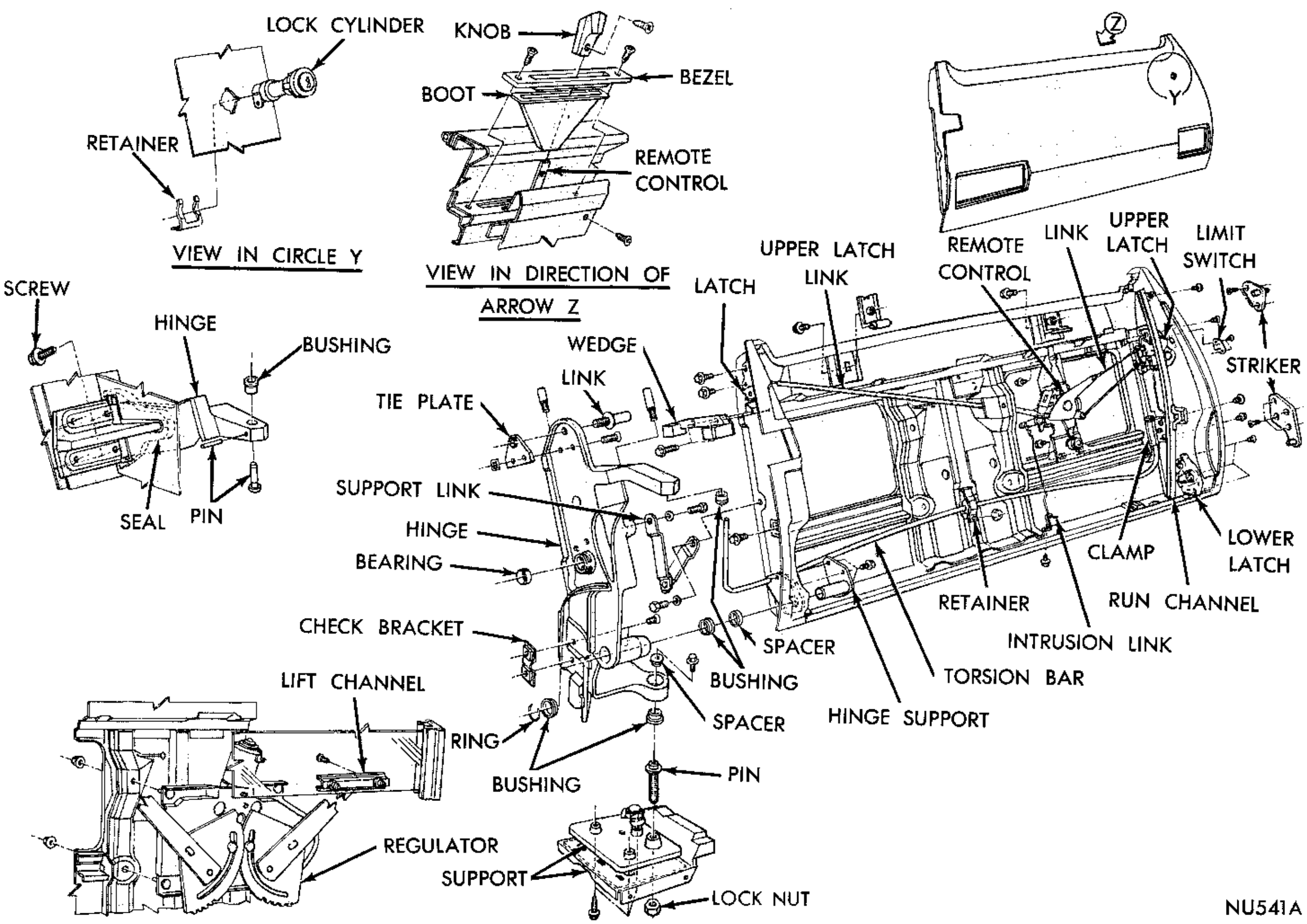


Fig. 88—Tail Gate Assembly

Installation

(1) With torsion bar and hinge plates pushed in toward center of tail gate, engage hinge plates into lower opening of body.

(2) Attach hinge plate attaching bolts into pillar posts and locate hinge plates in relation to previous marked positions.

(3) Tighten attaching bolts firmly enough to hold position and inspect alignment.

(4) Close tail gate and center in opening.

(5) Attach torsion bar bracket to pillar post.

(6) Open tail gate and tighten locking screws on hinge pivot pin.

(7) Connect electrical leads and install trim panel.

(8) Operate tail gate window and inspect alignment.

TRIM PANEL

The tail gate trim panel is attached with metal screws. Clean all foreign material from the seating area of the trim panel before installing.

LOCK AND CYLINDER

To replace the lock assembly (Fig. 88) remove trim panel glass and glass runs. The lock assembly is retained on tail gate by screws accessible at end of tail gate. The lock cylinder assembly is retained on the outer panel with a horseshoe type retainer.

GLASS ADJUSTMENT

Refer to Figure 89 for glass adjusting point.

GLASS REPLACEMENT

Removal

(1) Support glass at bottom and remove glass to lift bracket screws (Fig. 90).

(2) Slide glass up and out of door.

(3) Remove lift channel fasteners from glass (Fig. 90).

Installation

Utmost care must be used to prevent lubricant from touching wiper blades.

(1) Apply lubricant to surfaces of glass lift channel contacting regulator sliding block.

(2) Install lift channel fasteners in glass.

(3) Lower glass into runs of lower glass channels

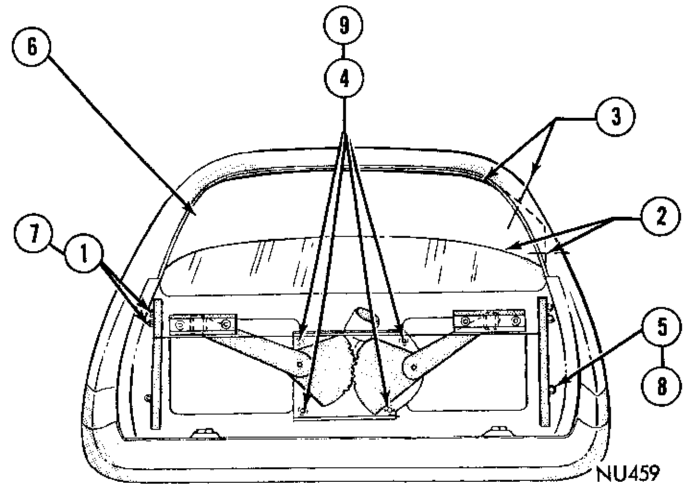


Fig. 89—Tail Gate Glass Adjustment

to a position under the lift channel on each regulator arm.

(4) Align holes in lift channels with glass lift fasteners and secure with screws.

LOCK LINKAGE

Installation and Adjustment (Fig. 91)

The lower right to upper right latch link and upper right lock to release regulator mechanism arm link can only be adjusted to three total turns from nominal position for all release, interlocking and latch engaging operations.

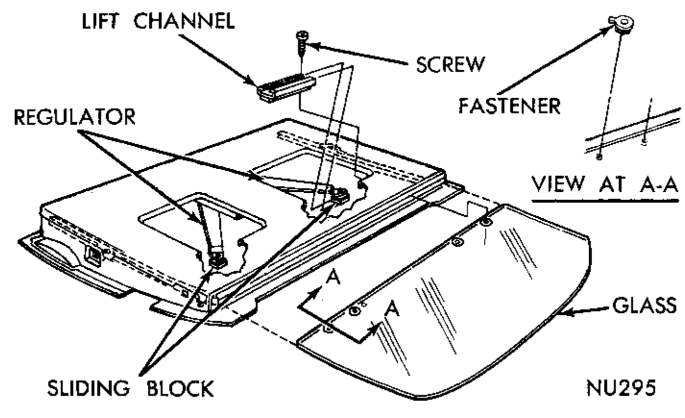


Fig. 90—Glass Replacement

(1) Inspect locks to make certain they are in the fully latched position.

(2) Install link to lower right latch detent clip, raise upper right lock actuator until it contacts upper latch lock detent.

(3) Adjust threaded portion of link until aligned with clip hole of actuator and insert link into clip.

(4) Connect link to upper right lock remote control lever and to release regulator mechanism actuator.

(5) Install link from release regulator arm to the glass restraining bracket.

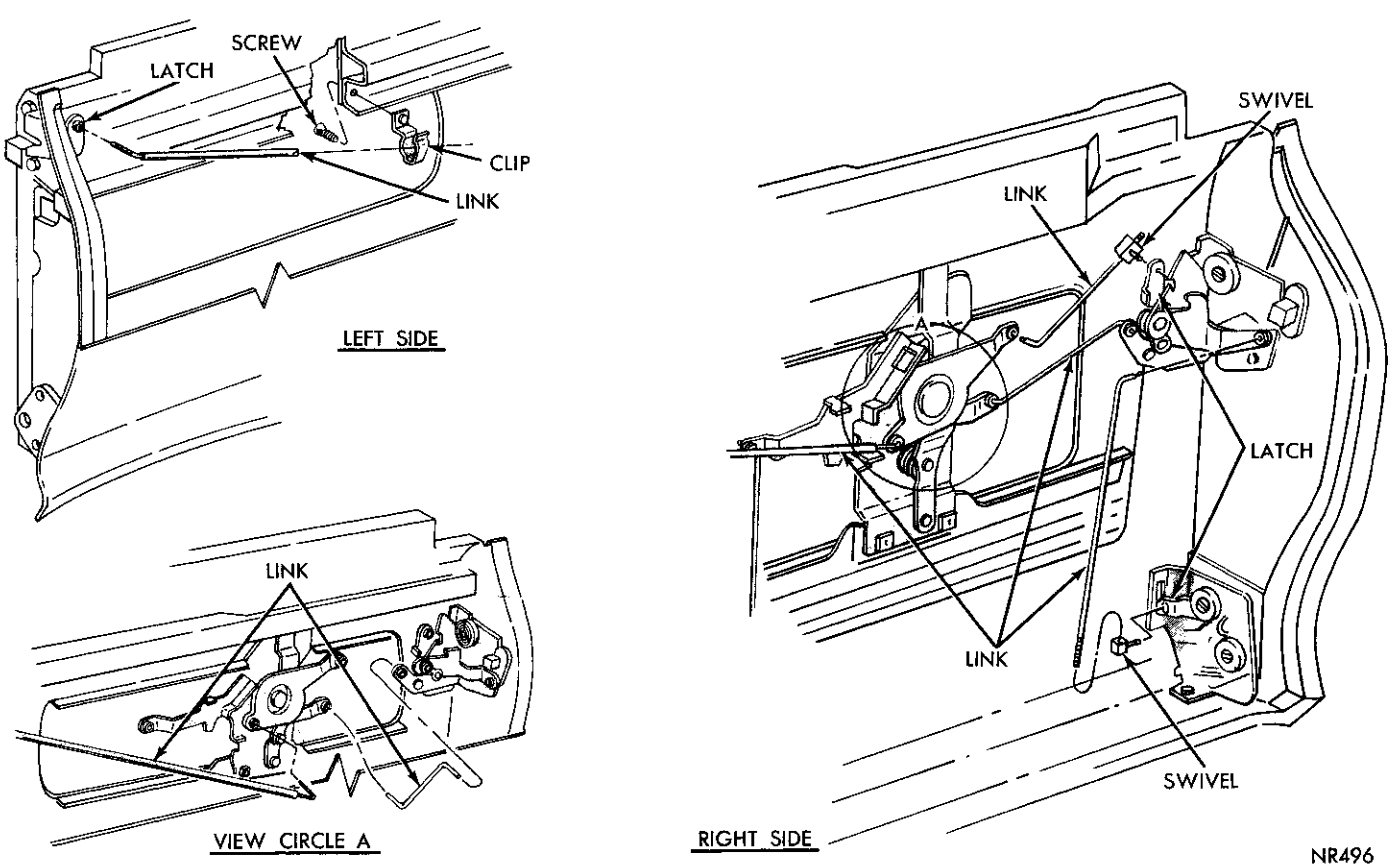


Fig. 91—Lock Linkage Adjustments

(6) Install link into release regulator mechanism and upper left latch remote lever clip.

(7) Install link into lock remote lever.

(8) Take up all play in latch remote lever and release regulator mechanism arm and adjust link threaded end to this point.

(9) Install link into upper right lock remote lever and test operation of tail gate and door assembly.

Glass Lift Channels

To replace the glass lift channels (Fig. 90) it is necessary to first remove the glass assembly. The channels are positioned over sliding blocks on the regulator arms.

Regulator Replacement

The electric regulator assembly is retained on the tail gate inner panel with nut and washer assemblies (Fig. 92). **Be sure wiper actuator mechanism is in OFF-GLASS position during replacement of regulator.**

Removal

(1) Remove tail gate glass and glass lift channels.

(2) Disconnect electrical leads at regulator.

(3) Remove regulator to inner tail gate panel nut and washer assemblies.

(4) Remove regulator assembly through large access hole on right side.

Installation

(1) Position regulator in tail gate through large access hole on right side.

(2) Position regulator mounting studs in holes of inner panel and install nut assemblies: **It may be necessary to tilt and secure one corner of regulator mounting, then the opposite corner and finally the remaining two nuts on units equipped with the window washer assembly.**

(3) Connect electrical leads.

(4) Position glass lift channels on regulator sliding blocks.

(5) Install tail gate glass assembly.

Glass Run Channel

Removal

(1) Remove the tail gate glass assembly.

(2) Remove tail gate pillar to glass run channel screws (Fig. 93).

(3) Remove channel assembly through access holes in inner panel.

Installation

(1) Position channel assembly into tail gate and align to upper and lower holes in tail gate pillar.

(2) Secure channel to pillar with screws.

(3) Install glass assembly.

TORSION BAR

Removal

(1) Remove trim panel from tail gate.

(2) Remove screws attaching torsion bar clamp to tail gate pillar (Fig. 88) and remove clamp.

(3) Remove torsion bar bearing retainer and bearing.

(4) Remove screws attaching torsion bar and hinge to tail gate.

(5) Remove torsion bar from hinge.

Installation

(1) Lubricate torsion bar at right hinge area and at torsion bar bearing area.

(2) Install hinge on torsion bar and insert torsion bar into tail gate.

(3) Position hinge to tail gate and install mounting screws. Tighten screws.

(4) Install bearing and bearing retainer on torsion bar (Fig. 88). Tighten retainer nut.

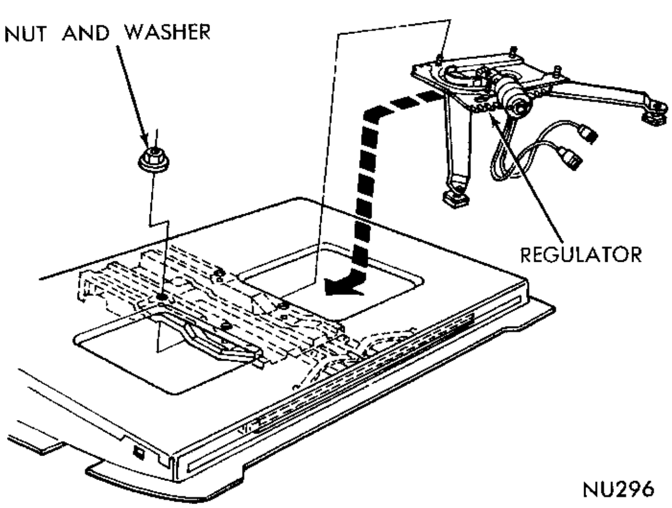


Fig. 92—Regulator Assembly

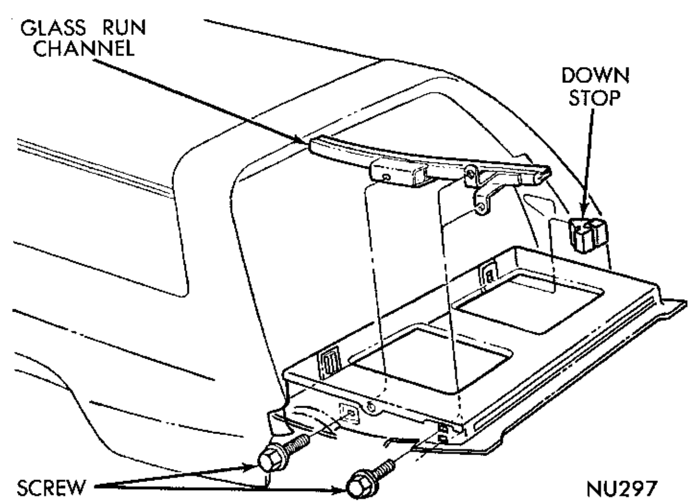


Fig. 93—Glass Run Channel

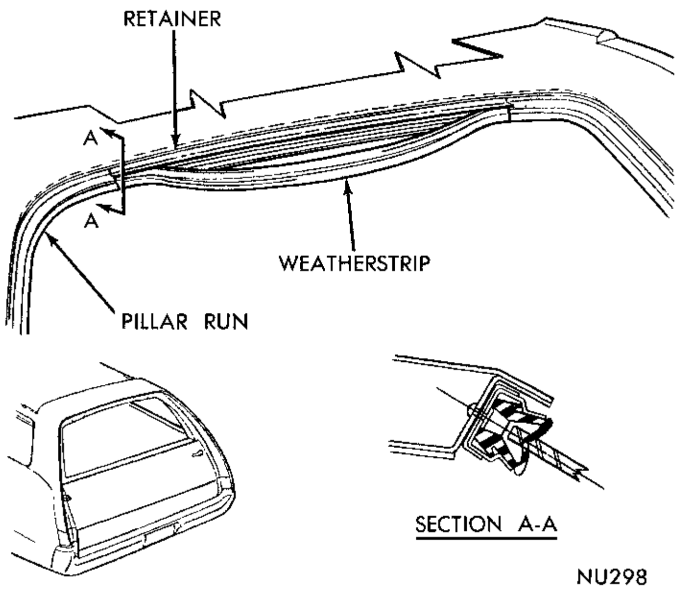


Fig. 94—Rear Header Weatherstrip

(5) Position clamp over end of torsion bar and from outside end of tail gate install attaching screws.

(6) Install tail gate trim panel.

Rear Header Weatherstrip

The roof rear header weatherstrip is a press fit in the retainer (Fig. 94). Position the ends first to form a seal with the quarter pillar runs.

Rear Header Weatherstrip Retainer

The roof rear header weatherstrip retainer is attached to the header with "pop" rivets (Fig. 95). The seal has adhesive applied to one side which attaches it to the retainer. Trim the ends of the seal flush with the retainer.

Pillar Weatherstrip—Retainer and Seal

The tail gate upper pillar, retainer, seal and weatherstrip is retained on the pillar with screws (Fig. 96). The seal has adhesive applied to one side which attaches it to the retainer. The outer weatherstrip and

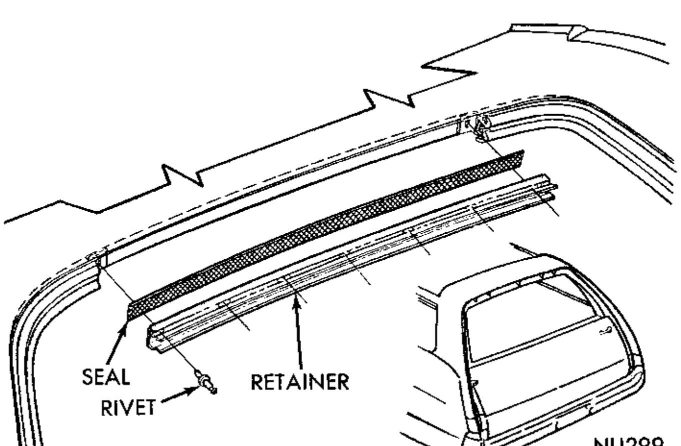


Fig. 95—Rear Header Weatherstrip Retainer

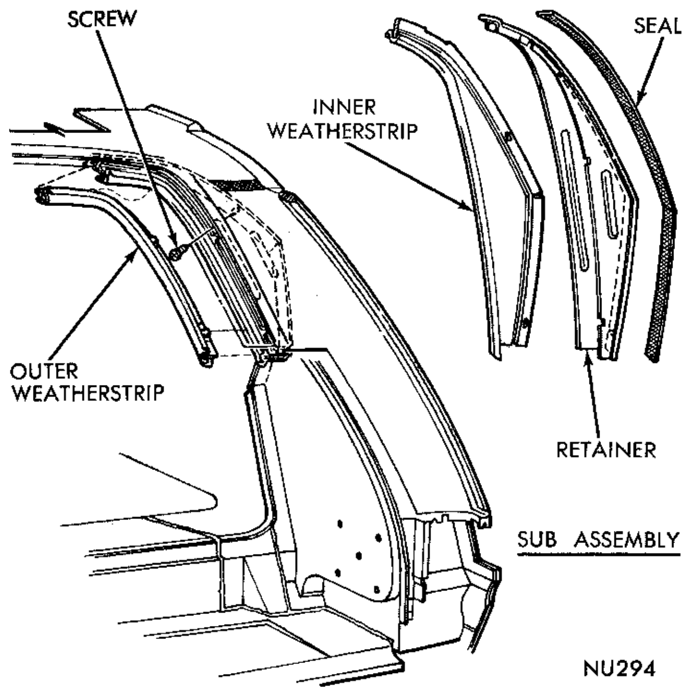


Fig. 96—Pillar Weatherstrip—Retainer and Seal

clip assembly is held in position in the retained by the weatherstrip clips. Index top edge of outer weatherstrip flush with top edge of inner weatherstrip. Secure weatherstrip by pressing weatherstrip clips into notches in retainer.

ROOF REAR AIR DEFLECTOR

The rear air deflector (Fig. 97) used on station

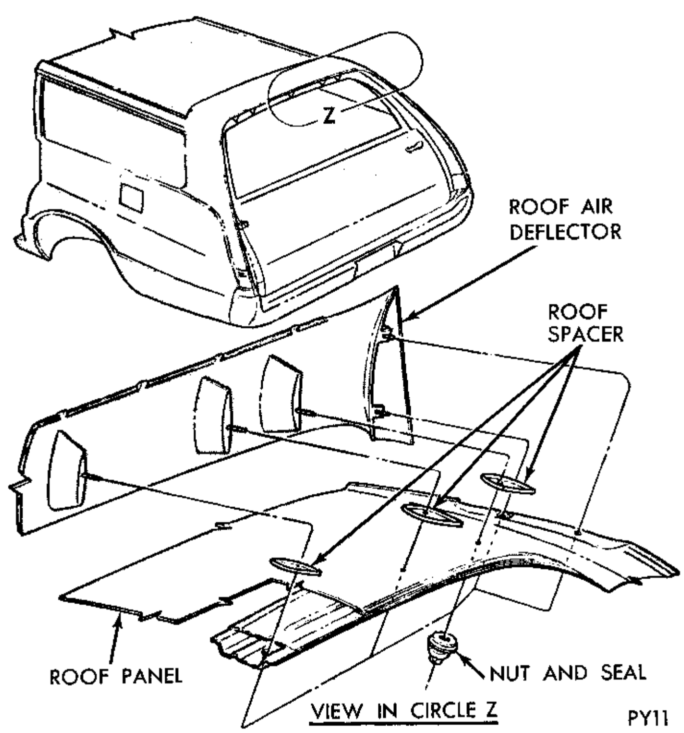


Fig. 97—Roof Rear Air Deflector

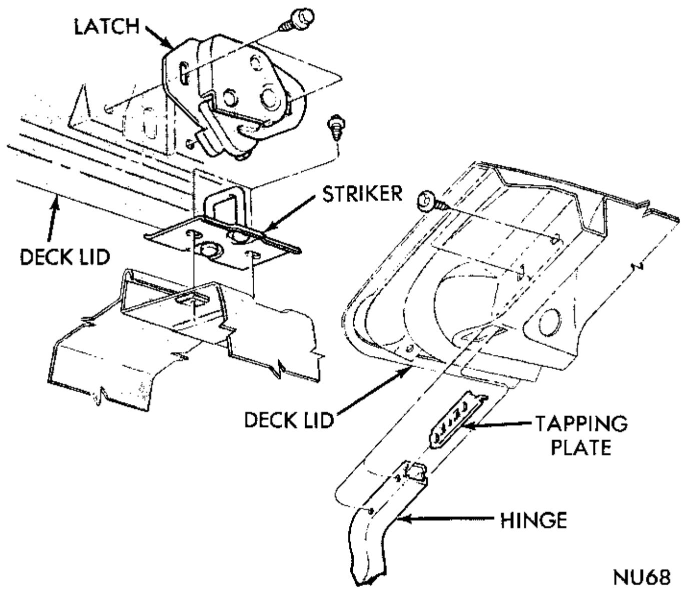


Fig. 98—Deck Lid Hinge and Latch

wagon models is mounted on the roof by inserting the deflector studs through holes drilled in the panel and securing with sealing type nuts from the car interior. Tighten the nuts 75-115 inch-pounds.

DECK LID

ALIGNMENT

The deck lid hinge (Fig. 98) to lid attaching holes are slightly oversize, allowing slight to and fro, and, in and out adjustment.

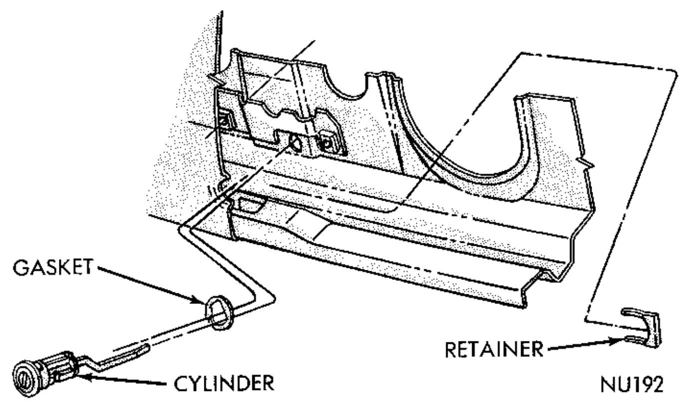


Fig. 99—Deck Lid Lock Cylinder

REPLACEMENT

The deck lid is attached to each hinge by two screws. An assistant's aid is recommended when replacing lid to prevent it sliding rearward and damaging paint, also to aid in aligning of hinge screw holes when installing.

LOCK

REPLACEMENT

The deck lid lock (Fig. 99) is attached to the deck lid by two screws. Scribe location of lock mounting

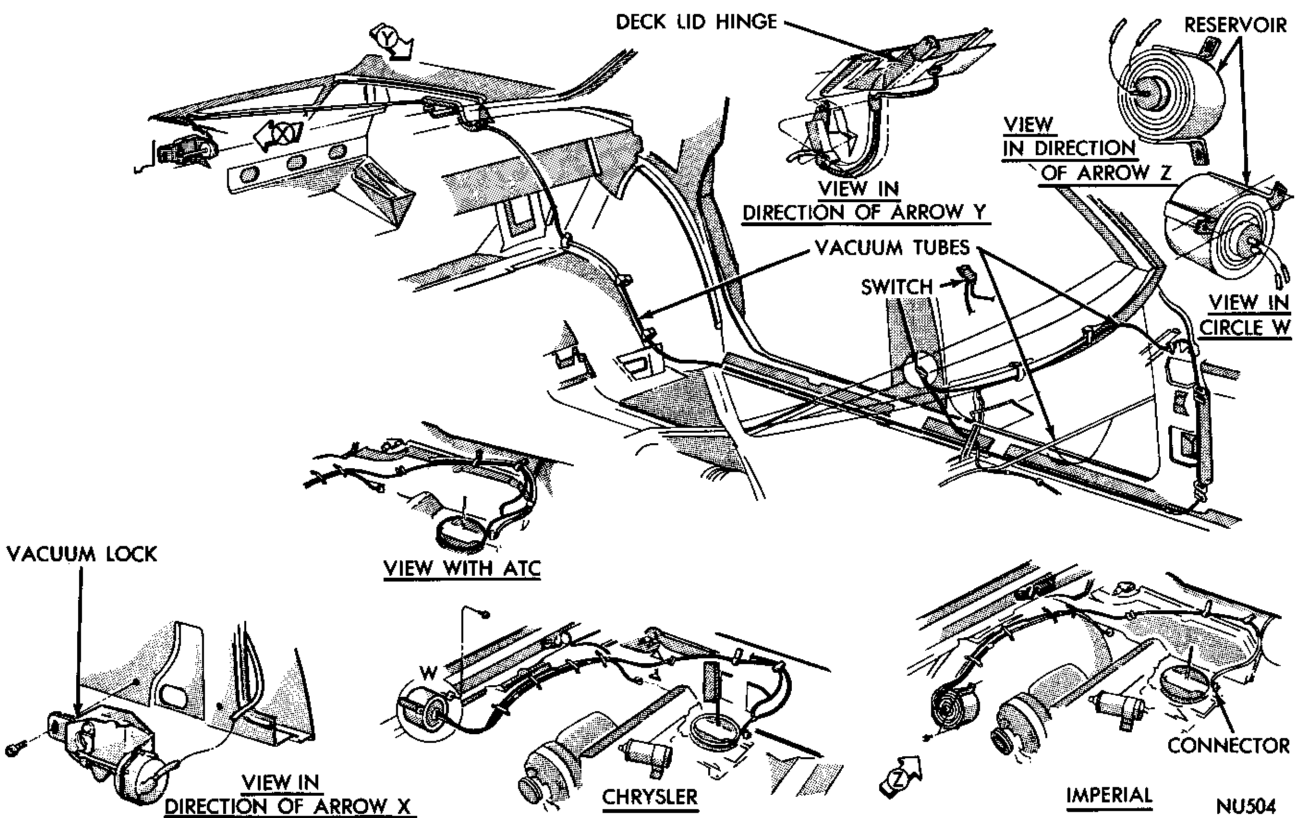


Fig. 100—Vacuum Actuated Deck Lid Lock

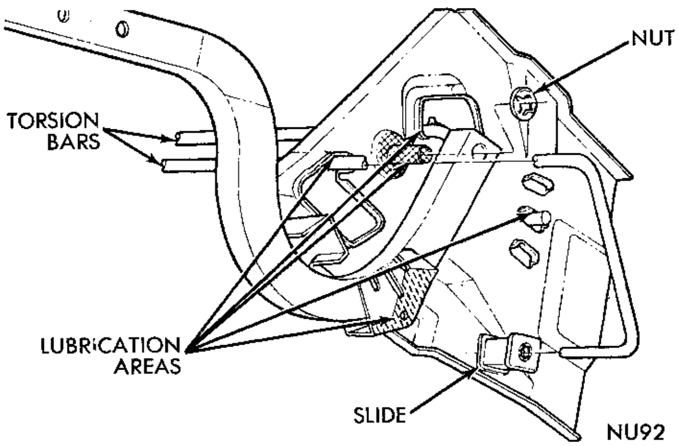


Fig. 101—Deck Lid Torsion Bar

flanges to aid in installation. On vacuum actuated units, disconnect vacuum hose.

Adjustment

Vertical adjustment of lock is made at the attaching screws and side adjustment is made at the striker attaching bolt.

Cylinder Replacement

The lock cylinder is retained by a spring steel "U" shaped clip (Fig. 88).

VACUUM ACTUATED DECK LID LOCKS

The vacuum actuated deck lid lock release system (Fig. 100) consists of a vacuum tank mounted over the right front wheel housing, a push button control switch the glove box and a vacuum actuated diaphragm assembly connected to the lock. Vacuum is supplied to system from intake manifold. Rubber hoses are used to connect component units.

If failure of the system is accompanied with a rough engine idle, remove hose from manifold fitting tube and plug end of the tube. If engine idle improves noticeably, inspect hoses for possible leaks.

Should system fail to operate entirely, remove hose at the release diaphragm in deck lid and connect a vacuum gauge to hose. With engine running, actuate button in glove box while a helper observes gauge. If no reading can be obtained, inspect for a pinched hose. A reading of less than 16 inches will indicate a leak in the system.

HINGE

Removal

(1) Remove deck lid assembly and disengage torsion bar from hinge (Fig. 101) being removed.

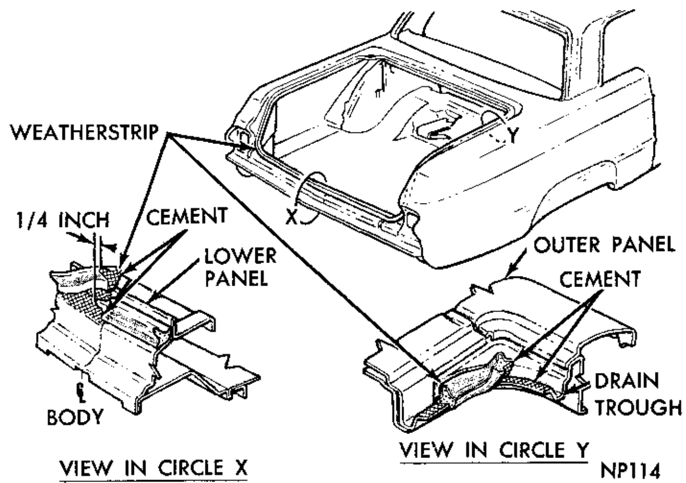


Fig. 102—Deck Lid Weatherstrip

(2) Remove hinge to hinge bracket spring nut and remove hinge.

Installation

(1) Position hinge on bracket pin and install a new spring nut.

(2) Install deck lid, connect torsion bar and inspect alignment.

TORSION BAR

Removal

Use care when removing torsion bar as it is under a load. Release load from torsion bar slowly and remove from support bracket.

(1) Remove torsion bar (Fig. 101) from adjustment slot.

(2) Push bar out of roller in hinge arm and remove from hinge support.

Installation

(1) Position torsion bar into hinge support and insert end into roller in hinge arm.

(2) Hook torsion bar into support bracket.

(3) Wind bar and insert end into center adjusting slot.

(4) Place lid in various open positions and test tension.

(5) Adjust bars until deck lid stays in open position.

WEATHERSTRIPS

Apply an even continuous coat of cement to entire weatherstrip contact surface of deck lid opening (Fig. 102). Install weatherstrip, make sure weatherstrip molded corners are correctly positioned.

INTERIOR TRIM AND SEATS

INDEX

SERVICE PROCEDURES

INTERIOR TRIM

GARNISH MOULDINGS

Procedures for the servicing of garnish mouldings are incorporated with their respective component.

INSTRUMENT PANEL TRIM PAD

Replacement

The instrument panel trim pad (Fig. 1) it attached with screws at the top and lower edges. To remove, perform the following operations:

Remove upper and lower steering column covers, gearshift indicator pointer screw and lower the steering column assembly. Remove glove box door, glove box and instrument panel bezel. Remove vent control mounting screws, map lamp and lamp panel. Remove trim pad attaching screws and trim pad.

CONSOLE

The console (Fig. 2) is attached to welded brackets on the floor pan tunnel. The end cap is integral with the base. To loosen the rear mounting, raise rear carpet edges on console to expose attaching screws and bolts. All other attachments are accessible from within the console.

FLOOR COVERING

Scuff Plates

The scuff plates and extensions are retained to the floor sills, quarter inner panels and support brackets

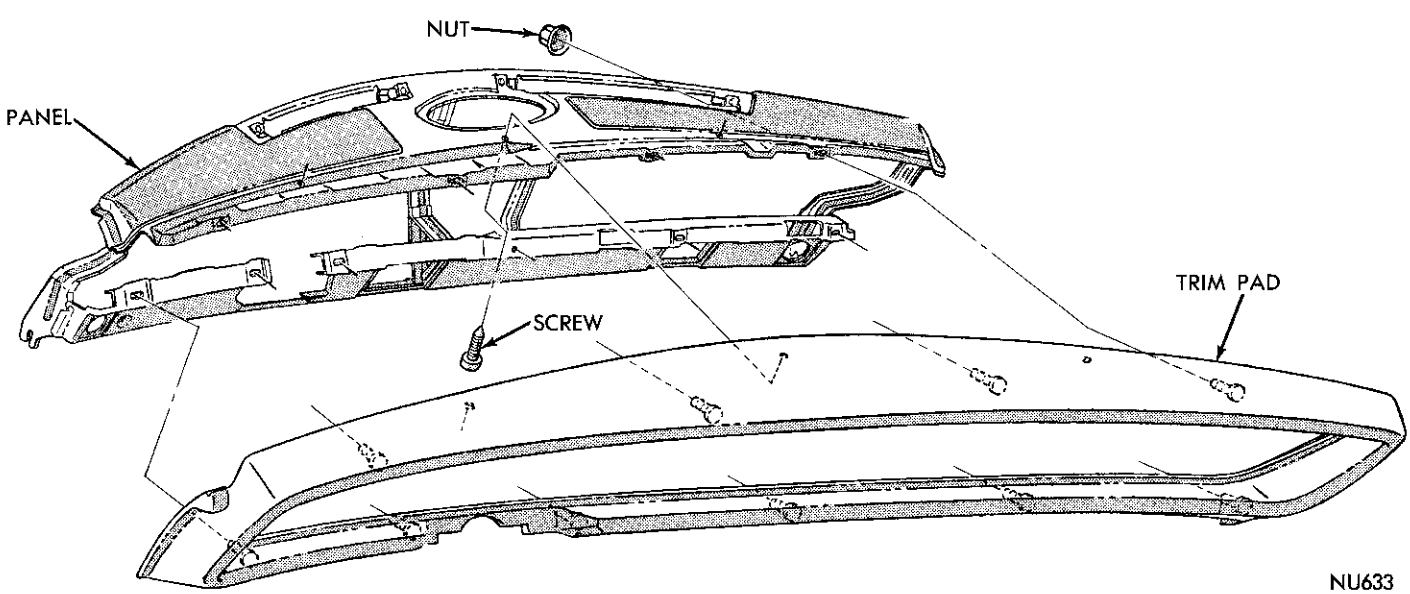


Fig. 1—Instrument Panel Trim Pads

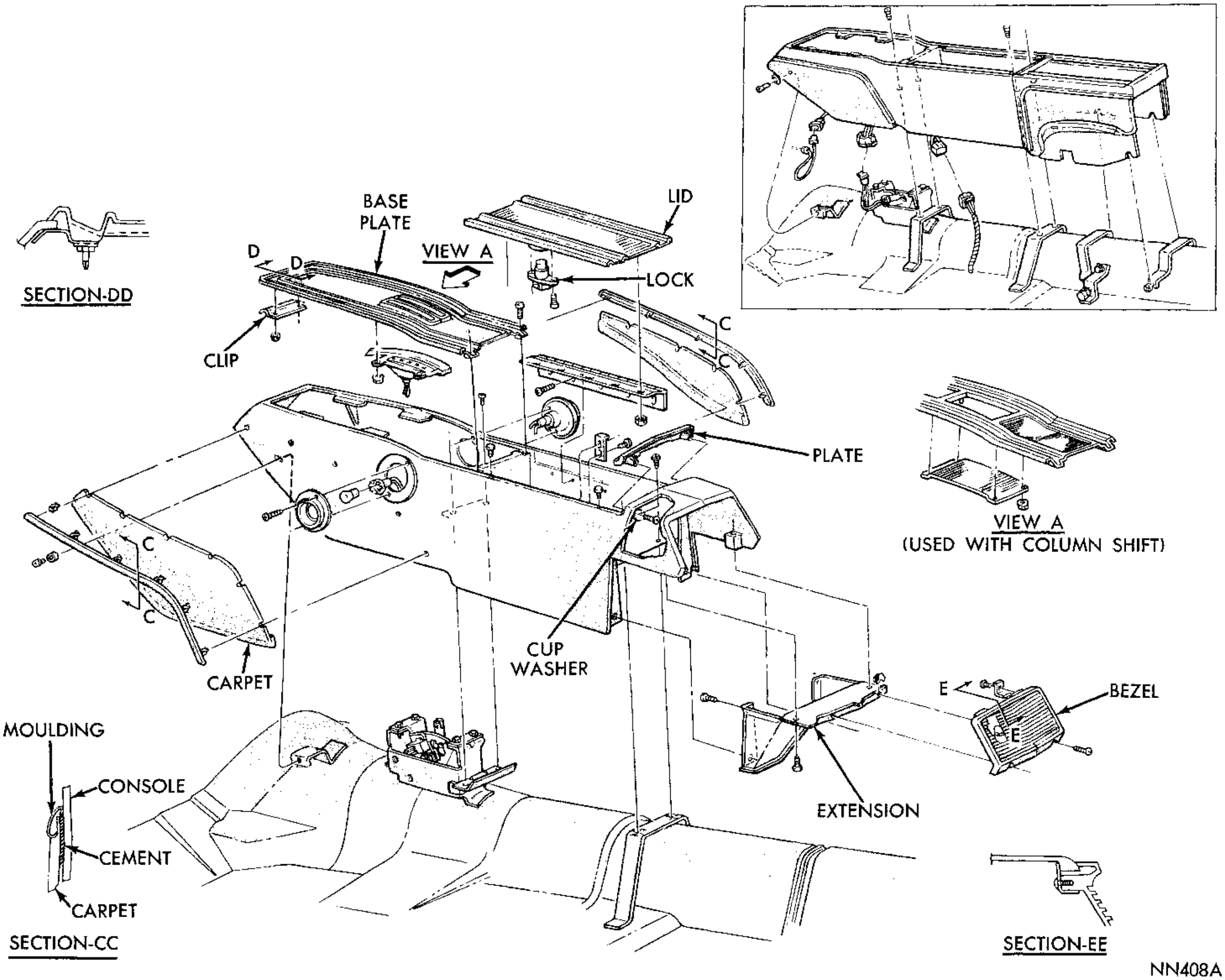


Fig. 2—Console Attachment

with screws. When replacement is required, a continuous 1/4 inch bead of sealer should be applied on scuff plate ends and outer edges.

Floor Covering

To remove the rear floor covering it is necessary to remove the front seat assembly and the rear seat cushion. The front seat mounting brackets are positioned on top of both front and rear floor covers. The rear floor covering is positioned under the front covering.

On units equipped with consoles, the carpet must be assembled over the floor pan mounting brackets and/or shifting lever. The body wiring is positioned through the holes in the carpet. The front edge of carpet is positioned under the rubber flap on the cowl trim panel. With air conditioning, the carpet front edge must be positioned on front of the air conditioning housing flange and secured with the floor air outlet retainer bracket.

HEADLINING

Removal—Fabric Type

(1) Remove rear seat cushion, dome light bezel and lens, sun visors, rear view mirror and coat hooks.

(2) Remove headlining from cemented areas at windshield header.

(3) Remove headlining from under shelf panel and from quarter panels.

(4) Using a dull putty knife, disengage fabric from side rail retainers by gently forcing material up and off of retainers and while maintaining pressure on fabric pull disengaged portion down and out. Work only small areas at a time.

(5) Remove headlining at windshield header and from rear window area.

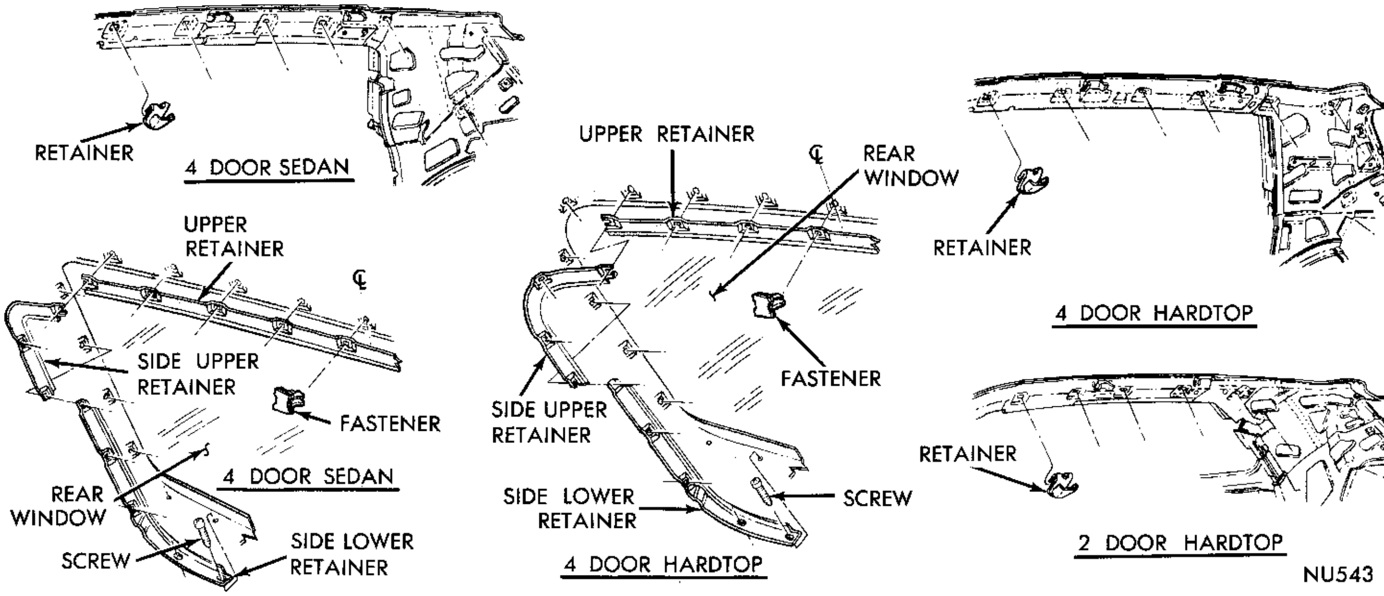


Fig. 3—Listing Wire Retainers

(6) Remove listing wires from side rail retainers (Fig. 3) and support wire from rear listing wire.

(7) Remove all foreign material and cement from windshield header area and rear window opening areas.

(8) Remove listing wires from headlining and insert in comparable listing of new liner.

Installation

(1) Trim excess listing material even with edges of headlining.

(2) Locate centerline of lining and at front and rear ends, cut a small notch as an aid in maintaining headlining alignment during installation.

(3) Locate and with chalk mark centerline points of

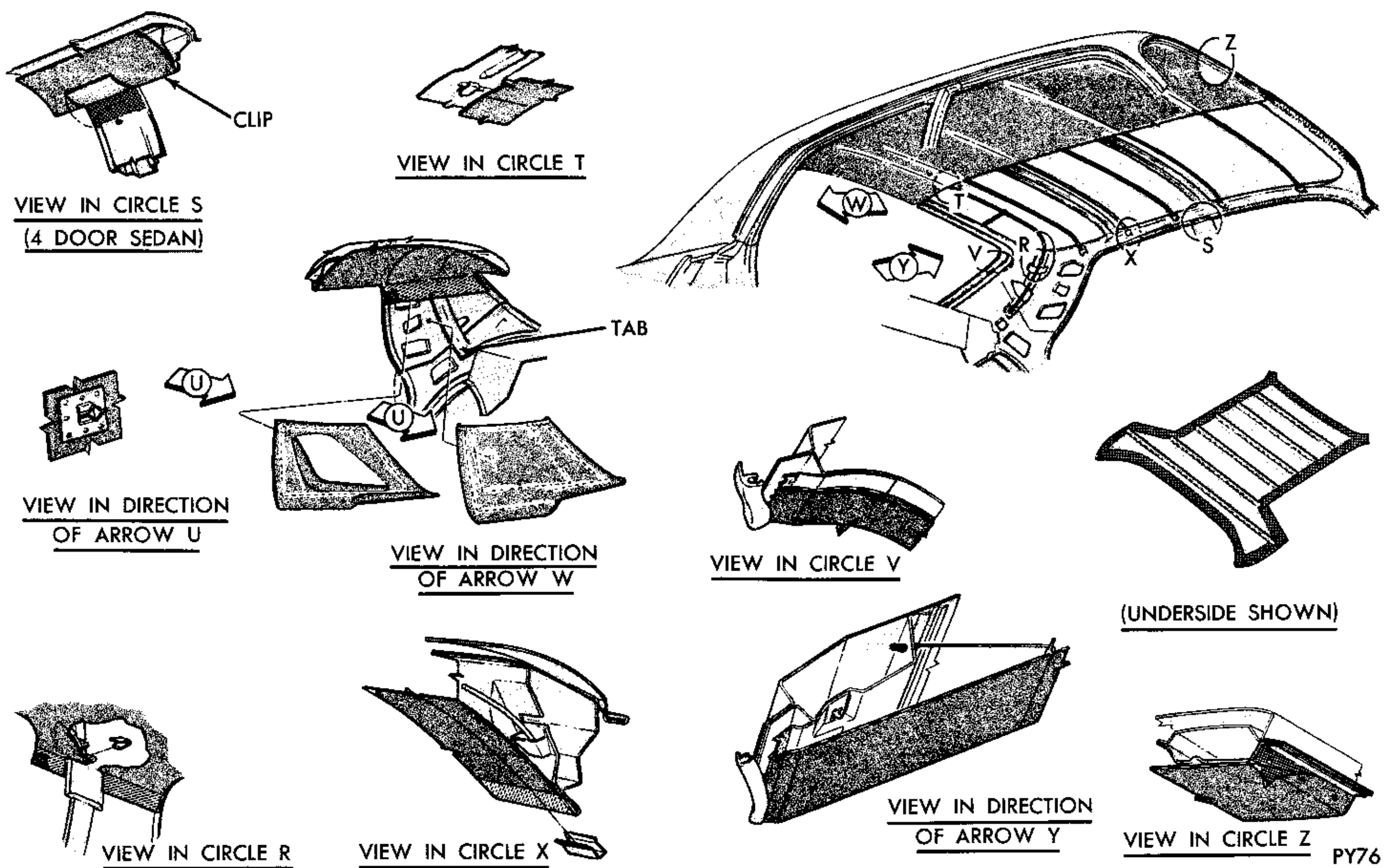


Fig. 4—Soft Headlining (Sedan)

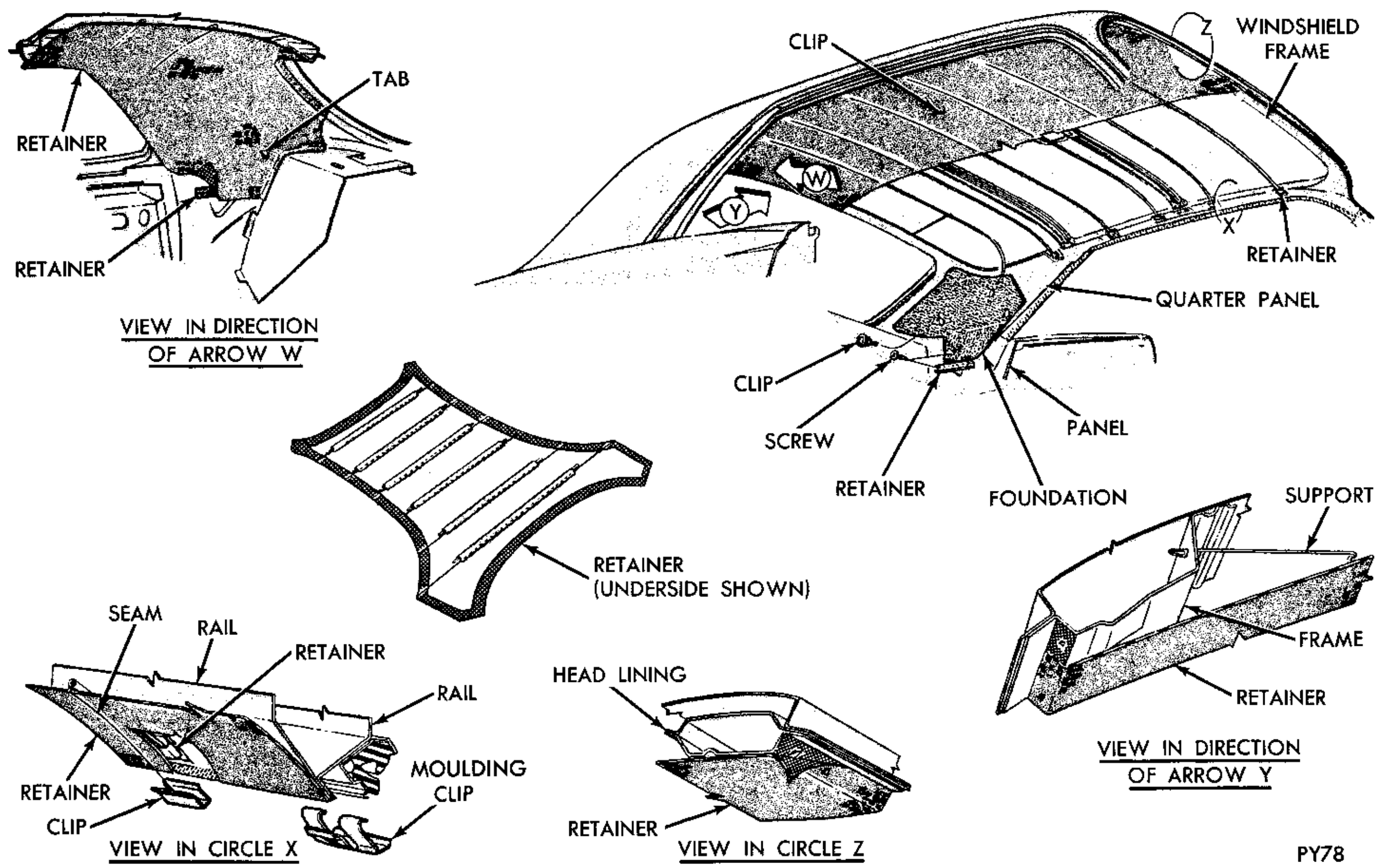


Fig. 5—Soft Headlining (Hardtop)

windshield and rear window.

(4) Center headlining at rear window. Insert rear listing wire to retainer clips on roof rail extensions and hook to wire supports (Figs. 4 and 5).

(5) While maintaining front to rear alignment, stretch material to remove all wrinkles. Equal amounts of material should hang down at both sides.

(6) Install remaining listing wires, following same cautions as in step 5.

(7) When cement at windshield header area becomes tacky, start at centerline area of windshield and position headlining to cemented area.

(8) Using a dull putty knife, secure liner on barbs at header area, **do not install material at top of windshield posts,** making sure there are no wrinkles and fabric seam is straight.

(9) Locate sun visor mounting bracket screw holes in header and cut holes in headlining slightly larger than attaching screws.

(10) Install sun visors and tuck in corners of headlining at top of windshield posts.

(11) Locate rear view mirror bracket screw holes, cut holes in fabric slightly larger than screws and install mirror.

(12) When installing headlining at side rail retainers, work only a small section at one time to make certain seams are straight and material is free of wrinkles.

(13) Using a dull putty knife and working alternately from side to side, install headlining on side rail retainers.

(14) Apply cement to rear window opening and to quarter panel area, after cement becomes tacky, install headlining starting at top center and working outward down the sides.

(15) Install rear seat cushion and coat hooks.

(16) Locate dome light opening and cut out sufficient material for correct lighting. Install dome lamp bezel and lens.

HARD BOARD LINING

Retainer Moulding Replacement

The individual hard board headlining sections are held in position with semi-flexible type plastic mouldings (Fig. 6) forced over retainer sections of the roof bows. Starting at either outer end, remove end cap and pry moulding off retainer. When installing, make certain it is fully seated and evenly spaced from side to side. Install end caps.

Replacement

To remove either front or rear sections, remove the windshield or rear window garnish mouldings

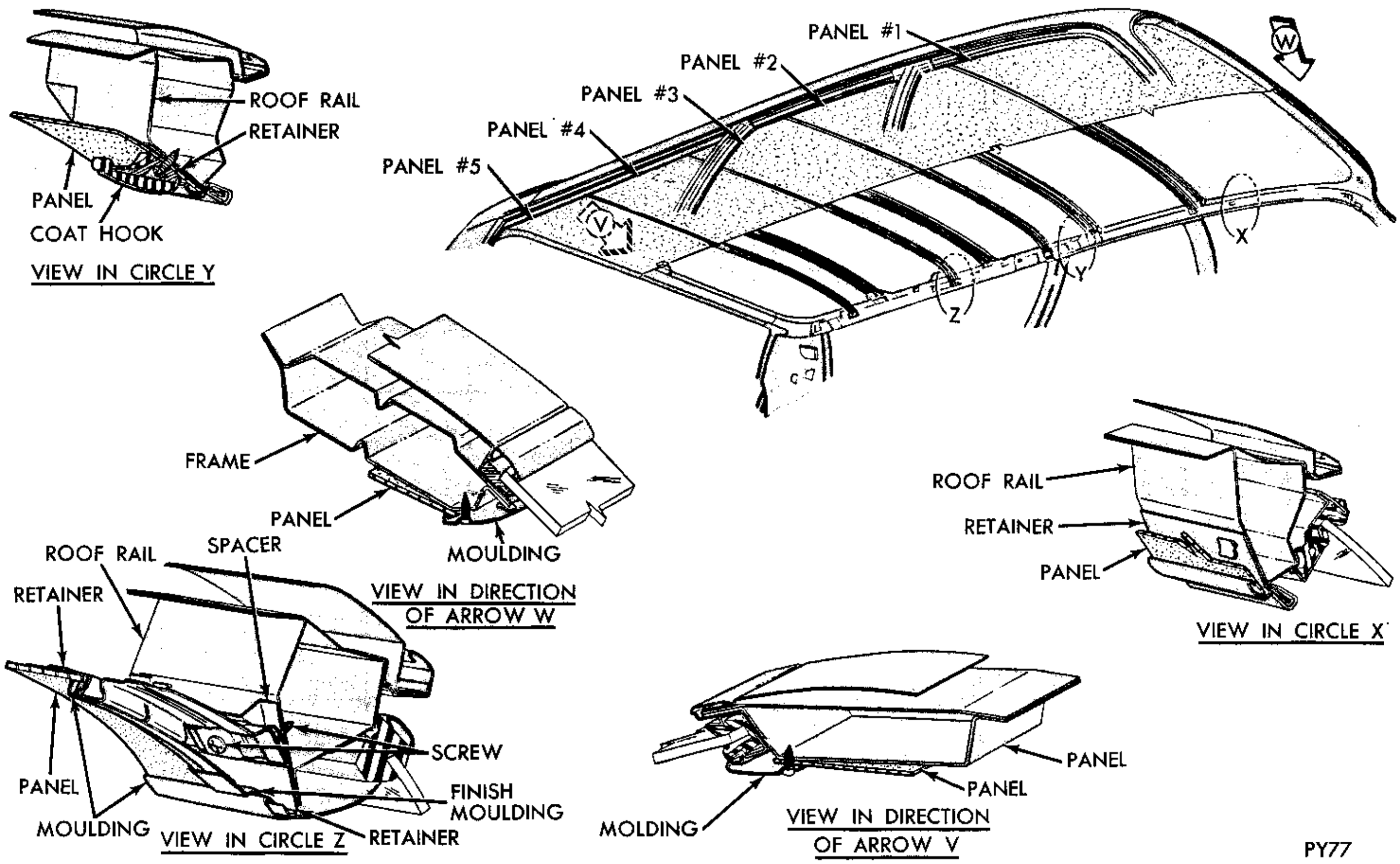


Fig. 6—Hardboard Headlining

and the one moulding at inner edge, all inner sections require only the outer edge mouldings be removed.

Removal

(1) Remove mouldings (Fig. 4) at edges of section being removed.

(2) Using a fibre tool force liner section off of roof bow and out of side retainers.

(3) Inspect liner section for damaged edges.

Installation

(1) Position liner section on side retainers and in alignment with mating surface of roof bow.

(2) Push section up at center to seat it in side retainers.

(3) Align edges of section with moulding retainer on roof bows.

(4) Install mouldings and caps over ends.

(5) Install any garnish mouldings removed.

GLOVE BOX

Installation

Refer to Figure 7 for the glove box attaching points. The glove box consists of an upper and lower section and are attached into a single unit with screws.

Door Assembly

Refer to Figure 8 for the method of attaching the glove box door assembly.

Lock and Catch Assembly

The glove box lock is attached to the inner side of the door and the catch is attached to the instrument panel.

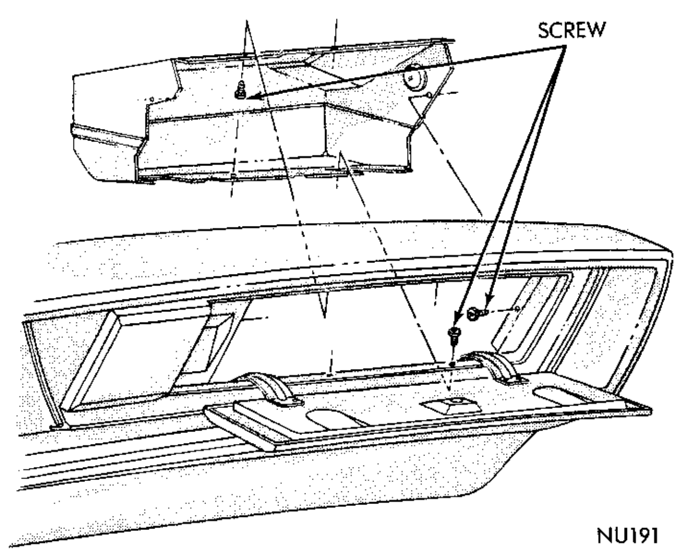


Fig. 7—Glove Box Attachment

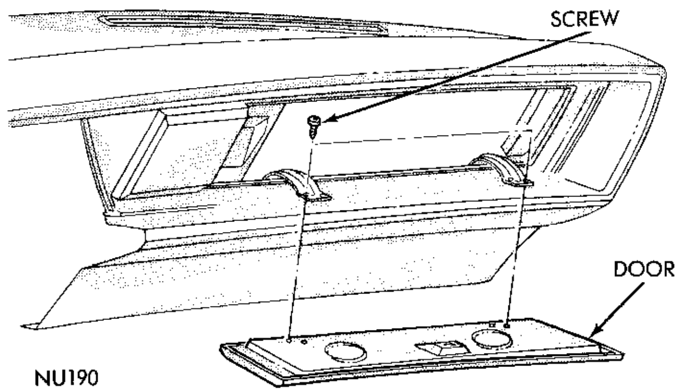


Fig. 8—Glove Box Door Installation

SHELF TRIM PANEL

Removal

(1) Remove rear seat cushion and back assembly.

(2) Loosen cemented edges of trim panel at side extensions.

(3) Lift trim panel at front and remove panel retainers.

(4) Slide trim panel forward and up to remove.

(5) Remove retainers from panel.

(6) Remove all cement and foreign material from shelf panel.

Installation

(1) Remove defogger gated sections from new panel.

(2) Install panel retainers into position on shelf panel. Make sure retainers are aligned with mounting holes, but do not insert.

(3) Apply cement to shelf panel extension.

(4) Force retainers into their mounting holes using hand pressure.

(5) Position trim panel extension flaps on cemented areas.

(6) Install rear seat back and cushion.

SEATS

ADJUSTMENT

To raise or lower the front seat (Fig. 9) loosen the adjuster mounting bolt nuts, under floor pan, and remove or install shims between the adjuster base and floor pan.

To move seat "fore or aft," reposition the adjuster mounting bolts in the adjuster base. Three holes are provided at each mounting bolt area.

FRONT SEAT BACK LATCH

All two door vehicles having split back bench type seats incorporate latches to prevent the seat back falling forward. To move seat back forward, move the latch assembly (Fig. 10) until clearance is obtained at the pivot pin.

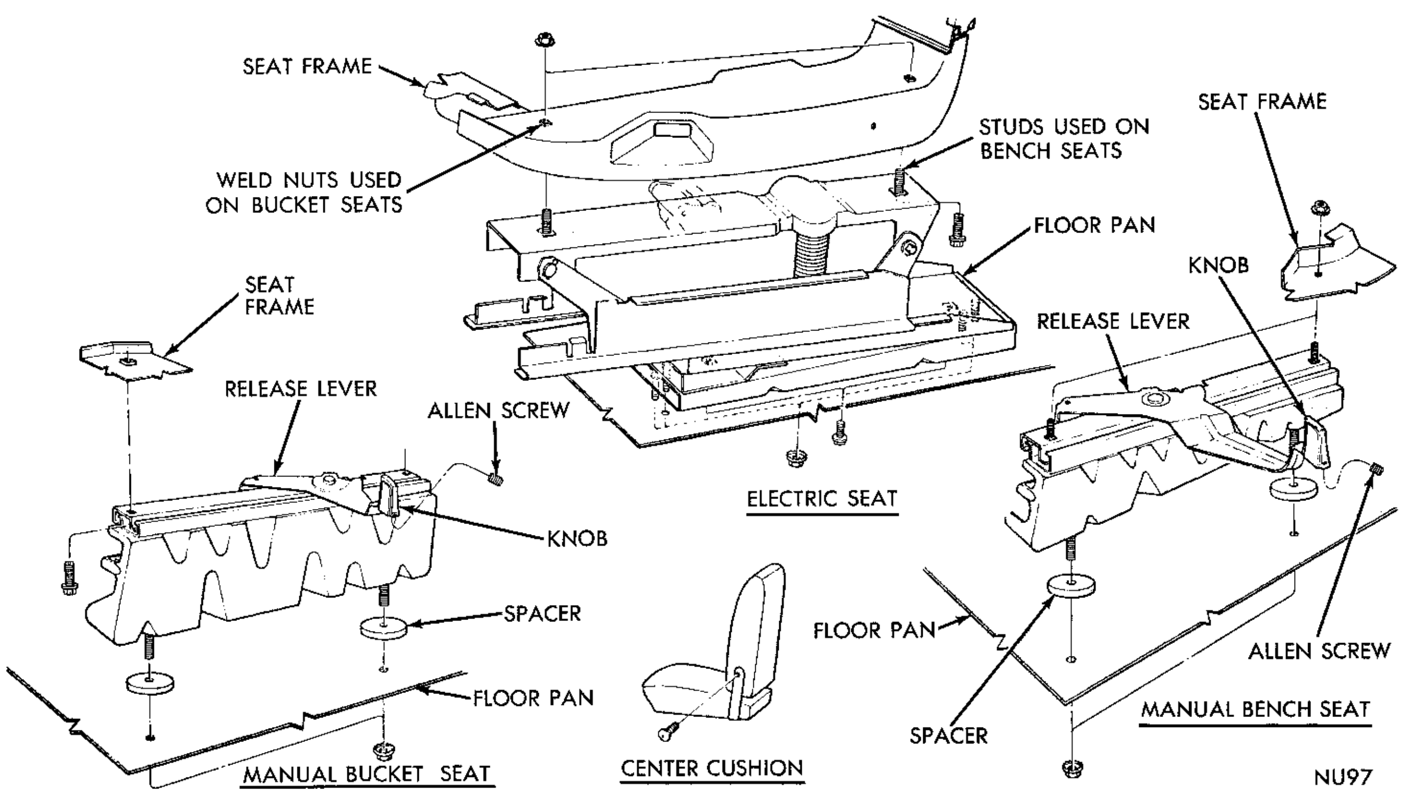


Fig. 9—Front Seat Adjuster

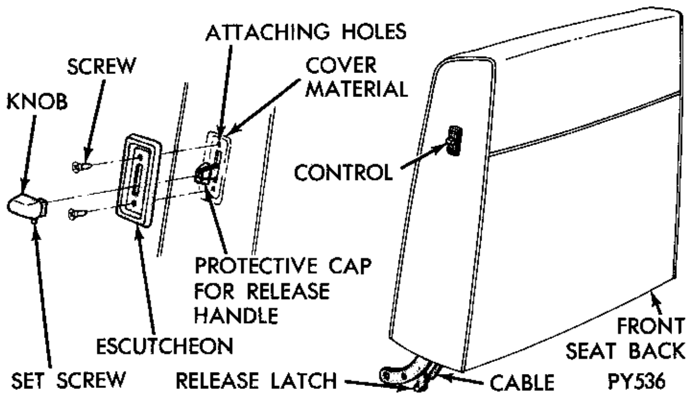


Fig. 10—Front Seat Back Latch

Removal

(1) Remove snap ring and flat washer from pivot pin.

(2) Remove end of spring from latch and remove latch assembly.

(3) Remove spring from groove of pivot pin.

(4) Remove knob and clip from end of latch.

Installation

(1) Position spring on pivot pin and align inner end of spring in pivot groove.

(2) Install latch assembly on pivot pin and insert outer end of spring in notch on latch.

(3) Install flat washer and retainer firmly against latch assembly.

(4) Install clip and knob on latch.

RECLINING SEAT MECHANISM

For ease of assembling, the following procedures should be performed in sequence as listed.

Bucket Type (Fig. 11)

Installation

(1) Before pad support and cover are assembled, attach lever release to front recliner.

(2) Insert upper end of cable into hole in lever. Attach cable and latch to front spring and cover using screw.

(3) Install spacer on rod end of adjuster. See Figure 11. **(THE SEAT CANNOT BE ASSEMBLED WITHOUT SPACER).**

(4) Insert adjuster into back of recliner with clevis end on bracket and rod end protruding through the opening in bottom recliner.

(5) Align holes of clevis in adjuster, with hole in bracket on front recliner. Drive pin spring through bracket and sides of clevis on adjuster.

(6) Cut clearance hole in side facing of cover so that the release handle shaft is accessible.

