QUICK REFERENCE INDEX: To use, bend manual back to expose black spots on pages of the various groups. Then, by means of the index arrows on this page, locate the corresponding black spots on the pages of the group you desire to find.

H SERIES

Valiant

SERVICE MANUAL

CHRYSLER
AUSTRALIA LTD.

SERVICE DIVISION

CHRYSLER PARK, SOUTH AUSTRALIA

PART NO. 3714721

GROUP INDEX

General Specifications and Information

This manual has been prepared to provide service personnel with service information for vehicle models shown on the following pages. It covers many conditions that may be encountered with a listing of possible causes and remedies. Each section contains practical removal, repair and installation procedures.

Included in the manual are numerous illustrations showing the correct service tools in use. Specifications are tabulated at the beginning of each section for quick reference.

Chrysler Australia Limited reserves the right to make changes in design or to make additions to, or improvements in, its product without imposing any obligation upon itself to install them on its products previously manufactured.

MODEL CODE IDENTIFICATION

6 CYLINDER SEDANS

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Ranger	VH1–M–41	215	Single BBL	Low Compression	3 sp. Manual
Ranger	VH2–M–41	215	Single BBL	Low Compression	Torqueflite D
Ranger	VH3–M–41	245	Single BBL	Standard	3 sp. Manual
Ranger	VH4–M–41	245	Single BBL	Standard	Torqueflite D
Ranger XL	VH3–D–41	245	Single BBL	Standard	3 sp. Manual
Ranger XL	VH4–D–41	245	Single BBL	Standard	Torqueflite D
Ranger XL	VH7–D–41	265	Two BBL	High	3 sp. Manual
Ranger XL	VH8–D–41	265	Two BBL	High	Torqueflite C
Pacer	VH7–S–41	265	Two BBL	Premium	3 sp. Floor
Regal	VH4–H–41	245	Single BBL	Standard	Torqueflite D
Regal	VH8–H–41	265	Two BBL	High	Torqueflite C
Regal 770	VH8–P–41	265	Two BBL	High	Torqueflite C
Chrysler	CH8–P–41	265	Two BBL	High	(Floor Console) Torqueflite C

8 CYLINDER SEDANS

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Regal 770	VH6–P–41	318	Two BBL	Fireball	Torqueflite A904LA
Chrysler	CH6–P–41	360	Two BBL		(Floor Console) Torqueflite A727

6 CYLINDER WAGONS

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Ranger	VH1–M–45	215	Single BBL	Low Compression	3 sp. Manual
Ranger	VH2–M–45	215	Single BBL	Low Compression	Torqueflite D
Ranger	VH3–M–45	245	Single BBL	Standard	3 sp. Manual
Ranger	VH4–M–45	245	Single BBL	Standard	Torqueflite D
Ranger XL	VH3–D–45	245	Single BBL	Standard	3 sp. Manual
Ranger XL	VH4–D–45	245	Single BBL	Standard	Torqueflite D
Ranger XL	VH7–D–45	265	Two BBL	High	3 sp. Manual
Ranger XL	VH8–D–45	265	Two BBL	High	Torqueflite C
Regal	VH4–H–45	245	Single BBL	Standard	Torqueflite D
Regal	VH8–H–45	265	Two BBL	High	Torqueflite C

8 CYLINDER WAGONS

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Regal	VH6–H–45	318	Two BBL	Fireball	Torqueflite A904LA

MODEL CODE IDENTIFICATION

6 CYLINDER COUPE

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Charger	VH1–M–29	215	Single BBL	High	3 sp. Manual
Charger	VH2–M–29	215	Single BBL	High	Torqueflite D
Charger	VH3–M–29	245	Single BBL	Low Compression	3 sp. Manual
Charger	VH4–M–29	245	Single BBL	Low Compression	Torqueflite D
Charger XL	VH3–D–29	245	Single BBL	Standard	3 sp. Floor
Charger XL	VH4–D–29	245	Single BBL	Standard	Torqueflite D
Charger XL	VH7–D–29	265	Two BBL	Standard	3 sp. Floor
Charger XL	VH8–D–29	265	Two BBL	Standard	Torqueflite C
Charger R/T	VH7–S–29	265	Two BBL	High	3 sp. Floor
Charger 770	VH7–H–29	265	Two BBL	High	3 sp. Floor
Charger 770	VH8–H–29	265	Two BBL	Premium	Torqueflite C

8 CYLINDER COUPE

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Charger 770	VH6–H–29	318	Two BBL	Fireball	Torqueflite A904LA (Floor Console)

6 CYLINDER UTILITY

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Dodge	VH1–E–22	215	Single BBL	Low Compression	3 sp. Manual
Valiant	VH1–L–22	215	Single BBL	Low Compression	3 sp. Manual
Valiant	VH3–L–22	245	Single BBL	Standard	3 sp. Manual
Valiant	VH4–L–22	245	Single BBL	Standard	Torqueflite D
Ranger	VH3–M–22	245	Single BBL	Standard	3 sp. Manual
Ranger	VH4–M–22	245	Single BBL	Standard	Torqueflite D
Ranger	VH7–M–22	265	Two BBL	High	3 sp. Manual
Ranger	VH8–M–22	265	Two BBL	High	Torqueflite C

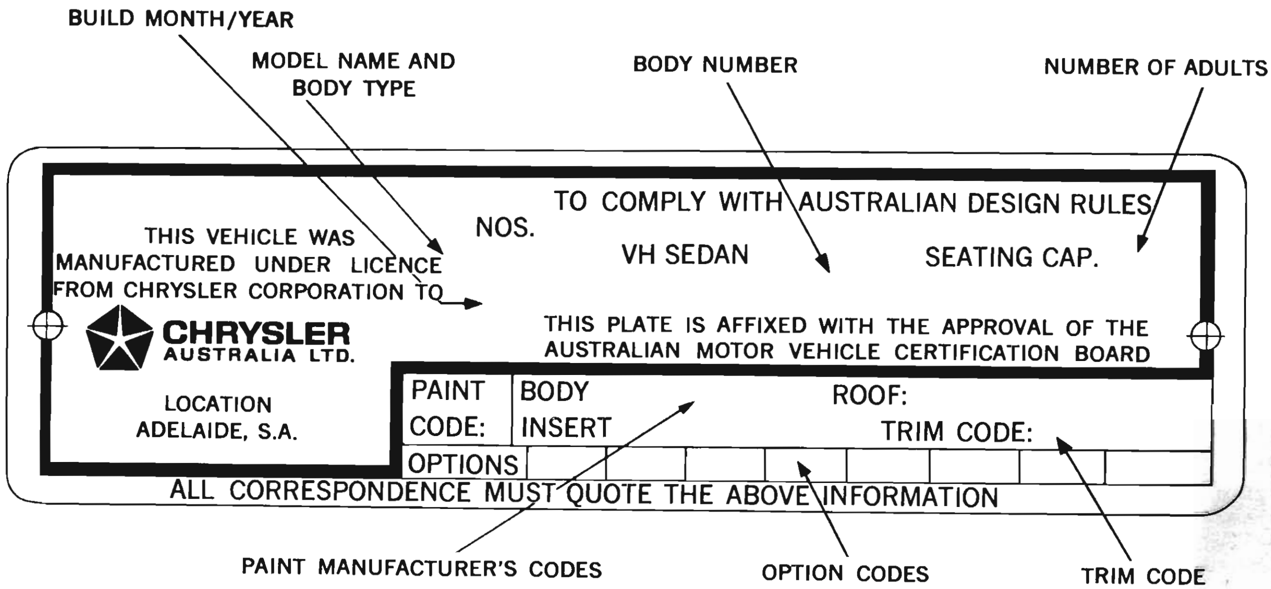
6 CYLINDER HARDTOPS

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Regal	VH4–H–23	245	Single BBL	Standard	Torqueflite D
Regal	VH8–H–23	265	Two BBL	High	Torqueflite C (Floor Console)
Regal 770	VH8–P–23	265	Two BBL	High	Torqueflite C
Chrysler	CH8–P–23	265	Two BBL	High	Torqueflite C

8 CYLINDER HARDTOPS

MODEL NAME	MODEL CODE	C.I.D.	CARB. TYPE	PERFORMANCE	TRANSMISSION
Regal 770	VH6–P–23	318	Two BBL	Fireball	Torqueflite A904LA (Floor Console)
Chrysler	CH6–P–23	360	Two BBL		Torqueflite A727

VEHICLE CERTIFICATION PLATE



This plate is attached to the plenum chamber on the right hand side of the engine compartment.
The model type and body number is also stamped into the right hand engine compartment splash shield panel.

ENGINE NUMBER LOCATIONS

Six Cylinder Engines: The engine number is stamped on the right hand side of the cylinder block on the distributor mounting boss.
Vee Eight Engines: The engine number is stamped on the horizontal pad on the left hand side of the cylinder block at the rear above the starter motor.

ENGINE NUMBER IDENTIFICATION

6 CYLINDER

Engine Type Capacity	Performance	Transmission	Year Built	Serial No.
D–1 215 C.I.D.	1–Low Comp. 1 BBL	1–Automatic	B—1971	00000
D–2 245 C.I.D.	2–Std. Perf. 1 BBL	3–3-sp. Manual	C—1972	
D–3 265 C.I.D.	3–High Perf. 2 BBL			
	4–Premium Perf. 2BBL			
	5–Premium Perf. E37			
	6–Premium Perf. E38			

8 CYLINDER

A–2 318 C.I.D.	2–Std. Perf. 2 BBL	1–Automatic	B—1971	
A–3 340 C.I.D.	3–High Perf. 4 BBL		C—1972	00000
A–4 360 C.I.D.				

Rev. July 1972

CHART—VH/CH OPTIONS

NOTE: Option codes are stamped on the vehicle compliance plate attached to the plenum chamber inside the engine compartment.

CODE	
A28	Taxi Package
A29	Valiant Low Line Sedan
A48	Interior Package
A51	Ornamentation Package
A65	Hood Dress-Up Package
A66	Hood & Fender Dress-Up Package
A77	Town & Country Package
A84	Track Pack (incl. large fuel tank)
A87	Track Pack
A95	Interior Dress-Up Package
A96	Decor Interior Dress-Up Package
B41	Disc Brakes
B51	Power Brake Booster
C16	Console
C25	Centre Seat and Arm Rest
C53	Bucket Seats (with Centre Cushion and Arm Rest)
C54	Bucket Seats (Tilt and Reclining)
C55	Bucket Seat (Fixed Back)
C56	Full Bench Seat—Independent Seat Backs and Centre Arm Rest
C93	Carpet Set (Except Cargo Area of the Station Wagon)
D20	4 Speed Manual Transmission
D53	Rear Axle 3.23 : 1 ratio with Sure Grip
D56	Rear Axle 3.50 : 1 Ratio with Sure Grip
E20	225 cu. ins. 6 cylinder engines (Export Built Up Only)
E37	"Six Pack" Engine (248 bhp)
E38	"Six Pack" Engine (280 bhp)
E48	"Six Pack" Engine (248 bhp)
E49	"Six Pack" Engine (302 bhp)
E55	340 cu. ins. V8 Engine (4 BBL Carburettor)
F21	Battery Dry Charged Less Acid (Export Only)
F22	Heavy Duty Battery (Export Only)
F56	Anti-Freeze (Export Only)
G18	Laminated Windshield
H51	Air Conditioning

CODE	
P25	Power Operated Driver's Seat
P31	Power Operated Windows
R24	Radio S/Tune with Stereo Cassette Player and Rear Speakers
R48	Power Antenna
R71	13 Transistors Push Button Radio
R73	11 Transistors Push Button Radio
S77	Power Steering
T14	Tyres 185 SR Radial
T15	Tyres EHR 70
V10	Vinyl Roof
V12	Landau Vinyl Roof
V99	Tonneau Cover
W31	Wheel and Tyre Package
W32	Styled Road Wheel Package
X12	Delete Heater (built up Export)
X21	Kilo Speedometer (Export Only)
X33	Japan (Built Up Export)
X34	New Caledonia (Built Up Export)
X41	Omit Disc Brakes (Export Only)
X51	Air Conditioning with E20 Option
X52	Maximum Cooling Package (Export Only)
X77	Power Steering with E20 Option
X82	Tyres WSW 6.95 x 14 (Export Only)
X83	Tyres WSW 7.35 x 14 (Export Only)
X86	Tinted Windshield (Export Only)
X87	Prismatic Mirror (Export Only)
X88	Trunk Lamp (Export Only)
X89	Remote Control Mirror (Export Only)
X90	Delete LH External Mirror (Built Up Export)
X92	Omit Rear Seat Belts (Export Only)
X93	Add LH External Mirror (Built Up Export)
Z96	Retractable Seat Belts (Delete Option)
Z97	Electric Tail Gate (Delete Option)
Z98	Steering Wheel—3 Spoke (Delete Option)
Z99	Radio

GENERAL SPECIFICATIONS

SIX CYLINDER	215 C.I.D.	245 C.I.D.	265 C.I.D.
Type of Engine	Upright 6 Cylinder Inclined O.H.V.		
Cylinder Bore x Stroke	3.52″ x 3.68″	3.76″ x 3.68″	3.91″ x 3.68″
Compression Ratio	8.0:1	9.5:1	9.5:1 9.7:1 (E37) 10.0:1 (E38)
Taxable Horsepower	29.6	33.9	36.7
Max. B.H.P. @ R.P.M.	140 @ 4,400	165 @ 4,400	203 @ 4,800 (High) 218 @ 4,800 (Premium) 248 @ 4,800 (E37) 270 @ 5,000 (E38)
Max. Torque @ R.P.M.	200 lbs. ft. @ 1,800	235 lbs. ft. @ 1,800	262 lbs. ft. @ 2,000 (High) 273 lbs. ft. @ 3,000 (Premium) 306 lbs. ft. @ 3,400 (E37) 310 lbs. ft. @ 3,700 (E38)

EIGHT CYLINDER	318 C.I.D.	340 C.I.D.	360 C.I.D.
Type of Engine	90° O.H.V. V8	90° O.H.V. V8	90° O.H.V. V8
Cylinder Bore x Stroke	3.91″ x 3.31″	4.04″ x 3.31″	4.00″ x 3.58″
Compression Ratio	9.2:1	10.5:1	8.8:1
Taxable Horsepower	48.9	52.2	51.2
Max. B.H.P. @ R.P.M.	230 @ 4,400	275 @ 5,000	255 @ 4,400
Max. Torque @ R.P.M.	340 lbs. ft. @ 2,400	340 lbs. ft. @ 3,200	360 lbs. ft. @ 2,400

VEHICLE DIMENSIONS

	COUPE	SEDAN	WAGON	UTILITY	H/T REGAL	H/T CHRYSLER	CHRYSLER
Wheelbase	105″ (266.7 cm)	111″ (281.9 cm)	111″ (281.9 cm)	111″ (281.9 cm)	115″ (292.1 cm)	115″ (292.1 cm)	115″ (292.1 cm)
Overall Length	179.7″ (456.4 cm)	192.8″ (489.4 cm)	197.3″ (501.1 cm)	194.3″ (493.5 cm)	196.8″ (499.8 cm)	196.7″ (500.1 cm)	196.7″ (500.1 cm)
Overall Width	74.2″ (188.5 cm)	74.2″ (188.5 cm)	74.2″ (188.5 cm)	74.2″ (188.5 cm)	74.2″ (188.5 cm)	74.2″ (188.5 cm)	74.2″ (188.5 cm)
Overall Height	54.5″ (138.4 cm)	55.9″ (141.9 cm)	58.2″ (147.8 cm) (top of wind deflector)	56.6″ (143.7 cm)	55.2″ (140.2 cm)	55.2″ (140.2 cm)	56.2″ (142.7 cm)
Front Track*	58.32″ (148.1 cm)	58.32″ (148.1 cm)	58.32″ (148.1 cm)	58.32″ (148.1 cm)	58.32″ (148.1 cm)	58.32″ (148.1 cm)	58.32″ (148.1 cm)
Rear Track*	58.72″ (150.2 cm)	58.72″ (150.2 cm)	58.72″ (150.2 cm)	58.72″ (150.2 cm)	58.72″ (150.2 cm)	58.72″ (150.2 cm)	58.72″ (150.2 cm)

* For vehicles equipped with styled wheels add 1″ (2.5 cm) to the dimensions quoted above.

GROUP 1

LUBRICATION AND MAINTENANCE

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SERVICE INFORMATION—PROCEDURES

1. ENGINE OIL

Lubricants are classified and graded according to standards recommended by the Society of Automotive Engineers (S.A.E.), the American Petroleum Institute (A.P.I.) and the National Lubricating Grease Institute (N.L.G.I.).

The S.A.E. grade number indicates viscosity or fluidity of the lubricant, e.g. S.A.E. 30 engine oils may have a dual number, one of which is S.A.E. 10W–40. This marking indicates that the oil is comparable to S.A.E. 10W, S.A.E. 20, and S.A.E. 30 and 40 grades.

The A.P.I. designations relate to the type of service for which the oil is recommended. The three designations are MS or SD, MM or OO and ML or OO.

> All engines require the MS or SD oils, both the S.A.E. number and the MS or SD designation should be marked on the container.

The N.L.G.I. makes the recommendation for greases by numbering them from 0 to 6. The numbers refer to the consistency (or stiffness) of the grease.

For the best performance and engine protection, Chrysler Australia recommends the following:

(1) An oil which conforms to the requirements of A.P.I. classification for Service MS or SD.

(2) An oil with the correct S.A.E. number is recommended for the anticipated temperature shown:

Anticipated Temperature Range	Viscosity Number
Above + 32°F	S.A.E. 30, 10W–40 20W–40
As low as + 10°F	S.A.E. 20, 10W–40
As low as – 10°F	S.A.E. 10W, 10W–40

Chrysler Australia Limited does not recommend the use of any lubricant which does not have both S.A.E. designation and MS or SD Service Classification printed on the container.

Frequency of Lubrication

Engine oil change intervals of 4,000 miles or every three months, whichever occurs first, are recommended. However, unusual or severe operating conditions frequently encountered, can greatly reduce the protective life of oil and necessitate more frequent changes.

When a car is operated primarily in city traffic type driving, with some highway use, most trips are less than 10 miles long at slow speeds when the engine often does not warm up enough to resist the formation of condensation and sludge. The recommendation to change the oil every three months will ensure the effects of these harmful materials will be minimised.

The oil added to the engine at the factory is a special high quality oil for Service MS. It should be drained after 1,000 miles of vehicle operation. New engines frequently consume some oil during their early life. If it is necessary to add oil during this initial period, an oil for Service MS of the correct viscosity grade should be used.

The engine oil level should be checked each time the car is re-fuelled. When the level drops below the *"ADD OIL"* mark on the engine oil level indicator (dip stick) *(See Fig. 1),* the addition of one quart of oil will usually bring the level within the running range.

> When adding or changing engine oil use lubricants which have both the S.A.E. designations and the MS Service Classification printed on the container.

High quality, well refined engine oils usually have both classifications shown on the containers. Choice of brands should include the reputation of the refiner and the marketer.

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 every two months, not to exceed 2,000 miles. Replace filter every second oil change.

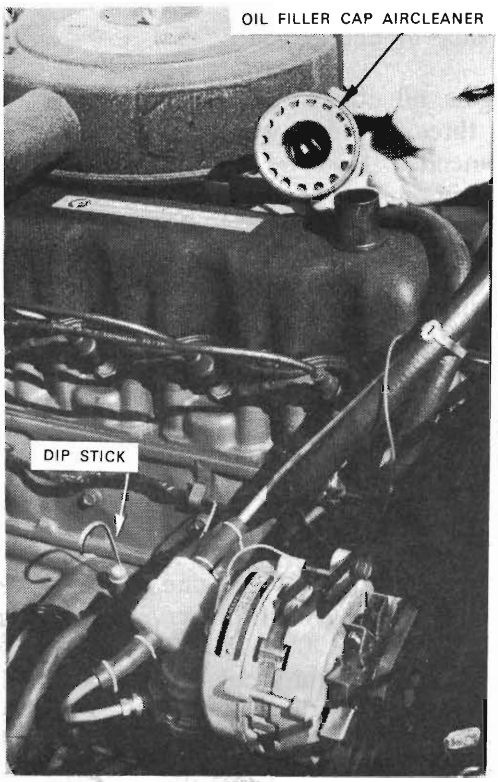


Fig. 1 – Engine oil level dip-stick and oil filler cap air cleaner (Hemi 6 Models)

2. CAPACITIES
(IMPERIAL MEASURES)

Cooling System		
6 CYLINDER—with heater	—	24.0 pints
8 CYLINDER—with heater	—	26.0 pints
Engine Crankcase without filter	—	6.6 pints
with filter	—	8.3 pints
Fuel Tank—Sedans, Wagon and Hard Tops	—	19.0 galls
Charger	—	17.5 galls
Utility	—	19.5 galls
Optional Track Pack	—	35.0 galls
Rear Axle	—	2.3 pints
Transmission—Manual 3 speed	—	3.1 pints
—Manual 4 Speed	—	3.25 pints
—Automatic		
(A-904-LA)	—	14.0 pints
(A727A)	—	13.25 pints
—Models C, D & E	—	14.25 pints

3. OIL FILLER PIPE AIR CLEANER

Engines require ventilation through the cylinder head cover and crankcase to remove combustion products. Air enters the engine through the oil filler cap where any dust is trapped by the oil soaked material in the cap. *(Refer Fig. 2).*

The oil filler pipe air cleaner should be cleaned in kerosene and re-oiled with S.A.E. 30 engine oil every time the engine oil filter is changed, or *more often as operating conditions dictate*. In dusty areas as often as each 500 miles, and in *extremely dusty areas, daily*.

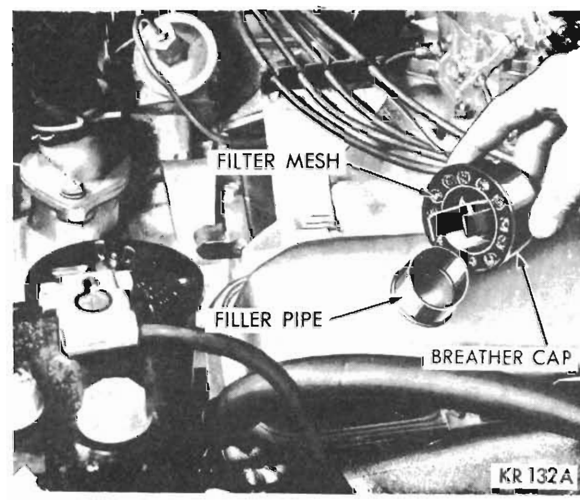


Fig. 2 – Engine oil filler cap air cleaner (8 cyl. Models)

4. CARBURETTOR AIR CLEANER

The carburettor air cleaner paper filter element should be cleaned *as often as conditions warrant*, but not exceeding 8,000 mile intervals. New element replacements periods are scheduled for every 24,000 miles.

To Clean

Remove the cover and fiter element, clean the housing and the cover with compressed air. Using compressed air, gently clean the paper element by holding the nozzle at least 2" from the inside screen. Examine the paper element for punctures. Discard an element that has even a pinpoint puncture. Also examine the soft plastic sealer on both sides of the element. These sealing surfaces must be smooth and uniform.

5. BATTERY

Every month, or more often in hot weather and on long trips, check fluid level of cells. Restore level to ⅜ inch above plates, using only water of a known low mineral content. Do not overfill.

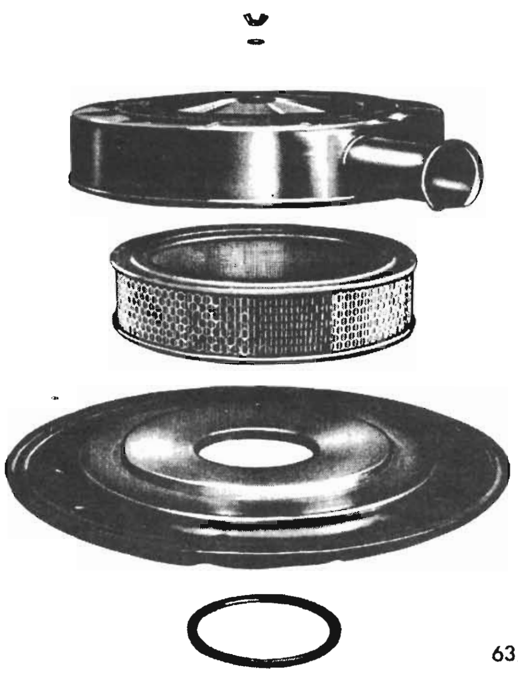


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Fig. 3 – Carburettor Air Cleaner (typical view)

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 to 18-24 lbs.-in. Protect terminals with light mineral grease.

6. BODY

The following parts should be inspected every 8,000 miles and lubricated if necessary. Prior to applying any lubricants, parts should be wiped clean to remove dust and grit. After lubrication, excess oil or grease should be removed. Particular attention should be given to external lock cylinders during winter months to ensure protection from water.

Lubricate the door hinges, stop cams, rollers lock latches, strikes and lock cylinders.

Lubricate the hood hinges, lock striker and catch.

Lubricate the boot lid hinges, torsion bar slides, lock striker and catch.

Lubricate the tailgate hinges, torsion bar slides, links, rotors and catches.

Lubricate door latch rotor, door hinges and other parts which are hard to lubricate, with penetrating oil. Lubricate parking brake lever with engine oil.

7. BRAKES

All models, except the 215 cu. in. engined 6 cylinder model vehicles (which use four wheel drum brakes), are equipped with the ventilated disc front brakes. The rear brakes are drum type, containing the park brake system, which is used on all models.

The service brakes are normally self adjusting with the exception of vehicles equipped with a Taxi Pack Option.

The service brakes on vehicles equipped with a Track Pack Option are not self adjusting.

These variations do not include the self-adjusted mechanisms and therefore must be manually adjusted as required. The self-adjusting brakes require no minor adjustment. However, periodic checks of the foot and parking brakes should be carried out in accordance with the Maintenance Chart.

Disc Brake equipped Models Only
Every 4,000 Miles

When rotating the wheels the front disc pads should be inspected visually for abnormal or excessive wear and replaced where necessary. Refer Group 5 Brakes, Part 3.

Every 8,000 or 12,000 miles (or where necessary between scheduled brake check inspections) the brakes of vehicles operating under "Continuous Capital City Driving Conditions" should be inspected to ensure that safe operating lining surfaces are maintained.

All Models

First 12,000 miles and subsequent 16,000 mile intervals.

When the front wheel bearings are lubricated as described in Para. 19, also remove the rear brake drums and clean all drums/disc surfaces and shoe/pad assemblies, etc., carefully, then inspect all components for wear, damaged condition or leaks, etc., remedy if required. Disassemble and disconnect the parking brake cables from the connections to enable them to be cleaned and re-lubricated (by pulling the inner cable through the outer casing to expose the inner cable).

Hydraulic Brake System

Clean the reservoir cover before removing to check the fluid in the tandem master cylinder every time engine oil is changed. Replenish with approved Chrysler heavy duty brake fluid to ¼" from the top of reservoir. *(See Fig. 4).*

Check that the reservoir cover diaphragm gasket is correctly "formed" before reinstalling cover and tightening screw to 60 lbs./in. torque.

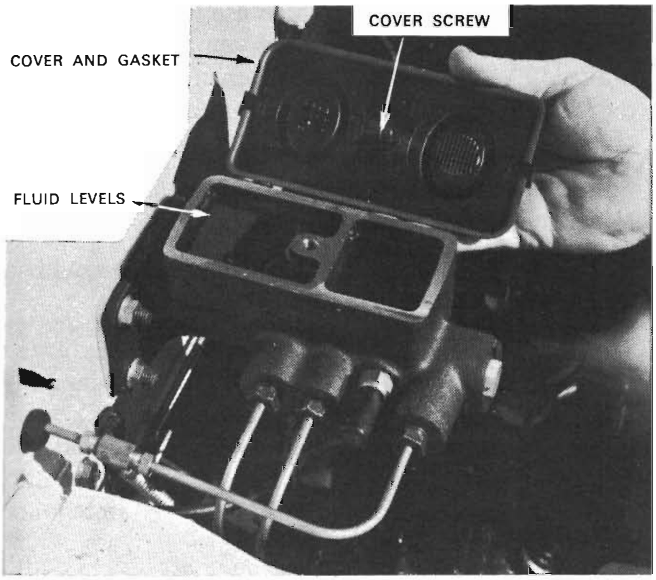

Fig. 4 – Brake Master Cylinder (tandem) Reservoirs

8. CHASSIS LUBRICATION

All ball joints and the torsion bars are effectively sealed against road splash by tightly fitted balloon type flexible seals.