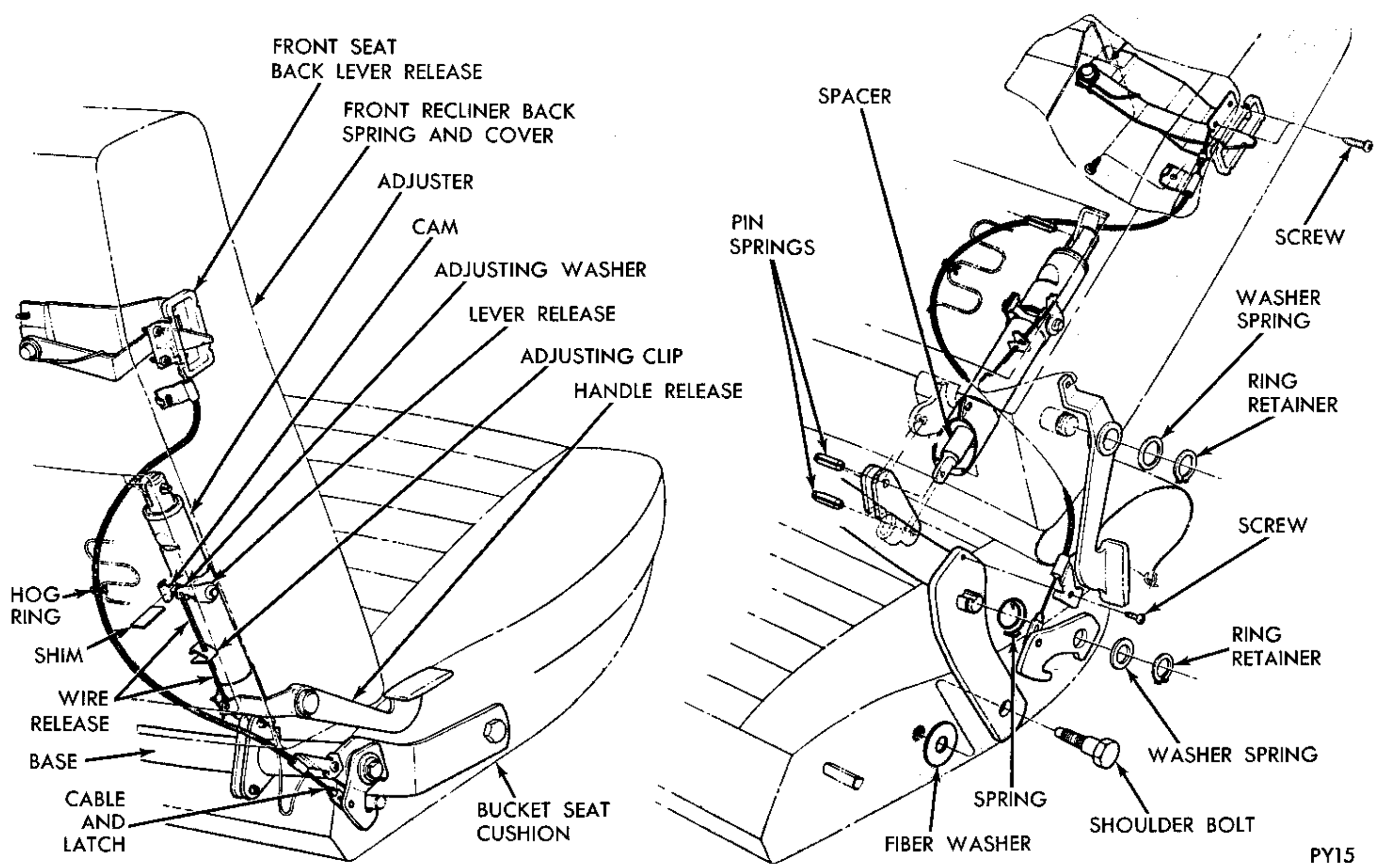


Fig. 11—Reclining Seat Mechanism (Bucket Type)

(7) Place handle release on wire release. Slide release and washer spring onto the handle shaft, secure in place with ring retainer.

(8) Position pivot brackets on back spring. Align holes, and drive pin spring through holes in pivot bracket on each side of recliner.

(9) Position rod end of adjuster in corresponding stanchion on base and drive pin spring through holes in stanchion and rod.

(10) With recliner, cover, base and seat cushion assembled put back spring and cover in position. Compress clip to free wire release. Press handle down as far as possible. Insert shim between adjusting washer and cam and move lever release down until cam presses shim against adjusting washer. Release clip and remove shim.

(11) With handle in released position move recliner back spring and cover forward, as far as possible, and remove spacer.

(12) Raise and lower front recliner back spring and cover. Check operation and adjustment.

(13) Move front recliner forward. Pull flap on front recliner over base, and place hog ring to front recliner.

(14) Place inner end of spring in latch pivot. Attach end of spring on forward tab of latch. Slide latch and washer spring over latch pivot shaft and secure with ring retainer.

(15) Attach cable and latch to base using screw in lower attaching bracket.

(16) Attach cable and latch to zig-zag element, in front recliner using hog ring.

(17) Raise lever in front seat back to operate latch on cable. Check operation and alignment.

4 Door Models

Make certain spacer is installed on rod end of adjuster assembly (Fig. 12), otherwise seat cannot be assembled.

(1) Insert adjuster and cable assembly into rear of seat back, with clevis end on bracket and rod end protruding through hole in bottom facing of seat back.

(2) Route cable between edge of bottom facing and back spring frame of seat back. **Do not use hole for adjuster rod.**

(3) Position adjuster clevis end in bracket on seat back and secure with spring pin.

(4) Position seat back on cushion, with shoulder bolt on right side with pivot pin and push nut on left side.

(5) Position cable to rear of seat cushion.

(6) Position adjuster rod end in cushion bracket and secure with spring pin.

(7) Slide fibre washer, release handle and spring washer over release shaft and secure in place with retaining ring.

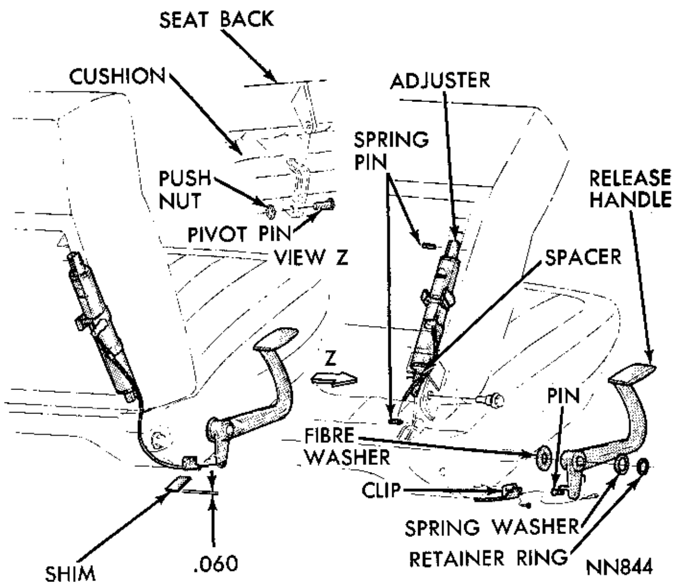


Fig. 12—Reclining Seat Mechanism (4 Door)

(8) Push retainer pin through hole in release handle, slide eye of adjuster cable over pin and fasten with cotter pin.

(9) Slide retaining clip over cable housing and fasten to side of seat cushion with two screws finger tight only.

(10) Insert .060 inch shim between release handle and bottom of seat cushion. Push release handle down firmly against shim and pull cable housing through retaining clip (away from handle) to remove all slack.

(11) Tighten screw to lock sheath in retaining clip and remove shim.

(12) Raise seat back to upright position and remove spacer from rod end of adjuster.

(13) Test operation of mechanism.

REPLACEMENT

Front Seat

The bench type front seat cushion is an integral part of the seat frame. All seat frames are attached to the adjuster by studs and nuts. Remove nuts from adjuster mounting bolts, under floor pan, and remove seat.

Rear Seat Cushion

The rear seat cushion (Fig. 13) is held in place by inserting the rear edge of seat cushion under lower edge of seat back. The front lower frame of seat engages a slotted bracket welded to the floor pan.

Rear Seat Back

The rear seat back (Fig. 13) is held in place by tangs of the upper edge of seat frame being positioned over hangers on the shelf panel. The lower

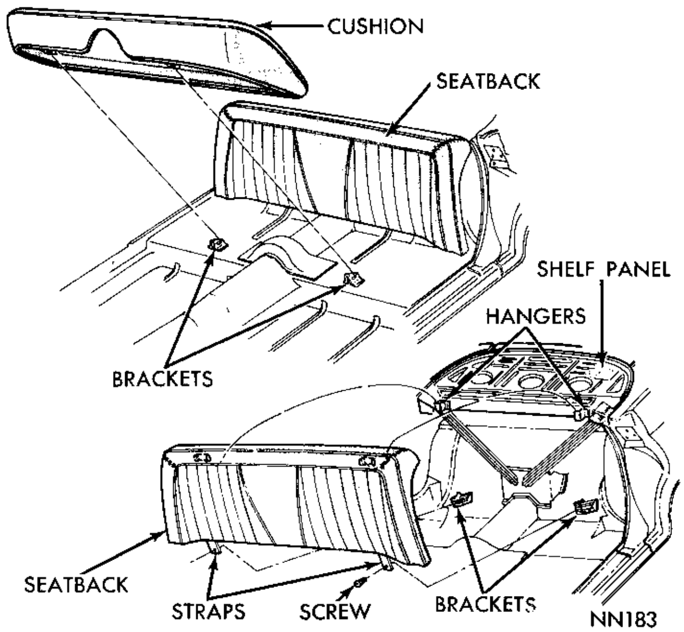


Fig. 13—Rear Seat Attachment

edge of the seat back incorporates two metal straps which attach to brackets welded on the floor pan.

Station Wagon—Second Seat Back

Removal

(1) Remove second seat back hinge to floor pan stud nuts (Figs. 14 and 15).

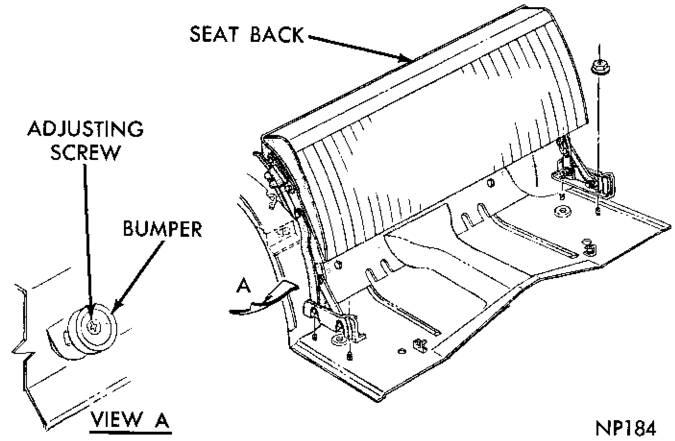


Fig. 15—Second Seat Back Hinge

(2) Release catch from seat back and remove back assembly.

(3) Refer to Figure 16 for seat back to panel attaching points.

Installation

(1) Position back on hinge assemblies, install screws and tighten 80-120 inch-pounds.

(2) Test engagement of seat back catches.

Second Seat Cushion

Removal

(1) Raise rear floor hinged panel at rear of cushion

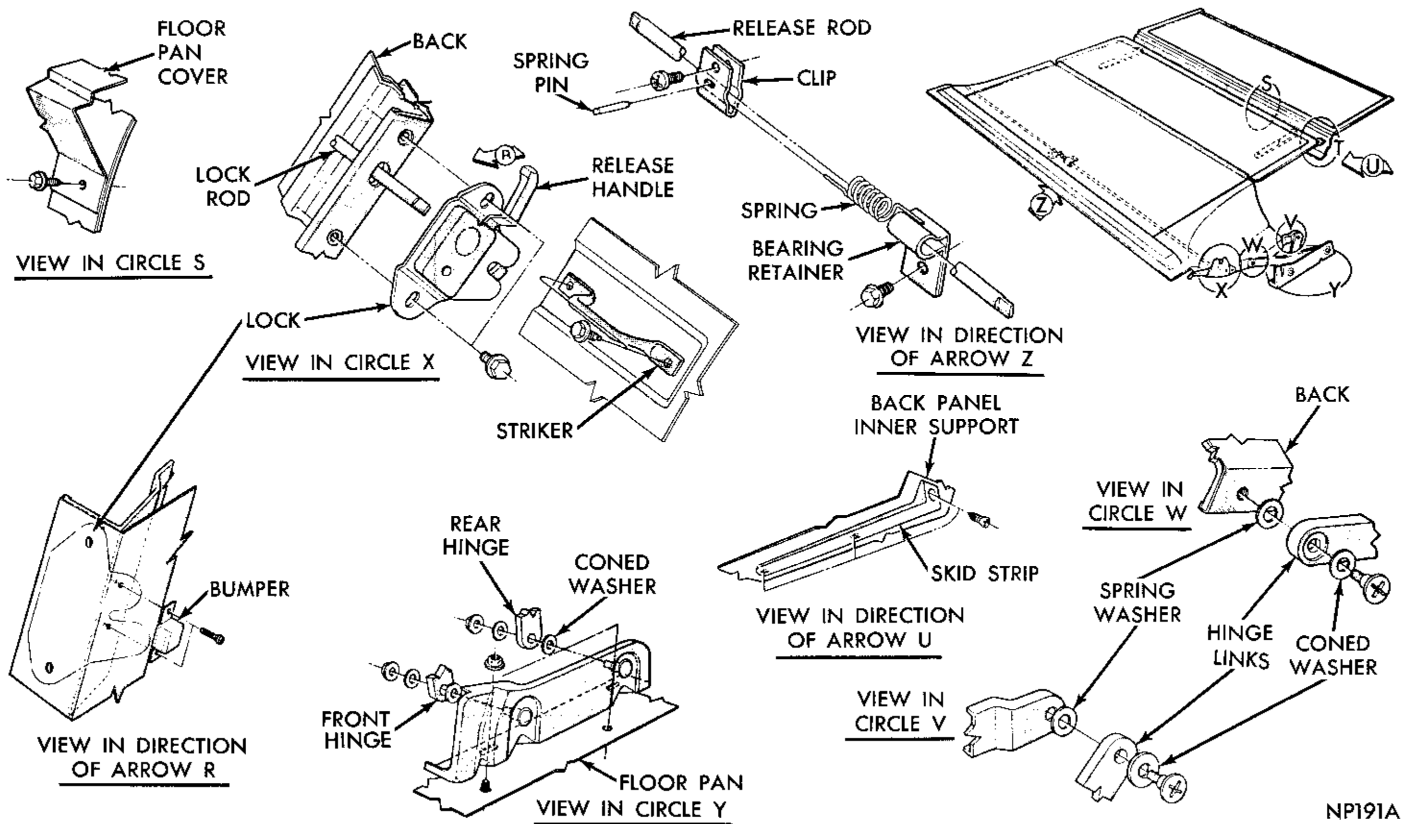


Fig. 14—Second Seat Back Assembly

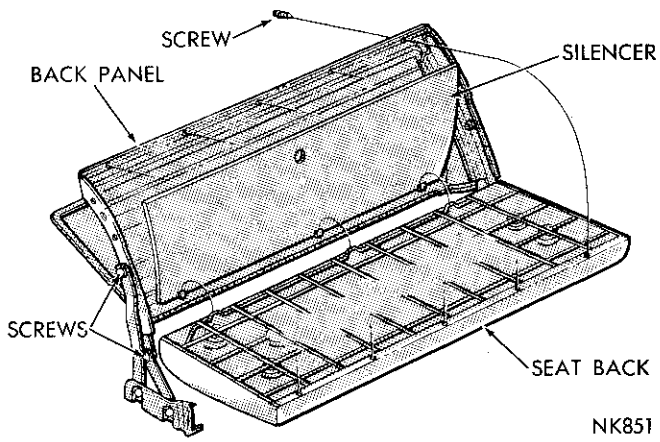


Fig. 16—Second Seat Back

(Fig. 17) to expose cushion to floor pan screws.

(2) Remove screws attaching, move cushion slightly rearward to disengage locking bars, at front bottom, from floor brackets.

(3) Remove cushion assembly.

Installation

(1) Place cushion in position, and engage locking bars in brackets on floor pan.

(2) Raise hinged portion of rear floor and install cushion mounting straps to floor pan screws.

Third Seat Back

Removal

(1) With seat back in the UP position (Fig. 18), remove screws from seat hinge links.

(2) Remove back and support panel assembly.

(3) The cushion is retained to the seat back panel (Fig. 19) with screws.

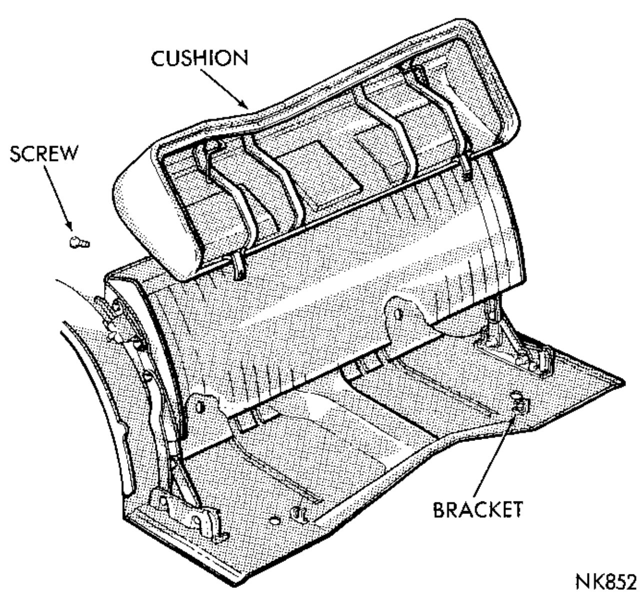


Fig. 17—Second Seat Cushion

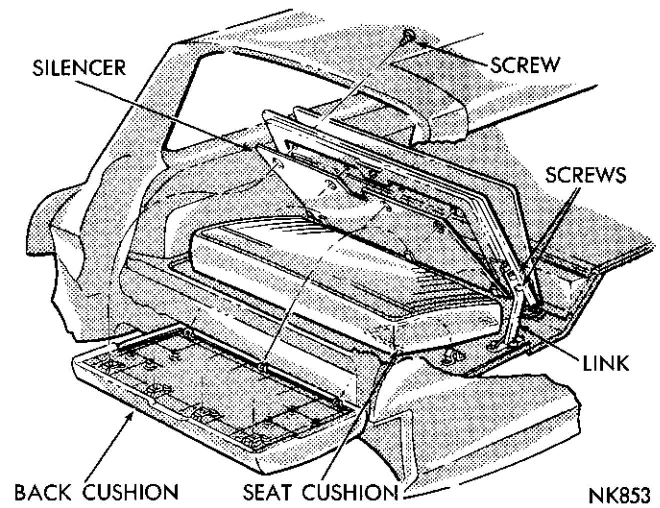


Fig. 18—Third Seat Back and Cushion

Installation

(1) Position cushion on back panel and install screws.

(2) Position back and support panel assembly on hinge links and install screws.

Cushion

Removal

(1) The third seat cushion (Fig. 18) is attached to hinges, which in turn are attached to the quarter panels by screws.

(2) Remove hinge to quarter panel screws and remove cushion assembly.

Installation

(1) Position cushion assembly on floor pan.

(2) Position hinges on quarter panel and install screws securely.

(3) Test seat operation, inspect fit and alignment.

(4) Adjust seat by loosening hinges and moving as required.

Third Seat Back and Cover Panel

Refer to Figure 19 for the attaching points and method of attachment for the third seat back and cover panel assembly.

Cover Material Installation

Prior to installing the original or new cover, make certain the spring pad (where used) and pad cover are centered on the spring and are firmly attached. **Make certain all buttons and medallions (where used) are pulled down securely and locked in position.**

As an aid in attaching the cover correctly, mark the areas on the spring where the cover was attached with hog rings, screws or drive nails.

SAFETY BELTS

Refer to Figures 20 through 24 for application of the lap and shoulder safety belts.

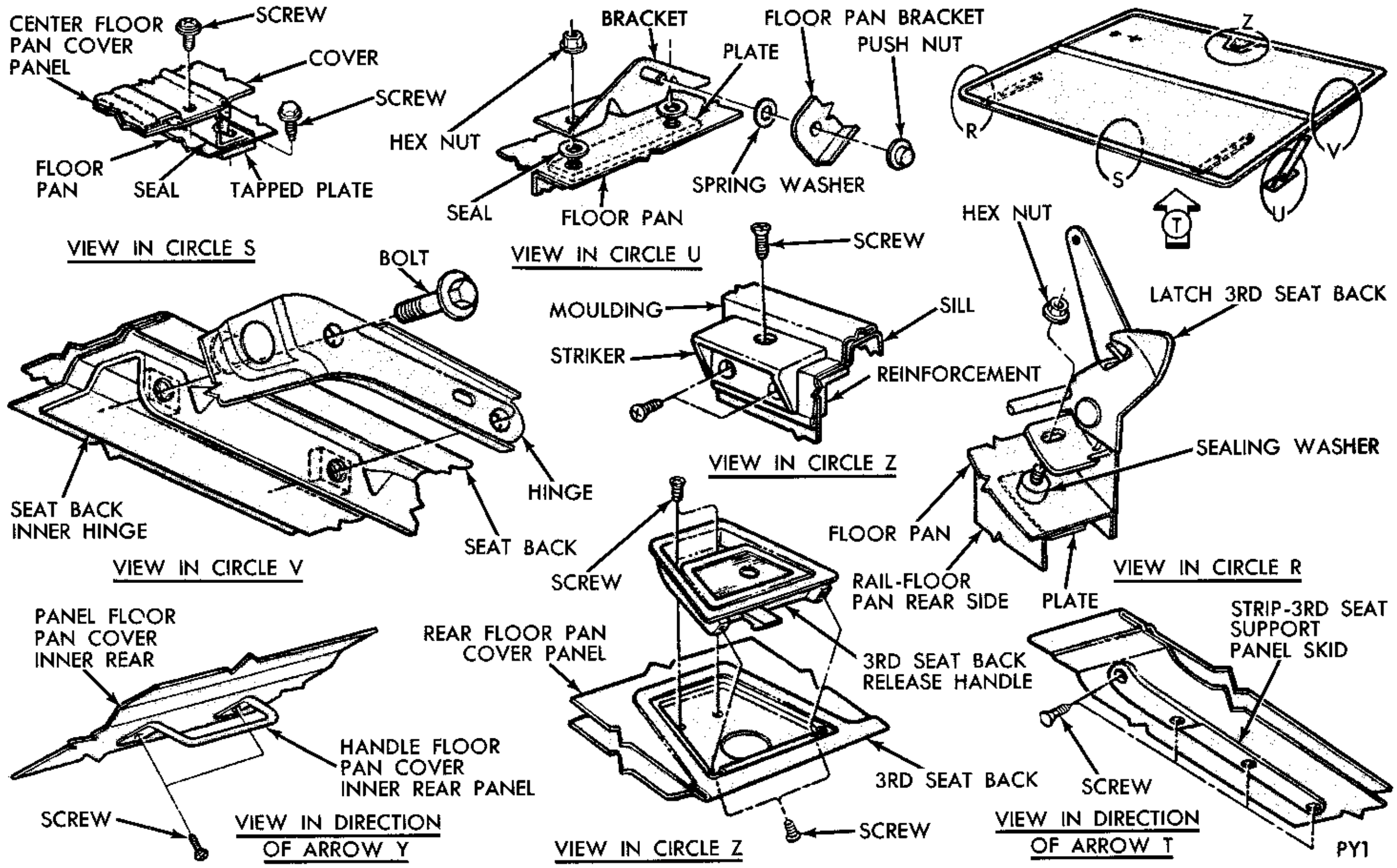


Fig. 19—Third Seat Back and Cover

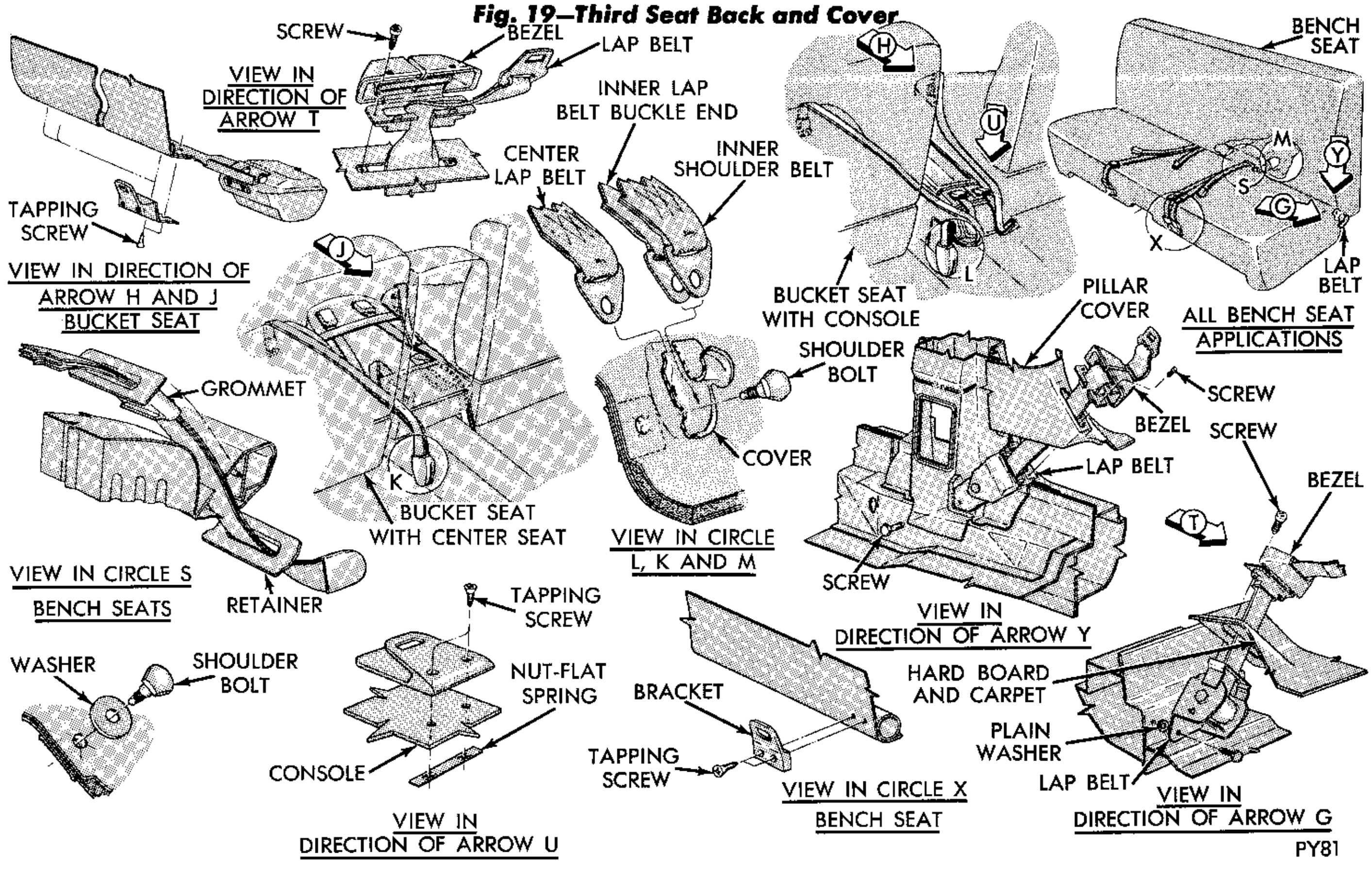


Fig. 20—Front Seat Lap Belts

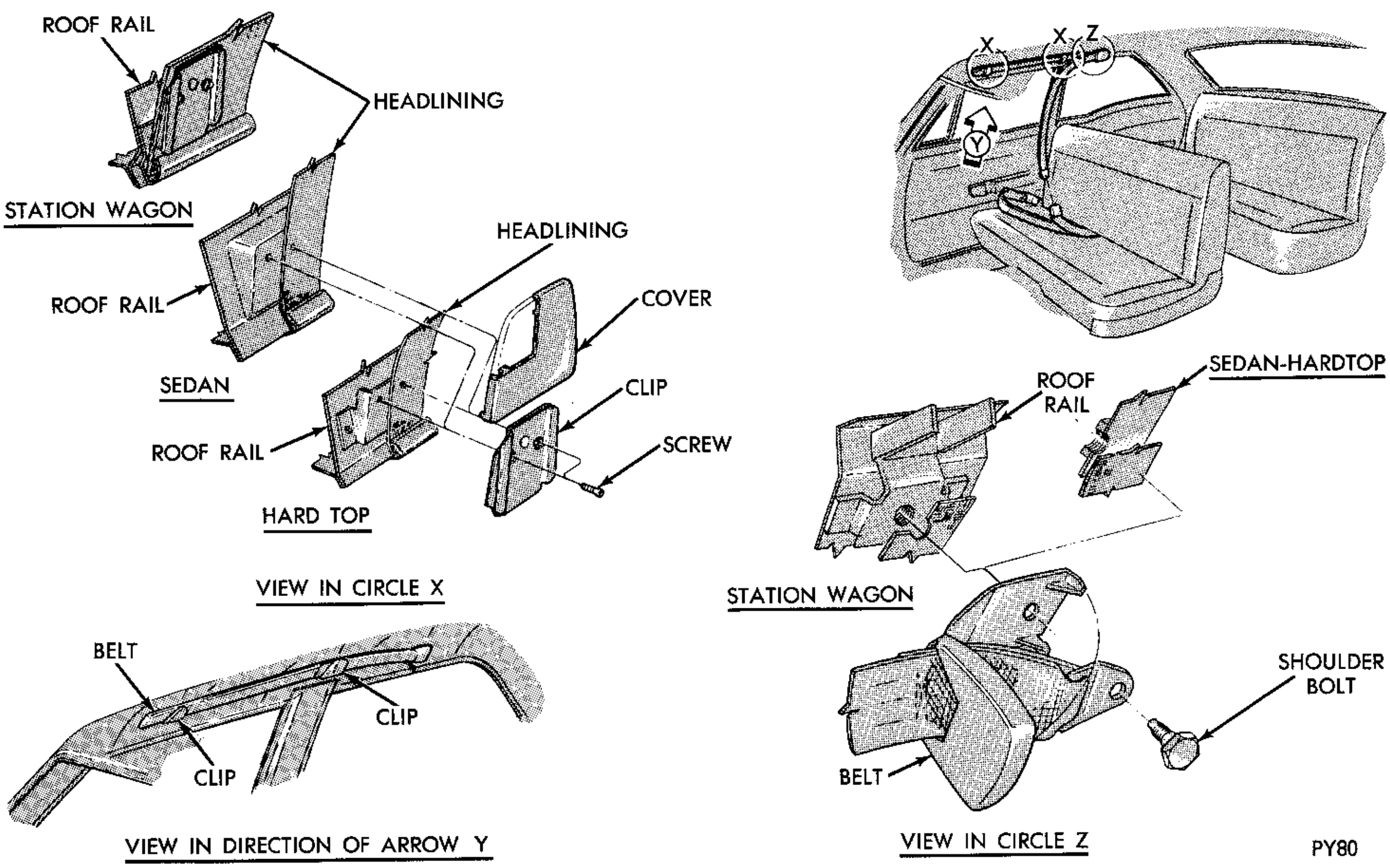


Fig. 21—Front Seat Shoulder Belts (Except Convertible)

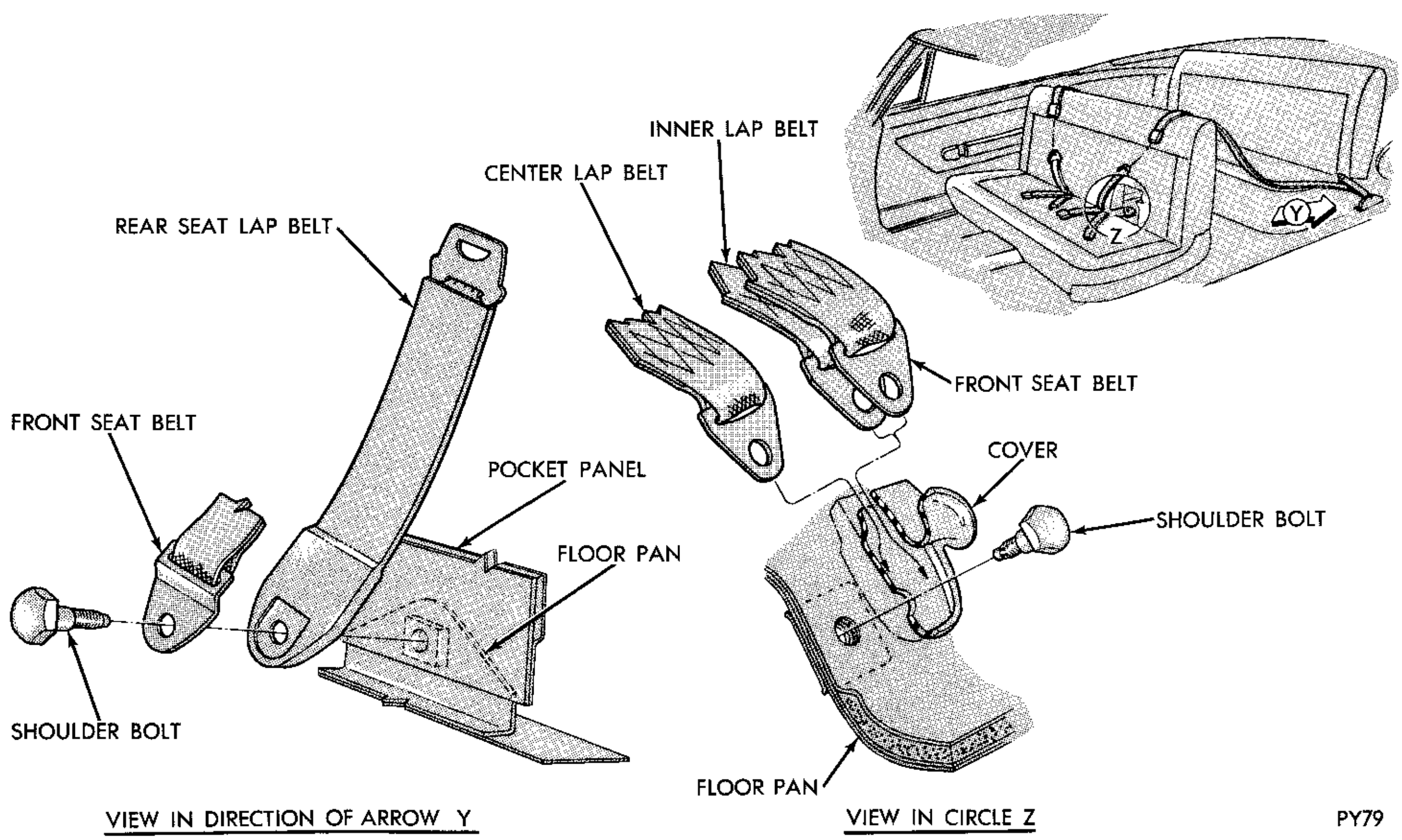


Fig. 22—Front Seat Shoulder Belts (Convertible)

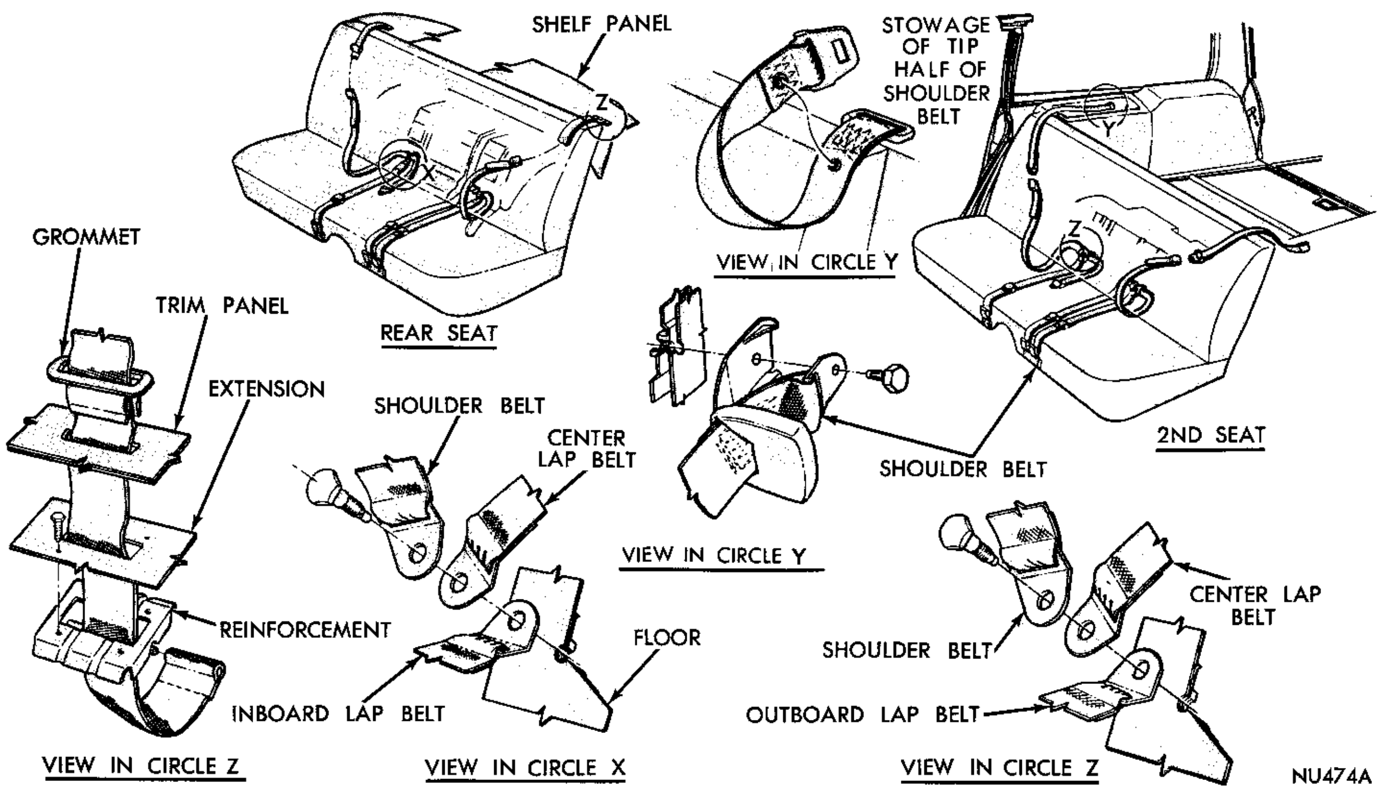


Fig. 23—Rear and Second Seat Shoulder Belts

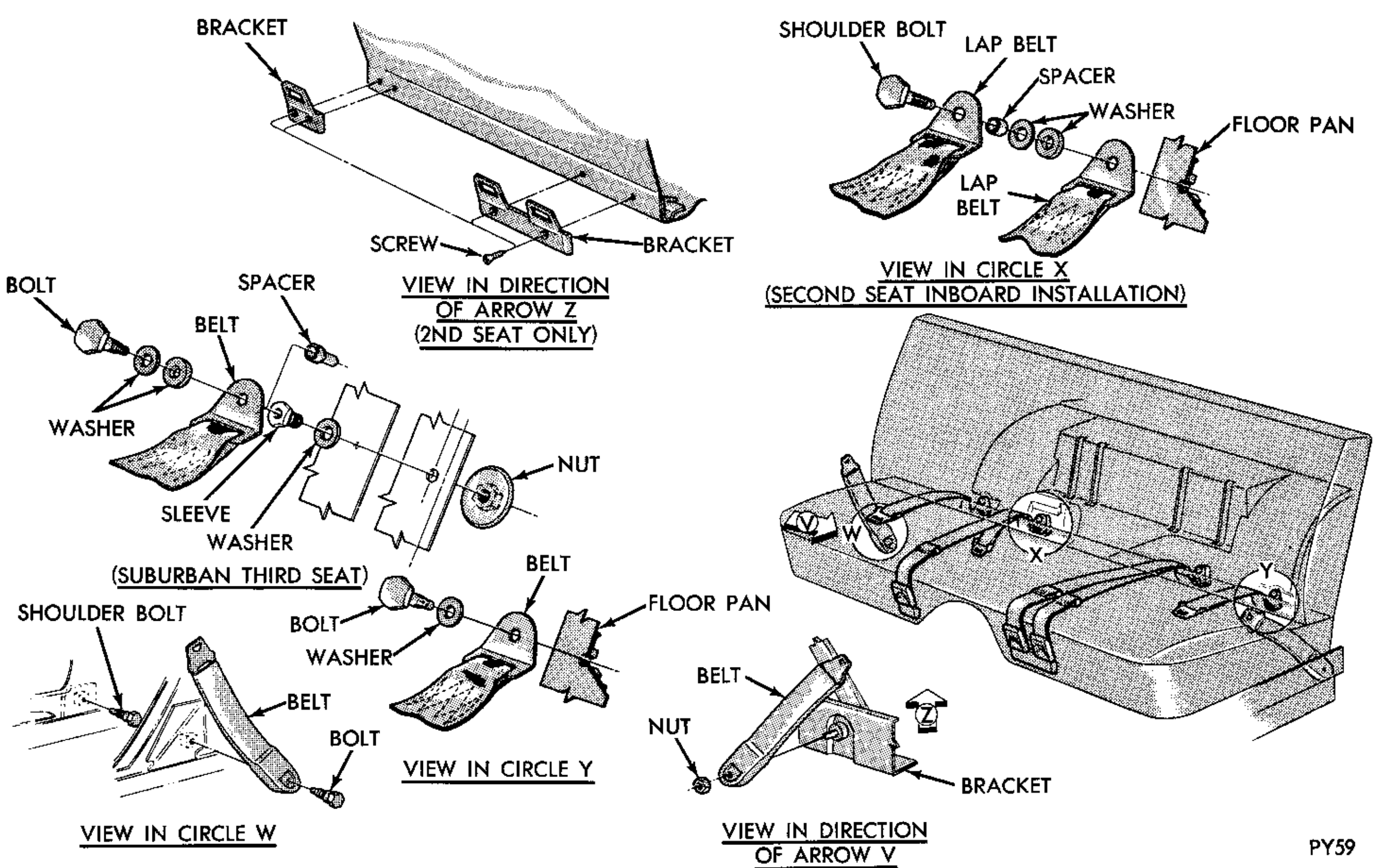


Fig. 24—Rear and Third Seat Lap Belts

WINDSHIELD AND REAR WINDOW

INDEX

SERVICE PROCEDURES

The windshield and rear windows are polysulfide adhesive sealed (cemented-in) types. Service procedures for the two glass are comparable.

Short cut sealing methods should not be used. To ensure a permanent watertight glass installation, use only the recommended adhesive sealer kit or its equivalent.

REPLACEMENT

Removal

(1) Place protective covering over the areas adjacent to the glass being replaced.

(2) Remove window exterior mouldings (Figs. 1 or 2) and inner garnish mouldings using Tool C-4009.

(3) Secure one end of a two foot length of tempered steel wire (.028 gauge max.) to a wooden handle.

(4) Insert other end of wire through adhesive at lower corner of window and secure to another wooden handle.

(5) With an assistant, carefully cut through adhesive material by pulling wire, in a sawing motion, up one side, across top, down opposite side and across bottom (Fig. 3).

(6) With an assistant, remove glass from opening and if original glass is to be reinstalled, place on a protected surface.

(7) All old adhesive should be removed from glass and opening reveal using a putty knife or razor blade. **DO NOT use an oil base solvent to remove adhesive.**

(8) Using steel wool, remove loose flakes of adhesive and old primer from reveal. Use light air pressure to clean reveal and surrounding areas.

Installation

(1) Inspect moulding retaining clips. Remove and straighten clips bent more than 1/32 inch away from the body panel. Use block self-sealing screw-on type clips when necessary to replace. All clips must be attached tightly.

(2) Inspect rubber spacers in window reveals. When replacement of spacers is required, make certain they are positioned in the exact areas removed from.

(3) Clean interior surface of glass. **Hand pressure to clean the glass interior surface after installing glass and before adhesive has set up may result in glass being pushed out of opening.**

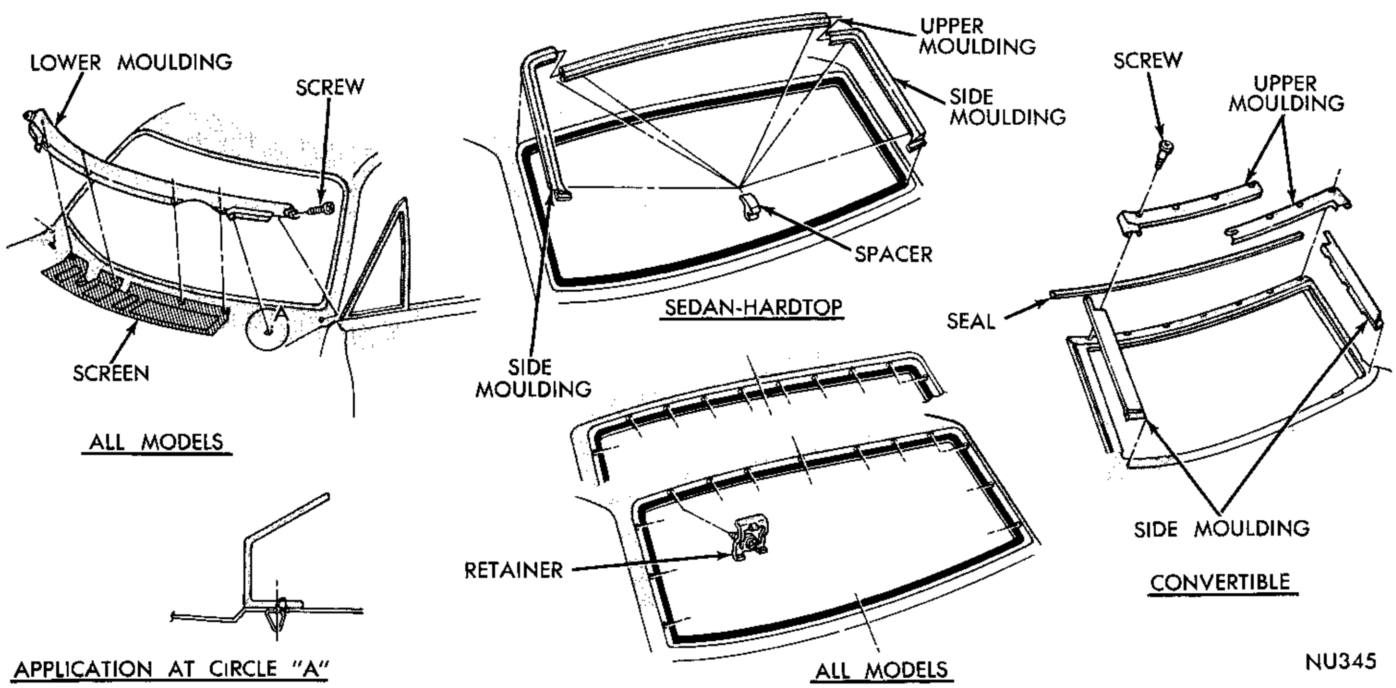


Fig. 1—Windshield Outer Mouldings (Chrysler)

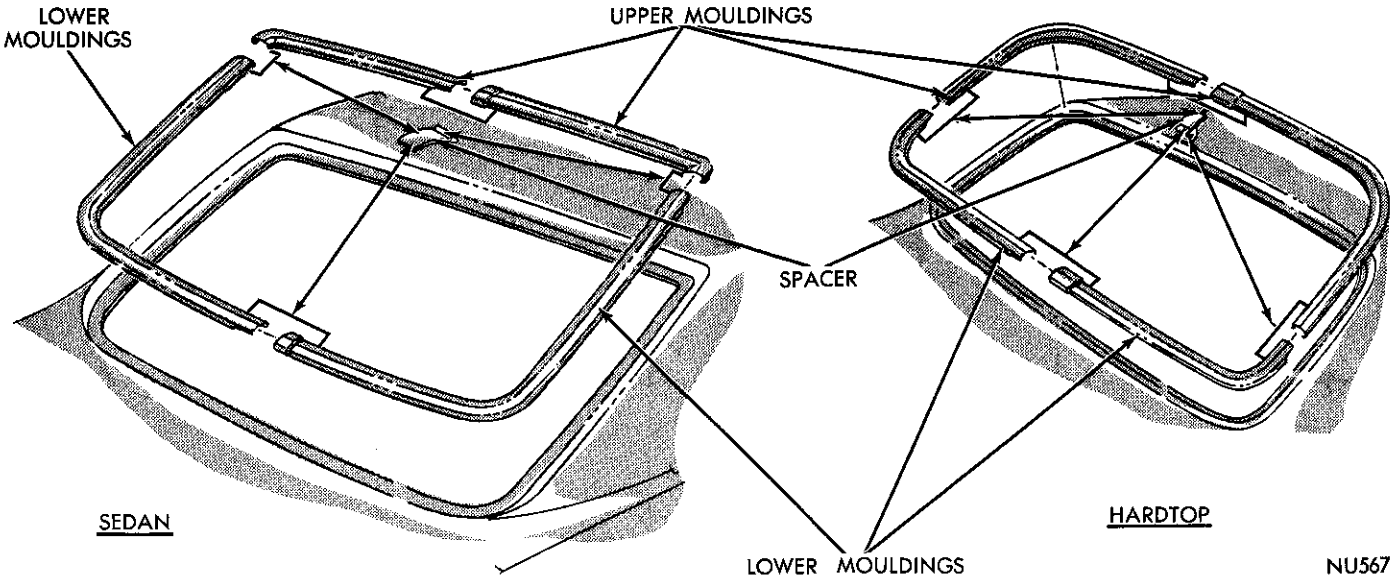


Fig. 2—Rear Window Outer Mouldings

(4) Install spacer dam 1/4 inch from edge and positioned so it leans toward edge on glass inner surface (Fig. 4).

(5) Attach suction cups to glass outer surface and position glass in opening.

(6) Inspect relationship of glass to fence completely around opening. The spacer dam should fold under and create a cushion for the glass to rest on.

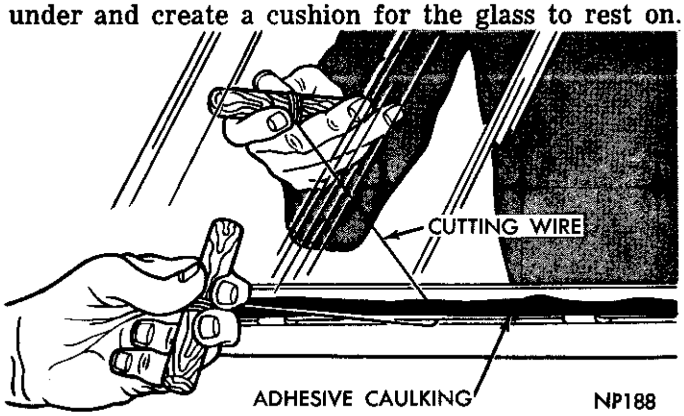


Fig. 3—Cutting Adhesive Caulking

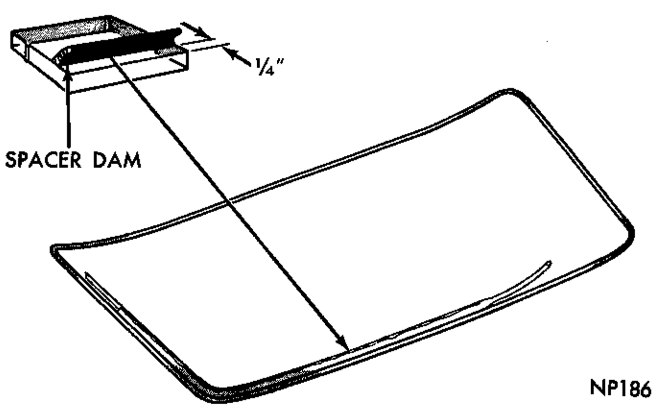


Fig. 4—Spacer Dam Installation

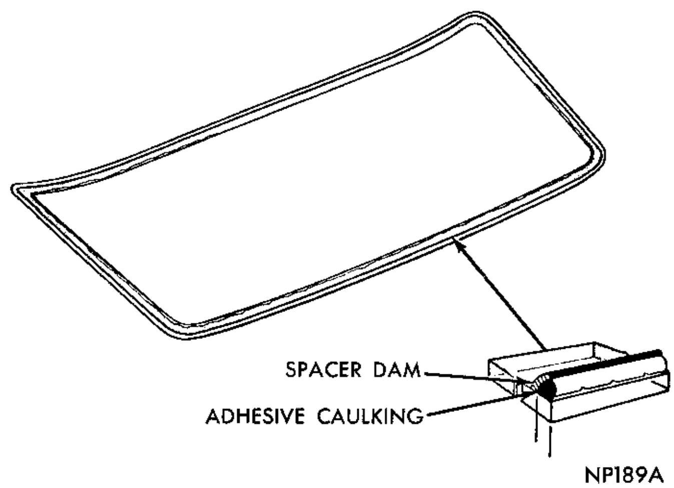


Fig. 5—Application to Glass

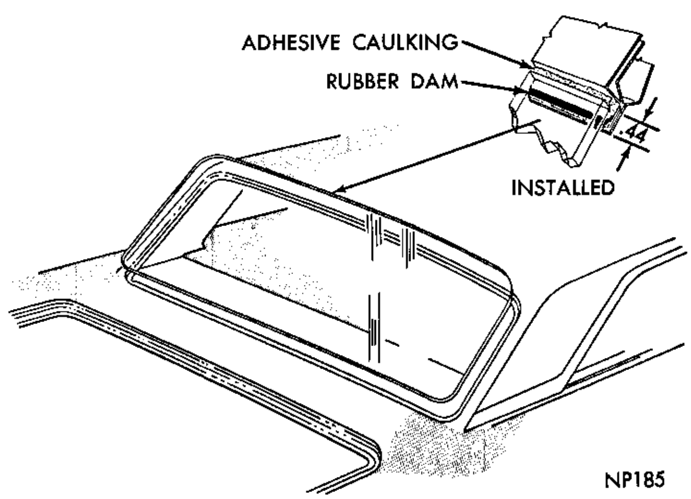


Fig. 6—Glass Installation

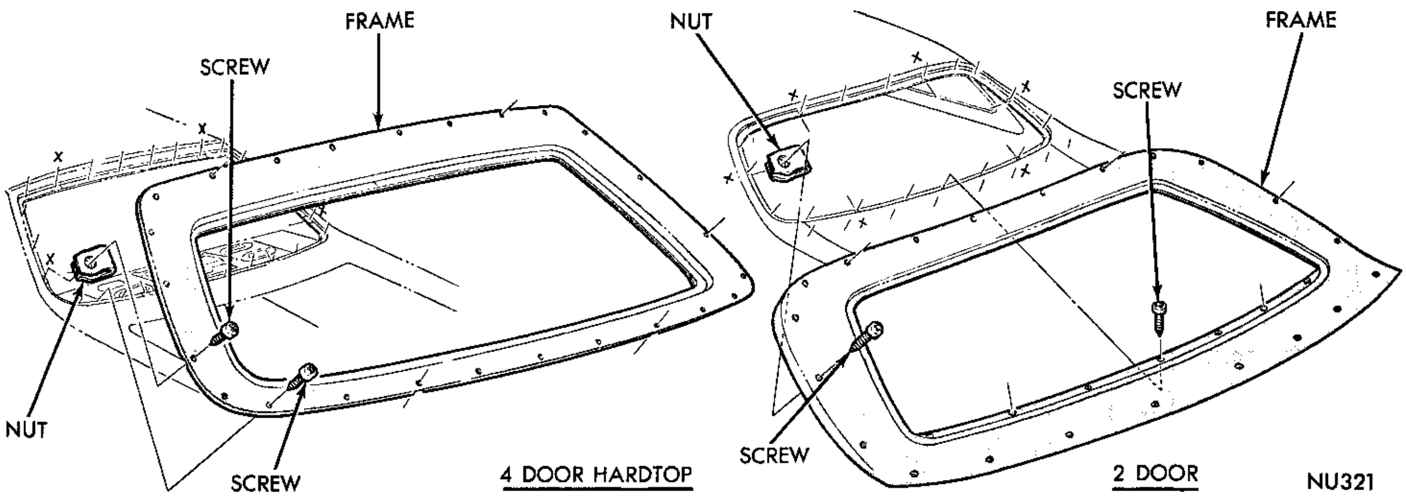


Fig. 7—Rear Window Panel Inserts

The glass to body fence overlap (0.30 inch minimum) should be equal across the top and sides. Use waterproof shims under spacers to obtain required overlap.

(7) Apply a piece of masking tape over each side of glass and roof extensions. Slit tape vertically at edge of glass so when glass is installed, tape on glass can be aligned with tape on body.

(8) Remove glass from opening and place on a protected surface, with inside surface up.

(9) **Primer solution will damage any paint or trim it comes in contact with.** Using a cheesecloth pad saturated with adhesive primer, thoroughly apply to rear window fence and reveal areas.

(10) **The adhesive begins to cure immediately upon exposure to air. The working life is limited to approximately 15 minutes. Perform the following steps as quickly as possible.**

(11) Insert adhesive tube into a standard household caulking gun, install nozzle on end of tube, and puncture adhesive seal at nozzle.

(12) Apply a smooth continuous 3/8 inch bead of adhesive on glass between glass edge and spacer dam (Fig. 5).

(13) When positioning glass in opening, alignment must be exact to prevent necessity of moving glass after adhesive contacts fence.

(14) With an assistant and using suction cups on glass, **align tape on glass with tape on body, make certain glass will set on rubber spacers and install glass in opening (Fig. 6).**

(15) Press glass **lightly** to adhere adhesive to fence flange.

(16) Run a flat wooden or fibre tool around entire edge of glass to force adhesive into opening between edge of glass and reveal.

(17) **Close car doors gently, do not slam** and water test window. Use a cold water spray, **do not run a heavy stream of water directly on freshly applied adhesive.** If leaks are evident, work applied adhesive into leak point. Additional material can be applied and worked into leak point.

(18) Install garnish and exterior mouldings, clean glass exterior surface and remove protective covers.

(19) **Leave a window open and do not slam any doors for at least one hour. Sufficient pressure could build up in a closed car to force the rear window out of the opening.**

REAR WINDOW PANEL INSERTS—IMPERIAL

Imperial models equipped with a vinyl roof covering incorporate plastic type window opening inserts (Fig. 7).

CONVERTIBLE

INDEX

SERVICE PROCEDURES

OPERATING THE TOP

Raise or lower top only when vehicle is standing still.

To Lower Top

Release safety catch, pull handle down and push top free of the header.

Be sure the well compartment is free of articles. Operate engine in neutral slightly above idle and hold switch control to the **Down** position until top is fully lowered.

To Raise Top

Remove boot, operate engine in neutral slightly above idle and hold switch control in the **Up** position. As dowels seat in their sockets, pull header down firmly and push locking handles forward until catches engage.

RESERVOIR

Do not add fluid to reservoir until it is installed in its normal position in the vehicle. Adding fluid to the reservoir in a position other than its normal installed position does not allow for fluid expansion and damage to the reservoir may result.

Measure fluid level only when top is lowered. After filling reservoir, raise and lower top several times to expel air that may be trapped in system.

Insufficient fluid in the system may cause slow raising or noise in the pump or motor. Measure fluid level and if low, look for a leak due to a broken line or a loose connection. Fill reservoir (use only AQ-ATF Suffix "A" "Dexron" type transmission fluid) until fluid runs out of filler hole.

FOLDING TOP MECHANISM

The electric-hydraulic top folding mechanism (Fig. 1) 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 external circuit breaker.

The cylinders are serviced only as an assembly. The reservoir end plate "O" ring is replaceable. The pump cover plate is serviced as an assembly and the rotors are serviced as a package with the "O" rings.

ADJUSTMENTS

Minor adjustments are provided to assist in aligning the top header and windshield header to prevent leakage into this area; to improve top frontal area appearance and assure ease of raising and lowering operation.

They are also provided to assure correct alignment of the roof side rails with door and quarter glass to prevent leakage. Adjustments are provided to eliminate wrinkles in the top material.

Major Adjustments

Major adjustments are at the cam, control link bracket and the outer moulding. These adjustments are necessary to improve roof side rail alignment if minor hinge and header adjustment do not completely correct the condition.

Roof Side Rail Alignment

The roof side rail structure (Fig. 2) consists of separate rails, hinged together to enable the top to fold into the well. The rails must be in good alignment and parallel to top edges of vent wings, door and quarter glass to provide a good weatherseal. Alignment of the rails is controlled by the side rail structure mounting support assembly, cam control link and the front hinge set screw (Fig. 2).

The front hinge set screw (Fig. 2) is accessible only from the top of the side rail assembly.

Door and Glass Alignment

After making top adjustments, doors, vent wings, door glass and quarter glass must be properly aligned. Misalignment in any of these areas make it impossible to obtain satisfactory results from top

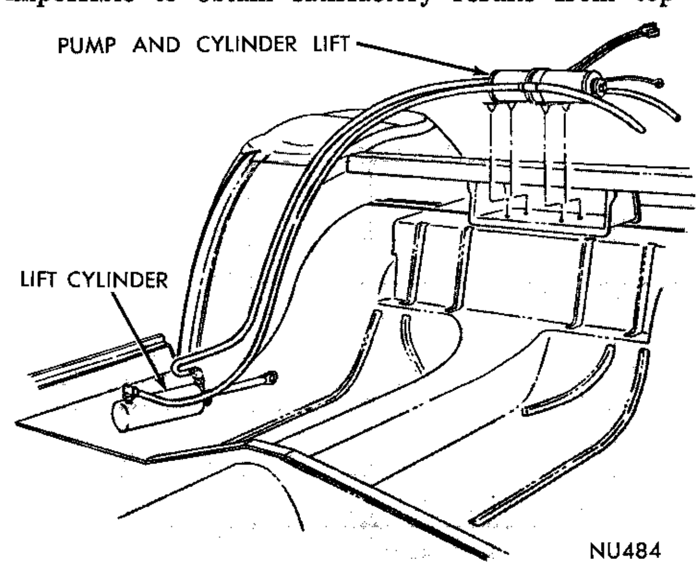


Fig. 1—Folding Top Mechanism

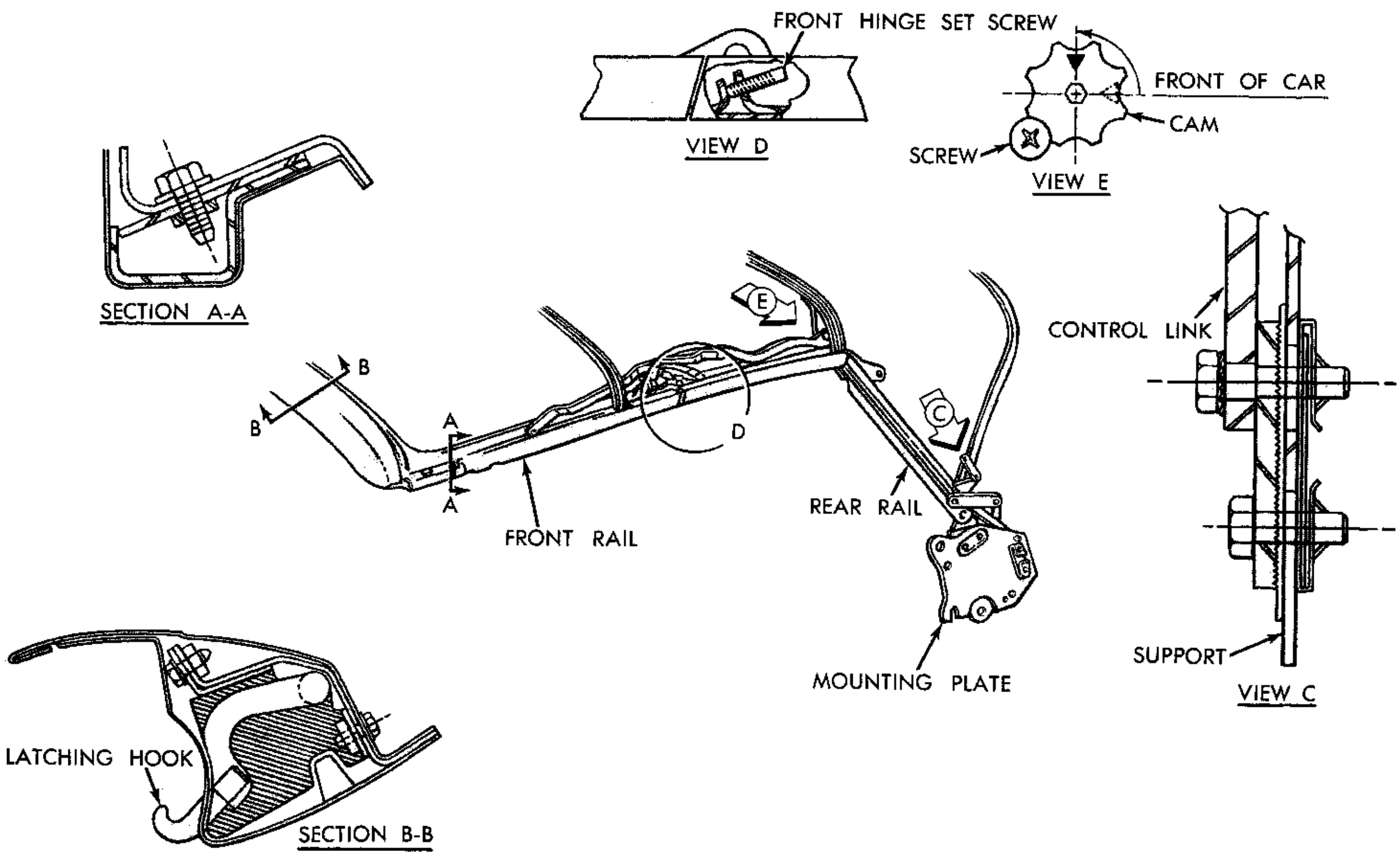


Fig. 2—Side Rail Structure

adjustments alone. Glass up-stop adjustments should be made after the correct roof side rail alignment to limit the upward travel of the glass and to assure effective sealing between the roof side rail weatherstrip and glass.

LATCHING MECHANISM (Fig. 3)

Removal

(1) Remove weatherstrip from header.

(2) Remove retaining screws and remove weatherstrip retainer from header.

(3) Remove the top material from the header assembly. (Caution should be exercised during the removal since the material is cemented to the header assembly).

(4) Unload the latching spring from the header assembly.

(5) Remove four latch attaching screws from header.

(6) Remove three nylon wedge attaching screws and remove nylon wedge from header.

(7) Remove pivot bolt and nut.

(8) Remove the latching mechanism from the header.

Installation

(1) Before assembling the latch, install the tension spring to the latching mechanism.

(2) Insert the latching mechanism into the header assembly.

(3) Insert the pivot bolt and tighten nut. This will

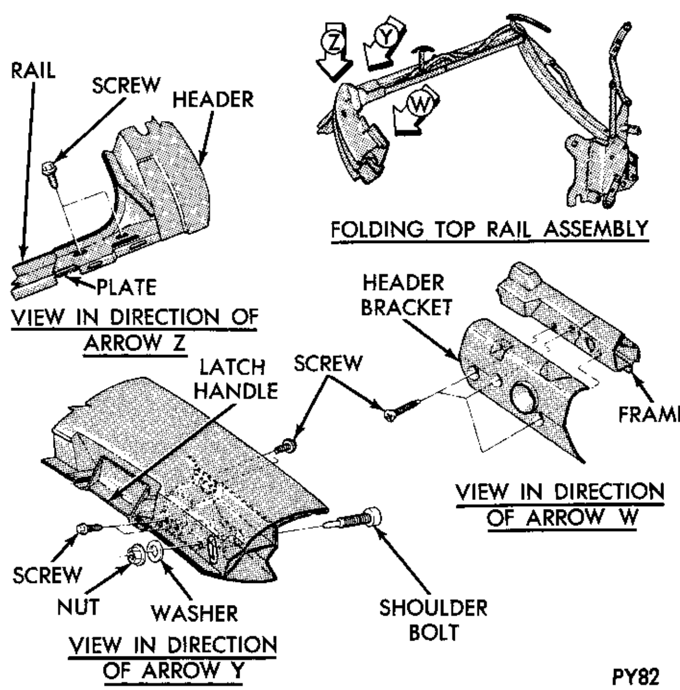


Fig. 3—Latching Mechanism

secure the latch assembly to the header.

(4) Secure the latch mechanism with four screws.

(5) Secure the nylon wedge to the header.

(6) Load the tension spring to the header assembly.

(7) Position and cement the top material to the header.

(8) Install weatherstrip retainer to header assembly.

(9) Install weatherstrip to retainer assembly.

(10) Check top, latching mechanism, and weatherstrip for proper fit to windshield finish moulding.

Header Adjustments

Inspect top linkage and mouldings for sharp edges, burrs or screws that are too long which may damage the top material. Dress or file them down.

The top header is adjustable at the front roof side rails to permit fore-or-aft movement. The header is attached to the side rails by two screws on each side (Fig. 2).