The suspension balljoints are semi-permanently lubricated with a special lubricant at the factory, and should not, in *normal operating conditions,* require lubrication before 32,000 miles or two years, whichever occurs first.

All balljoint seals and tie rod end protectors should be inspected at each oil filter change period. Damaged seals must be replaced on balljoints to prevent lubricant leakage or contamination and subsequent component failure. *(See Fig. 5).* Tie rod ends must be replaced as assemblies if seals are damaged.

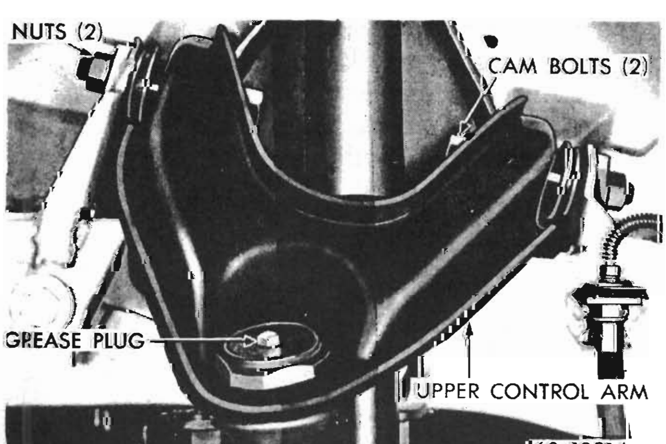

Fig. 5 – Balljoint grease retaining plug

Front Suspension Ball Joints

Every 32,000 miles or two years, remove the plug (on all models except taxi pack equipped vehicles) from the ball joint and install a lubricant fitting. Using a hand type gun, pump the lubricant into the unit until the lubricant flows from the seal, or until the seal balloons show fullness. Remove the lubricant fitting and re-install the plug.

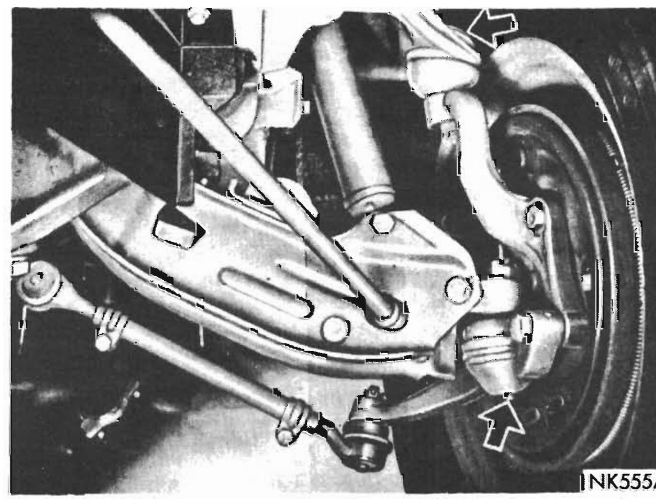

Fig. 6 – Front suspension balljoint lubrication fittings

> WARNING: Do not use pressure type lubrication equipment as the pressure may damage the balloon type seals. Use hand type lubrication gun only filled with *lithium-base grease* — No. 2 consistency. Fill each unit slowly to avoid rupturing the seal.

Steering Linkage

The steering linkage ball joints are semi-permanently lubricated. These ball joints should be inspected every 8,000 miles for cut or damaged seals and re-lubricated every 32,000 miles in the following manner.

Remove the threaded plug from the ball joint and *temporarily* screw a standard grease fitting into the threaded hole.

Inject *Lithium base grease* of No. 2 consistency into each ball joint until the grease flows freely from the seal bleed area at the base of the seal. High pressure dispensing equipment may be used to flush and fill the unit. *Re-install the plugs (where removed).*

9. COOLING SYSTEM

The cooling system should be drained, flushed and re-filled with proper coolant at 8,000-mile intervals or twice yearly. When necessary to remove accumulations of rust and other deposits, maximum cleanliness can be restored by using a reputable cooling system cleaner, according to the directions on the container.

When ready for refilling with "soft" water, protect against corrosion by adding Chrysler Parts Corrosion Inhibitor, Pt. No. 3424491, as directed, and anti-freeze where required. When draining the system, remove all the engine block drain plugs and open the drain cock in the radiator lower tank.

A 180°F (6 cyl.) or 190°F (8 cyl.) thermostat is fitted, with which anti-freeze may be used if warranted by climatic conditions.

10. DISTRIBUTOR

The distributor shaft has sintered bushes, which need to be lubricated only during distributor overhaul. At this time the shaft should be smeared with suitable grease and a few drops of light engine oil added to the bush lubrication wick, through the hole in the distributor plate. Every 8,000 miles apply a light smear of petroleum jelly to the distributor cam after the old cam lubricant has been wiped off. Add two or three drops of engine oil to the centre felt wick under the rotor every 8,000 miles.

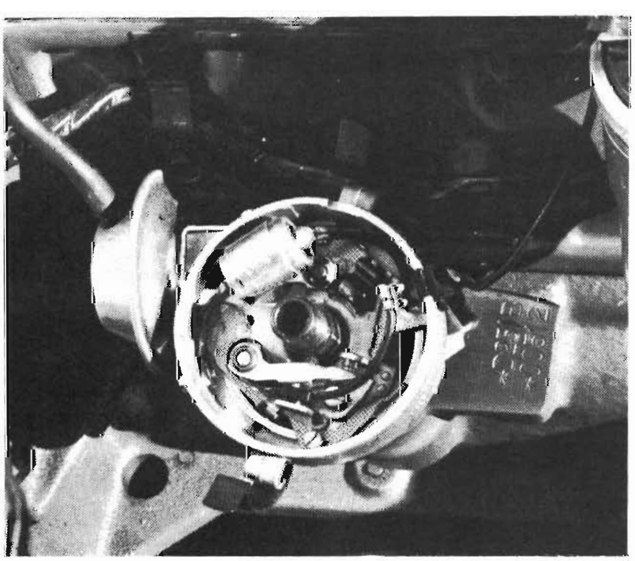

Fig. 7 – Distributor lubrication points

Every 8,000 miles

The contact points should be inspected, cleaned and adjusted or replaced as required. Clean rotor, lead conductors and cap. Refer Group 8, Electrical Part 4, for complete information.

11. ENGINE OIL FILTER

The engine oil filter is very efficient in trapping foreign matter until it becomes clogged.

Filter changes should be carried out at the following periods in accordance with the Maintenance Schedule every 8,000 miles or 6 months, whichever occurs first.

Operation in dusty areas will require more frequent filter changes than the specified figures.

> CAUTION: When installing the filter assembly lubricate the seal surface and tighten only *by hand* $\frac{1}{4}$ - $\frac{3}{8}$ turn after contacting the engine seal surface.
>
> Ensure that only the approved filter which *incorporates* the flow-back *check valve* is installed on the Hemi 6 cylinder model.

12. FRONT WHEEL ALIGNMENT

This operation should be performed at first 12,000 miles, then again at each 16,000 miles of service or 12 months operation, whichever occurs first, *more often* where heavy duty operation or possibility of accidental damage may warrant.

The need for a wheel alignment check is usually indicated by abnormal tyre wear patterns. Refer Group 22.

13. MANIFOLD HEAT CONTROL VALVE

At every oil change period check the valve operation. Work the valve back and forth a few times to ensure that the valve is free. *(See Fig. 8).*

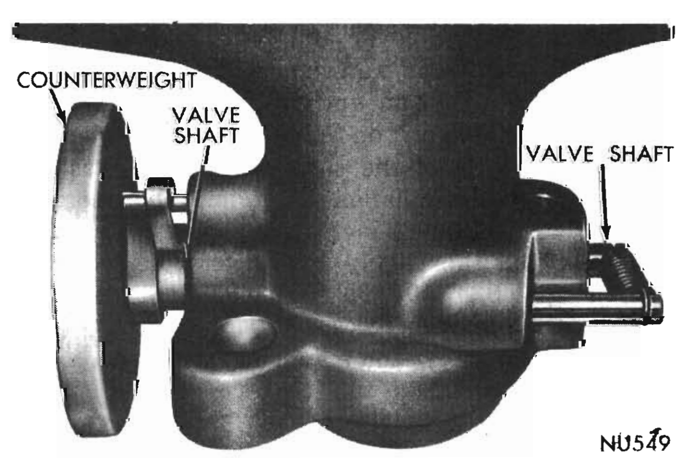

Fig. 8 – Exhaust manifold heat control valve (Typical view)

14. REAR AXLE

At every engine oil change period remove the rear axle filler plug and check the fluid level which should be between the bottom of the filler plug hole and ½" below. The fluid level must be checked with the car in a level position and supported at the rear axle housing or the wheels. Drain and refill are not normally required or recommended; however, where necessary, remove the plug and remove the lubricant with a small suction tube through the filler hole *(refer Fig. 9)*. REFILL USING THE CORRECT LUBRICANT TYPE and viscosity grade. Reinstall the plug.

Standard Axle

The standard rear axle is filled at the factory with G.L.5 S.A.E. 90, which is essential for running-in purposes. It is not necessary to remove the lubricant after run-in, and it can be topped up with G.L.5 S.A.E. 90 when necessary. G.L.5 S.A.E. 90 is also recommended for drain and refill where necessary.

"Four Pinion" Axle

On models equipped with the "4-pinion" type conventional rear axle, G.L.5 S.A.E. 90 is specified.

Sure Grip Axle

The Sure Grip equipped rear axle is filled at the factory with a special lubricant Part Number A3649436, which is Caltex Gear Lubricant TL3450. This is the only lubricant recommended for this axle.

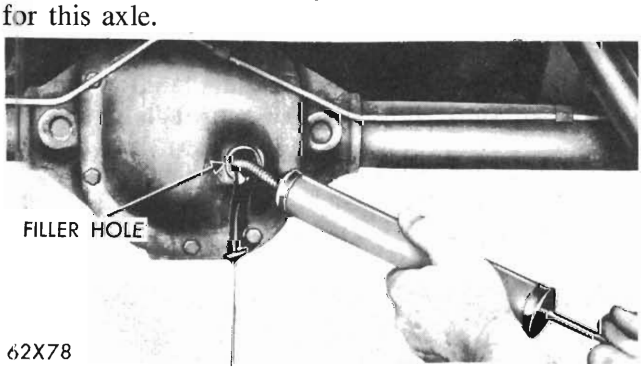

Fig. 9 – Removing rear axle lubricant

15. STEERING

Manual

Check the lubricant level at 8,000 mile intervals. *(See Fig. 10)*. Replenish with steering gear grease, when lubricant is not covering the work gear. Top up with G.L.5 S.A.E. 90 gear lubricant if steering gear grease is not available.

Power Steering

Check fluid level in the power steering pump reservoir every 8,000 miles *(Fig. 11)*. When fluid is cold, level should be below the "full" mark; when the fluid is hot, the level should be at the "full" mark.

> CAUTION: Before removing filler neck cap, wipe it carefully to prevent accumulated dirt from dropping into reservoir.

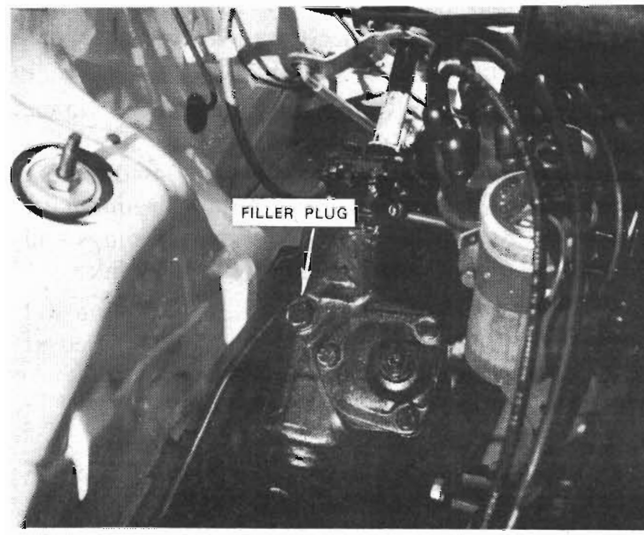

Fig. 10 – Manual steering gear lubrication

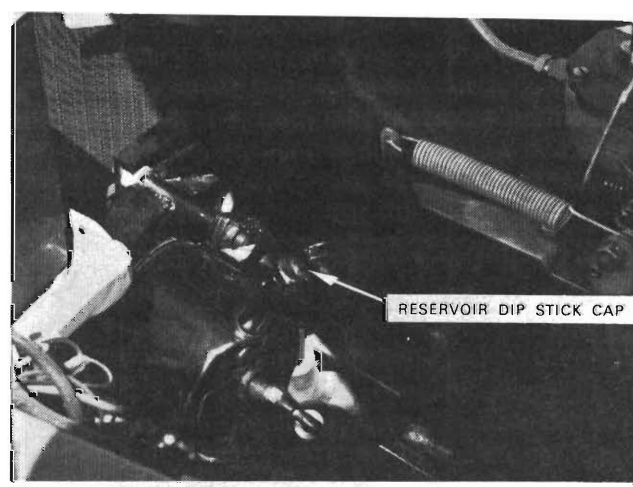

Fig. 11 – Power steering pump reservoir (typical view)

To restore level, if necessary, replenish with hydraulic fluid specially formulated for minimum effect on rubber hoses. Such a fluid is available under Part Number 2793254 Power Steering Fluid. For "top-up" Dexron Automatic Transmission Fluid may be used.

16. TYRES

Tyres should be rotated including the spare, at regular intervals (see Maintenance Schedule) to provide long tyre life and to retain comfortable riding qualities *(see Fig. 12)*. The spare should be used so that all the tyres will wear at approximately the same rate.

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The tyres should be examined for unusual wear patterns, foreign material and lack of adequate air pressure at regular intervals. Such conditions may reflect unusual driving habits or indicate that mechanical corrections are required. (See Group 22 for inflation recommendations).

Disc Brake Equipped Models

During tyre rotations, inspect the disc brake pads for wear.

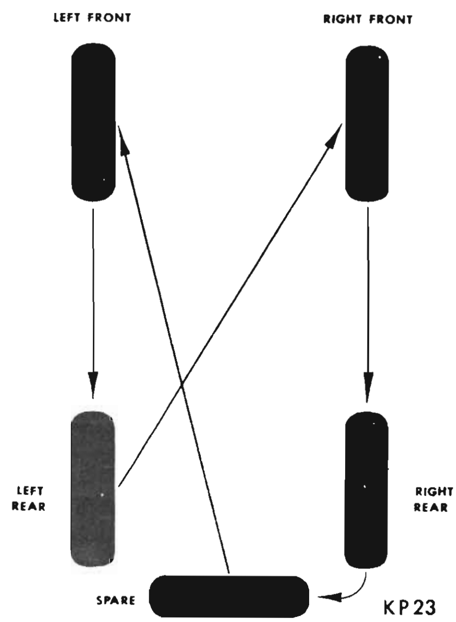


Fig. 12 – Tyre rotation

17. TRANSMISSIONS

Manual—3 and 4 Speed

At every engine oil change period remove the filler plug and check the fluid level. Replenish with S.A.E. 30 engine oil.

Regular drain and refill services are not specified in Maintenance Schedule. Where necessary, remove the transmission drain plug and allow the unit to drain. Install the plug. Refill with 3.1 pints (3 speed) or 3.25 pints (4 speed) of S.A.E. 30 engine oil to bring to the level of the filler hole. *(See Fig. 13).*

Automatic

NOTE: The recommended fluid for any Chrysler Torqueflite Transmission is Automatic Transmission Fluid, conforming to Chrysler Aust. Limited specification of 41/MS 5033 or a 'Dexron" type equivalent.

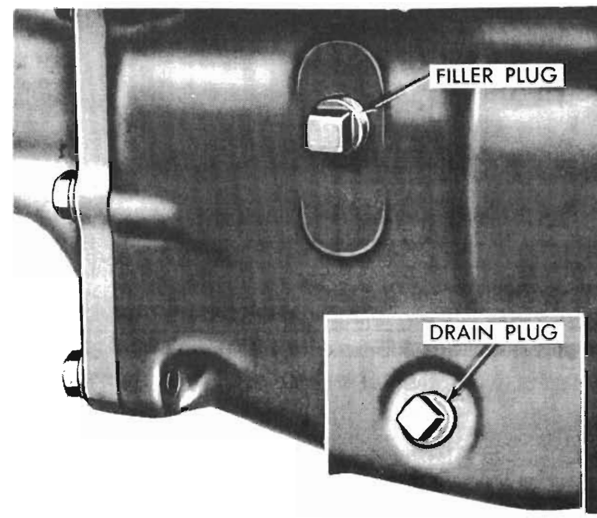


Fig. 13 – Manual transmission drain and fill plugs (typical)

The fluid level should be checked at every change of engine oil. When checking, the engine and transmission should be at normal operating temperature.

NOTE: High mileage transmissions may require the addition of Transmission Fluid Sealer, Part No. 2298923, to provide better seal performance of A904LA and A727A transmissions.

(1) With the parking brake on, and the engine idling, select each drive position momentarily ending with N (neutral) selected.

(2) The fluid level should check at the full mark, or slightly below, *but never above the "Full" mark* when the engine is at its normal warmed condition. *(See Fig. 14).*

Add or remove fluid as necessary to bring to this prescribed level.

CAUTION. To prevent dirt or water from entering transmission after checking or replenishing fluid, make certain that the dip stick cap is re-seated correctly on to the filler tube.

If it is necessary to check the fluid when the transmission is cold, the fluid should be at, or slightly *below the Add One Pint mark* (A904LA and A727A), or ⅜" below the full mark (Models C, D and E). If below, add one pint of fluid then recheck the level.

Frequency of Location (Normal Operation)

At 32,000 mile intervals, adjust the automatic transmission as outlined, renew the oil filter (A-904-LA and A727A) and change the transmission fluid.

ND167

Fig. 14 – Automatic transmission dip stick markings

> NOTE: This *service* should be performed *more frequently should the regular operating conditions of the vehicle be similar to any of the following*:— Police cars, taxi cabs and vehicles which frequently tow trailers, *operate* in heavy traffic in hot weather, or *operate continuously with abnormal loads,* should have the transmission serviced every 12,000 miles. *Transmission should not be idled in gear for long periods.*

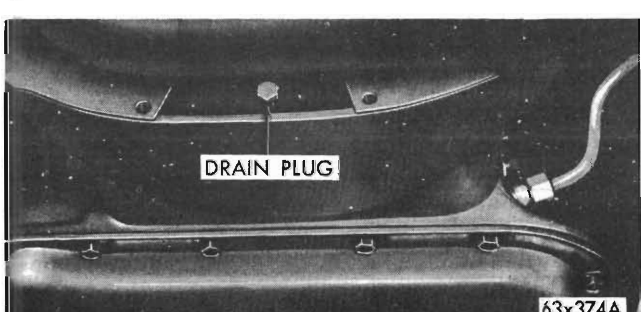


Fig. 15 – Converter drain plug (A904 Models)

Maintenance

(1) Drain oil from transmission as follows:— Model A-904-LA and A727A – Loosen the transmission oil pan bolts and tap pan with a soft mallet to break it loose, permitting the fluid to drain. Other models, remove the drain plug.

(2) Remove flywheel access plate and remove the torque converter drain plug (where equipped) and allow to drain. *(See Fig. 15).*

(3) Replace the torque converter drain plug; and torque to 100 lbs.-in.

(4) Remove transmission oil pan. Remove A-904-LA and A727A dacron filter and discard. Clean oil pan.

(5) Adjust reverse band *(see Group 21).*

(6) Adjust kickdown band *(see Group 21).*

(7) Adjust gearshift control linkage *(see Group 21).*

(8) Re-install a new A-904-LA or A727A dacron filter. Refit oil pan using a new gasket and tighten to 10 lbs.-ft. torque — tighten drain plug to 14 lbs.-ft.

(9) Add 10 pints of the recommended transmission fluid, through the filler tube.

(10) Start engine and add approximately one quart of fluid whilst engine is idling.

(11) Allow engine to idle for at least two minutes, then, with the parking brake applied select each drive range momentarily, ending with the N (neutral) position selected.

(12) Add sufficient fluid to bring the fluid level to the *Add One Pint* mark.

(13) Adjust engine idle to the recommended specifications outlined for the appropriate model vehicle in the Fuel Group 14 pages.

(14) Adjust the transmission and carburettor throttle linkage *(see Group 21).*

(15) Test vehicle performance and re-check the transmission fluid level.

> CAUTION: To prevent dirt or water from entering transmission, make certain that dipstick cap is reseated correctly onto filler tube.

18. UNIVERSAL JOINTS

At the recommended mileages, disassemble, clean and repack the cross and roller universal joints with fibrous universal joint grease *(see Fig. 16).*

Refer to Group 16 for correct servicing procedures.

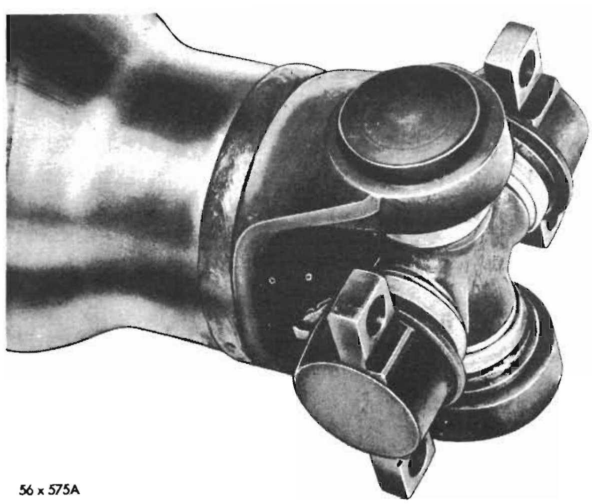


Fig. 16 – Universal joint (cross and roller) (typical rear type illustrated)

19. WHEEL BEARINGS

Rear wheel bearings are pre-lubricated and require no further lubrication. At recommended mileages, remove all grease from front wheel bearings and re-pack with multi-purpose *extreme pressure lithium base* grease Grade 2. Add enough lubricant to fill annular space in the inner hub. The hub and grease cap should also be cleaned and coated with new grease. *(See Fig. 17).*

To adjust the front wheel bearings *(see Fig. 18).*

(1) Tighten wheel bearing adjustment nut to 70 lbs.-in. torque whilst rotating the wheel.

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

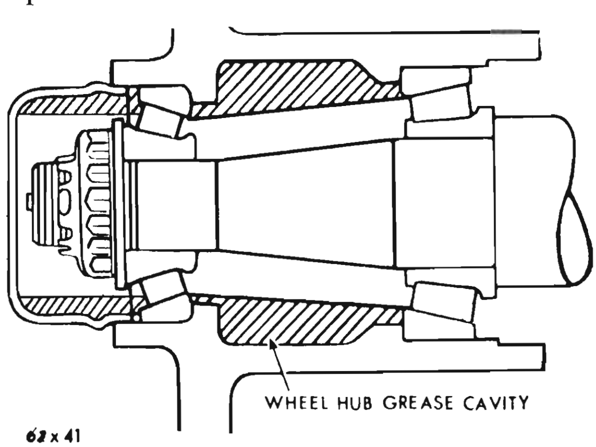


Fig. 17 – Refill inner hub as shown

(3) Back off adjusting nut and lock assembly one slot and install the cotter pin.

(4) Clean grease cap, coat inside with wheel bearing lubricant (do not fill) and install cap.

(5) Install wheel, tighten nuts to 55 lbs.-ft. torque. Refer to Group 22 for correct tightening procedure (where wheel removed).

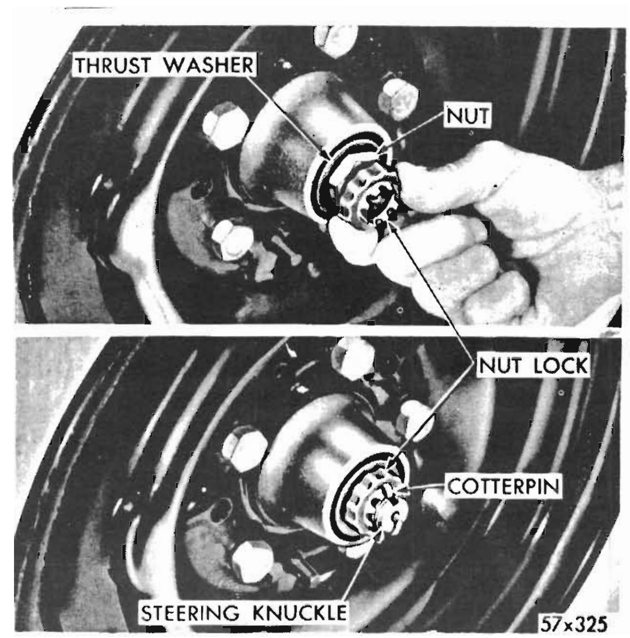


Fig. 18 – Front wheel bearing installation

20. CRANKCASE VENTILATOR VALVE

This type of crankcase ventilator valve is sealed and cannot be disassembled for cleaning. Service procedures for this sealed type valve are listed below.

NOTE: POLICE and TAXI type operation, where frequent short distance driving and prolonged idling periods are usual, the engine oil and crankcase ventilation system service periods should be halved (i.e., 2,000 mile frequencies) to ensure that increased deposits are removed.

Every 8,000 miles

With the engine running at idle, remove the ventilator valve assembly from the rocker cover grommet. 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. Install the ventilator valve assembly and remove the oil filler breather cap. With the engine still running at idle, loosely hold a piece of stiff paper or cardboard over the oil filler pipe. It should be held against the oil filler pipe with a noticeable force after approximately one minute when crankcase pressure has been reduced.

If this occurs, a final test should be made to be certain the valve shuttle is free. A clicking noise should be heard when the valve is shaken (engine not running). If the noise is heard, the unit is satisfactory and no further service is necessary.

However, if valve is plugged with sludge detach valve assembly from the ventilator hose and soak valve assembly in lacquer thinners then blow out with compressed air.

> NOTE: The only solvent recommended for this cleaning operation is lacquer thinners.

If the valve has been correctly cleaned, the shuttle valve will click when the unit is shaken, and the outlet passage should be clean. If the valve is badly plugged and cannot be cleaned by this procedure, it will be necessary to replace the valve assembly.

Whilst the ventilator valve assembly is removed for cleaning, place a finger over the open end of the ventilator hose and have the engine started. If the ventilator hose and carburettor passages are open and operating normally, a strong "suction" will be felt and there will be a large change in engine idle quality when the end of the hose is uncovered. If these conditions are not observed, the carburettor passages and/or ventilator hose are plugged and must be cleaned by dipping the lower part of the carburettor in solvent. A pipe cleaner or wire can be used to aid in cleaning passages. It is not necessary to disassemble the carburettor for this cleaning operation.

Every 16,000 miles

Remove the valve assembly from the rocker cover grommet and install a new ventilator valve. Check the operation of the system as outlined in the 8,000 mile service.

Clean ventilator hose if necessary.

21. CARBURETTOR FUEL FILTER

The fuel filter *should* be replaced regularly. Loss of performance may occur if the filter traps an unusually large quantity of dirt due to either operating conditions or contaminated fuel, restricting flow of fuel to carburettor. If this occurs, filter should be replaced as required. In normal operating conditions it *should* be changed each 24,000 miles.