Incorrect alignment between the top header and windshield finish mouldings may result in leakage, making it difficult to engage the nylon wedges in their sockets or cause objectionable locking and unlocking effort. Inspect clearance for uniformity. The nylon wedges control the fore and aft position of the folding top header.

To eliminate interference between the header and finish moulding, rotate the cams on the side rail so the cam lobes are forward. **It may be necessary to lengthen the control links one or two serrations after the cam adjustment.** If cam lobes were already in the full forward position, it may be necessary to loosen the header-to-side-rail screws and adjust header to provide proper clearance.

Front Hinge Adjustment

To facilitate front hinge adjustment, unfasten header latches and partially lower top before adjusting set screws.

Leakage between the top and door or quarter glass may be caused by poor contact between roof side rail weatherstrip and glass or only a partial contact between roof rails and top edge of glass. If inspection shows leakage is due to incorrect side rail alignment at the front hinge, adjust set screw until front and center side rails provide the proper glass line. When the rail sags, it indicates the control link is too long.

Control Link Adjustment

The control links incorporate serrated adjusting links (Fig. 2). Loosen screws just enough to permit moving links up or down.

Raise the side rail assembly by lifting the front end of the center rail until the folding top header is six to eight inches above the windshield header. Loosen the control link adjusting screws and allow the control link to seek its proper position. Tighten screws while rail assembly is held in the position described.

Cam Adjustment

The cam assembly (Fig. 2) is used to change top header position in relation to the windshield header. The cams turn inside the rear side rail and the thrust link. When rotated, it changes the relationship between the front and rear side rails by moving the thrust link forward or rearward.

The position of the cam high side determines the angle between the center and rear side rails. When the high side is fully forward, the angle is at the minimum and when turned rearward the angle is increased. An increased angle increases the forward "throw" of the entire top assembly.

The cam lobe position is indicated by a single triangular mark on the cam. When adjusting, the cam high side position can be determined by referring to the triangular mark. Before adjusting, place top in half raised position to remove all possible strain off the cam. The cams are adjustable in 45 degree increments only.

Stack Height

Do not move mounting plate positions until control links have been adjusted.

Stack height should be correct if the control links have been adjusted as outlined. If control link adjustment does not correct stack height, loosen lower two of the three mounting plate screws (Fig. 4). Force lower portion of mounting plates to rotate fully forward. While exerting pressure downward on both sides at top of side rails. Tighten screws and inspect stack height after raising and lowering top.

Top Shifts To One Side

If necessary to pull top to one side to engage locating wedges or top shifts to one side when raising

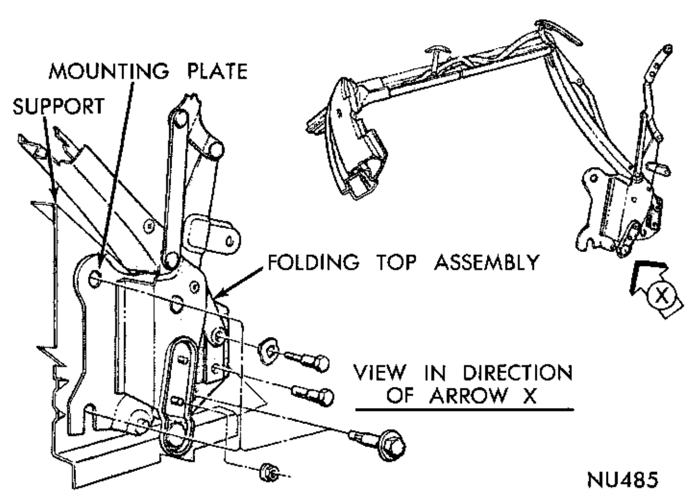


Fig. 4—Mounting Plate Attachment

from the windshield header, inspect positions of control links. It may be necessary to adjust the control links unevenly to achieve proper alignment of the top.

REAR CURTAIN STAY STRAPS (Fig. 5)

Two web straps attached to the rear bow and the tacking strip are provided to keep the number 3 bow from moving forward and wrinkling the top material. The straps are attached to the tacking strip with tacks and staples (Fig. 5).

ELECTRICAL TESTS

Refer to the Electrical Group for tests and wiring diagrams.

WELL LINER

The well liner (Fig. 6) is attached to the quarter panel belt area tacking strip with stud snap-on type fasteners.

When installing liner, apply a thin coat of cement to the front face of liner lower edge approximately two inches wide at area where liner attaches to upper face of rear seat back support. Apply cement to area contacting wheelhouse cap.

WEATHERSTRIPS

Roof Side Rail

After roof side rails have been aligned, inspect side rail weatherstrip to make sure it is providing a good seal at top of door and quarter glass.

If not sealing properly, the retainer can be adjusted. The retainer has elongated, attaching screw holes. Raise glass until top edge curls outer lip of weatherstrip inward just enough to contact inner lip. Adjust up-stops to limit further upward travel of glass.

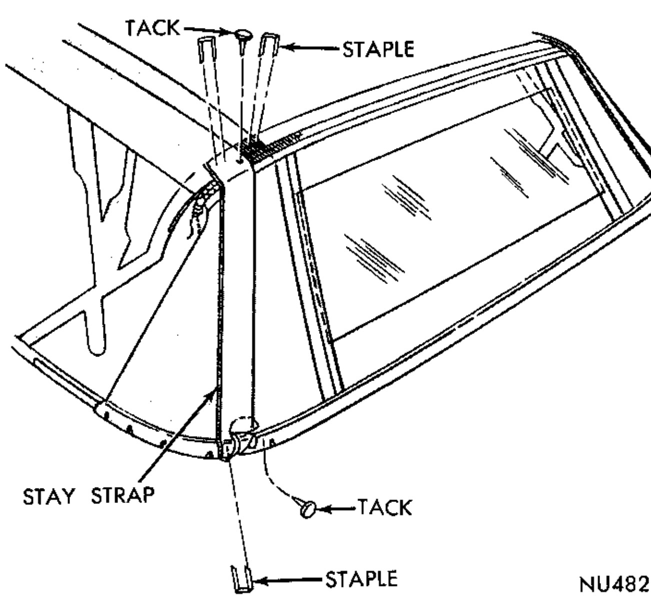


Fig. 5—Rear Curtain Stay Straps

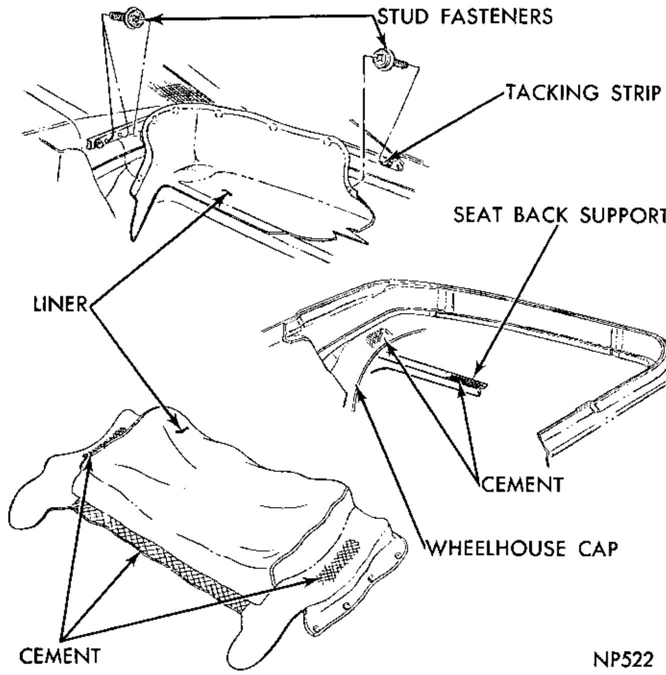


Fig. 6—Well Liner

Top Header Front Weatherstrip and Welts

Leakage between the top and windshield headers is eliminated by a tube type weatherstrip secured to the underside of the top header.

Seals and Sealers

Clean all areas thoroughly, before installing weatherstrips and seals.

When repairing or replacing a seal or weatherstrip at the header and pillar areas, make certain they are firmly seated, in correct alignment and free of twists.

COVER REPLACEMENT

Removal

Inspect weatherstrips for damage or excessive wear before removing the top cover. Test adjustment of rear tension cables or web straps. Inspect cover cables for being correctly connected and stay pads for excessive wear or moisture stains.

(1) Place protective covering over deck lid, upper panel, hood and cowl areas.

(2) Remove staples, attaching moulding retainer to roof bow and remove retainer.

(3) Using a sharp pointed tool remove staples and tacks at rear bow. **Use care not to damage top material if original cover is to be reinstalled. In some instances the staple ends may have become peened over and if excessive effort is required to remove**

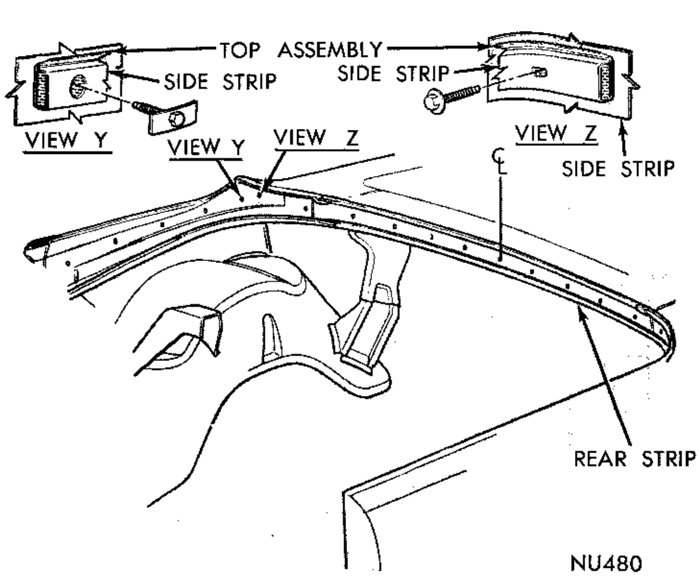


Fig. 7—Cover Locking Strips

them, it is advisable to cut the heads off and remove pieces after cover has been removed, otherwise damage to the material may result.

(4) Remove staples and tacks (one tack used on each side) at binding areas attaching cover to the rear bow.

(5) Remove the top boot.

(6) Prop the top off the windshield header and remove moulding from top header. The moulding attaching screws are located under the weatherstrip.

(7) Raise top to the 1/2 open position and remove rear roof rail weatherstrip. Mark location of retainer screws on roof rail to aid in reassembling, and remove retainer.

(8) Remove top and rear curtain material from roof rail.

(9) Raise top completely and remove trim in well area to permit removal of top material retainers at tacking strips (Fig. 7).

(10) Remove staples, drive nails and tacks attaching material to the header.

(11) Mark location of top material bead on ends of cover pads.

(12) Loosen vent wing seals at the corners.

(13) Remove front screws from front roof rail weatherstrip retainers and remove top material locking flaps (Fig. 8) from between retainer and roof rail.

(14) Remove tension cables and attaching bracket assembly (Fig. 8) at front roof rail and number 3 roof bow. If original cover is to be reinstalled tie a cord to one end of cables prior to removing. When cables are removed, the cord should be left in listing to aid in reinstalling cables.

(15) Remove cover from folding linkage.

Installation

Prior to installing cover, inspect bow pads for

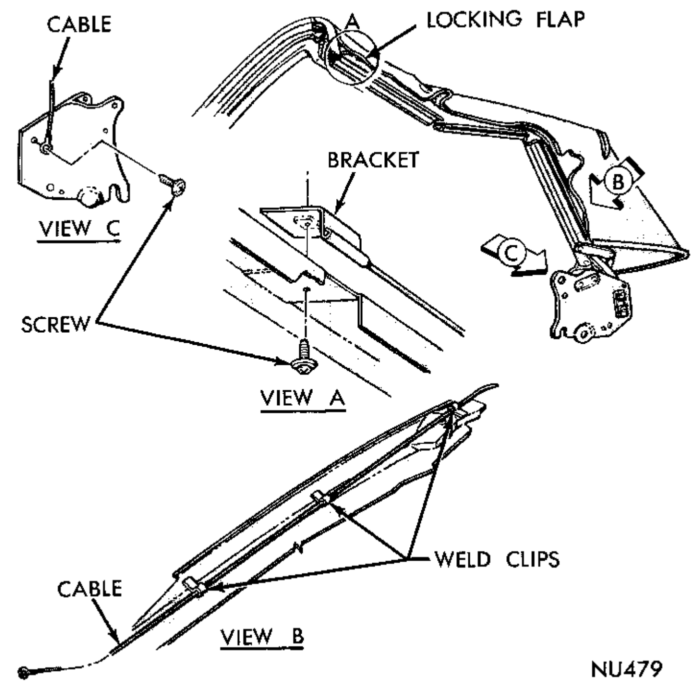


Fig. 8—Cover Locking Flaps and Tension Cable

moisture or damage. The pads are a press fit in the bows. The cover stay pads should be inspected for damage and moisture. The backlight zipper top half is attached to the rear bow with staples.

(1) Insert cables in cover listings. Use cord to install cables in original cover.

(2) Locate and mark center line on top header, rear bow and at each end of new cover.

(3) Position cover on folding top structure.

(4) Align center line marks on cover with marks on structure.

(5) Block top header off the windshield header approximately four inches to relieve all tension on cover when it is being installed in the well area.

(6) Install cover on tacking strips with tacks spaced approximately 6 inches apart.

(7) Pull material into position at corner of windshield header and align cover bead with alignment mark on pad end.

(8) Tack cover in position at corner and bead area only. Space tacks approximately one half inch apart.

(9) With cover in position at quarter panel and center line marks in alignment, tack cover to corner and bead area of roof bow only.

(10) Repeat installation on opposite side.

(11) Connect cover cables and brackets, lock header in place and inspect fit of cover at rear bow and top header.

(12) Raise top to one half open position and apply a bead of rope type sealer to back of rear roof rail weatherstrip retainers.

(13) Apply cement to rear roof rail and between rear curtain and top cover at area where they fit on

roof rail and position on rear pillar.

(14) Position weatherstrip retainers on roof rails and using a sharp pointed tool align screw holes in curtain and cover material with holes in roof rails. On new covers use tool to make holes in cover.

(15) Install retainer screws and weatherstrips.

(16) Raise top completely and lock in position.

(17) Open and close both front doors several times and inspect fit of cover in relation to top of door glass and vent wings. Should either vent wing or door glass contact beading on edge of cover on one side, the cover may be loosened at the header and moved slightly toward the opposite side until clearance is obtained. Should contact at both doors be made, it will be necessary to build up cover pads on both sides to eliminate interference.

(18) While keeping center line of cover and header in alignment, tack one half of cover to the header. Space tacks approximately one inch apart.

(19) Install a drive nail at lower front edge of cover and one long tack through cover beading to the header.

(20) At rear bow on same side, make certain center line marks of cover and bow are in alignment and tack cover into position spacing tacks approximately 1/4 inch apart. Install a large tack through cover beading at rear bow (Fig. 9).

(21) Complete tacking of cover at tacking strips, spacing tacks 1/4 inch apart.

(22) Repeat steps 18, 19 and 20 for opposite side. Inspect alignment of cover and if satisfactory complete tacking operation at the header. **Make sure all wrinkles are removed at header during tacking operation. Do not allow cover material to lap over.** Tacks should be installed approximately 1/8 inch apart.

(23) Position locking flaps at front outer edge of cover between weatherstrip retainers and front rail. Install retaining screws and weatherstrips.

(24) **Use care not to allow cement outside of tacking strip area** and apply cement across tacking area, making sure each tack is completely covered.

(25) Apply cement between outer edge of cover

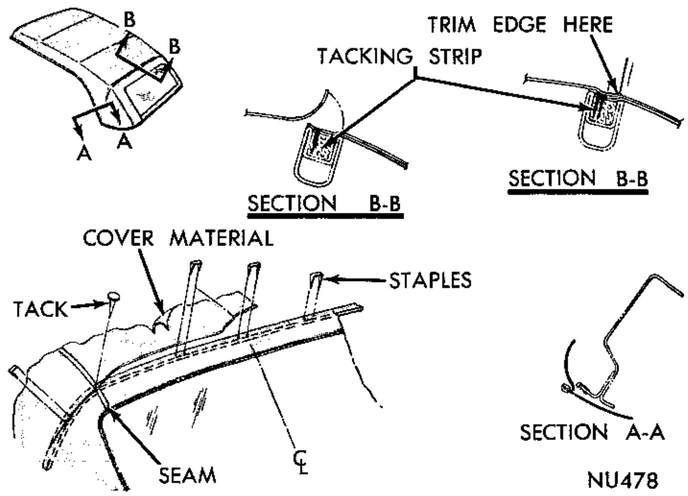


Fig. 9—Tacking Cover at No. 3 Bow

and header. Press cover firmly down on header.

(26) Position header moulding retainer on header. Align moulding retainer clips with holes in header and install screws.

(27) Apply cement to vent wing seals and press into place.

(28) Apply cement to header weatherstrip, where loosened to expose moulding attaching screws, and press firmly into place.

(29) **Use care not to allow cement to extend outside of the tacking area** and apply cement to tacking area on rear bow making certain each tack is completely covered.

(30) Apply sealing tape, same color as cover, and slightly narrower than width of moulding retainer across tacking area. Press firmly into place.

(31) Install moulding retainer over tape.

(32) After retainer has been installed, insert moulding in retainer from either end and install end caps.

(33) Position mouldings on quarter panels and rear window moulding retainers and install snap retainer and screw assemblies. **Do not overtighten.**

(34) Test operation of top and inspect fit at header, door and quarter window areas.

(35) Remove masking tape and protective covers.

SEALING

INDEX

GENERAL INFORMATION

The procedures for weatherstrip sealing and replacement are incorporated with the procedures of the component unit.

The sealing illustrations used in this section indicate the area sealed during manufacture of the vehicle. These areas should be considered when testing for leaks. When sealing joints with balls of sealer, press the sealer into the area firmly.

SERVICE PROCEDURES

TESTING

Water Method

Normally a visual inspection of an area will indicate the area for sealing. When testing with water, use a spray simulating rain or a garden hose without the nozzle and regulate the pressure to an approximate 3 inch stream. All water tests must be made starting at the bottom of the door opening or weatherstrip and slowly moving up the joint, seam or suspected area.

Powder Method

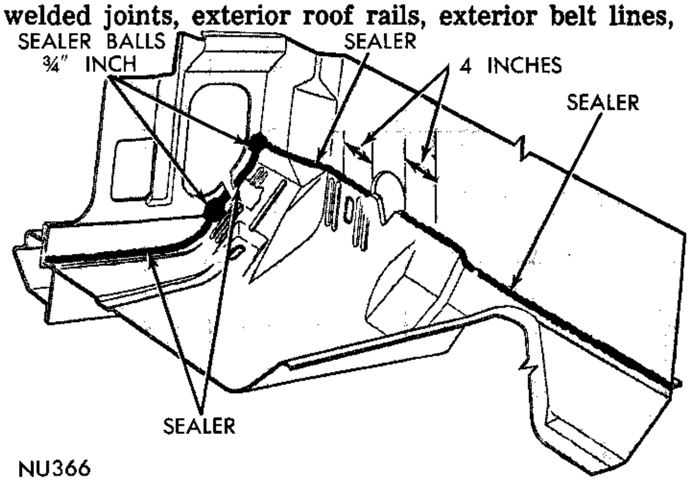
To test sealing between body and weatherstrips, use trace powder and a test bulb. The powder will leave a trace line through the point of entry. In hard to reach points, such as dog leg at "A" post, blue carpenter's chalk applied to weatherstrip will transfer to the "A" post when door is closed if a good contact exists.

SEALERS AND COMPOUNDS

Super Rubber Cement—May be used where a strong bonding of rubber parts to painted or unpainted steel surfaces is desired, attachment of weatherstrip on doors and luggage compartment lid or for attachment of felt pads.

Windshield Rubber Sealer—A heavy viscosity, rubber expander. Sealer can be used where rubber is confined between a glass and metal channel, such as on the windshield and rear window glass assembled in one-piece type weatherstrips. Sealer will not harm paint or chrome finish.

Body Seam Sealers—For External Sealing along welded joints, exterior roof rails, exterior belt lines,



Dash Panel Inside Area

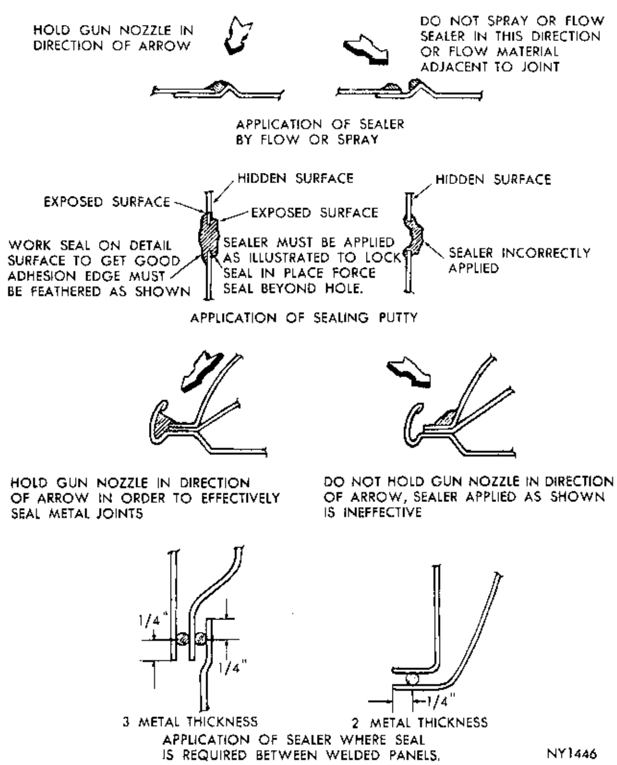
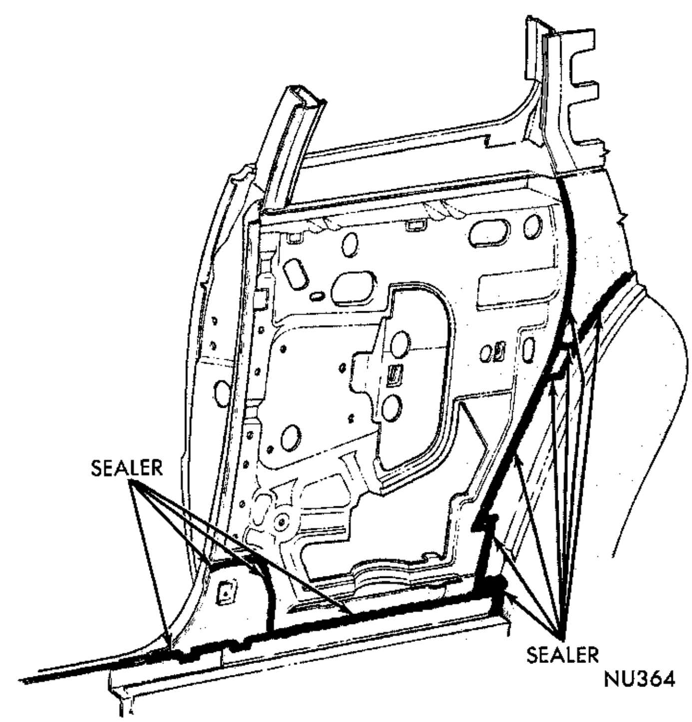
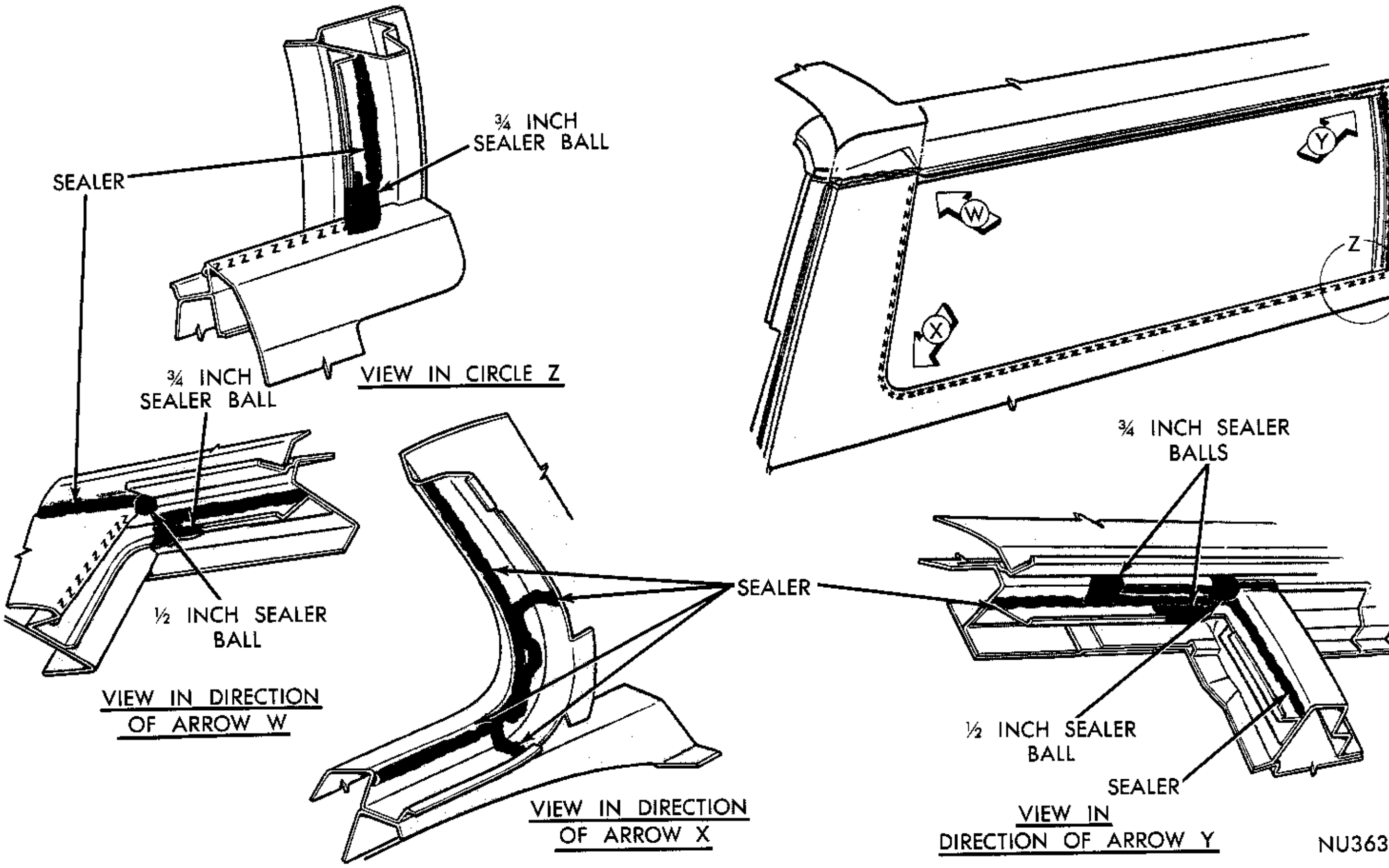


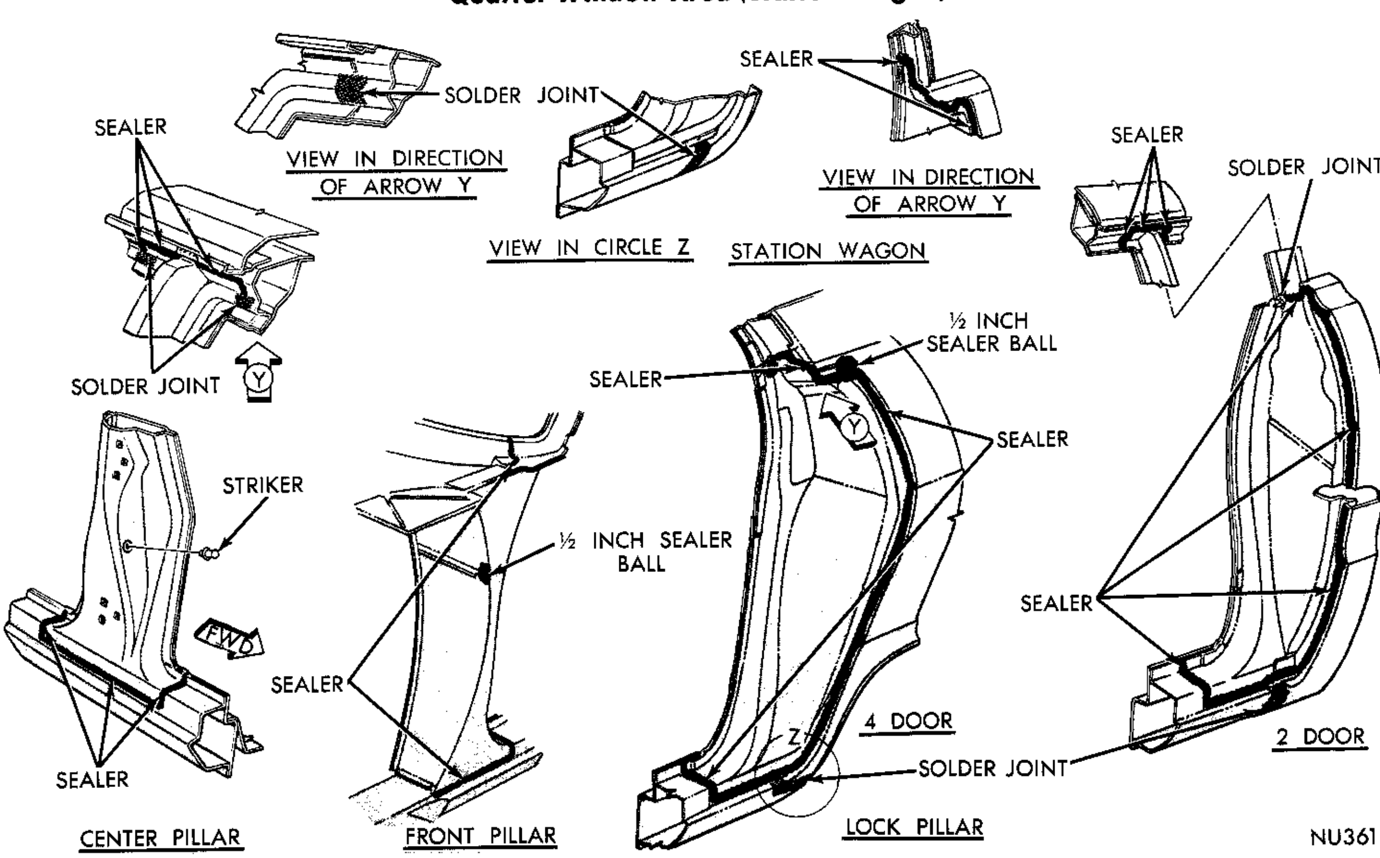
Fig. 1—Methods of Applying Sealer



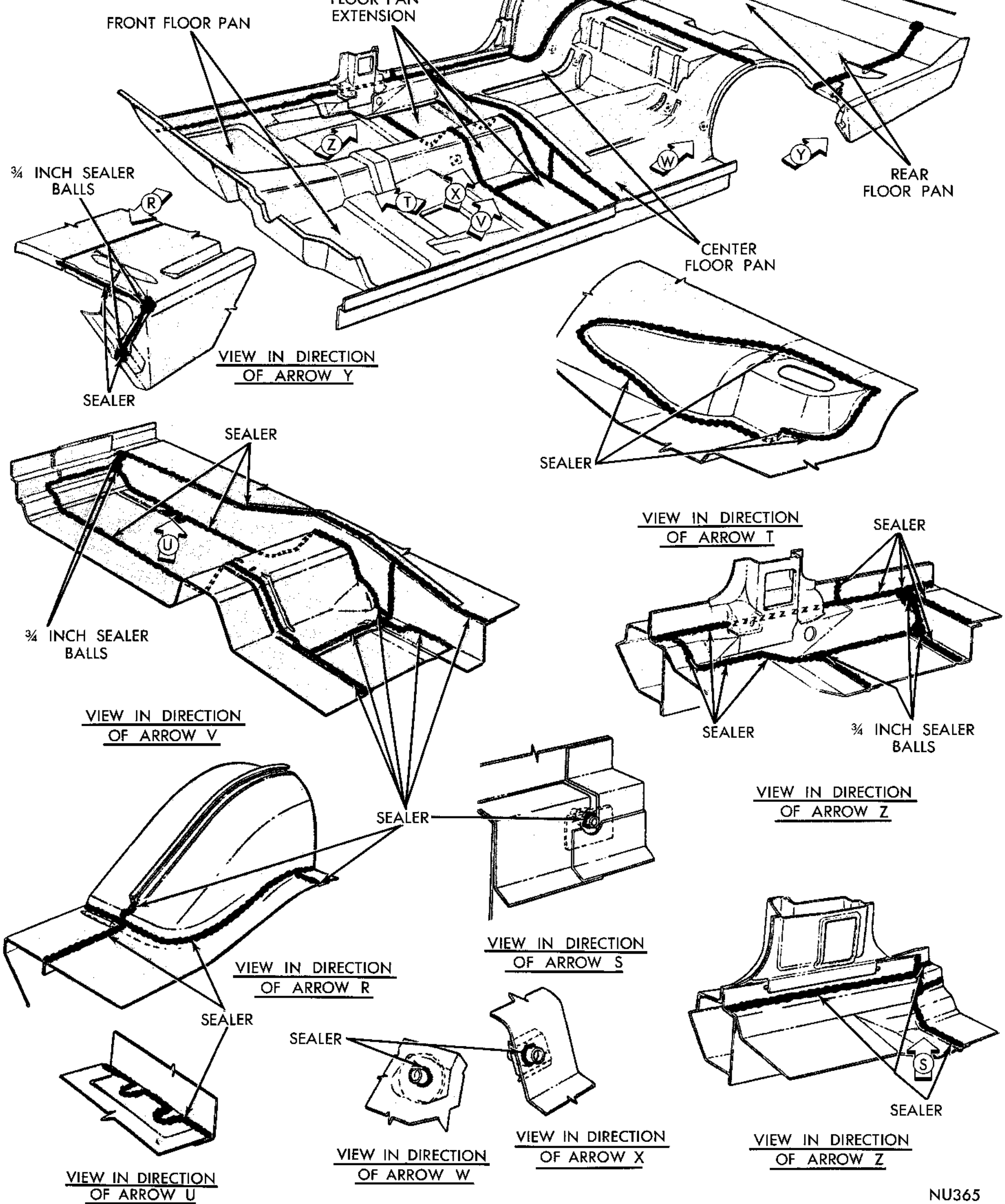
Quarter Inside Panel



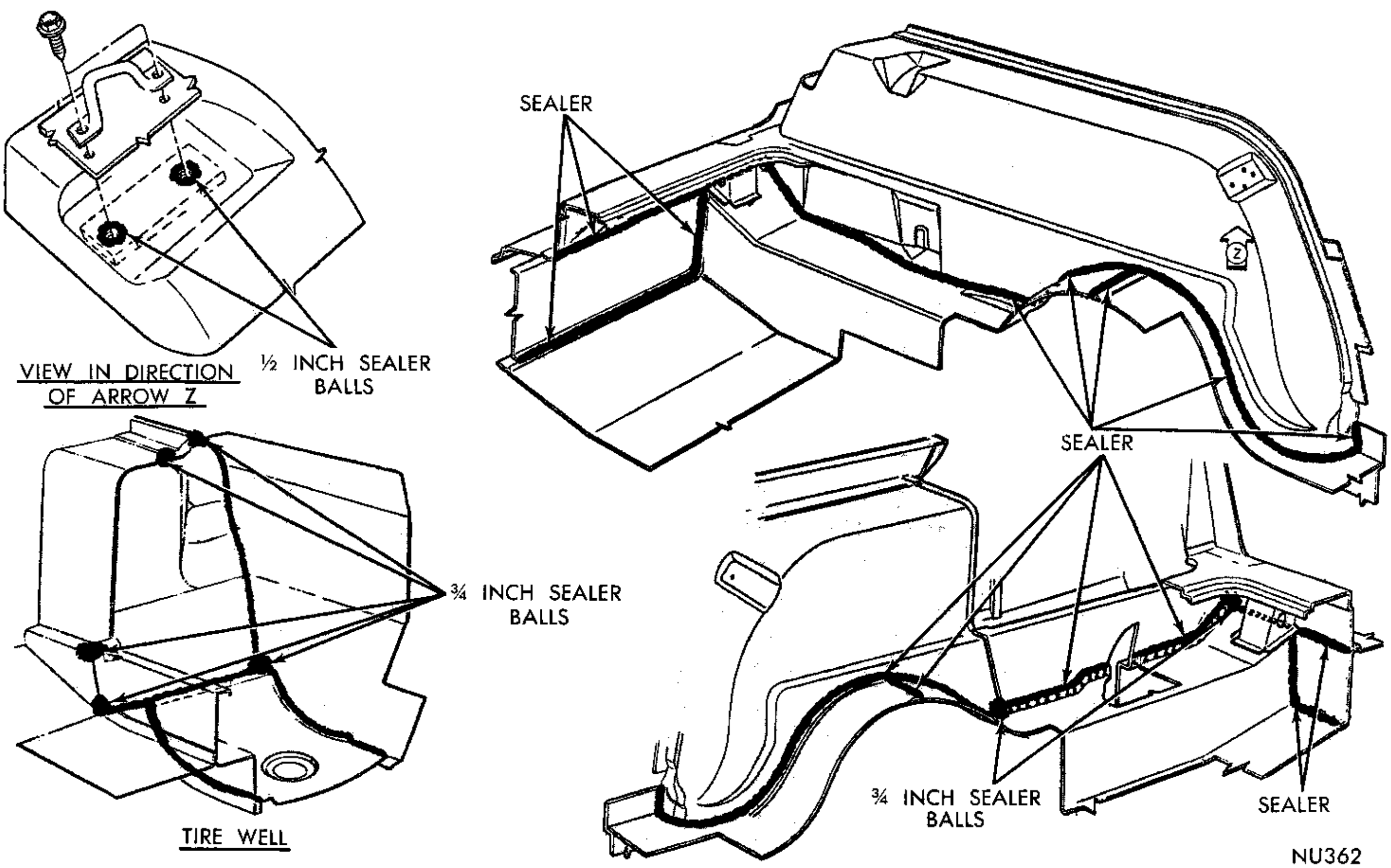
Quarter Window Area (Station Wagon)



Pillar Areas



Underbody Area



Tire Well and Floor Pan (Station Wagon)

B-post welds, weatherstrips and floor seams. Upon drying, the sealer forms a tough skin which can be painted.

Heavy Sealing Putty (For Interior Sealing)—A heavy, fibrous, putty-like compound, which can be formed or rolled into pellets or long string shapes.

VINYL ROOF COVERINGS

INDEX

COVER REPLACEMENT

Removal

Remove windshield and rear window mouldings. To aid in installation of mouldings, mark hole locations with a removable type marker. Remove roof side mouldings. Remove all sealer from drain trough, windshield and rear window reveals. Pull vinyl cover off of roof panel. Inspect old cement on roof panel. The roof panel should be relatively free of high or low spots.

Imperial Hardtop Models

Mask, shield or otherwise keep free of sealer the outside surface of roof panel, roof side extension, and deck opening upper panel in that area which lies between the highlight break line, the vinyl roof retainer attaching holes and a line approximately 1/4 inch under the outer periphery of pads. Apply masking tape to fence flange around rear backlight opening (Fig. 1). Spray or brush sealer to area where backlight pads will be applied. Remove peripheral masking tape or shield and apply upper and lower backlight pads. Apply a strip of sealer along retainer attaching holes and extending between peak lines of metal.

Application

(1) Mask body from edge of drain trough across upper "A" pillar, across windshield and rear window reveal, across top of deck upper and bottom of roof panel at the belt line.

(2) Locate and mark center line of roof panel and vinyl cover at front and rear ends.

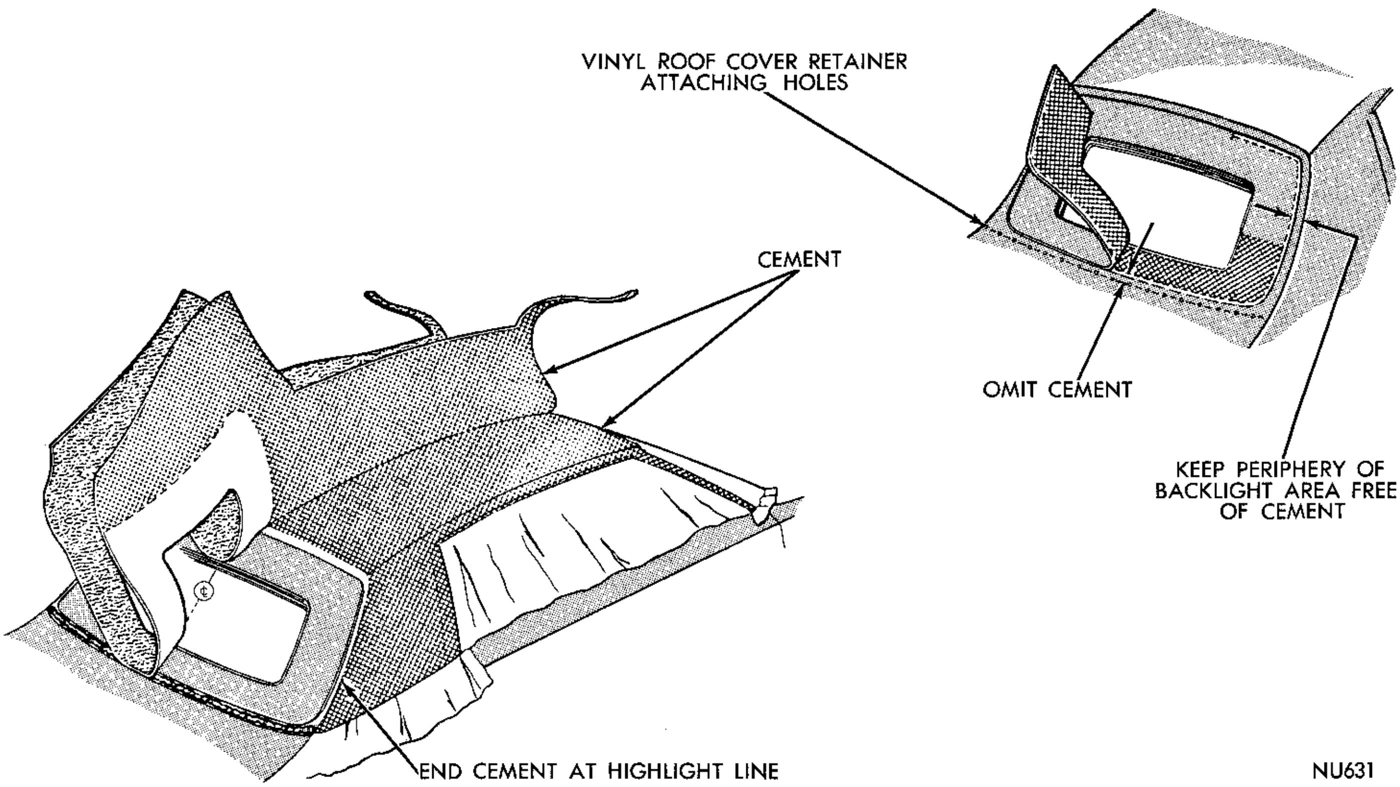


Fig. 1—Cover Application—Imperial Hardtop

(3) Apply a thin film of contact type cement to the center four inches of roof panel and vinyl cover.

(4) When cement becomes tacky, not wet to the touch, position cover on roof, aligning the centerline marks.

(5) Apply cement to half of roof panel, roof extension and "A" post. Apply cement to cover half on same side (Figs. 2 and 3).

(6) When cement becomes tacky, not wet to the touch, position cover on roof panel, extension and "A" post.

(7) Repeat steps 5 and 6 for opposite side.

(8) Using a new paint roller, pressurize cover to roof, working from center out toward drain troughs.

(9) Press cover into windshield and rear window reveals using a dull pointed fibre tool (Fig. 4).

(10) Starting at top center, secure cover to windshield reveal using staples spaced 1-1/2 inches apart (maximum) or tacks spaced 1/2 inch apart (Figs. 5 and 6). **Do not apply staples at moulding clip holes.**

(11) Position cover to roof panel extension making certain all wrinkles are removed.

(12) Starting at top center, secure cover to rear window reveal using staples spaced 1-1/2 inch apart (maximum) or tacks spaced 1/2 inch apart (Figs. 5 and 6). **Do not apply staples at moulding clip holes.**

(13) Trim fabric at base of windshield reveal and at same area on "A" post. At lower edge of "A" post,

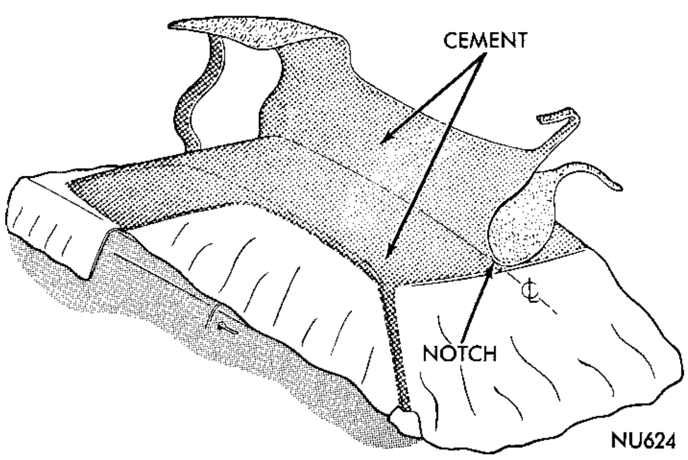


Fig. 2—Position Cover on Roof (2 Door)

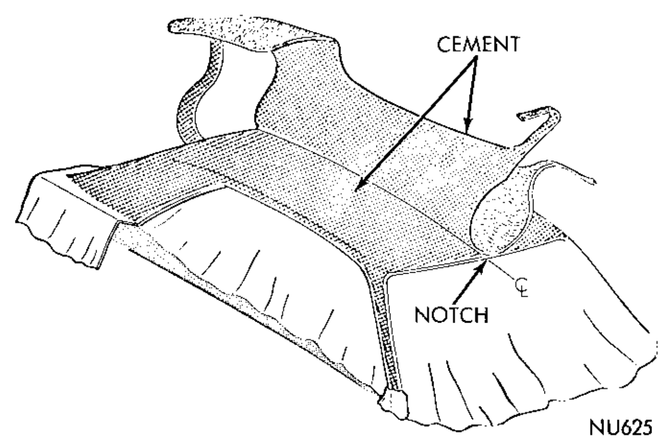


Fig. 3—Positioning Cover on Roof (4 Door)

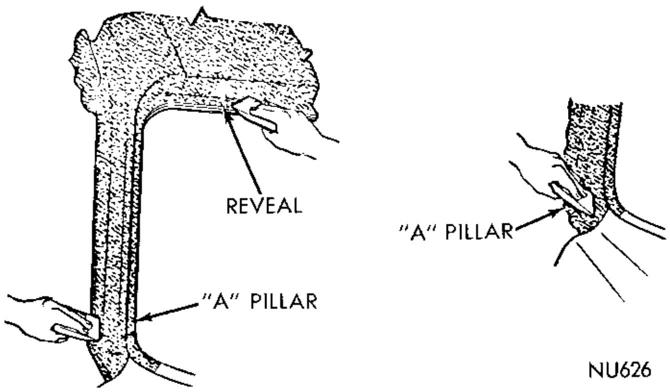


Fig. 4—Positioning Cover at Window

trim fabric at bottom of drain trough. Secure cover at bottom of "A" post in window reveal area with one staple (Fig. 7).

(14) Trim excess material at inside corner of "C" pillar face and blend upper trimmed edge to join trimmed edge of cover at drain trough (Fig. 8).

(15) Locate and punch holes in cover material, at belt moulding holes in roof extension, on a line 3/16 inch below the holes.

(16) Grasp edge of cover and while pulling material outward and down, use upper edge of drain trough flange as a breakover for draping material on to the flange face (Fig. 6). **Use care to avoid pulling cover material loose at base of drain trough.**

(17) Press material against drain trough flange face.

(18) Trim excess material, hanging below flange, about 1/8 inch above lower edge of flange (Fig. 8).

(19) Apply a 1/8 inch bead of sealer over trimmed edge of cover at roof extension belt area and smooth out to form a seal.

(20) Apply a bead of sealer to edge of cover and blend upward to form a seal over staples and edge of cover.

(21) Locate and punch holes in cover at roof extension belt line.

(22) Trim cover on a line 1/4 inch below belt line moulding holes (Fig. 8).

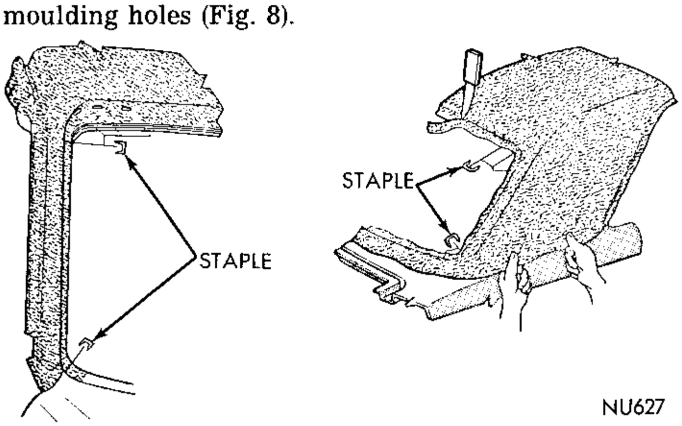


Fig. 5—Cover Application at Window (2 Door)

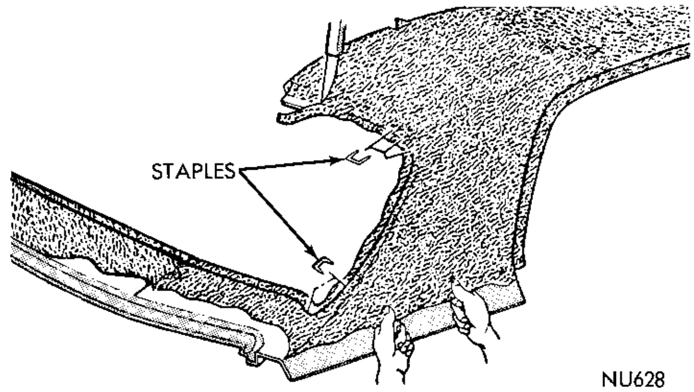


Fig. 6—Cover Application at Windows (4 Door)

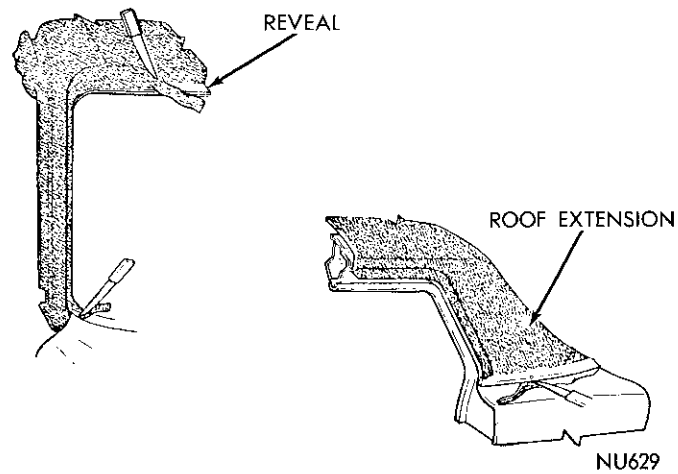


Fig. 7—Trimming Cover at Windows

(23) Apply sealer along entire length of cover material to seal trimmed edge adjacent to drain trough flange.

(24) Apply 1/4 inch balls of sealer to index studs of pillar mouldings.

(25) Position moulding by inserting a locating pin in index hole and align moulding.

(26) Install mouldings at windshield, rear window and drain troughs.

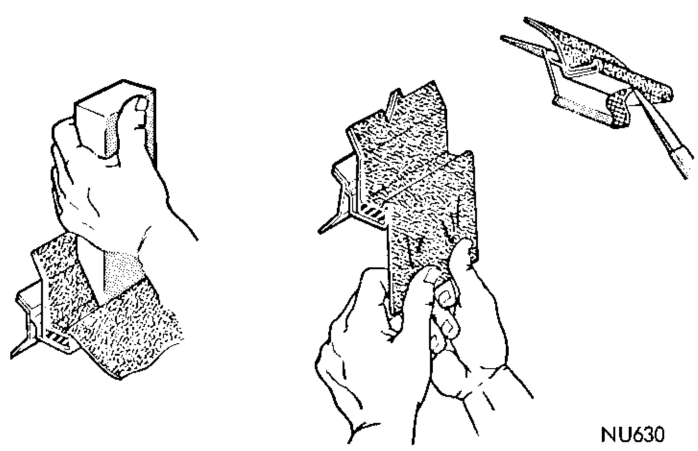


Fig. 8—Trimming Cover at Drain Troughs

(27) Remove masking tape and paper. Inspect cover for air bubbles.

AIR BUBBLE REMOVAL

(1) Place strips of masking tape over surface of bubble.

(2) Using a No. 19 hypodermic needle and suitable syringe, insert 3M Vinyl Trim Adhesive No. 8046 (or equivalent) into bubble area. **Extreme care must be used to avoid depositing any adhesive on top surface of vinyl cover.** The perforation must be made in center of bubble, through the masking tape and vinyl material. Approximately 0.5 mil of adhesive per square inch should be used.

(3) Remove needle and work adhesive on to the affected area by pressing cover to the roof carefully. This will also transfer some of the adhesive to the surface of the vinyl cover.

(4) Allow cement to dry 5 minutes at room temperature.

(5) Heat bubble area with a relatively low heat (150°-160°F.) until bubble area begins to enlarge in circumference. Infra-red heat lamps provide a suitable source of heat.

(6) Remove heat source and allow cover to cool. A method of rapid cooling is beneficial.

(7) Using a **DRY** No. 19 hypodermic needle, puncture vinyl cover 4 times equidistant around circumference of bubble to remove entrapped solvent and air.

(8) After bubble collapses, pressurize cover, starting from one side of bubble and working toward opposite side until all raised surfaces disappear and good contact is effected.

(9) Keep car from hot sunlight and other direct heat sources and examine after 24 hours period.

WOOD GRAIN OVERLAY

INDEX

SERVICE PROCEDURES

SURFACE PREPARATION

The body surface to which the overlay will be applied must be free of grease, oil and other foreign material. Sand all areas to be covered with the overlay using No. 360 paper soaked in water or mineral spirits. The area to be sanded should be approximately 1/4 inch larger in all dimensions than the overlay, except when the overlay is turned at the door and other comparable areas. **All metal and/or paint nibs must be removed prior to application of overlay. Tack off all dust and dirt particles from the sanded areas.**

TEMPERATURE

The overlay is most easily handled when the air and application surface temperatures are between 70 and 90 degrees. For applications below 70 degrees, use heat lamps to warm the application surfaces.

WETTING SOLUTION

Thoroughly mix two to three level teaspoons of **mild powdered household detergent** per gallon of clean, warm (80 to 95 degree) water in a non-rusting type retainer.

APPLICATION OF OVERLAY (Fig. 1)

It is mandatory to remove the paper backing from the overlay and not the overlay from the backing, as possible stretching or tearing may result.

Cut overlay 1/2 inch larger than area to be covered and lay on a clean flat surface with the paper backing surface up. Hold overlay firmly and remove backing paper in a smooth 180 degree motion. Under hot, humid conditions, a slight jerking motion will aid in paper backing removal.

Thoroughly wet application surfaces of body and the adhesive surface of the overlay with the wetting solution and immediately apply overlay, grained side out, to the body. Adjust overlay so 1/2 inch of material shows beyond all edges and apply wetting solution to outer surface of overlay.

Flat Surfaces

Use a plastic squeegee having a cloth sleeve, or is teflon coated and pressurize all flat surfaces with firm, overlapping strokes to remove all air bubbles, water, wrinkles and to assure a good adhesive contact. On vertical surfaces, pressurize and level off entire top edge first with a 3 x 4 squeegee, then work from top to bottom.

On horizontal surfaces, start at the center and work

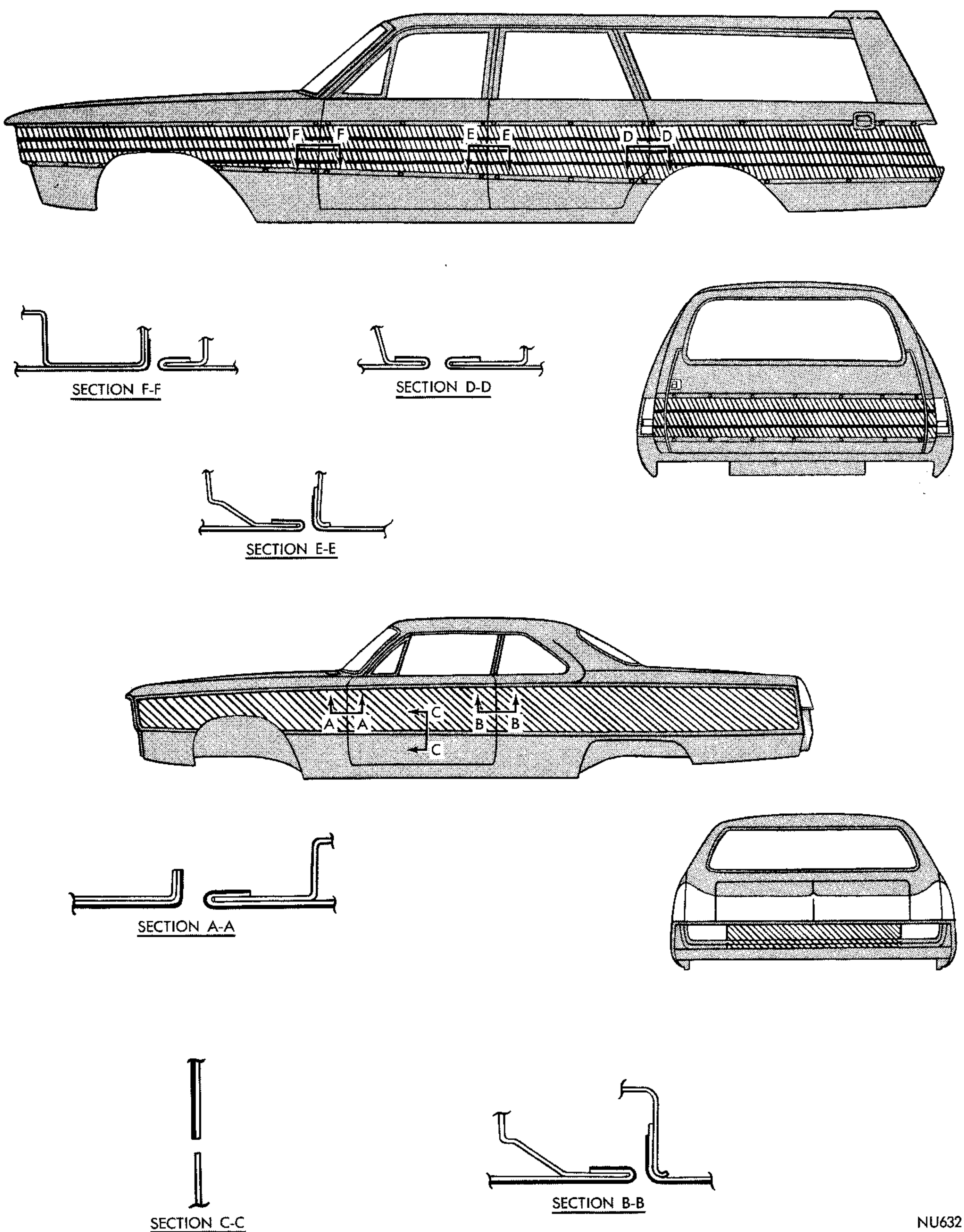


Fig. 1—Wood Grain Overlay Application

toward the edges using a 3 x 4 inch squeegee. **Do not apply pressure to edges that will be wrapped around doors, fenders, gas cap areas or to compound curve areas.**

Flange Areas

(1) After being sure all metal and/or paint nibs and sanding residue have been removed, hand brush 3M Vinyl Adhesive 8064 (Quart Size Only), or equivalent, to entire flange area with a smooth, even coverage.

(2) Warm the unapplied overlay with a heat lamp.

(3) **Avoid trapping air when turning the edge** and wrap overlay around flange area. Press firmly into position with the fingers, making sure overlay overlaps the flange.

(4) Using a single edge razor blade, trim off all material extending beyond flange.

(5) Pressurize flange area with a 2 inch rubber roller to be sure that overlay is well adhered to the painted metal surface.

Contoured Areas

(1) Warm the unapplied overlay with a heat lamp, working on an area no more than 1/2 inch larger than the squeegee.

(2) Using the 3 x 4 inch plastic squeegee, pressurize and level off the small warmed area.

(3) Repeat warming and pressurizing until entire contoured surface is completely adhered and free of air, water and wrinkles.

INSPECTION

Upon completion of an area, inspect for blisters due to trapped air or water. All blisters should be worked out with the squeegee, or punctured with a sharp needle or pin and then pressurized until the film adheres to the body surface. All edges must be adhered to the body surface.

MINOR REPAIRS

Minor Scratches in Clear Top Coat

Caution must be taken during the sanding operation. If base printed wood grain overlay is damaged during sanding, the entire applique must be replaced.

(1) Using No. 400 grit sandpaper, lightly sand and feather out damaged area.

(2) Wipe sanded area with a clean cloth dampened with a clean solvent such as V M and P, isopropyl alcohol, heptane or equivalent.

(3) Clean sanded area with a tack rag.

(4) Using a **touch-up-brush,** apply the recommended air dry repair clear enamel top coat sparingly.

(5) Air dry at room temperature.

Minor Damage to Base Printed Overlay

Areas to be repaired should not be larger than .04 square inches (approximately 1/8 x 1/4 inch).

(1) Apply air dry repair touch up paints using a **touch-up-brush** only. The light colored paint should be applied first.

(2) After all color repair is completed, apply the recommended air dry repair clear enamel top coat using a **touch-up-brush.** Apply enamel sparingly.

(3) Air dry at room temperature.

Sheet Metal Dings in Applique Area

(1) To help prevent applique from shattering when hammered, heat dinged area, with a heat gun or lamp, to approximately 150°F. to unbond applique from sheet metal.

(2) Bump out dinged area in conventional manner.

(3) Using a hypodermic needle, or similar device, insert repair adhesive, such as 3M EC2262 or equivalent, between applique and sheet metal.

(4) Using a plastic squeegee pressurize all of the repaired area with firm, overlapping strokes to remove all air bubbles and wrinkles and to assure a good adhesive bond.

(5) If top coat or base film has been damaged, repair as outlined in applique repairs.

REFINISHING PROCEDURES

INDEX

ACRYLIC FINISHES

The vehicles are finished in an acrylic enamel. To determine the correct color and part number of the enamel used on the car, refer to the code on the body number plate and then locate the corresponding code on the paint chart.

DEFINITIONS OF TECHNICAL TERMS

Coat—Single

This means one coat overlapping to give complet coverage.

Coat—Double

A double coat means to first spray a single coat with vertical strokes and then across with horizontal strokes, or vice versa.

Drying

The drying or hardening of a film goes through several stages. The first is known as "dust-free" and is the time required for a film to reach the condition where, if any dust settles on it, the dust will not become imbedded, but may be wiped off after the film has hardened. The second stage is known as "tack-free" and is the time required for a film to reach the condition where it may be touched with light pressure of the finger. The third is "hard-dry" and is the time required for the film to become thoroughly hard so that it may be rubbed and polished.

Feather-Edging

This is the tapering of the edges of a finish so that when the finger is passed over it no break will be felt. Feather-edging is usually done with water and sandpaper on a sanding block.

Ferrous and Non-Ferrous Metals

Ferrous metals are those which are made from iron (steel). Non-ferrous metals are those which are not made from iron or do not present an iron (steel) surface, such as aluminum, aluminum alloys, brass, copper and magnesium.

Flash

This is the term applied to a coat of a product when enough of the solvent has passed off for recoating.

Mist Coat

This is a coat of thinner to which may be added a small amount of retarder and applied as a final coat to increase flow and lustre of lacquer-type finishes.

Priming

The function of a primer is to form a bond between the surface and the succeeding product.

Puttying

A glazing putty is used for filling in small imperfections which are too deep to be taken care of by surfacer coats. It may be applied either before or after the last coat of surfacer.

Reducers

Reducers are mixtures of volatile liquids used to reduce alkyd, synthetic and orthodox materials to the proper consistency for application.

Sanding Block

As a rule a sanding block is a flexible rubber block, so arranged sandpaper may be fastened to it securely. Affords a good grip for the operator.

Wherever possible sanding should be done with a block as it distributes the pressures and gives a more uniform surface.

Surfacing

The function of a surfacer is to prepare a smooth surface for the color coats.

Tack Rag

This is a piece of cheesecloth that has been dipped in thin, non-drying varnish and then wrung out. It is kept in a container so that the varnish will not harden but will remain tacky. The tack rag is used to wipe off a surface or remove dust.

Thinners

Thinners are mixtures of volatile liquids used to thin lacquer-type finishing materials to the proper consistency for application.

Undercoats

All products used to prepare the surface to receive the color coats are classified as undercoats, such as primers, surfacers, putties, primer-surfacers and sealers.

PAINT REPAIRS ON GALVANIZED METALS

To perform paint repairs on galvanized rocker panels or any other galvanized steel surfaces, care must be exercised when preparing the bare galvanized surface to properly accept the prime-surfacer and finish paint. Do not use short cut methods nor inter-mixing of materials.

Metal Preparation

(1) Thoroughly sand the affected area to remove all corrosion products from the exposed metal surface while carefully feathering all paint edges.

(2) Wire brush or steel wool entire metal surface and remove all grease or oil by wiping with MOPAR MOPREPX11.

(3) Treat bare metal panel with MOPAR METAL PREPX12 or equivalent according to label directions.

(4) Rinse with clean water and blow off with compressed air.

Refinishing

(1) Apply one light coat of MOPAR Zinc Chromatic Primer L38 and as soon as thinner flashes off and within 30 minutes, apply a coat of MOPAR Acrylic Sealer G40.

(2) Apply MOPAR MOPRIME Primer Surfacer G 37 Gray, G38 Red, G39 Neutral Gray or equivalent.

(3) Sand when dry and proceed with application of finish coats according to the paint manufacturers recommendations.

RUST PROTECTION

Prior to applying any paint to the sheet metal clean the area to be repainted with MOPAR MOPREPX 11. Eliminate all fingerprints. Chemically treat all bare metal using MOPAR METAL PREPX12. This conditions the exposed metal to resist rust.

BUFFING AND POLISHING

Minor imperfection in the paint finish normally can be removed by sanding, buffing and polishing. The following procedure should be used when working on these minor conditioners:

(1) Oil sand by hand the affected area using #600 paper which has been soaked in mineral spirits. **Caution** should be used not to rub too hard over any of the affected areas or on ridges.

(2) Tack off the area with a clean soft cloth.

(3) Buff the entire area using a fine buffing compound—MOPARX14 extra fast dry or X16.

REFINISHING

Preparation Acrylic System Over Old Acrylic

(1) Remove outside accessories, mouldings and bumper face bars (if necessary).

(2) Remove silicone polish, wax, or any other surface contamination with wax and grease remover MOPREPX11. A chemically clean surface allows for effective sanding and assures adhesion of the undercoats and finish color.

(3) Sand the old finish. This operation removes surface deterioration, feathers out scratches, nicks, stone bruises, or any other minor imperfections. Water sand with MOPAR Multi-Purpose #360 grit paper, part No. 1-1474 or its equivalent.

(4) Blow off entire car, using high pressure air to eliminate dirt or dust from blowing out on to the surface as the paint is applied.

(5) Mask off the areas not to be painted. If a complete color change is being made, mask off interior parts adjacent to door openings to prevent paint spray from soiling interior trim and upholstering.

(6) Reclean entire area to be painted with wax and grease remover, MOPREPX11, eliminating workman's fingerprints.

(7) Chemically treat bare metal with MOPAR Metal PrepX12 or equivalent metal conditioner.

Priming the Surface

This operation is the backbone or foundation for the finish color. It primes the metal to insure adhesion and fills minor surface imperfections. Use one of the recommended lacquer primer surfacers.

(8) Apply MOPAR Lacquer Primer Surfacer MO Prime Part No. G37 gray, G38 red, and G39 neutral gray or equivalent.

(9) To expedite repairs to other surface imperfections use MOPAR putties, Spot-Check G41 or 42 gray type, or G43 or 44 red type or equivalent.

(10) Sand undercoats. Water sand with MOPAR Multi-Purpose No. 400 paper, part No. 1-1475 or finer paper (or its equivalent if other sanding methods or systems are employed). This is the key operation in refinishing. The final finish will be as good as the foundation over which it is applied.

(11) Respray with MOPrime or equivalent primer surfacer any area that may have been sanded through to bare metal in step 10.