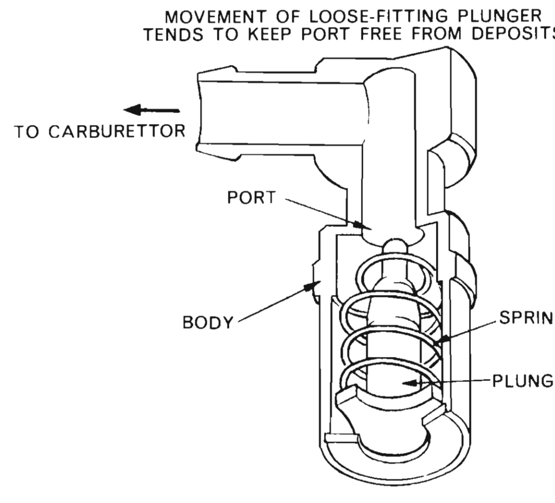


Fig. 19 – Crankcase ventilator valve (cutaway view)

22. CLUTCH TORQUE SHAFT

(Manual Transmission)

Every 32,000 miles, disassemble, clean, inspect for wear, re-lubricate with zinc oxide grease — medium and re-assemble.

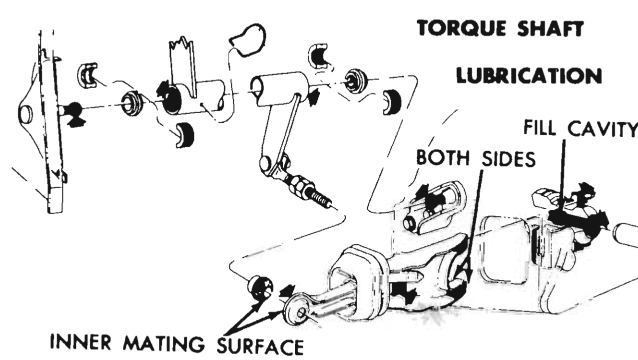


Fig. 20 – Clutch torque shaft lubrication (typical)

23. ALTERNATOR

The alternator is equipped with pre-packed bearings which require no periodic lubrication servicing. At regular periods the outside of the alternator should be wiped clean and the ventilating holes inspected for an accumulation of dirt, which would obstruct the flow of air. *(For servicing the alternator refer Group 8, Part 3).*

24. RUBBER BUSHINGS

The rubber bushings listed below, are designed to grip the contacting metal parts firmly and operate as a flexible medium between these parts. The use of any lubricant will destroy the necessary friction and will cause premature failure of the rubber parts.

Rear springs and bushes, upper control arm bushes, lower control arm bushes, steering gear arm pivot, idler arm pivots and fan belts.

25. SPEEDOMETER CABLE LUBRICATION

Every 36,000 miles or when necessary to lubricate a speedometer drive cable, disconnect housing at speedometer head. Remove shaft and clean it thoroughly. Apply a very thin film of speedometer cable lubricant to the shaft. Re-install drive cable, wiping off surplus lubricant which is on the uppermost 12″ of cable end.

> CAUTION: EXCESSIVE lubricant may cause the speedometer to malfunction due to the ingress of cable lubricant.

26. HOISTING INSTRUCTIONS

Post Type Hoisting

Special care must be taken when raising the vehicle on a frame contact hoist to support the vehicle with the proper adaptors at the correct lifting locations, *refer Fig. 21.*

Conventional (rail type) hoists may be used with the lifting cradles positioned under the rear axle housing and the lower control arms.

Floor Jacking

A regular floor jack may be used under the rear axle housing or front suspension lower arms only, *never under any body panels or flanges, etc.*

> CAUTION: DO NOT attempt to raise one entire side of the vehicle by jacking at mid-point of body.

27. SAFETY CHECKS

Finally, before completion of *any* service it is advisable that a suspension and tyre condition inspection be carried out for adequate safety provisions. This also must include inspecting the headlamps for damage and the windshield wiper blades, arms and windshield washers for effective operation.

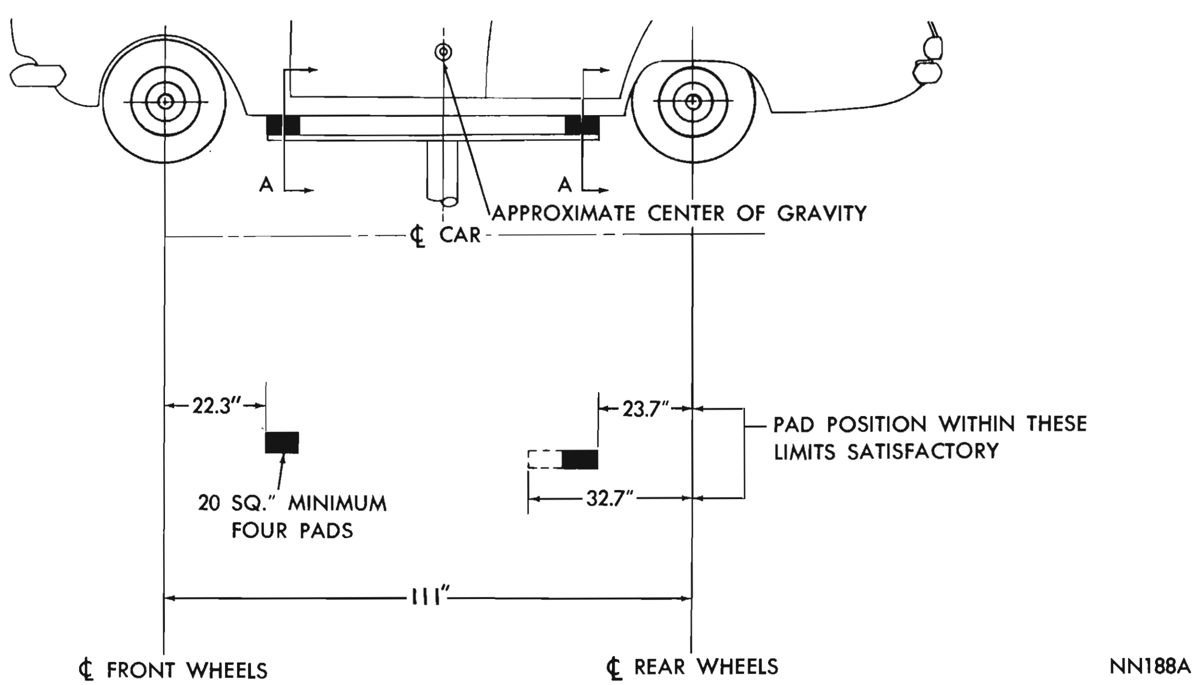


Fig. 21 – Support locations for frame contact hoisting (typical diagram)

(Wheelbase 111″ Front Wheel centre to centre of gravity 49½″) (Dimension "A")

(Wheelbase 115″ Front Wheel centre to centre of gravity 51″) (Dimension "A")

LUBRICATION AND MAINTENANCE SCHEDULE

'000 MILES

	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
Lubrication															
Check fluid level—brake master cylinder tandem reservoirs	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Steering gear or power steering pump reservoir		x		x		x		x		x		x		x	
Manual or automatic transmission	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Rear axle	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Change engine oil	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Change engine oil filter		x		x		x		x		x		x		x	
Automatic transmission								x							
Remove oil pan and clean															
Adjust reverse band															
Adjust control linkage															
Adjust kickdown band															
Replace **A904LA and A727A model dacron filter and re-install oil pan**															
Refill transmission **and torque convertor**															
Lubricate—Carburettor swivel points			x			x			x			x			x
Handbrake lever		x		x		x		x		x		x		x	
Coat handbrake cable connections and guide surfaces (and torsion bar anchors where necessary)		x		x		x		x		x		x		x	
Front suspension ball joints								x							
Gearshift linkage			x			x			x			x			x
Disassemble, clean and repack propellor shaft universal joints									x						
Speedometer drive cable									x						
Door-hinges, stop cams rollers, lock catches, strikers and lock cylinders		x		x		x		x		x		x		x	
Hood-hinges, lock, striker and catch		x		x		x		x		x		x		x	
Deck lid—hinges, torsion bar slides, lock, striker and catch		x		x		x		x		x		x		x	
Tailgate—hinges, torsion bar slides and link		x		x		x		x		x		x		x	
Distributor felt wick under rotor		x		x		x		x		x		x		x	
Disassemble, clean and repack clutch torque shaft and adjust release lever free play								x							
Clean and repack front wheel bearings			x				x				x				x
Check seal and ball joint condition—steering and suspension (note permissible suspension joint clearances as per Service Manual) Specifications		x		x		x		x		x		x		x	
Engine															
Clean and reoil oil filler cap air cleaner		x		x		x		x		x		x		x	
Clean carburettor air cleaner element		x		x				x		x				x	
Replace carburettor air cleaner element						x						x			
Check operation closed emission valve		x				x				x		x		x	
Replace closed emission valve				x				x				x			
Inspect and adjust breaker points (replace only if necessary) and set ignition timing. Clean and adjust spark plugs (replace only if necessary). (Authorised by owner.) Adjust engine idle speed and idle mixture, checking carburettor setting		x			x			x			x			x	
Inspect fuel filter and replace only if necessary						x						x			
Check and adjust if necessary fan belt tension also power steering pump belt and/or air conditioner compressor drive belt (where equipped)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Suspension and Steering															
Cross tyres and inflate to correct pressures	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Check and adjust if necessary, front wheel alignment and steering linkages. Aim headlamps			x				x				x				x
Electrical															
Clean battery terminals and ensure tightness		x		x		x		x		x		x		x	
Check operation of instrument panel gauges and all vehicle lights, including brake warning light, and electric operation of tailgate window		x		x		x		x		x		x		x	
Brakes															
Inspect hydraulic brake hoses for wear, cracking or other deterioration		x		x		x		x		x		x		x	
Remove dust from brake drums/discs, inspect linings and pads and check wear. (More frequent where driving conditions warrant.) Repack handbrake cables and adjust all brakes			x				x				x				x
Check disc brake pads for wear (coincident with cross switch of tyres)		x			x				x				x		
Adjust handbrake		x				x				x				x	
Check and Adjust Service Brakes (where necessary—Taxi and Track Pack option models)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Miscellaneous															
Drain and reverse flush cooling system—refill, using soft water and adding Chrysler parts Corrosion Inhibitor—add anti-freeze as required		x		x		x		x		x		x		x	
Check and adjust clutch release lever free play	x	x	x	x	x	x	x		x	x	x	x	x	x	x
Road test, including check of gearshift operation and brake performance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

GROUP 2

FRONT SUSPENSION

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SPECIFICATIONS

Type	Independent, lateral, non-parallel control arms with torsion bar springs
Torsion bar size	(bar length x diameter)
All models, except *	35.8″ x .850″
*All Pacer and 8 cyl (models with AC) – Charger "R/T" and utility	35.8″ x .870″
Suspension height differential —	Setting dimensions
All models, except *	2.125″
* Charger models	1.625″ with A84 option 1.50″
Tolerance	Even within ⅛″ (Max)
Camber — (left side)	0° to Pos ½° (Pos ¼° preferred)
(right side)	Pos ¼° to Pos ¾° (Pos ½° preferred)
Caster — Manual Steering	0° to Neg 1° (Neg ½° preferred)
Tolerance	¾° max difference — Driver's side least positive)
— Power Steering	Pos ¾° to Pos 1¼°
Toe-In	3/32″ to 5/32″ (⅛″ preferred)
Toe-Out on turns (when inner wheel at 20°)	17.5° All models except * 17.8° * 115″ wheel base
Steering axis inclination (@ 0° nominal camber)	7.5°

SPECIAL TOOLS

E2C5A	Puller — Steering (Pitman) Arm
E2C15	Remover — Tie rod end
E2C15B	Wrench — Upper ball joint remover/installer
E2C15D	Remover — Upper balljoint stud
E2C20D	Installer — Ball joint seal
E2C25A	Remover/Installer — Upper control arm bushing
E2C25C	Installer — Lower control arm shaft bushing
E2C30	Remover — Torsion bar
E9C15	Plate — Engine lifting (8 cylinder)
E9C15B	Plate — Engine lifting (6 cylinder)

TORQUE SPECIFICATIONS

Anti-Sway Bar Bracket Nuts	200 lbs.-in.
Anti-Sway Bar Link Nuts	100 lbs.-in.
Balljoint (upper)	125 lbs.-ft. (min.)
Balljoint (lower) stud nut	100
Balljoint (upper) stud nut	55
Balljoint assembly to steering knuckle bolt nuts	100
Balljoint assembly to steering knuckle bolt screws	115
Control arm (lower) shaft to "K" member nut	130
(rebound bumper)	200 lbs.-in.
Cam bolt nuts	65 lbs.-ft. (max)
Caliper support	
Front suspension ("K") cross-member bolts	150
Idler arm stud nut (at mounting bracket)	70
(at centre link)	40
Steering arm nut	175 lbs.-ft.
Steering knuckle to brake	
Steering knuckle to brake support bolt nuts/screws (upper)	55
Strut — front bushing nut	40
Strut — to control arm nuts	100
Tie rod clamp bolt nuts	115 lbs.-in.
Tie rod nuts (to steering knuckle arms)	40 lbs.-ft.
Shock absorbers:	
Front — upper	25
— lower	50
Wheel mounting — nuts (progressively)	55
Lubrication plug	30 lbs.-in.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. FRONT END NOISE

(1) Worn upper control arm bushings.

(2) Worn lower control arm shaft bushings.

(3) Worn upper balljoint.

(4) Excessively worn lower balljoint.

(5) Worn tie-rod ends.

(6) Loose or worn front wheel bearings.

(7) Shock absorber bushings worn or loose.

(8) Worn or collapsed strut bushings.

(9) Loose steering gear or arm mounting bracket stud.

2. POOR ROADABILITY

(1) Low or uneven tyre pressure.

(2) Shock absorber inoperative.

(3) Incorrect front suspension alignment.

(4) Improper steering cross-shaft adjustment.

(5) Weak or broken rear spring.

(6) Loose wheel bearings.

(7) Steering gear cross-shaft not centred.

(8) Strut bushings worn or loose.

3. HARD STEERING

(1) Balljoints — insufficient lubrication.

(2) Low or uneven tyre pressure.

(3) Incorrect front-end alignment particularly caster.

(a) Upper control arm bent.

(b) Lower control arm bent.

(c) Steering knuckle or steering knuckle arm bent.

(4) Low level of lubricant in steering gear.

(5) Steering not correctly adjusted.

(6) Idler arm binding.

4. EXCESSIVE PLAY IN STEERING

(1) Worn or loose front wheel bearings.

(2) Worn balljoints on tie rods.

(3) Worn upper control arm bushing.

(4) Worn lower control arm bushing.

(5) Worn or loose steering gear parts.

(6) Incorrect steering gear cross-shaft adjustment.

(7) Loose steering gear mounting bolts.

5. FRONT WHEEL SHIMMY

(1) Tyre, wheel, out of balance.

(2) Uneven tyre wear, or extremely bald tyres.

(3) Worn or loose wheel bearings.

(4) Worn tie rod ends.

(5) Incorrect front suspension heights.

(6) Incorrect front end alignment, particularly caster.

(7) Strut mounting bushings loose or worn.

(8) Upper control arm bushings worn.

(9) Lower control arm bushings worn.

(10) Steering gear loose on frame or loose cross-shaft adjustment.

6. VEHICLE PULLS TO ONE SIDE

(1) Low or uneven tyre pressures.

(2) Incorrect front end alignment, particularly camber.

(3) Front brake dragging.

(4) Broken or weak rear spring.

(5) Grease, lubricant, or brake fluid leaking on brake lining.

(6) Incorrect steering gear cross-shaft adjustment.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

Construction of the fully unified body employs a bolted-on engine and front suspension support member ("K" member), which is attached to the body horizontals (side rails) at four points. The lower control arm pivot shafts and struts are attached to the legs of the "K" members *(refer Fig. 1)*.

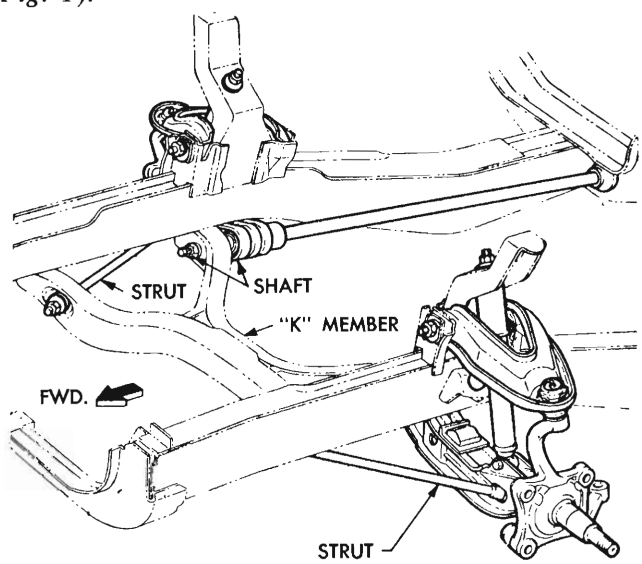


Fig. 1 – Front suspension mounting points

The torsion bar rear anchors are integral with the engine rear support member in the body.

The torsion bar front anchors, which are part of the lower control arms, provide the means of adjustment or setting of vehicle front height.

The lower balljoints are integral with the steering arms.

All balljoints and the torsion bars at the front of the rear anchors are effectively sealed against road splash by tightly fitted balloon type flexible seals. The suspension balljoints are of the semi-permanent lubricated type and should not under normal operating conditions require lubrication before 32,000 miles or two years, whichever occurs first.

It is necessary to remove the plug provided in the balljoint to enable a grease fitting to be installed.

> NOTE: When lubrication of suspension balljoints is necessary, use only a hand type grease gun, filled with the specified lubricant *(See Group 1)*. Use of pressure type grease equipment may damage the balloon type seals.

Remove the grease fitting after lubrication and re-install the plug.

The balljoint and tie rod end seals and tie rod end shields should be inspected at regular intervals *(refer Group 1)*. Damaged seals will necessitate replacement of the tie rod end assembly. The tie rod end seal SHIELDS are serviced separately.

Caster and camber adjustments are made by cams on the upper control arm pivot bolts.

> NOTE: Rubber bushings should not be lubricated at any time.

When replacement of a bushing is necessary, water may be used to aid in installation.

> 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.
>
> Lower balljoints, steering arm assemblies, 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.

2. PREPARATION FOR CHECKING FRONT WHEEL ALIGNMENT

Front wheel alignment is the mechanics of adjusting all the inter-related factors affecting the running and steering of the front wheels. Incorrect alignment of front wheels will result in hard steering, abnormal tyre wear as well as braking problems.

The method of checking alignment will vary, depending on the type of equipment being used. The instructions furnished by the manufacturer should be followed in conjunction with the specifications recommended by Chrysler Australia Limited.

> NOTE: Do not attempt to modify any suspension or steering component by heating or bending.

All checks and adjustments should be made in the following order.

(1) Front suspension height.

(2) Caster and camber.

(3) Toe-in.

(4) Steering axis inclination.

(5) Toe-out turns.

(6) Headlight aiming if height has been adjusted.

A check of steering axis inclination and toe-out on turns is valuable in determining if parts are bent or damaged. Bent or damaged suspension and steering linkage parts must be replaced. When replacements of this kind are made it is important that other front end parts are checked and front wheels re-aligned.

Before any attempt is made to check or correct caster, camber and toe-in, the following preliminary checks and necessary corrections must be made on those parts which influence the steering of the vehicle.

(1) Inflate tyres to recommended pressures. All tyres should be the same size, in good condition and have equal wear. Note the type of wear to aid in diagnosing *(refer Group 22)*.

(2) Check suspension and steering linkage pivot points for excessive looseness, rear spring 'U' bolt nuts correctly tightened and the rear wheels aligned evenly with the front wheels. Check that the front suspension vehicle height is as specified with the vehicle standing on a level floor, or on an accurate wheel aligner.

The fuel tank should be full (or equivalent weight placed evenly in boot), but there should be no other load, either luggage or passengers, in the vehicle.

(3) Check front wheel bearing adjustment *(see Para. 3)*. Measure front wheel and tyre assembly runout.

(4) To obtain accurate readings the vehicle should be jounced in the following manner just prior to taking each measurement (height, caster, camber and toe-in):

Grasp the bumpers at the centre (rear bumper first) and jounce the vehicle up and down several times. Release the bumpers on the down cycle after jouncing both rear and front of vehicle an equal number of times.

3. FRONT WHEEL BEARING ADJUSTMENT

(1) Tighten the wheel bearing adjusting nut to 70 lbs./in. whilst rotating the wheel.

(2) Position the nut lock on nut with one pair of slots in line with the cotter pin hole.

(3) Back off the lock and adjusting nut to the next slot.

(4) Install cotter pin.

(5) Clean the grease cap, coat the inside with wheel bearing grease (do not fill) and install.

4. FRONT SUSPENSION HEIGHT ADJUSTMENT

Front suspension height must be held to specifications for a satisfactory ride, correct appearance, correct front alignment and minimum tyre wear. The height should only be checked when the vehicle has been prepared as set out in paragraph 2.

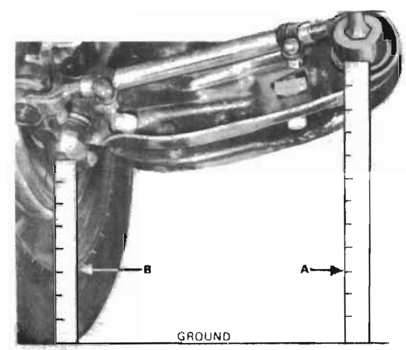


Fig. 2 – Measuring front suspension height

(1) Clean all foreign material from the bottom of the steering knuckle arm assemblies and from the lower control arm bushing housing directly below the centre of the lower control arm pivots.

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

(3) Measure the distance from the lowest point of the lower control arm bushing housing to the floor *(measurement A)* and from the lowest point of the steering knuckle arm, on the same side *(measurement B)* to the floor *(Fig. 2)*.

MEASURE ONLY ONE SIDE AT A TIME.

The difference between measurement A and B should be: as specified on page 2-3 of this Manual.

(4) Measure the other side in the same manner.

(5) Adjust if necessary by turning in the torsion bar adjusting bolt to increase the height, and backing off the bolt to decrease the height.

(6) After each adjustment jounce the vehicle before rechecking measurements. Both sides should be checked, even though only one side has been adjusted.

5. FRONT WHEEL ALIGNMENT

Front wheel alignment settings must be held to specifications to hold tyre wear to a minimum and to maintain steering ease and handling of the vehicle. Wheel alignment measurements should only be taken when vehicle has been prepared as set out in paragraph 2. Any parts of the front suspension system found to be bent, should be replaced.

DO NOT ATTEMPT TO STRAIGHTEN ANY BENT PART.

Camber and Caster

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

(2) Prepare the vehicle for checking as outlined in paragraph 2.

(3) Take the initial camber and caster readings *before* loosening the cam bolt nuts.

(4) Camber settings should be held as close as possible to the "preferred" setting. Caster should be held nearly equal if possible on both wheels with the driver's side *least positive, on manual* steering equipped models.

If adjustment is necessary proceed as follows:

(a) Adjust either front or rear cam bolt to obtain the specified *camber* reading. Tighten the cam bolt lock nut to hold this reading.

(b) *Measure* the *caster* and then refer to the caster-camber correction table as a guide for adjustment. Select *this* caster figure on the chart *(top line)* and follow the line down to the *camber line* of the chart applicable to the wheel being set. (2nd Lowest-line)

Note this camber specification.

(c) Adjust the *front* cam bolt to give the *camber* specification *indicated on the chart* (as selected in the previous paragraph). Lock cam bolt.

(d) Adjust the *rear* cam bolt to bring the camber to within the *correct camber specifications.*

(5) When both camber and caster settings are correct, tighten the adjusting bolt nuts to 65 lbs. ft. maximum — 50 lbs. ft. minimum torque.

MANUAL STEERING: For this caster reading

POSITIVE CASTER																	NEGATIVE CASTER																					
4	3¾	3½	3¼	3	2¾	2½	2¼	2	1¾	1½	1¼	1	¾	½	¼	0	¼	½	¾	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	3¾	4	4¼	4½	4¾	5	5¼	5½
SET FRONT CAM BOLT TO GIVE THIS CAMBER READING																																						
NEGATIVE CAMBER															POSITIVE CAMBER																							
⅞	¾	¾	⅝	⅝	½	½	⅜	⅜	¼	¼	⅛	⅛	0	0	⅛	⅛	¼	–	¼	⅜	⅜	½	½	⅝	⅝	¾	¾	⅞	⅞	1	1	1⅛	1⅛	1¼	1¼	1⅜	⅜	1½
Adjust rear cam bolt to change camber to Pos. ¼° ± ¼° reading (Left Side)—Pos. ½° ± ¼° (Right Side)																																						

POWER STEERING: For this caster reading

POS. 5¼	POS. 5	POS. 4¾	POS. 4½	POS. 4¼	POS. 4	POS. 3¾	POS. 3½	POS. 3¼	POS. 3	POS. 2¾	POS. 2½	POS. 2¼	POS. 2	POS. 1¾	POS. 1½	POS. 1¼	POS. 1	POS. ¾	POS. ½	POS. ¼	0	NEG. ¼	NEG. ½	NEG. ¾	NEG. 1	NEG. 1¼	NEG. 1½	NEG. 1¾	NEG. 2	NEG. 2¼	NEG. 2½	NEG. 2¾	NEG. 3	NEG. 3¼	NEG. 3½	NEG. 3¾	NEG. 4
Adjust front cam bolt to change camber to this camber reading																																					
NEG. ⅝	NEG. ⅝	NEG. ⅝	NEG. ⅝	NEG. ½	NEG. ½	NEG. ⅜	NEG. ¼	NEG. ¼	NEG. ¼	NEG. ¼	NEG. ¼	NEG. ⅛	NEG. ⅛	0	POS. ⅛	POS. ⅛	—	—	—	POS. ⅜	POS. ⅜	POS. ½	POS. ½	POS. ½	POS. ⅝	POS. ⅝	POS. ¾	POS. ¾	POS. ¾	POS. ⅞	POS. ⅞	POS. ⅞	POS. 1	POS. 1	POS. 1⅛	POS. 1¼	POS. 1¼
Adjust rear cam bolt to change camber to Pos. ¼° ± ¼° reading (Left Side) — Pos. ½° ± ¼° (Right Side)																																					

Camber - Caster Correction Guide Chart (Manual Steering or Power Steering Equipped Models).

Toe In

The toe-in setting should be the final operation of the front wheel alignment adjustments. The front wheels must be in a straight ahead position and the steering wheel should be centred during this operation. Follow equipment manufacturer's procedure.

Turning the tie rod sleeve will centre the steering wheel spokes. If steering wheel was centred, make the toe-in adjustment by turning both sleeves an equal amount. Be sure to tighten with clamp rotated so that bolts are on bottom and at right angles to the slot in the tie rod tube.

> NOTE: Ensure that after any adjustments have been made that the tie rod end balljoints are positioned so that they are central in their sockets.

6. TORSION BARS

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

The last 3 digits of the part number are forged into the *rear end* of each bar.

To Remove

(1) Remove the rebound bumper from its mounting bracket located under the upper control arm.

(2) If vehicle is to be raised on a hoist, make sure it is lifted on the body only, so that the front suspension is in full rebound (under no load). If vehicle is to be raised on jacks, placed under the centre of the "K" member, it will be necessary that a support first be placed under the "K" member. *In no circumstances should the front end of the vehicle be raised with a jack unless a support is first placed under the "K" member.*

(3) Release the load from the torsion bar by backing off the anchor adjusting bolt.

(4) Remove the lock ring from the rear of the torsion bar rear anchor *(Fig. 6).*

(5) Using Tool E2C30, remove the torsion bar from its anchors *(Fig. 5).* It is advisable to place Tool toward rear of the torsion bar to allow sufficient room for striking the pad of the tool.

> NOTE: On some Power Steering equipped models, it may be necessary to loosen and raise the steering chuck to allow the torsion bar to be withdrawn.

> Do not apply heat to the torsion bar, front anchor or rear anchor.

It may be necessary to remove the exhaust pipe from the manifold when using Tool E2C30 on the left bar.

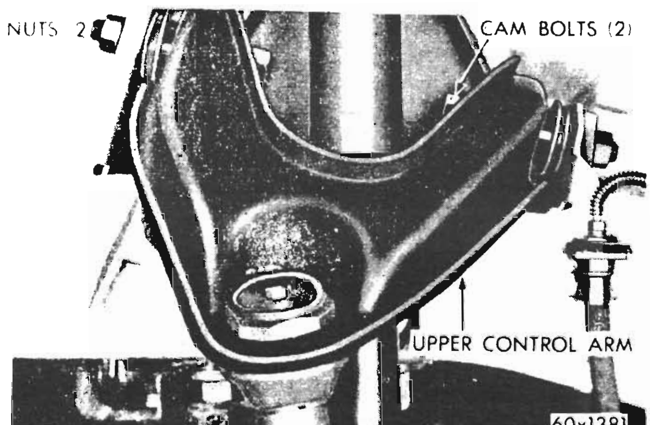


Fig. 3 – Camber and caster adjusting points (typical)

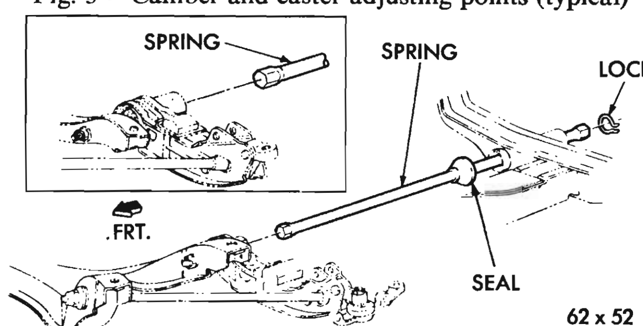


Fig. 4 – Torsion bar spring

(6) Remove the tool and slide the rear anchor balloon seal off the anchor to facilitate removal of torsion bar.

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

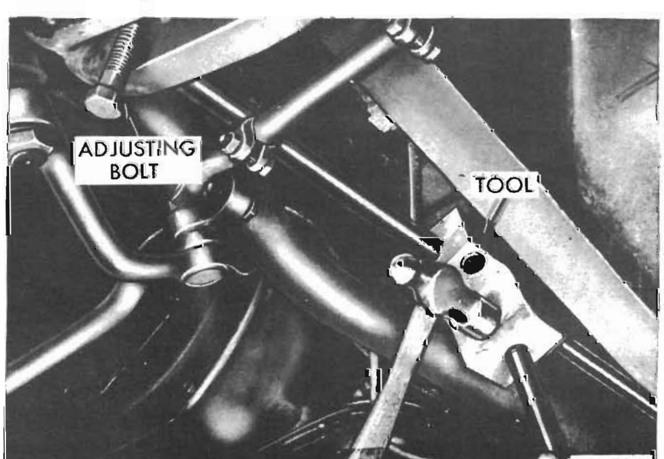


Fig. 5 – Removing torsion bar (Tool E2C30)

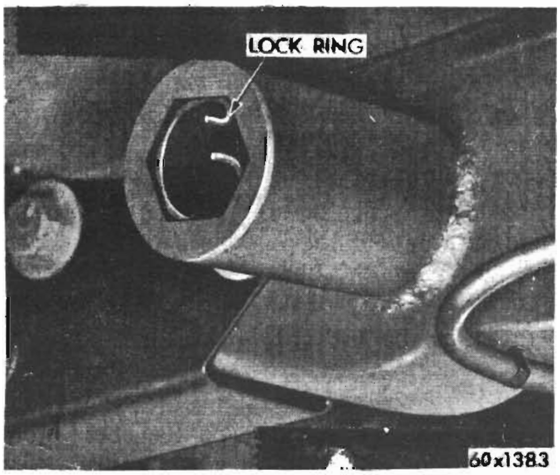


Fig. 6 – Torsion bar lock ring

To Install

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

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

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

(4) Inspect the torsion bar adjusting bolt and swivel for corrosion or other damage, and if necessary, replace. Lubricate for easy operation.

(5) Insert the torsion bar through the rear anchor. Install in correct sides, right and left.

(6) Slide the balloon seal over the torsion bar (cupped end towards rear of bar).

(7) Coat both hex ends of the torsion bar with multi-purpose grease.

(8) Slide the torsion bar into the hex opening of the lower control arm with the numbered end rearwards.

(9) Install the lock ring in the rear of the torsion bar rear anchor.

(10) Pack the annular opening in the rear anchor completely full of multi-purpose grease.

(11) Position the balloon seal on the rear anchor so the lip of the seal engages with the groove in the anchor.

(12) Tighten the adjusting bolt to place a load on the torsion bar.

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

(14) Install the upper control arm rebound bumper on its mounting bracket.

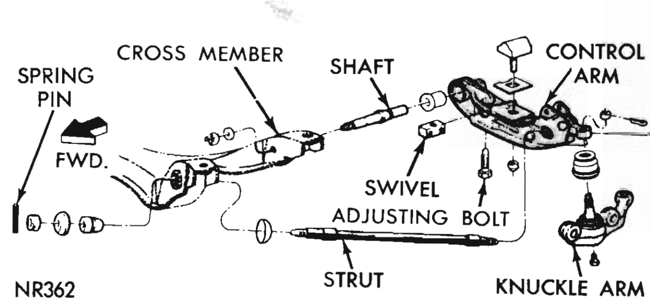


Fig. 7 – Lower control arm assembly

7. LOWER CONTROL ARM AND SHAFT

To Remove

(1) Remove the upper control arm rebound bumper.

(2) Raise the vehicle so that the front suspension is in full rebound (under no load) and remove anti-sway bar link from lower arm bracket (where equipped).

Drum Brake Models:

Remove the wheel and drum assembly.

Disc Brake Models:

Remove the wheel assembly.

(3) Disconnect the shock absorber from the lower control arm and push it up out of the way.

(4) Remove all load from the torsion bar by backing off the adjusting bolt.

(5) Remove the torsion bar from the lower control arm *(see Para. 6).*

(6) Remove the cotter pin and nut. Slide the tie rod end seal shields up the steering knuckle arm. Remove the tie rod end from the steering knuckle arm using Tool E2C15 *(Fig. 8).*

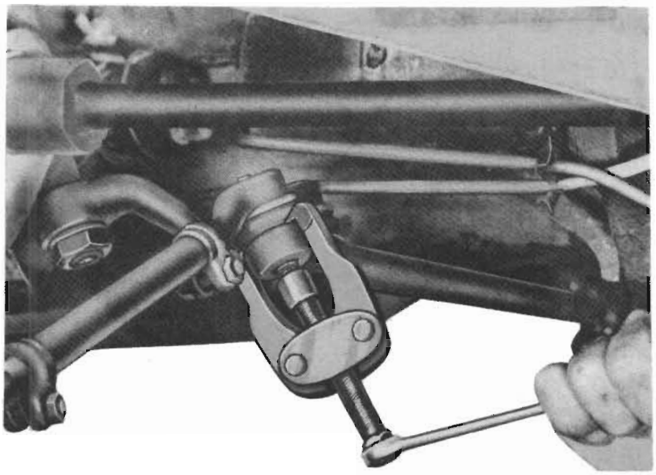


Fig. 8 – Removing the tie rod end stud (Tool E2C15)

(7) Release the tab washer lock tabs (disc brake models) and remove the steering knuckle to lower ball joint assembly bolts or screws and remove the steering knuckle arm. Move the steering knuckle out of the way and provide a suitable support.

(8) Remove the balljoint stud from the lower control arm using Tool E2C5A *(Fig. 9)*.

(9) Remove the strut nut and bushing retainer *(Fig. 7)* from the forward end of the "K" member.

(10) Remove the cotter pin, nut and washer from the lower control arm shaft *(Fig. 7)*.

(11) Tap the end of the lower control arm shaft with a "soft end" hammer to aid in removal of the shaft from the "K" member.

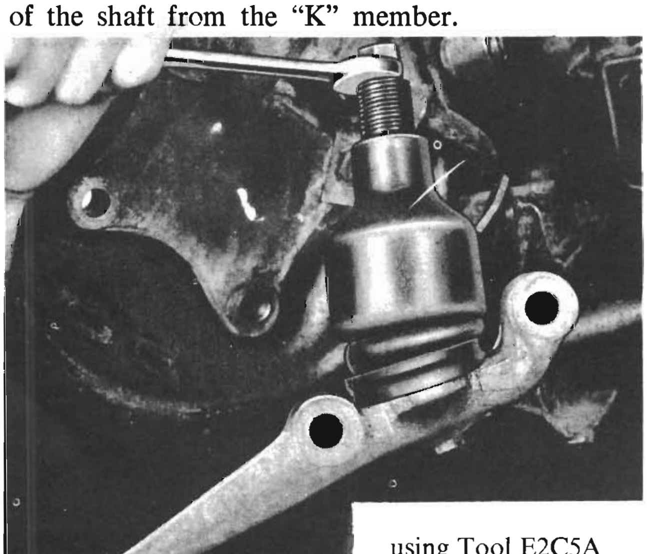


Fig. 9 – Removing lower ball joint stud using Tool E2C5A

(12) Remove the lower control arm, shaft and strut as an assembly from the "K" member.

(13) Remove the strut rubber bushing from the "K" member only if damaged.

(14) Remove the strut bushing inner retainer (washer) from the 'K' member, if it did not come out with the strut.

To Disassemble

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

(2) Remove the strut from the lower control arm.

(3) Remove the jounce bumper from the lower control arm.

(4) Remove the torsion bar adjusting bolt and swivel.

(5) Place the lower control arm assembly in an arbor press with the torsion bar hex opening up, supported at outer edge of arm *(Fig. 10)*.

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

(7) Cut and remove the rubber portion of the bushing from the control arm shaft.

(8) Insert a 1$\frac{3}{8}$″ N.F. 12 T.P.I. tap into the pivot shaft bushing outer shell, approximately one half the depth of the bushing.

(9) Using a hand press and a blunt drift, force the bushing out of the control arm *(Fig. 10)*.

(10) Remove the bushing shell from the tap.

(11) Remove the bushing inner shell from the pivot shaft, cutting off if necessary.

To Assemble

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

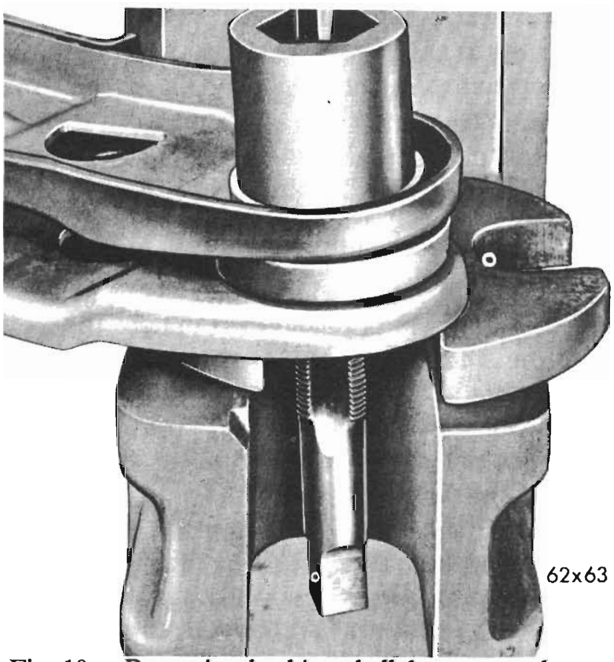


Fig. 10 – Removing bushing shell from control arm

(2) Press the shaft and bushing assembly into the lower control arm using Tool E2C25C and an arbor press *(Fig. 11)*.

(3) Install the torsion bar adjusting bolt and swivel.

(4) Install the jounce bumper on the control arm and tighten to 200 lbs. in.

(5) Position the strut in the lower control arm and tighten nut to 110 lbs./ft.

To Install

(1) Install the new strut bushing if necessary (in "K" member), with a twisting motion. Water may be used as a lubricant to aid in installation.

(2) Position the lower control arm shaft and strut into their respective mountings in the "K" member. The strut bushing inner retainer should be placed over the shaft before the strut is inserted into the bushing.

(3) Install the strut bushing outer retainer and nut finger tight only.

(4) Install the lower control arm shaft washer and nut finger tight only.

(5) Position the lower balljoint stud into the lower control arm and tighten the nut 100 lbs. 'ft. Install the cotter pin.

Drum Brake Models only:

(6) Position the brake support on the steering knuckle and install the two upper bolts and nuts finger tight only.

(7) Position the steering knuckle arm on the steering knuckle and install the two lower bolts and nuts (drum brake models) or screws and lockwashers (disc brake models).

(8) Tighten the upper bolt nuts to 55 lbs./ft. (drum brake models). Tighten lower bolt nuts to 100 lbs. ft., or screws to 115 lbs./ft. then bend the lock tabs (away from the rubbers) to secure the screws.

(9) Inspect tie rod seals for damage and replace assembly if damaged. Connect the tie rod end to the steering knuckle arm and tighten the nut 40 lbs./ft. Slide the tie rod end seal shield over the tie rod end. Install the cotter pin over the outer tie rod stone shield.

Disc Brake Models:
NOTE: Shock absorber bolt *nut* must face *forward.*

(10) Connect the shock absorber to the lower control arm and tighten the nut.

(11) Install the torsion bar *(Para. 6)*.

Drum Brake Models:

(12) Install the wheel and drum assembly and adjust the front wheel bearings *(Para. 3)*.

Disc Brake Models:

(12a.) Install the wheel assembly.

(13) Lower the vehicle to the floor and re-install the anti-sway bar link to the lower arm bracket.

(14) Tighten the strut nut at the "K" member to 40 lbs./ft. and the lower shock absorber to 50 lbs. ft.

(15) Adjust the front suspension height.

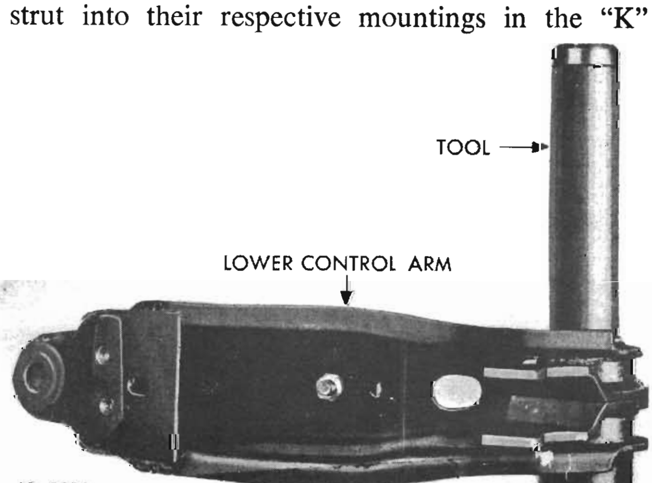


Fig. 11 – Installing shaft assembly in lower control arm

(16) Tighten the lower control arm shaft nut to 130 lbs. ft. and install the cotter pin.

(17) Check and adjust the front suspension alignment

8. LOWER CONTROL ARM STRUT

To Remove

(1) Remove the lower control arm, shaft and strut as an assembly *(Para. 7)*.

(2) Remove the nut holding the strut to the lower control arm.

(3) Remove the strut from the lower control arm. Inspect bushings for wear or damage.

To Install

(1) Install new strut bushings, if necessary.

(2) Position the strut into the lower control arm and tighten the retaining nut to 100 lbs. ft.

(3) Install the lower control arm, shaft and strut assembly *(see Para. 7)*.

9. LOWER BALL JOINTS

The lower balljoint is integral with the steering arm and is not serviced separately.

Inspection

(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, install dial indicator and clamp assembly to lower control arm *(Fig. 12)*.

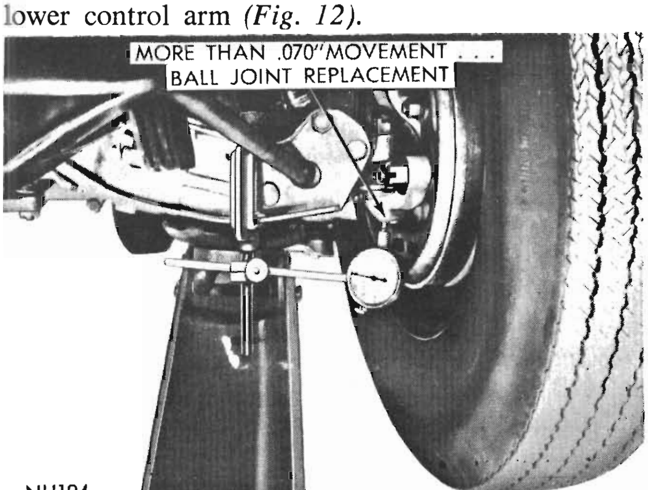


Fig. 12 – Measuring lower ball joint axial travel

(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 centre of the tyre.

NOTE: 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.*

To Remove

(1) Remove the upper control arm shoulder bumper.

(2) Raise the vehicle so the front suspension is in full rebound (under no load) and slacken the torsion bar adjuster. If jacks are used to raise the vehicle it is essential that a support be used between the "K" member and jack.

Drum Brake Models:

(3) Remove the wheel and drum as an assembly. It may be necessary to back off the brake shoes to facilitate removal of drum assembly.

Disc Brake Models:

(3a.) Remove wheel assembly.

(4) Remove the two lower bolts or screws from the backing plate that attach the steering arm and balljoint assembly to the steering knuckle.

(5) Remove the tie rod end from the steering arm using Tool E2C15 USE CARE NOT TO DAMAGE SEAL.

(6) Using Tool E2C5A remove the balljoint stud from the lower control arm *(Fig. 9)* and remove the steering arm and balljoint assembly.

To Install

(1) Place a new seal over the balljoint making certain the lip of the seal is seated on the balljoint housing using Tool E2C20A *(refer Fig. 13)*.

(2) Position the steering arm and ball joint assembly on the steering knuckle and install the two mounting bolts and nuts and tighten to 100 lbs. ft. torque (drum models) or screws and tab lock washers and tighten to 115 lbs. ft. torque (disc models).

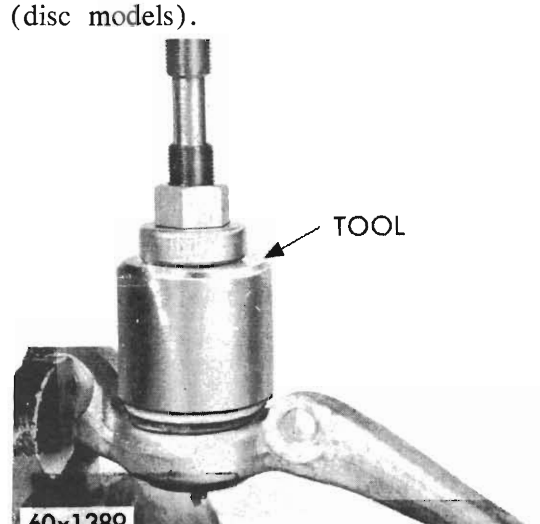


Fig. 13 – Installing lower ball joint seal using Tool E2C20A

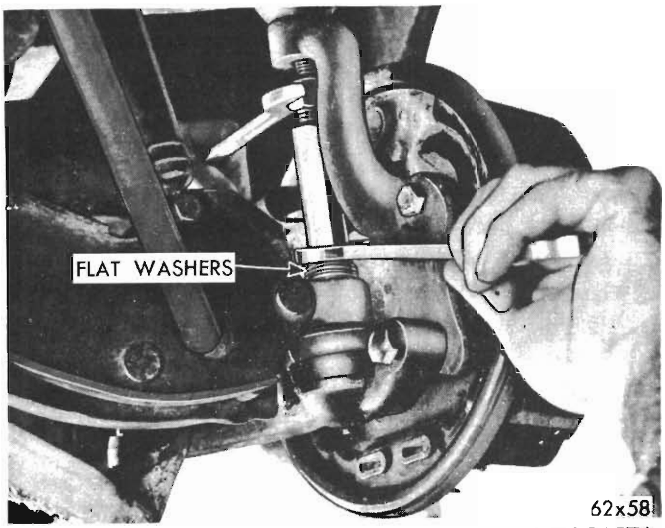
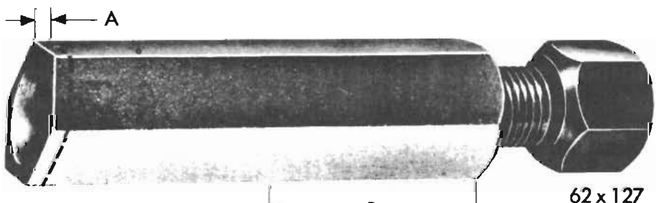


Fig. 14–Removing upper ball joint stud (Tool E2C15D)



A. REMOVE 1/16 INCH FROM LOWER PART OF TOOL.
B. ROUND OFF PORTION OF THE TOOL THAT IS POSITIONED NEXT TO THE STEERING KNUCKLE ARM.

Fig. 15 – Tool E2C15D

(3) Insert the balljoint stud into the opening in the lower control arm.

(4) Install the stud retaining nut and tighten to 100 lbs. ft. Install the cotter pin. Remove the plug from the balljoint housing and install a grease fitting. Repack joint with specified grease until seal passes grease, or the seal swells showing fullness. Replace grease fitting with plug.

(5) Inspect tie rod seal for damage and replace the assembly if damaged. Connect the tie rod end to the steering knuckle arm and tighten the nut to 40 lbs. ft. Slide the tie rod end seal shield over the nut and install the cotter pin.

(6) Place a load on the torsion bar by turning the adjusting bolt.

Drum Brake Models:

(7) Install the wheel and drum assembly and adjust the front wheel bearings *(see Para. 3).*

Disc Brake Models:

(7a.) Install the wheel assembly.

(8) Lower the vehicle to the floor and install the upper control arm rebound bumper.

(9) Measure and adjust (if necessary) the front end height.

(10) Check the front end alignment and adjust if necessary.

10. UPPER CONTROL ARMS

To Remove

(1) Place a jack under the lower control arm as close to the wheel as possible. Raise the vehicle until wheel clears floor.

(2) Remove wheel and tyre assembly.

(3) Remove the upper and lower balljoint stud nuts — add approximately 7/16″ of flat washers over the lower balljoint stud to allow the use of Tool E2C15D without damaging the threads on the lower balljoint stud. Place Tool E2C15D over the stud. Turn the threaded portion of the tool, locking it securely against the upper stud *(Fig. 14).* (To use Tool E2C15D as outlined it will be necessary to modify the tool *(Fig. 15).* Tools bearing the imprint "M" will not need this modification.)

(4) Spread tool enough to place upper stud under a load, then strike the steering knuckle sharply with a hammer to loosen stud. DO NOT ATTEMPT TO FORCE STUD OUT OF STEERING KNUCKLE WITH TOOL ALONE.

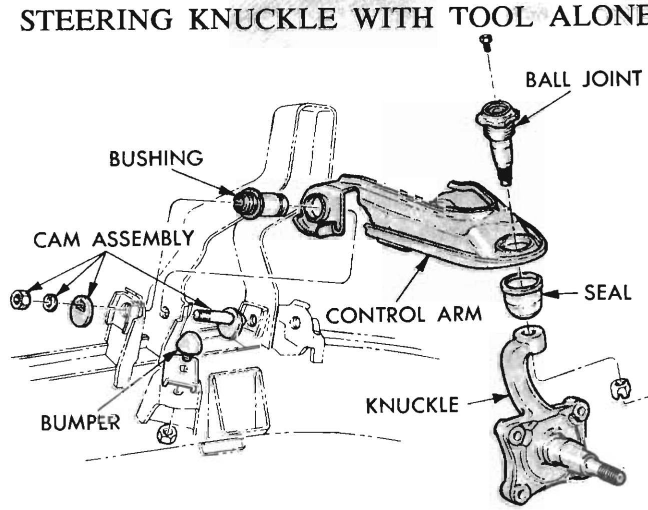


Fig. 16 – Upper control arm assembly ND 54C

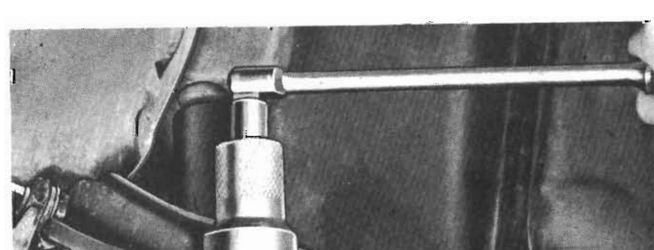


Fig. 17 – Removing or installing upper ball joint using Tool E2C15B

(5) Remove the nuts, lockwashers, cams and cam bolts that attach the upper control arm and bushings *(Fig. 16)* to the front and rear support brackets. Lift upper control arm up and away from support.

(6) Remove the balljoint using Tool EC215B *(Fig. 17)*. (The seal will come off as the balljoint is removed).

(7) Assemble Tool E2C25A over bushing and press bushing out of arm (from inside out) *(Fig. 18)*.

To Assemble

When installing new bushings, be sure the control arm is supported squarely at the point where bushing is being pressed in. DO NOT USE OIL OR GREASE TO AID INSTALLATION.

(1) Position the flange end of new bushing in Tool E2C25A, support the control arm squarely, and force bushing into control arm (from outside) until tapered portion of bushing seats on arm *(Fig. 19)*.

(2) Install balljoint into arm using Tool E2C15B *(Fig. 17)*. Tighten until seated (125 lbs.-ft. minimum). The balljoint will cut threads into new arm during the tightening operation.

(3) Install new balljoint balloon seal using Tool E2C20A.

To Install

(1) Slide the upper control arm into position and install the control arm cam bolts *(Fig. 16)*, removable cam and nuts, and tighten nuts in preparation for final adjustments.

(2) Slide the upper balljoint stud into position in steering knuckle and install nut. Tighten nut to 55 lbs. ft. and install cotter pin. Remove the plug from the balljoint housing and install a grease fitting. Repack the joint with the specified grease, until seal passes grease, or until the seal swells showing fullness. Remove grease fitting and re-install plug. Tighten lower stud nut to 100 lbs. ft. and install cotter pin.

(3) Install wheel and tyre assembly.

(4) Measure and adjust vehicle height and alignment.

11. UPPER BALLJOINTS

To Remove

(1) Raise the vehicle by placing a jack under the lower control arm as close as possible to the wheel.

(2) Remove the wheel and tyre assembly.

(3) Remove the upper and lower balljoint stud nuts. It will be necessary to add 7/16" of flat washers over the lower balljoint stud to allow the use of Tool E2C15D without damaging the threads on the lower balljoint stud. Place Tool E2C15D over the studs. Turn the threaded portion of tool locking it securely against the upper stud *(Fig. 14)*. To use Tool E2C15D as outlined, it will be necessary to modify it *(see Fig. 15 and step 3 in Para. 10)*.