(12) Resand undercoat with MOPAR Multi-Purpose grit No. 400 (Part No. 1-1475) or finer paper.

(13) When the color is being changed, wash the door jambs and door opening areas. Spray interior.

(14) Remove overspray from exterior and reclean entire surface with MOPAR wax and grease remover MOPrepX11.

(15) Tack rag the entire surface to remove lint and dust.

(16) Apply Chrysler Engineer Approved MOPAR Acrylic Lacquer Colors. (Four to six double coats). Refinishing in the field must be done with acrylic lacquer. The acrylic lacquer can be polished to match original finish gloss. Care must be exercised when selecting paint for refinishing Acrylic Metallics, to select the proper paint code.

(17) When the color has dried hard, compound and polish.

SPOT REPAIRS

The procedures for making spot repairs with acrylic lacquer are the same as for complete panel refinishing with the following exceptions:

Sealer Coats

The use of a sealer is not practical where a spot repair is demanded, as it is difficult to spray sealer without leaving an edge. If care is taken in preparation of the surface, a satisfactory repair is possible by sanding the original finish about 2 or 3 inches beyond the area where the acrylic lacquer will be applied. Apply the lacquer directly on the sanded original finish, being careful not to overlap the color on the unsanded enamel.

Application of Color Coats

Metallic color can appear to vary in richness. The variation can be described as:

A closed pattern that appears lighter with fine metallic dispersion.
An open pattern that appears richer with the metallic flakes less noticeable.

A closed pattern is best matched by reducing MOPAR Acrylic Lacquer Color 150% with MOPAR Deluxe Acrylic Lacquer Thinner G35 or equivalent.

An open pattern is achieved by lowering the air pressure to 20-30 lbs. at the gun, reducing the MOPAR Acrylic Lacquer Color 100% with a blend of MOPAR Deluxe Acrylic Lacquer Thinner G35 and MOPAR all Purpose Retarder G36.

Compounding Color Coats

Compound the sanded area that extends around the refinish lacquer and then compound the lacquer, blending it into the enamel. **The hard surface of the acrylic enamel will permit compounding without leaving scratches.**

PAINT BAKE OVEN TREATMENT (WITH TEXTURED GRILLES)

To avoid warpage all models with textured grilles and headlamp bezels should be covered with paper or other material to shield the grille assembly from the heat before the car enters the paint bake ovens or be completely removed from the cars.

PAINT CHARTS

EXTERIOR COLORS

CHRYSLER—IMPERIAL

Paint Code		Color Name	Chrysler Code	Ditzler Code
A4		Platinum Poly	AY2EA4	2016
A9	(I)	Charcoal Poly	AY2EA9	2017
B3		Bahama Blue Poly	AY2EB3	2018
B7		Jubilee Blue Poly	AY2EB7	2020
F4		Lime Green Poly	AY2FF4	2133
F8		Jade Green Poly	AY2EF8	43786
F9		Dark Emerald Poly	AY2EF9	2026
L1	(C)	Sandalwood	AY1BL1	22542
	(I)	Navaho Beige		
M9	(I)	Deep Plum	AY1EM9	2027
P6		Teal Poly	AY2FP6	2132
R6	(C)	Crimson	AY1ER6	2029
R8		Burgundy Poly	AY2DR8	50749
T3		Satin Tan Poly	AY2FT3	2131
T6		Deep Bronze Poly	AY2FT6	2129
T8	(I)	Walnut Poly	AY2FT8	2130
W1		Spinnaker White	AY1EW1	2033
X9		Formal Black	AY1TX9	9300
Y3	(C)	Antique Ivory	AY1DY3	81575
	(I)	Champagne		
Y4		Mystic Gold Poly	AY2FY4	2117
Y6		Citron Gold Poly	AY2FY6	2102

C—Chrysler
I—Imperial

ACCENT STRIP COLORS

CHRYSLER

Side Body Color Name	Chrysler Code	Ditzler Code
White	AS1VW1	2033
Black	AS1TX9	9000
Blue	AS1AB4	13001
Chestnut	AS1AL8	22535
Beige	AS1AL1	22598
Green	AS1EF3	43870
Red	AS1VR7	71498

CORPORATE IDENTITY COLORS

Corporate White	8367
Corporate Blue	12785
Single Tone—X9-X9	
Two-Tone—X9-W1	

First two digits are Accent or Roof Color.
Second two digits are Basic Body Color.

For special colors (coded 999)—Furnish special order (SO) number and selling dealer with serial number of car.

Argent Silver—DX-8555

INTERIOR COLORS

LOW GLOSS FINISH COLORS

CHRYSLER

Used On: (a) Upper Windshield Moulding. Roof Rail. Convertible Header.
(b) Wagon Deck. Tailgate Mouldings. Brackets and Exposed Parts.
(c) Backlite Mouldings 2 Door Hardtop.
(d) Convertible Top Mechanism.
(e) Air Condition Unit (Station Wagon).

Color Name	Chrysler Code	Ditzler Code	Remarks
Ivory	AB3VW2	8355	e
Dove White	AB5EW1	8745	a,c
Jewel Black	AB5TX9	9028	
Jewel Black (Semi-gloss)	AB3TX9	9293	Seat Track Option
Baltic Blue Poly	AB6EB7	13670	a,c
Sierra Blue Poly	AB6EB3	13672	a,b,c
Teal Blue Poly	AB6FP6	13914	a,c
Saturn Beige Poly	AB5EL1	23059	a,b,c
Puma Tan Poly	AB6FT4	23275	a,b,c
Citron Gold Poly	AB6FY4	23276	a,c
Bayou Green Poly	AB6EF8	43929	a,b,c
Aztec Maroon Poly	AB6DR8	50755	a,b,c

SUEDE FINISH COLORS

Used On: Instrument Panel. Stereo and radio grilles. Steering Column and Defogger Bezels.

Jewel Black	AC38VX9	9324
Baltic Blue Poly	AC39EB7	13705
Teal Blue Poly	AC39FP6	13847
Laser Gold Poly	AC39EY8	23062
Puma Tan Poly	AC39FT4	23219
Citron Gold Poly	AC39FY4	23221
Bayou Green Poly	AC39EF8	43925
Orchid Maroon Poly	AC39FR9	50829

LUGGAGE COMPARTMENT SPATTER FINISH

Three-Tone Black & Gray	AC48CAA	DX-1768

INTERIOR COLORS

LOW GLOSS FINISH COLORS

IMPERIAL

Used On: (a) Garnish Moulding.
(b) Seat Side Shield.

Color Name	Chrysler Code Number	Ditzler Code DIA	Remarks
Dove White	AB5EW1	8745	a,b
Jewel Black	AB5TX9	9028	a,b
Jewel Black (Semi-Gloss)	AB3TX9	9293	Seat Track Option
Baltic Blue Poly	AB6EB7	13670	a,b
Sierra Blue Poly	AB6EB3	13672	a,b
Teal Blue Poly	AB6FP6	13914	a,b
Walnut Poly	AB6FT8	23274	a,b
Puma Tan Poly	AB6FT4	23275	a
Citron Gold Poly	AB6FY4	23276	a,b
Teak Tan Poly	AB6FT2	23277	a
Saber Silver Poly	AB6EA4	32715	a
Bayou Green Poly	AB6EF8	43929	a,b
Cypress Green Poly	AB6EF4	44129	a,b
Aztec Maroon Poly	AB6DR8	50755	a,b
Burgundy	AB5EM9	50799	a,b

SUEDE FINISH COLORS

Used On: Instrument Panel. Steering Column. Accessory Bezels and Speaker Grille.

Jewel Black	AC38VX9	9324
Baltic Blue Poly	AC39EB7	13705
Teal Blue Poly	AC39FP6	13847
Puma Tan Poly	AC39FT4	23219
Dark Walnut Poly	AC39FT8	23220
Citron Gold Poly	AC39FY4	23221
Bayou Green Poly	AC39EF8	43925
Burgundy	AC38EM9	50803
Aztec Maroon Poly	AC39FR9	50829

BODY AND FRAME ALIGNMENT

INDEX

SERVICE PROCEDURES

FORESTRUCTURE (STUB FRAME)

Frame Alignment Dimensions

The various frame dimensions (Figs. 1 and 2) may be used as a guide in measuring frame alignment. Diagonal measurements (Fig. 3) should be taken when straightening frame.

Measure distance between points connected by line "A," (Fig. 3). This distance should agree within 1/4 inch with distance between points connected by line "B" or comparable diagonal on opposite side.

The diagonals (Fig. 3) represent only one of the few that may be checked. **Care should be taken to make sure that any two diagonals compared represent exactly corresponding points on each side of the frame.**

Minor frame alignment can usually be corrected by straightening bent frame parts. A badly distorted frame can in most cases be replaced more economically than by attempting repairs.

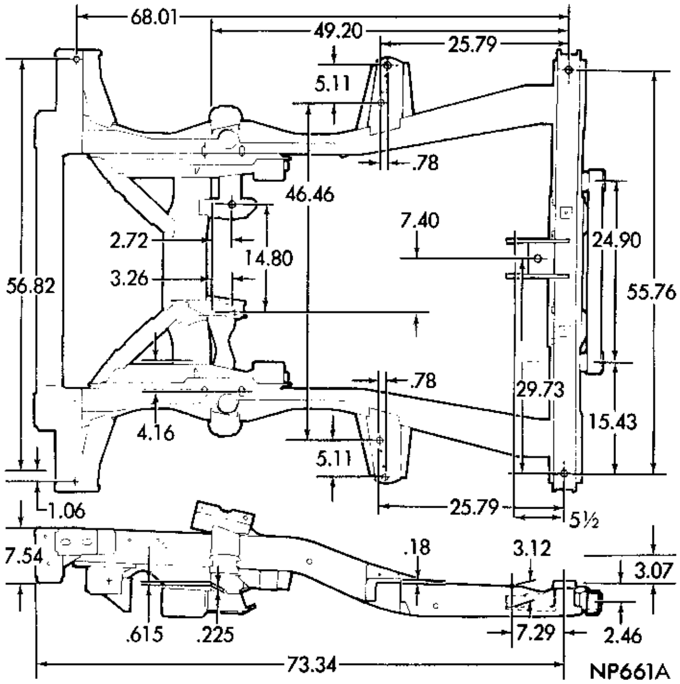


Fig. 1—Frame Dimensions (Imperial)

REPLACEMENT

Removal

The forestructure (stub-frame), engine, transmission, steering and suspension can be removed as an assembly for further disassembly out of the vehicle by two methods.

First method: remove hood and bumper, then remove fenders wheel house panels, grille and radiator as an assembly, support vehicle at sill area and remove frame assembly.

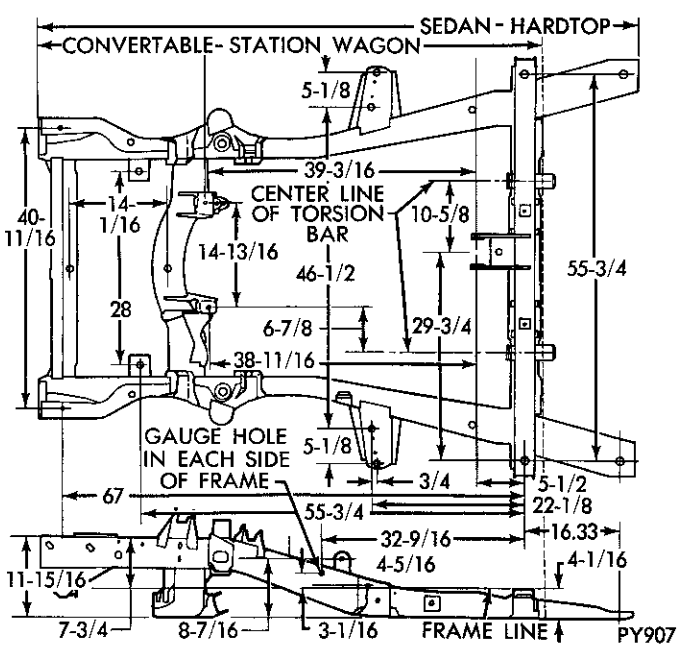


Fig. 2—Frame Dimensions (Chrysler)

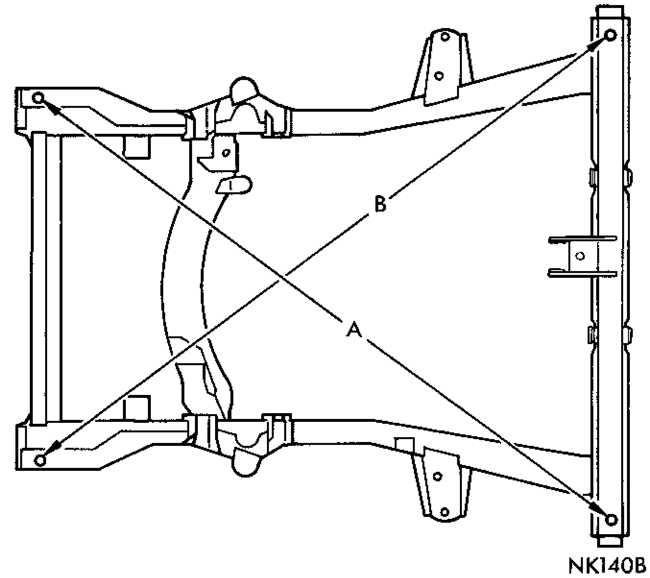


Fig. 3—Frame Diagonal Measurements

Second method: support vehicle and lower frame assembly out of vehicle as follows:

(1) Remove battery and air cleaner, drain cooling system, remove radiator and shroud, disconnect heater hoses from engine, and disconnect battery tray from frame.

(2) Discharge air-conditioning system, (refer to "Group 24 Air-Conditioning" for discharging and charging the system). Disconnect air-conditioning lines at firewall, discharge line at muffler and suction line at evaporator. **Seal open ends of air-conditioning fittings and connectors.**

(3) Disconnect throttle and speed control cables at carburetor, vacuum hose controlling accessories at engine manifold, remove or disconnect electrical wiring including engine to cowl ground strap.

(4) Remove roll pin from steering gear coupling, disconnect shift linkage, steering column floor pan and steering column from support bracket and move column up approximately 3 inches.

(5) Raise vehicle on twin post hoist, remove drive shaft, exhaust pipes, shift rod or clutch linkage at torque shaft, rear seat heater or air-conditioning clamps at side rail, wheel house bolts at frame side rails, radiator support brace, bumper assembly and hood lock vertical lower support.

(6) Disconnect speedometer cable, electrical leads at starter, gas line at frame connection and plug line, emergency brake cable at rear cable attaching bracket and remove from rear frame crossmember.

(7) Support vehicle securely on stable floor stands (4,000 lbs. capacity) at rear of rear spring shackle boxs. At the front of vehicle place stands under body at the side sill area, place a 4" x 4" x 7' wood beam across stands for extra strength and 2" x 4" x 6" pieces of wood on top of main support beam and to

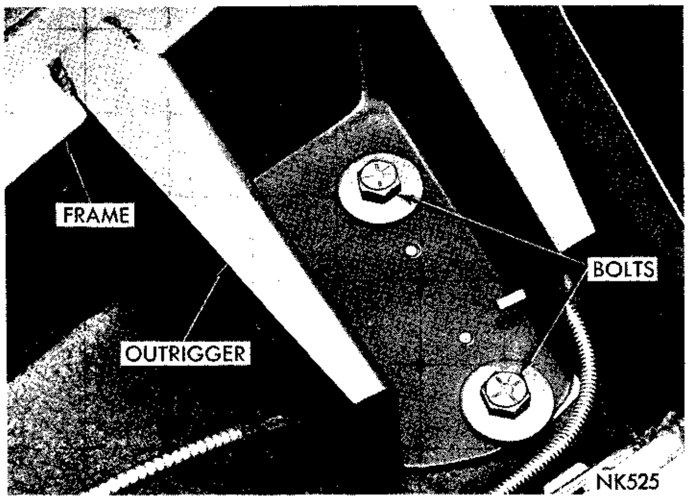


Fig. 4—Body to Frame Outrigger Mounting

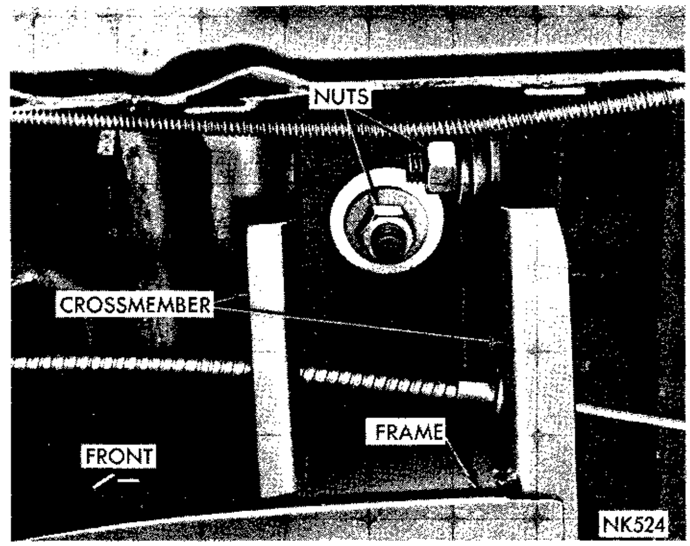


Fig. 5—Body to Frame Crossmember Mounting

lower flat surface of the side sills. Then lower rear axle to lowest position to assist in balancing body weight when frame assembly is removed.

(8) Position a hydraulic transmission jack under the frame rear crossmember and remove the frame to body bolts (Figs. 4, 5 or 6), and yoke to frame crossmember nuts and washers or spacers.

(9) Remove the frame assembly from the vehicle by lowering the front post and transmission jack slowly at the same speed.

(10) If a twin post hoist is not available the vehicle can be supported on short stands about 36 inches high and using the same wood blocking with the use of floor jacks to support the transmission and suspension the stub-frame assembly removal can be accomplished.

(11) If frame is to be replaced transfer serviceable parts to new frame.

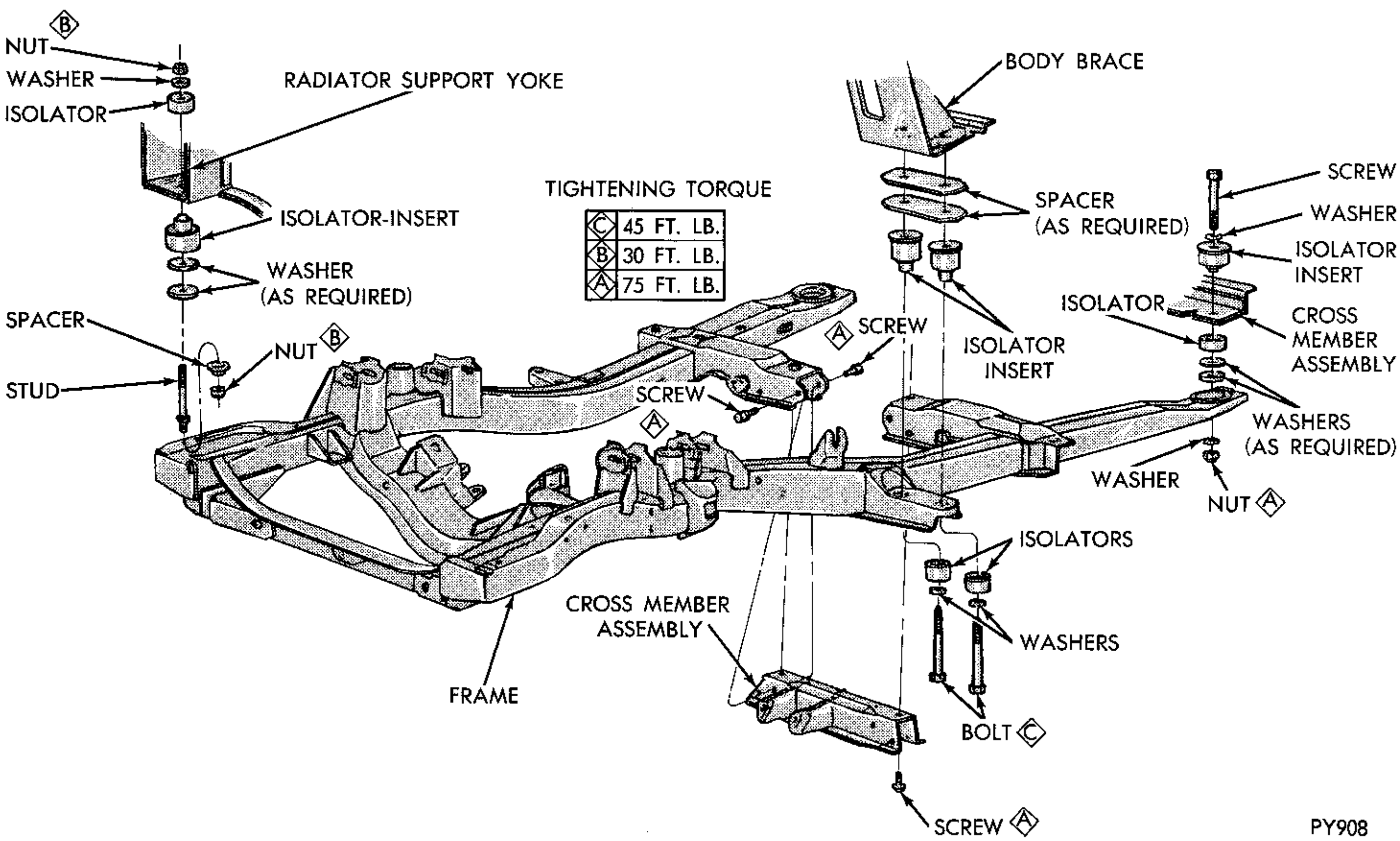


Fig. 6—Isolated Stub Frame

Installation

(1) Raise frame assembly into position. On Convertible and Station Wagon models, guide rear crossmember into channel and studs, and front top edge of frame into slots in lower flange of radiator support yoke.

On Sedan-Hard Top models, position rear of frame on insulators (Fig. 6) and front on insulator studs at radiator support.

(2) Install body to frame bolts, nuts, washers and/ or insulators.

On Station Wagon and Convertible models torque to 75 foot-pounds.

On Sedan-Hard Top models tighten to specified torque in Fig. 6.

(3) Install nuts, washers, spacers and insulators, if so equipped, on studs at radiator support yoke lower flanges.

On Sedan models torque nuts to 30 foot-pounds (Fig. 6).

(4) Remove transmission jack and body support stands.

(5) Connect emergency brake cable, starter leads, gas line and speedometer cable.

(6) Install drive shaft, exhaust pipes, shift rod or clutch linkage at torque shaft, rear seat heater or air-conditioning piping clamps at side rails, wheel house and battery tray bolts at frame, radiator support brace, hood lock vertical lower support and bumper assembly.

(7) Lower vehicle, install and adjust steering column, accelerator and speed control cables.

(8) Install radiator and shroud, connect coolant lines, radiator and heater hoses, electrical wiring, vacuum and air conditioning lines.

(9) Install battery and air cleaner, fill cooling system and charge air-conditioning system.

Body to Frame Alignment

The body to frame alignment measurement should be performed whenever the stub frame has been removed, replaced or repaired. Use shims from original frame, when replacing frame, as a guide in accomplishing body to frame alignment.

Align front suspension and aim headlights after body to frame alignment has been completed. For body to frame alignment dimensions refer to "Body Alignment Dimensions" (Figs. 1 or 2). **Follow equipment manufacturers recommendations and procedures.**

BODY ALIGNMENT DIMENSIONS

Body alignment may be accurately measured by the following method. Elevate vehicle to a level position

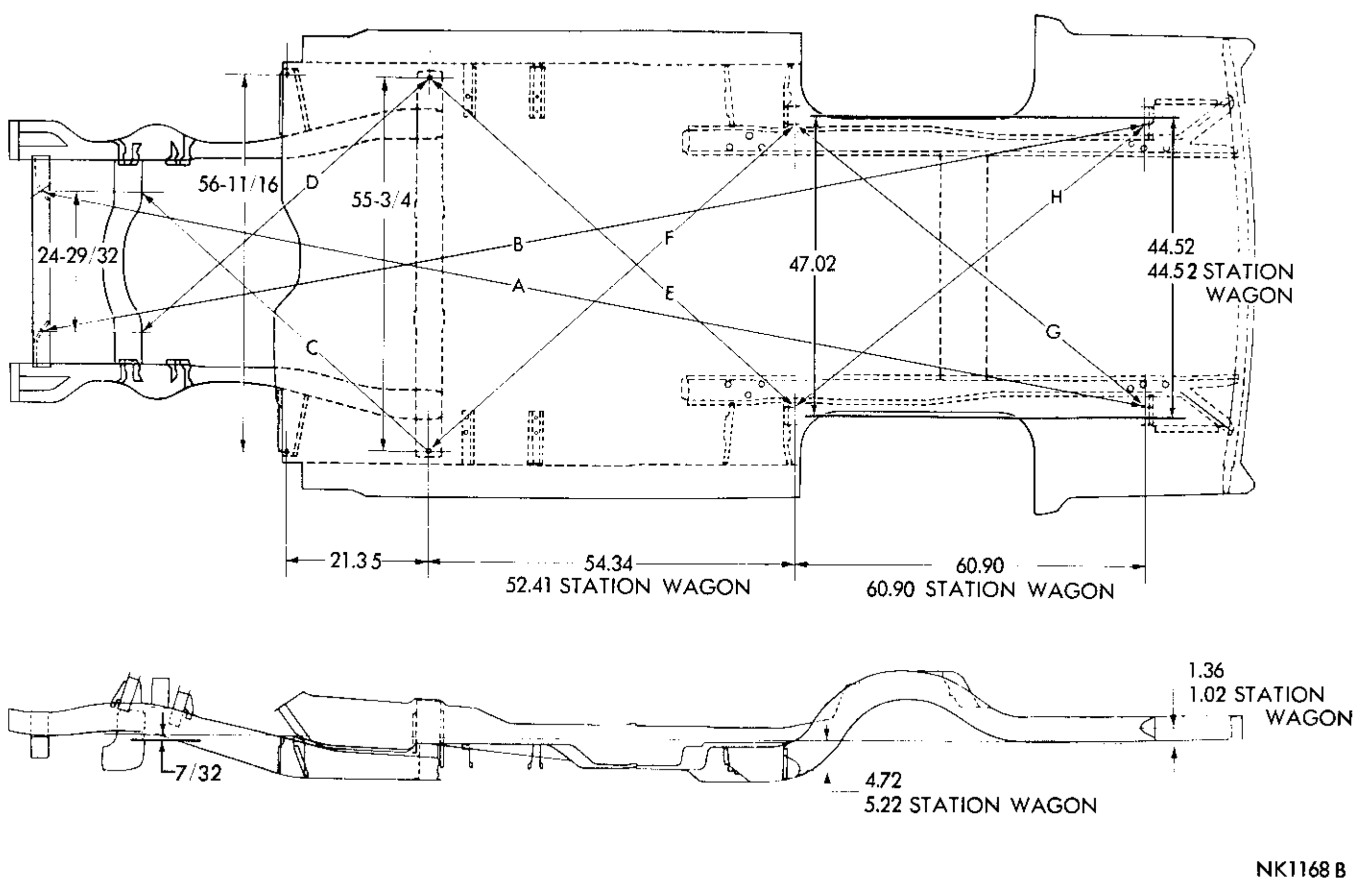


Fig. 1—Body to Frame Alignment (Chrysler)

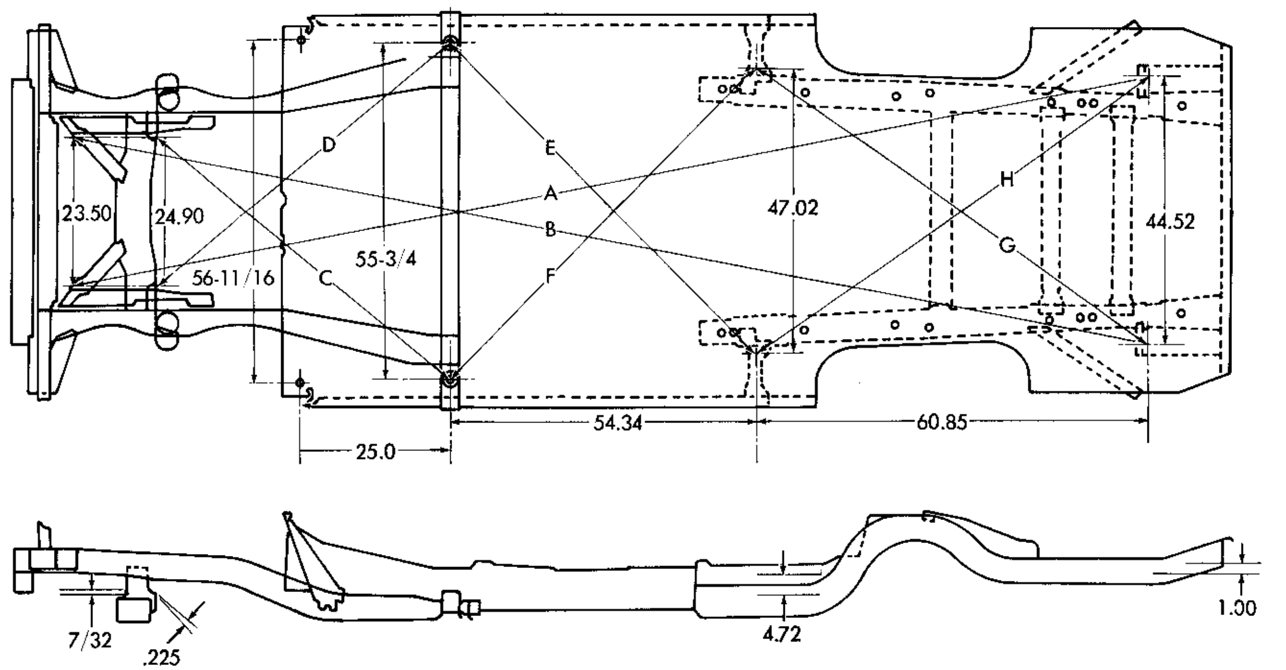


Fig. 2—Body to Frame Alignment (Imperial)

over a clean and smooth floor.

Refer to (Figs. 1 or 2) and place the line of a plumb-bob on point "A" with the plumb-bob just contacting the floor. Mark the plumb-bob contact point on floor. Repeat process at points B, C, D, E, F, G and H on both sides of body. Snap a chalk line between points as illustrated. **Care should be taken that all diagonals compared represent the corresponding measuring points.**

Compare the dimensions with the specifications. All matching point to point dimensions should agree within 1/4 inch.

In making any body opening measurements, always compare the matching measurements of both sides of the vehicle. All dimensions must be measured at the welded joints of the body to insure uniform measurements.

IMPERIAL RUBBER ISOLATED FRONT CROSSMEMBER

Removal

Should it become necessary to remove the rubber isolated "K" frame (Fig. 1), from the Imperial, proceed as follows:

(1) Raise vehicle on hoist and support stub frame on jackstands.

(2) Raise and support engine assembly, using engine support Fixture C-3487. Disconnect engine front motor mounts from "K" frame assembly.

(3) Remove steering gear assembly, as described in Group 19, Steering.

(4) Remove front wheels and tires.

(5) Remove steering linkage tie rods and idler arm. (See Front Suspension, Group 2). Remove lower bolts from shock absorbers.

(6) Remove lower control arm struts and sway bar assembly. (See Front Suspension, Group 2).

(7) Remove tension on torsion bars by turning adjusting bolts counterclockwise. Remove snap rings and slide torsion bars toward the rear, far enough to clear lower control arms. **Be careful not to damage balloon type seals.** (See Front Suspension, Group 2).

(8) Remove ball joint studs from steering knuckles. (See Front Suspension, Group 2).

(9) Remove wheel house splash shields.

(10) Remove upper shock absorber attaching nuts, then slide shock absorbers and dust shields out of well in frame.

(11) Remove upper control arm and bracket assemblies from "K" frame. (See Front Suspension, Group 2).

(12 Remove lower control arm and pivot shaft assemblies. (See Front Suspension, Group 2).

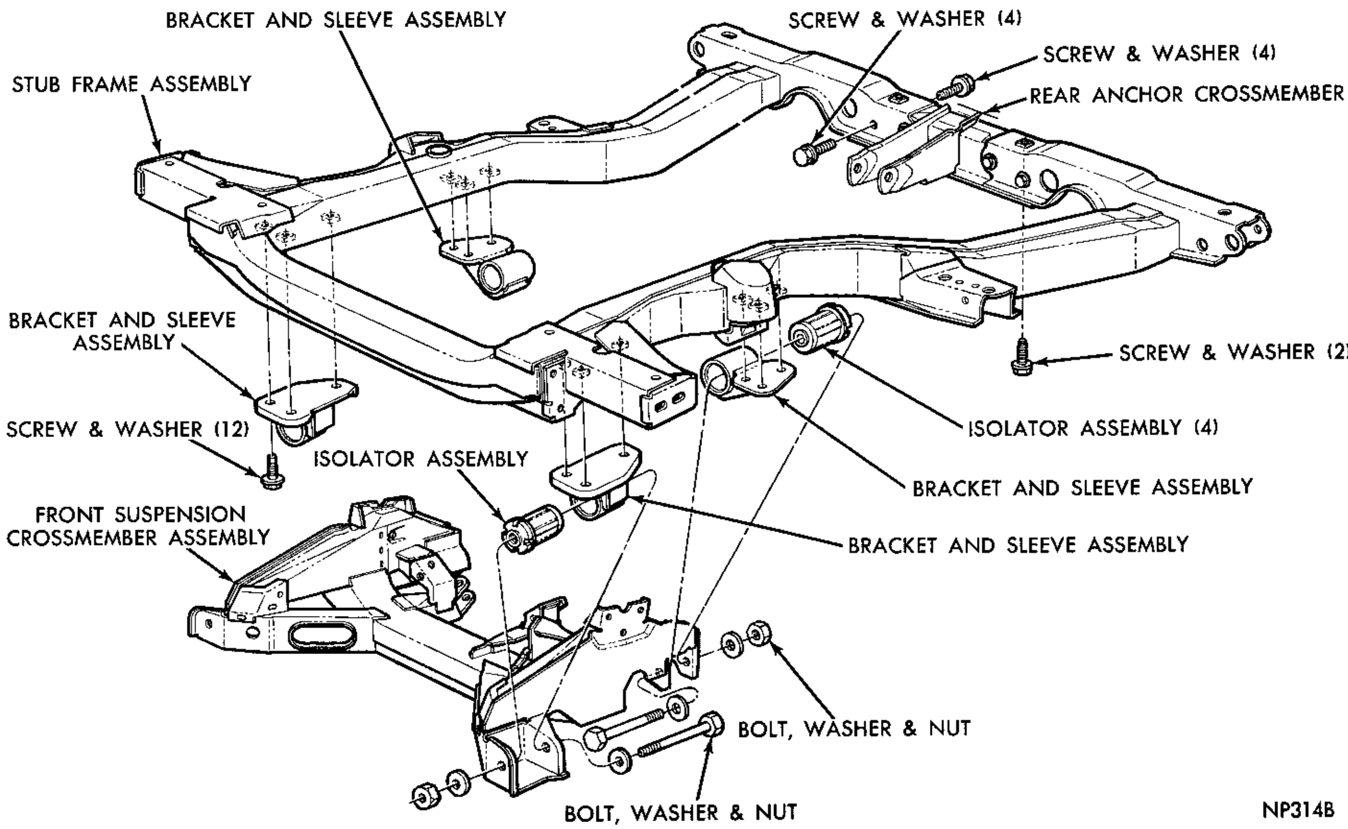


Fig. 1—Isolated "K" Frame

(13) Disconnect brake hose at disc brake calipers.

(14) Remove ground strap, connecting insulated "K" frame to stub frame.

(15) Remove "K" frame bracket and insulator assemblies and lower "K" frame to shop floor, using transmission jack.

Installation

When installing isolated "K" frame, the following information is very important: **All front suspension points that contain rubber, should be tightened only while the suspension of the vehicle is at the specified height,** (see Specifications—Front Suspension Group 2) **with full weight of vehicle on its wheels.**

(1) Center "K" frame in position under vehicle and raise into position with transmission jack. Install attaching bolts and tighten securely.

(2) Install ground strap and secure with attaching bolts.

(3) Reconnect brake hose at disc brake calipers.

(4) Install lower control arm and pivot shaft assemblies (See Front Suspension, Group 2).

(5) Install upper control arm and bracket assemblies. (See Front Suspension, Group 2).

(6) Install shock absorbers and dust shields by sliding up into well. Install retaining insulators, covers and nuts. Tighten securely.

(7) Install wheel house splash shields.

(8) Install ball joint studs in steering knuckles. (See Front Suspension, Group 2).

(9) Slide torsion bars forward, engaging lower control arms. Install retaining snap rings. Be careful not to damage balloon type seals. Increase tension on bars by turning adjusting bolts clockwise. (See Front Suspension, Group 2).

(10) Install lower control arm struts and sway bar assembly. (See Front Suspension, Group 2).

(11) Install idler arm and steering linkage tie rods. (See Front Suspension, Group 2). Install lower attaching bolts on shock absorbers.

(12) Install front wheels and tires. Adjust front wheel bearings as described in Group 22, Wheels Bearings and Tires.

(13) Install steering gear assembly as described in Steering, Group 19.

(14) Lower engine assembly and install front motor mounts to "K" frame. Tighten attaching bolts securely. Remove Engine Support Fixture C-3487.

(15) Remove jackstands from under stub frame and lower vehicle to shop floor.

(16) Check and adjust front suspension height. (See Front Suspension, Group 2).

(17) Bleed the hydraulic brake system, using a pressure bleeder.

(18) Tighten all front suspension points that contain rubber to specified torques. (See Front Suspension, Group 2).

HEATERS AND AIR CONDITIONING

CONTENTS

HEATERS

INDEX

GENERAL INFORMATION

Chrysler models use a "Blend Air" type heater (Fig. 1). Fresh air enters the heater through the cowl grille and passes through a plenum chamber to the heater core. A temperature control door in the heater plenum chamber directs the fresh air either through or past the heater core. The amount of "blend" is controlled by the setting of the temperature lever on the instrument panel. Direction of the "blended air" is controlled by the "Heat-Defrost" push buttons on the instrument panel.

Two doors, inside the heater assembly, are controlled by the "Heat" and "Defrost" buttons. When the "Heat" button is pressed the heater defroster door is closed and the heater shut-off door by the action of the vacuum actuator, is opened. When the "Defrost" button is pressed the heater shut-off door remains open and the heater defroster door, by the action of the vacuum actuator, is opened to route the heated air up to the windshield. The "Fan Switch" determines the speed of the heater blower motor.

The "Max" button will automatically put the heater in a high blower speed condition regardless of the position of the fan switch.

Heating the Vehicle

For best heating results, the windows of the vehicle should be closed. When the green temperature indicator light goes "out", move the temperature control lever to the "warm" position. Push the "Heat" button and move the fan switch to "high." The temperature condition inside the vehicle can then be controlled using the "Fan Switch" and the "Temperature Control Lever."

Summer Ventilation

Two air inlets are provided to allow outside air to be brought inside the vehicle in warm weather independent of the heater. The control knobs for the inlets are located on the lower edge of the instrument panel on both sides of the steering column. **Be sure the air inlets are shut during cold weather.**

Rear Seat Heater

A recirculating hot water rear seat heater mounted in the right side of the luggage compartment, is offered as optional equipment in all except convertible and station wagon models. A variable speed electric blower draws inside air through a duct mounted in the shelf panel behind the rear seat back and forces it through the heater core. From the heater core, warm air can be deflected either to the rear floor through ducts mounted under the rear seat cushion or through a defroster duct which is also mounted in the shelf panel.

The heater core is supplied with warm engine coolant from the front heater hoses by means of "tee" connections. A vacuum actuated valve controls the supply of coolant routed through steel tubing, under the right side of the floor pan, to the heater core.

Control consists of two toggle type switches mounted in the instrument panel. The right hand switch controls the heater blower motor speed. The other switch controls a vacuum actuated damper which directs the flow of air either to the defroster—defogger or floor heater ducts. This switch also controls coolant flow at the valve in the engine compartment.

Heating the Vehicle

When the green temperature control indicator light goes "out" move the left hand toggle switch to either the defroster position or the heat position. The right hand switch controls the blower speed.

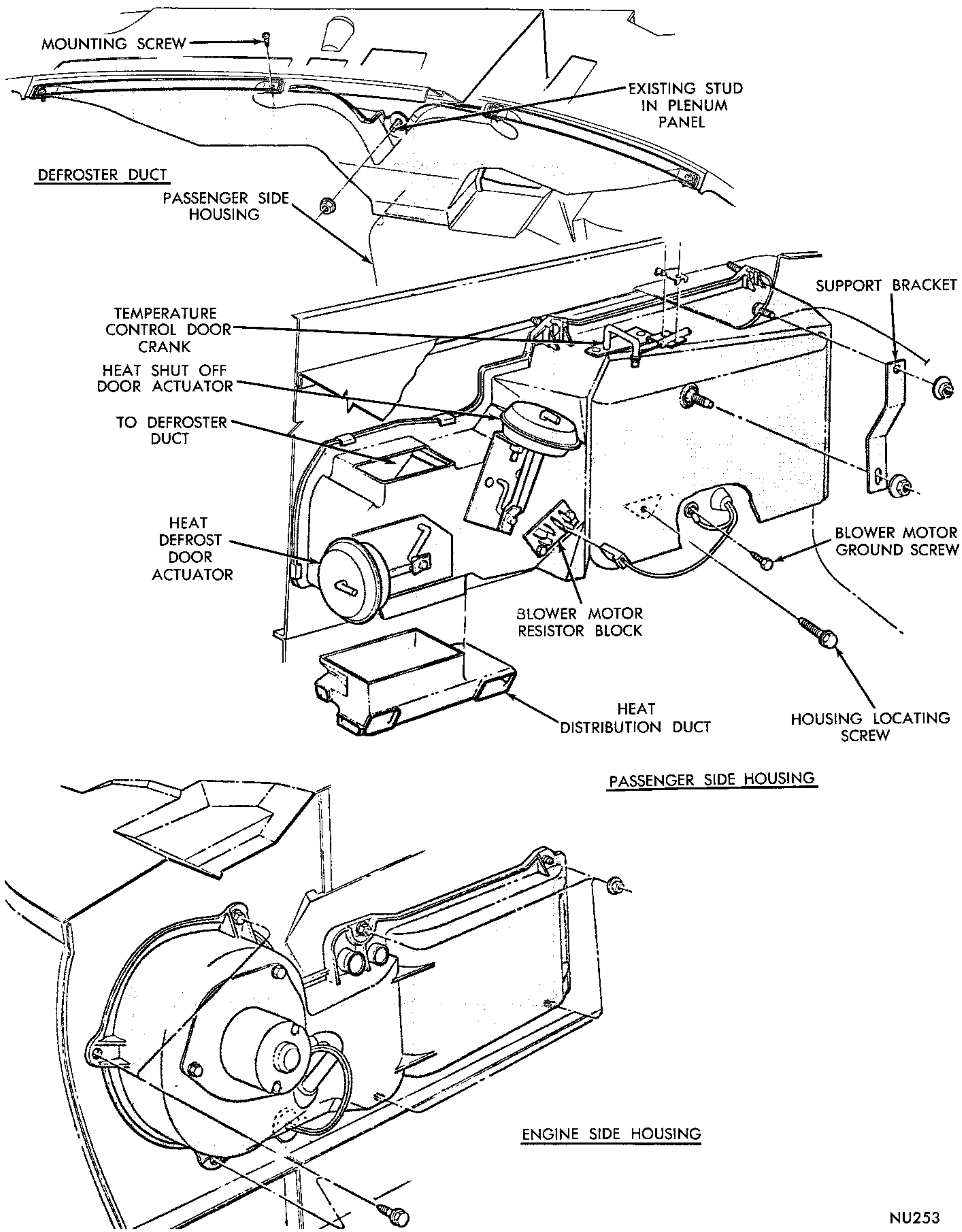


Fig. 1—Heater, Chrysler and Imperial

Defogging the Rear Windows

To defog the rear glass, place the left hand switch in the "Air" position. This will close the vacuum actuated water valve and cool air will flow to the rear glass. The blower switch will control the volume of air.

For summer operation, the heater control switch should be kept in the "Air" position. This shuts off the coolant supply to the heater core and stops the natural flow of warm air through the heater ducts. With the control in the "Heat" or "Defrost" position, the coolant valve is open and coolant flows through the heater unit.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
INSUFFICIENT HEAT	(a) Carpet obstructing outlet.	(a) Reposition carpet to uncover outlet.
	(b) Coolant level too low.	(b) Fill the radiator to recommended level.
	(c) Engine thermostat stuck open.	(c) Replace thermostat. See Group 7, "Cooling System".
	(d) Damaged vacuum line to shut-off damper.	(d) Replace vacuum line.
	(e) Obstructed heater hose.	(e) Replace heater hoses as necessary.
	(f) Radiator hoses leaking.	(f) Correct leaks and bleed cooling system.
	(g) Fresh air vent doors leaking.	(g) Adjust control cables.
	(h) Temperature control door leaking.	(h) Adjust control cable.
	(i) Kinked hoses.	(i) Reroute to eliminate restrictions.
TOO MUCH HEAT	(a) Disengaged cable.	(a) Connect or replace cable.
	(b) Thermostat stuck in closed position.	(b) Replace thermostat. See Group 7, "Cooling System".
BLOWER MOTOR NOT OPERATING	(a) Blown fuse.	(a) Check for excessive resistance in circuit and replace fuse.
	(b) Faulty electrical connection.	(b) Tighten all electrical connections.
	(c) Faulty blower switch.	(c) Replace switch.
	(d) Faulty motor.	(d) Replace motor.

SERVICE PROCEDURES

CONTROL CABLE ADJUSTMENT

(1) Disconnect battery ground cable.

(2) Remove ash receiver and housing (Chrysler only).

(3) Remove vacuum control switch, temperature control bracket and lower assembly through ash receiver housing opening.

(4) Remove glove box to provide access to the heater temperature door.

(5) Disconnect temperature control cable at heater.

(6) At heater control assembly, position cable housing to edge of cable bracket (Fig. 2) and install clip.

(7) Install temperature control bracket and secure vacuum control switch in place on temperature control bracket.

(8) Place temperature control arm in extreme left position and connect cable to temperature control door crank on heater assembly while holding door in extreme right position. Install clip.

(9) Install ash receiver and housing assembly.

(10) Connect battery ground cable and test operation of heater controls. **For Heater Control and Switch removal, see "Switches in Instrument Panels"—Group 8.**

Fresh Air Vent Control Cable Adjustment

(1) Push the fresh air control knob in (leave about 1/8 inch between the knob and panel).

(2) Remove the kick pad at the fresh air outlet.

(3) Remove the control cable clip from the vent door cable bracket.

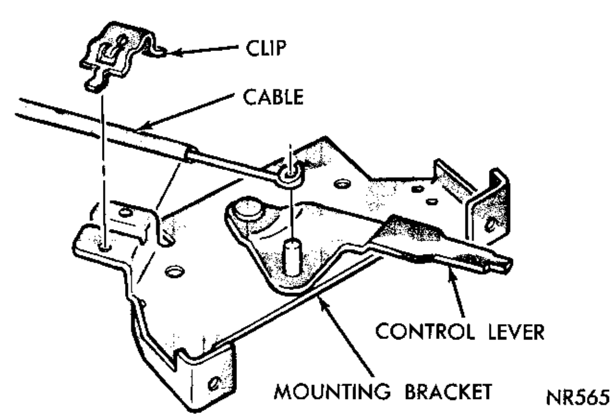


Fig. 2—Heater Control Cable Adjustment (Typical)

(4) Rotate and hold the vent door firmly closed and attach cable clip.

(5) Reinstall kick pad.

HEATER REMOVAL

Passenger Side Housing

(1) Disconnect battery negative cable and drain radiator.

(2) In engine compartment disconnect heater hoses at dash panel. Plug hose fittings on heater to prevent any coolant from spilling on inside of vehicle as heater assembly is removed.

(3) Slide front seat back to allow room to remove unit from vehicle and unplug antenna lead from side of radio.

(4) Remove vacuum hoses from trunk lock if so equipped.

(5) Disconnect electrical connectors from blower motor resistor block on face of housing.

(6) Remove two vacuum hoses from defroster actuator and two vacuum hoses from heater shut off door actuator.

(7) Remove bottom retaining nut from support bracket and swing bracket up out of the way.

(8) In engine compartment remove four retaining nuts from studs on engine side housing.

(9) Remove locating bolt from bottom center of passenger side housing.

(10) Roll or tip housing out from under instrument panel.

(11) Remove temperature control cable retaining clip and cable from heat shut off door crank.

Installation

NOTE: Before pressing housing to dash panel, be sure housing to panel seal is not misaligned or damaged.

(1) Position housing on front floor of vehicle under instrument panel and place temperature control cable in bracket. Place end of cable housing flush with end of bracket and install retaining clip.

(2) Tip housing up under instrument panel and press mounting studs through dash panel.

(3) While holding housing in position, install locating screw. Then swing mounting bracket down onto stud on face of housing and install mounting nut.

(4) In engine compartment install four retaining nuts and tighten securely. (24 inch-pounds).

(5) Connect electrical connectors to resistor block and vacuum hoses to actuators (white hose to rod side of actuator).

(6) Plug antenna lead into radio and connect vacuum trunk lock hoses if so equipped.

(7) From engine compartment, remove plugs from core tubes and connect hoses to heater (Fig. 3).

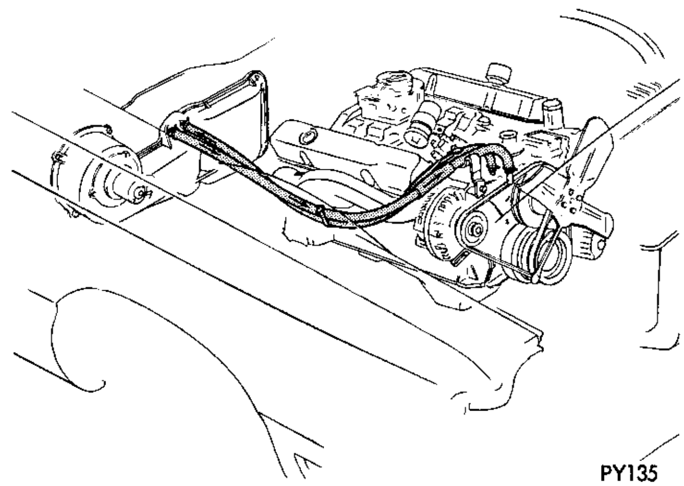


Fig. 3—Heater Hose Routing

(8) Fill cooling system and connect battery negative cable.

(9) Start engine, operate heater and bleed air from system.

HEATER CORE

Removal

(1) Remove passenger side housing from vehicle. (See Passenger Side Housing Removal).

(2) From inside housing, remove two retaining nuts from right side of heater core and four screws from outside of housing.

(3) Remove core tube locating metal screw from top of housing.

(4) Carefully pull heater core out of housing.

Installation

NOTE: Examine core to housing seal for damage or misalignment before seating heater core in housing.

(1) Position core on studs in housing and install two retaining nuts.

(2) Install four core retaining screws from outside of housing and one core tube locating screw in top left of housing. Tighten all nuts and screws securely. (24 inch-pounds).

(3) Install housing under instrument panel. (See Passenger Side Housing Installation).

BLOWER MOTOR

The blower motor is mounted to the engine side housing under the right front fender between the inner fender shield and the fender. The inner fender shield must be removed to service either the blower motor or engine side housing. See Group 23 "Body and Frame" of this manual for detailed illustrations.

Heater Door Service

For service of the heater regulator door, heater defroster door or the heater fresh air door the heater must be removed from the vehicle and disassembled. Refer to "Heater Removal and Installation."

Blower Motor Resistor Replacement

(1) From under instrument panel disconnect wiring at resistor.

(2) Remove two screws that mount resistor to heater and remove resistor.

(3) Position new or repaired resistor into opening in heater assembly and install the mounting screws.

(4) Connect wiring to resistor.

REAR SEAT HEATER

Removal

(1) From under the car, remove two heater hose clamps at the junction of the front and rear tube assembly and drain system (Fig. 5).

(2) Remove rear seat cushion and back seat.

(3) From inside car, remove two heater hose clamps and hoses from the heater.

(4) Remove spare tire from luggage compartment.

(5) Disconnect motor feed wire, fresh air intake hose and flexible blower discharge duct.

(6) Remove the four metal screws from mounting brackets and remove heater to the bench for servicing (Fig. 4).

Installation

(1) Position heater assembly in luggage compartment and install the four mounting screws in mounting bracket.

Be sure to install motor ground wire terminal to the mounting screw under blower motor.

(2) Install blower discharge duct and air intake hose.

(3) Inside car, install two heater hoses and clamps to heater.

(4) Install spare tire.

(5) Install two heater hoses at junction of tube assemblies.

(6) Fill cooling system, start engine, bleed heater system of air and check for leaks.

(7) Install seat back and rear seat cushion and heat shield.

CAUTION: Carefully align the seat cushion to mate with floor mounted air ducts before locking seat in place. Misalignment will crush air ducts.

HEATER CORE

Removal

(1) Remove heater from vehicle as outlined in "Heater Removal."

(2) Remove the 11 metal screws from end plate and remove plate.

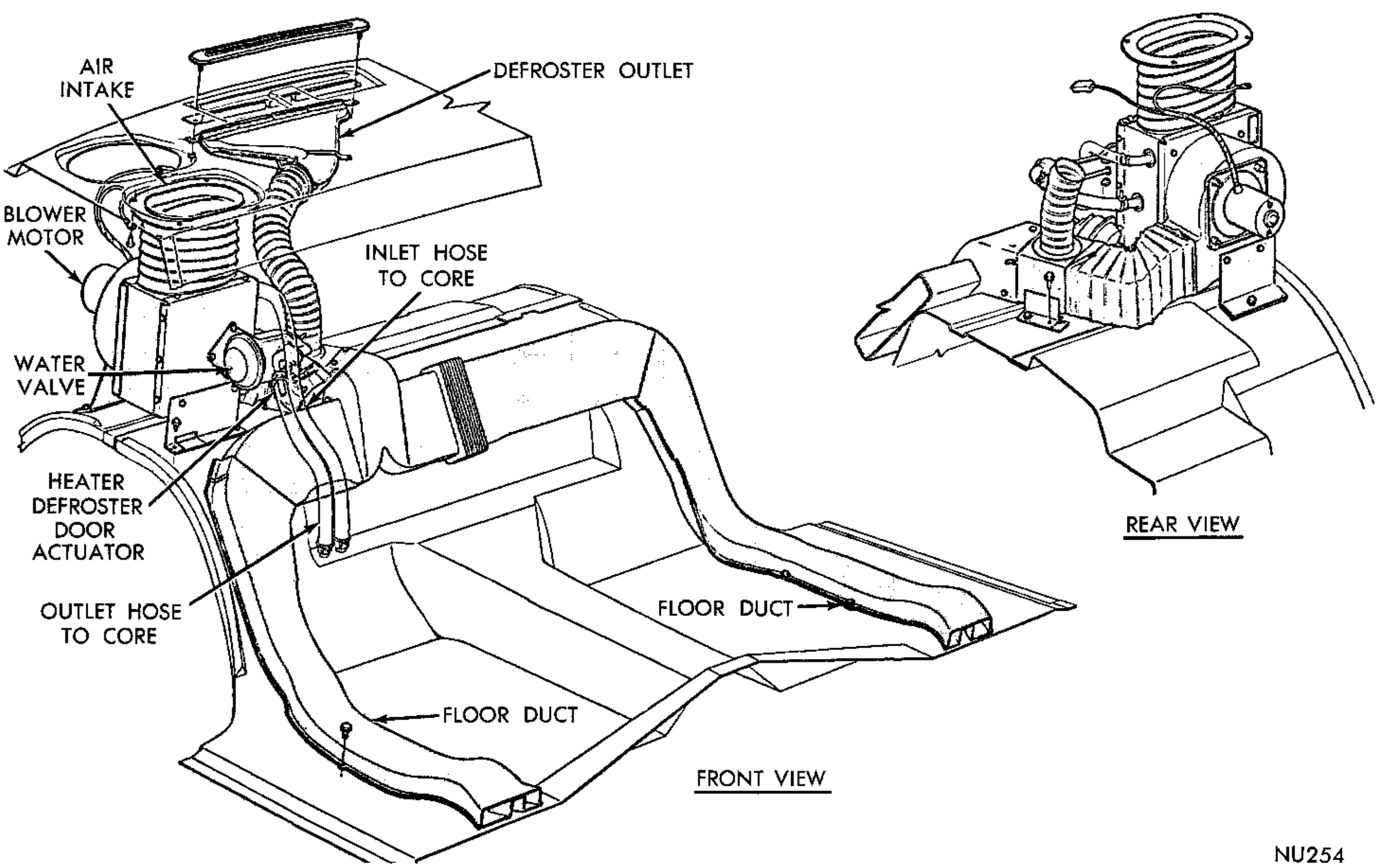


Fig. 4—Rear Seat Heater

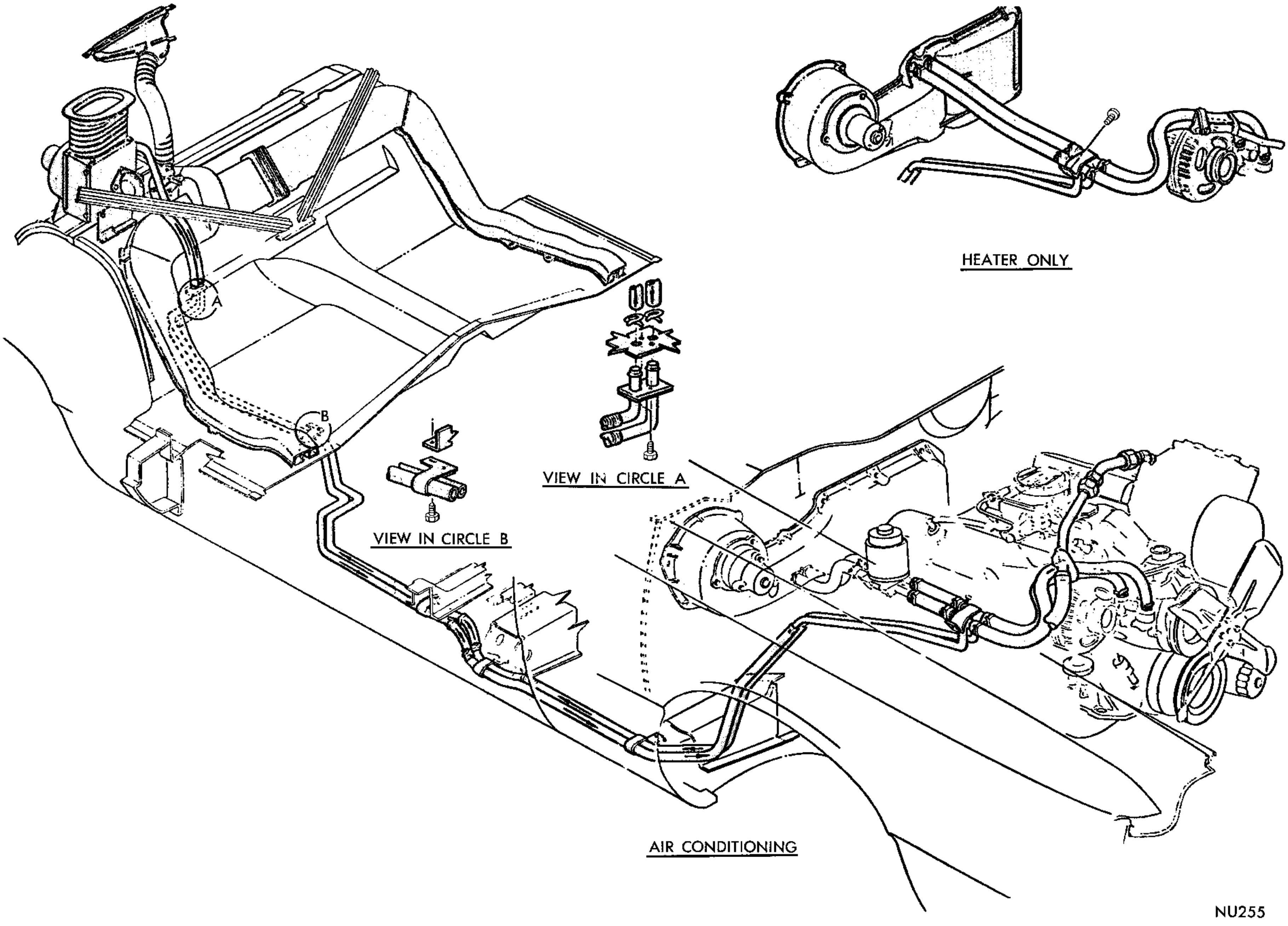


Fig. 5—Rear Seat Heater Hose Connections

(3) Remove the four screws retaining heater core to heater body and remove the core.

Installation

(1) Position heater core in heater body and install the four retaining screws.

(2) Install end plate and 11 metal screws.

(3) Install heater as outlined in "Heater Installation."

Blower Motor Rear Unit

The heater blower motor can be replaced without removing heater from vehicle as follows:

(1) Remove spare tire from luggage compartment.

(2) Disconnect motor feed wire and ground wire from end mounting bracket screw.

(3) Remove the four motor mounting plate nuts and remove motor assembly from the heater.

(4) Loosen set screw mounting fan to shaft and slide fan from shaft.

(5) Remove the two nuts from plate and separate motor from plate.

Installation

(1) Install back plate on end of motor and secure with the two nuts.

(2) Install fan on the motor shaft. Adjust for clearance of fan and heater chamber.

(3) Install motor assembly in heater and the four mounting nuts.

(4) Connect motor feed wire and install ground wire terminal under end mounting bracket screw.

(5) Install spare tire in luggage compartment.

Floor Air Ducts

Replacement of the floor air ducts is accomplished by removing the seat back and seat cushion. The ducts are fastened to the floor pan with sheet metal screws. (Fig. 4).

CAUTION: When installing the seat cushion, carefully align the seat cushion with the floor air ducts before locking seat cushion in place. Misalignment will crush the air ducts.

AIR CONDITIONING

INDEX

OPERATING INSTRUCTIONS FOR OWNERS

Anti-Freeze Required for Summer Operation

Air conditioned cars must be protected with a permanent type antifreeze during summer to +15°F. or lower to prevent the heater case from freezing. However, this protection does not provide sufficient corrosion inhibitors for the engine cooling system.

Summer protection to —15°F. will provide adequate inhibitors for protection of engine cooling system against corrosion. **Do not use the same antifreeze for more than one year.**

Fast Cool Down

If the car has been parked in the hot sun, open the windows and drive the car for several minutes to expel the warm air, and at the same time:

(1) Slide the temperature control lever to the "Off" position (far left).

(2) Push the "MAX. A/C" button.

(3) Move the fan switch to "High".

(4) Adjust the four cooling outlet vanes to direct cooled air to the desired area to suit occupants wishes.

(5) Close windows.

Normal Cooling (Cooling with Fresh Air)

When the desired amount of cooling is obtained with the "Max" button, you can continue cooling with fresh outside air for added comfort by pushing the "A/C" button and adjusting the fan switch to change fan blower speed. If less cooling is desired, move the fan switch lever to "Low" speed and readjust the cooling outlets for indirect cooling. For warmer air, move the temperature control lever to the right to the desired temperature.

Cooling For Special Conditions

The air conditioner provides maximum dehumidified air at the most comfortable weather conditions above 50°F.

During rainy or muggy weather, operate the system as usual, using the temperature control lever to clear the windows and provide interior comfort.

If the outside air is extremely humid or too warm for cooling with fresh air as previously described, push the "Max. A/C" button.

This method is also recommended when driving through areas which are extremely dusty or have objectionable odors.

Operation in Traffic

In extremely slow traffic, additional cooling may be required.

When pulling a trailer, when driving through heavy traffic at 10 to 15 mph. or when pulling up steep hills additional engine cooling may be required. If any or all of these situations are encountered, put the transmission in a lower gear. At stop lights and other stops put transmission in Neutral and increase engine speed.

Radiator Cap

Air conditioned vehicles must be equipped with a radiator cap having a holding pressure of 15 to 16 psi. Replace the radiator cap that does not test within these specifications with a cap that does.

Condenser

Inspect the condenser for obstructions for foreign matter. Clean if necessary.

Any obstructions to the free flow of air across the condenser will decrease heat dissipation from the condenser, decrease the efficiency of the condenser and, in turn, decrease the evaporator's efficiency. These conditions result in increasing the discharge pressure and horsepower load on the engine. The use of a bug screen is not recommended as it, too, will decrease the free flow of air.

Inspect the condenser for bent or damaged fins. The bent fins on the condenser deflect air flow across the bent portions, decreasing the condenser area.

Bug Screens

Bug screens should not be installed on vehicles equipped with air conditioner. A bug screen installed in front of the condenser will reduce air flow and effect air conditioner performance. Under severe heat conditions a bug screen may cause the engine to over-heat.

THE GAUGE SET MANIFOLD INSTALLATION

The Gauge Set Manifold is an indispensable test and diagnosis instrument. The gauge set manifold Tool C-3740 has two compound suction gauges and one discharge pressure gauge. Two accurately calibrated suction pressure gauges are required for the evaporator pressure regulator valve test. (Fig. 1).

The hoses are shown in the test illustrations for quick reference to distinguish the various adaptations.

Evaporator Suction Gauge—at the left side of the manifold set is calibrated to register 0 to 30 inches of vacuum and 0 to 150 psi. This gauge is connected to the suction service port of the compressor. A special service port adapter, supplied with the gauge set, provides the means of connecting the gauge set mani-

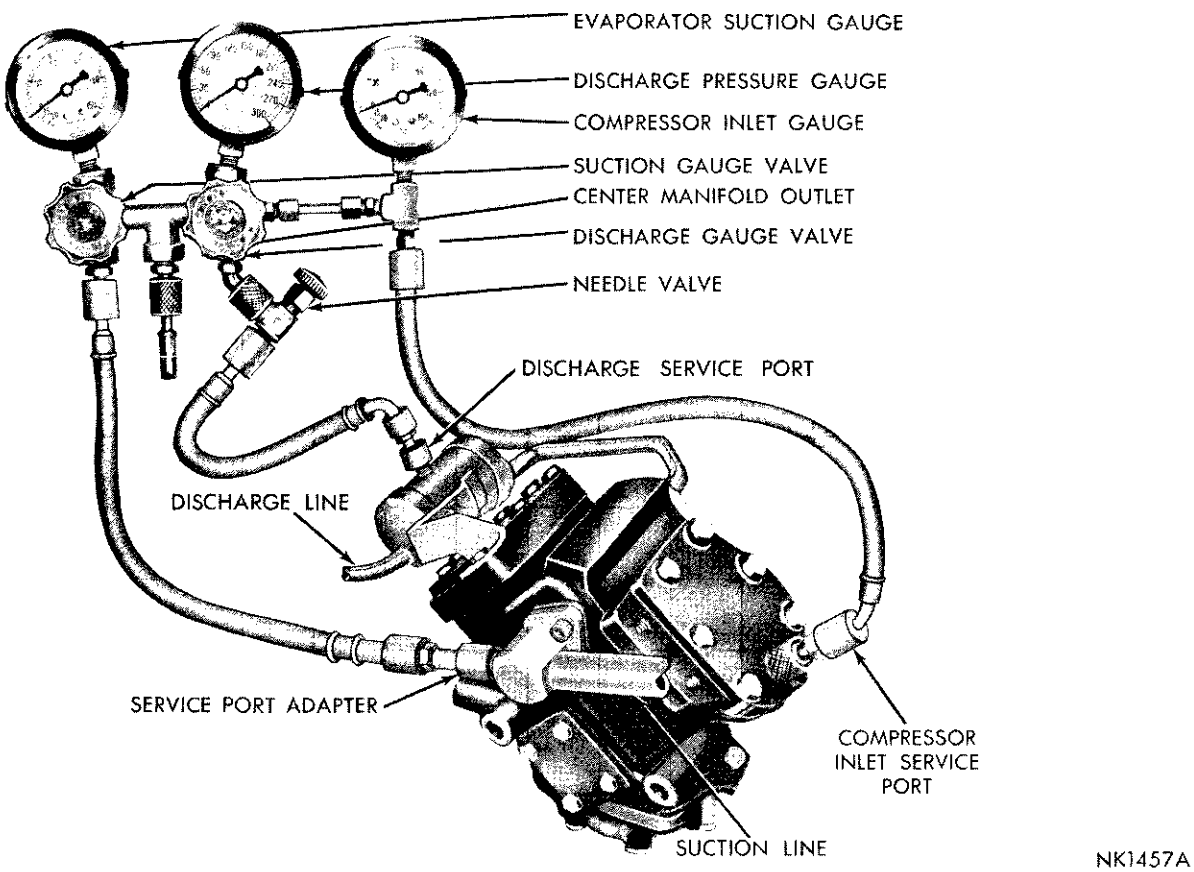


Fig. 1—Gauge Set Manifold Connections

fold hose to the service port. When the adapter is installed at the port and tightened, the stem of the valve in the service port is depressed, opening the service port valve.