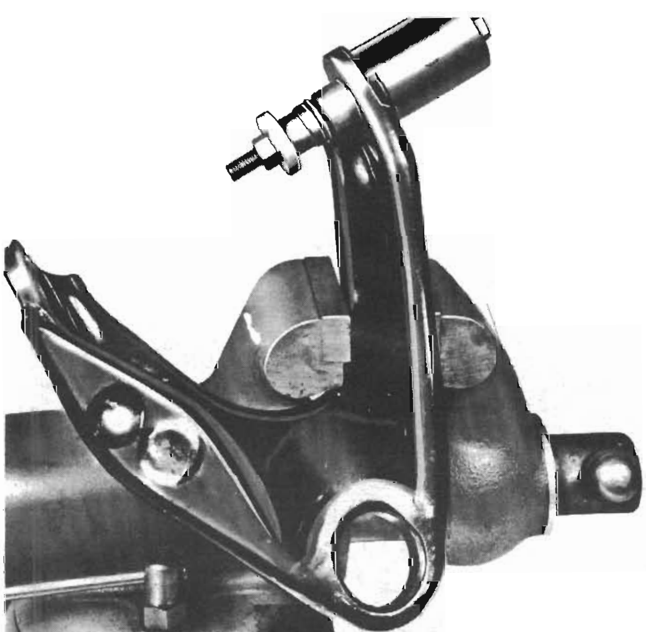


Fig. 18 – Removing upper control arm bushing (Tool E2C25A)

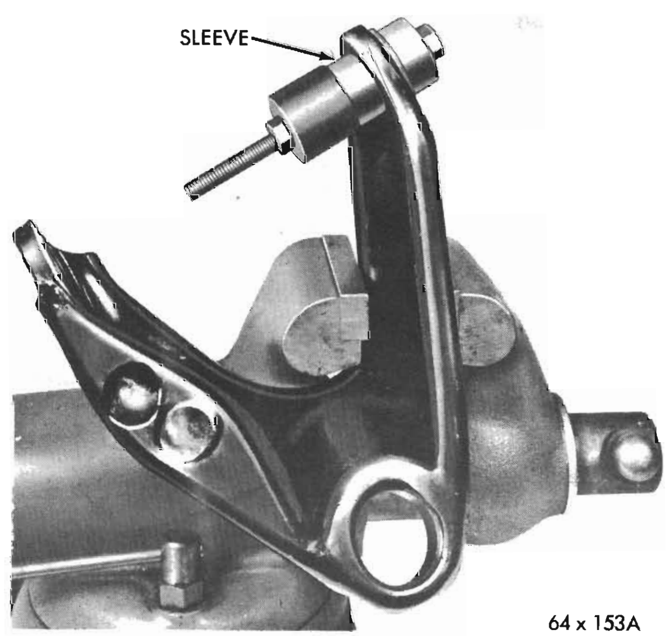


Fig. 19 – Installing upper control arm bushing (Tool E2C25A)

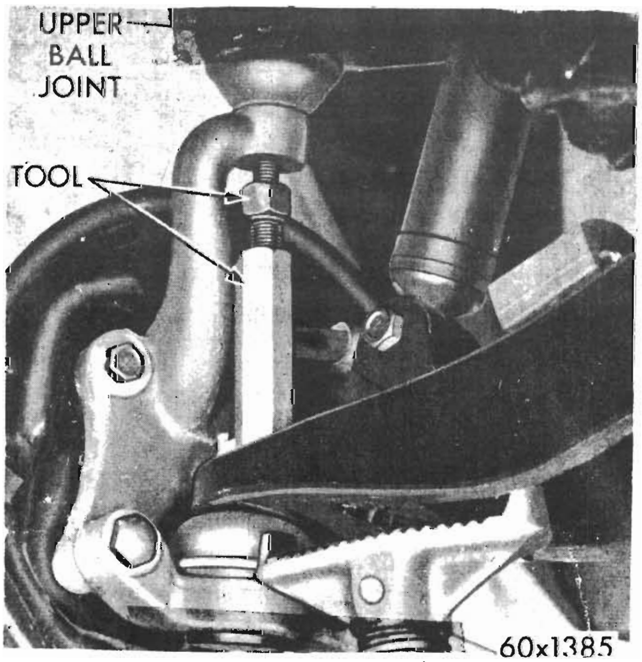
(4) Spread tool enough to place upper stud under a load, then strike the steering knuckle sharply with a hammer to loosen stud. DO NOT ATTEMPT TO FORCE STUD OUT OF THE STEERING KNUCKLE WITH TOOL ALONE.

(5) Remove tool, then remove the balljoint stud from the steering knuckle.

(6) Using Tool E2C15B unscrew balljoint from the upper control arm *(Fig. 17)*. The seal will come off as the balljoint is being removed.

To Install

When installing a balljoint, it is very important that the balljoint threads engage those of the control arm squarely. Balloon type seals should always be replaced once they have been removed.



using Tool E2C15D

Fig. 20 – Removing upper ball joint from steering knuckle

(1) Screw balljoint squarely into the control arm as far as possible by hand.

(2) Using Tool E2C15B tighten the balljoint until it bottoms on the housing. Tighten to a minimum of 125 lbs-ft. If balljoint cannot be torqued to 125 lbs.-ft. inspect the threads of the balljoint and also in the control arm and replace the balljoint or control arm as necessary.

(3) Position a new balloon seal over the balljoint stud and install seal, using Tool E2C20A.

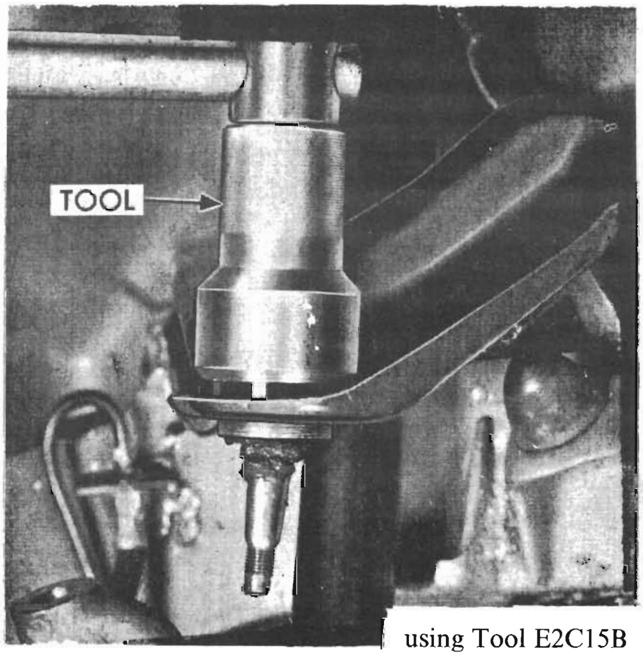
(4) Position balljoint stud in the steering knuckle and install retaining nut.

(5) Tighten the nut to 55 lbs. ft. and install the cotter pin. Remove the plug from the balljoint housing and install a grease fitting. Repack the joint with the specified grease until grease passes through seal or the seal swells showing fullness.

(6) Install the lower balljoint stud nut and tighten to 100 lbs. ft. Install the cotter pin.

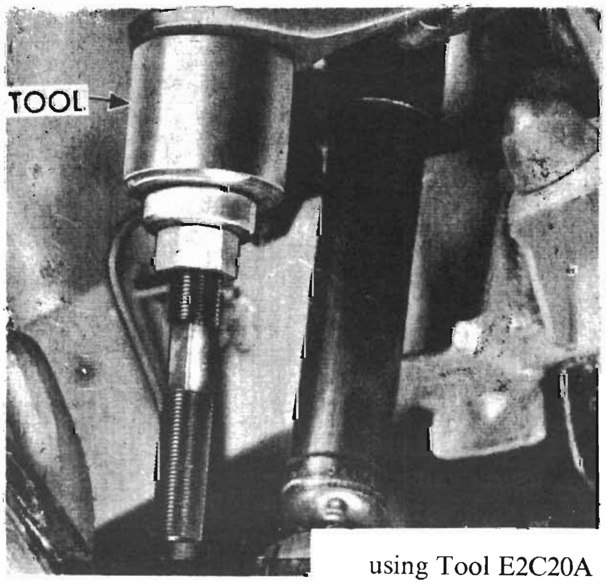
(7) Install the wheel and tyre assembly.

(8) Lower the vehicle and adjust front suspension height as necessary.



using Tool E2C15B

Fig. 21 – Removing or installing upper ball joint



using Tool E2C20A

Fig. 22 – Installing upper ball joint seal

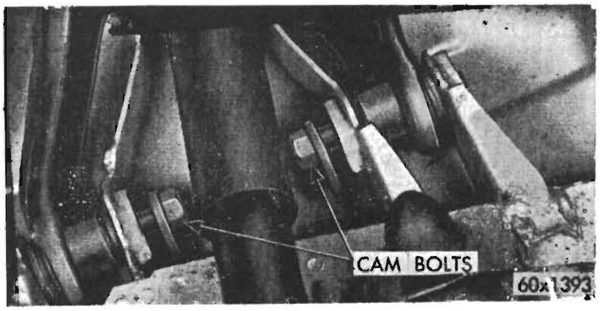


Fig. 23 – Installing cam bolts in upper control arm

12. STEERING KNUCKLES

To Remove

(1) Remove upper control arm rebound bumper.

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

Disc Brake Models:

(3) a. Remove the wheel assembly.

b. Remove the caliper mounting screws and carefully remove the assembly.

c. Suitably support the caliper to relieve the hose of any weight.

d. Remove the disc assembly from the spindle.

(4) Remove all load from the torsion bar by backing off the adjusting bolt.

(5) Remove the upper balljoint stud from the steering knuckle using Tool E2C15D *(see Para. 10).*

(6) Remove the brake splash shield from the steering knuckle.

Drum Brake Models only:

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

(8) Remove the two lower bolts or screws attaching the steering arm to the steering knuckle and remove the steering knuckle.

Support the brake assembly during this operation to prevent damage to the brake hose when the lower bolts are removed.

To Install

Drum Brake Models:

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

Disc Models:

(1a.) Install the brake splash shield to the steering knuckle.

Both Models:

(2) Position the steering arm and ball joint assembly on the steering knuckle and install the two mounting bolts and nuts (drum models) or install two screws (disc models) with tab lock-plates. Tighten finger tight only.

(3) Install the upper balljoint stud in the steering knuckle and tighten the balljoint stud 55 lbs./ft. Install the cotter pin.

(4) Tighten the steering knuckle upper bolt nuts to 55 lbs./ft. (drum models). Tighten the lower bolts nuts (drum models) to 100 lbs./ft. torque or screws (disc models) to 115 lbs./ft. torque, then bend lock tabs (away from rubber seal) to secure screws.

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

Drum Brake Models:

(6) Install wheel and drum assembly and adjust the front wheel bearings *(see Para. 3).*

Disc Brake Models:

(7) a. Install the disc assembly and adjust wheel bearings *(refer Para. 3).*

b. Install the caliper assembly carefully, then install the mounting screws and lock plates.

c. Torque mounting adapter screws to 55 lbs./ft. and *lock "tabs" securely* (where removed).

d. Install the road wheel assembly.

(8) Lower the vehicle to the floor.

(9) Install the upper control arm rebound bumper and tighten the nut 200 lbs./in.

(10) Check and adjust front wheel alignment and suspension height as necessary.

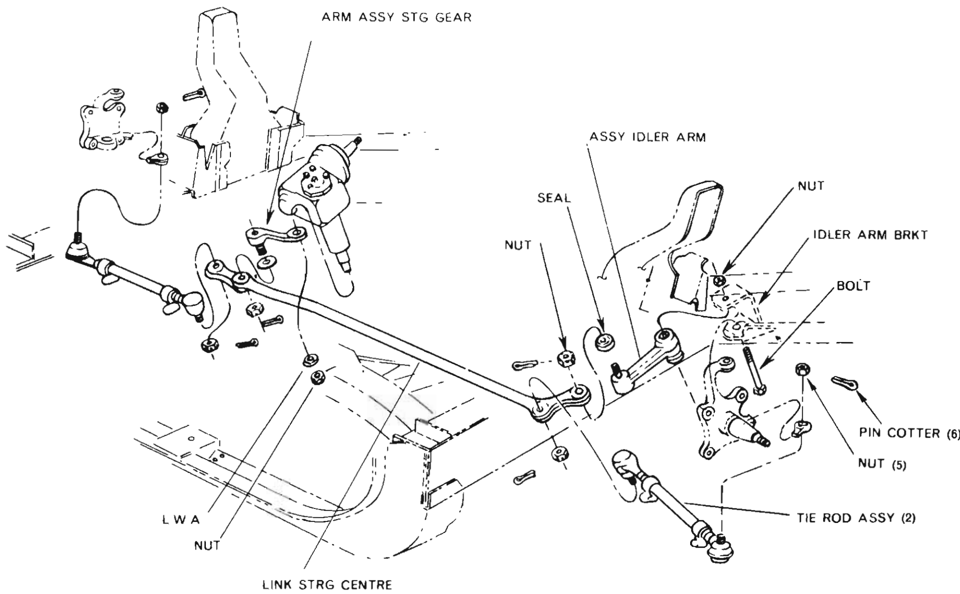


Fig. 24 – Steering linkage (typical view)

13. STEERING LINKAGE

The tie rod end seals and shields *(see Fig. 24)* should be inspected at all regular oil change periods. Damaged seals necessitate replacement of the tie rod end assembly. The tie rod end seals are not serviced separately.

To Remove

When removing the tie rod ends, idler arm or steering gear arm, all seals should be closely inspected for wear or damage. If tie rod or pitman arm seals are damaged replace the assembly.

(1) Remove the tie rod ends from the steering knuckle arms using Tool E2C15 *(Fig. 8)*. USE CARE NOT TO DAMAGE SEALS.

(2) Using Tool E2C15 remove the inner tie rod ends from the link.

(3) Remove the idler arm stud from the link using Tool E2C15.

(4) Remove the idler arm stud from the "K" member, using Tool E2C15.

(5) Remove the steering gear arm stud from the link using Tool E2C15.

To Install

Replace all tie rod and pitman arm assemblies that are damaged or worn.

(1) Position the idler arm stud in the bracket and install the washer and nut. Tighten nut to 70 lbs. ft. and install the cotter pin.

(2) Place the link over the idler arm stud and the steering gear arm stud and tighten the nuts to 40 lbs. ft. Install the cotterpins.

(3) Connect the tie rod ends to the steering knuckle arms. Tighten nuts to 40 lbs. ft. Slide the stone shields into position and install the cotter pins.

(4) Check and adjust toe-in.

14. ANTI-SWAY BAR (Where Equipped)

To Remove

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

(2) Loosen and remove bolts attaching both brackets to front cross member.

(3) Remove sway bar from vehicle.

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

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

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

To Install

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

(2) Position sway bar assembly in vehicle and install attaching bolts and nuts and tighten to 200 lbs. ins.

(3) Install retainer on link, followed by rubber insulator and sway bar. Using a screwdriver or pinch bar between strut and sway bar, if necessary, apply pressure and install upper rubber insulator, retainer and nut, tighten nuts to 100 lbs. in.

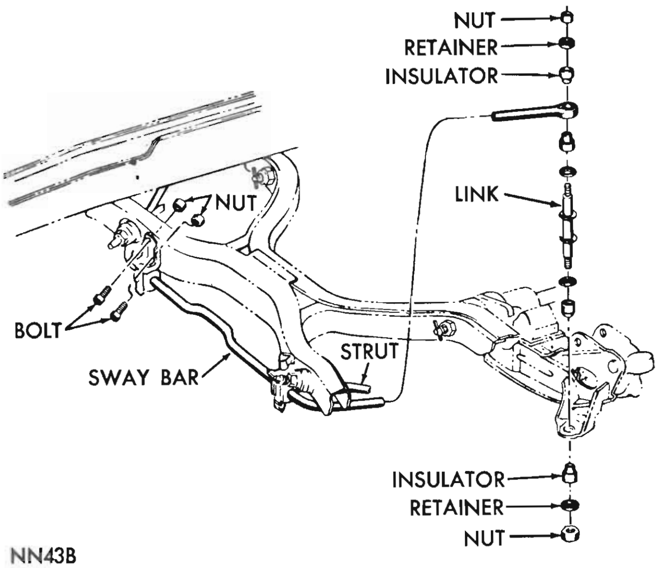


Fig. 25 – Anti-Sway Bar Assembly Arrangement

15. FRONT SUSPENSION "K" MEMBER

To Remove

(1) Remove the engine mount to "K" member mounting bolts.

(2) Remove the carburettor air cleaner.

(3) Attach engine lifting plate Tool E9C15B to the 6 cylinder head or Tool E9C15 on the 8 cylinder carburettor mounting pad. Raise the engine until motor mounts clear the "K" member, using a suitable hoist.

(7) Install frame stands under the body side rails.

(8) Remove the "K" member mounting bolts and remove the "K" member.

(9) Remove the strut bushings from the "K" member.

To Install

(1) Install the lower control arm strut bushings into the "K" member using only water as a lubricant.

(2) Position the "K" member on the body side rails, install the four mounting bolts. Tighten the bolts to 150 lbs. ft.

(3) Lower the engine and install the engine mounting nuts and tighten to 85 lbs. ft. (6 cylinder), 75 lbs. ft. (V8 cylinder).

(4) Position the steering gear on the side rail and install the mounting bolts and washers. Tighten bolts to 80 lbs. ft.

(5) Connect the idler arm to its mounting bracket and tighten the nut to 70 lbs. ft. (maximum). Install the cotter pin.

(6) Install the lower control arms, shafts, and strut assemblies *(Para. 7)* (do not tighten).

(7) Remove the engine lifting fixture and plate, and install the carburettor if removed.

(8) Install the carburettor air cleaner.

(9) Re-install the sway bar (where equipped) *(Para. 14)*.

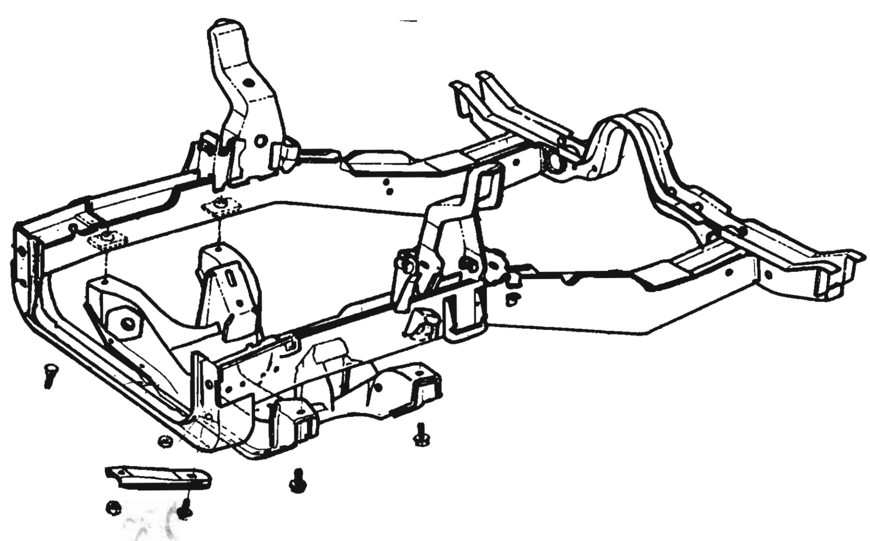


Fig. 26 – "K" member

(4) Remove the lower control assemblies, both sides *(Para. 7)*.

(5) Remove the idler arm at the "K" member mounting.

(6) Disconnect the steering gear from the "K" member and support it to relieve all tension.

(10) Measure and adjust front suspension height if necessary. Tighten lower control arm shaft to "K" member nuts and insert cotter pins. Tighten strut nuts both ends to specifications.

(11) Check and adjust front end alignment where necessary.

GROUP 3

REAR AXLE

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

PART 1 — CONVENTIONAL DIFFERENTIAL

SPECIFICATIONS

Type	Semi-floating Hypoid
Rear Axle Ratios	MODEL APPLICATION

3.23 : 1 (STD) 215, Pacer, Charger 770 (6 cyl.) and Charger RT.
3.23 : 1 (S.G.) Optional on Pacer, Charger 770 (6 cyl.) and Charger RT.
3.50 : 1 (S.G.) Charger RT "Optional with" condition with 3.23 : 1 S.G. axle when A84 or A87 option used.
2.92 : 1 (STD) Std with 245, 265 and 318 (Except models listed above).
2.77 : 1 (4 pinion) 360 Chrysler.

Adjustment by	Spacer washer .250″ – .294″ .002″ graduations
Carrier bearing preload spread	See differential preload spacer selection chart
Pinion and drive gear backlash	.005″ – .007″ at point of minimum backlash
Pinion bearing preload adjustment by spacer washers	.074″ – .106″ in .001″ graduations
Pinion bearing drag torque	15 – 25 lbs.-in. (new bearings) 8 – 13 lbs.-in (used bearings)
Pinion depth of mesh adjustment by spacer washers	.084″ – .100″ in .002″ graduations
Run-out, case and drive gear	.005″ maximum
Wheel bearing type	Single row roller "Unit-Bearing"
Bearing End-float (built-in)	.001″ – .015″ (installed)
Axle Shaft Bearing Fit (on shaft)	.001″ – .0022″(interference)(2,700–6,000 lbs. Press Fit)
Cup to Housing Fit	.0005″ – .003″ (clearance)
Bearing lock-collar Fit (on shaft)	.005″ min. (interference) (2,500 lbs. max. Press Fit)

SPECIAL TOOLS

Dial indicator set
Lbs.-in. torque wrench
300 lbs.-ft. torque wrench
E3C10 pinion yoke remover
E3C10B pinion yoke installer
E3C10E pinion setting gauge kit
E3C10G pinion bearing installer
E3C10J pinion oil seal driver
E3C10L pinion yoke holder
E3C15A housing spreader
E3C15B spreader adaptor plates
E3C20C axle shaft and bearing remover/installer kit
E3C25 differential bearing installer
E21C35B ⅜″ whit. pilot stud
E21C35C 5/16″ whit. pilot stud
E1673 bearing remover kit (with plates)

ALL ESSENTIAL TOOLS

TORQUE SPECIFICATIONS

Axle shaft retainer nuts	35 lbs.-ft.	Propeller shaft bolts	170 lbs. in.
Differential bearings bolts	35 – 45 lbs.-ft.	Drive gear bolts (right hand thread)	40 – 50 lbs. ft.
Wheel stud nuts (progressively)	55 lbs.-ft.		
Carrier cover bolts	17 – 22 lbs.-ft.		
Pinion yoke nut	240 – 280 lbs.-ft.	Spring (U bolts) nuts	40 lbs. ft. (max.)

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. REAR WHEEL NOISE

(1) Wheel loose on axle shaft studs.

(2) Worn drum.

(3) Wheel hub nuts loose.

(4) Brinnelled or scored wheel bearings.

(5) Insufficient or incorrect lubrication.

(6) Bent axle shaft or wheel and hub.

(7) Dragging brakes.

(8) Axle shaft retainer plate loose.

2. REAR AXLE NOISE

The main difference between an axle bearing noise and a gear noise is in the duration and the sound. Bearing noise is continuous and may change slightly in volume only as speed changes.

A continuous whine may be produced by a pinion and ring gear which are set up too tightly — not enough backlash. Gear noise comes in when the car is being driven under load, on the coast, or on both the pull and coast, but, gear noise changes in volume and in pitch as the car speed changes. There can also be a combination bearing and gear noise.

(1) Steady noise on pull — loss of lubricant, the use of improper lubricant or incorrect mesh of gear teeth will cause a steady hum.

(2) Steady noise on coast — Gear teeth that are badly scored due to excessive end play in the pinion bearings, or because of improper adjustment of bearings, will cause a steady hum.

(3) Bearing noise on pull and coast — When the pinion or differential bearings are scored, chipped, cracked or badly worn, a noise will be heard when accelerating or coasting down to lower speeds.

(4) Ring gear and pinion — a sharp, metallic sound, heard when shifting from reverse into a forward speed may indicate that the ring gear is creeping on the case, or that its mounting bolts are loose. A thumping sound, heard when the vehicle is turning a corner may be due to a broken tooth, or a large nick in a differential side gear.

3. REAR AXLE DRIVESHAFT BREAKAGE

(1) Incorrect torque of axle shaft retainer nuts.

(2) Abnormal clutch operation.

(3) Misaligned axle housing.

(4) Vehicle overloaded.

4. OVERHEATING OF AXLE UNIT

(1) Lubricant level too low or incorrect type.

(2) Bearings adjusted too tight.

(3) Excessive wear in gears.

5. LOSS OF LUBRICANT

(1) Lubricant level too high.

(2) Clogged breather.

(3) Oil seals worn.

(4) Improper type of lubricant (foaming).

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The rear axle housing *(see Fig. 3)* is a one piece assembly. The drive pinion and the differential case with drive gear are mounted directly to the centre (carrier) section of the housing assembly. Access to the differential, drive gears and carrier bearing is obtained by removal of the carrier cover. Axle shafts and the pinion oil seal can be removed without removing the assembly from the vehicle, but the unit should be removed for any additional operations.

Gear ratio and axle identification numbers are supplied on the tag affixed to the driver's side axle tube, facing rearward. Axle shaft end play is preset and is not adjustable. The oil seal is mounted between the bearing retainer plate outboard of the unit-bearing type roller wheel bearing. This requires the removal of the bearing cone for a seal replacement.

2. SERVICING THE REAR AXLE ASSEMBLY

Should it become necessary to remove the rear axle for overhaul or repair *(see Fig. 3)* proceed as follows:

To Remove

(1) Raise rear of vehicle until rear wheels clear the floor, support body at front of rear springs.

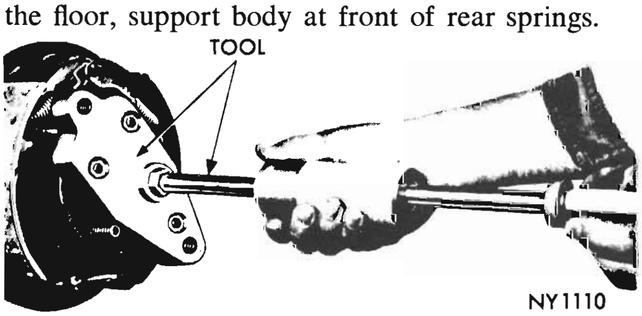


Fig. 1 – Removing axle shaft (Tool E3C20C)

(2) Block brake pedal up.

(3) Remove rear wheels.

(4) Disconnect hydraulic flex line.

(5) Disconnect parking brake cables.

(6) Disconnect propeller shaft at differential yoke.

(7) Remove rear spring U bolts and shock absorbers.

(8) Remove axle assembly from vehicle.

> NOTE: It may be necessary to remove one side axle shaft and brake assembly to provide sufficient clearance to withdraw the axle assembly over the springs.

To Install

(1) With the body supported at front of rear springs, position the rear axle housing spring seat over the spring centre bolts.

(2) Connect the hand brake cable.

(3) Install spring U bolts and shock absorbers. Tighten U bolt nuts to 40 lbs.-ft. torque (max.). (Non-insulated axle Models).

(4) Connect propeller shaft and tighten screws to 170 lbs.-ins. torque.

(5) Connect hydraulic flexible lines (and install brake assemblies and axle shafts, if removed).

(6) Install wheels and tighten nuts to 55 lbs.-ft. as described in Group 22 Page 10.

(7) Remove pedal block and bleed brake system.

(8) Remove support stands, refill rear axle with lubricant *(refer Group 1, para. 14).*

3. AXLE DRIVE SHAFT ASSEMBLY

To Remove

(1) With wheel removed, remove clips holding brake drum on wheel studs and remove drum.

(2) Remove the axle retaining nuts from housing studs (axle flange has access hole for socket spanner).

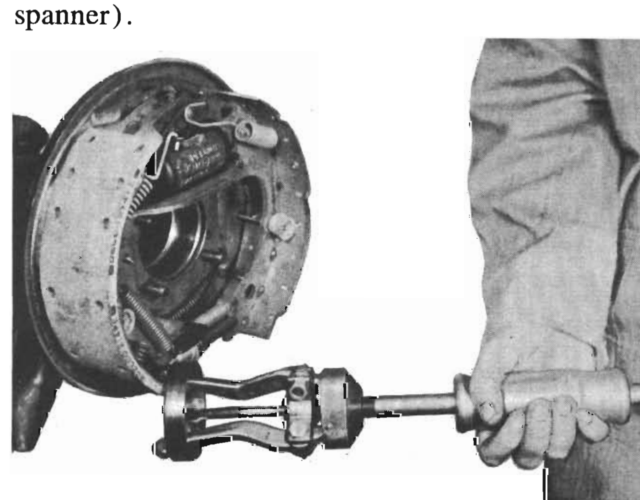


Fig. 2 – Removing axle bearing cup using Tool E6666

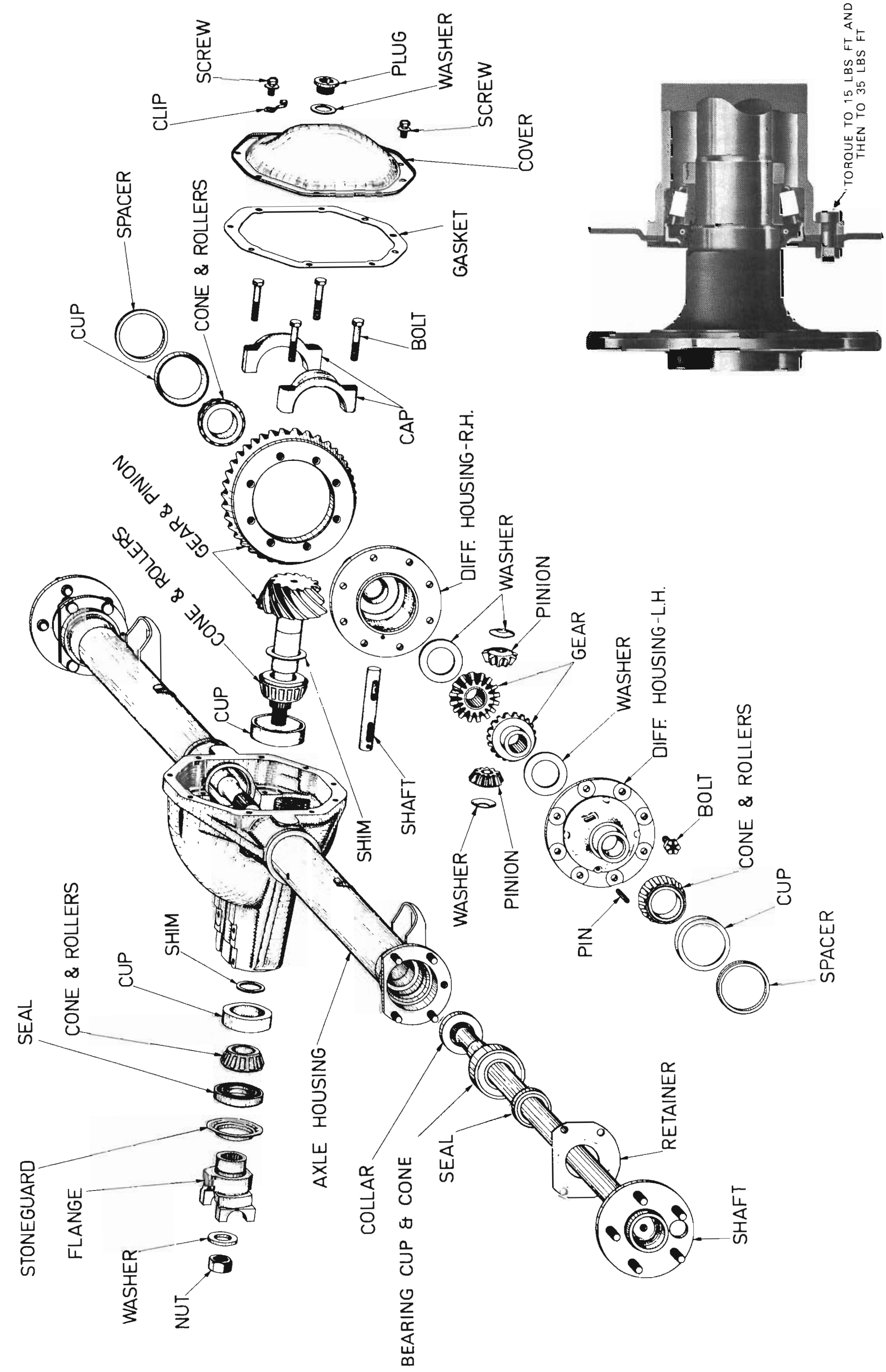


Fig. 3 – Rear axle assembly (typical view)

(3) Withdraw the axle shaft carefully from housing (using Tool E3C20C or slide hammer *Fig. 1* to loosen bearing where necessary) *taking care* to *prevent oil spillage* on to brake components.

NOTE: The oil seal is outboard of the bearing cone and will be removed with the axle shaft — The bearing cup may become detached from the bearing and remain in the housing — *refer Fig. 3* inset.

(4) Remove the bearing cup, where necessary, using a suitable tool, i.e. E6666 (slide hammer) *Fig. 2*.

Cleaning and Inspection

NOTE: DO NOT remove the bearing cone UNLESS Bearing or seal replacement is necessary or where the retainer plate is damaged — refer to Unit-Bearing removal.

(1) Clean the bearing using only a solvent which will not affect the oil seal material. *Refer Fig. 4*.

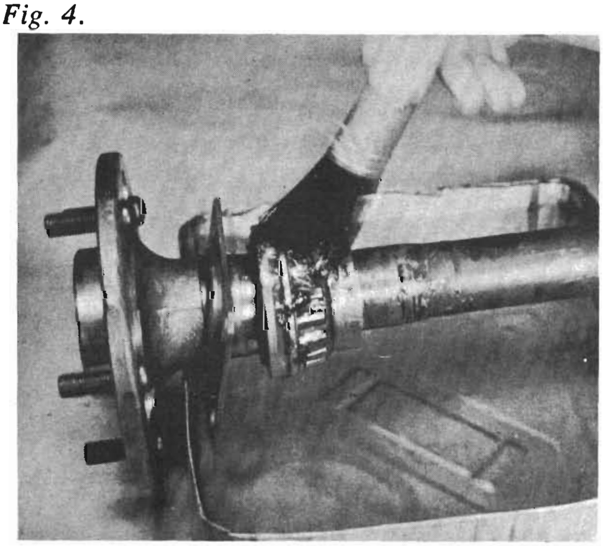


Fig. 4 – Cleaning bearing cone and seal on the shaft.

(2) Blow the bearing dry but *do not spin* the cone as scoring may occur, *refer Fig. 5* then inspect cone and cup for damage.

(3) Clean out the cup and seal recess area in the axle housing and examine for damage.

(4) Inspect the seal "fit" on shaft and seal condition — if unsatisfactory the seal must be replaced — refer to Unit Bearing Replacement.

To Re-install

(1) Re-lubricate the bearing cup and cone assembly and the sealing surfaces on the shaft and

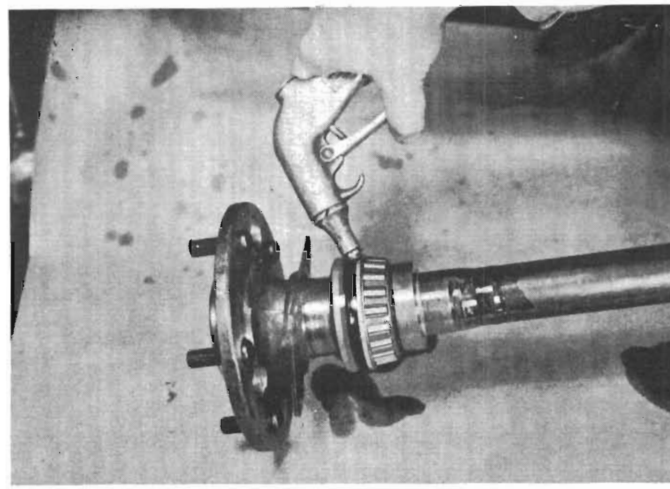


Fig. 5 – Blowing bearing cone and seal clean.

oil seal, using the same type of rear axle lubricant as for the particular axle type installed.

(2) Install the bearing cup into the housing ensuring that it seats against the back face of bearing *(Fig. 6)*.

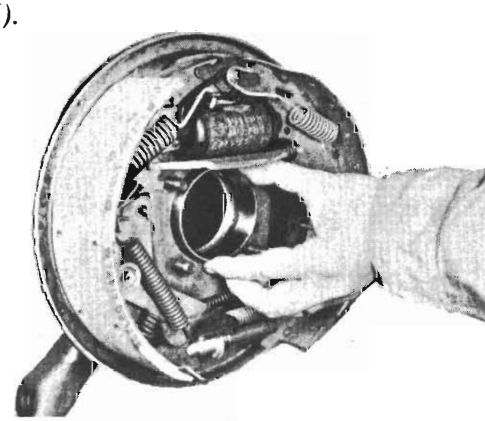


Fig. 6 – Installing bearing cup

(3) Carefully insert the axle shaft into the housing and engage the drive shaft splines.

(4) Wipe off any surplus lubricant to prevent brake contamination then commence to start the

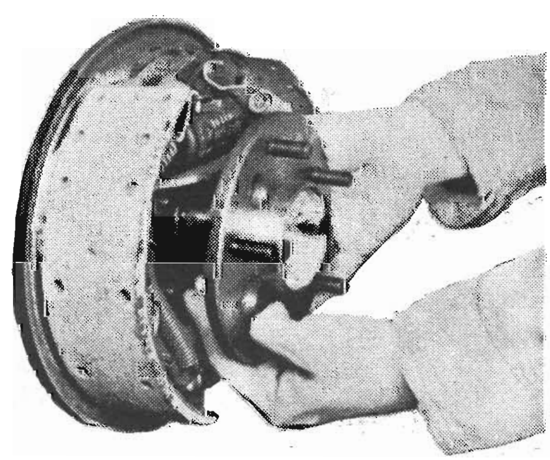


Fig. 7 – Carefully positioning the seal and cup "rib-ring"

bearing cup "rib-ring" and the seal into the housing using finger tips as shown in *Fig. 7.*

(5) Correctly install the bearing retainer plate and push the axle, bearing and seal into its seated position to install the retainer nuts.

(6) Install the retainer nuts and tighten evenly to 15 lbs.-ft., then finally tighten evenly to 35 lbs.-ft., (to prevent distortion of the plate and seal), using a torque wrench, *refer Fig. 8.*

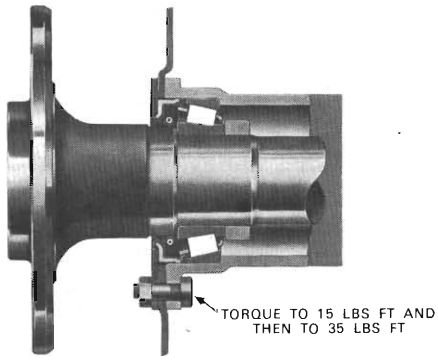


Fig. 8 – Bearing Retainer Bolts.

NOTE: The shaft end play clearance should be .001" to .015".

(7) Re-install the brake drums and retainer clips.

(8) Re-install wheels and covers then top up rear axle lubricant if necessary (*refer to Group 1, Para. 14 for correct lubricant).*

NOTE: Axle Bearing and Retainer Removal MUST BE accomplished using SPECIAL TOOL E3C20C—DO NOT SUBJECT AXLE SHAFT TO HEAT.

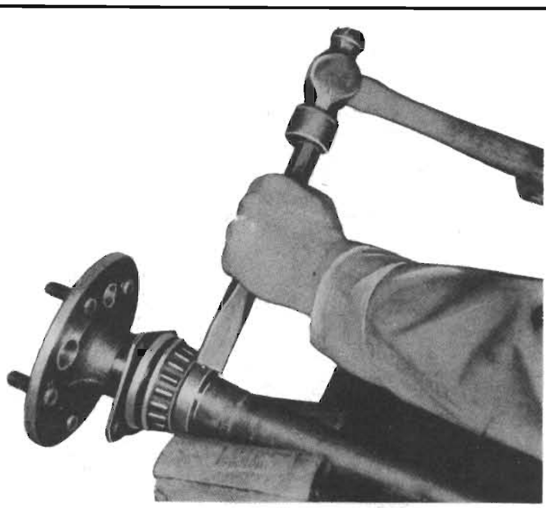


Fig. 9 – Loosening the bearing retainer collar prior to removal.

UNIT BEARING REPLACEMENT

Axle Bearing Removal

(1) Loosen the bearing retainer collar with 4 deep chisel cuts, *refer to Fig. 9.*

(2) Assemble the bearing remover (Tool E9C20C) jaws of puller between the seal and the bearing cone, *ensuring* that the pressure of the tool is applied to the *shoulder* of the cone (*not* upon the rollers) *(refer Fig. 10)* or the sealing surface *(refer Fig. 3).*

(3) Install the tool base to the axle flange nuts to direct the screw pressure upon the two pads of the jaws.

(4) *Lubricate* the tool pusher screw *threads* and tighten sufficiently and evenly to force the bearing and retainer from shaft.

NOTE: The retainer must be discarded. The bearing cone assembly may be reinstalled, where necessary, for re-use, if not damaged by removal.

Axle Bearing Installation

It is recommended that when replacement bearings are used, replace the seal also.

Inspection

a. Prior to replacing the bearings and seals, first check that the bearing retainer plate is serviceable, i.e. not damaged or distorted *(refer Fig. 11).*

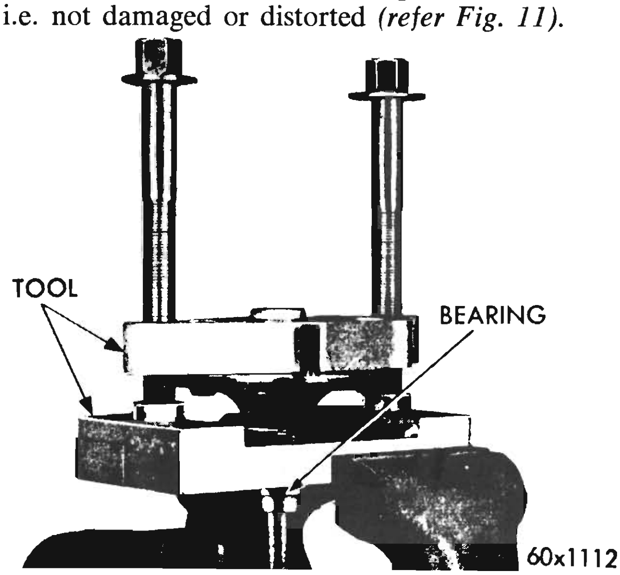


Fig. 10 – Removing the axle shaft bearing cone and collar using Tool E3C20C.

b. Ensure that any damage such as bruises, nicks or burrs are removed from the seal or bearing surfaces of the axle shaft, to prevent installation damage.

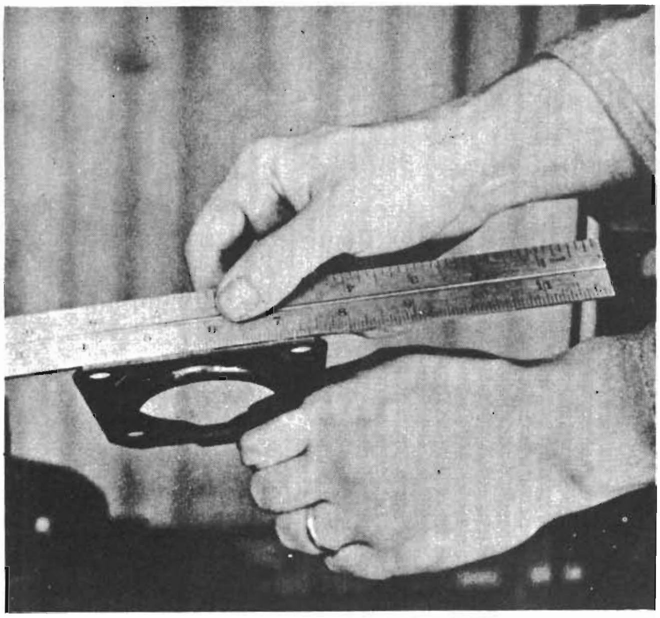


Fig. 11 – Checking retainer plate for flatness.

To Assemble

(1) Place the retainer plate on the axle shaft with the flat side toward the splined end. *(Refer Fig. 12).*

(2) Apply a small volume of bearing lubricant to the cavity between the seal lips and carefully position the seal on the shaft seal surface with the *flat side* of the seal *toward* the retainer plate.

> DO NOT force the seal on to the *unground* surface of the shaft. Install the unit bearing without removing the protective grease — where dry, lubricate using rear axle lubricant of the type required. New bearings have the cup bonded to the cup rib-ring for installation.

(3) Place the lubricated bearing on the axle shaft ensuring that the cup *rib-ring* is *toward the retainer plate. (Refer Fig. 3 insert).*

CAUTION — DO NOT OMIT THE CUP RIB-RING OR REVERSE THE BEARING DIRECTION — SAFETY CHECK.

(4) Position the bearing squarely onto the axle shaft using tool No. E3C20C. When pressing the bearing onto the axle shaft, between 2,700-6,000 lbs. force should be required. (*Fig. 13*)

(5) Force the bearing cone to seat against the shaft shoulder — check using feeler gauges.

> NOTE: An incorrectly installed collar may lose half the retaining interference "grip".

(6) Place a new collar (champfer towards bearing) onto the axle shaft and press it on until it contacts the bearing cone. When pressing the collar onto the axle shaft DO NOT exceed 2,500 lbs. force.

(7) Install the assembly as described in Para. 2.

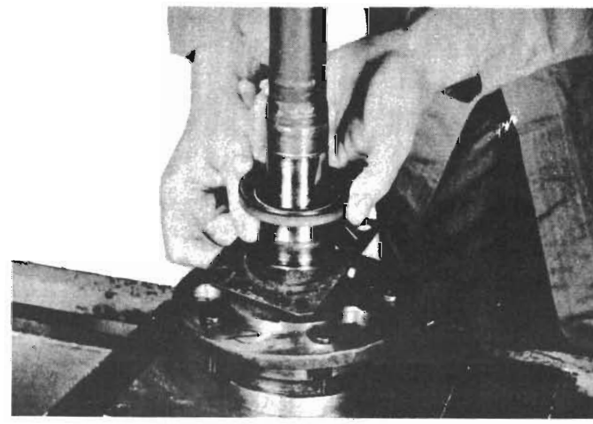


Fig. 12 – Positioning retainer plate and seal correctly on shaft.

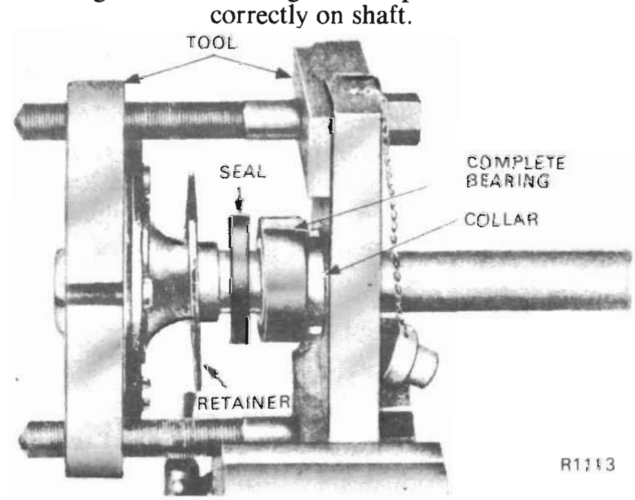


Fig. 13 – Installing axle shaft bearing and collar using Tool E3C20C.

Fig. 14 – Checking the bearing installation using feeler gauges.

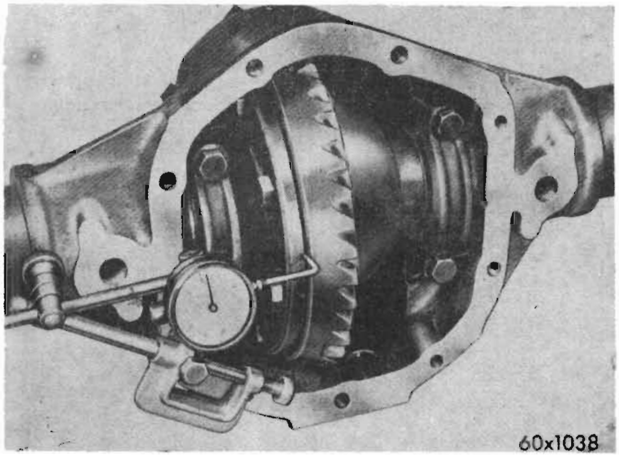


Fig. 15 – Measure drive gear runout.

4. DIFFERENTIAL DIS-ASSEMBLY

Axle Shafts Removed

(1) Drain lubricant from housing, and turn the unit to have the cover facing upward.

(2) Remove cover and clean the differential case and drive gear with kerosene, mineral spirits or other similar cleaning fluid.

(3) Check for differential side play. There should be no side play.

(4) To check drive gear runout on differential case (provided no side play was found), mount dial indicator, on pilot stud E21C35C and load the indicator slightly when the plunger is at right angle to the back face of the drive gear *(see Fig. 15)*.

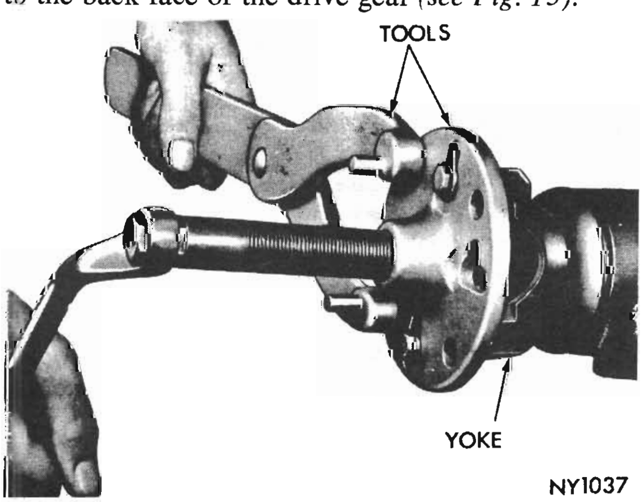


Fig. 16 – Removing pinion yoke (Tools E3C10 and E3C10L) (typical)

(5) Check drive gear runout by reading dial indicator, whilst turning the drive gear several complete rotations. Mark the drive gear and the case at the point of maximum runout for use later in checking the differential case. Total indicator reading should be no more than .005". If runout is over .005" the differential case assembly may have been sprung. A test of the case assembly will be described later.

(6) Remove pinion nut and remove yoke with puller Tool E3C10 and holding Tool E3C10L *(see Fig. 16)*.

(7) Remove pinion oil seal with Puller Tool E3C10C *(see Fig. 17)*. Remove pinion front bearing and preload spacer washer.

(8) Mark carrier and differential bearing cups for location in assembly *(see Fig. 18)*.

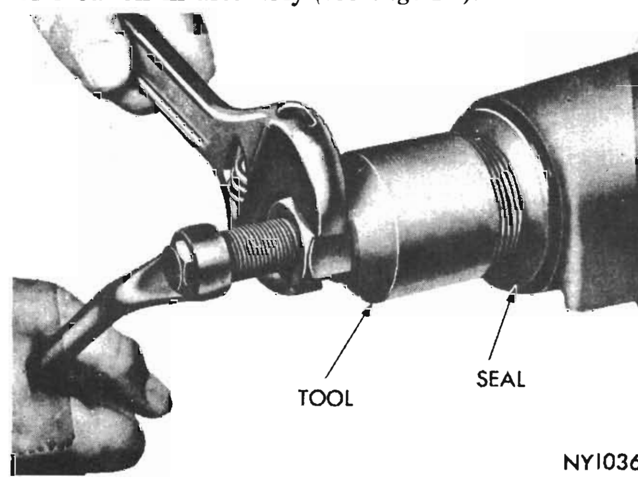


Fig. 17 – Removing pinion oil seal (Tool E3C10C)

> NOTE: A suitable pilot stud can be made by cutting a $\frac{3}{8}''$ Whitworth thread $\frac{1}{2}''$ long on one end of a $6\frac{1}{2}''$ length of $\frac{3}{8}''$ steel rod.

(9) Remove bearing caps and locate spreader Tool E3C15A with adaptor plates E3C15B on carrier, making sure that the plates fit flat on the carrier flange when the mounting screws are properly tightened. If any projections from the axle tube weld points interfere with the correct seating of the adaptor plates, dress down with a file to form a flat surface. At this time the spreader tool screw should be tightened finger tight only.

(10) Screw a pilot stud Tool E21C35B into the side bearing lower stud hole on the ring gear side. Attach a dial indicator and load slightly against the opposite side of the carrier *(see Fig. 19)*.

(11) The carrier must be spread sufficiently (.012" – .015") to permit removal of the differential, *but not over .020"*.

(12) Remove dial indicator and remove differential assembly from carrier. A light prying

action can be used to unseat the differential from the carrier *(see Fig. 20)*. Identify bearing cups and preload washers for location in reassembly. Do not remove spreader tool.

(13) Remove pinion from carrier.

(14) Remove pinion bearing cups with flat end brass drift.

(15) Mount differential case assembly in a vice equipped with soft jaws.

(16) Remove drive gear bolts.

CAP BOLTS ARE RIGHT-HAND THREAD

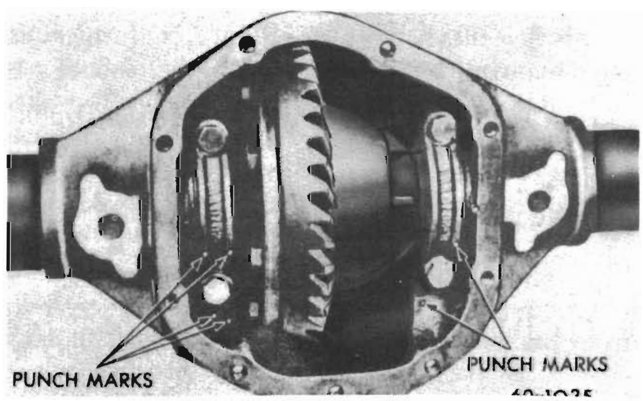


Fig. 18 – Bearing cap identification.

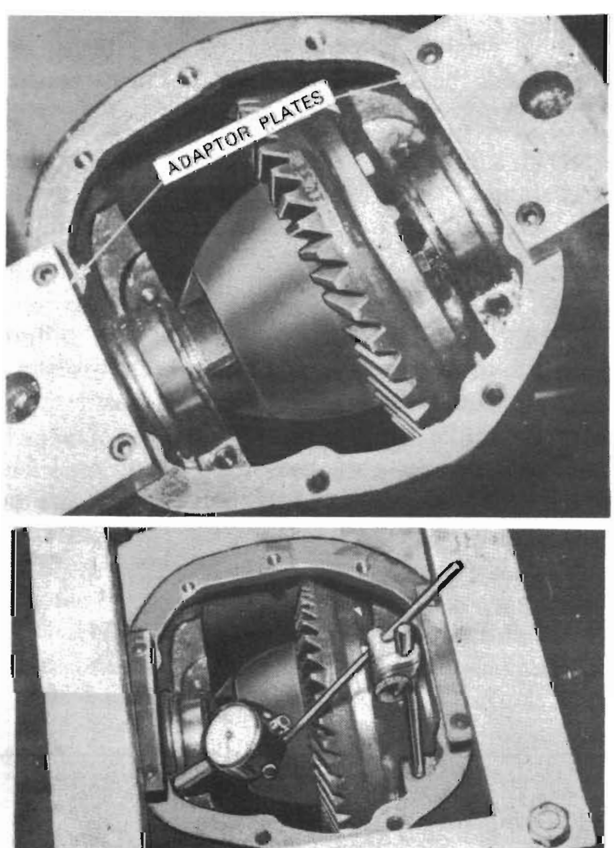


Fig 19 – Spreading rear axle housing using Tools E3C15A and E3C15B

Remove drive gear and inspect for burrs or other reasons which could cause the runout condition.

(17) If drive gear runout exceeds .005″ in step 4, the differential case assembly flange runout should be checked.

Temporarily install substitute bolts to hold the case halves together when the drive gear is removed, then check the drive gear mounting face runout, as described in Para. 4.

Install the differential case assembly and spacer washers in the carrier and loosen the spreader tool. Mount the dial indicator in contact with the ring gear side of the flange to take a reading as in steps (3), (4) and (5). Total allowable runout, should not exceed .003″. In a case of slight runout, it may be possible during the assembly to locate the high runout section of the drive gear, opposite (180°) from the runout section of the case to reduce the tolerance of the assembly.

(18) Drive differential pinion shaft lock pin out of case from ring gear end of case.

(19) Remove differential pinion shaft with a brass drift.

(20) Remove bolts from carrier halves and separate to remove pinion gears and washers.