Discharge Pressure Gauge—at the center of the manifold set is calibrated to register 0 to 300 psi. For all tests this gauge is connected to the discharge service port of the compressor. A service port adapter is used to make this connection. The needle valve, located below the discharge pressure gauge, is used to damp out gauge needle oscillations so that accurate readings can be obtained.

Compressor Inlet Gauge—is mounted at the right side of the manifold set. This mounting is for convenience only. There are no passages between this gauge and the gauge manifold. The compressor inlet gauge is calibrated to register 0 to 30" of vacuum and 0 to 150 psi. This gauge and the evaporator suction gauge must be accurately calibrated so that the needles of both gauges are exactly at 0 before making tests. The compressor inlet gauge is connected to the compressor inlet service port by a special service port adapter.

This gauge is used, when checking the EPR Valve.

Center Manifold Outlet—provides the necessary connection for a long service hose used when discharging the system, using a vacuum pump to "pull a vacuum" before charging the system, and for connecting the supply of refrigerant when charging the system.

Manifold Gauge Valves—should be closed when connecting the gauge set manifold to the service ports of the compressor. The suction gauge valve at the left is opened to provide a passage between the suction gauge and the center manifold outlet. The discharge gauge valve at the right is opened to provide a passage between the discharge pressure gauge and the center manifold outlet.

Detailed instructions for proper use of the gauge set manifold are contained in the test covering each test and service operation employing these gauges.

SAFETY PRECAUTIONS

The refrigerant used in all air-conditioning installations is Refrigerant 12. It is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of **21.7 degrees F. below zero** (at atmospheric pressure), it will be a vapor at all normal temperatures and pressures. The vapor is heavier than air, non-flammable and nonexplosive. It is nonpoisonous except when it is in direct contact with open flame. It is noncorrosive except when combined with water. It is a safe refrigerant. The following precautions, however must be observed when handling Refrigerant 12.

CAUTION: Wear safety goggles when servicing the refrigeration system.

Refrigerant 12 evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes.

Always wear safety goggles when servicing the refrigeration part of the air-conditioning system. Keep a bottle of sterile mineral oil and a weak solution of boric acid handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out. Refrigerant 12 is rapidly absorbed by the oil. Next, wash the eyes with the weak solution of boric acid. Call your doctor immediately even though irritation has ceased after first aid treatment.

CAUTION: Do not heat Refrigerant 12 above 125 degrees F.

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant. A bucket or large pan of hot water not over 125 degrees F. is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

CAUTION: Keep Refrigerant 12 containers upright when charging the system.

When metering Refrigerant 12 into the refrigeration system, keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

CAUTION: Always work in a well-ventilated room.

Always maintain good ventilation in the working area. Always discharge the refrigerant into the service bay exhaust system or outside the building. Large quantities of refrigerant vapor in a small, poorly ventilated room can displace the air and cause suffocation.

Although Refrigerant 12 vapor is normally nonpoisonous, it can be changed into a very poisonous gas if allowed to come in contact with an open flame. Do not discharge large quantities of refrigerant in an area having an open flame. A poisonous gas is produced when using the flame-type leak detector. Avoid inhaling the fumes from the leak detector.

CAUTION: Do not allow liquid refrigerant to touch bright metal.

Refrigerant will tarnish bright metal and chrome surfaces. Avoid splashing refrigerant on any surface. Refrigerant in combination with moisture is very corrosive and can cause great damage to all metal surfaces.

TEST PROCEDURES

INDEX

TEST 1

TEST SYSTEM PRESSURE

(Engine not Running)

Install the gauge set manifold. After tightening service port adapters, make sure that the needle valve located below the discharge pressure gauge is open. Purge air from the gauge hoses (Fig. 1) as follows:

(1) Open suction gauge valve momentarily, then close it.

(2) Open discharge gauge valve momentarily, then close it.

(3) Loosen compressor inlet suction hose connection at the manifold momentarily, then tighten it.

If vehicle has been parked and the air conditioning system not operating, gauge pressure should be normal for temperature of the system. Refer to the Temperature-Pressure Relationship Chart.

If no pressure is indicated on the gauges it means that the system is empty, due to a leak. It will be necessary to evacuate, charge with a sweep-test charge, locate and correct the leak, purge the test charge, replace the drier, vacuum the system and charge the system with the proper amount of Refrigerant 12.

If pressures are normal, proceed with the next test and adjustment.

TEST 2

REFRIGERANT LEVEL

The system must be operated at high blower speed, with vehicle doors and windows open, if the system is a dual system, both units must be operated simultaneously at high blower speed when this test is made, and when adding to the charge.

The sight glass is an integral part of the receiver-strainer-drier. The outlet line (liquid) from the condenser must be attached to the connection marked IN. The word IN is stamped on the top face of the inlet connection (Fig. 2). If the receiver-strainer-drier is reversed and the lines are connected wrong, the system must be purged, the lines reversed and the system recharged.

Block the air flow across the condenser to raise the discharge pressure to 225 to 250 psi, and check the sight glass for foam. There should be no foam. If sight glass is clear, remove the air restriction from the condenser and allow the discharge pressure to return to normal.

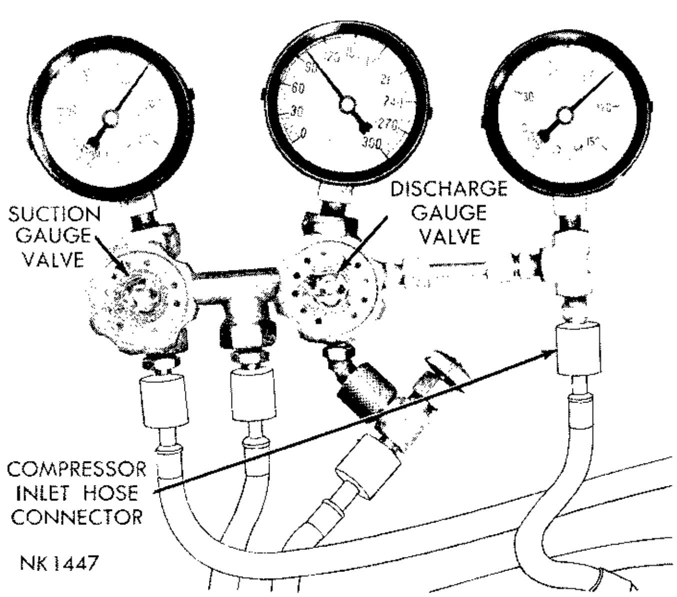


Fig. 1—Purge Gauge Hoses

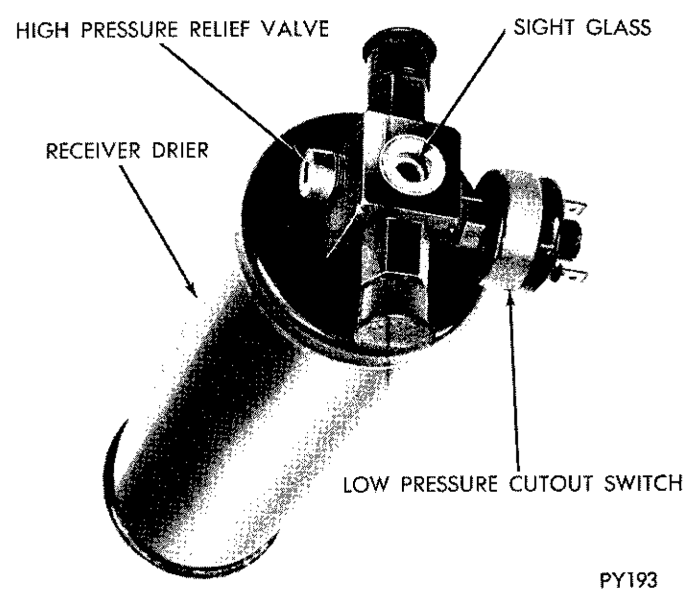


Fig. 2—Receiver Drier

TEMPERATURE-PRESSURE RELATIONSHIP CHART (FOR REFRIGERANT 12)

Temp. F.	Press. PSI	Temp. F.	Press. PSI	Temp. F.	Press. PSI	Temp. F.	Press. PSI	Temp. F.	Press. PSI
0	9.2	35	32.6	60	57.7	85	91.8	110	136.4
2	10.2	36	33.4	61	58.9	86	93.3	111	138.4
4	11.2	37	34.3	62	60.1	87	94.7	112	140.5
6	12.0	38	35.2	63	61.3	88	96.5	113	142.6
8	13.5	39	36.1	64	62.5	89	98.2	114	144.7
10	14.6	40	37.0	65	63.8	90	99.8	115	146.8
12	15.8	41	37.9	66	65.0	91	101.5	116	148.9
14	17.1	42	38.9	67	66.3	92	103.1	117	151.1
16	18.4	43	39.8	68	67.6	93	104.8	118	153.2
18	19.7	44	40.7	69	68.9	94	106.5	119	155.4
20	21.0	45	41.7	70	70.2	95	108.3	120	157.7
21	21.7	46	42.7	71	71.5	96	110.0	121	159.9
22	22.4	47	43.6	72	72.9	97	111.7	122	161.2
23	23.2	48	44.7	73	74.2	98	113.5	123	164.4
24	23.9	49	45.7	74	75.6	99	115.3	124	166.7
25	24.6	50	46.7	75	77.0	100	117.2	125	169.1
26	25.4	51	47.7	76	78.4	101	119.0	126	171.4
27	26.1	52	48.8	77	79.8	102	120.9	127	173.8
28	26.9	53	49.9	78	81.3	103	122.7	128	176.2
29	27.7	54	51.0	79	82.7	104	124.6	129	178.6
30	28.5	55	52.5	80	84.2	105	126.6	130	181.0
31	29.3	56	53.2	81	85.7	106	128.5	131	183.5
32	30.1	57	54.3	82	87.2	107	130.4	132	185.9
33	30.9	58	55.4	83	88.7	108	132.4	133	188.5
34	31.7	59	56.6	84	90.2	109	134.4	134	191.0

If the foam shows in the sight glass when the discharge pressure is 225 to 250 psi, it indicates the system is low on refrigerant. The proper amount of refrigerant required to complete a full charge may be added to the system as follows: Maintaining the discharge pressure at 225 to 250 psi, add refrigerant gas through the suction side of the system until foam is cleared from sight glass, then add exactly one-half (1/2) pound of refrigerant.

Low Pressure Cut Out Switch

The Low Pressure Cut-Out switch, which is located on the receiver drier, is wired in series with the compressor magnetic clutch. It cuts off the electrical power supply to the clutch when liquid refrigerant pressure drops to the control point of the switch. (Fig. 2).

The switch is a sealed, factory calibrated unit. No attempt shall be made to adjust or otherwise repair it. If it is found to be defective it must be replaced.

Switch Test (Engine not running)

(1) Remove the two wires from the low pressure cut-out switch and connect them together.

(2) Press the A/C button.

(3) Momentarily turn the ignition switch on **(do not crank the engine)**, listen for the compressor clutch engaging.

(4) If the clutch does not engage, the clutch, wiring or fuse may be defective. Check the clutch circuit and clutch.

(5) If the clutch engages, connect the manifold gauge set and read the discharge pressure. At any pressure of 40 psi and above, the switch must actuate the clutch.

(6) Reconnect the wires to the switch and perform step number 3.

If clutch does not engage, discharge the system, replace the switch, check compressor oil level, and recharge the system.

NOTE: Check compressor oil level before charging the system in accordance with instructions under "Oil Level—Compressor". If the pressure is below 40 psi the system may be low of charge. In this case it is mandatory to follow the procedure described below:

(1) Add partial charge until the pressure gauge reads 40 psi.

(2) Perform step number 3 (wires connected to switch). If the clutch engages, the switch is satisfactory; if it does not, it must be replaced. In either case the following steps must be performed:

(a) Check the system for leaks and repair as necessary.

(b) Discharge the system. **Check the compressor oil level.** Replace the switch if it was found defective and recharge the system.

NOTE: Whenever the system is inactivated by the low pressure cut-out switch due to the loss of refrigerant, refrigerant oil may also have been lost. Therefore, to prevent damage to the compressor due to operation without sufficient lubrication, the leak must be repaired and the compressor oil level checked before final charge of the system in accordance with instructions under "Oil Level—Compressor".

High Pressure Relief Valve

The High Pressure Relief Valve is located on the receiver drier opposite the low pressure cut-out switch. Its function is to prevent damage to the air conditioning system in the event that excessive pressure develops due to condenser air flow being restricted by, for example, leaves, newspaper, or an overcharge of refrigerant.

NOTE: The high pressure relief valve differs from the fusible plug in that it vents only the small amount of refrigerant necessary to reduce system pressure and then reseats itself. The majority of the refrigerant is conserved in the system. The valve is calibrated to vent at a pressure of 475 to 550 psi. therefore, the fact that the valve vented refrigerant, does not mean the valve is defective. The valve is part of the receiver drier assembly and must not be removed nor otherwise disturbed.

A mylar disc protects the venting ports of the valve and must not be removed, perforated, or otherwise damaged. The disc is intended to prevent humidity and salt from entering the valve mechanism. A valve in which the protective disc does not seal the venting port shall be repaired by removing the old protective disc and cleaning the surface of the valve so it will be free of oil, grease or other substances. Apply a disc cut from adhesive mylar, or "Scotch" type tape. Be sure that the disc covers the venting port. **Avoid the use of masking tape or electrical insulation tape.**

TEST 3

TESTING THE SYSTEM FOR LEAKS

The Leak Detector Torch Tool C-3569 is a propane gas-burning torch used to locate a leak in any part of the refrigeration system. Refrigerant gas drawn into the sampling or "snifter" tube will cause the flame to change color in proportion to the size of the leak. A very small leak will produce a flame varying from yellowish-green to bright green. A large leak will produce a brilliant blue flame.

CAUTION: Do not use the lighted detector in any place where explosive gases, dust or vapors are present.

Do not breathe the fumes that are produced by the burning of refrigerant gas. Large concentrations of refrigerant in the presence of a live flame become dangerously toxic. Observe the flame through the window of the burner shield, not through the top of the shield.

If the flame remains bright yellow when the tester is removed from possible leak point, insufficient air is being drawn in through the sampling tube, or the reaction plate is dirty.

(1) Open the torch valve until you hear a faint hiss of escaping gas. Light the test torch and adjust the valve until the flame is very small. A small flame will detect large as well as small leaks, whereas a large flame will detect only large leaks. As soon as the reaction plate seen through the window in the burner shield becomes red hot, the tester is ready for use.

(2) Examine all tube connectors and other possible leak points by moving the end of the sampling hose from point to point. Since Refrigerant 12 is heavier than air, it is good practice to place the open end of the sampling hose directly below the point being tested. Be careful not to pinch the sampling tube since this will shut off the air supply to the flame and cause a color change.

(3) Watch for a change in the color of the flame. Small leaks will produce a green color and large leaks a bright blue color. If leaks are observed at tube fittings, tighten the connection, using the proper flare wrenches, and retest.

Remove Sweep-Test Charge

If the system is free of leaks; or after correcting a leak, and if no air conditioning components have been removed, add the necessary refrigerant as described under TEST 4 "Correcting Low Refrigerant Level." If any parts of the refrigerant system were disconnected, remove the sweep test charge. Close the refrigerant manifold valve so that any refrigerant remaining in the container is sealed. Remove the long test hose from the refrigerant manifold. Insert the free end of this test hose into an exhaust system outlet. Open the right-hand gauge set manifold valve a fraction of a turn to let the sweep-test charge escape slowly. Allow the system to discharge until the discharge pressure gauge registers zero. Open the left-hand gauge valve to allow any refrigerant trapped in the suction side of the system to escape.

TEST 4

CORRECTING LOW REFRIGERANT LEVEL

Since the refrigeration system is completely sealed, refrigerant level will not be low unless there is a leak in the system or refrigerant has been allowed to escape by depressing one of the service port valves. For detailed instructions on the proper procedure for checking refrigerant level, refer to "Refrigerant Level," TEST 2.

Before adding refrigerant where cause of low level is not known, the system should be tested for leaks. Assuming no leaks are present, or that leaks have been corrected without discharging the system, proceed with partial charge.

Install and connect gauge set manifold (Fig. 3).

(1) Close both of the gauge set manifold valves. Open the gauge set manifold needle valve.

(2) Connect the suction gauge test hose to the suction service port of the compressor.

On all models connect the discharge gauge test hose to the discharge service port of compressor.

(3) Connect one end of long test hose to center manifold outlet, other end to refrigerant dispensing manifold.

(4) Close two of the dispensing manifold valves and open remaining dispensing manifold valve. Remove protective cap from opened valve.

(5) Screw a can of Refrigerant 12 to the opened manifold valve. Be sure gasket is in place and in good condition. Tighten refrigerant can and manifold locking nut to insure a good seal. Do not over-tighten since 6 to 8 foot-pounds is sufficient if gasket is in good condition.

(6) Turn manifold valve (above the refrigerant can) completely clockwise to puncture the can. This closes the valve and seals the refrigerant in the can.

(7) Place the refrigerant in a large pan of water heated to 125°F. Place pan of water containing the refrigerant can on an accurate scale so that the amount of refrigerant added can be weighed. Open the refrigerant manifold valve.

(8) Purge all air from test hoses. Air in the system will be trapped in the condenser causing abnormally high discharge pressures and interfering with condensation of the refrigerant.

(9) Loosen both test hoses at the gauge set manifold. Tighten the hoses as soon as the air is purged.

(10) Loosen charging hose connection at gauge set manifold. This will purge air from the charging hose. Tighten connection as soon as air is purged.

(11) With vehicle windows open and hood up, operate engine at 1300 rpm.

(12) Push in "A/C" button, fan switch on high. On dual installation both blowers must be on high speed during charging operation.

(13) If necessary, block the condenser to maintain a discharge pressure of 225 to 250 psi. The system must

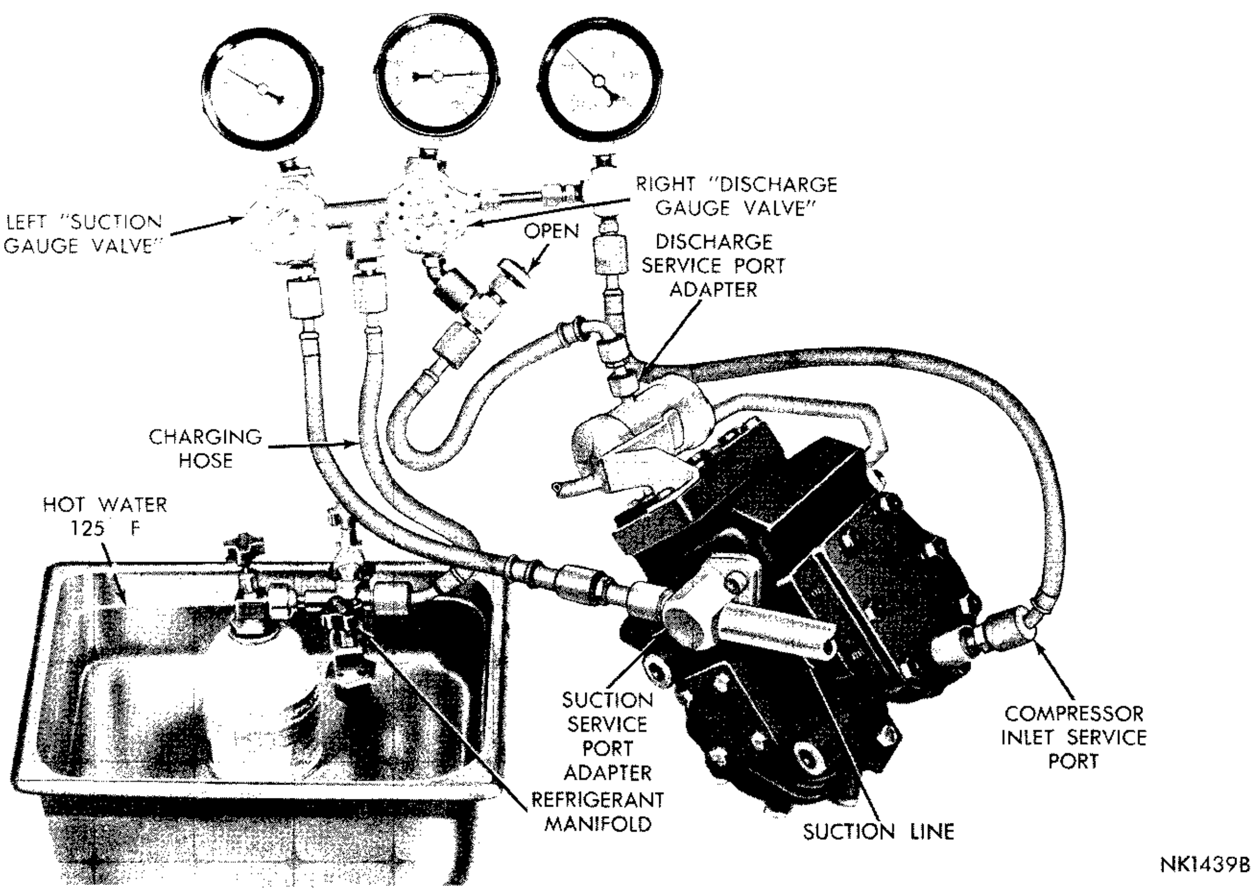


Fig. 3—Adding Partial Refrigerant Charge

be charged through the evaporator suction service port as follows:

(a) Slowly open the suction service gauge valve. Meter flow of refrigerant by adjusting the suction service gauge valve so that pressure registered at the suction service gauge does not exceed 50 psi. **Keep refrigerant container upright.**

(b) Add refrigerant gas until there is no foam visible at the slight glass. As soon as all foam clears, note the weight registered on the refrigerant scale.

(c) Watch the refrigerant weighing scale and add **exactly** 1/2 pound more refrigerant to the system. Close the suction gauge valve. **Too much refrigerant in the system can cause abnormally high discharge pressures. Care must be used so that exactly 1/2 pound of refrigerant is added after foam clears in the sight glass.**

(d) Close dispensing manifold valve. Remove test hoses and adapters from the service ports of compressor, and install protective caps at service ports.

TEST 5

OVER-ALL PERFORMANCE TEST

Humidity (the amount of moisture in the air) has an important bearing on the temperature of the air delivered to the vehicle's interior. This is true of all air-conditioned systems whether in the home, office or vehicle. It is important to understand the effect humidity has on the performance of the system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature and the temperature of the moisture carried in the air. Condensing the moisture in the air transfers a great deal of heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. In other words, high humidity greatly reduces the evaporator's ability to lower the temperature of the air delivered to the vehicle interior.

Evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds materially to the comfort of the passengers. However, an owner may expect too much from his air-conditioning system on humid days. A performance test is the best way to determine whether or not the system is performing up to standard. This test also provides valuable clues to the possible cause of trouble.

The preliminary inspections in TESTS 1 thru 4, outlined previously, should be made before the "Over-All Performance Test." Install gauge set manifold. **Air temperature in test room must be 75°F. minimum for this test.**

FRONT UNIT PERFORMANCE TEST

(1) Start the engine, open the windows, temperature control lever must be in the off position.

(2) Push in "A/C" button, fan switch on high. Open all grille outlets.

When testing the front unit of a dual system, leave roof unit blower turned off.

(3) Adjust engine to 1300 rpm.

(4) Arrange gauge set manifold hoses and tachometer leads to allow hood to be lowered, then close hood.

(5) Place motor-driven psychrometer Tool C-3704 at cowl inlet opening. Distilled water should be used with this meter to prevent drying out and hardening the wet sock.

(6) Place thermometer Tool C-3623 fully into right outlet grille opening. The left outlet should be fully extended and directed towards rear of vehicle.

(7) Operate the air-conditioning system until a stabilized condition on the gauges and thermometers has been established. One of the most important steps in making the over-all performance test is that the engine must be operated at 1300 rpm for approximately five minutes to allow all the under-hood components of the system to reach their operating temperature.

(8) **Partially** close the needle valve, located below the discharge pressure gauge, to minimize oscillation of the pointer. Do not close the needle valve completely since this would prevent the discharge pressure gauge from registering pressure.

This test should be performed with the discharge pressure from 190 to 210 psi. The 190 to 210 pound pressure is for **test purposes only.** To increase pressure restrict the air flow across the condenser using cardboard, or paper, to decrease pressure, increase air flow across condenser with external floor fans.

(9) Observe and record the "Inlet Dry Bulb Temperature" and "Inlet Wet Bulb Temperature" as registered on the psychometer.

Observe and record "Discharge Air Temperature" registered by thermometer at right hand grille outlet.

From the appropriate "Performance Temperature Chart," for vehicle and type installation being tested (Figs. 4 thru 10), determine the maximum allowable discharge air temperature for the prevailing "Dry" and "Wet" bulb temperatures recorded. If the vehicle's discharge air temperature is at or below the temperature given on the Performance Chart, the air-conditioning is delivering its cooling capacity. However, to assure trouble-free operation, continue with the "Expansion Valve and Evaporator Pressure Regulator Valve Test."

If discharge air temperature at the outlet grilles is above the maximum allowable on Performance Chart, perform the "Expansion Valve and Evaporator Pressure Regulator Valve Test."

SINGLE UNIT

INLET AIR WET BULB TEMPERATURE	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
DISCHARGE AIR DRY BULB TEMPERATURE	41	42	43	44	45	46	47	48	49	50	50	50	51	51	52	52	53	53	53	54	54	55	56	57	58	59	59	60	62	64	66	67	68	69	70	71

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 110°F NK1342 A

Fig. 4—Performance Temperature Chart—Front Unit Only

FRONT UNIT OF DUAL

INLET AIR WET BULB TEMPERATURE	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
DISCHARGE AIR DRY BULB TEMPERATURE	43	44	45	46	47	48	49	50	51	52	52	52	53	53	54	54	55	55	55	56	56	57	58	59	60	61	61	62	64	66	68	69	70	71	72	73

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 110°F NK1343A

Fig. 5—Performance Temperature Chart—Front of Dual System

ROOF UNIT PERFORMANCE TEST

The method used to test the roof unit of a dual installation is essentially the same as for a front unit. The front unit should be tested before testing the roof unit. Turn the front unit off by pushing the "OFF" button.

(1) Connect a jumper from the positive terminal of the battery to the compressor so that the refrigeration part of the entire system can be operated without air-flow through the front unit.

(2) Open the windows, adjust engine speed to 1300 rpm and close the hood. Turn roof unit blower motor switch to "high" speed position.

(3) Place motor-driven psychrometer Tool C-3704 near roof unit air outlet grille and a thermometer Tool C-3623 in right-hand air outlet grille (Fig. 7).

(4) Operate the air-conditioning system until a

ROOF UNIT OF DUAL

INLET AIR WET BULB TEMPERATURE	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
DISCHARGE AIR DRY BULB TEMPERATURE	52	53	54	55	56	57	58	59	60	61	61	61	62	62	63	63	64	64	64	65	66	67	68	69	70	71	71	72	74	76	78	79	79	80	80	81

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 110°F NK1344A

Fig. 6—Performance Temperature Chart—Roof Unit of Dual System

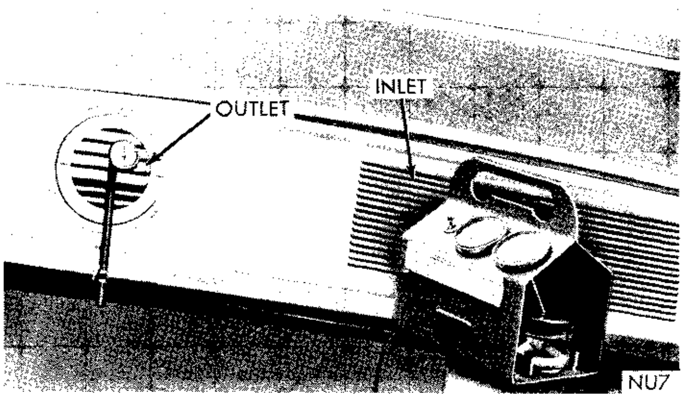


Fig. 7—Roof Unit Performance Test

stabilized condition on the gauges and thermometers has been established. One of the most important factors in making the over-all performance test is that the engine must be operated at 1300 rpm for a sufficient time to build up to operating temperatures and allow all the under-hood components of the system to be subjected to the under-hood operating temperatures for a period of time.

(5) Partially close the needle valve, located below the discharge pressure gauge, to minimize oscillation of the discharge gauge pointer. Do not close the needle valve completely since this would prevent discharge pressure gauge from registering discharge pressure.

(6) Read the discharge pressure on the gauge. This test should be performed with the discharge pressure from 190 to 210 psi. The 190 to 210 pound-pressure is for test purposes only. These pressures change according to the ambient temperature, humidity and the efficiency of the entire system.

(7) Take the necessary steps to bring and maintain the discharge pressure within these limits.

To increase the discharge pressure, restrict the air flow across the condenser using cardboard, or paper. In high ambient temperatures and high humidity areas, it may be necessary to put an electric fan in front of the condenser to keep the pressure down to these limits.

(8) Observe and record the "Inlet Dry Bulb Tem-

FRONT UNIT ONLY
INLET WET BULB TEMPERATURE VERSUS DISCHARGE DRY BULB TEMPERATURE

INLET AIR WET BULB TEMPERATURE	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
DISCHARGE AIR DRY BULB TEMPERATURE	41	42	43	44	45	46	48	49	50	51	51	51	52	52	54	54	55	55	55	56	56	58	59	60	61	62	62	64	66	68	70	71	72	73	74	75

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 110°F NP655

Fig. 8—Performance Temperature Chart—Front Unit Only—Imperial

FRONT UNIT OF DUAL
INLET WET BULB TEMPERATURE VERSUS DISCHARGE DRY BULB TEMPERATURE

INLET AIR WET BULB TEMPERATURE	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
DISCHARGE AIR DRY BULB TEMPERATURE	43	44	45	46	47	48	50	51	52	53	53	53	54	54	56	56	57	57	57	58	58	60	61	62	63	64	64	66	68	70	72	73	74	75	76	77

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 110°F NP653

Fig. 9—Performance Temperature Chart—Front Unit of Dual—Imperial

TRUNK UNIT OF DUAL
INLET WET BULB TEMPERATURE VERSUS DISCHARGE DRY BULB TEMPERATURE

INLET AIR WET BULB TEMPERATURE

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
42	43	44	45	46	47	49	50	51	52	52	52	53	53	55	55	56	56	56	57	57	59	60	61	62	63	63	65	67	69	71	72	73	74	75	76

DISCHARGE AIR DRY BULB TEMPERATURE

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 110°F NP654

Fig. 10—Performance Temperature Chart—Trunk Unit of Dual—Imperial

perature" and "Inlet Wet Bulb Temperature" as registered on the psychrometer.

(9) Observe and record "Discharge Air Temperature" registered by the thermometer at right-hand grille outlet.

(10) From the approximate Roof Unit Performance Temperature Chart for vehicle and type installation being tested (Fig. 6), determine the maximum allowable discharge air temperature for the prevailing "Dry" and "Wet" bulb temperatures. If the discharge air temperature is at or below the temperature given on the Performance Chart, the roof unit is delivering its rated cooling capacity.

If the discharge air temperature at the outlet grilles is above the maximum allowance on the "Performance Chart," perform the "Expansion Valve and Evaporator Pressure Regulator Valve Test."

Pilot Operated Evaporator Pressure Regulator (EPR) (Fig. 11)

An improved version of the Evaporator Pressure Regulator (EPR) Valve, has been introduced this year.

Like the EPR valve, it is entirely self contained, requires no external motivation and is located in the suction cavity of the compressor.

Its purpose is to restrict the flow of refrigerant under light air conditioning loads. This is done in order to keep the evaporator pressure high enough to prevent freeze-up of the condensate on the external surfaces of the evaporator. Such a condition would restrict air flow, and under extreme circumstances, result in complete loss of capacity.

The **Pilot Operated EPR** differs from the EPR (internally), in that it contains a built-in pilot valve, which "triggers" the main throttling portion of the valve. The valve offers more precise control, and permits system operation at lower ambient temperatures, before evaporator "freeze-up" occurs.

NOTE: If the EPR valve must be removed or replaced, it is to be replaced by the pilot operated EPR valve identified by Part Number 3406143. No attempt shall be made to adjust the valve. All further reference to the EPR Valve in this Manual will apply to the Pilot Operated EPR Valve only.

TEST 6

EXPANSION VALVE AND EPR VALVE TEST (In Car) SINGLE UNIT OR FRONT UNIT OF DUAL

This test is to be performed after performing Test 1 through 5. The gauge set manifold will be connected as illustrated. (Fig. 12).

(1) **Preliminary Checks**

Before performing any of the tests listed in Section 3, the following conditions shall be established.

(a) System must be adequately charged in accordance with Test 2.

(b) Make sure sensing tubes of the expansion valve are not damaged. Replace any expansion valve that has broken or damaged tube. Be sure sensing tube is properly inserted in its well in the suction line. (Fig. 13).

(2) **Test Conditions for all Requirements Except 3(d)**

(a) Test must be made at room temperature of 75 degrees F. minimum, under hood temperature 86 degrees F. minimum.

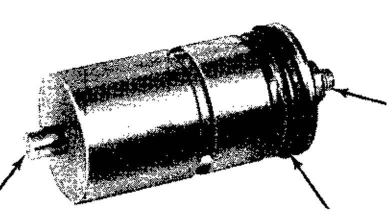


Fig. 11—Pilot Operated EPR Valve

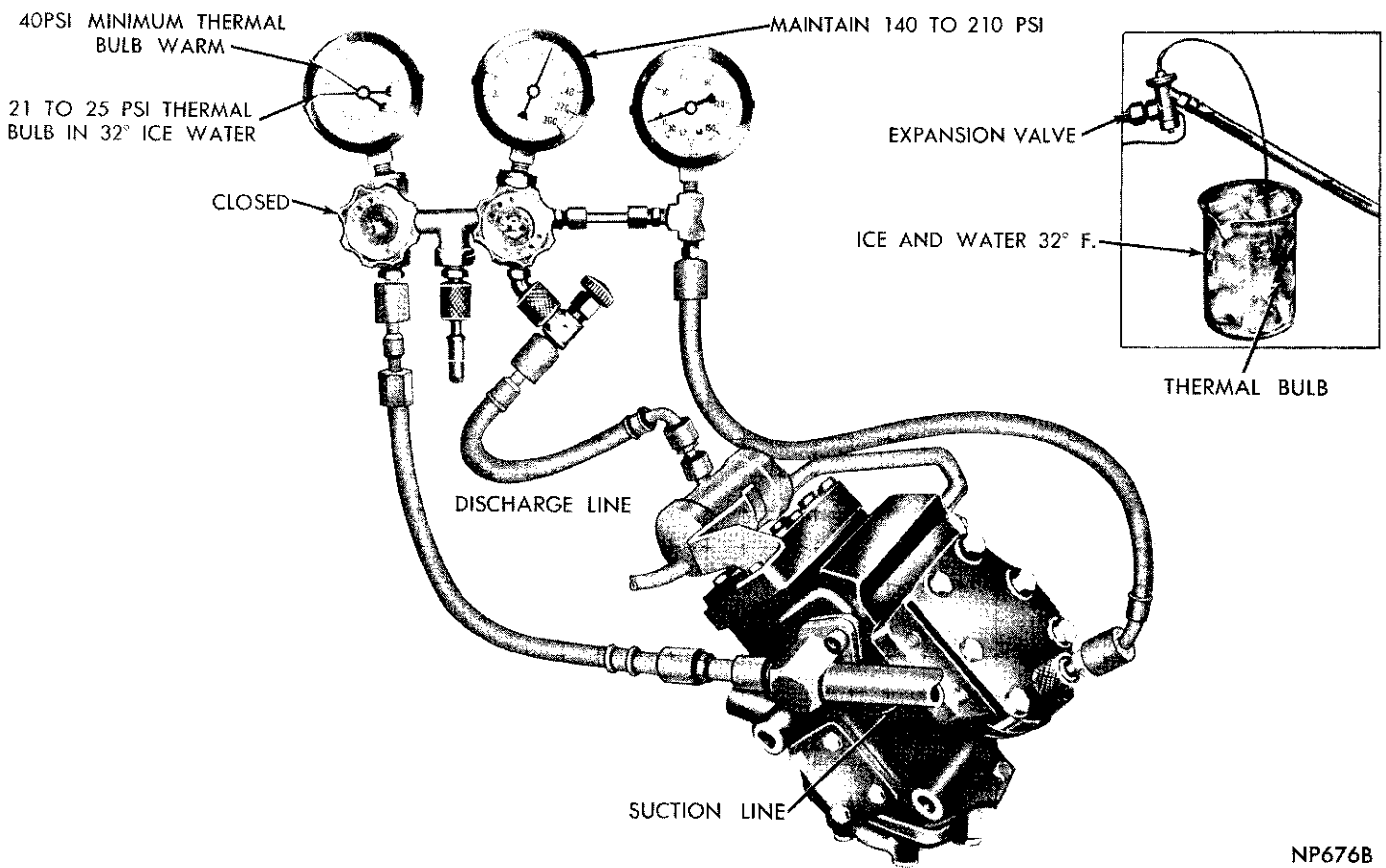


Fig. 12—Expansion Valve and EPR Valve Test

(b) Close the doors and windows, set the air conditioning controls for Max. A/C, high blower and temperature lever to maximum temperature position. NOTE: An external vacuum source must be used to open the water valve.

(c) Set the engine speed at 900 rpm unless otherwise specified.

(d) Operate the system for at least ten minutes to obtain partial stabilization and sufficient reheat to load the evaporator.

(3) Requirements

Check the system as follows and refer to Diagnosis Chart if findings are different from these specified.

(a) Under conditions in paragraph 2, pressure shall be as follows when the sensing tube of the expansion valve is in its well.

Head Pressure 140 to 210 psi

(b) Under conditions in paragraph 2. Remove the expansion valve sensing tube from its internal well and hold it in your hand for several minutes until suction pressure stabilizes. The pressure should read:

Evaporator suction pressure 40 psi or more.
Compressor Inlet pressure no more than 4 psi below evaporator suction pressure.

(c) Under conditions in paragraph 2, immerse 5 inches of the sensing tube in a container of ice water at 32 degrees F. The pressure should read:

Evaporator Suction Pressure
Not More Than 27 psi
Compressor Inlet Pressure 17 psi or Less

(d) This check must be performed under the following conditions:

Engine Speed 1500 rpm
Blower on Low Speed
Max. A/C Button Depressed
Temperature Control Lever in Minimum Temperature Position. Disconnect External Vacuum.

The sensing tube of the expansion valve must be in its well in the suction line. The pressures should read:

Evaporator Suction Pressure 23-27 psi
Compressor Inlet Pressure 17 psi or Less

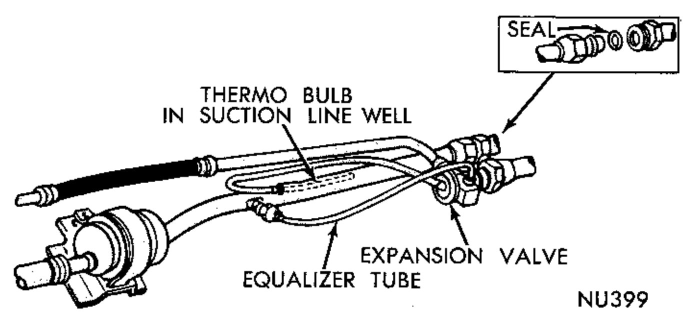


Fig. 13—Expansion Valve Details

EXPANSION VALVE AND EPR VALVE DIAGNOSIS CHART

Condition	Possible Cause	Correction
Head Pressure Below 140 psi (Ref. 3 a)	Expansion Valve Closed EPR Valve Closed Compressor not Properly Working	See 4(a) See 4(b) Replace valve plates & gaskets of compressor
Low Evaporator Suction Pressure Below 23 psi (Ref. 3 b)	Expansion Valve Closed EPR Valve not Controlling (open)	See 4(a) See 4(d)
High Pressure Differential (Ref. 3 b)	EPR Valve (closed)	See 4(b)
Evaporator Suction Pressure Between 27 and 40 psi (Ref. 3 b)	Expansion Valve Defective Lack of Capacity	See 4(a)
Compressor Inlet Pressure Higher than 17 psi (Ref. 3 c) Expansion Valve Known to be Good	EPR Valve Defective Compressor Defective	See 4(d) Replace valve plates & gasket of compressor
Evaporator Suction Pressure Does not Drop (Ref. 3 c)	EPR Valve Not properly set (high control point) Expansion Valve—Not working properly (sticking open) Compressor Defective	See 4(c) See 4(c)
Evaporator Suction Pressure Not Between 23 and 27 psi (Ref. 3 d)	EPR not Set Properly	Replace EPR Valve
Compressor Inlet Pressure Higher than 17 psi (Ref. 3 d) Expansion Valve Known to be Good	EPR Valve Defective Compressor Defective	See 4(d) Replace valve plates & gasket of compressor

(4) **Tests**

Refer to the Diagnosis Chart.

(a) Remove the sensing tube of the expansion valve from its well and hold it in your hand. Read the evaporator suction pressure. It should read 40 psi or more. If the evaporator suction reads less than 40 psi, replace the expansion valve. If the evaporator suction pressure reads more than 40 psi, proceed with Test (b).

(b) Remove the sensing tube of the expansion valve from its well. Hold it in your hand, allow time for equalization. Observe the differential pressure. If the evaporator suction pressure is more than 40 psi and the differential pressure between the evaporator suction pressure and compressor inlet pressure is more than 4 psi, the EPR valve is defective and should be replaced.

(c) Perform the test as in (b). If the EPR valve is satisfactory, immerse the expansion valve sensing tube in ice water at 32 degrees F. The evaporator suction pressure should drop below 27 psi. If it does not drop to this value raise the engine speed to 1750 rpm and check the evaporator suction pressure again. If it remains above 27 psi and the compressor inlet pressure is more than 4 psi, the EPR valve has too high control point and should be replaced. If the pressure drop is less than 4 psi and the evaporator suction pressure is above 27 psi, the expansion valve is defective and should be replaced.

If after raising the engine rpm to 1750, the evaporator suction pressure drops below 27 psi, both EPR and expansion valve are working properly, but the compressor capacity is low.

The compressor valve plates and the gaskets should be inspected and replaced if necessary.

(d) Remove the sensing tube from its well and hold it in your hand. Read the evaporator suction pressure then immerse the sensing tube in ice water at 32 degrees F. and read the evaporator suction pressure which should be below 27 psi. If the pressure does not drop to this value, read the compressor inlet pressure. It should be 17 psi or less. If it is more than 17 psi, the EPR valve is faulty and must be replaced.

If the compressor inlet pressure is still above 17 psi, inspect the valve plates and gaskets and replace them if necessary.

EXPANSION VALVE TEST DUAL UNIT (Roof Unit)

The expansion valves for the front and rear units of a dual unit installation will have to be tested separately as follows:

(a) Close car doors and windows and operate the engine at 800 rpm. Set air conditioning controls at "Max. A/C" high blower and temperature control lever to full reheat position.

(b) Operate the system for a few minutes to obtain partial stabilization and sufficient reheat to load the evaporator. The pressure at the discharge service port should read between 140 and 210 psi. before starting the test (expansion valve thermo bulb in well).

(c) Place the sensing element thermo bulb of the rear unit expansion valve in a salt and ice water brine which is at a temperature of 18°F., or lower and place the expansion valve thermo bulb of the front unit in a container of 32°F., ice water. The evaporator suction pressure should read between 21 to 28 psi. The compressor inlet pressure should be 22 psi. or less. If the compressor inlet pressure is higher than 22 psi., the EPR valve should be replaced. If the evaporator suction pressure is greater than 28 psi., the EPR valve cannot be checked until after the expansion valve passes the test; read step (g) and continue with the test, step (d).

(d) Remove the front unit thermo bulb from the ice water and hold the bulb in your hand for several minutes until the suction pressure stabilizes. The evaporator suction pressure should read a minimum of 40 psi. Any expansion valve which does not produce this reading is defective and should be replaced.

With the evaporator suction pressure reading a minimum of 40 psi. under the conditions in step (d) above, the compressor inlet pressure should read 1 to 4 psi. less. If the compressor inlet pressure is more than 4 psi less than the evaporator suction pressure, the EPR valve is defective and should be replaced.

(e) Then, place the front unit expansion valve thermo bulb in the 18°F., ice water and brine solution and place the rear unit thermo bulb in the 32°F., ice water solution. The evaporator suction pressure should read 17 to 25 psi.

(f) Remove the rear unit expansion valve thermo bulb from the ice water solution and hold the bulb in your hand for several minutes until the suction pressure stabilizes. The evaporator suction pressure should read a minimum of 35 psi. Any expansion valve which does not produce this reading is defective and should be replaced.

(g) If the evaporator suction pressure was greater than 28 psi. (step c) and 25 psi. (step e), one or possibly both of the expansion valves are stuck open. The expansion valve that produced the least evaporator suction pressure change when its thermo bulb was moved from in the 32°F., ice water to in the hand location, is stuck open and should be replaced. After replacing the defective expansion valve, charge the system and repeat the testing of the other expansion valve.

If the expansion valve passes Test (a) through (g), then the compressor valve plate should be removed and the gaskets and valves inspected. Replace gaskets and any damaged valve plate assemblies. **Make sure that all of the old gasket material is removed from the valve plates, cylinder head and crankcase before rebuilding the compressor.**

COMPLETE SYSTEM DISCHARGE AND RECHARGE

INDEX

REFRIGERANT SERVICE

Use only Refrigerant 12 in the air-conditioning system. Refrigerant 12 is available in bulk tanks or in sealed 15 ounce cans. The use of canned refrigerant is preferred by most technicians because it provides a very quick and simple means of adding refrigerant or charging the system completely. Refer to the Refrigerant Charge Chart.

An accurate scale must be used to insure charging with the proper amount of refrigerant.

Since the use of canned refrigerant is preferred universally, only that method is described.

Before the system can be opened for replacement

REFRIGERANT CHARGE

Single	Dual
3 lbs. 2 oz. to 3 lbs. 6 oz.	4 lbs. 2 oz. to 4 lbs 6 oz.

of lines or components, the system must be completely discharged. Whenever the system has been opened, it must be swept with a partial charge, and the entire system tested for leaks. Compressor oil level should be checked and adjusted, if necessary. See "Oil Level". The drier should be replaced and the system evacuated using a vacuum pump to remove all air and moisture. The system should be charged with the proper amount of refrigerant. Detailed instruction for performing these operations follow.

DISCHARGE THE SYSTEM

(1) Be sure the valves of the gauge manifold set are closed before attaching the gauge set manifold (suction test hose to the suction service port and discharge test hose to the discharge service port). Attach the long test hose to the center connection of the gauge set manifold. Lead the other end of this hose into an exhaust ventilation system outlet or to the outside of the building.

(2) Open the gauge set manifold needle valve and close both of the gauge set manifold gauge valves.

(3) With the vehicle windows open and hood up, operate the engine at 1300 rpm.

(4) Push in "A/C" button, fan switch on high. On dual installation both blowers must be on high speed during the charging operation.

(5) Allow the system to operate at full capacity for at least 15 minutes at the rpm shown in step (3). This will cause most of the compressor oil in the system to return to the compressor crankcase.

(6) Open the discharge right-hand gauge valve a small amount. This will allow the refrigerant vapor to discharge **slowly.**

CAUTION: Do not allow the system to discharge rapidly since this would sweep some of the refrigerant oil out of the compressor.

(7) Allow the system to discharge until the discharge pressure gauge registers zero. Open the left-hand valve to release any vapor trapped at the suction side of the system.

SWEEP-TEST CHARGE

The purpose of the sweep-test charge is to pressurize the system so that a leak test can be made. The sweep-test charge also serves the purpose of drying the system or sweeping out trapped moisture. Repairs and component replacement must be completed before charging with the sweep-test charge.

(1) Close both gauge set manifold valves and open the gauge set manifold needle valve.

(2) Attach the free end of the long hose used for discharging to the refrigerant dispensing manifold.

(3) Attach a single can of Refrigerant 12 to the dispensing manifold. Place the refrigerant in 125 degree water. For detailed instructions on attaching refrigerant can for charging, see "Charging the System" in this section.

(4) With vehicle windows open and hood up, operate engine at 1300 rpm.

(5) Push in "A/C" button, fan switch on high. On dual installation both blowers must be on high speed during the charging operation.

(6) Slowly open the left-hand gauge set manifold valve to meter the refrigerant into the system. When the full can of refrigerant has been metered into the system, close the gauge set manifold valves and the refrigerant manifold valve.

If the system has been opened for repair or replacement, a complete leak test must be made to make sure the system is sealed. Also, if the system has accidentally lost its charge it will be necessary to perform a leak test while the sweep-test charge is in the system. Stop the engine and disconnect the test hoses and adapters from the compressor service ports.

TESTING THE SYSTEM FOR LEAKS

The leak detector torch Tool C-3569 is a propane gas-burning torch used to locate a leak in any part of the refrigeration system. Refrigerant gas drawn into the sampling or "snifter" tube will cause the flame to change color in proportion to the size of the leak. A very small leak will produce a flame color varying from yellowish-green to bright green. A large leak will produce a brilliant blue flame.

CAUTION: Do not use the lighted detector in any place where explosive gases, dust, or vapor are present. Do not breathe the fumes that are produced by the burning of refrigerant gas. Large concentrations of refrigerant in the presence of a live flame become dangerously toxic. Observe the flame through the window of the burner shield, not through the top of the shield.

(1) Open the torch valve until you hear a faint hiss of escaping gas. Light the test torch and adjust the valve until the flame is very small. A small flame will detect large as well as small leaks, whereas, a large flame will detect only large leaks. As soon as the reaction plate seen through the window in the burner shield becomes red hot, the tester is ready for use.

(2) Examine all the tube connectors and other possible leak points by moving the end of the sampling

hose from point to point. Since Refrigerant 12 is heavier than air, it is good practice to place the open end of the sampling hose directly below the point being tested. Be careful not to pinch the sampling tube since this will shut off the air supply to the flame and cause a color change.

(3) Watch for a change in the color of the flame. Small leaks will produce a green color and large leaks a bright blue color. If leaks are observed at the tube fittings, tighten the connection, using the proper flare wrenches, and retest.

If the flame remains bright yellow when the tester is removed from a possible leak point, insufficient air is being drawn in through the sampling tube, or the reaction plate is dirty.

REMOVE SWEEP-TEST CHARGE

If the system is free of leaks, or after correcting a leak, if no air-conditioning components have been removed, add the necessary refrigerant as described under "Correcting the Low Refrigerant Level." If any parts of the refrigerant system were disconnected remove the sweep-test charge. Close the refrigerant manifold valve so that any refrigerant remaining in the container is sealed. Remove the long test hose from the refrigerant manifold. Insert the free end of this test hose into an exhaust system outlet. Open the right-hand gauge set manifold valve a fraction of a turn to let the sweep-test charge escape slowly. Allow the system to discharge until the discharge pressure gauge registers zero. Open the left-hand gauge valve to allow any refrigerant trapped in the suction side of the system to escape.

REPLACE THE RECEIVER-DRIER

The system must be discharged and swept with a test charge before replacing the receiver-drier.

To remove the receiver-drier, simply unscrew it at the fittings and disconnect Low Pressure Cut-out wires. When installing a new receiver-drier, use new "O" rings. Tighten the new unit to 40 foot-pounds. **Do Not** overtighten as this might damage the "O" rings. Connect Low Pressure Cut-out wire.

CAUTION: Replacement receiver-drier-strainer units must be sealed while in storage. The drier used in these units is so hungry for moisture that it can saturate quickly upon exposure to the atmosphere. When installing a drier, have all tools and supplies ready for quick reassembly to avoid keeping the system open any longer than necessary.

EVACUATE THE SYSTEM

Whenever the system has been opened to atmosphere, it is absolutely essential that the system be

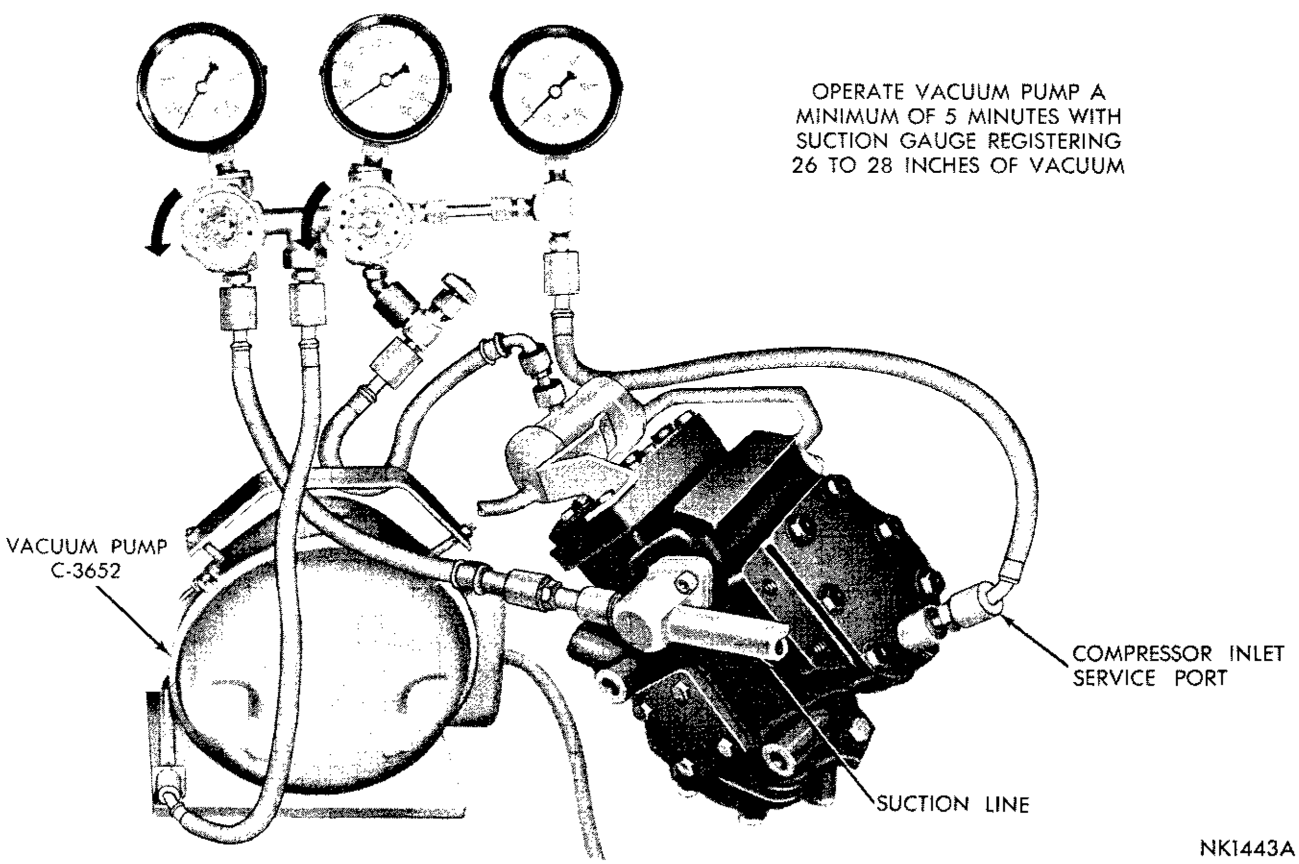


Fig. 1—Evacuating the System

swept with refrigerant and evacuated or "vacuumed" to remove all the air and the moisture. If any appreciable amount of air remains in the system when it is charged, the trapped air will concentrate near the top of the condenser and cause abnormally high discharge pressure. Air in the system will reduce the condenser's ability to condense the refrigerant gas and supply adequate liquid refrigerant to the evaporator. To evacuate the system, proceed as follows:

(1) Connect gauge set manifold to compressor and long test hose from gauge set manifold center connection to vacuum pump, Tool C-3652. (Fig. 1).

(2) Open both gauge set manifold valves, and the needle valve.

(3) Start the vacuum pump and operate until the evaporator suction gauge registers at least 26 inches of vacuum. If system is tight and pump in good condition, vacuum will go as low as 28 inches.

(4) Allow vacuum pump to operate with the suction gauge registering 26 to 28 inches of vacuum for a minimum of five minutes.

(5) Close both gauge set manifold valves, turn off vacuum pump and remove test hose from vacuum pump. Leave gauge set manifold connected to compressor. Charge system with proper amount of Refrigerant 12. **Failure to pull at least 26 inches of vacuum indicates a leak in the refrigeration system or a defective vacuum pump. Locate and correct the trouble before recharging the system.**

CHARGING THE SYSTEM (Fig. 2)

An accurate scale must be used to insure charging with the proper amount of refrigerant.

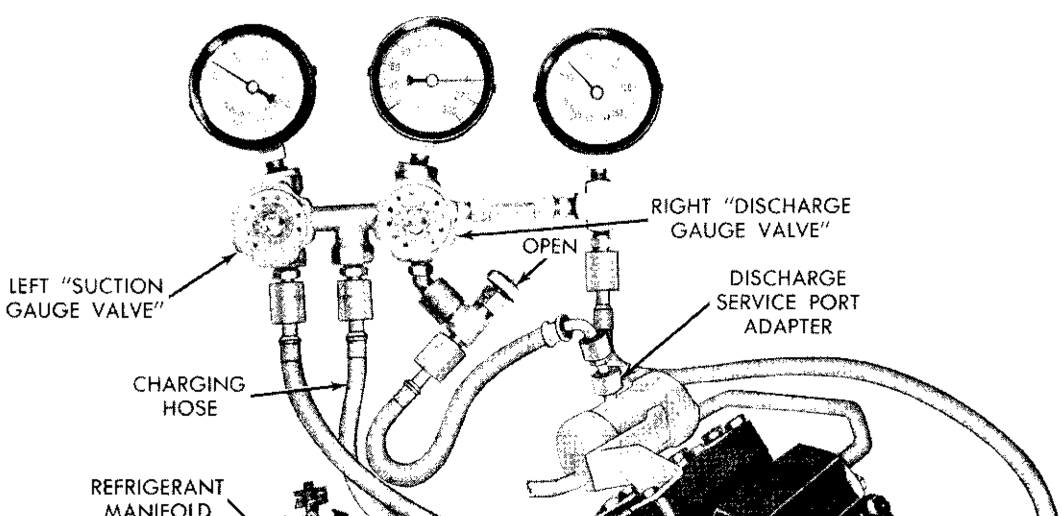
REFRIGERANT CHARGE

Single	Dual
3 lbs. 2 oz. to 3 lbs. 6 oz.	4 lbs. 2 oz. to 4 lbs. 6 oz.

The special refrigerant dispensing manifold permits charging three full cans of refrigerant at one time.

Keep the refrigerant manifold valves capped when not in use. Keep a supply of extra refrigerant-can-to-refrigerant-manifold gaskets on hand so that gaskets can be replaced periodically. This will insure a good seal without excessive tightening of the can or the manifold nuts.

(1) Attach center hose from gauge set manifold to refrigerant dispensing manifold. Turn refrigerant manifold valves completely counterclockwise so they



are fully open. Remove protective caps from refrigerant manifold.

(2) Screw refrigerant cans into manifold. Be sure manifold-to-can gasket is in place and in good condition. Tighten can and manifold nuts to 6 to 8 foot-pounds.

(3) Turn three refrigerant manifold valves completely clockwise to puncture the cans and close the manifold valves.

(4) Turn refrigerant manifold valves counterclockwise to open them.

(5) Momentarily loosen the charging hose at the gauge set manifold to allow the refrigerant gas to purge air out of the charging hose.

(6) Place the three cans of refrigerant into a pan containing hot water at a temperature of 125 degrees F.

(7) Start engine and adjust speed to 1300 rpm.

(a) Charge the system through the suction side of the system by slowly opening the left-hand gauge set manifold valve. Adjust valve as necessary so charging pressure does not exceed 50 psi. Maintain the temperature of the water in the pan by adding warm water as necessary.

(b) When all three cans of refrigerant are completely empty, close gauge set manifold valves and refrigerant manifold valves.

(c) If more than three cans of refrigerant are necessary to complete charge repeat steps two through six.

SERVICE PROCEDURES

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HANDLING TUBING AND FITTINGS

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed.

The system must be completely discharged before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly. Use a suitable tube bender when bending the refrigerant lines to avoid kinking. **Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing.**

A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose. Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 3 inches from the exhaust manifold. It is good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.

"O" rings and fittings must be in good condition. The slightest burr or foreign material may cause a leak. "O" rings and fittings must be coated with refrigerant oil to allow the connections to seat squarely and to be tightened evenly to the proper torque. Fittings which are not oiled with refrigerant oil are almost sure to leak (Fig. 1).

The use of proper wrenches when making connections is very important. Improper wrenches or improper use of wrenches can damage the fittings. Al-

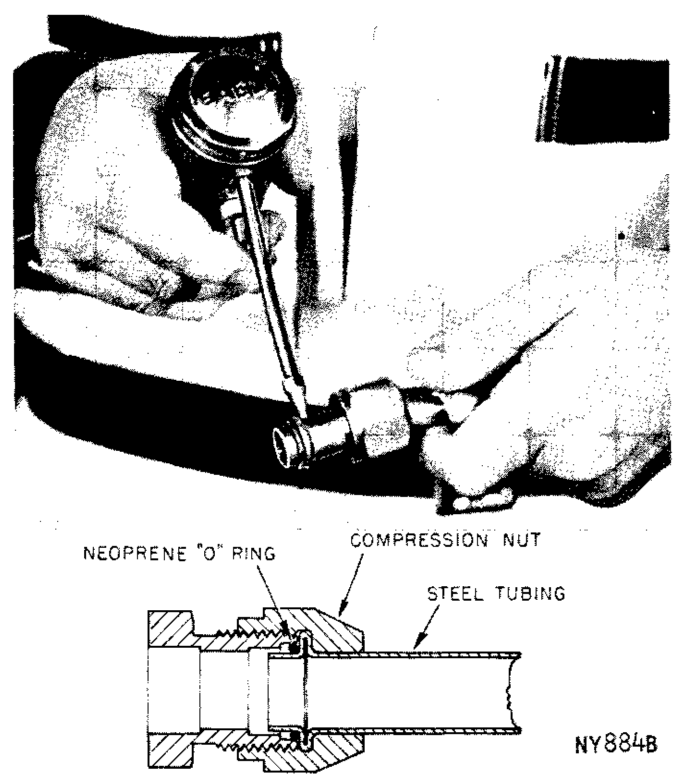


Fig. 1—Lubricate with Refrigerant Oil (Typical)

ways use two wrenches when loosening or tightening tube fittings to prevent distorting of lines and com ponents.

The internal parts of the refrigeration system will remain in a state of chemical stability as long as pure-moisture-free Refrigerant 12 and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability and cause operational troubles or even serious damage if present in more than minute quantities.

When it is necessary to open the refrigeration system, have everything you will need to service the system ready so that the system will not be left open any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are ready to be used.

All tools, including the refrigerant dispensing manifold, the gauge set manifold and test hoses should be kept clean and dry.

The special refrigeration oil supplied for the system is as clean and dry as it is possible to make it. **Only refrigeration oil** should be used in the system or on the fittings and lines. The oil container should be kept tightly capped until it is ready for use, and then tightly capped after use to prevent entrance of dirt and moisture. Refrigerant oil will quickly absorb any moisture with which it comes in contact.

COMPRESSOR DRIVE BELT ADJUSTMENT

If the proper tensions are not maintained, belt slippage will greatly reduce air-conditioning performance and drive belt life.

(1) Adjust air-conditioning drive belts at the time of new-car preparation. See Chart, "Accessory Belt Drives." Group 7—Cooling.

(2) Measure drive belt tension at regular service intervals using torque method, and adjust as needed.

(3) Always replace belts in pairs if so equipped, otherwise the old belt will have insufficient tension and the load will be primarily on the new belt.

ANTIFREEZE RECOMMENDATIONS

The Air-Conditioning System requires the engine's cooling system to be protected to +15°F. with a permanent type antifreeze for summer operation. This is to prevent freezing of the coolant in the heater core.

However, this protection does not provide sufficient corrosion inhibitors for the engine cooling system. Summer protection to —15°F. will provide adequate inhibitors for protection of engine cooling system against corrosion.

In the springtime, after the winter's operation with the cooling system protected with permanent-type antifreeze for the temperatures of the area, it is suggested the system be drained and flushed out with water. When draining, flushing and refilling, have the temperature control lever in the extreme hot position so the heater core is drained, flushed and refilled. Install a gallon of permanent type antifreeze in the system, and add enough water to fill the system.

Do not re-use the old antifreeze. The permanent type antifreeze does not lose its antifreeze qualities during the winter season operation, but the chemical inhibitors for rust and corrosion prevention are weakened and finally exhausted by extended use. Do not add new inhibitor to used antifreeze in hope of revitalizing the used antifreeze.

The chemical inhibitors come in various chemical compositions, some are compatible, some neutralize each other, and some form violent reactions to each other causing foaming and other undesirable reactions. Play it safe and use new permanent-type antifreeze.

RADIATOR PRESSURE CAP

Air conditioned vehicles must be equipped with a 15 to 16 psi radiator cap.

A radiator pressure cap testing below these specifications will permit loss of coolant during a hard pull on a hot day, or in slow moving traffic, or when the engine is stopped on a hot day.

Test the radiator pressure cap, using Tool C-4080 (Fig. 2). Before assembling adapter and radiator pressure cap to the pump, dip radiator cap and both ends of adapter into clean water to assure a tight seal.

Hold the assembled tester in a vertical position with the radiator cap downward. (Fig. 2). Stroke the tester pump plunger until the gauge indicates the pressure cap is relieving pressure. It must relieve at a pressure between 14 to 17 psi. If within these specifications, reinstall on the radiator.

These test specification are for caps tested at average altitudes. In high altitudes, the test specifications are lowered about one (1) psi for each 2,000 feet above sea level.

If the radiator cap does not test within these specifications, replace it with a cap that does.

VACUUM CONTROL SYSTEM ADJUSTMENTS AND TESTS

The test of the push-button operation determines whether or not the vacuum and electrical circuits are properly connected and the controls are functioning properly. However, it is possible that a vacuum control system that operates perfectly at the high vacuum provided at engine idle speed may not function

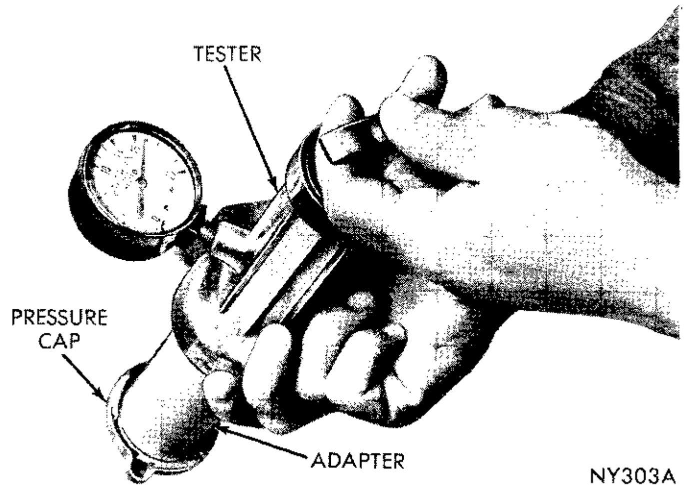


Fig. 2—Radiator Cap Tester

properly at high engine speeds. Before starting this test, stop engine and make certain the vacuum source hose at engine intake manifold is tight on its connector.

Start vacuum pump (Tool C-3652) and connect to the vacuum test set (Tool C-3707). Adjust bleed valve on test set to obtain exactly 8 inches of vacuum with a finger blocking the prod on end of test hose (Fig. 3).

It is absolutely essential that the bleed valve be adjusted so the vacuum gauge pointer will return to exactly 8 inches when the prod is covered by a finger. Otherwise a false reading will be obtained when the control circuit is tested.

CAUTION: Alternately release and reblock the hose prod several times. Make sure the bleed valve is adjusted so the vacuum gauge pointer returns to exactly 8 inches of vacuum when the prod is covered with a finger.

Disconnect engine vacuum source hose at engine intake manifold and insert vacuum tester hose prod into source hose leading to control switch. Place vacuum gauge on the cowl so it can be observed from the driver's position as push buttons are operated.

Start the test by pushing the "Heat" button. Vacuum tester gauge needle will drop until the actuator has operated, and then will return to 8 inches. Note how much the vacuum drops below 8 inches. Continue to push buttons; "Off," "Max A/C" "A/C" "Defrost" and "Heat" allowing time for actuators to operate after each button is pushed, and note the vacuum drop below 8 inches after each operation. The maxmium allowable vacuum drop below 8 inches after each operation is 3/4 inch.

If the vacuum drop is more than 3/4 inch, first recheck the tester for reading exactly 8 inches. If correct, inspect the fit of the 7-hole hose connector plug on the control switch (Fig. 4). This plug must be positioned all the way on the 7 prods on the control switch.