(21) Remove axle side gears and washers.

(22) Remove differential bearings with puller Tool E1673 bearing remover *(see Fig. 21)*.

(23) Remove pinion rear bearing with puller Tool E1673 bearing remover *(see Fig. 22)*.

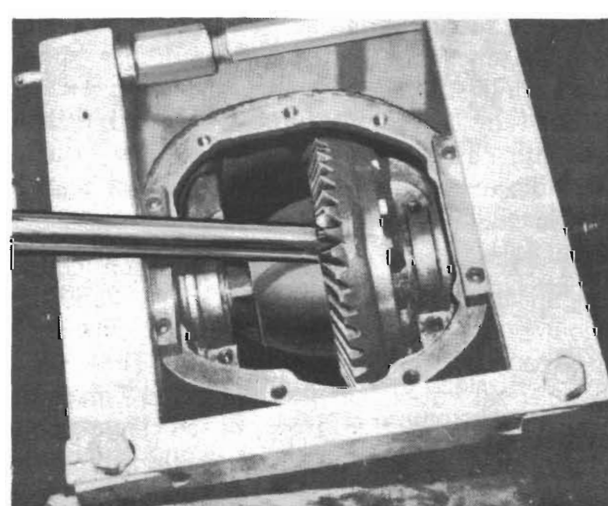


Fig. 20 – Loosening differential assembly

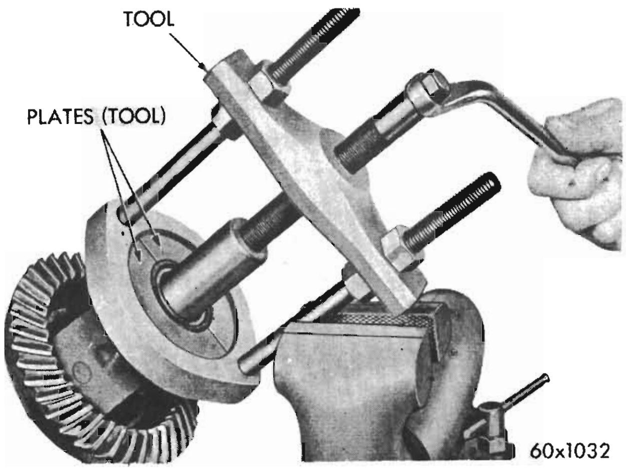


Fig. 21 – Removing differential carrier bearing using Tool E1673.

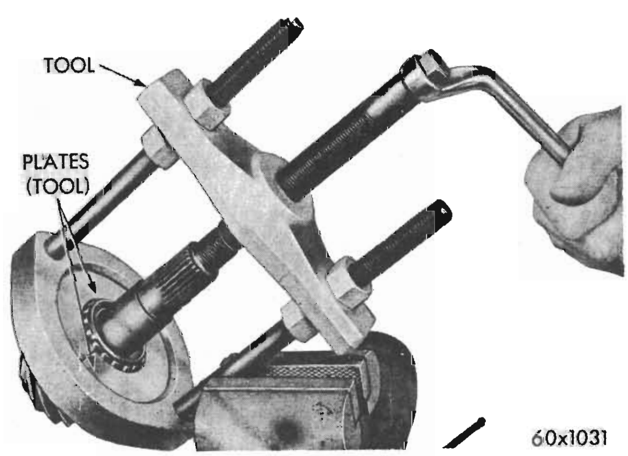


Fig. 22 – Removing pinion rear bearing using Tool E1673.

5. CLEANING AND INSPECTION

(1) Clean all parts except the wheel bearings with kerosene, mineral spirits, or other similar cleaning fluids. Clean housing tubes with a cleaning cloth by inserting a stiff wire from ends of tubes into carrier section, and withdraw cleaning cloth from the centre outward. Wipe wheel bearings with clean, lintless cloth.

(2) The two differential bearing cup contact areas in the carrier should be smooth and flat, without raised metal either in the contact areas or the edges of the machined surfaces. The bearing caps should also have undamaged machined surfaces, and be free from raised metal edges along both sides and also around the bolt holes. In the drive pinion section of the carrier, the bearing cup bores should be smooth and flat. Raised metal on shoulders of the bores incurred in removing the cups, should be flattened by use of a flat nose punch.

(3) The axle drive shaft bearing and oil seal bores at both ends of the housing should be smooth and free from rust or damage.

(4) Axle drive shaft splines should be straight and free from excessive wear. The shaft bearing and retainer area must be smooth and free from raised metal. When necessary to clean this portion remove only the raised metal and use crocus cloth to *polish the area without reducing the diameter of the shaft.*

(5) If the axle shaft bearings were removed from the shaft, install bearings using new retaining collars as these parts are unfit for further use after removal *(refer Para. 3).*

(6) Taper roller bearing cone assemblies should have a smooth, unbroken surface on the cone and both shoulders. The rollers should also have smooth unbroken surfaces. The roller retainer should be free from damage and cracks. Bearing cups should have a smooth unbroken surface.

(7) Differential pinion gears and side gears should have smooth teeth with a uniform contact pattern, without excessive wear or broken surfaces. The hub surfaces of side gears should be smooth and the splines should be straight and without excessive wear. The outer surfaces of the pinion gears should be smooth and bright. Thrust washers should be smooth and unbroken.

(8) Inside the differential case, the machined areas should be polished, without surface imperfections. The pinion shaft bore in the case should be round and smooth. Both ends of the pinion shaft should also be round and without excessive wear.

(9) Drive gear teeth should have a uniform contact pattern and have smooth unbroken surfaces with out excessive wear. The pinion teeth should have a similar appearance *(see Fig. 33).* The machined surface of the pinion shaft and back face of the head should be undamaged and without wear.

(10) Use new gaskets and oil seals in assembly.

6. ASSEMBLING THE DIFFERENTIAL

If new differential side gears are to be installed, use new thrust washers also.

> NOTE: Lubricate all parts when assembling and adjusting.

(1) Install thrust washers on the differential side gears and position gears in each case half.

(2) Place thrust washers on both pinion gears and mesh the pinion gears with the side gear, having the pinion gears exactly 180° apart, positioned in the drive gear case half.

(3) Align the pinion gears and washers with the shaft holes in the case.

(4) Install pinion gear shaft with care not to damage thrust washers and to have hole in shaft aligned with lock pin hole in case.

(5) Assemblies fitted with four pinion differentials incorporate a differential block which must be fitted to the pinion shaft between the pinions. The additional two pinions and pinion shafts are then fitted.

(6) Install a new lock pin in drive gear side of case half, carefully positioning the case on to the smaller case, engage the lockpin in the pin bore, then carefully press halves together.

(7) Position the drive gear on the case to separate the points of maximum runout 180° and start all bolts through the case into the drive gear, finger tight.

(8) Tap drive gear against the flange. Install retaining bolts, where SUREGRIP EQUIPPED, include Locking Plates — tighten bolts evenly to 40-50 lbs.-ft. torque and lock-over tabs, where equipped.

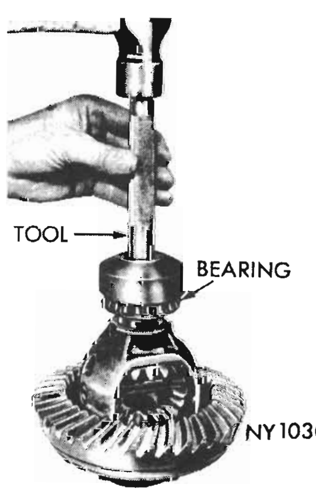


Fig. 23 – Installing differential bearing using Tool E3C25.

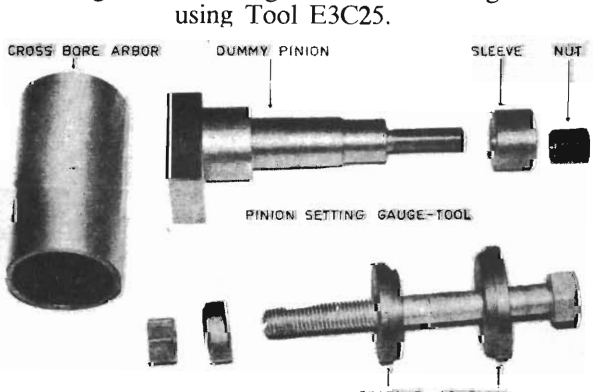


Fig. 24 – Pinion setting gauge (Tool E3C10E)

NOTE: All rear axles fitted to vehicles equipped with "six pack" engines have left hand thread bolts holding the drive gear to the carrier. These bolts must be dipped in "Locktite Studlock" prior to assembly and are identified by a letter "L" stamped on the head of the bolt.

(9) Install bearing cones with driver. Tool E3C25 as shown in Fig. 23.

7. PINION BEARING CUP INSTALLATION

(1) Start both bearing cups into the carrier. Tool Bolt (with bearing adaptors) installs both bearing cups in one operation.

(2) Position the bearing cup adaptors and draw cups into position evenly by tightening the nut on centre pulling screw until both cups bottom in their respective bores.

8. DRIVE PINION DEPTH OF MESH

Tool E3C10E must be used for *quick and accurate* selection of the correct pinion bearing spacer washer.

(1) Locate the rear bearing on the dummy pinion and place in housing. Install front bearing, sleeve and nut, tighten until 15-25 lbs.-in. turning torque is obtained rotating dummy pinion back and forth to ensure bearings seat.

(2) Place the cross bore arbor of E3C10E in carrier and install caps. Tighten lightly.

(3) Select a bearing spacer washer which fits between the gauge block and arbor when the washer is flat on the block. The fit should have a definite drag, similar to the fit of a feeler gauge. Should a washer have a little drag and the next thicker washer will not pass through, select the thinner washer. The selected washer is the correct one for this carrier. It would be the correct one for installation with a pinion marked "O". If the pinion has a +2 marking, select a washer of the same number of thousandths thinner for installa-

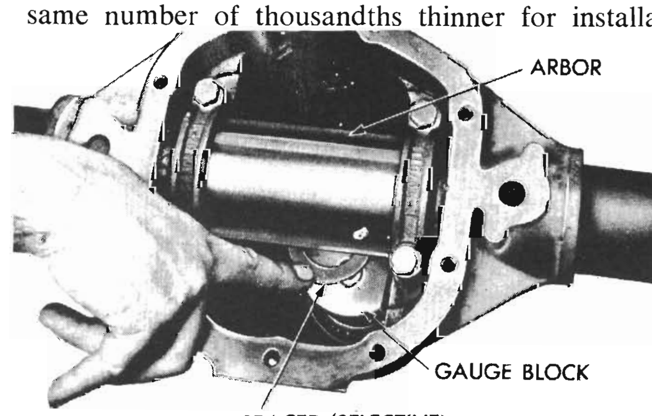


Fig. 25 – Checking housing for pinion spacer thickness using Tool E3C10E — typical view.

tion. If the pinion has a −2 marking, select a washer that many thousandths thicker for installation. Treat other pinion markings in a similar manner. Spacer washers are available in .002″ variations from .084″ to .100″.

(4) Remove tool from carrier and proceed with pinion installation and bearing preload as set out in paragraph 9.

9. PINION INSTALLATION AND BEARING PRELOAD

Pinion spacer washers are chamfered on one side and must be installed with the chamfered side toward the pinion head.

(1) Place the selected spacer *(see Para. 8)* and the bearing on the pinion. Use installing Tool E3C10G to press bearing on pinion *(see Fig. 26)*.

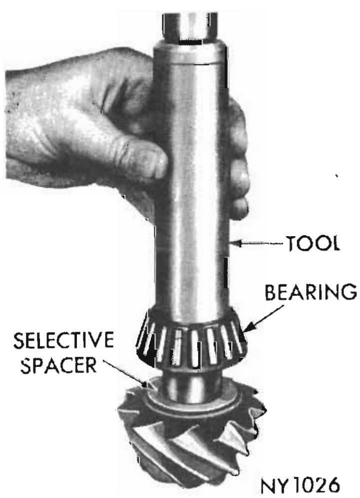


Fig. 26 – Installing pinion spacer and rear bearing using tool E3C10G.

(2) Hold pinion in carrier and install the original preload washer (chamfered side toward shoulder), front bearing yoke and nut.

(3) Turn the housing to bring the nose of the carrier up. Tighten the nut to 240 lbs.-ft. (minimum) with torque wrench using holding Tool E3C10L on the yoke to hold assembly in several positions to make a complete revolution whilst tightening. Remove holding tool and rotate the assembly several times in both directions to align bearing rollers.

(4) Use inch-pound torque wrench to test preload. Accurate readings can be obtained only with the nose of the carrier up. With the handle of the wrench floating, take readings when wrench is moving through several full turns.

Correct pre-load is 15-25 lbs.-in. (new bearings), 8-13 lbs.-in. (used bearings).

A reading which varies during rotation indicates a binding condition which should be corrected. Use thinner washers to increase preload and thicker washers to decrease preload. Always perform steps (3) and (4) in exactly the same manner each time to obtain accurate preload readings. Preload washers are available in .001″ variation from .074″ to .106″.

(5) When preload is correct, remove the nuts and yoke.

(6) Apply a thin film of sealing compound to the inner bore of the carrier in the area of the pinion seal.

(7) Install pinion oil seal (lip toward the pinion head) with driver Tool E3C10J *(see Fig. 27)*.

> NOTE: The correct location of this seal in the housing is extremely important. When correctly installed the distance from the front face of the seal to the front face of the axle housing should be flush or not exceeding .010″ below the housing surface.

(8) Install the yoke, using yoke installing Tool E3C10B and holding tool E3C10L *(see Fig. 28)*.

(9) Remove tools and install washer (cupped side toward pinion head) and nut. Tighten nut to 240 lbs.-ft. torque (minimum).

10. DRIVE GEAR AND PINION BACKLASH

(1) With pinion installed and the bearing preload set, install the differential carrier, with a .260″ spacer on the ring gear side *(see Fig. 29)* into the differential housing. Do not install the bearing caps.

Spacer washers are supplied in .002″ from .254″ to .284″ and are chamfered on one or both sides. Install with the chamfer to the carrier housing.

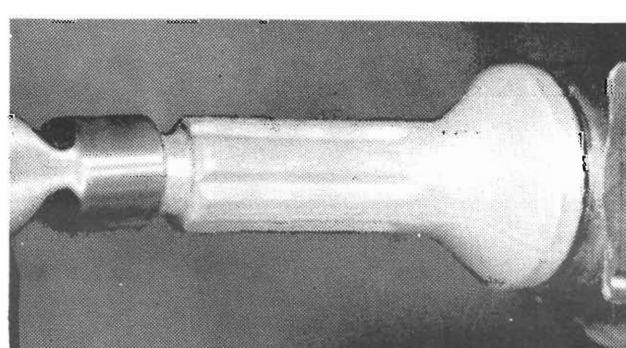


Fig. 27 – Installing pinion oil seal (Tool E3C10L)

(2) Install a spacer on the opposite side that will leave a little end play.

(3) Measure the end play by using two sets of feeler gauges. *(See Fig. 30).* Push the differential to the left side or ring gear side of the carrier. Insert a feeler gauge between the spacer and the right side of the casting above the centre-line of the case. Insert the same thickness of another set of feeler gauges beween the spacer and casting below the centreline of the case. *Increase the thickness of the gauges evenly, until a heavy drag is felt.*

(4) Rotate the differential several times in both directions to seat the bearings and cups and re-check the feeler gauge drag. Increase as required.

NOTE — THIS IS MOST IMPORTANT

(5) Install a spacer totalling the combined thickness of the spacer and the feeler gauge. This will provide zero end play.

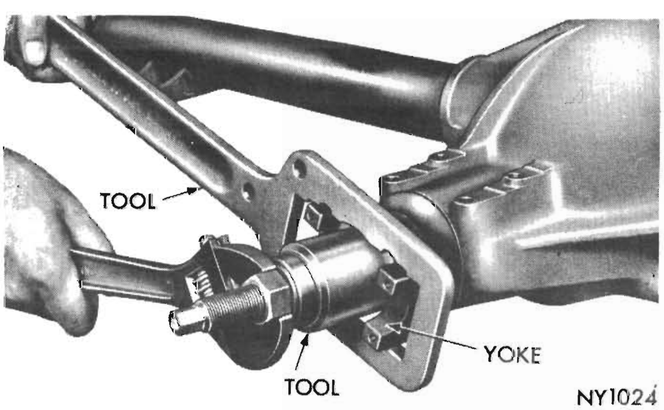


Fig. 28 – Installing pinion yoke using Tools E3C10L and E3C10B.

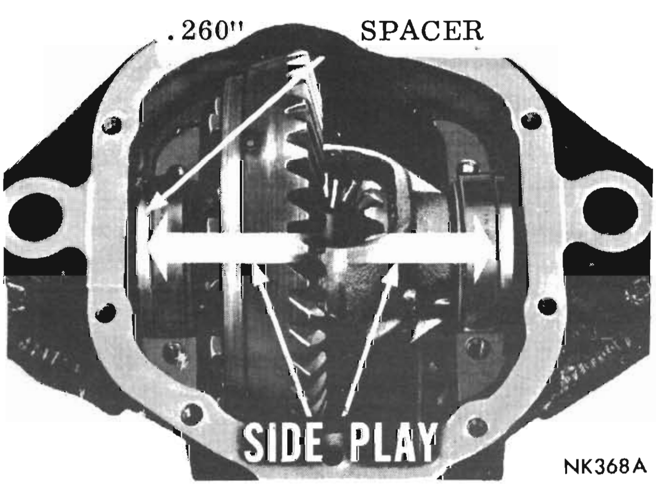


Fig. 29 – Temporarily install thinnest spacers available

(6) Measure the drive gear backlash *(see Fig. 31)* and refer to the "Differential Preload Spacer Selection Chart" for the proper spacers to provide .005" to .007" backlash *(Page 16).* Measure the backlash at 90° intervals.

(7) Remove the differential from the carrier housing and install the proper spacers for left and right sides as specified by the "Differential Preload Spacer Selection Chart."

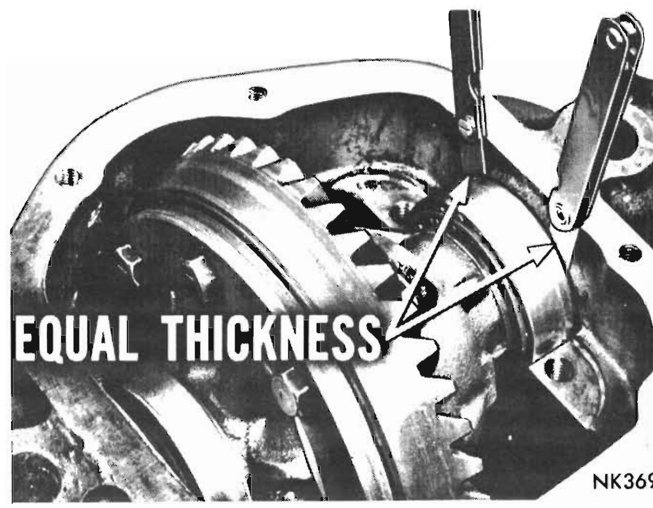


Fig. 30 – Feeler gauges eliminate side play

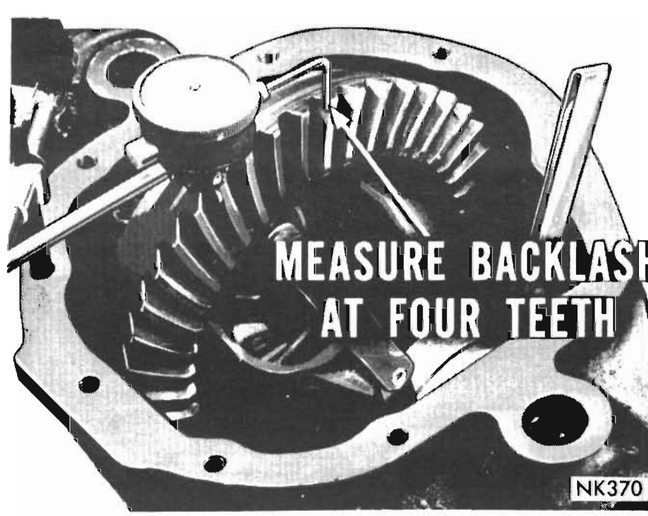


Fig. 31 – Finding minimum backlash

(8) Attach the spreader Tool E3C15A but do not spread the housing at this time.

(9) Install pilot stud into side bearing lower stud hole on ring gear side, and attach the dial indicator with the plunger in contact with he opposite side of the carrier opening *(Fig. 19).*

(10) Read the dial indicator whilst tightening the spreader tool to spread the carrier enough to

install the differential assembly. Usually a spread of .010″ to 0.15″ is sufficient.

> Never spread the carrier more than .020″.

(11) Remove the dial indicator.

(12) Hold the bearing cups and the preload spacers on the bearing cones and carefully guide the differential assembly into position in the carrier.

(13) Release the tension on the spreader tool.

(14) Install bearing caps and tighten the bolts 35-45 lbs.-ft. torque.

(15) Attach dial indicator to the carrier bringing the indicator parallel with the ring gear rotation and into contact with one tooth.

(16) Determine the amount of backlash and mark this tooth.

(17) To find the position of least backlash, take readings on three more teeth approximately 90 degrees apart.

(18) Using the teeth with the minimum backlash, the dial indicator should read .005″ - .007″ If the reading is not within tolerance it will be necessary to refer to the "Differential Preload Spacer Selection Chart" and install different spacers.

(19) Make a gear tooth pattern test using red lead and refer to the patterns in Figs. 32 and 33.

(20) Install cover with a new gasket and tighten the bolts to 17-22 lbs.-ft. torque.

(21) Install rear axle assembly as described in Para. 2.

(2) Install axle drive shafts as described in Para. 3.

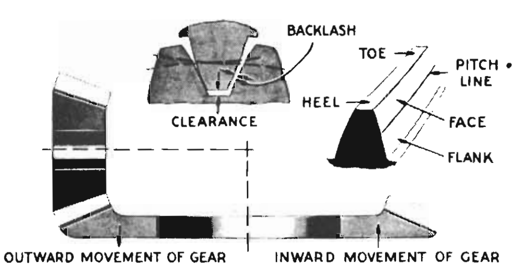


Fig. 32 – Gear tooth contact pattern

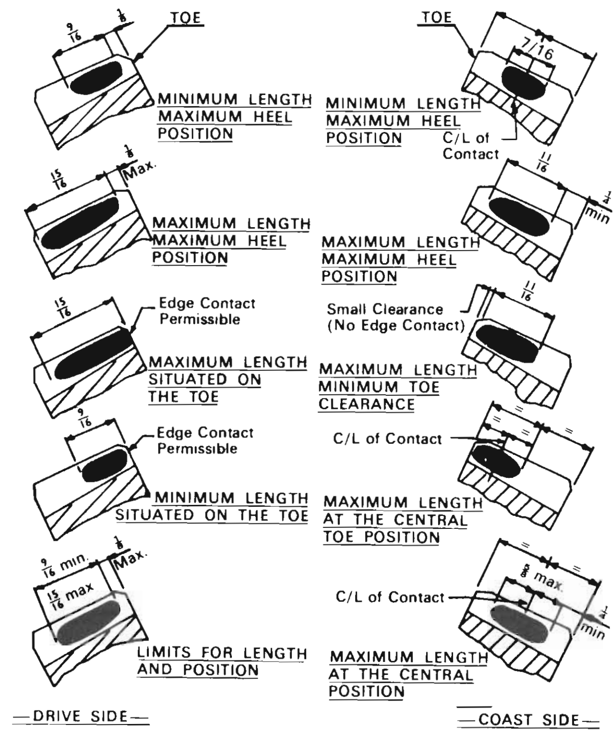


Fig. 33 – Acceptable tooth contact pattern limits chart.

DIFFERENTIAL PRELOAD SPACER SELECTION CHART

Backlash—With No Preload, No Side Play	Change Spacer Thickness At Ring Gear Side by:	Change Spacer Thickness At Pinion Side by:
.020″	+ .020″	– .014″
.019″	+ .020″	– .014″
.018″	+ .018″	– .012″
.017″	+ .018″	– .012″
.016″	+ .016″	– .010″
.015″	+ .016″	– .010″
.014″	+ .014″	– .008″
.013″	+ .014″	– .008″
.012″	+ .012″	– .006″
.011″	+ .012″	– .006″
.010″	+ .010″	– .004″
.009″	+ .010″	– .004″
.008″	+ .008″	– .002″
.007″	+ .008″	– .002″
.006″	+ .004″	+ .002″
.005″	+ .002″	+ .004″

Should backlash with no preload and no side play measure more than the maximum chart figure of .020″, increase the thickness of the spacer at the ring-gear side from the specified .260″ to a thickness great enough to reduce backlash to within the chart limits. Then follow the procedure.

PART 2 — SURE GRIP DIFFERENTIAL

(Optional Equipment with Heavy Duty Axle Housing)

SPECIFICATIONS

Type	Cone brakes — Located between side gears and housing
Drive Ratios	3.23:1 and 3.5:1
Number of differential pinions	2
Shim Application Dimensions	(Case half joint to inner cone/ gear face)
No Shims	1.162″ – 1.155″
.005″ Shim	1.167″ – 1.163″
.010″ Shim	1.172″ – 1.168″
(Dimensions above the maximum indicate replacement parts are required)	
Case-half Cone surface runout (Test mounted on joint face and register)	.002″ T.I.R.
Cone clearance from case abutment face	.053″ – .015″
Spring free length (Min)	1.283″
Spring force test	315 – 290 lbs. @ 1.010″
Test Torque (assembly on bench)	50 lbs./ft. (Min.)
(assembled in vehicle)	65 – 105 lbs./ft.
Lubricant	(Pt. No. A3649436) Caltex Gear Lubricant TL 3450

SPECIAL TOOLS

Adaptor — Turning torque testing

TORQUE SPECIFICATIONS

Differential Case/Retaining Screw Torque	
(used)	21 –26 lbs./ft.
(new)	27 – 32 lbs./ft.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The sure-grip differenial *(Fig. 34)* is similar to the conventional differential, with the addition of brake (friction) cones between each side gear and the differential case.

The side gears and brake cones, which are splined to the axle, are forced against the case by spring loaded plates, to provide initial resistance to differential action. When torque is applied to the assembly, the differential pinions further load the side gears in proportion to the resistance to the drive load. Should wheel slip occur, the reaction to the combined cone friction is applied to the driving wheel to provide a proportion of drive.

> NOTE: When adjusting the rear wheel brakes allow both rear wheels to turn freely.

The service procedures covering the remainder of the axle assembly is contained in Part 1 of this group.

Identification may be made by viewing the eight retaining bolts viewed through the filler plug hole.

Operating Noise

On occasions of severe unbalanced wheel drive conditions, a whirring sound may be heard. This *does not* indicate a sure-grip failure. Where "Chatter" or "Groaning" noises are heard, inspect the lubricant.

Drain and refill with the correct lubricant then road test, after sufficient running to ensure complete circulation of fresh lubricant.

Do not overlook other possible sources of noise.

2. TO TEST SURE-GRIP OPERATION (IN VEHICLE)

(1) Securely "chock" one rear wheel.

(2) Raise the other rear wheel free of the floor and remove the hub cap.

(3) Select neutral, release parking brake and engine switched off.

(4) Using a suitable tool adaptor *(refer Fig. 35)* attached to a lbs.-ft. torque wrench, apply a 65 lbs.-ft. torque (nominal) in the *forward* direction — do not apply a test torque to the wheel nuts.