CAUTION: Do not use lubricant on the switch prods or in the holes in the plug, as lubricant will ruin the vacuum valve in the switch. If it is impossible to properly position the connector plug all the way on the switch prods, put a drop or two of clean water in the holes of the connector plug. This will allow the plug to slide completely on the switch prods.

If vacuum drop is now within limits, proceed with the over-all performance test. If vacuum drop is still in excess of 3/4 inch, remove connector plug from the switch. Insert the vacuum test prod alternately in each of the connector holes except the source hose connector hole (Fig. 5). Note amount of vacuum drop **below** 8 inches after each actuator has operated. If vacuum test gauge comes back to 8 inches at each of the 6 holes, the hoses and actuators are not leaking. The control switch is faulty and must be replaced. If excessive vacuum drop shows up at one or more holes in connector block, isolate faulty hose or actuator.

Inspect hose connections to the actuator involved. Then test whether actuator or hose is at fault; use the test hose on the actuator involved (Fig. 6).

A leak in a hose may be detected with leak tester by running the fingers along the hose and watching vacuum gauge reading. A faulty spot may be cut out

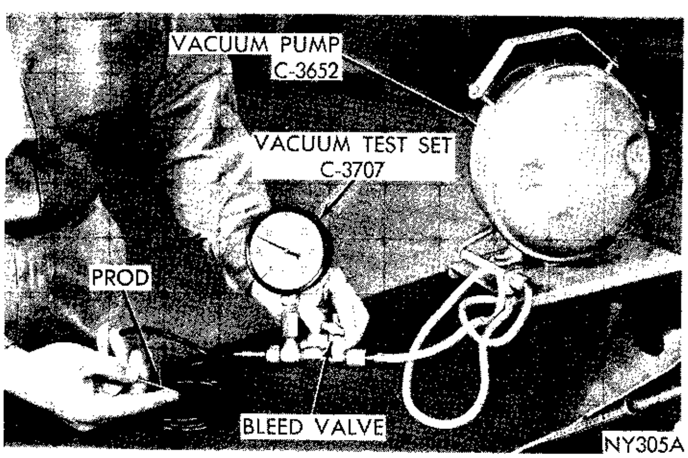


Fig. 3—Adjusting Vacuum Test Bleed Valve

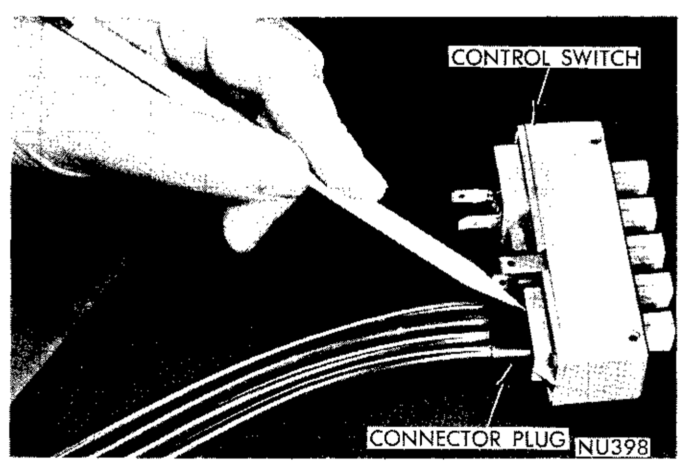


Fig. 4—Push Button Vacuum Test

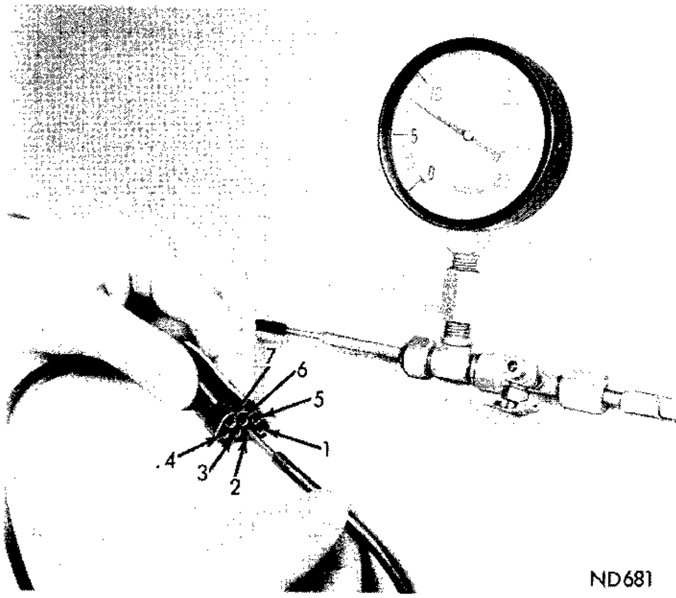


Fig. 5—Vacuum Tube Assembly Test

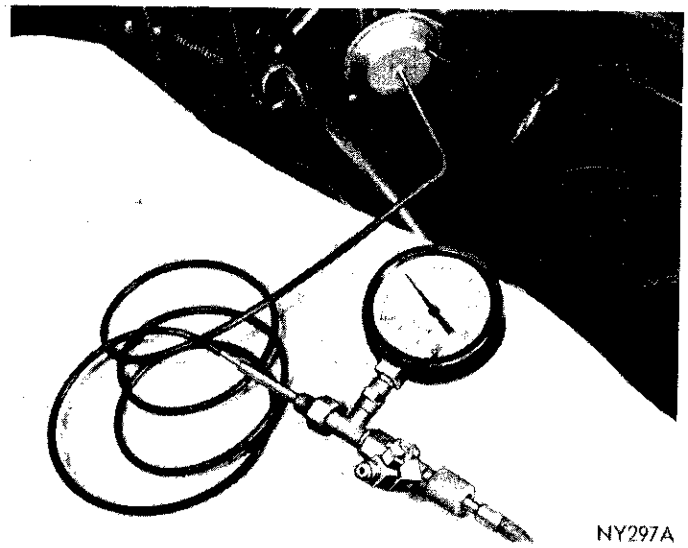


Fig. 6—Vacuum Actuator Test

and the hose spliced, using 1/8 inch 00 copper tubing.

A vacuum drop in excess of 3/4 inch below the 8 inches needed in this test would not interfere with the engine operation, other than perhaps to cause a rough idle. It could, however, interfere with the proper operation of the air-conditioning and heating controls at high speeds and during acceleration.

SERVICING THE COMPRESSOR

INDEX

MAGNETIC CLUTCH

The compressor is equiped with an electro-magnetic clutch that is built-in the drive pulley assembly. (Fig. 1). An electro-magnetic field coil is mounted on the compressor and electrical connections are made directly to the coil lead. The electro-magnet does not rotate with the drive pulley, therefore, collector rings and brushes are eliminated.

Testing Electromagnet 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 field coil lead. The current draw at 12 volts and 68° temperature should be as follows:

2.7 to 3.3 amperes for Warner (Copper Wire).

4.0 to 4.6 amperes for Warner (Aluminum Wire). **Note:** Housings on Aluminum coils bear the letter "AL".

Removal (All)

(1) Loosen and remove the belts. Disconnect clutch field lead wire at the connector.

(2) Remove the special locking bolt and the washer from the compressor crankshaft at the front center of the clutch.

(3) Insert a 5/8"-11 X 2-1/2" cap screw into the threaded portion of the hub assembly.

(4) Support clutch with one hand, then tighten cap screw until clutch is removed.

(5) Remove the three hexagon head screws attaching the clutch field assembly to the compressor and lift off the assembly.

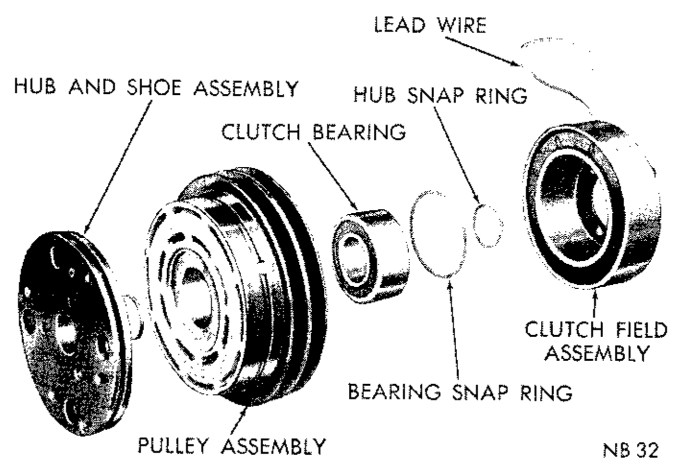


Fig. 1—Warner Clutch

Installation (All)

(1) Install clutch field coil assembly on the base of compressor bearing housing. Make sure coil assembly is positioned so lead wire points to left of compressor as viewed from the front. Install the three mounting screws and tighten to 17 inch-pounds.

(2) Insert woodruff key in the crankshaft.

(3) Insert clutch assembly on crankshaft.

(4) Install washer and a new self-locking bolt. Hold clutch from turning with a spanner wrench inserted in the holes of front bumper plate. Tighten to 20 foot-pounds.

(5) Connect field lead wire.

(6) Install belts and tighten to specified tension.

Disassembly

(1) Remove the small snap ring from the drive hub.

(2) Install drive hub puller Tool C-3787 aligning the three pins of the Tool in the three holes in the hub and shoe assembly. Tighten the hex head bolt down until the drive hub is removed from the bearing (Fig. 2).

(3) Remove bearing snap ring from pulley.

(4) Place pulley assembly on an arbor press, with pulley side down, and bearing hub centered on Tool C-3825. Install Tool SP-3496 on inner race of bearing and press the bearing from pulley assembly (Fig. 3).

A new bearing must be installed every time the magnetic clutch is disassembled.

Assembly

(1) Install pulley assembly with pulley side up on an arbor press and insert a **new** bearing into the bore. Install Tool C-3807 against the bearing and press into position (Fig. 4).

(2) Install pulley assembly with pulley side facing down on Tool C-3807.

(3) Start drive hub into the inner bearing race, and press hub into position with an arbor press.

(4) Install bearing snap ring and hub snap ring.

CAUTION: The pulley assembly and hub assembly are mated parts. They are burnished at the factory before shipment. No attempt should be made to replace either unit separately as this may reduce the initial torque of the clutch.

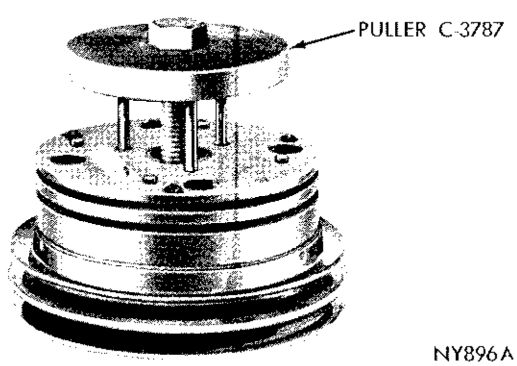


Fig. 2—Removing the Hub and Shoe Assembly

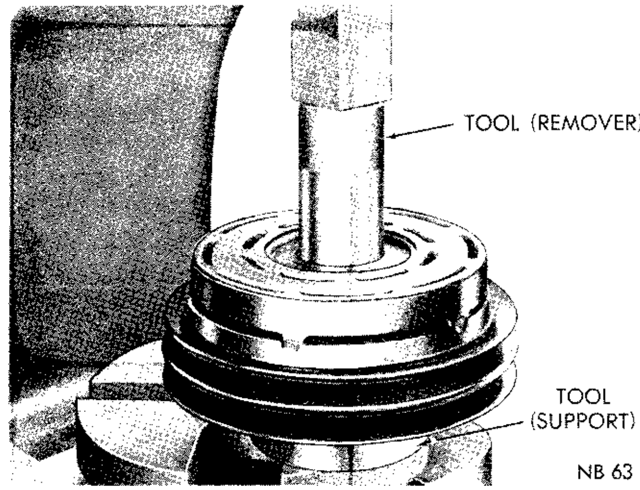


Fig. 3—Removing the Bearing from Pulley Assembly

COMPRESSOR

The compressor is a two-cylinder, reciprocating-type designed specifically for the Chrysler Air-Conditioning System. Service parts are available so that the compressor can be repaired in the field.

Fig. 5 is a disassembled view of the compressor with the nomenclature of the parts. Some parts are serviced individually and some are serviced in packages which include two or more service parts. Refer to the parts book for this information.

CAUTION: The refrigerant oil used in the compressor is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in the system when the refrigerant is discharged for testing or unit replacement. If the compressor is to be removed for repair or replacement, measure the refrigerant oil level in the compressor before the compressor is removed from the vehicle so that the same oil level can be established when the new or repaired compressor is installed on the vehicle.

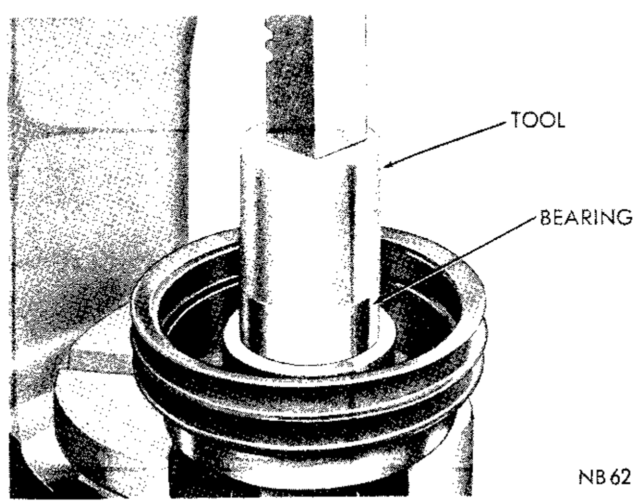


Fig. 4—Installing a New Bearing in the Pulley Assembly (Typical)

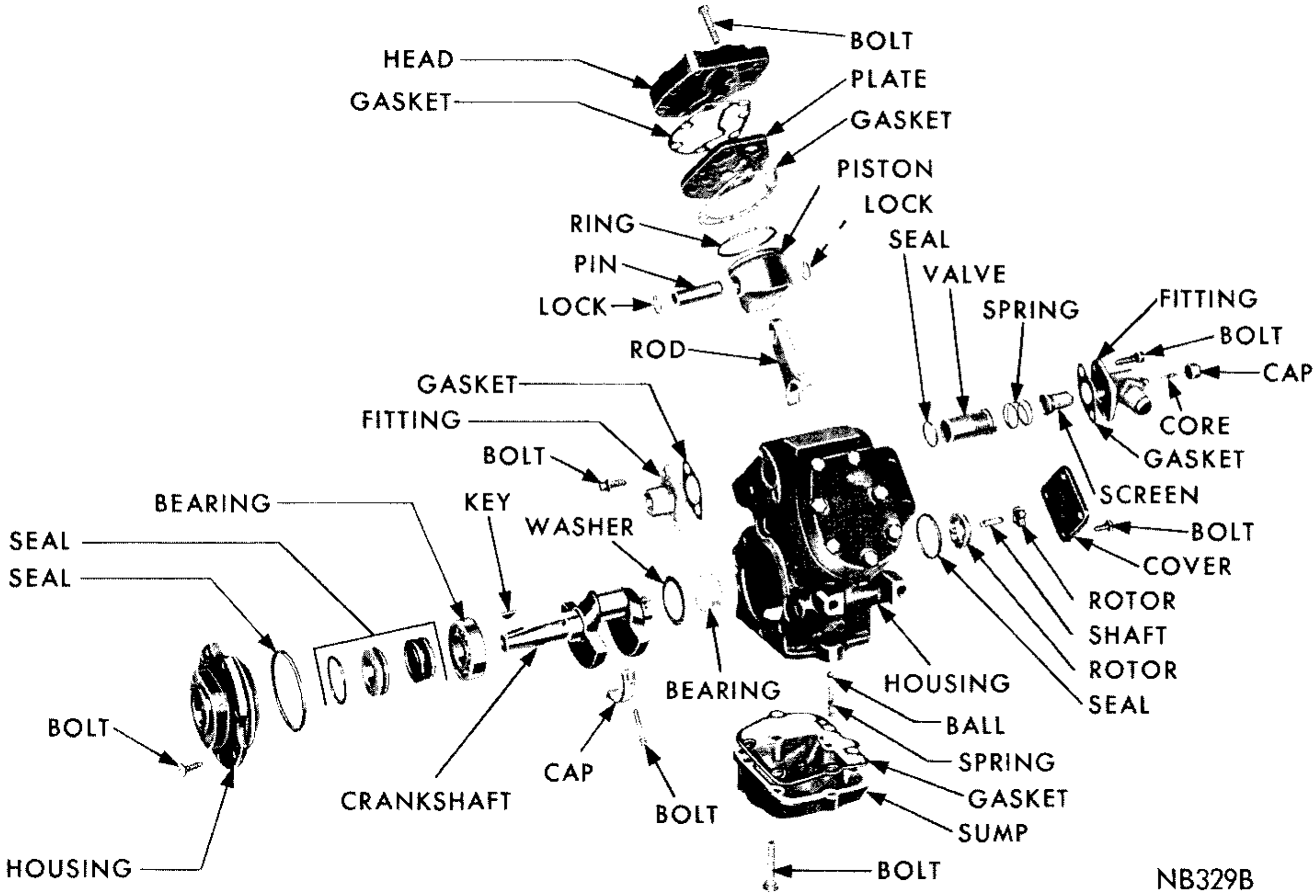


Fig. 5—Compressor Disassembled

Too much refrigerant oil in the system can cause abnormal operating pressures and reduce the performance of the entire system.

Complete disassembly and assembly of the compressor must be performed with the compressor removed from the vehicle. On some models however, the valve plate and crankshaft gas seal assemblies can be repaired with compressor installed on vehicle.

CAUTION: The system must be completely discharged before attempting to perform any disassembly or repair service to the compressor. Before bleeding system down, cover clutch with a cloth to prevent contamination of clutch pole faces.

Before disassembling the compressor, clean exterior surfaces thoroughly.

Cleanliness is extremely important. The work area must be clean and free of air-borne dust and dirt. All parts must be thoroughly cleaned and blown dry before reassembly.

Do not use air to dry the crankshaft front main bearing. Wash bearing in **clean** mineral spirits and shake out all excess cleaning fluid. Saturate bearing with **clean refrigerant oil** and assemble immediately. Any dirt in the front main bearing assembly will cause noisy operation and possible damage to bearing.

CAUTION: Before reassembly of any unit, all contact surfaces must be liberally coated with clean refrigerant oil. Refrigerant oil must be kept in a sealed container until ready for use to prevent entrance of moisture and dirt. Never use engine oil as a substitute for refrigerant oil.

EPR VALVE

Removal (System Discharged)

(1) Remove the two "EPR" Valve suction line fitting bolts, the fitting which also contains the compressor suction screen, spring, and the gasket.

(2) Remove the "EPR" Valve and "O" ring from the compressor using Tool C-3822, by rotating the valve counterclockwise slightly (Fig. 6).

CAUTION: Do not handle the "EPR" Valve more than necessary. The valve should be inspected externally and wiped clean with a lint-free cloth. Place the valve in a plastic bag until ready to be installed.

Installation

(1) Install new "O" ring on the "EPR" Valve.

(2) Lubricate "O" ring with refrigerant oil and install "EPR" Valve in the compressor with Tool C-3822

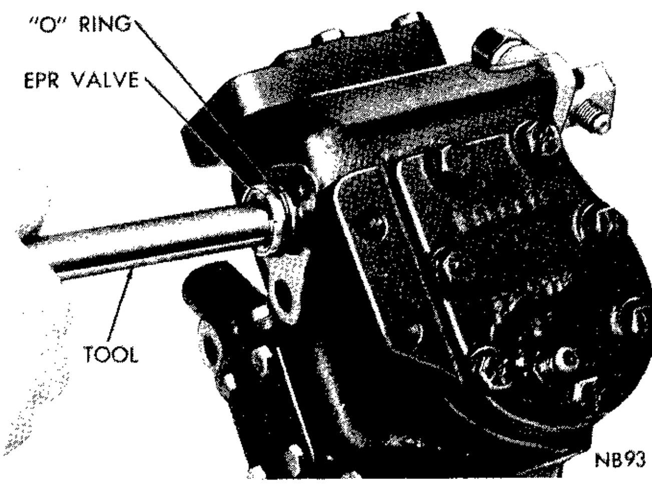


Fig. 6—Removing the EPR Valve

while rotating the valve counterclockwise.

(3) Install compressor suction screen in the "EPR" Valve suction line fitting.

(4) Install suction line fitting gasket, spring, fitting, and tighten the attaching bolts to 8 to 14 foot-pounds.

COMPRESSOR

Removal

(1) Discharge the system. (Refer to "Discharging the System.")

(2) Measure and record the refrigerant oil level so that the oil level of a replacement or repaired compressor can be adjusted to the **exact level in the compressor removed from the vehicle.** See "Oil Level."

(3) Disconnect suction line from suction muffler and the discharge line from the muffler fitting.

CAUTION: Plug or cap all the lines as soon as they are disconnected to keep the moisture out of the system.

(4) Disconnect the magnetic clutch-to-control-unit wire.

(5) Loosen and remove compressor pulley belts.

(6) Remove the compressor-to-bracket attaching bolts, and remove compressor.

Installation

(1) Install the compressor to the bracket, and tighten the attaching bolts.

(2) Install compressor pulley belts.

(3) Connect magnetic clutch-to-control-unit wire.

(4) Remove the caps or plugs and connect the suction line to the suction muffler and connect discharge line to the muffler fitting.

CAUTION: When replacing the compressor assembly, the crankshaft should be rotated by hand at least two complete revolutions to clear oil accumulation from the compressor head before the clutch is energized to avoid damaging the compressor reed valves. IMPORTANT: After the compressor is installed on the engine, the oil level must be adjusted to at least 6 ounces and not more than 8 ounces. (Fig. 7).

Oil Level

When a new compressor is installed at the factory, the compressor contains 10 to 11 ounces of a special wax-free refrigerant oil. While the air conditioning system is in operation, the oil is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in various parts of the system. Consequently, once the system has been in operation, the amount of oil left in the compressor will always be less than the original charge of 10 to 11 ounces.

The compressor oil level should be checked as a matter of routine, whenever the refrigerant has been released from the system.

(1) Operate the system for 15 minutes at 1000 engine rpm. This engine setting will provide a compressor speed of approximately 1200 rpm.

(2) Open car windows and keep engine hood raised.

Engine	Dipstick Reading Inches @ 6 ounces Minimum	Dipstick Reading Inches @ 8 ounces Maximum
318, 383 & 440	1-5/8"	2-3/8"
Compressor Set Vertically on Bench	1-5/8"	2-3/8"

(3) Press the A/C button and turn blower switch to high. **On completion of the above operations, shut the air conditioning off, without changing any of the described settings.**

After the system has been bled down, wait ten minutes for refrigerant to boil off and then measure the oil in the compressor by inserting a dipstick (made up as shown in Figure 7) through the crankcase oil

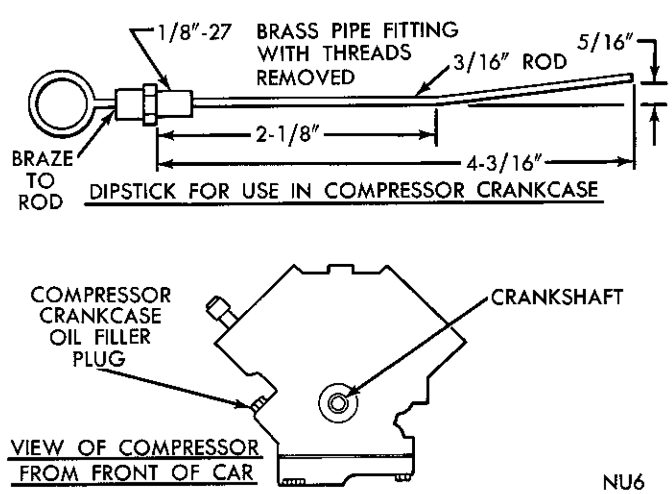


Fig. 7—Compressor Dipstick Chart

filler hole. Measure the height on the dipstick and determine the amount of oil in the unit by referring to the following chart: **Dipstick reading should be at least six ounces and not more than eight ounces.**

If the sump contains less than six ounces of oil, add fresh clean refrigerant oil to bring the level to the minimum shown in the table above. **Remove any oil in excess of eight ounces.**

CYLINDER HEAD AND VALVE PLATE ASSEMBLY

Removal

(1) Remove the cylinder head bolts, head and valve plate assembly. If plate does not separate from head, tap the removing lip on the valve plate lightly with a plastic hammer (Fig. 8). Do not pry apart.

Inspection

After removal of head, plate and gaskets, examine the valves. If valves are broken and the damage extends to cylinder bores, examine bores to see if they can be repaired by removing light scoring, scuffing or scratches with a crocus cloth. After conditioning cylinder bores, clean surfaces of cylinder block, valve plate and head thoroughly with mineral spirits.

Use care to remove all shreds of old gasket from plate, block and head surfaces. Clean attaching stud holes in the block. If valve plate or cylinder head is damaged, replace, using a complete compressor valve plate replacement package.

CAUTION: Do not touch or pry the reed valves.

Installation

(1) The valve plate and the cylinder head must be

Fig. 8—Valve Plate and Head Removing Lip

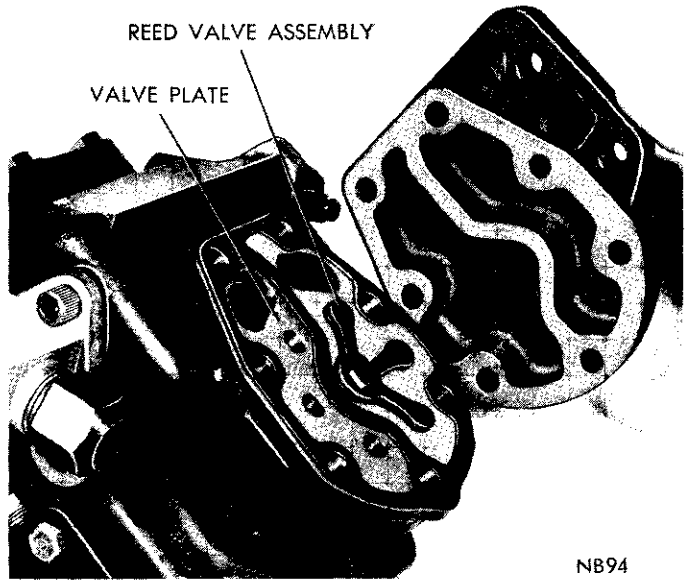


Fig. 9—Valve Plate—Installed Position

assembled with the reed valve assembled as shown. (Fig. 9).

(2) Using the pilot studs as a guide, install the valve plate gasket, valve plate, cylinder head gasket and cylinder head. (Fig. 10).

(3) Install the attaching bolts. Tighten each bolt alternately and evenly 18 to 24 foot-pound (name plate bolts) and 20 to 26 foot-pounds on the remaining bolts.

PISTON AND CONNECTING ROD

Removal

(1) Drain oil from compressor.

(2) Remove sump attaching bolts.

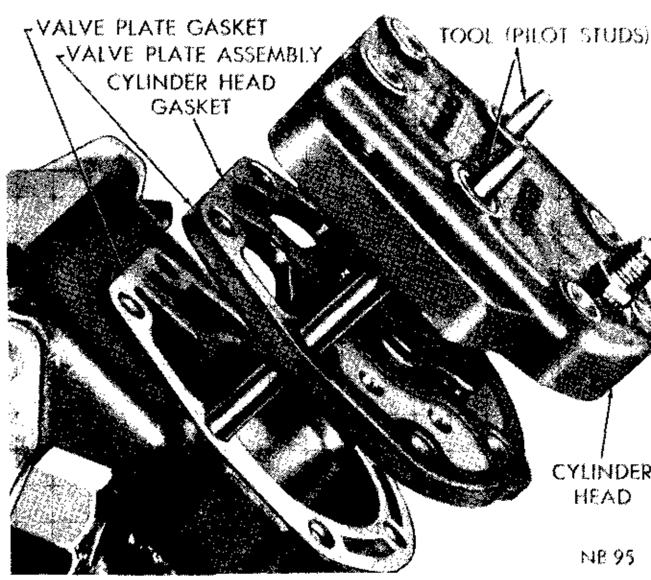


Fig. 10—Installing the Valve Plate and the Cylinder Head

(3) Separate the sump from the case by tapping with a plastic hammer being careful not to distort the oil pressure relief spring.

(4) Remove oil relief spring and (rubber) ball from crankcase.

(5) Remove cylinder heads and valve plates. **Before removing the pistons, rods or rod caps, mark all parts to insure reassembly in the original position.**

(6) Remove rod caps; remove piston and rod assembly from cylinder.

Inspection

Inspect piston and rings for score marks. Inspect rod bearing for pits and for chipping. Replace parts if damaged.

Installation

(1) Remove bearing cap and install piston in bore. Use piston ring compressor to prevent ring damage.

(2) Install bearing caps, and tighten screws 50 to 60 inch-pounds. Be sure each cap is installed in its original position.

(3) Install valve plates and cylinder heads.

(4) Turn compressor upside down. Install pilot studs, gasket, oil pressure relief ball and spring.

(5) Install the sump over pilot studs (Fig. 11), making sure the oil pressure relief spring depresses uniformly as the sump is lowered on the case.

(6) Tighten sump bolts finger tight to prevent spring misalignment, then tighten 14 to 20 foot-pounds.

(7) Refill with new refrigerant oil after the compressor is installed on vehicle. Do not re-use the oil that was previously drained.

CRANKSHAFT BEARING HOUSING AND GAS SEAL

Replacement (System Discharged)

The gas seal may be replaced with the compressor installed in the vehicle or with the compressor removed and placed on a workbench.

Special care should be taken when installing the new seal in a compressor mounted on the engine, that the carbon ring does not fall out of its housing. Adequate lubrication of the rotating seal assembly prior to installation on the compressor shaft, will prevent the carbon ring from falling out of place.

If the compressor has been removed from the vehicle, it should be placed on its back, to facilitate seal replacement.

The crankshaft gas seal replacement package consists of the crankshaft gas seal assembly and crankshaft bearing housing seal seat plate. Two types of crankshaft seals are supplied for service (Fig. 13). If the replacement package contains the cartridge-type seal, follow the entire installation procedure given below. If the replacement package contains the unitized type seals, follow the appropriate sections only.

Removal

(1) Loosen belt, remove clutch, coil and drive key.

(2) Remove crankshaft bearing housing seal bolts.

(3) Remove bearing housing from crankshaft, using two screwdrivers inserted in the slots provided, to pry the housing from the case (Fig. 12).

(4) Remove bearing housing oil seal.

(5) Remove gas seal seat plate from the bearing housing. This is part of the gas seal replacement package and must be replaced when the gas seal assembly is replaced.

(6) Clean the front bearing housing thoroughly.

Installation

(1) Immerse the new seal seat in clean refrigerant oil and install in the bearing housing with the smooth (micro finish) side up. Use a sleeve with the minimum inside diameter of 1-3/8″ to avoid damaging the micro finish sealing surface of the face plate. Tap the sleeve lightly until the seal seat is fully seated in the housing.

(2) Before installing the cartridge-type assembly, inspect the assembly to make sure that the tangs of the carbon seal are indexed in the slots of the mating, steel part (Fig. 13).

(3) Immerse the seal assembly in clean refrigerant oil, carbon ring up.

(4) Hold the seal assembly firmly at the outside edge, at the same time preventing the ring from coming out of position. Do not touch the sealing face of the carbon seal.

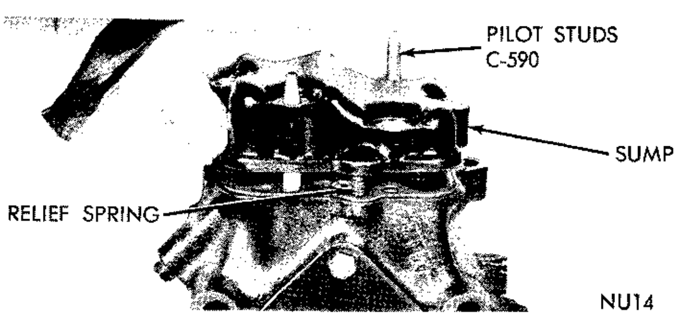


Fig. 11—Installing the Compressor Sump

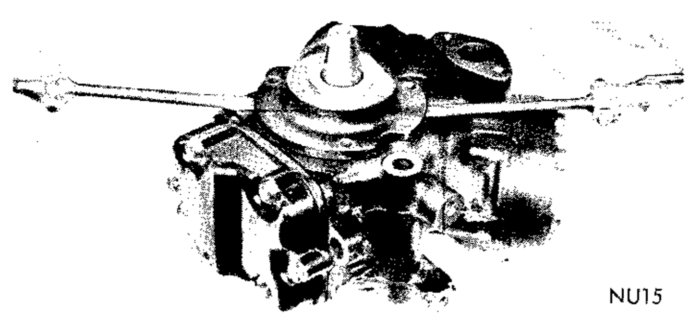


Fig. 12—Removing the Crankshaft Bearing Housing

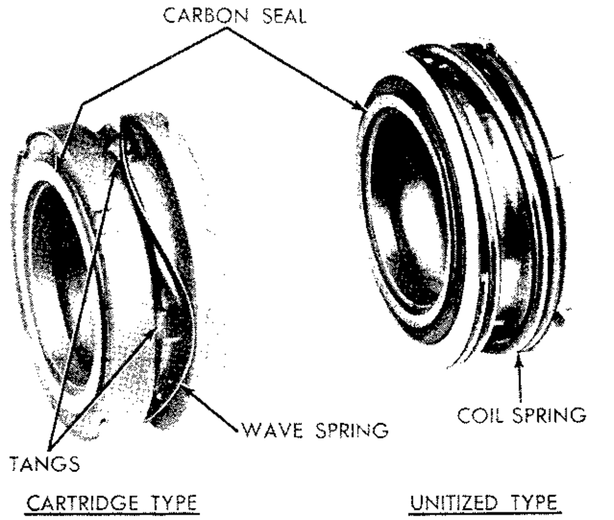


Fig. 13—Gas Seal Identification

(5) When the seal bottoms against the crankshaft bearing, inspect the indexing tangs of the carbon ring again.

(6) Oil the bearing housing oil seal and install. (Make certain that the seal is evenly stretched into position.)

(7) Wipe the seal seat clean with a lint-free cloth, and re-oil with refrigerant oil.

(8) Install the bearing housing, taking care to ensure that the "nose" of the crankshaft does not touch the seal seat in the bearing housing.

(9) Insert 5, 1/4 x 20 screws and pull bearing housing squarely into position. This must be done 1/2 turn at a time per screw so that the ball bearing outer race will not be jammed by the bearing housing.

(10) Replace drive key in shaft.

(11) Assemble clutch to compressor and turn crankshaft by turning clutch armature. No more than 10 inch-pounds of torque should be required to turn crankshaft. If shaft is tight, remove clutch and loosen the bearing housing screws until shaft loosens up. Again, slowly tighten screws.

(12) Check the oil level which should meet the requirements of the oil check.

(13) Install clutch package on compressor, applying 20 ft-lbs. torque to tighten the clutch center mounting bolt. Install and tighten belts. Evacuate system and recharge.

CRANKSHAFT AND BALL BEARINGS

Removal

(1) Remove cylinder heads and valve plates.

(2) Remove pistons and connecting rods.

(3) Remove crankshaft bearing housing and gas seal. **The pistons and rods must be completely removed before the crankshaft removal.**

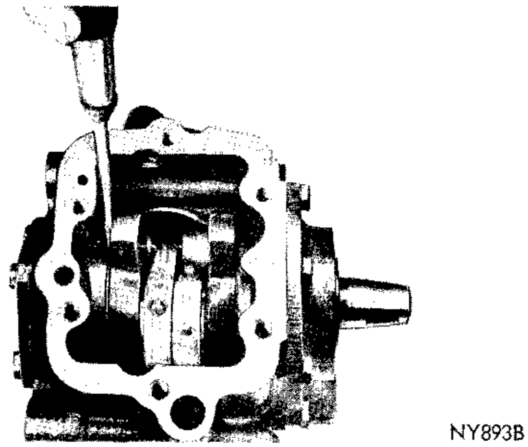


Fig. 14—Measuring Crankshaft Axial Movement

(4) Remove crankshaft and thrust washer from crankcase.

(5) To remove the crankshaft ball bearing, use a small arbor press. Make sure bearing is properly supported before pressing bearing from shaft.

Inspection

Clean and inspect all the parts. Replace questionable parts as required. If the crankshaft ball bearing is in good condition and clean, protect it against entry of dirt and re-use it. If bearing is serviceable but dirty, or there is evidence of dirt, clean it carefully with mineral spirits and shake dry. Saturate bearing with clean refrigerant oil and assemble immediately. If a new bearing is to be installed, leave it wrapped in its protective package until ready for installing. **Do not wash a new bearing assembly before installation. Do not spin bearing with air.**

Installation

(1) Press crankshaft ball bearing on crankshaft using a sleeve which bears on inner race **only.**

(2) Install crankshaft, making sure the thrust washer is on the rear bearing journal before placing crankshaft in the crankcase.

(3) Rotate crankshaft to engage the oil pump shaft in the crankshaft slot.

(4) Install new gas seal and crankshaft bearing housing. Use a suitable tool, as shown in Fig. 14 to assure free axial movement.

(5) Install pistons and connecting rods.

(6) After pistons and connecting rods are installed, turn the crankshaft to check freeness. Shaft should turn without binding.

(7) Install oil sump, valve plates and cylinder heads, using new gaskets.

OIL PUMP

Removal

To remove oil pump, it is not necessary to drain the refrigerant oil from the crankcase.

(1) Remove oil pump cover plate and oil seal.
(2) Remove drive shaft and rotors.

Installation

(1) Install oil pump drive shaft by rotating the shaft until tang end engages in the crankshaft slot.
(2) Install inner rotor on the drive shaft, engaging the drive.
(3) Install outer rotor, and rotate it until it will slide forward over inner rotor cams. Turn compressor crankshaft with the oil pump in this position to determine that rotors do not bind.
(4) Install oil pump cover plate and oil seal.
(5) Tighten bolts 8 to 14 foot-pounds.

EVAPORATOR HEATER ASSEMBLY

INDEX

GENERAL INFORMATION

Imperial—Installations

Two types of original equipment air conditioner options are available. The first option is the Automatic Temperature Control System which automatically controls the heating and air conditioning operation of the vehicle to maintain a selected interior temperature. In cold weather, the system provides heat as soon as the warm air is available. When outside temperature increases, the system provides cool dehumidified air.

The unit will heat or cool according to ambient temperature, interior temperature, and control setting; in varying degrees of either heating or cooling without any action on part of operator other than dialing desired temperature and setting system on "Auto".

The basic air conditioning package has not changed. The controls have changed and various sensor components have been added.

The second option is a dual installation consisting of the combination front unit and a rear unit. The rear unit evaporator assembly is mounted in the luggage compartment. This deluxe installation insures equal distribution of conditioned air to rear seat as well as front-seat passengers.

The dash-mounted front unit is the basic factory installed option. The rear unit, mounted in the luggage compartment is not available as a single unit without the front unit. Since the rear unit option operates automatically in conjunction with the front unit, only the front unit will be described in detail in the Automatic Temperature Control (Auto-temp) section of this manual.

Trunk Unit Control (Imperial)

The trunk unit evaporator is dependent upon the controls used to operate the front unit. The evaporator of a trunk unit of a dual installation will cool only when the "MAX. COOL" or the "FR. COOL" push button of the front unit control is depressed to energize the magnetic compressor clutch.

The blower circuit of the trunk unit is entirely independent of the front unit. See "Wiring Diagrams" Section 8 of this Manual.

Chrysler—Installations

Three air conditioner options are available. The first option (Front Unit) (Fig. 1), is a combination air conditioning and heating unit contained in two housings separated by the dash panel. The evaporator and heater core are inside the housing installed under the instrument panel. This housing is called the "Passenger Side Housing". The blower motor and time delay relay are installed on the housing attached to the engine side of the dash panel. This housing is called the "Engine Side Housing". The controls and cooling air outlets are integral with the instrument panel (Fig. 2). This system functions on the reheat principle.

In the "reheat" air conditioner unit all the air entering the system passes through both the evaporator coil and the heater core, regardless of whether the heater, defroster or air conditioning is in use. All output air temperatures are controlled by a single slide lever in the instrument panel, which operates the heater water flow control valve through a vacuum regulator. Airflow is controlled and directed through the unit by a series of doors operated by vacuum actuators and mechanical linkages. The blower is turned on by any of four push buttons.

The second option is the Automatic Temperature Control System (Auto-Temp) which automatically controls the heating and air conditioning operation of the vehicle to maintain a selected interior temperature. In

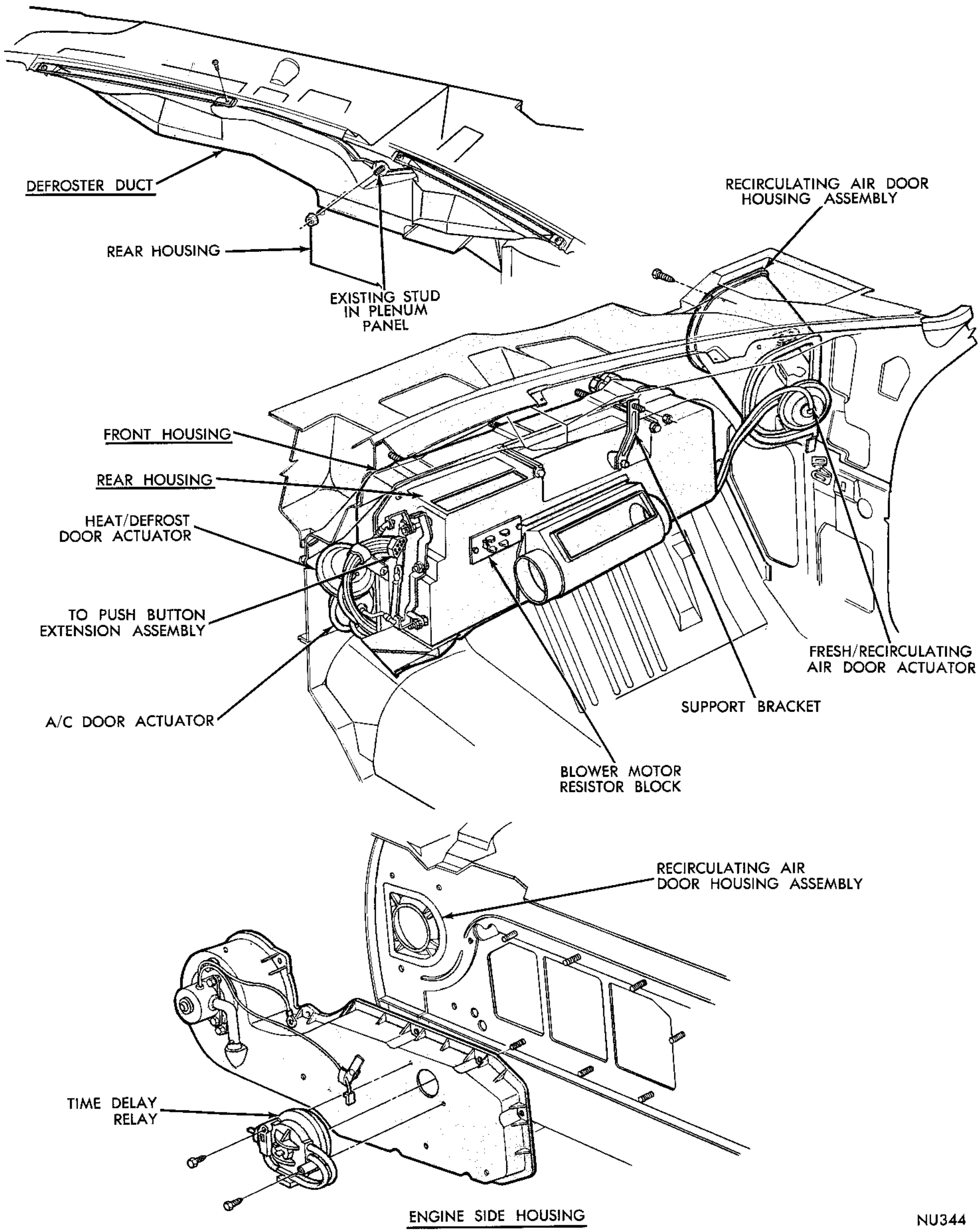


Fig. 1—Air Conditioner Heater Assembly

cold weather, the system provides heat as soon as the warm air is available. When outside temperature increases, the system provides cool dehumidified air.

The unit will heat or cool according to ambient temperature, interior temperature, and control setting; in varying degrees of either heating or cooling without any action on part of operator other than dialing desired temperature and setting system on "Auto."

The basic air conditioning package has not changed. The controls have changed and various sensor components have been added and are described in detail in the "Auto-Temp" Section of this manual.

The third option (Station Wagons Only), includes the first or second option plus a roof mounted evaporator assembly.

The roof mounted unit operates automatically in conjunction with the front unit and is not available as a single unit without the front unit.

Controls for the front system (Standard A/C) consists of five push buttons, a temperature control slide lever and a three-position toggle-type fan blower switch.

Control for the roof mounted system consists of a rotary two speed switch.

Push Buttons—Control the source and route of circulating air. "Off" (turns off system); "MAX A/C" (maximum air conditioning); "A/C" (fresh air—air conditioning); "HEAT" (for heater use only); "DEF" (windshield defroster).

Temperature Control Slide Lever—Maintains any desired temperature by sliding the lever right or left when operating **either the heater or air conditioner.**

Fan Switch—Permits selection of low, medium or high blower speeds. "LO" (far left); "MEDIUM" (center) and "HI" (far right) used when operating either the heater or air conditioner.

Air Directional Vanes—One at each end, and two in the center of the instrument panel. These are adjusted manually to direct cool air to suit the requirements of the driver and passengers.

The center outlets are units that can be rotated to direct air up or down; adjustable vanes direct air to either side (Fig. 2).

The outlets at each end of the instrument panel are also adjustable or can be shut-off by a damper operated by a vertical slide lever or a horizontal slide lever depending on car model.

VACUUM CONTROLS AND CIRCUITS

When testing or adjusting the doors in the distribution system, it is necessary to know the correct posi-

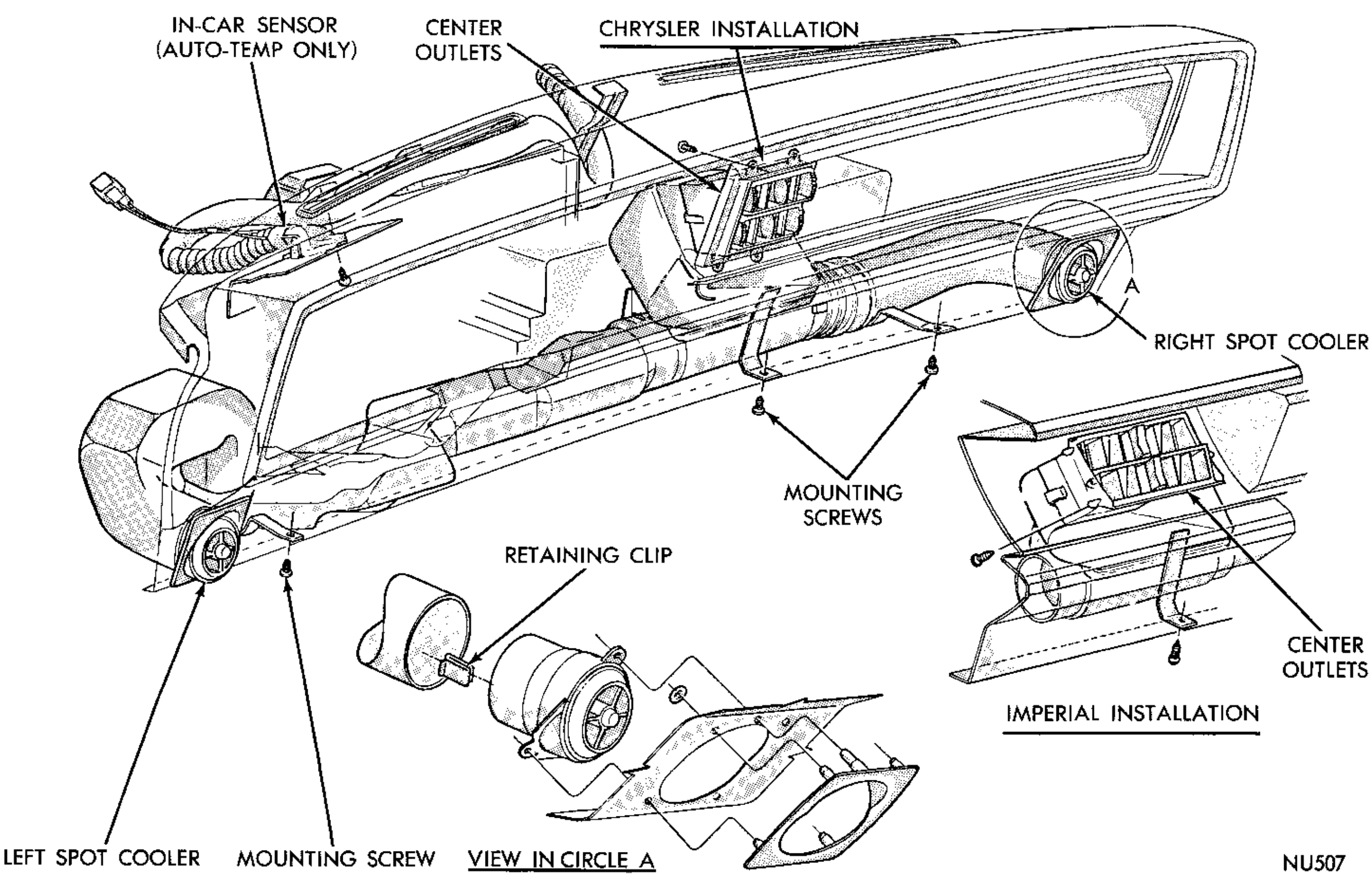


Fig. 2—Air Conditioning Ducts

tion of each door for each push-button position. It is also necessary to know which vacuum hoses are activated for each push-button position. In the following illustrations air flow is indicated as the vacuum actuator hoses are activated for each push-button position (Figs. 3 through 7).

Ventilation

While driving, outside air can be brought into the interior through the inlets in the side cowls. These inlets are opened by pulling the control knobs located on the lower edge of the instrument panel on both sides of the steering column. The knob to the left of the column controls the air inlet on the left side of the car and the right hand knob controls the right side. The amount of air intake is regulated by the distance the knobs are pulled out. Pushing the knobs all the way in closes off the air intake. **Be sure the air intake controls are pushed all the way in before operating the air conditioning system.**

ELECTRICAL CONTROLS AND CIRCUITS

There are two switches, a push button switch (air conditioner and heater vacuum switch), and a fan switch (air conditioner and heater blower switch).

Push Button Control

The power feed circuit is shown in Figure 7. A 20 ampere fuse in the fuse block protects the circuit.

The compressor clutch circuit is energized when either the "MAX. A/C" (maximum air conditioning) or the "A/C" (fresh air—air conditioning) push buttons are depressed. The "OFF" button turns off the system.

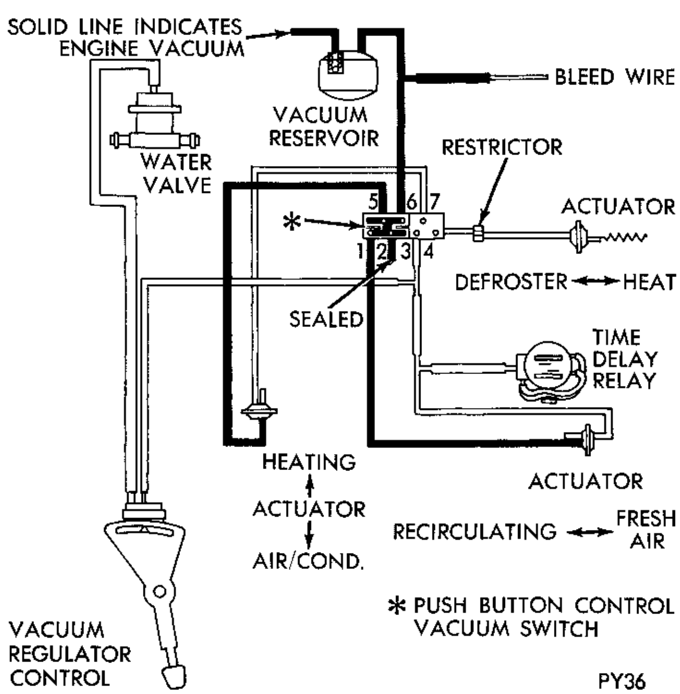


Fig. 3—Vacuum Circuit—Off-Max. A/C Position

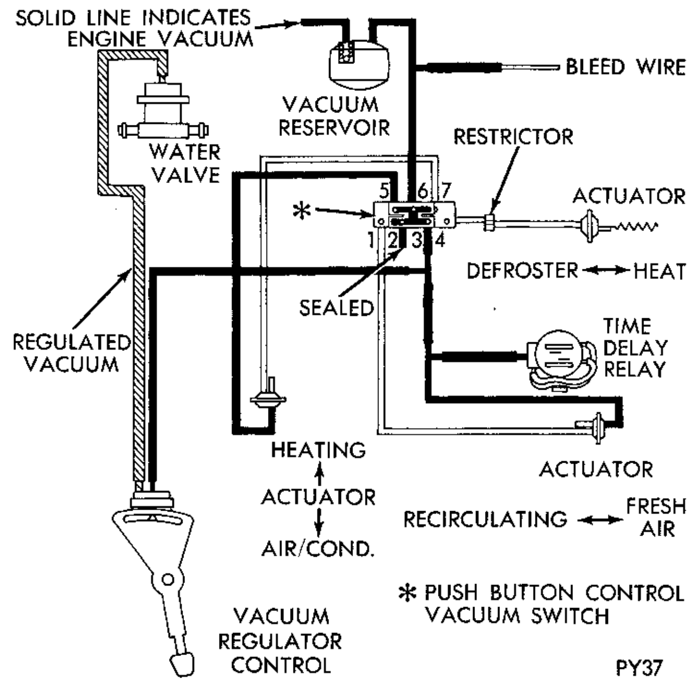


Fig. 4—Vacuum Circuit—A/C Position

Blower Motor (Fan Switch)

The power feed line from the push-button switch to the blower switch is energized only when the ignition is on and any push button, other than "OFF," is depressed.

The switch is controlled by moving the control lever in or out.

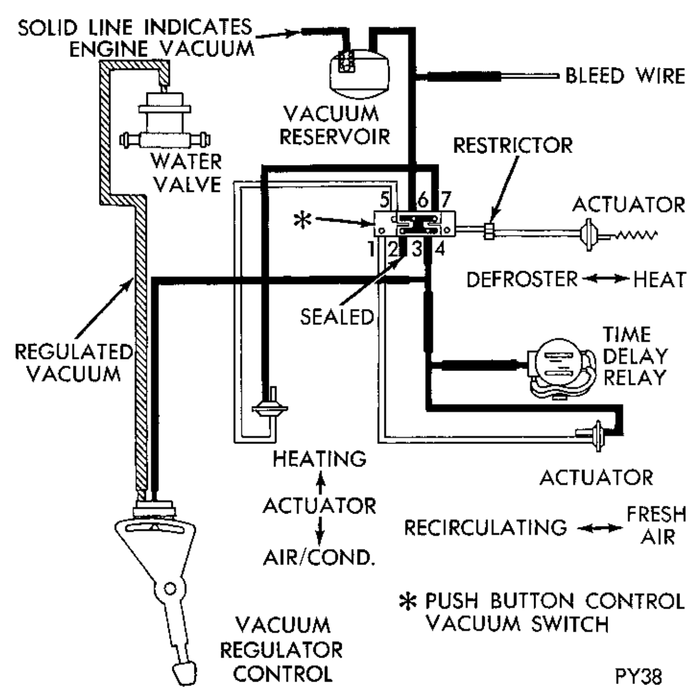


Fig. 5—Vacuum Circuit—Heat Position

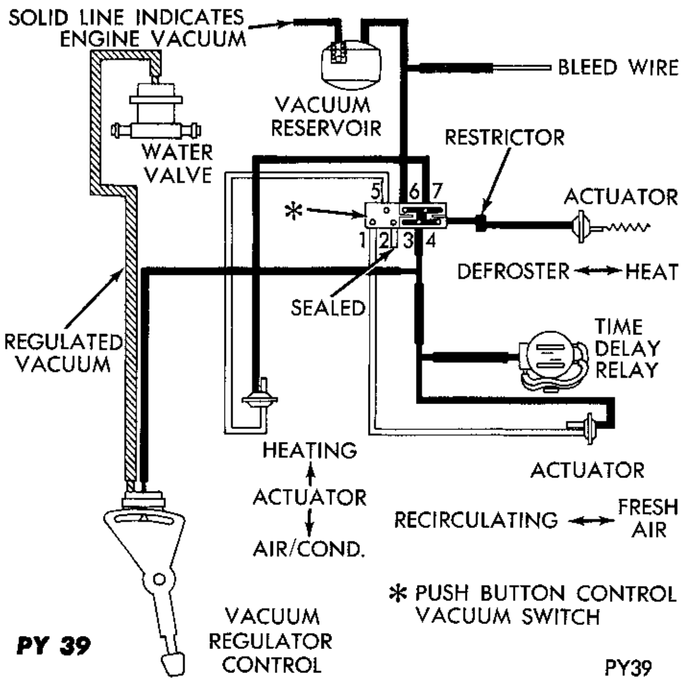


Fig. 6—Vacuum Circuit—Defrost Position

OPERATION OF ALL CONTROLS

Satisfactory performance of the combined air-conditioning and heating system is dependent upon proper operation and adjustment of all operating controls, as well as proper functioning of all refrigeration system units. The inspections, tests and adjustments should be used to locate the cause of a malfunction. The inspections and tests in this manual have been arranged in a logical sequence that has proved to be the surest and shortest route to accurate diagnosis. It is recommended that they be followed and performed in the order in which they are presented.

Operating controls must be tested in the following sequence.

(1) Inspect and adjust compressor drive belt.

(2) Open vehicle windows.

(3) Move temperature control slide lever to "Off" position.

(4) Start engine and adjust engine speed to 1130 rpm. Use a reliable tachometer.

(5) Push the "A/C" button in.

(6) Fresh-recirculating door should be open to fresh air.

(7) Test the blower operation at all three speed positions. If the blower does not operate correctly, refer to "Electrical Controls and Circuits." Leave the blower switch in the "Low" position.

(8) The compressor clutch should be engaged, the compressor operating, and the air conditioning system in operation. If the clutch does not engage, test

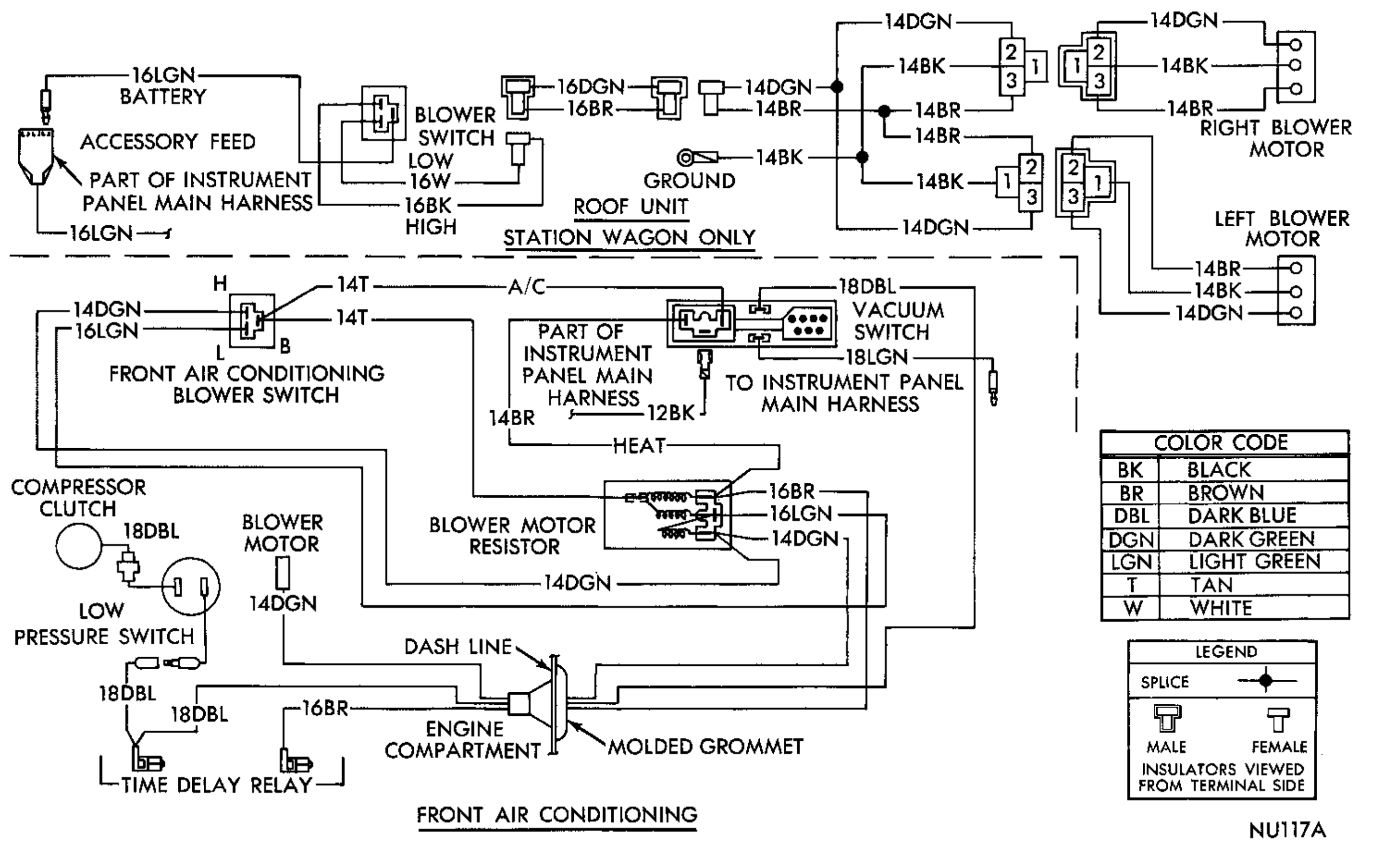


Fig. 7—Electrical Control Circuits

the circuit as outlined under "Electrical Controls and Circuits."

Push Button Operation

Reduce the engine speed to normal idle. With the engine operating at idle speed, the vacuum will be high and the vacuum actuators should operate quickly.

If the actuator operation is slow, check the source hose connection at the engine manifold.

Push each button to test the over-all operation of the electrical and vacuum controls.

The "Push Button Control Chart" summarizes the actions that should take place when each button is pushed. See "Chart." Also refer to "Vacuum Controls and Circuits."

If all the controls operate in the proper sequence but the action of the dampers and doors is slow or incomplete, inspect for mechanical misalignment, binding or improper linkage adjustment.

Time Delay Relay

A vacuum actuated time delay relay is located on the face of the engine side housing in the engine compartment. The purpose of this relay is to reduce the interior windshield condensation to an acceptable level.

When the ambient temperature is above 25 degrees, and the heat or defrost buttons are pressed, the air conditioner will go on for a period of 2 to 10 minutes.

If the system is shut down for less than 10 minutes no delay will occur upon restarting. The relay will reset automatically after 10 minutes shut down.

Restrictor

The time delay system includes, in addition to the time delay relay, a plastic restriction in the vacuum hose leading to the heater door actuator. This restrictor provides some delay in the opening of the defroster door after the "HEAT" or "DEFROST" button is depressed. This delay gives the blower time to expel condensation from the evaporator housing through the heater outlets before it can be blown up onto the windshield.

Should it become necessary to replace the vacuum hose leading to the heater door actuators, the correct restrictor should be used.

Vacuum Actuated Water Valve

The water temperature control valve is operated by engine vacuum which is modulated by a regulator on the back of the temperature control lever (Fig. 8).

When the control lever is in the off position, 0 to 1 inch of vacuum will be present at the water valve and no water will flow through the heater core.

With the control lever placed in the center position, vacuum at the water valve should read 8 inches + or — 1/2 inch and a moderate amount of water will flow through the heater core.

Movement of the control lever to the extreme right (Heat) position allows 14-1/2 inches to 16 inches of vacuum through the regulator and full water flow through the heater core.

Vacuum Reservoir Tank

A vacuum reservoir tank is used to maintain sufficient vacuum in the system in cases where source vacuum is lost momentarily. The tank has a check valve at the inlet port which closes when the vacuum drops off. (Fig. 8).

Operation of the tank and check valve can be tested in the following manner:

(1) Connect a 0-29 inch Hg. vacuum gauge to outlet port of tank.

(2) Start engine and allow to run at idle speed.

(3) Vacuum at gauge should build up to within 2 inches of engine vacuum in less than one minute.

PUSH BUTTON CONTROL CHART

Button	Off	Max. A/C	A/C	Heat	Defrost
FRESH AIR DOOR	Closed	Closed	Open	Open	Open
RECIRCULATING DOOR	Open	Open	Closed	Closed	Closed
AIR CONDITIONING DOOR	Open	Open	Open	Closed	Closed
HEATER DOOR	Closed	Closed	Closed	Open	Closed with Air Bleed
DEFROSTER DOORS	Closed	Closed	Closed	Closed with Air Bleed	Open
BLOWER SPEED	Off	Hi.-Med. Lo	Hi.-Med. Lo	Hi.-Med. Lo	Hi.-Med. Lo
COMPRESSOR CLUTCH	Off	On	On	*Off	*Off

*Compressor will be ON for a period of 2 to 10 minutes when ambient temperature is above 25°.

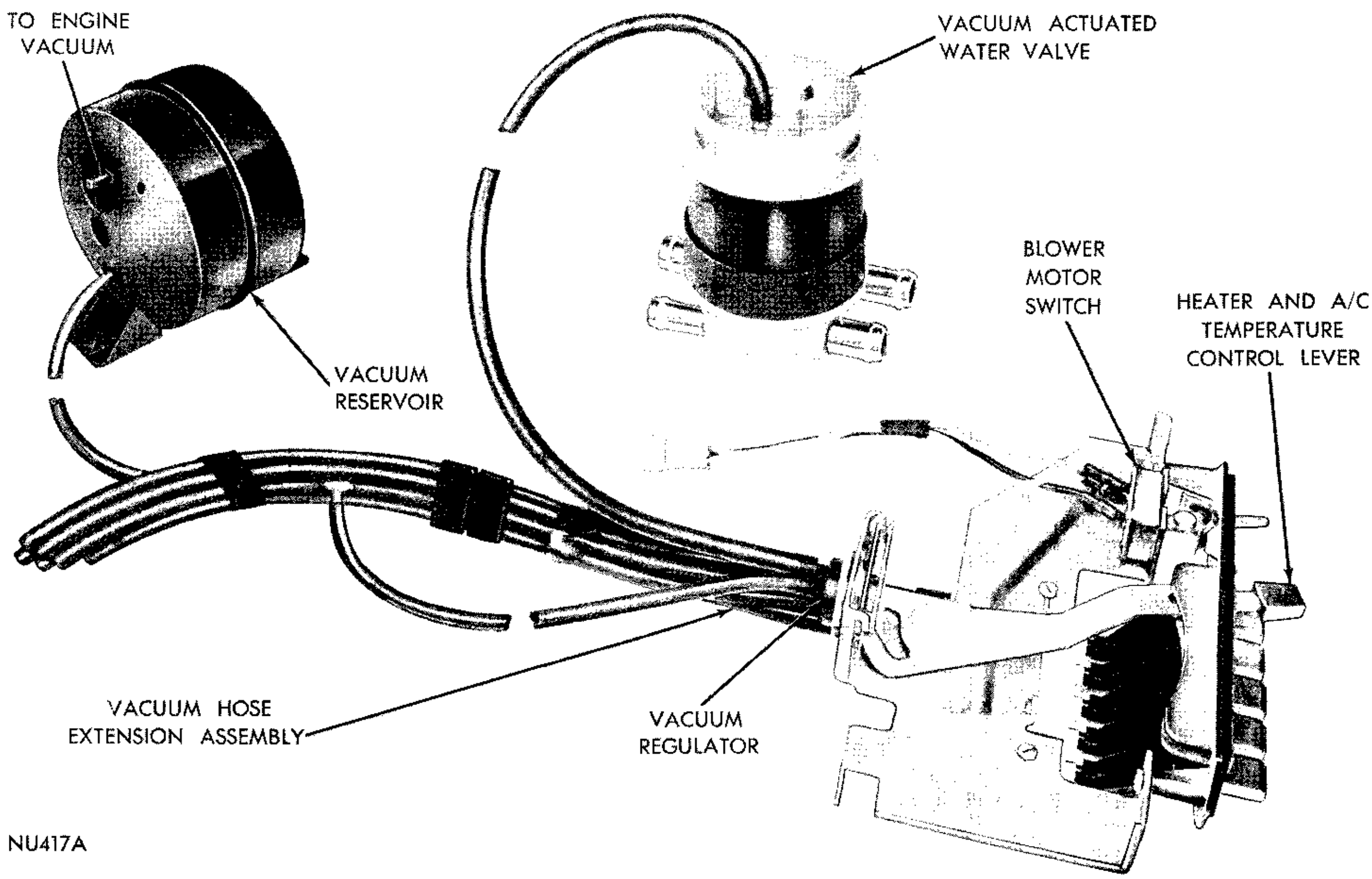


Fig. 8—Vacuum Controls (Chrysler)

(4) Shut engine off, and observe gauge.

(a) If vacuum does not drop off, the check valve and tank are operating satisfactorily.

(b) If vacuum drops off, there is a leak and tank assembly should be replaced.

Linkage Adjustment

Adjusting gauges can be made as shown in Fig. 9. The Heater door bleed gauge is made from a short length of welding rod with a flat washer soldered at a right angle to the rod 5/16 of an inch down from the end. The Defrost door bleed gauge is an 8 inch piece of 3/8 inch O.D. copper tubing bent to 60 degrees as illustrated.

Defrost Door Bleed Adjustment

Place the system in "Heater" mode, loosen the nut on the defroster door shaft. Insert the 3/8" gauge on the unit between the defroster door and the rear wall of the rear A/C housing as shown on Fig. 9. Tighten the nut on the defroster door shaft. Remove gauge.

Heater Door Bleed Adjustment

Place the system in "Defrost" mode, loosen nut on adjustable link (heater door spring will cause heater door to open). Insert adjusting gauge through rear most rectangular slot (Fig. 9) in heater distribution duct so that collar on the gauge rests on the edge of the heat door. Push the door to the bleed position 5/16 inch until tip of the gauge is bottomed on the floor of rear housing. Push slotted (lower) link toward heat duct until lower slot bottoms on shoulder rivet and tighten adjustable link screw. Remove gauge.

EXPANSION VALVE

Removal

The system must be completely discharged before opening any of the refrigerant lines.

(1) Disconnect equalizer from suction line fitting (Fig. 12).

(2) Disconnect expansion valve from liquid line and evaporator. Use two wrenches to loosen each of these connections.

(3) Carefully pull out capillary sensing tube from suction line well.

(4) Remove rubber seal from the capillary sensing tube. Inspect condition of inlet screen.

Installation

(1) With new "O" rings and clean refrigerant oil on all fittings, connect expansion valve to liquid line and evaporator assembly using two wrenches to prevent rotation and twisting of the lines.

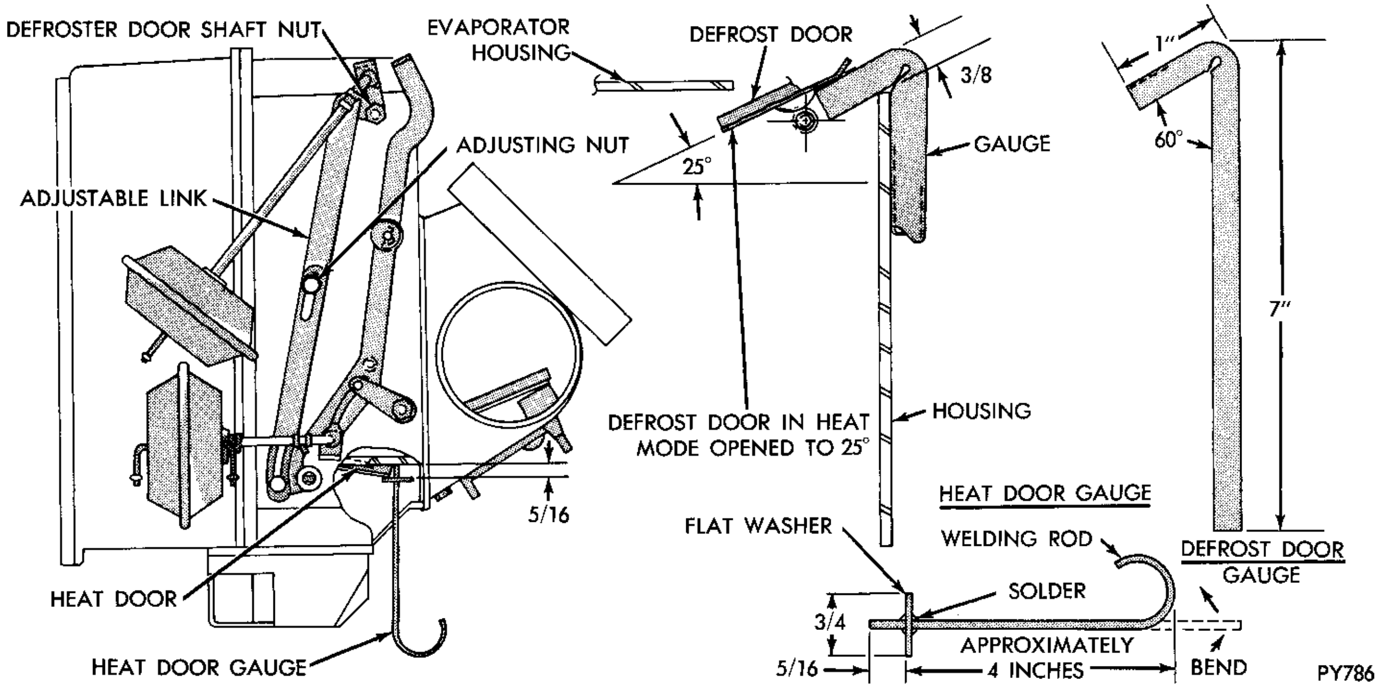


Fig. 9—Linkage Adjustment

(2) Connect equalizer tube to the fitting on suction line.

(3) With a rubber seal on the capillary sensing tube, carefully insert the tube in the suction line well as far as it will go (approximately five inches).

(4) After expansion valve is installed, it must be completely tested and the system must be tested for leaks and recharged.

HEATER CORE

Removal (Fig. 10)

The heater core is located in the front cover of the passenger side housing. To remove the heater core **only,** the air conditioning system need not be discharged or disconnected.

(1) Disconnect negative battery cable, drain cooling system, remove air cleaner and disconnect heater hoses.

(2) Plug both heater core tubes to prevent spilling coolant when core is removed.

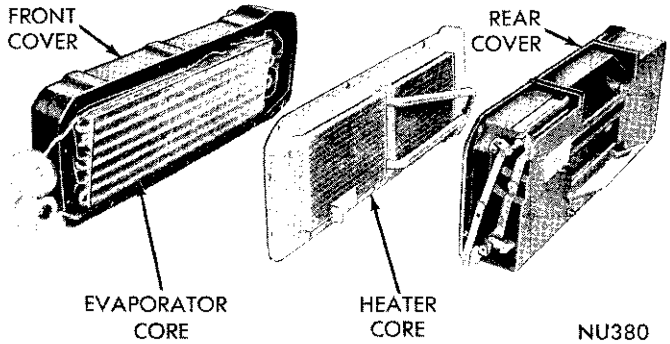


Fig. 10—Heater and Evaporator Core—Passenger Side

(3) Remove steering column cover and left spot cooler duct.

(4) Disconnect two actuator rods at linkage on left side of housing, and remove two cover retaining screws.

(5) Remove five screws retaining heat distribution duct. When heat duct is removed, three screws in bottom lip of front cover will be exposed, remove these screws.

(6) Remove glove box and remove center spot cooler, air distribution housing and right spot cooler duct.

(7) From glove box opening, remove two top retaining screws and three screws from right side of housing.

(8) Disconnect wires at resistor block and vacuum hoses from recirculating housing actuator.

(9) Remove nut from housing end of support bracket and swing bracket up out of the way, carefully roll front cover and heater core out from under instrument panel.

Installation

(1) Place heater core in front cover and position core and cover on evaporator housing. Hold front cover in place and swing support bracket down over existing stud on face of front cover. Install retaining nut.

(2) From glove box opening, install two top housing retaining screws and three screws at right side of front cover.

(3) From under instrument panel, install five remaining screws surrounding housing.

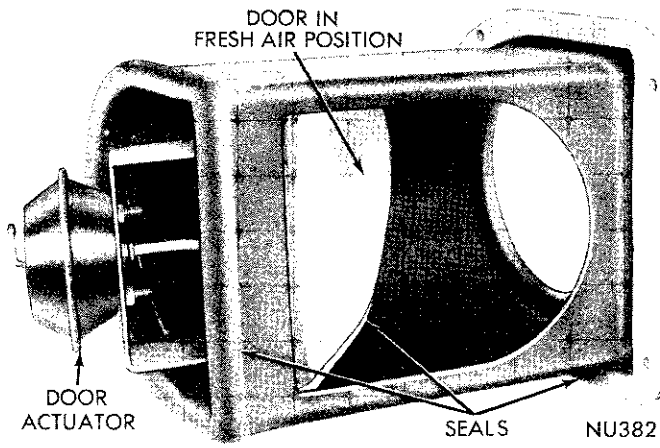


Fig. 11—Fresh Air-Recirculating Door Housing

(4) Install heat distribution duct to bottom of housing.

(5) Connect actuator rods.

(6) Connect all vacuum hoses to actuators and electrical connectors to resistor block.

(7) Install air distribution housing, center spot cooler duct and right spot cooler duct through glove box opening.

(8) Install steering column cover and left spot cooler duct. Install glove box assembly.

(9) Connect heater hoses and fill cooling system. For summer operation as well as winter operation, be sure the system is protected with the proper type and amount of anti-freeze.

(10) Install air cleaner and connect battery ground cable.

(11) Start engine, operate until normal engine operating temperature is obtained and test operation of heater.

BLOWER MOTOR

The blower motor is mounted to the engine side housing under the right front fender between the inner fender shield and the fender. The inner fender shield must be removed to service the blower motor, recirculating housing (Fig. 11), or engine side housing. See Group 23 "Body and Frame" of this manual for detailed illustrations.

EVAPORATOR

Removal

The refrigerant system must be completely discharged before opening any of the refrigerant lines.

To remove the evaporator, the entire unit housing must be removed from under the instrument panel.

(1) Disconnect negative battery cable, drain cooling system, remove air cleaner and disconnect heater

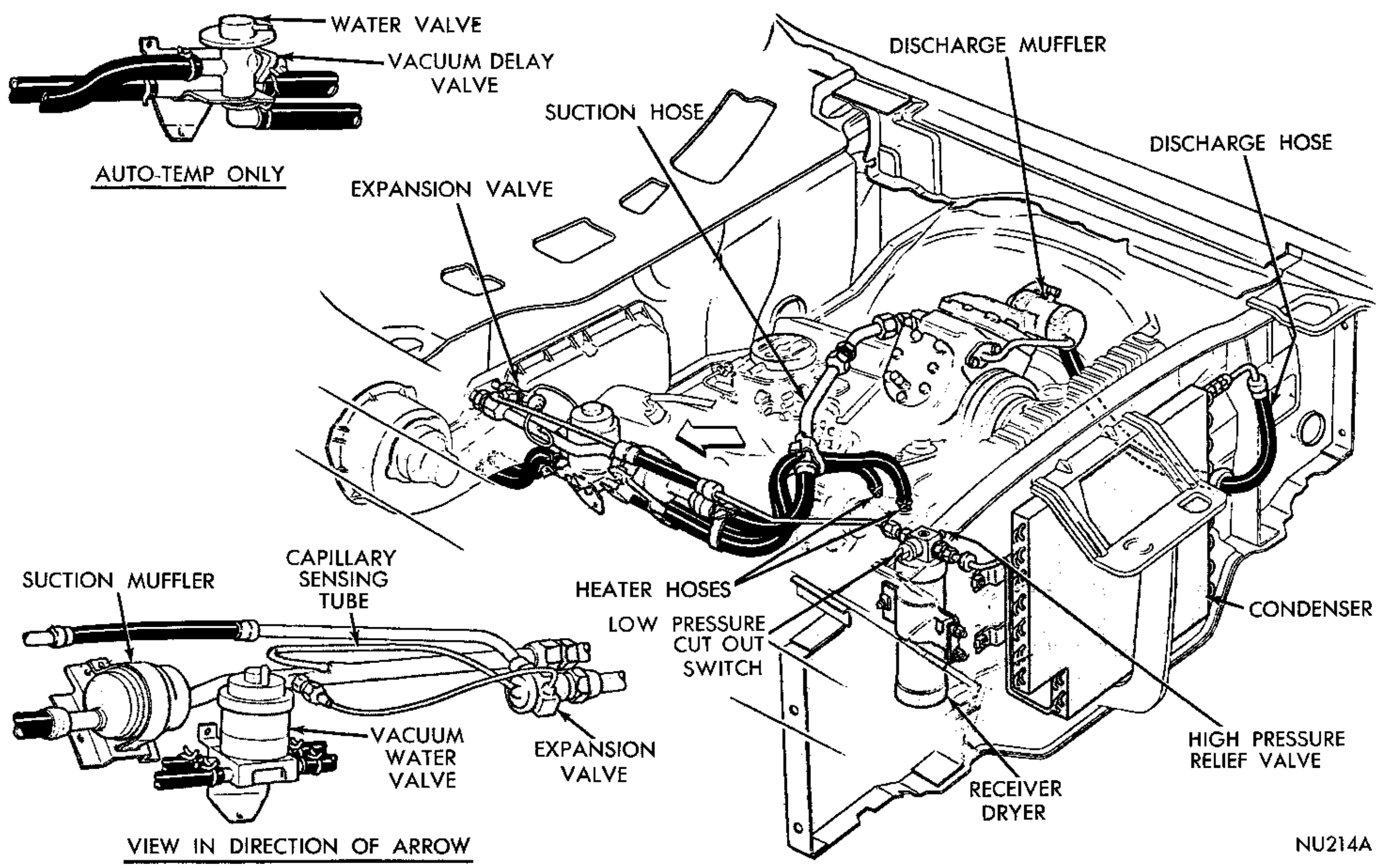


Fig. 12—Air Conditioning and Heater Plumbing (383-440 Engines)

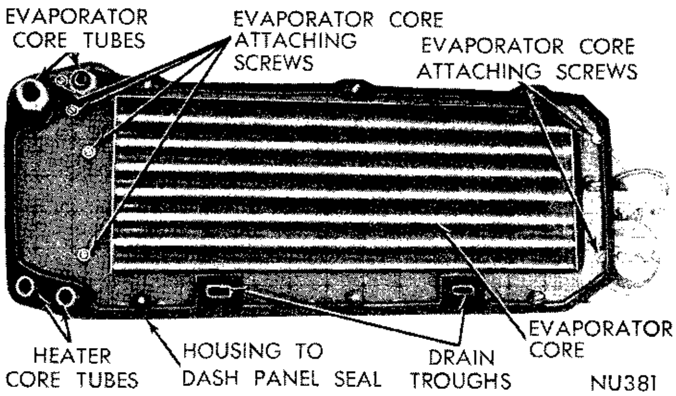


Fig. 13—Evaporator—Back Side of Front Cover

hoses. Plug both core tubes to prevent spilling coolant when unit is removed (Fig. 12).

(2) Disconnect suction line and expansion valve from evaporator tubes. Use two wrenches to loosen each of these connections. **Cap all refrigerant openings to prevent the entrance of dirt or moisture.**

(3) Remove steering column cover and remove left spot cooler duct.

(4) Remove glove box and remove center spot cooler, air distribution housing and right spot cooler duct.

(5) From glove box opening, disconnect wires at resistor block and vacuum hoses from recirculating housing actuator.

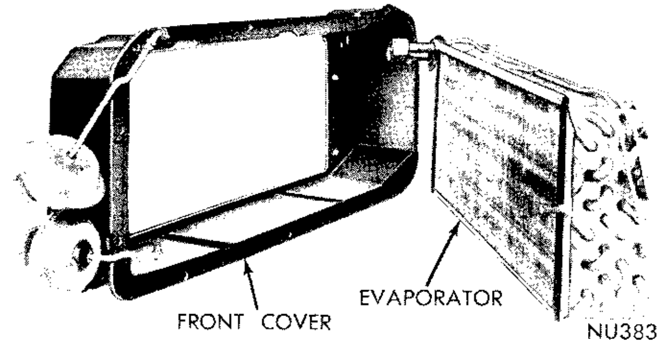


Fig. 14—Evaporator Removed from Front Cover

(6) Unplug antenna wire from radio and place wire out of the way.

(7) From engine compartment remove seven retaining nuts surrounding engine side housing (Fig. 46).

(8) Through glove box opening remove retaining nut from housing end of support bracket and swing bracket up out of the way.

(9) Carefully roll housing out from under instrument panel.

(10) Place unit on bench, disconnect actuator rods, remove heat distribution duct, and seperate front cover from evaporator housing by removing eleven screws surrounding the housings.

(11) From the tube side of the evaporator housing,

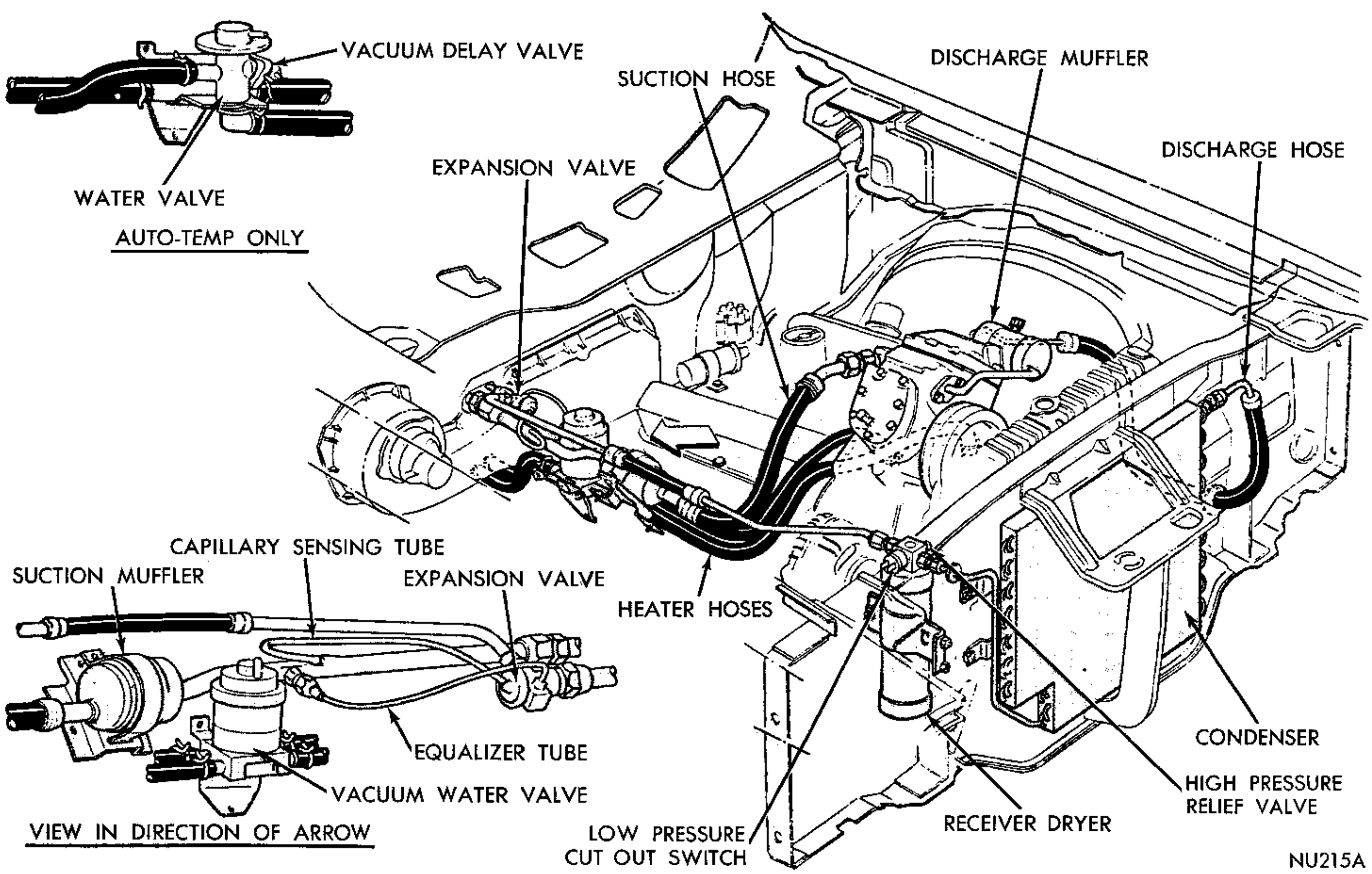


Fig. 15—Air Conditioning and Heater Plumbing 318 Engines

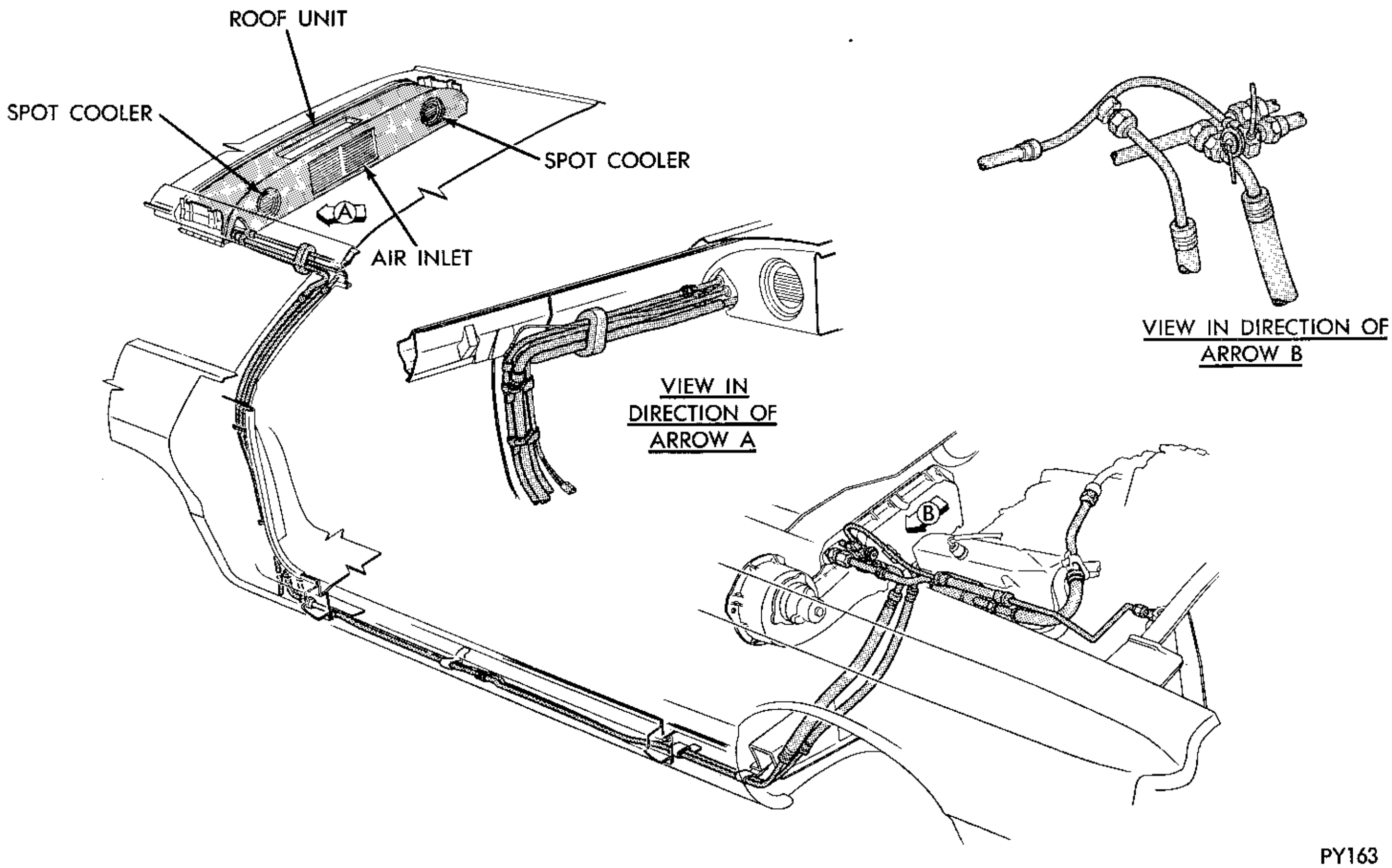


Fig. 16—Roof Unit Air Conditioning Plumbing Station Wagon Only—Chrysler

remove six screws and carefully lift out the evaporator (Figs. 13 and 14).

Installation

(1) Position evaporator core in housing, align holes and install six mounting screws.

(2) Place heater core and front cover on evaporator core and secure the two-covers with eleven screws.

(3) Install heat distribution duct to bottom of housings.

(4) Connect actuator rods and adjust linkage if necessary.

(5) Position unit under instrument panel and place support bracket over existing stud on face of housing. Install retaining nut.

(6) From engine compartment, install seven retaining nuts to studs surrounding engine side housing.

(7) From glove box opening, connect wire to resistor block and vacuum hoses to recirculating housing actuator.

(8) Install center air distribution housing, center spot cooler and right spot cooler duct. Plug antenna wire into radio and replace glove box.

(10) Connect vacuum hoses to actuator on left side of housing.

(11) Install steering column cover.

(12) Install left spot cooler duct.

(13) Connect suction line and expansion valve. Use two wrenches to tighten fittings (Fig. 15 and 16).

(14) Connect heater hoses, fill cooling system and inspect for leaks.

(15) Install air cleaner and connect battery cable.

After the evaporator and heater assembly is installed in the vehicle, it will be necessary to sweep the system, test for leaks and charge the system with the proper amount of refrigerant. It is recommended that

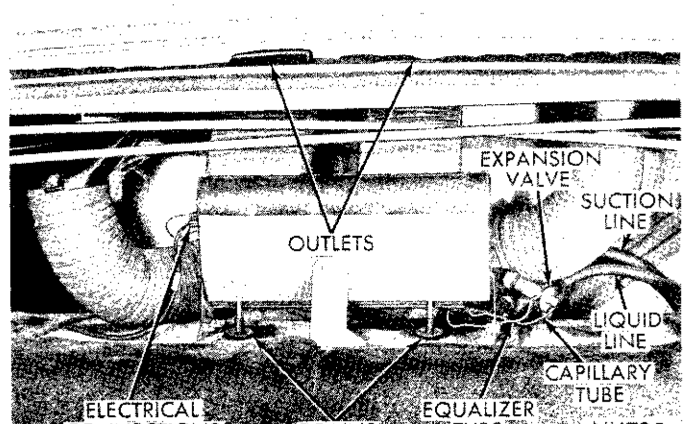


Fig. 17—Evaporator Installed in Trunk—Imperial Only

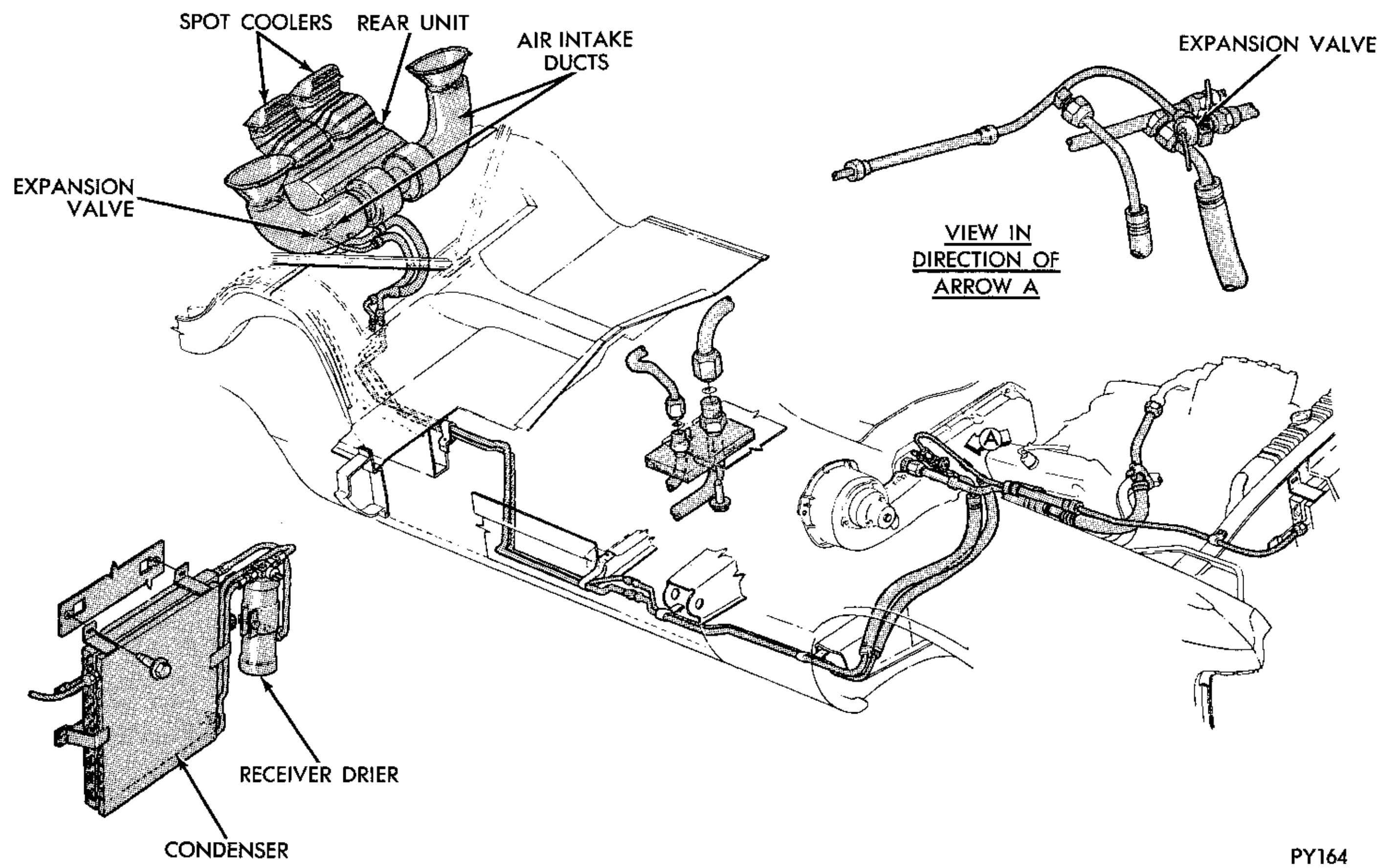


Fig. 18—Rear Unit Air Conditioning Plumbing Imperial Only

the operation of all controls be tested and an overall performance test be made after the repair or replacement of the evaporator assembly.

REAR UNIT (Imperial) (Fig. 17 and 18)

Removal

(1) Discharge the refrigerant from the system.

(2) Remove the rear seat, back rest and insulation blanket to assist in removal of the trunk unit components.

(3) Release the four clamps on the flexible ducts and remove the ducts from the evaporator.

(4) Disconnect electrical connections and drains.

(5) Disconnect the suction and discharge lines. Cap all refrigerant lines to prevent dirt and moisture from entering the system.

(6) Remove the mounting bracket to flange bolts (six) and remove the evaporator assembly from the luggage compartment.

Installation

(1) Position the evaporator assembly in the luggage compartment and install the mounting bracket to flange bolts. The blower motor ground is connected to the left front bolt.

(2) Install the electrical connection and drains.

(3) Use new "O" rings with clean refrigerant oil on connections. Install the suction and discharge lines using two wrenches to prevent rotation and twisting of the lines.

(4) Install the flexible ducts and secure the clamps.

(5) After the evaporator assembly is installed in the vehicle, it will be necessary to sweep the system. Test for leaks, and charge with the proper amount of refrigerant. **An over-all Performance Test should be made after repair or replacement of the evaporator assembly.**

(6) Install the insulation blanket, back rest and back seat.

AUTO TEMP

CHRYSLER AND IMPERIAL

INDEX

GENERAL INFORMATION

The Auto-Temp System automatically controls the heating and air conditioning operation of the vehicle to maintain a selected interior temperature. In cold weather, the system provides heat. In warm weather the system provides cool dehumidified air.

The unit will heat or cool according to interior temperature, ambient temperature and control setting; in varying degrees of either heating or cooling without any action on the part of the operator other than dialing a desired temperature and setting the system on "Auto".

The basic air conditioning package is the same as that used for the standard heater-air conditioning system (Fig. 1). The controls have been changed and various sensors and components have been utilized to compose the "Auto-Temp" system.

OPERATING CONTROLS

The Automatic Temperature Controls are located in the center of the instrument panel and consist of a thumbwheel selector and five push-button switches.

Thumbwheel Selector

Thumbwheel selector operates similar to a home thermostat. The thumbwheel has 5 numbers, 65-70-75-80-85, to allow the operator to select a corresponding interior temperature (Fig. 3).

Pushbutton Switches

Off—System will not operate (servo will be properly positioned but the blower will not operate and the fresh air door will be closed).

Auto—Blower will automatically remain off and the fresh air door will remain closed (if heating is required) until water temperature reaches 125°F.—temperature controlled discharge air will then come out of the heater slots (with normal defrost bleed) or the air conditioning outlets as required by the system. There are five blower speeds available on the air conditioning mode of operation and four available on the heat mode (the maximum blower speed on air conditioning is higher than the maximum blower speed on heat).

Hi-Auto—Same as "Auto," except the blower will operate at the higher speeds only. There are three blower speeds available on the air conditioning mode and two available on the heat mode of operation (again the maximum blower on air conditioning is higher than the maximum blower on heat and the speeds are slightly higher in the "Hi-Auto" position). **This position is available to allow the operator to select the higher blower speeds that are required to:**

(1) Maintain comfort during city traffic operation where air distribution may be inadequate.

(2) Satisfy the rear seat passengers under extreme conditions.

(3) Provide adequate smoke removal under extreme conditions.

Def—Blower will come on immediately, air will come out of defroster outlets (with normal heat bleed)—system will then control the same as "Auto" except the blower will operate at the two highest speeds only (the speeds being those used on the heat mode of operation). **Since the system controls in the "Def" position, it is possible to have maximum air conditioned air deposited on the windshield (and at the same time obtaining the higher blower speed that is available on the air conditioning mode of operation). However, it is not probable that the system would be operated in the "Def" position while requiring full cooling on the car interior.**

Hi-Def—Same as "Def" except blower will operate on high speed (used on the heat mode of operation) only and discharge air will be maximum temperature.

Both "Def" and "Hi Def" positions override a vacuum circuit to start the blower, regardless of water temperature. Therefore, if the operator returns to either the "Auto" or "Hi-Auto" position, the blower will remain on, even though the water temperature is still below 125°F. However, the blower may be turned off by depressing the "Off" button.

In all of the positions except "Off," the compressor will operate if the ambient temperature is above 32°F.

MAJOR COMPONENTS (Fig. 2)

In-Car Sensor

This sensor is located in a grille to left of steering column in upper left corner of instrument panel. It senses car interior temperature and automatically signals the control unit to compensate for any variation from the selected comfort setting.

Temperature Control Dial (Thumbwheel)

This control is located above the push buttons in the control head. It allows the operator to select any

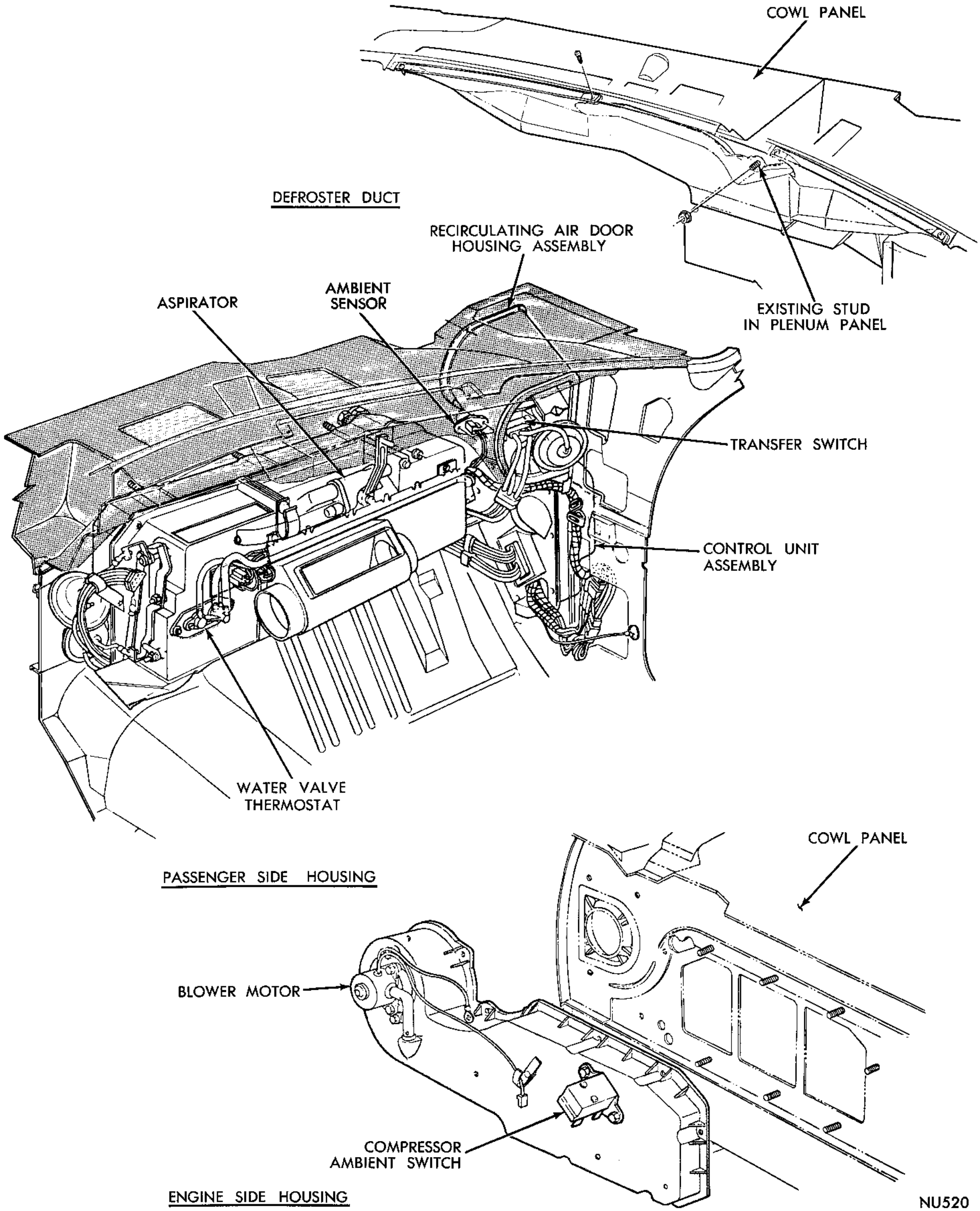


Fig. 1—Auto-Temp Housing Assemblies

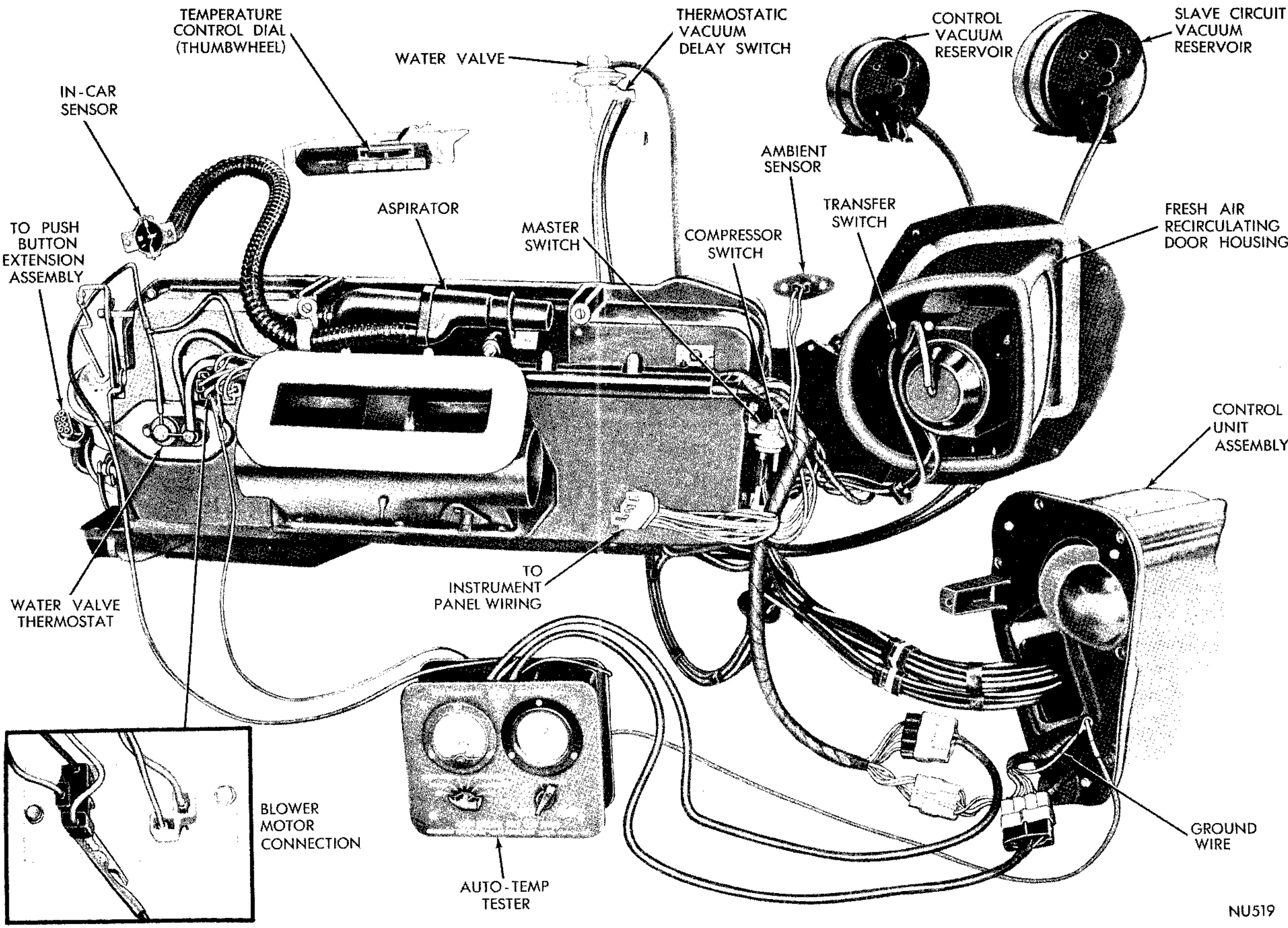


Fig. 2—Auto-Temp Components and Test Connections

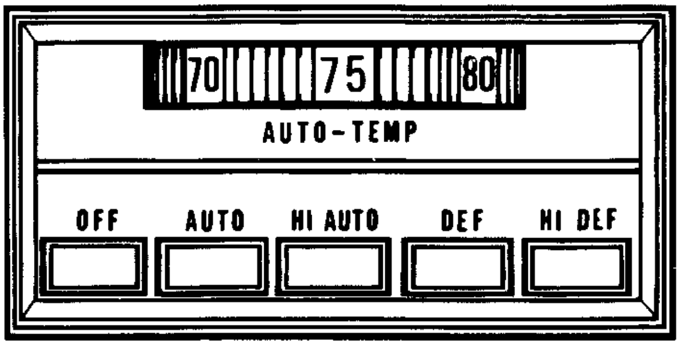


Fig. 3—Push Button Control

interior comfort setting from 65 to 85. Movement of the thumbwheel controls a resistance potentiometer which is part of the assembly. The potentiometer will create the proper resistance to signal the control unit so that it will control at the selected comfort setting.

Evaporator Temperature Regulator Switch (Anti-Frost Control System)

This switch is located on the right end of the passenger side housing. It has a sensing capillary routed through the evaporator coil fins. This control allows the evaporator to maintain a minimum air temperature without freezing. The Anti-Frost control system consists of a second unit, the **evaporator temperature regulator valve (ETR).** This valve is located at the compressor suction fitting (same place as the regulator EPR valve). It consists of an electrical solenoid which is actuated by the evaporator temperature regulator switch which senses coil fin temperature. When the solenoid is energized the valve closes and stops the flow of refrigerant to the compressor.

Master On-Off Switch

This switch is located on the right end of the passenger side housing and is color coded green. It is vacuum operated and turns on the blower when 8 inches of vacuum is applied.

Compressor Switch (Vacuum)

This switch is color coded yellow and is located on the rear cover of the air conditioning unit just to the left of the master on-off switch. It is vacuum operated and actuates the compressor clutch when 2 inches of vacuum is applied (if the ambient switch is closed).

Water Valve Thermostat

This thermostat is located on the face of the rear cover of the air conditioning unit. It is vacuum operated and temperature compensated and in conjunction with the water valve, controls the discharge air temperature. The thermostat receives the same vacuum as the control unit and then sends modulated vacuum to the water valve to control the amount of engine coolant to the heater core.

Ambient Switch

This switch is located on the face of the engine side housing. It has a sensing capillary protruding through the bottom of the housing in front of the blower inlet. The compressor switch completes the electrical circuit to the clutch if the ambient (outside) temperature is above 32°F. Due to its location, the switch will become heated periodically during the winter by brief shut downs of the Auto-Temp or the engine. On re-starts, the compressor will operate briefly and allow the seals of the compressor to be lubricated.

Vacuum Transfer Switch

This switch is located in the fresh/recirculating air door housing. The switch holds the fresh/recirculating air door in one of three positions: OFF, 20% Fresh Air and 100% Fresh Air. The three positions are accomplished by the use of the regulator vacuum actuator, a spring and the transfer switch.

Thermostatic Vacuum Delay Switch

This switch is located on the water valve in the engine compartment. It is an integral part of the water valve and is controlled by a wax pellet that is sensitive to water temperature. The switch delays the start of the blower, by not allowing the vacuum circuit to the blower master switch to be completed on AUTO or HI-AUTO position (heat mode) until the engine water temperature reaches 125°F. At that point the switch opens and allows vacuum to the master switch completing the electrical circuit to the blower motor. Vacuum to vacuum transfer switch allows switch to position door in 100% fresh air position.

Ambient Sensor

This sensor is located in the dash panel behind the glove box. The ambient sensor senses the outside temperature. It signals the control unit to make adjustments to the system that are required to maintain a constant interior comfort level regardless of outside temperature changes.

Control Unit Assembly

This unit is located in place of the right side cowl vent assembly. It is the control unit of the system and consists of a power servo, amplifier and transducer. If the unit is found defective, it is to be replaced as an assembly and no attempt shall be made to service it internally.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
SYSTEM OPERATES ONLY ON MAXIMUM COOLING AND HI-BLOWER.	(a) Control vacuum leak external to control unit assembly.	(a) Inspect vacuum connections at water valve thermostat, control unit assembly, and engine components.
	(b) Internal control unit assembly leak.	(b) Test control unit assembly, replace if leaking.
	(c) A short circuit in the ambient or in-car sensor.	(c) Inspect wiring, repair short or replace sensor.
	(d) An open circuit in the temperature control dial potentiometer.	(d) Test wiring, replace potentiometer if necessary.
	(e) Defective control unit assembly.	(e) Test control unit assembly, replace if necessary.
	(f) No vacuum input to control unit (crossed hoses at control vacuum reservoir or at control unit, pinched hose).	(f) Check vacuum lines.
	(g) Vacuum leak in water valve thermostat.	(g) Test thermostat.
SYSTEM OPERATES ON AIR CONDITIONING MODE AT ALL TIMES WITH CONTROLLED AIR TEMPERATURE.	(a) Damper linkage binding, from improper adjustment.	(a) Re-adjust linkage.
	(b) Vacuum not supplied to rod side of mode actuator.	(b) Check vacuum line connection (plugged or disconnected at actuator fitting. Check for pinched vacuum line).
SYSTEM OPERATES ONLY ON MAXIMUM HEATING AND M3.	(a) An open circuit in the in-car sensor.	(a) Test wiring, repair or replace sensor.
	(b) A short circuit in the temperature control dial potentiometer.	(b) Test wiring, repair or replace potentiometer.
	(c) Defective control unit assembly.	(c) Test control unit assembly, replace if necessary.
	(d) An open circuit in ambient sensor.	(d) Test wiring, repair or replace sensor.
SYSTEM OPERATES ON HEAT MODE AT ALL TIMES	(a) An open circuit in the ambient sensor.	(a) Test wiring, repair or replace sensor.
	(b) Damper linkage binding from misadjustment.	(b) Readjust properly.
	(c) Vacuum not supplied to pot side of mode actuator.	(c) Inspect vacuum line connection (plugged or not connected at actuator fitting. Check for pinched vacuum line).
SYSTEM PUTS OUT ONLY HOT AIR IN ALL MODES AT ALL TIMES	(a) Defective water valve thermostat.	(a) Replace if necessary.
	(b) Defective water valve (stuck open).	(b) Replace if necessary.
	(c) Water valve thermostat not sensing representative air temperature.	(c) Check for abnormal cold air in area of the thermostat (missing seals inside evaporator package or partially plugged heater core). Repair or replace package.
SYSTEM PUTS OUT ONLY COLD AIR IN ALL MODES AT ALL TIMES	(a) Defective water valve thermostat.	(a) Replace if necessary.
	(b) Defective water valve (stuck closed).	(b) Replace if necessary.
	(c) Kinked water hose.	(c) Inspect hoses.
	(d) No vacuum to water valve (pinched or disconnected vacuum line to water valve or to thermostat).	(d) Inspect lines.
BLOWER AND COMPRESSOR WILL NOT OPERATE, AND SYSTEM WILL NOT GO INTO SELECTED MODE	(a) A failed (open) circuit.	(a) Replace if necessary.
	(b) A vacuum leak at engine fitting source or slave circuit tank in engine compartment.	(b) Check vacuum connections.
	(c) A loose connection between harness and push button switch.	(c) Connect properly.
	(d) A defective (leaking) vacuum harness connector at push button switch.	(d) Replace harness.
	(e) A defective (leaking) push button switch.	(e) Replace switch.

Condition	Possible Cause	Correction
	(f) Vacuum hose leak in slave circuit.	(f) Inspect all connections, repair if possible, replace if necessary.
	(g) Crossed vacuum lines at slave system vacuum reservoir.	(g) Inspect lines.
	(h) Pinched vacuum line in slave circuit.	(h) Inspect lines.
BLOWER WILL NOT OPERATE ON ANY MODE.	(a) Blower motor wiring disconnected.	(a) Connect properly.
	(b) Defective blower motor.	(b) Check by connecting directly to battery. Replace if necessary.
	(c) Vacuum operated master on-off switch, defective.	(c) Test and replace if necessary.
	(d) A vacuum leak in slave circuit.	(d) Inspect for leaks and correct.
	(e) Resistor block burned out.	(e) Replace.
	(f) Pinched vacuum line to master switch.	(f) Inspect lines.
	(g) Blower motor not grounded.	(g) Ground properly.
COMPRESSOR WILL NOT OPERATE AT ANY TIME.	(a) Clutch wire disconnected.	(a) Connect.
	(b) Vacuum operated compressor switch, defective.	(b) Test and replace if necessary.
	(c) Compressor ambient switch, defective.	(c) Test and replace if necessary.
	(d) Ambient is below 32°F.	(d) Instruct owner that compressor operates only at ambients above 32°F.
	(e) Pinched vacuum line to compressor switch.	(e) Inspect lines.
	(f) Low pressure cut-out switch defective.	(f) Test and replace.
	(g) System pressure below low pressure cut-out switch limit.	(g) Test system for leaks and repair.
AIR CONDITIONING AND HEAT MODES REVERSED (HOT AIR FROM CONDITIONING OUTLETS AND COLD AIR FROM HEAT OUTLETS).	(a) Air conditioning and heat mode actuator vacuum hoses reversed.	(a) Route properly (white to pot side, red to shaft side).
AIR COMING OUT OF AIR CONDITIONING OUTLETS WHEN SYSTEM IS IN THE DEFROST OR HI-DEFROST POSITION.	(a) Vacuum hoses to pot side of mode actuator and pot side of defrost actuator reversed.	(a) Route properly.
	(b) Air conditioning and heat and heat and defroster mode actuator vacuum hoses interchanged and reversed on actuators.	(b) Route properly.
MOST OF THE AIR COMING OUT OF DEFROSTERS WHEN SYSTEM SHOULD BE ON THE HEAT MODE.	(a) Vacuum hoses to shaft side of mode actuator and pot side of defrost actuator reversed.	(a) Route properly. (Red to shaft side, white to pot side).
	(b) Air conditioning door binding on air distribution duct.	(b) Reinstall properly.
AIR COMES OUT OF THE DEFROSTERS WHEN THE SYSTEM SHOULD BE IN HEAT MODE, AND AIR COMES OUT OF HEATER OUTLETS WHEN SYSTEM SHOULD BE IN AIR CONDITIONING.	(a) All vacuum lines to mode and defrost actuators completely crossed.	(a) Route properly.
	(b) Linkage misadjustment.	(b) Readjust.
AIR COMES OUT OF ALL OUTLETS WHEN THE SYSTEM SHOULD BE IN DEFROST OR AIR CONDITIONING. AIR COMES OUT THE AIR CONDITIONING OUTLETS WHEN THE SYSTEM SHOULD BE IN HEAT MODE.	(a) All vacuum lines to mode and defrost actuators completely crossed.	(a) Route properly.
	(b) Linkage misadjustment.	(b) Readjust.

Condition	Possible Cause	Correction
SYSTEM WILL NOT CHANGE MODE IN AUTO OR HI-AUTO (EVEN WITH TESTER OPERATING CONTROL UNIT)	(a) Doors binding or linkage bent or misadjusted.	(a) Repair or adjust linkage.
AIR COMING OUT OF DEFROSTER WHEN SYSTEM SHOULD BE IN THE AIR CONDITIONING MODE.	(a) Air conditioning/heat and heat/defroster mode actuator hoses interchanged and reversed on actuators.	(a) Route properly.
	(b) Defrost button may be depressed.	(b) Instruct owner on proper operation of unit.
INSUFFICIENT AIR-FLOW OUT OF UPPER (AIR CONDITIONING) OUTLETS WHEN SYSTEM IS CALLING FOR MAXIMUM COOLING AND HI-BLOWER.	(a) Air hoses disconnected from air conditioning outlets or distribution duct.	(a) Connect properly.
	(b) Failing blower motor.	(b) Test by connecting directly to battery.
BLOWER SPEEDS ALWAYS TOO GREAT ON AUTO.	(a) Resistor block, faulty (resistors shorted).	(a) Repair or replace.
BLOWER SPEEDS ALWAYS TOO GREAT ON HI-AUTO.	(a) Lower speeds not provided for Hi-Auto.	(a) Instruct owner on operation of unit.
SYSTEM BLOWS COLD AIR ON FEET AT THE START DURING COLD WEATHER OPERATION.	(a) Thermostatic vacuum delay switch in water valve, faulty.	(a) Test and replace if necessary.
	(b) Blower master switch inoperative in closed position.	(b) Test and replace if necessary.
	(c) Vacuum bleed plugged.	(c) Inspect.
	(d) Check valve #2 failed open or reversed.	(d) Check connections, test and replace if necessary.
INSUFFICIENT HEAT WHEN MAXIMUM HEATING IS REQUIRED.	(a) Water valve thermostat out of calibration or faulty.	(a) Check calibration, recalibrate or replace.
	(b) A vacuum leak at water valve or thermostat connections.	(b) Check visually, repair.
	(c) Water valve, faulty.	(c) Replace.
	(d) Heater core, faulty (plugged).	(d) Replace.
	(e) Vacuum line from control unit to water valve thermostat or from thermostat to water valve pinched.	(e) Inspect lines.
ERRATIC TEMPERATURE CONTROL.	(a) Heater hoses reversed at core inlet and outlet tubes.	(a) Route properly.
	(b) Air in heater core.	(b) Press Hi-Defrost to open water valve fully and run engine at approximately 1500 rpm for about three minutes.
	(c) Radiator water level low.	(c) Fill as required.
	(d) Loose vacuum or electrical connection at control unit assembly.	(d) Inspect connections.
	(e) Faulty water valve (sticking).	(e) Check and replace if necessary.
	(f) Water valve thermostat faulty.	(f) Check and replace if necessary.
INSUFFICIENT COOLING WHEN MAXIMUM COOLING IS REQUIRED.	(a) ETR valve stuck closed.	(a) Check by energizing solenoid directly from battery.
	(b) Refrigeration system low on refrigerant.	(b) Test for leaks, repair, and add charge according to procedure in Air Conditioning Service Manual.
	(c) ETR switch cut-in setting too high.	(c) Test according to procedures in Standard Air Conditioning Service Manual.
	(d) Expansion valve.	(d) Test according to procedures in Standard Air Conditioning Service Manual.
	(e) Clutch not running (pinched vacuum line to compressor switch, wires not	(e) Inspect vacuum lines and electrical connections, check for high resist-

Condition	Possible Cause	Correction
	connected or high resistance compressor switch).	ance by replacing switch with a jumper wire, replace switch if necessary.
	(f) Fresh air doors stuck in 100% fresh air position (broken return spring or defective vacuum transfer switch).	(f) Inspect spring, test vacuum transfer switch, replace if necessary.
DISCHARGE AIR TOO COLD AT TIMES.	(a) ETR valve or switch leads disconnected.	(a) Connect.
	(b) ETR valve failed (open).	(b) Check by energizing solenoid directly from battery, replace if necessary.
	(c) ETR switch failed (capillary broken).	(c) Replace.
	(d) ETR switch capillary not properly installed.	(d) Install properly.
AFTER APPROXIMATELY ONE HOUR OF SUSTAINED DRIVING AIRFLOW DROPS OFF TO PRACTICALLY NONE, WHILE BLOWER CAN BE HEARD OPERATING AT A HIGH SPEED.	(a) Evaporator coil freeze-up, same causes as in "Discharge Air Too Cold At Times."	(a) Same as in "Discharge Air Too Cold At Times".
	(b) ETR switch setting too low.	(b) Check out according to Auto-Temp component test procedures.
AIR COMES OUT OF AIR CONDITIONING OUTLETS OR HEAT OUTLETS WHILE DRIVING IN THE "OFF" POSITION.	(a) Fresh/Recirculating door in Fresh Air position (vacuum hoses on Fresh Air door actuator reversed).	(a) Route properly.
	(b) Blower master switch (failed in closed position).	(b) Test and replace if necessary.
	(c) Fresh air door not sealing properly.	(c) Check for binding door or damaged seals. Repair.
	(d) Check valve #2 reversed or failed closed.	(d) Check connections, test and replace if necessary.
OBJECTIONABLE ODORS BEING DISCHARGED THROUGH THE AIR CONDITIONING OR HEAT OUTLETS.	(a) Fresh/Recirculating door in recirculating air position (vacuum hoses on Fresh Air door actuator reversed).	(a) Route properly.
SYSTEM QUITS ON ACCELERATION.	(a) Slave vacuum-reservoir check valve leaking.	(a) Test and replace if necessary.
	(b) A vacuum leak in slave system.	(b) Inspect all connections, repair if possible, replace if necessary.
	(c) Check valve #1 reversed or failed open.	(c) Check connections, test and replace if necessary.
SYSTEM WILL NOT GO TO MAXIMUM HEAT ON HI-DEFROST.	(a) Defrost override circuit in amplifier of control unit assembly defective.	(a) Check unit for proper performance.
	(b) Hi-Defrost feed from push button switch to amplifier not connected at switch.	(b) Connect.
	(c) Push button actuated Hi-Defrost feed switch in control head, faulty.	(c) Replace push button switch.
SYSTEM SHUTS OFF WHEN HI-DEFROST BUTTON IS PUSHED AND GOES TO HI-DEFROST WHEN THE OFF BUTTON IS PUSHED.	(a) Push button switch reversed (push button extensions incorrectly installed).	(a) Visually inspect switch (vacuum ports and electrical terminals are located left and right side of switch respectively, as viewed by passenger if switch is properly installed). Remove and reassemble if necessary.
SYSTEM DOES NOT ACHIEVE A COMFORTABLE CONDITION—SYSTEM LEVELED OUT	(a) Control dial potentiometer out of calibration.	(a) Test and recalibrate if possible, replace if necessary.
	(b) Control unit assembly out of calibration.	(b) Test and replace if necessary.
	(c) Air conditioning outlets not directed properly.	(c) Instruct owner on positioning of outlets and/or on moving control dial slightly to attain his comfort level.

Condition	Possible Cause	Correction
	(d) Aspirator not operating properly pinched or disconnected tube).	(d) Test aspirator and tube. Repair or replace if necessary.
SYSTEM DOES NOT ACHIEVE A COMFORTABLE CONDITION—ERRATIC CHANGES OF TEMPERATURE AND POSSIBLY BLOWER SPEED	(a) Loose electrical connection at sensors or at control unit.	(a) Inspect connections.
	(b) Loose electrical connection or other fault in control unit.	(b) Test control unit, replace if necessary.
SYSTEM DOES NOT ACHIEVE A COMFORTABLE CONDITION—CYCLING OF TEMPERATURE AND POSSIBLY BLOWER SPEED	(a) Defective control unit (excessive play in power servo.)	(a) The control vacuum at the calibration point on decreasing vacuum should be within 1 inch of the reading on increasing vacuum.
	(b) Vacuum leak in control unit, in the water valve thermostat, or at the connections to them.	(b) Check connections, check control unit and thermostat for leaks. Replace if necessary.
	(c) Aspirator not operating properly (pinched or disconnected tube).	(c) Test aspirator and tube. Repair or replace if necessary.
	(d) Water valve sticking.	(d) Test and replace if necessary.
	(e) Water valve thermostat out of calibration.	(e) Test and replace if necessary.
SYSTEM DOES NOT ACHIEVE A COMFORTABLE CONDITION—TEMPERATURE SLOWLY DRIFTS UP AND DOWN	(a) Aspirator not operating properly (pinched or disconnected tube).	(a) Test aspirator and tube. Repair or replace if necessary.
	(b) Frayed or bare sections in sensor leads.	(b) Inspect sensor leads. Repair or replace.
BLOWER DOES NOT SHUT OFF WHEN "OFF" BUTTON IS PUSHED	(a) Check valve #2 failed closed or installed backwards.	(a) Check routing and replace if necessary.
	(b) Defective pushbutton switch.	(b) Check switch according to push button control charts check routing.
BLOWER DOES NOT COME ON IN "DEFROST" OR "HI-DEFROST" WHEN THE ENGINE IS COLD	(a) Check valve #1 failed closed or installed backwards.	(a) Test and replace if necessary.
BLOWER SPEED CHANGES WITH CHANGES IN CAR VOLTAGE (CAR IS ACCELERATED OR ACCESSORIES ARE TURNED ON OR OFF)	(a) Defective control unit.	(a) Test control unit and replace if necessary.

AUTO-TEMP COMPONENTS

SERVICE PROCEDURES

Satisfactory performance of the Auto-temp system is dependent upon proper operation and adjustment of all operating controls, as well as proper functioning of all system components. The inspection, tests and adjustments should be used to locate the cause of a malfunction. The inspections and tests in this manual have been arranged in a logical sequence that has proved to be the surest and shortest route to accurate diagnosis. It is recommended that they be followed and performed in the order in which they are presented.

Test Connections (Auto-Temp Tester C-4064)

With the use of the Auto-Temp Tester (C-4064) (Fig. 2), a thorough operational check can be performed on the system, and some of the components. Connect the tester according to procedure:

(1) Remove right cowl trim panel.

(2) Disconnect electrical harness eight terminal connector and connect tester in series with system harness and control unit harness (Fig. 2).

(3) Remove left spot cooler duct.

(4) Raise blower motor three wire connector slightly off spade terminals, enough to attach aligator clip (Fig. 2). Black wire from tester. (Tan lead on blower motor resistor).

(5) Attach tester white wire to a good body ground.

(6) Tee in vacuum hose at the water valve thermostat. (Solid black hose).

Before performing any tests, the control potentiometer on the instrument panel must be set at 75 and must remain at this setting throughout all tests.

Control Unit Calibration

With engine idle set at 1000 RPM and the voltmeter in the off position, depress the "Auto" button and slowly rotate control dial, on tester, from minimum vacuum to "Calibrate". At this point the vacuum gauge should read 4 to 6 inches vacuum. Tap gauge and record this reading. Continue to increase vacuum to "Maximum" then slowly rotate control dial back to "Calibrate". Tap gauge. Reading must be within 1 inch Hg of the recorded reading, indicating the control unit is calibrated.

If the gauge readings are not within the given range, the control unit is out of calibration and must be replaced.

Sensor Tests

With engine running at idle RPM, rotate voltmeter dial from off to the "ambient sensor" position. Observe the voltmeter, if the indicator is in the red area to the left, the sensor is "shorted", if the indicator is in the red area to the right, the sensor is "open", in either case the sensor is faulty and must be replaced. The above procedure applies to the temperature control (set at 75), and in-car sensor.

CAUTION: Do not allow the voltmeter dial to remain in any of the sensor positions for more than 30 seconds, as voltage is being applied to the sensors and they may be damaged.

With the above instrumentation, a thorough operational check can be performed on the system, and some of the components. Refer to the push button control chart while performing the following steps:

SYSTEM TEST PROCEDURE

Start engine with system in the Off position and thermometer in right center outlet. Set control Vacuum Dial to obtain "O" vacuum on gauge. Set voltmeter on "Voltage". Adjust engine rpm to 1000. Observe the following:

(1) Vacuum should be zero.

(2) No reading on voltmeter.

Push the Hi-Auto Button. **Observe the following:**

(1) Vacuum should remain at zero.

(2) Compressor should be running and system should be in the air conditioning mode with fresh air door open to 20 (Above 32° Ambient).

(3) Blower should be running.

(4) Blower speed should be high if vacuum is less than 2.5 inches. Voltmeter should read approximately the same as supply voltage at the voltage regulator.

(5) Discharge air should be coming out of air conditioning (upper) outlets and should be dropping towards 40°F.

If all the mentioned steps occurred as stated, the system is operating properly in this position.

Auto

Proceed as follows:

Push Auto button and slowly rotate control Vacuum Dial so vacuum at gauge goes from minimum to maximum in such a manner that the following may be observed taking place in the order shown:

(1) Blower speed drops one step.

(2) Fresh air door goes from 20% to 100% Fresh/Air at above 3.5 inches vacuum, no change in discharge air temperature.

(3) Blower speed decreases a second step, a slight increase in discharge air temperature (approximately 10°F.).

(4) Blower speed decreases a third step, an additional rise in discharge air temperature.

(5) Blower speed decreases a fourth step, an additional rise in air temperature.

(6) System goes from A/C mode to Heat mode at about 8.0 inches vacuum. Discharge air temperature is within 85°F. ± 10° before and after the mode switch.

(7) After the switch to Heat mode, the blower speed increases one step, an additional rise in discharge air temperature.

(8) Blower speed increases a second step, an additional rise in discharge air temperature.

(9) Blower speed increases a third step, discharge air temperature is at its maximum (approximately 140°F.), and vacuum is about 12 inches.

(10) Continue to move control such that vacuum increases to full source vacuum, note that there is no further change in blower speed and little or no increase in discharge air temperature.

Hi-Auto

Adjust Control Vacuum Dial so vacuum is about 8.0 inches.

Push Hi-Auto button and observe the following:

An increase in air velocity. Note voltage increase on voltmeter, there was no change of vacuum and little or no temperature change.

Defrost

Return to Auto position leaving vacuum at about 8 inches on either air conditioning or heat and proceed as follows:

Push defrost button and observe the following:

(1) Vacuum remained the same.

(2) Majority of air is coming out of defroster outlets and there is bleed air coming out of heater slots. No air should be coming out of A/C outlets.

(3) The air temperature should have remained essentially the same as in Auto.

(4) Blower speed increases.

Hi-Defrost

Push Hi-Defrost button and observe the following:

(1) Vacuum is increasing to full source vacuum.

(2) The air temperature at defroster outlets is rising to maximum heat.

(3) Blower speed increases.

(4) Control dial on tester is no longer effective.

PUSH BUTTON CONTROL CHART

Push Button Position	Control Vacuum	Fresh Air Door Position	A/C Door Position	Heat Door Position	Defrost Door Position	Blower Motor Speed
OFF	Below 8 inches Hg.	0% F/A	Open	Closed	Closed	Off
	Above 8 inches Hg.	0% F/A	Closed	Open	Bleed	Off
AUTO	Minimum (0" Hg.)	20%	Open	Closed	Closed	Hi
Slowly rotate	↓	20%	Open	Closed	Closed	Hi to M3
vacuum control knob from minimum to maximum	3.5	100%	Open	Closed	Closed	M3
	↓	100%	Open	Closed	Closed	M3 to M2
		100%	Open	Closed	Closed	M2 to M1
		100%	Open	Closed	Closed	M1 to Lo
	7.5 to 9.0	100%	Closed	Open	Bleed	Lo
		100%	Closed	Open	Bleed	Lo to M1
	↓	100%	Closed	Open	Bleed	M1 to M2
	12.0	100%	Closed	Open	Bleed	M2 to M3
	↓	100%	Closed	Open	Bleed	M3
Slowly rotate vacuum control knob from maximum to minimum	12.0	100%	Closed	Open	Bleed	M3
	6.5 to 7.5	100%	Open	Closed	Closed	Lo
	2.5	20%	Open	Closed	Closed	M3
	0	20%	Open	Closed	Closed	Hi
HI-AUTO	Minimum (0" Hg.)	20%	Open	Closed	Closed	Hi
Slowly rotate vacuum control knob from minimum to maximum	↓	20%	Open	Closed	Closed	Hi to M3
	3.5	100%	Open	Closed	Closed	M3
	↓	100%	Open	Closed	Closed	M3 to M2
	7.5 to 9.0	100%	Closed	Open	Bleed	M2
	12.0	100%	Closed	Open	Bleed	M2 to M3
	↓	100%	Closed	Open	Bleed	M3
Slowly rotate vacuum control knob from maximum to minimum	12.0	100%	Closed	Open	Bleed	M3
	6.5 to 7.5	100%	Open	Closed	Closed	M2
	2.5	20%	Open	Closed	Closed	M3
	0	20%	Open	Closed	Closed	Hi

PUSH BUTTON CONTROL CHART (Continued)

Push Button Position	Control Vacuum	Fresh Air Door Position	A/C Door Position	Heat Door Position	Defrost Door Position	Blower Motor Speed
DEFROST	Minimum (0" Hg.)	20%	Closed	Bleed	Open	Hi
Slowly rotate vacuum control knob from maximum to minimum	↓	20%	Closed	Bleed	Open	Hi to M3
	3.5	100%	Closed	Bleed	Open	M3
	↓	100%	Closed	Bleed	Open	M3 to M2
	7.5 to 9.0	100%	Closed	Bleed	Open	M2
	↓					
	12.0	100%	Closed	Bleed	Open	M2 to M3
	↓	100%	Closed	Bleed	Open	M3
Slowly rotate vacuum control knob from minimum to maximum	12.0	100%	Closed	Bleed	Open	M3
	↓					
	2.5	20%	Closed	Bleed	Open	M2
	↓					
	0	20%	Closed	Bleed	Open	M1
HI-DEFROST (Temp. control dial has no effect)	12.0" or Above	100%	Closed	Bleed	Open	M3

Blower Motor Speeds
Hi—
M3—One speed down from Hi
M2—One speed down from M3
M1—One speed down from M2
Lo—One speed down from M1

CONTROL UNIT ASSEMBLY (Fig. 4)

If the control unit assembly is found defective, it is to be replaced as an assembly, and no attempt shall be made to service it.

It should be noted here that other component failures in the system can create the same symptoms as a defective control unit assembly. Therefore, a thorough check of other components should be made as directed in the service diagnosis charts before the control unit is replaced.

Water Valve Thermostat

The thermostat is vacuum-operated and temperature-compensated, and in conjunction with the water valve, controls the discharge air temperature. It received the same vacuum as the power servo and then sends a modulated vacuum to the water valve to maintain a constant duct discharge temperature.

To determine if the thermostat is modulating properly, proceed with the following test:

(1) Connect a 0-29 inch hg. vacuum gauge into the black with red tracer vacuum line at the thermostat using a "tee" connector. When disconnecting vacuum lines, twist and pull at the same time to avoid stretching the hose.

(2) Install the auto-temp tester as shown in Fig. 2, adjust the control vacuum to about 5 inches and de-

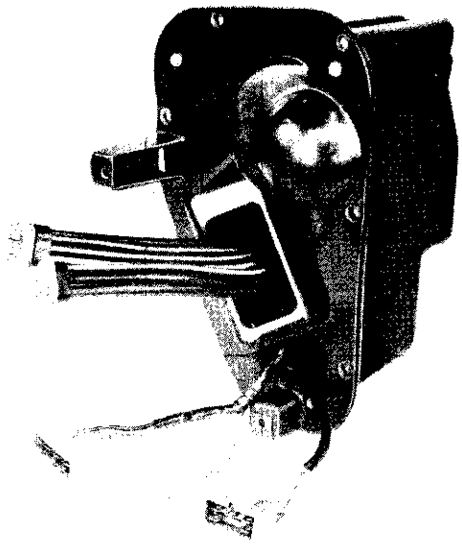


Fig. 4—Control Unit Assembly

press the "Auto" button on the instrument panel.

(3) Start the engine and allow it to run until it has attained normal operating temperature. Record vacuum to water valve.

(4) Press the "Hi Defrost" button and allow the defroster discharge air to become hot. The control vacuum should increase to at least 12 inches.

(5) Press the "Auto" button. The control vacuum should return to about 5 inches and the water valve vacuum should drop close to zero. As the air temperature stabilizes, the water valve vacuum should return to about the same reading acquired before pressing the "Hi Defrost" button.

(6) If the thermostat does not modulate properly, it cannot be repaired; it must be replaced.

To determine if the thermostat is controlling properly, proceed with the following calibration test:

With the engine off and the auto-temp tester connected;

(1) Disconnect and plug off the black with red tracer vacuum line at the thermostat. In its place, connect a 0-29 inches hg. vacuum gauge. When disconnecting vacuum lines, twist and pull at the same time to avoid stretching the hose. With the vacuum control dial and vacuum gauges, a certain input vacuum to the thermostat can be maintained and the thermostat output vacuum can be read.

(2) Disconnect compressor clutch wire in engine compartment. This will prevent compressor operation.

(3) Place a thermometer in the center of A/C outlet grille with outboard spot coolers closed.

(4) With the system in the "Auto" position, start the engine.

(a) Set the system to high blower and A/C mode.

(b) Engine speed should be at idle rpm.

(5) With the vacuum control dial, set the vacuum input to the thermostat at 7.0 inches Hg.

(6) Allow discharge air temperature to stabilize, it should be approximately the same as the room ambient temperature.

(7) After the temperature has stabilized, read the thermostat output vacuum. Determine if the thermostat is calibrated properly from the chart. If the thermostat is out of calibration, it should be replaced.

WATER VALVE THERMOSTAT CALIBRATION CHART

For 7 in. Hq. Input Vacuum

Temp. °F A/C Outlet	Output Vac. (± .5) In. Hq.	Temp. °F A/C Outlet	Output Vac. (± .5) In. Hq.
65	7.0	85	5.6
66	7.00	86	5.5
67	6.9	87	5.5
68	6.8	88	5.4
69	6.8	89	5.4
70	6.7	90	5.3
71	6.6	91	5.2
72	6.6	92	5.2
73	6.5	93	5.1
74	6.4	94	5.0
75	6.4	95	4.9
76	6.3	96	4.9
77	6.2	97	4.8
78	6.1	98	4.7
79	6.1	99	4.6
80	6.0	100	4.6
81	5.9	101	4.5
82	5.9	102	4.5
83	5.8	103	4.4
84	5.7		

WATER VALVE (Fig. 5)

The water valve is vacuum operated and with the thermostat controls the discharge air. It requires checking, mainly to see if it is opening and closing fully.

This check can be accomplished as follows:

(1) With the engine fully warm (at least 180° F. water) and at 1000 rpm, hood closed, system in Auto and Control Dial in minimum vacuum position, remove vacuum hose, black with red tracer, from thermostat and leave it vented. This will vent any vacuum to the water valve and it should be fully closed.

(2) Place a thermometer in center A/C outlet grille. Air temperature should drop to minimum (should be in the low 40°).

(3) With an external vacuum source, apply 3.5 inches Hg. to the water valve at the black with red tracer hose that was pulled off the thermostat. There should be no increase in discharge air temperature.

(4) Increase vacuum to water valve to 4.5 inches Hg. and observe a slight increase in discharge air. This increase should be about 10°F.

(5) Finally apply full vacuum (at least 12 inches

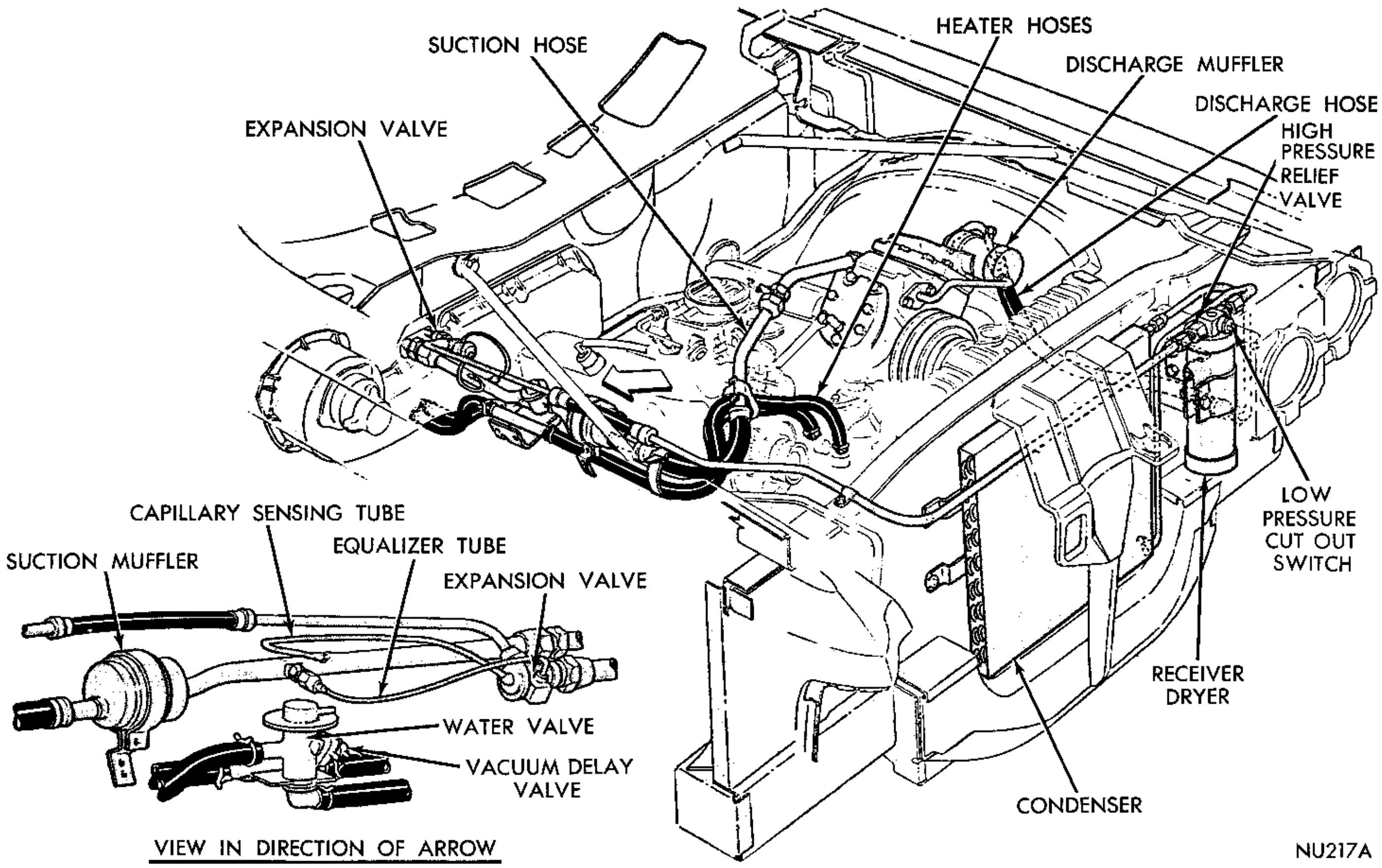


Fig. 5—Auto-Temp Plumbing (Imperial)

Hg.) to water valve and observe temperature. It should rise rapidly to maximum, approximately 140°F.

If the valve did not pass any of the above tests, it is defective and should be replaced.

THERMOSTATIC VACUUM DELAY VALVE

The valve is an integral part of the water valve, and it is controlled by a wax pellet that is sensitive to water temperature. The valve prevents the start of the blower (by not allowing the vacuum circuit to the blower master switch to be completed) on Auto and Hi-Auto when heat is required until the engine water temperature increases.

A functional check of the valve can be made only when the system is in the Auto position requiring heating, and the engine is cold.

Connect a vacuum gauge to the outlet port of the delay valve. The valve will remain at zero inches vacuum until the engine coolant increases to 125° ± 5° F. at this point the gauge reading will increase to full slave circuit vacuum. The temperature indicator on the vehicle's instrument panel can be used to estimate coolant temperature.

When it has been definitely determined that vacuum delay valve is faulty, the entire water valve assembly must be replaced.

VACUUM TRANSFER SWITCH

This three port vacuum transfer switch, a spring, and a regular vacuum actuator, combine to give the fresh/recirculating door 3 positions (Off or 0% fresh air, 20% fresh air, and 100% fresh air).

(1) Push the system Off button and start engine. Observe the following:

(a) Fresh/Recirculating Air Door is on 0% fresh air.

(b) Switch Plunger is retracted and touching lever.

(2) Disconnect solid black vacuum line at thermostat and leave it vented. Push the Auto button. Observe the following:

(a) Fresh/Recirculating Air Door is on 20% fresh air.

(b) Switch plunger has moved out but is still contacting lever.

Reconnect vacuum hose to thermostat after this check.

(3) Remain in Auto and set dial control to warmest position 85. Observe the following:

(a) Fresh/Recirculating Air Door is on 100% fresh air.

(b) Switch plunger has moved all the way out and is no longer in contact with lever.

If all of the above occurred as stated, the switch is operating properly. If they did not, proceed as follows:

(1) Push the system Off button, leave engine running.

(2) Remove 3 port vacuum plug from transfer switch and connect a vacuum source to the middle port of the switch. Do the following:

(a) Depress plunger all the way in and check for absence of vacuum at the right port (one closest to lever) and absence of vacuum at the left port.

(b) Release plunger and check for absence of vacuum at the left port and presence of vacuum at the right port.

If the above did not occur as stated, the transfer switch is faulty and should be replaced.

BLOWER MASTER ON-OFF SWITCH

The master switch is vacuum operated and turns on the blower. A magnet mounted inside the switch holds the electrical contacts open. When sufficient vacuum is applied an internal diaphragm with attached electrical contact is pulled away from the magnet and the electrical circuit is completed.

This switch can be checked by applying 8 ± 1 inch Hg. vacuum to it with an external vacuum source and checking for electrical continuity, and by removing the vacuum source and checking to see that it opens at less than 5 inches Hg. vacuum. The resistance of this switch can be checked by measuring the voltage of this motor when the system is in Hi-Blower air conditioning. If the motor voltage is low, and it can be corrected by replacing the master switch with a jumper, the switch should be replaced.

COMPRESSOR VACUUM SWITCH

This switch is vacuum operated and turns on the compressor (if the ambient switch is closed). It is identical to the blower master switch except in that it closes at 2 ± 1 inch Hg. vacuum and completes the electrical circuit to the compressor clutch. The switch is actuated immediately in any push-button position except Off.

The performance of the switch can be checked by applying 2 ± 1 inch Hg. vacuum with an external vacuum source and checking for electrical continuity then removing the vacuum source and checking to see that it opens. The resistance of the switch can be checked by measuring the voltage at the clutch any time the compressor should be running. If the clutch voltage is low, and can be corrected by replacing the switch with a jumper, the switch should be replaced.

AMBIENT SWITCH

The compressor ambient switch completes the electrical circuit to the clutch, ETR switch, and ETR solenoid if the ambient temperature is above 32°F. The operation of the compressor down to 32°F. provides a smooth transition for incoming air, and adds to comfort by also dehumidifying in cool, damp weather.

Due to its location, the switch will become heated periodically during the winter season by brief shutdowns of the Auto-Temp system or the engine. On restart, the compressor will operate for brief period and, thereby, allows the shaft seal to be lubricated automatically.

The ambient switch can be checked by removing it and checking for continuity at a temperature slightly above 32°F., and for being open at temperatures slightly below 32°F.

ANTI-FROST CONTROLS

This control consists of 2 parts: ETR Valve Solenoid and ETR Switch.

The anti-frost control is a device which allows the evaporator to maintain a minimum air temperature, without allowing the moisture on the fins to freeze, down to ambient temperatures of approximately 32°F. This ETR (evaporator temperature regulator) control was chosen for the Auto-Temp system because the EPR used on Standard A/C cars would not prevent coil freeze-up at the lower ambient temperatures at which the compressor is required to operate. The ETR consists of the electrical solenoid which is actuated by the temperature switch which senses coil fin temperature.

The ETR solenoid can be checked simply by energizing it directly off the battery and listening for its closing.

The ETR switch (Fig. 6) can be tested for operation as follows:

(1) Set thumbwheel potentiometer below 65.

(2) Connect a test light in series with the ETR switch feed wire at the compressor.

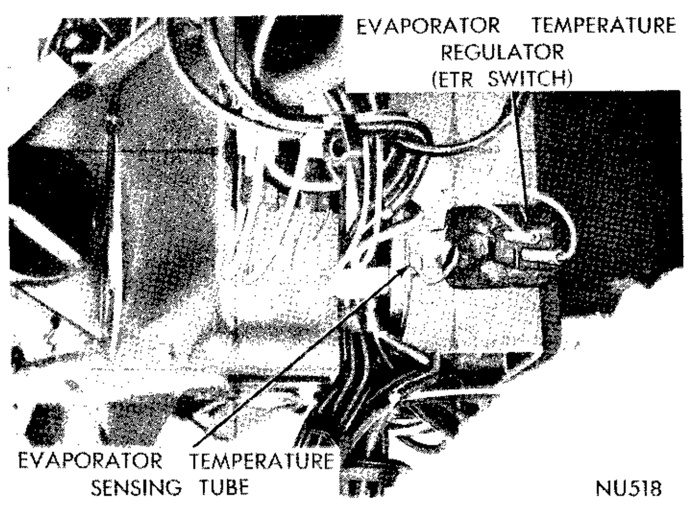


Fig. 6—ETR Switch Location

(3) Connect a three gauge manifold, Tool C-3740 (Fig. 7), with suction and discharge valves closed.

(4) Start engine and set at 1000 RPM. Close all car doors and windows and press Auto button.

(5) Allow engine to run about 5 minutes and compare gauge readings with switching action of ETR switch.

Test Light	Evaporator Suction Gauge	Discharge Pressure Gauge	Compressor Inlet Gauge
OFF	22	180	30
ON	30	150	0 or Below

Head pressure may vary, but a 25 to 30 pound pressure differential will show during switching action of the ETR switch.

ETR SOLENOID VALVE

The ETR valve is a precision part, with extremely small operating clearances. The presence of foreign material between the two sleeves can cause the valve to stick. It is, therefore, imperative that every effort be made to protect the valve from contaminents.

Replacement

(1) Discharge system as outlined in A/C section of this manual.

(2) Disconnect 12 volt D.C. lead from the ETR terminal gasket at the suction fitting.

(3) Remove the 2 bolts holding the suction fitting to the compressor, and remove the fitting.

(4) Remove the terminal gasket from the compressor, and discard.

(5) Scrape off any gasket particles remaining on the crankcase and suction fitting, working from the center outwards, thereby reducing the possibility of contaminating the compressor. If the system check had indicated a lack of electrical continuity, place a short length of 1" diameter tubing against the rear face of the ETR valve collar, and tap lightly, to ensure good contact between the compressor and the chamfered surface of the valve collar. Check the valve for operation by applying 12 volts D.C. to the valve terminal post.

(6) Remove the valve from the compressor, using Tool C-3301A (Fig. 8). Recheck the valve for operation, by connecting 12 volts D.C. to the valve terminal post. The valve should close when grounded at the bottom of the outer sleeve.

CAUTION: Do not energize the valve continuously for more than 30 seconds. If the valve is still inoperative, replace it.

(7) Inspect the suction annulus for foreign material, and ensure that the plug in the ETR oil bypass

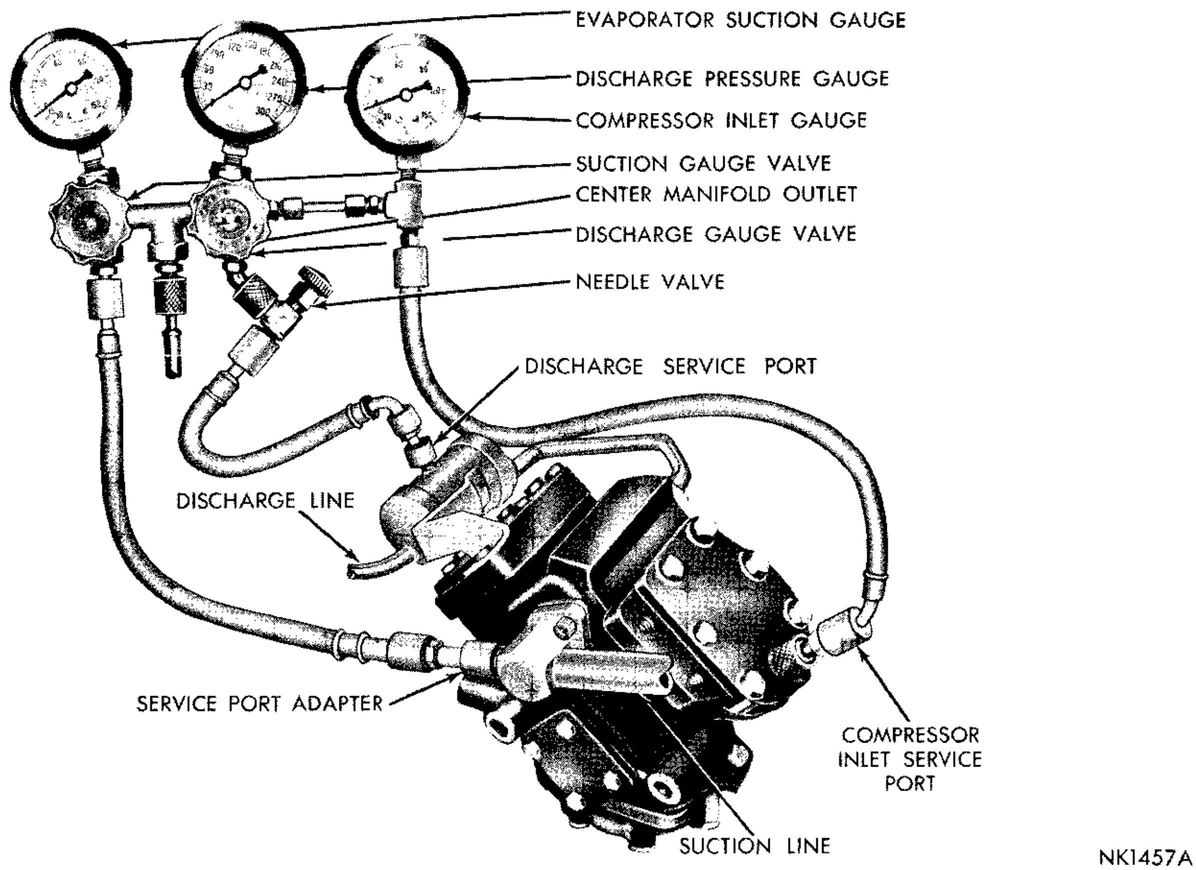


Fig. 7—Gauge Set Manifold Connections

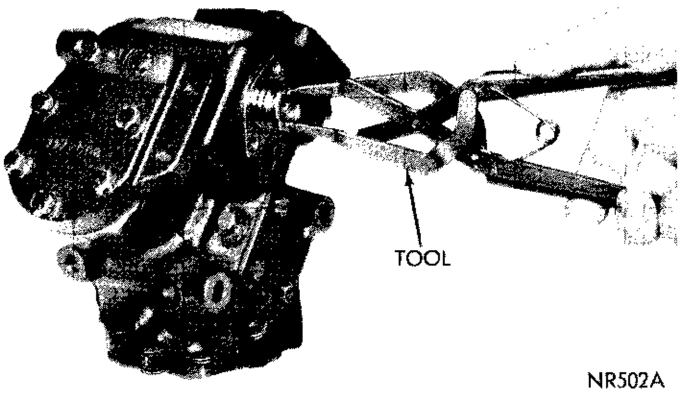


Fig. 8—Removing ETR Valve

is pushed below the machined surface of the ETR cavity.

(8) Check for valve operation by clamping a 12 volt D.C. lead to the terminal post and gently tapping the bottom of the valve against a clean grounding surface.

(9) Using Tool C-3301A, insert the ETR valve as far as possible into the suction annulus. Gently tap the valve in as far as it will go, using the tool previously described.

(10) Coat both the suction fitting and compressor crankcase mating surfaces with a light coating of clean refrigerant oil.

(11) Install new terminal gasket so that the copper terminal spring slips over the terminal post of the ETR valve.

(12) Torque the suction fitting bolts to 11 foot-pounds in small equal increments, to ensure proper seating on the gasket. Check for continuity and operation by applying 12 volts D.C. to terminal.

(13) Charge the system with refrigerant-12 and check for refrigerant leaks.

(14) Reconnect 12 V D.C. lead from anti-freeze switch to ETR valve at the terminal gasket. Check system for proper operation.

TEMPERATURE CONTROL DIAL

The control dial allows the operator to select an interior comfort level by selecting a number from 65 to 85. Movement of the dial controls a resistance potentiometer, which is part of the dial assembly. There is a calibration between the dial temperature and the potentiometer resistance. The potentiometer will put out the proper biasing resistance signal to the control system so that it will control at the selected interior temperature.

There are 3 basic problems which may occur with the control dial potentiometer assembly. These are listed along with the system malfunction symptom.

(1) **Potentiometer could be open**—System would operate on maximum A/C and high blower only.

(2) **Potentiometer could have a short**—System would operate on maximum heating and high blower only.

(3) **Dial and Potentiometer could be out of calibration**—Dial must be set too high or too low to attain comfort.

Checking the above can be accomplished as follows:

(1) To check the dial potentiometer for an open or short, disconnect potentiometer leads (violet color) and connect them to an ohmmeter (Simpson model 260 series 4, volt-ohm milliammeter, or any equivalent ohmmeter can be used). Observe the following:

(a) If meter shows infinite resistance, the potentiometer is open and should be replaced.

(b) If meter shows zero resistance, the potentiometer has a short.

(c) If potentiometer is good, there should be a smooth change in resistance from approximately 50 to 550 ohms in dial rotation from 85 to 65. If not, potentiometer should be replaced.

(2) To check the dial control calibration, set the dial to 75 at center of Bezel. The meter should read 300 ohms. If it is out of calibration, it can be adjusted as follows:

(a) Rotate dial so that meter reads 300 ohms.

(b) Hold potentiometer shaft as shown in Fig. 10 and slip dial so that number 75 is on center of Bezel.

After completing work on the control dial assembly, be sure to reconnect all wiring.

IN-CAR SENSOR

The in-car sensor is located in a removable grille so that check or replacement can be accomplished. It senses car interior temperature and automatically signals the control unit to compensate for any variation from the selected dial temperature.

There are two basic problems which may occur with the sensor. These problems and the system malfunction symptoms are:

(1) **Sensor could be open**—System would operate on maximum heating and high blower only.

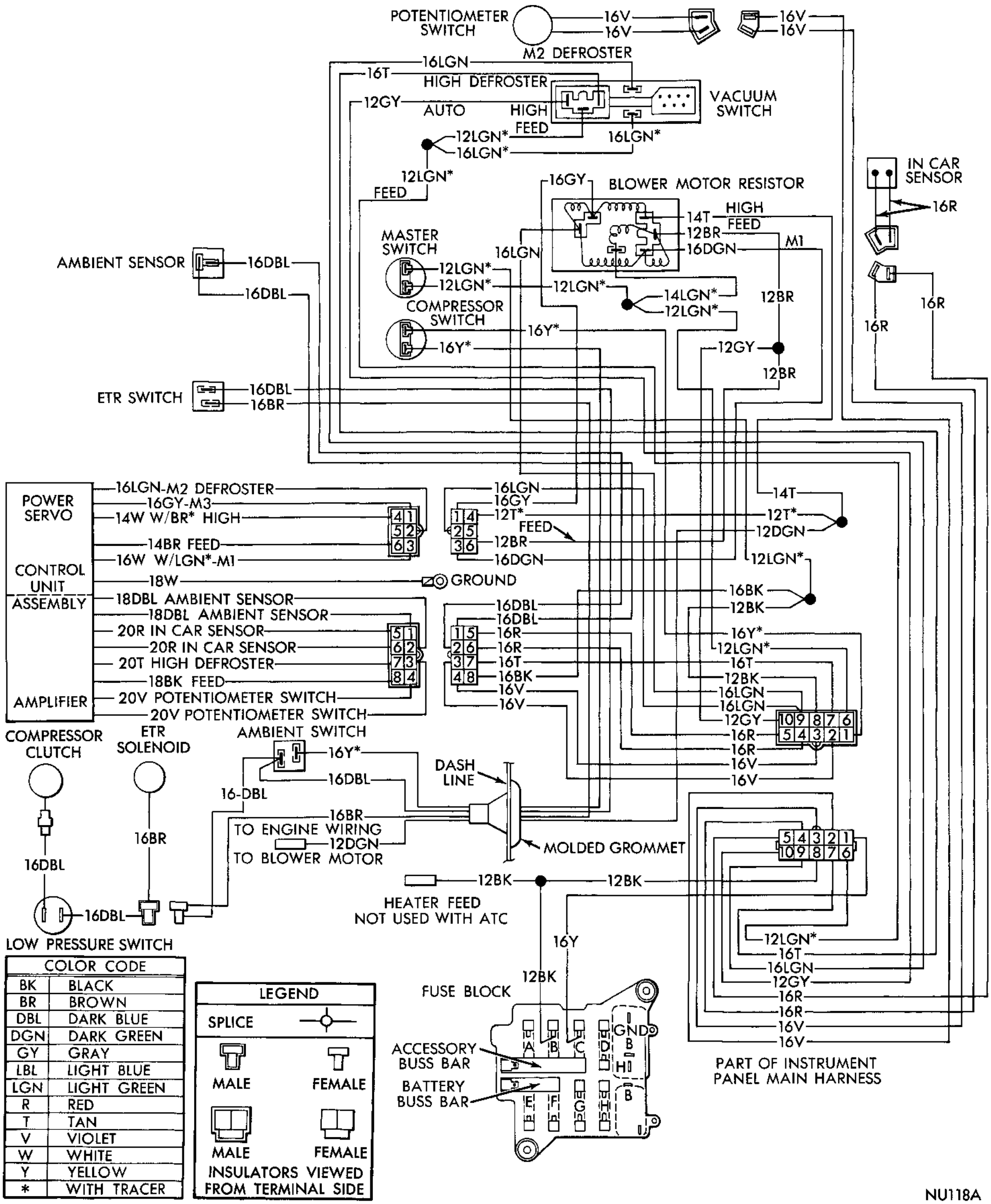
(2) **Sensor could have a short**—System would operate on maximum A/C and high blower only.

The above can be checked in the same manner as the control dial potentiometer.

If the sensor is defective, check connections, repair or replace as necessary. The calibration cannot be checked without extensive measuring techniques. If the sensor is suspected to be out of calibration, a new sensor may be tried, but it is considered very doubtful that this will occur.

AMBIENT SENSOR

This sensor senses the outside ambient temperature. It makes adjustments to the system that are



COLOR CODE	
BK	BLACK
BR	BROWN
DBL	DARK BLUE
DGN	DARK GREEN
GY	GRAY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
*	WITH TRACER

Fig. 9—Auto-Temp Wiring Diagram

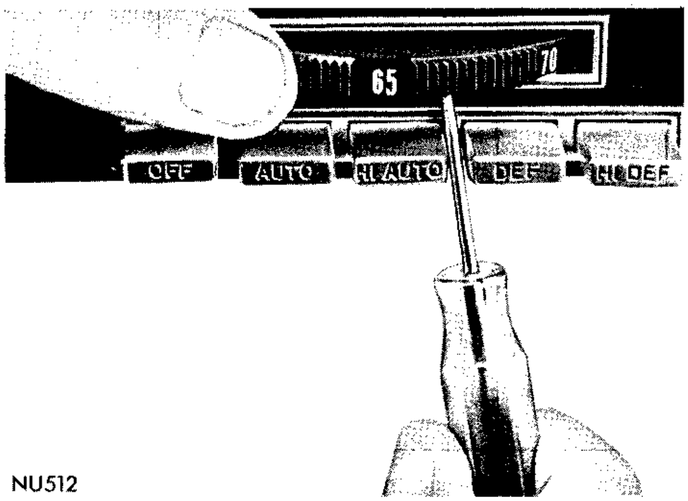


Fig. 10—Thumbwheel Calibration

required to maintain a constant interior comfort level due to ambient temperature changes.

There are two basic problems which may occur with this sensor, also. The problems and system malfunction symptoms are as follows:

(1) **Sensor could be open**—System operates on heat mode at all times.

(2) **Sensor could have a short**—System operates on maximum A/C and high blower only.

These deficiencies are checked in the same manner as for the in-car sensor. If sensor is faulty as described, repair or replace as necessary. A calibration check of this sensor is also difficult, therefore a new sensor may be tried in the system if it is suspected.

ASPIRATOR

The aspirator is a tube shaped device connected to the passenger side housing in such a manner that air flowing through the housing creates a slight vacuum in the aspirator. The aspirator is connected to the in-car sensor by a flexible tube. The vacuum in the aspirator tends to pull in-car air over the sensor.

Aspirator and Tube Test

With air flowing through the passenger side housing the aspirator should pull air into the in-car sensor grill. This can be checked by holding a smoking object (cigarette) next to the grille with the system on M3 blower in heat mode. If smoke is not pulled into the grille the aspirator is not working properly. The aspirator and tube must be inspected for incomplete connection or kinks.

VACUUM RESERVOIR TANKS

There are two reservoir tanks: Slave System Vacuum Tank and Servo System Vacuum Tank.

Both reservoir tanks are used for the purpose of maintaining sufficient vacuum in the system in cases where source vacuum is lost momentarily. Each tank has a check valve at the inlet port which closes when the vacuum supply drops off.

Operation of both tanks is checked in the same manner:

(1) Connect a 0-29 inch Hg. vacuum gauge to outlet port of tank.

(2) Start engine and allow to run at idle speed.

(3) Vacuum at gauge should build up above 20 inch Hg. in less than one minute.

(4) Shut engine off, and observe gauge.

(a) If vacuum does not drop off, the check valve and tank are operating satisfactorily.

(b) If vacuum drops off, there is a leak and tank assembly should be replaced.

CHECK VALVES (Fig. 11)

Check valves are used in the Auto-Temp system to prevent the venting of certain vacuum circuits, when the vacuum supply is lost or removed.

The check valves, which are an integral part of the reservoir tanks, are discussed in the vacuum reservoir tank check-out procedure. There are two other check valves in the vacuum system. These two valves are a part of the vacuum harness assembly, and are located in the area where the harness routes under the passenger side housing. The valves are spaced apart on the harness, and for identification, they will be referred to in sequence as numbers 1 and 2; where number 1 is the closest to the control unit assembly.

Each check valve also serves as a "tee" connector, thereby eliminating extra connections. On the body of each valve is an arrow which points to the port or ports being checked.

Test Procedure For Check Valves

The following is presented as an aid for diagnosing check valve failures:

(1) The most probable types of failures with check

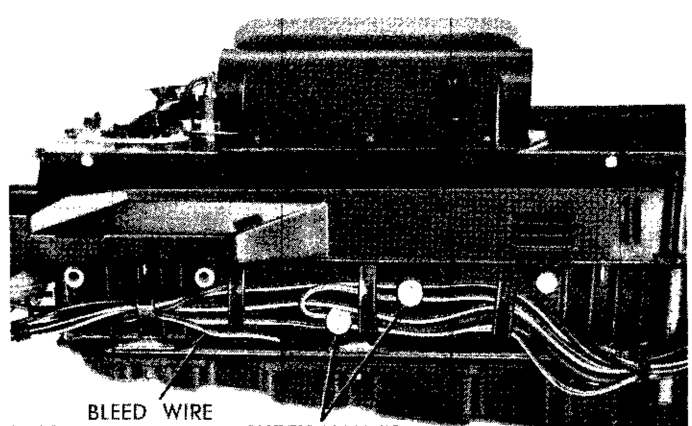


Fig. 11—Check Valves (Bottom View of Housing)

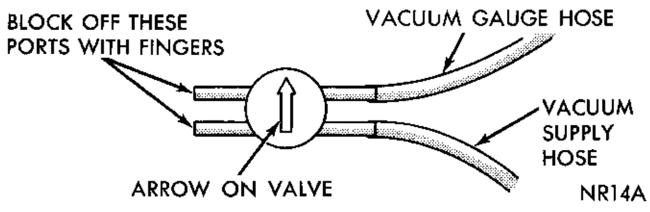


Fig. 12—Vacuum Check Valve Test

valves are leakage and incorrect installation. The malfunctions created by faulty check valves are:

Check Valve Number 1 Leaking: System stays on 20% fresh/air and will not go to 100% fresh/air. Also, system shuts off when vacuum supply is lost.

Check Valve Number 1 Installed Backwards: System malfunctions the same as with a leaking valve. Also, with a cold engine the blower will not come on when the "Defrost" or "Hi-Defrost" button is pushed.

Check Valve Number 2 Leaking: Blower starts immediately and blows cold air during cold weather.

Check Valve Number 2 Installed Backwards: Blower starts immediately and blows cold air during cold weather. With the engine cold the blower will not shut off when the "Off" button is pushed.

(2) When check valve failure is suspected, the following should be done:

(a) Inspect harness to see that valves are installed correctly as in (Fig. 11).

(b) Remove any valves which are suspected to be faulty, and check as follows:

Connect a vacuum gauge and supply vacuum to valve as shown (Fig. 12).

Apply full vacuum attainable from car or from an external source. Note vacuum at gauge and remove vacuum supply hose. The reading should have remained approximately the same. If vacuum is dropping off at the gauge, the check valve is faulty. Change any valves which are found faulty and check out system to see if malfunction has been corrected. It should be noted that the most severe test on a check valve is below freezing weather. It is possible that a defective valve will not work in such weather, but work at room ambient temperatures.

CAUTION: Do not use a lubricant of any type to attempt to increase the efficiency of faulty check valves as serious damage will result to the entire vacuum system.

System Vacuum Leak Test

(1) "Tee-in" a 0 to 30 inch vacuum gauge at the master switch (green color coded) vacuum connection.

(2) With the "Auto" button depressed, place system on Heat mode by rotating tester vacuum control dial to maximum vacuum.

(3) Allow vacuum at master switch gauge to build up to at least 18 inches and stabilize.

(4) Turn engine off and observe master switch gauge vacuum decay for one minute.

If the vacuum gauge did not build up to at least 18 inches vacuum with the engine running, or if the vacuum decay rate with the engine off exceeded 5 inches per minute, the system shall fail the performance test.

Servo System Vacuum Leak Test

(1) With engine running, push the "Hi-Def" button.

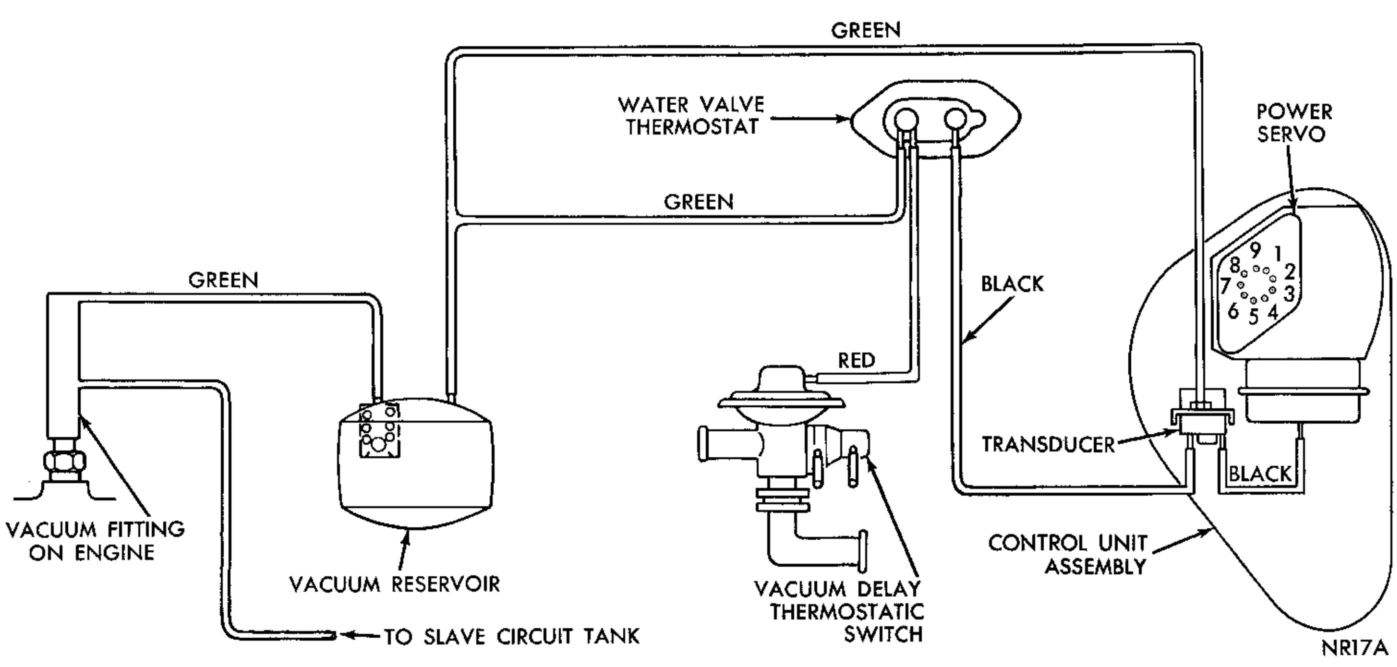


Fig. 13—Auto-Temp Control Vacuum Circuit

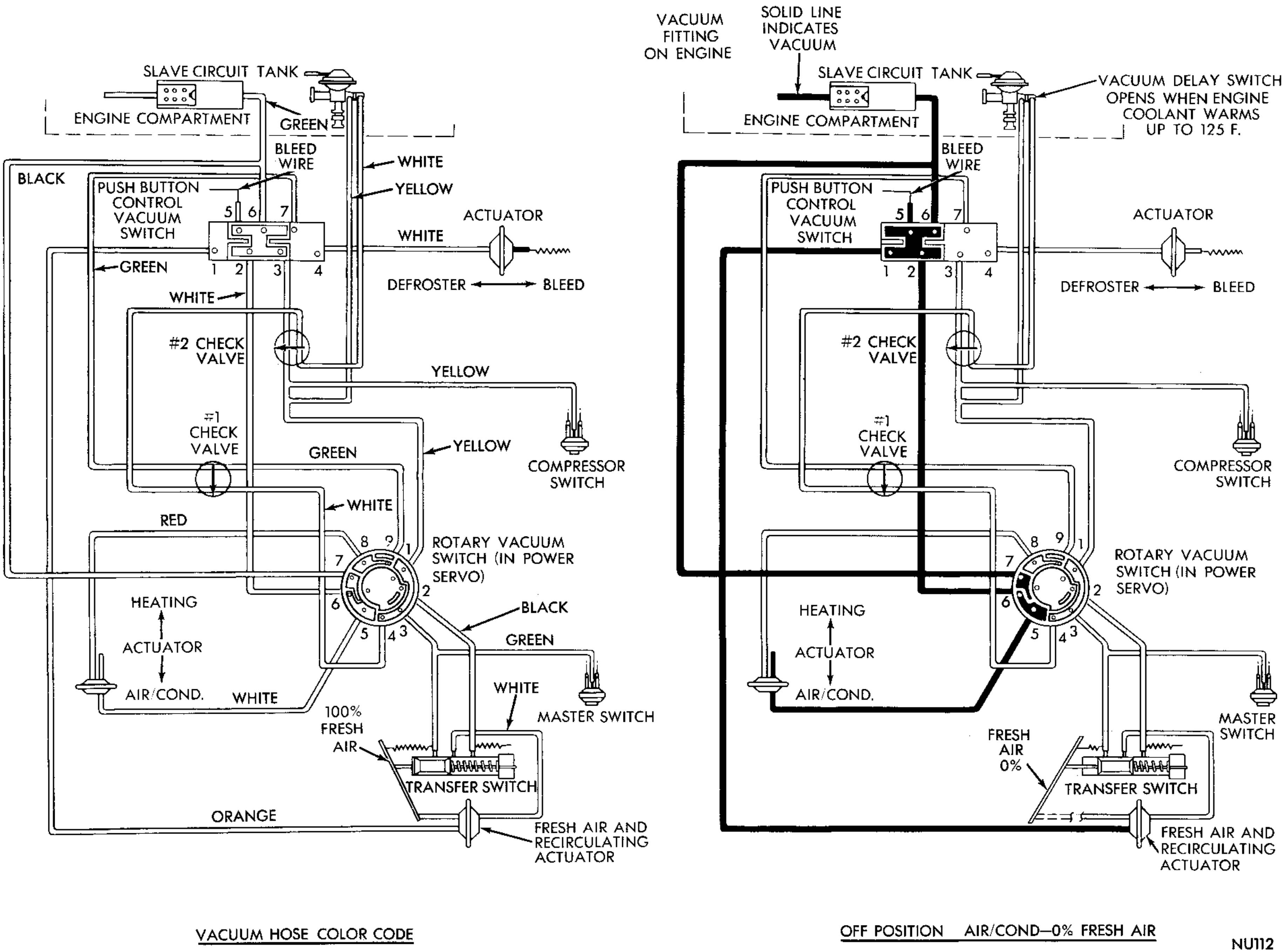
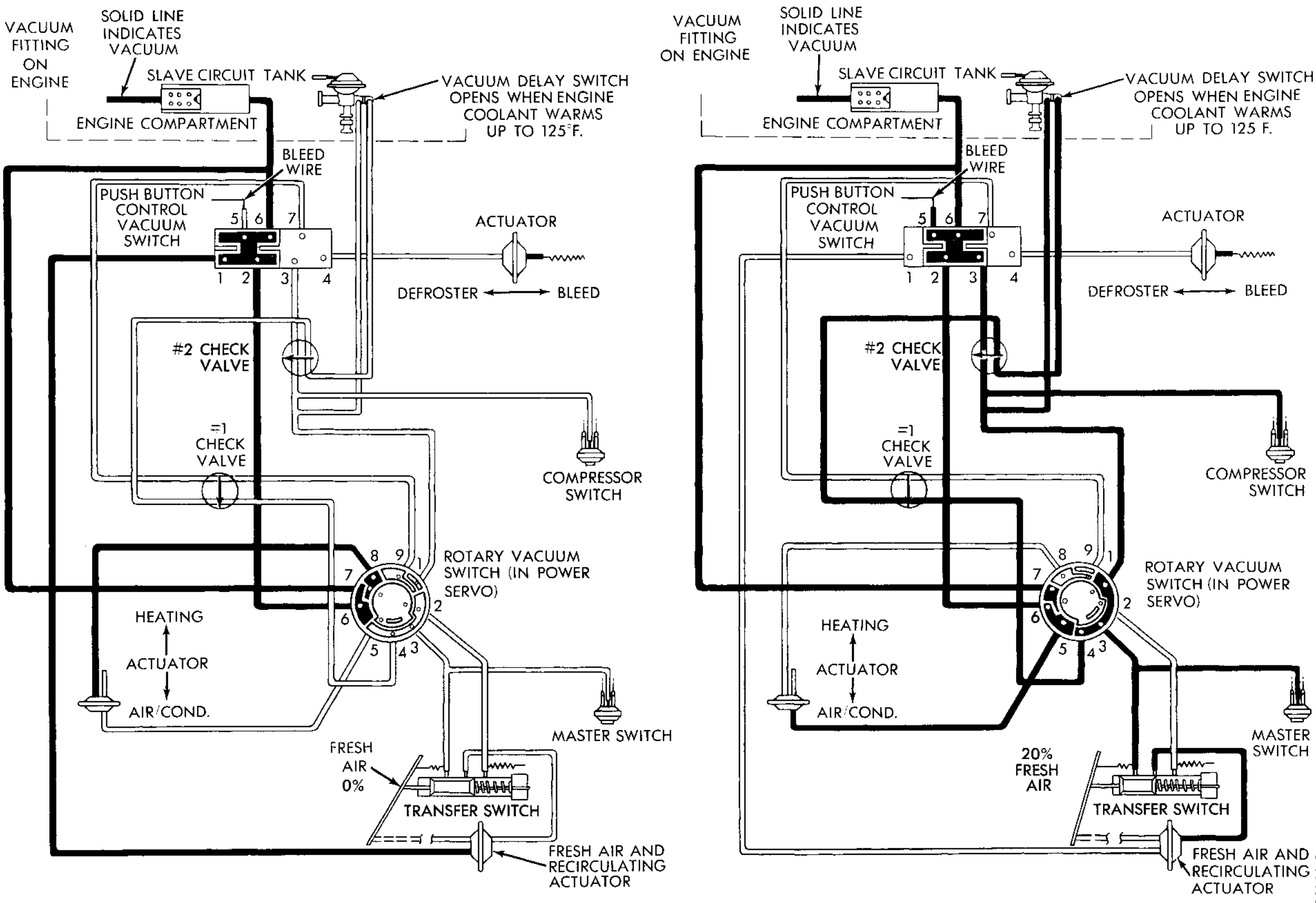


Fig. 14—Slave System Vacuum Circuit



OFF POSITION HEAT—0% FRESH AIR

AUTO OR HI-AUTO AIR/COND—20% FRESH AIR

NU113

Fig. 15—Slave System Vacuum Circuit

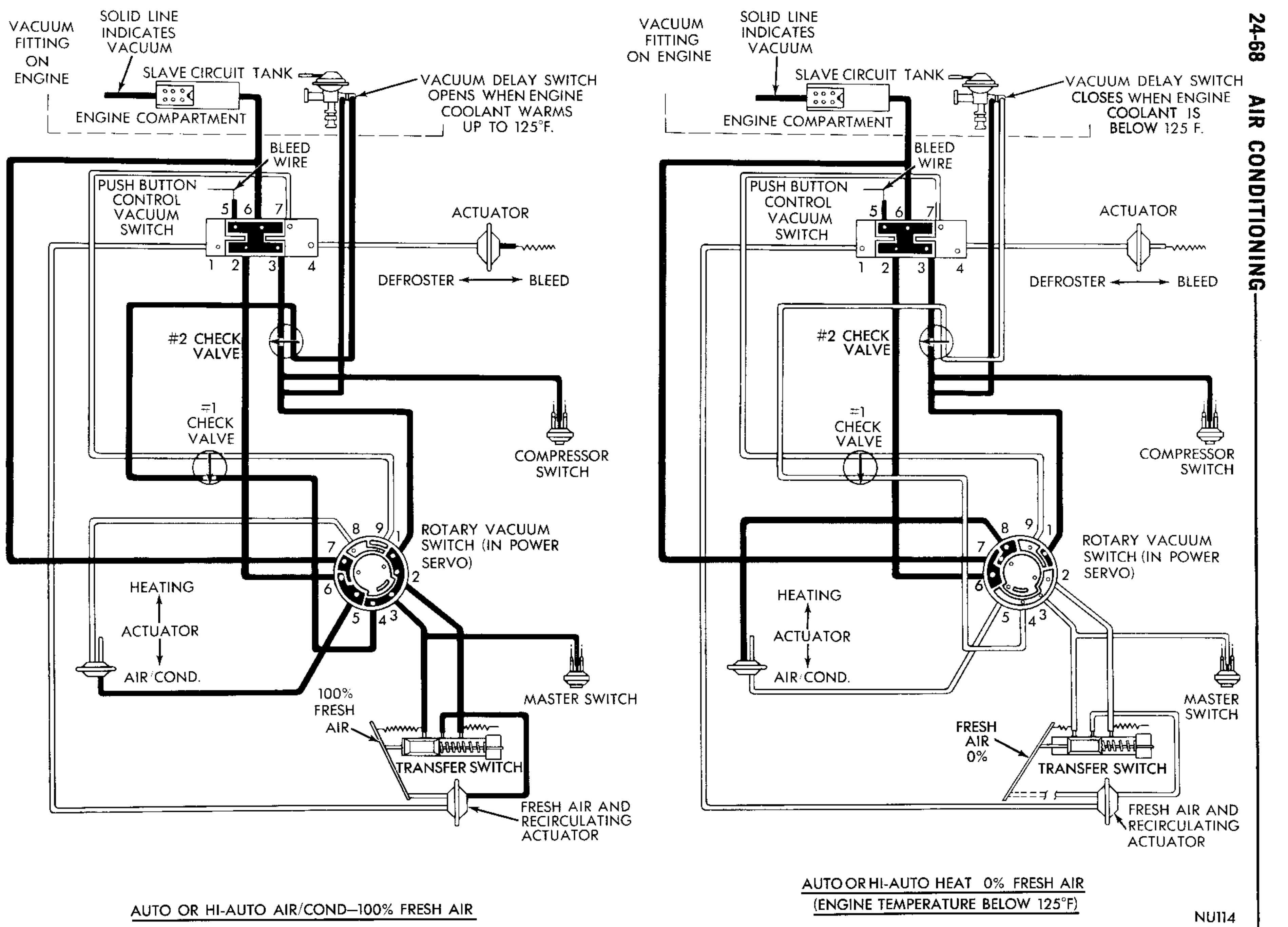
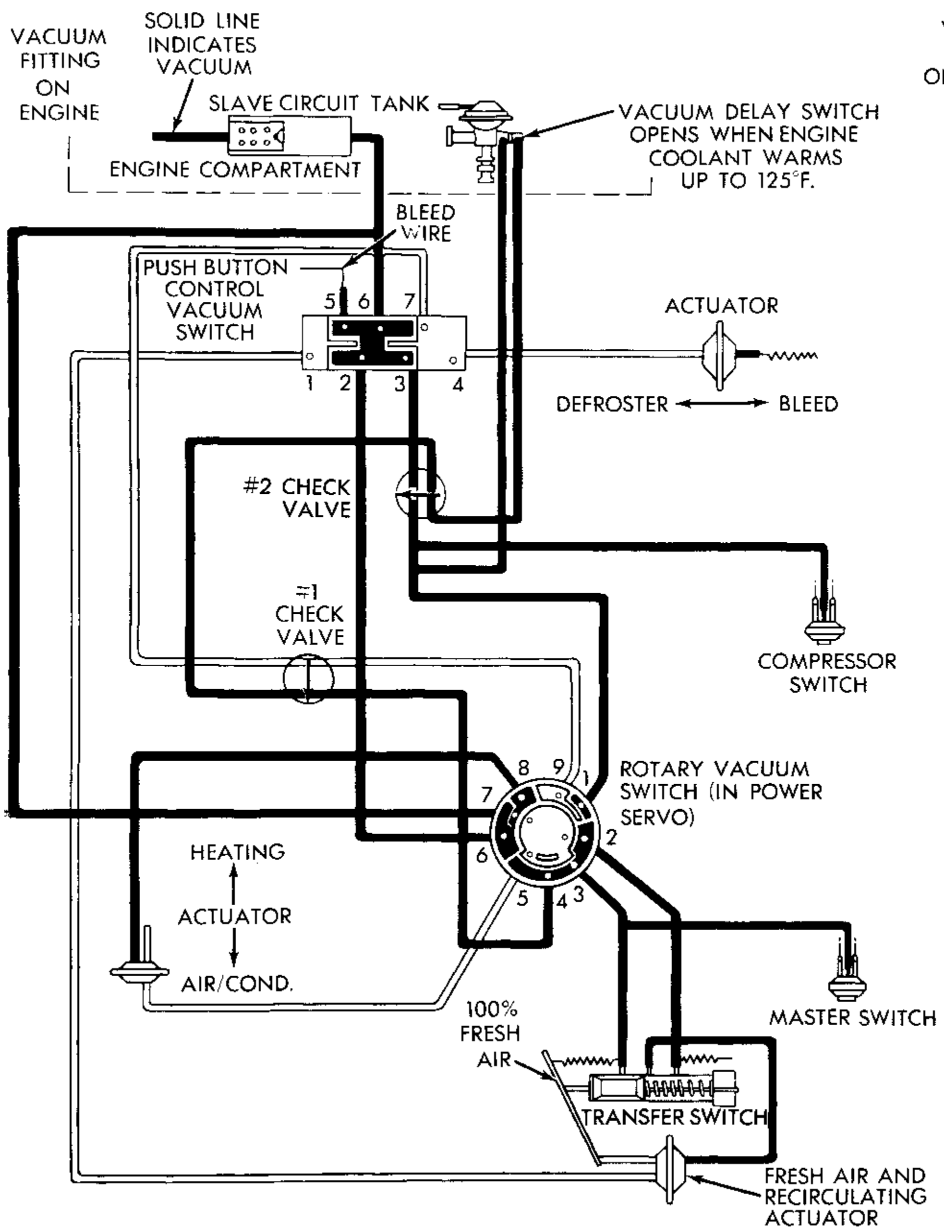
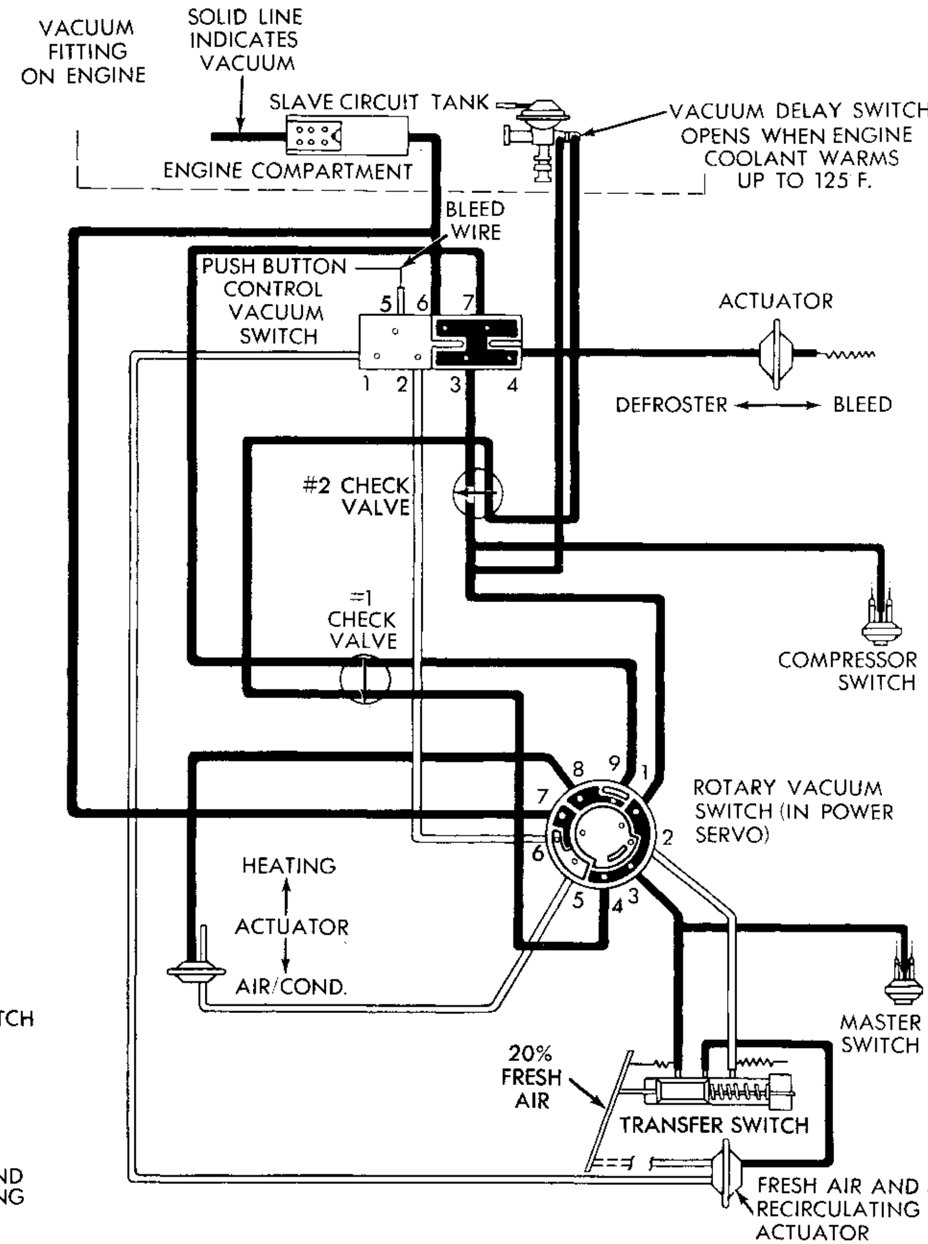


Fig. 16—Slave System Vacuum Circuit



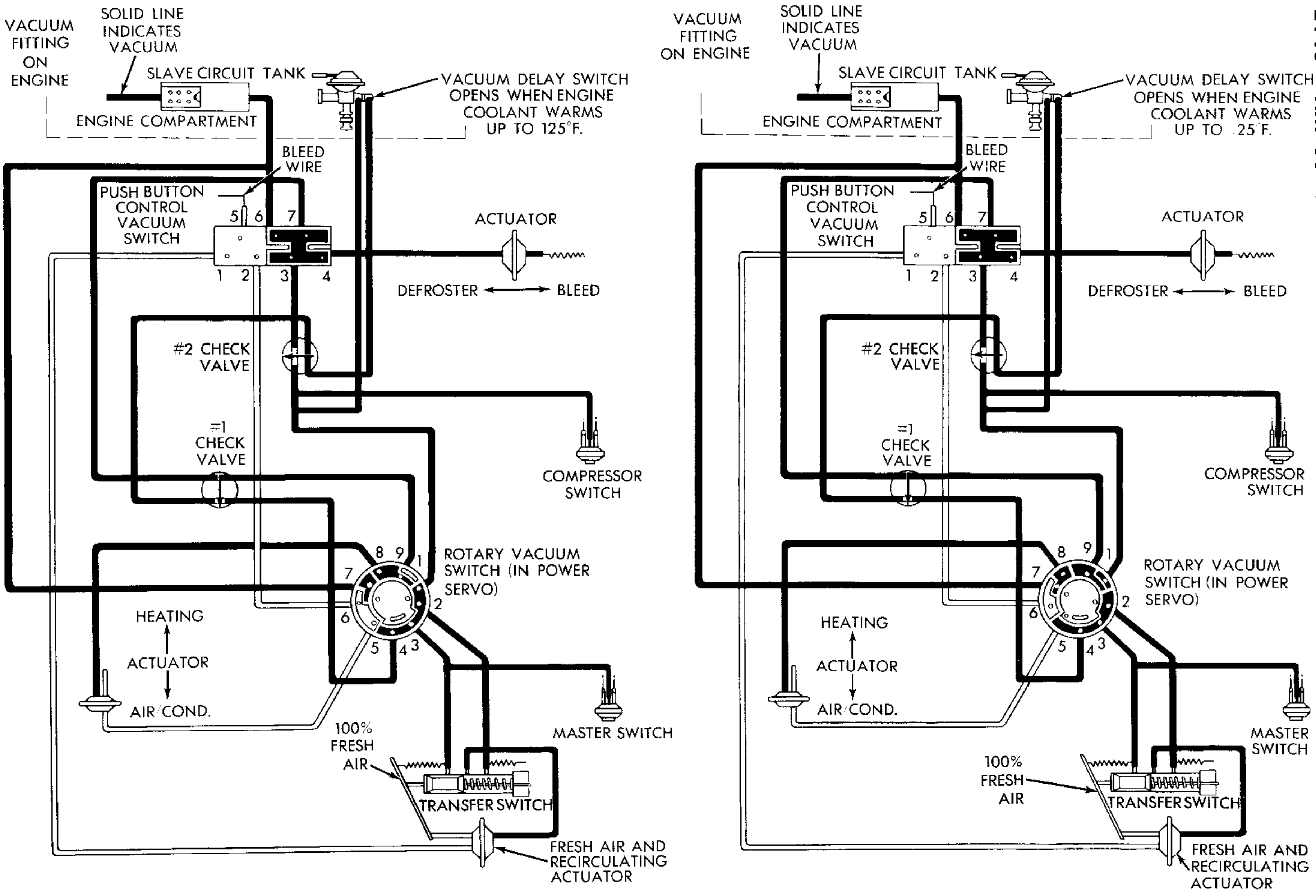
AUTO OR HI-AUTO HEAT—100% FRESH AIR
(ENGINE TEMPERATURE ABOVE 125°F)



DEFROST AIR/COND—20% FRESH AIR

NU115

Fig. 17—Slave System Vacuum Circuit



DEFROST AIR/COND—100% FRESH AIR

DEFROST OR HI-DEF HEAT—100% FRESH AIR

NU116

Fig. 18—Slave System Vacuum Circuit

(2) Observe that vacuum on tester gauge builds up above 15 inches and stabilizes.

(3) With engine running, pull off the vacuum supply hose to the servo system vacuum tank, and observe tester gauge vacuum decay for one minute.

If the vacuum decay rate exceeds 1 inch per minute, the system shall fail the performance test.

VACUUM CIRCUITS FOR EACH PUSH BUTTON POSITION (Figs. 13 thru 18)

When testing or adjusting the doors in the distribution system, it is necessary to know the correct position of each door for each push-button position. In the illustrations which follow; air flow is indicated, also which vacuum actuator hoses are activated for each push-button position.

With the use of the Service Diagnosis, Push Button Control Chart and Vacuum Circuit Diagrams, a quick and accurate solution to vacuum problems should be obtained.

CAUTION: Do not use lubricant on switch prods or in vacuum hoses as lubricants will ruin the vacuum valve in the switch and cause check valves to fail. If it is impossible to properly position the connector plug all the way on the switch prods, put a drop or two of clean water in the holes of the connector plug. This will allow the plug to slide completely on switch prods.

PERFORMANCE TEST

Humidity (the amount of moisture in the air) has an important bearing on the temperature of the air delivered to the vehicle's interior. This is true of all air-conditioned systems whether in the home, office or vehicle. It is important to understand the effect humidity has on the performance of the system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature and the temperature of the moisture carried in the air. Condensing the moisture in the air transfers a great deal of heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. In other words, high humidity greatly reduces the evaporator's ability to lower the temperature of the air delivered to the vehicle interior.

Evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds materially to the comfort of the passengers. However, an owner may expect too much from his air-conditioning system on humid days. A performance test is the best way to determine whether or not the system is performing up to standard. This test also provides valuable clues to the possible cause of trouble. Install gauge set as shown in Fig. 7.

Connect Auto-Temp Tester, as shown in Figure 2. Place system in minimum vacuum position. System should be in the maximum cooling position (air conditioning, 20% F/A, and Hi/blower).

Put fresh/recirculating door in the 100% fresh/air position. This can be done by removing the glove box and the right spot cooler duct. Remove and plug the white vacuum hose on the pot side of the fresh/air door actuator. Connect an external vacuum source to the pot side of this actuator. Replace the right spot cooler duct.

Arrange gauge set manifold hoses and tachometer leads to allow hood to be lowered, then close hood.

Place motor-driven psychrometer Tool C-3704 at cowl inlet opening. Distilled water should be used with this meter to prevent drying out and hardening the wet sock.

Place thermometer Tool C-3623 fully into center outlet grille opening. The left outlet should be fully extended and directed towards rear of vehicle.

Start the engine, open the windows, push the "Hi-Auto" button, open all grille outlets and set engine idle at 1300 R.P.M. **When testing the front unit of a dual system, leave rear unit blower turned off.**

Operate the air-conditioning system until a stabilized condition on the gauges and thermometers has been established. One of the most important steps in making the over-all performance test is that the en-

SINGLE UNIT

INLET AIR WET BULB TEMPERATURE	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
DISCHARGE AIR DRY BULB TEMPERATURE	41	42	43	44	45	46	47	48	49	50	50	50	51	51	52	52	53	53

INLET AIR WET BULB TEMPERATURE	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
DISCHARGE AIR DRY BULB TEMPERATURE	53	54	54	55	56	57	58	59	59	60	62	64	66	67	68	69	70	71

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 110°F

NK1342 A

Fig. 19—Performance Temperature Chart—Single Unit

gine must be operated at the RPM as indicated for approximately five minutes to allow all the underhood components of the system to reach their operating temperature.

Partially close the needle valve, located below the discharge pressure gauge, to minimize oscillation of the pointer. Do not close the needle valve completely since this would prevent the discharge pressure gauge from registering pressure.

This test should be performed with the discharge pressure from 190 to 210 psi. The 190 to 210 pound pressure is for **test purposes only.** To increase pressure restrict the air flow across the condenser using cardboard, paper, etc. to decrease pressure, increase air flow across condenser with external floor fans.

Observe and record both the "Inlet Dry Bulb Temperature" and "Inlet Wet Bulb Temperature" as registered on the psychometer.

Observe and record "Discharge Air Temperature" registered by thermometer at right hand grille outlet.

From the "Performance Temperature Chart," (Fig. 19), determine the maximum allowable discharge air temperature for the prevailing "Dry" and "Wet" bulb temperatures recorded. If the vehicle's discharge air temperature is at or below the temperature given on the Performance Chart, the air-conditioning is delivering its cooling capacity.