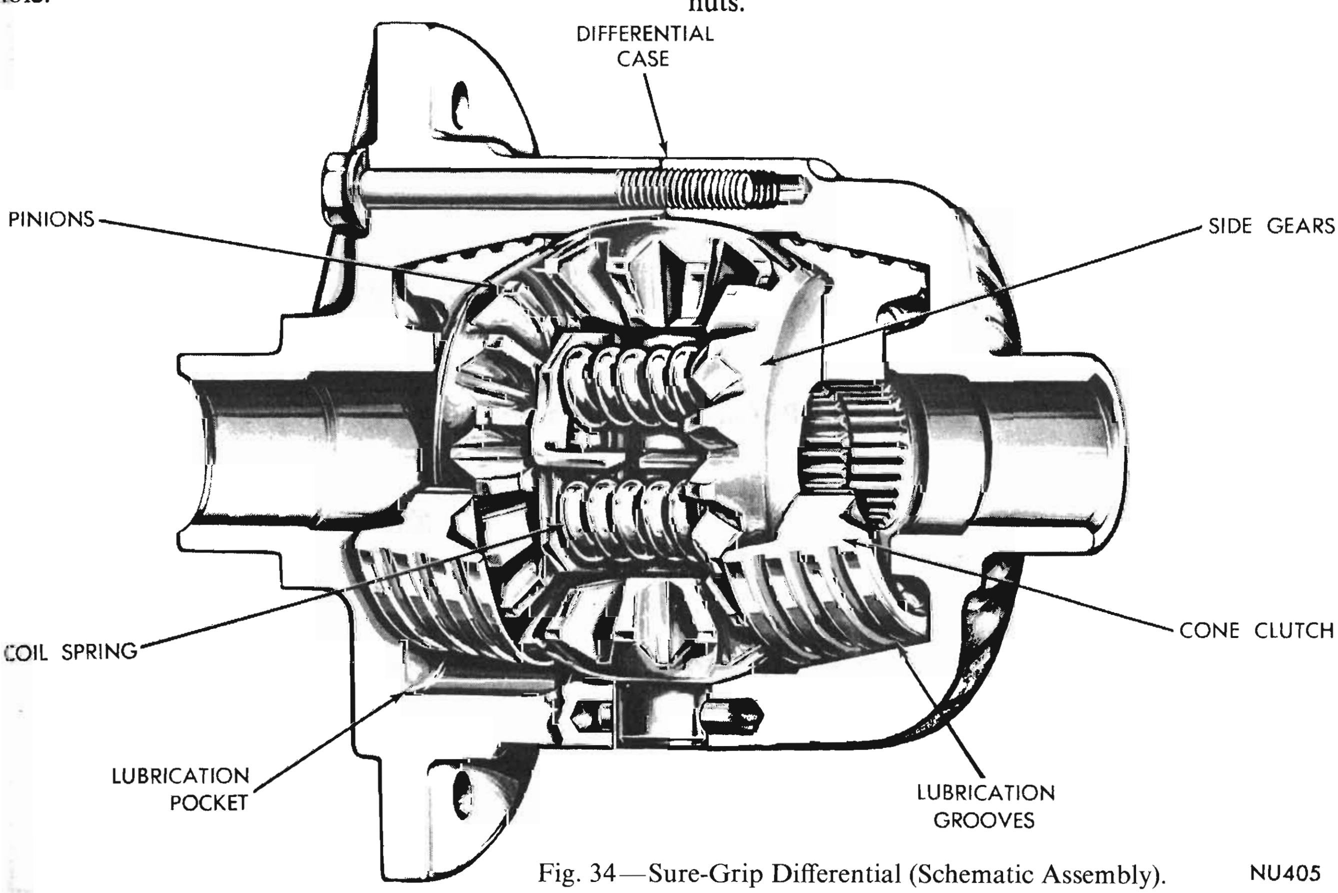


Fig. 34—Sure-Grip Differential (Schematic Assembly).

> NOTE: The torque test range is 65 lbs. ft. (min.) to 105 lbs. ft. Where the reading is obtained within this range the sure-grip operation is satisfactory.

> CAUTION: DO NOT DRIVE THE REAR AXLE WITH ONE WHEEL CONTACTING THE FLOOR AS THE VEHICLE MAY DRIVE AWAY.

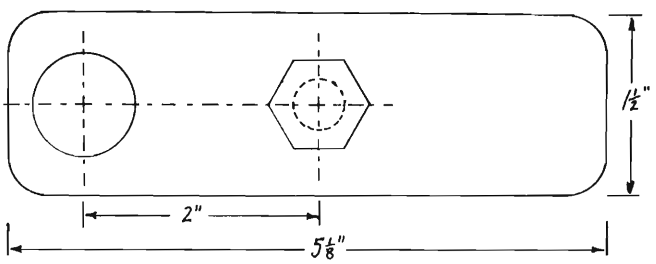


Fig. 35 – Drive Shaft to Torque Wrench Adaptor (Manufacturing sketch)

Material: 5⅝" x 1½" x ¼" M.S. Drilled ⅞" diam. and 7/16" diam. on 2" centre distance.
Insert a 7/16" x ¾" A.F. Hi-Test Bolt.
Weld bolt to bar where it protrudes — trim off surplus material.
Install over 1 wheel nut — blade between opposite nuts.
Attach torque wrench to bar and test turning torque as described in *Para. 2.*

3. SERVICING THE DIFFERENTIAL

Normal Rear Axle servicing is contained in Part 1 of this Group *(Pages 3–5 to 3–14).*

> NOTE: Lock plates are used on the Ring Gear retaining bolts.

SURE-GRIP DIFFERENTIAL

To dis-assemble

(1) Place the cleaned differential assembly in a soft jaw protected vice (preferably screws facing up).

(2) Loosen the eight differential carrier screws evenly *(refer to Fig. 35).*

(3) Remove the screws and lift off the drive side cover, taking care not to lose the components as they are released, observing the number of shims (where installed).

(4) Remove the brake cone, side gear, thrust block and springs, pinion shaft, pinions and washers, keeping the related components together for examination.

(5) Remove the remaining components and place aside marking the gears and cones to provide location identification.

(6) Remove the pinion shaft locating dowel from cap case half.

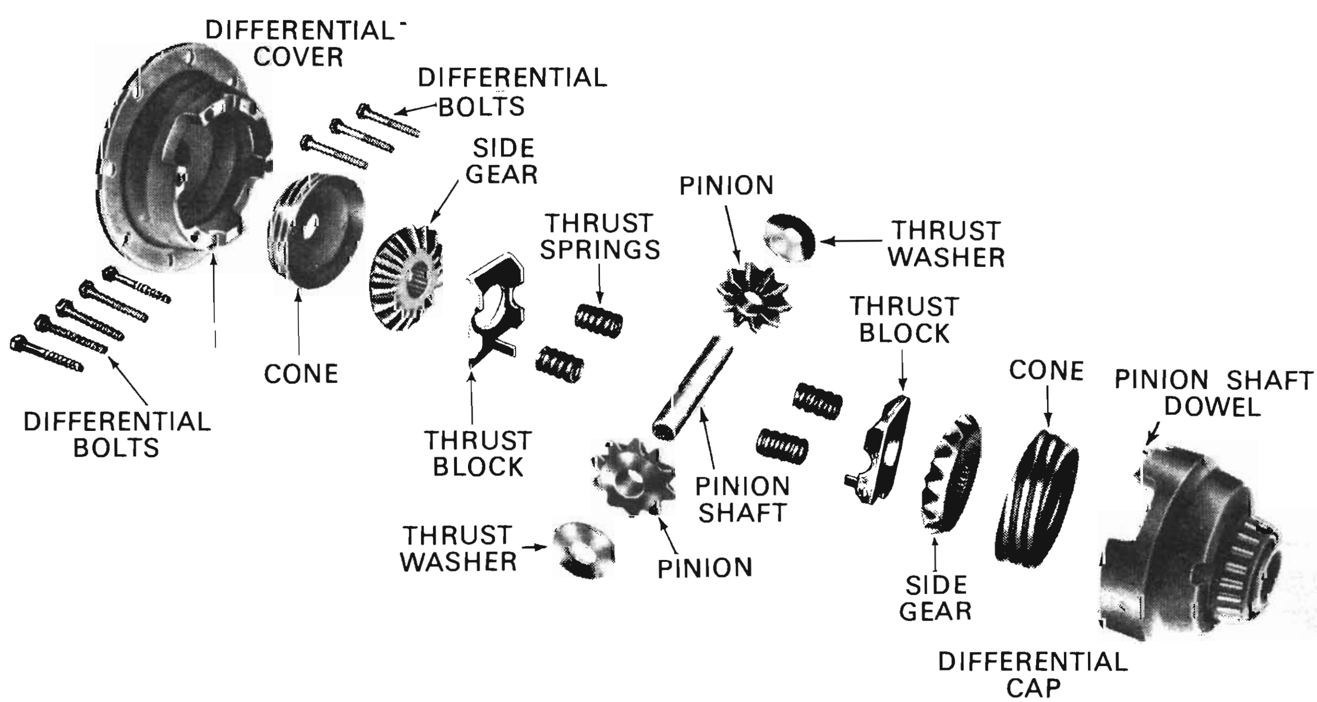


Fig. 36 - Sure-Grip Differential (dis-assembled view)

Inspection

(1) The cones and respective case surfaces should be smooth and free of heavy scoring or wear — slight scratching or scoring being normal. Replace any parts which are suspect. (The case and cones are serviced in matched assemblies.)

(2) Refer the specified dimensions and measure the brake cones for wear in the case. Replace components which are below specifications.

(3) Check the four springs for free length — if less than 1.283″ replace — test force is 315 – 290 lbs. at 1.010″.

(4) Thrust blocks should be replaced if heavy wear or damage is evident.

(5) Check mounting faces for damage or burring — remedy if necessary.

To re-assemble

(1) Grip one axle shaft in a soft jaw protected vice, with 3″ of spline protruding upward, to function as an alignment shaft.

(2) Position the "capside" differential case over the axle shaft with the inner side up. Lubricate all contact surfaces using Sure-Grip lubricant — before installation.

(3) Position the identified brake cone onto axle splines, seating the cone in case.

(4) Install shims (where originally installed) refer to specifications and maintain the dimensions to within the range shown.

(5) Install the cap side gear.

(6) Position the thrust block on the side gear with the pinion shaft relief areas aligned with the shaft grooves of the case and the impellor blade correctly positioned in the lubricating recess of the case.

(7) Place the pinions with their thrust washers on the pinion shaft and position the shaft in the case grooves, meshing the pinions with the side gear and aligning the dowel holes, then install a new dowel pin.

> NOTE: Ensure that the dowel pin is installed.

(8) Place the four springs onto the thrust block and install the opposite thrust block securely into the springs.

> NOTE: The lubrication recess and both impellor blades must be in line *(refer Fig. 34).*

(9) Position the remaining side gear in mesh with the pinions centrally on the plate, adding shims, where necessary, and the cone brake, cone upward.

(10) Position the flanged case half over the cone while aligning the assembly marks of each case, then install two bolts 180° apart finger tight.

(11) Place the opposite drive shaft splines into the upper cone brake splines turning the shaft to engage the splines of side gear, if necessary.

(12) Install the remaining case screws, tightening evenly to 21 – 26 lbs. ft. torque (used screws) 27 – 32 lbs./ft. torque for new screws and/or case assembly, while the drive shaft is engaged.

(13) Remove the drive shaft from the upper differential side gear (tapping the shaft lightly with a soft hammer to free shaft, where necessary), and install a suitable test shaft (drive shaft).

(14) Test the Sure-Grip operating torque before installation of assembly — reject an assembly which does not require 50 lbs. ft (minimum) torque.

(15) Remove the differential assembly and the testing shaft (drive shaft) being careful not to turn the side gears.

(16) Install and adjust the differential carrier assembled as described on Page 3 of Part 1.

> NOTE: When installing the drive shafts into the axle assembly, take care not to misalign the side gear/brake cone splines, by turning either shaft before both are fully engaged.

Lubrication

> NOTE: Refill the rear axle with the recommended Sure-Grip lubricant specification, which is Caltex Gear Lubricant TL 3450.

GROUP 5

BRAKES

PART 4—GIRLING FD50 MODEL BRAKE PRESSURE BOOSTER

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

PART 1 — PARKING AND DRUM TYPE SERVICE BRAKES

SPECIFICATIONS

Type	Duo-Servo Single Anchor
Adjustment	Automatic
Drum Diameter	9″
Drum Run-out (Max)	.006″ T.I.R.
Number of brake shoes	8
Front	2-9/16″ wide
Rear	2-1/16″ wide
Brake Lining	Moulded Asbestos
Front Primary	2¼″ wide 7.66″ long
Front Secondary	2½″ wide 9.8″ long
Rear Primary	2″ wide 7.66″ long
Rear Secondary	2″ wide 9.8″ long
Thickness (all)	3/16″
Wheel Cylinders	4
Front Wheel Cylinder Bore	1″
Rear Wheel Cylinder Bore	13/16″ ¾″ *
Master Cylinder—Bore	1″
Type	Tandem/Divided system
System Application:	
—Drum	Pt. No. 3428134
—Unboosted Disc	Pt. No. 3428135
—Boosted Disc	Pt. No. 3428158

* Used with Vacuum boosted Disc brake.

SPECIAL TOOLS

E5C10	Master Cylinder Bleeder Tubes
E5C15	Tool—Tube Cutter
E5C15A	Tool—Tube Flaring
E60	Wheel Cylinder Piston Retainer Clamp
E64	Tool—Brake Shoe Adjusting
E71	Remover/Installer—Brake Shoe Return Spring
E5C20A	Remover/Installer—Brake Shoe Retaining Spring
E14C25A	Easy Out
—	Bleeder Kit Hydraulic Brake System

TORQUE SPECIFICATIONS

Brake Pedal Pivot Pin Lock Plate Bolt	95 lbs. in.
Flexible Brake Hose to Front Wheel Cylinder	200 lbs. in.
Hydraulic Connection to Tube	200 lbs. in.
Hydraulic Tube Connection Nuts	95-150 lbs. in.
Hydraulic Tube Connection Nuts to 'T'	125 lbs. in.
Master Cylinder to Mounting Stud Nuts	95-150 lbs. in.
Master Cylinder Filler Cover Clamp Screw	60 lbs. in.
Plate to Steering Knuckle (upper)	55 lbs. ft.
Plate to Steering Knuckle (lower)	100 lbs. ft.
Push Rod to Lever Bolt Nut	30 lbs. ft.
Safety Warning Switch in Master Cylinder	130-155 lbs. in.
Wheel Cylinder Mounting Bolt	10 lbs. ft. (max.)
Wheel Stud Nut (progressively)	55 lbs. ft.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. HARD PEDAL

(Insufficient braking action)

(1) Incorrect brake linings.
(2) Seized brake pedal linkage.
(3) Restricted brake line (from master cylinder).
(4) Brake booster in-operative or malfunctioning (where so equipped).

2. PRESSURE BUILD UP

(1) Obstructed master cylinder compensating port.
(2) Pedal or brake booster pushrod free-play incorrect.

3. LOW BRAKE PEDAL

(1) Improper brake shoe adjustment.
(2) Low master cylinder reservoir level.
(3) Defective master cylinder cups or check valve (Drum brake system only).
(4) Air present in hydraulic system.
(5) Loose or broken brake line.
(6) Excessively worn brake linings.

4. PEDAL PULSATES

(1) Bent or out-of-round brake drum or non-parallel disc surfaces.

5. SPONGY BRAKE PEDAL

(1) Excessively worn or cracked brake drum.
(2) Air present in hydraulic system.
(3) Incorrect brake fluid.

6. BRAKES LOCK OR DRAG

(1) Contaminated brake linings or pads.
(2) Restricted brake line or master cylinder compensating port.
(3) Seized brake linkage.
(4) Improper brake shoe adjustment.
(5) Incorrect parking brake cable adjustment.
(6) Brake shoe guide surfaces binding or incorrect replacement shoes.
(7) Brake pedal linkage binding.
(8) Improper booster and/or brake pedal pushrod adjustment.

7. BRAKES FADE (HIGH SPEED)

(1) Incorrect brake linings.
(2) Incorrect brake adjustment.
(3) Out-of-round brake drum.
(4) Contaminated linings or pads.
(5) Overheated brake drums.
(6) Incorrect or contaminated brake fluid.

8. BRAKES OVERHEAT

(1) Incorrect brake adjustments.
(2) Broken, weak or misassembled shoe return spring.
(3) Obstructed master cylinder compensating port.
(4) Obstructed brake line or hose.
(5) Sticking wheel cylinder piston or shoe.
(6) Brake pedal binding.
(7) Brake drum distorted.
(8) Rear axle flange runout excessive on axle.

9. BRAKES PULLING

(1) Contaminated linings or pads.
(2) Front end misaligned.
(3) Unmatched linings or pads.
(4) Brake drums out-of-round.
(5) Brake shoes distorted.
(6) Restricted brake hose or line.
(7) Broken rear spring or axle loose on spring.

10. SQUEALING BRAKES

(1) Glazed brake linings or pads.
(2) Saturated brake linings or pads.
(3) Weak or broken brake retaining springs.
(4) Incorrect brake linings or pads.

11. BRAKE CHATTER OR SHOE KNOCK

(1) Bent or out-of-round brake drum.
(2) Loose or bent support plate.
(3) Distorted or incorrect brake shoes.
(4) Machined grooves in drum braking surface.
(5) Contaminated brake lining.

12. DRUM BRAKE SHOES DO NOT SELF ADJUST

(Except those with Taxi Pack and Track Pack option)

(1) Adjuster screw seized.
(2) Adjuster lever does not engage star wheel.
(3) Adjuster mechanism incorrectly assembled or on wrong side wheel.

13. INEFFECTIVE PARKING BRAKE

(1) Broken brake cable.
(2) Seized brake cable.
(3) Cable incorrectly adjusted.
(4) Damaged centering yoke.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The 215 c.i. 6 cylinder models are equipped with four internal expanding two-shoe 9″ drum brakes. (Duo-Servo single Anchor, self-adjusting brakes) as standard equipment. All the remainder of the model range are equipped with self-adjusting ventilated disc front brakes. Vacuum-boosted brakes on the Regal and Regal '770' models are standard, and are optional on all the others.

All Disc brakes are 11″ ventilated type with floating head calipers which are self-adjusting, sliding on mounting bolt bushings. Taxi pack and Track pack brake options require the deletion of the self-adjusting mechanism from the brakeshoes and therefore require manual adjustments periodically. The Track pack options includes a rear brake proportioning valve and finned brake drums.

The service brake system is operated by the new tandem master cylinder which provides separate front and rear hydraulic brake operation. A feature of this system is the inclusion of a brake system warning light and switch which operates should the hydraulic system master cylinder pressures become unequal, thus providing the warning signal light when the parking brake lever is fully "off", indicating that the hydraulic system requires immediate attention.

The brake system warning light also serves to indicate when the parking brake lever is NOT completely "off". This function is obtained by the operation of the switch mounted on the parking brake lever bracket.

DUO-SERVO BRAKES (Drum Type)

This brake drum is of centrifuse construction with a reinforcing rib at the open end of the drum. This rib serves to strengthen the drum and to act as an effective dust and weather seal. The two shoes rest against a common anchor attached to the backing plate. The anchor is located just above a single, two piston type wheel cylinder. Each shoe is held against the anchor by a brake shoe return spring. The shoes are held against the backing plate by a hold down spring passing through the centre of the brake shoe web and fastened to a clip in the backing plate. Each brake shoe rests on three platforms stamped in the backing plate. These platforms ensure parallel alignment of brake shoes to drum. The brake shoes are separated from each other by a tubular star wheel adjusting screw 180° opposite the anchor pin and wheel cylinder. The star wheel adjuster is retained between the lower ends of the brake shoes by a spring attached to both shoes. On expansion of the wheel cylinder, the top end of each shoe is pushed away from the anchor slightly. With the car moving in the forward direction, the front or primary shoe will be forced away from the anchor and on contacting the drum, forces the secondary or rear shoe against the anchor pin. This gives a self-energizing action which increases braking effectiveness.

Each wheel brake has a primary and a secondary type lining. The front wheels have 2¼″ width lining on the primary shoes and 2½″ width lining on the secondary shoes, 2″ wide linings are used on rear brakes. On both front and rear brakes the primary lining is shorter than the secondary lining.

The rear brakes act also as a parking brake and are operated by a cable fastened to an operating lever which actuates the rear shoes. This lever pivots against a floating strut extending to the front shoes. On applying the parking brake, the cable pulls the operating lever forward forcing the strut to move the front shoe off the anchor, against the drum which forces the rear shoe against the anchor. A compression type spring is placed over the front end of the strut and against the web of the front shoes. This acts as an anti-rattle spring and assures constant contact of strut and rear brake shoe.

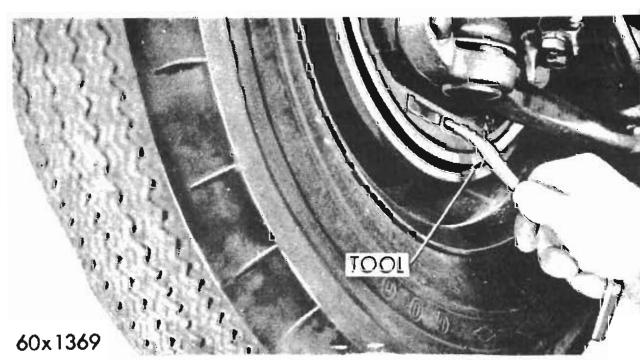


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Fig. 1 – Adjusting brake shoes using Tool E64.

2. SERVICE BRAKE ADJUSTMENT

Normally self adjusting brakes will not require a manual adjustment, but in the event of a brake reline it is necessary to make the initial adjustment manually.

(1) Raise the vehicle so all wheels are free to turn (particularly both rear, where sure-grip differential is installed).

(2) Remove the rear adjusting hole cover from the backing plate on all of the brake supports.

(3) Be sure the parking brake lever is fully released, then back off the parking brake cable adjustment so there is slack in the cable.

(4) Insert the adjusting tool E64 into the star wheel of the adjusting screw. Move the handle of the tool downwards until a slight drag is felt when the road wheel is rotated.

(5) Insert a thin screw driver into the brake adjusting hole and push the adjusting lever out of engagement with the star wheel, while holding the adjusting lever out of engagement, back off the star wheel 10 to 12 notches to ensure a free wheel with no brake shoe drag *(see Fig. 6).*

(6) Repeat the above adjustment at each wheel. The adjustment must be equal at all wheels. Install the adjusting hole covers in the brake supports.

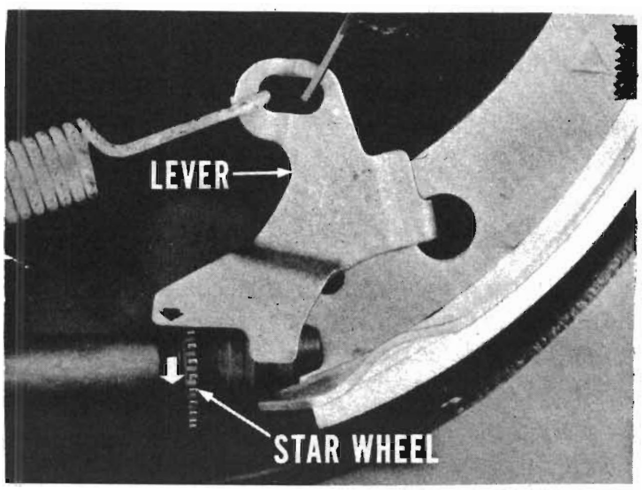


Fig. 2 – Adjuster lever turns star wheel. (All models except those fitted with Taxi or Track Pack option).

TESTING AUTOMATIC ADJUSTER

OPERATION (Except Models with Taxi or Track Pack option)

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 cannot 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 release of the brake pedal, the lever should snap downwards, turning the star wheel. Thus, a definite rotation of the adjuster star wheel can be observed if the automatic adjusters are working properly. If by the described procedure one or more automatic adjusters do not function properly, the respective drum must be removed for adjuster servicing.

3. PARKING BRAKE ADJUSTMENT

NOTE: A brake warning light switch is mounted on the lever arm to operate the brake warning light when the hand brake is not fully released and the ignition is turned 'ON'.

(1) With the parking brake in the fully released position, slacken the brake cable by loosening the adjusting nut.

(2) Adjust the service brakes as outlined in *Paragraph 2.*

(3) Tighten the cable adjusting nut at the equalizer until the rear wheels are difficult to turn.

(4) Loosen the adjusting nut until the rear wheels turn freely without dragging.

(5) Tighten locknut in this position.

(6) Operate brake pedal and parking brake release handle several times, and check for freedom from drag on rear wheel brakes.

(7) Check and adjust parking brake operated switch, if required.

4. BLEEDING HYDRAULIC BRAKE SYSTEM

CAUTION: Clean all dirt and oil from master cylinder cover and seal prior to filling reservoirs.

(1) Attach brake pressure bleeder tank (with adapter) to the master cylinder, and proceed as follows; provided that the tandem master is bled of air as described in *(Out of Vehicle) Part 2, Para. 3, page 5–14* or as follows:

Bleeding Master Cylinder *(In Vehicle).*

(a) Protect paint work area against splash or leakage of brake fluid during the bleeding operation.

(b) Disconnect all three brake tubes from the master cylinder unions.

(c) Install the bleeder tubes, Tool E5C10 to the master cylinder port unions — (attach the non-return (residual pressure) valve to the 'rear most' tubes, on disc brake models).

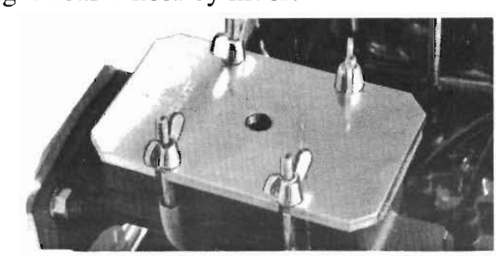
(d) With the reservoirs topped-up, proceed to bleed the master cylinder of air by carefully operating the brake pedal, until no air bubbles are produced.

After bleeding operation, remove the bleeding tubes and reconnect the brake tubes — tighten union to 95 lbs. in. torque.

NOTE: The system bleeding may be performed manually, with the aid of an assistant to depress brake pedal and replenish brake fluid, although this method is *not recommended*. Tightening of brake shoe adjustments to lock brakes may assist in a difficult bleeding operation.

Also at this time, the hydraulic warning lamp and switch may be checked for correct operation.

(2) With pressure bleeder tube attached to the master cylinder using the adapter cover (below), attach a brake bleeder tube to the bleed valve of the right rear wheel cylinder.



Proceed as follows.

(3) Insert the end of the bleeder hose in a partially filled glass jar of brake fluid. With 25 P.S.I. (maximum) air pressure in bleeder tank (or master cylinder pressure pumped up by pedal application), open bleeder valve and permit fluid to enter jar until all air has been expelled at the wheel cylinder.

NOTE: When bleeding brakes without pressure bleeder, make sure to open bleeder screw a *minimum of one full* turn to obtain best results.

(4) Repeat procedure at left rear wheel following with left front, then right front wheel.

NOTE: Disc brake cylinders may be satisfactorily *bled* by opening the bleeder screw wide and allowing fluid to drain without applying any pressure to system.

(5) Fill master cylinder and replace diaphragm gasket and cover, tighten screw to 60 lbs. in torque.

(6) Re-adjust brakes as described in *Para. 2*.

5. RECONDITIONING WHEEL CYLINDER

(1) With all drums removed, inspect wheel cylinder boots for evidence of brake fluid leakage. (A slight amount of fluid on the boot may not be a leak but may be preservative oil used on assembly).

(2) In the case of a leak, remove brake shoes (replace if soaked with grease or brake fluid), boots, piston wheel cylinder cups, and wheel cylinder cup expansion spring.

(3) Wash cylinder with alcohol and inspect cylinder for scores and pits.

(4) If the cylinder is scored or pitted, hone and polish the cylinder with a spring loaded cylinder hone. (Replace wheel cylinder if honing requires enlargement of cylinder bore .002" over standard diameter).

(5) Wash wheel cylinder with alcohol and air dry.

(6) Install expansion spring in cylinder. Dip wheel cylinder cups in brake fluid and install in each end of the cylinder with the open end of the cups facing each other.

(7) Install wheel cylinder pistons in each end of the cylinder with the recessed end of pistons facing the open ends of the cylinder.

(8) Install boots over ends of the cylinder. Keep the assembly compressed with the aid of a brake cylinder clamp until the brake shoes are assembled.

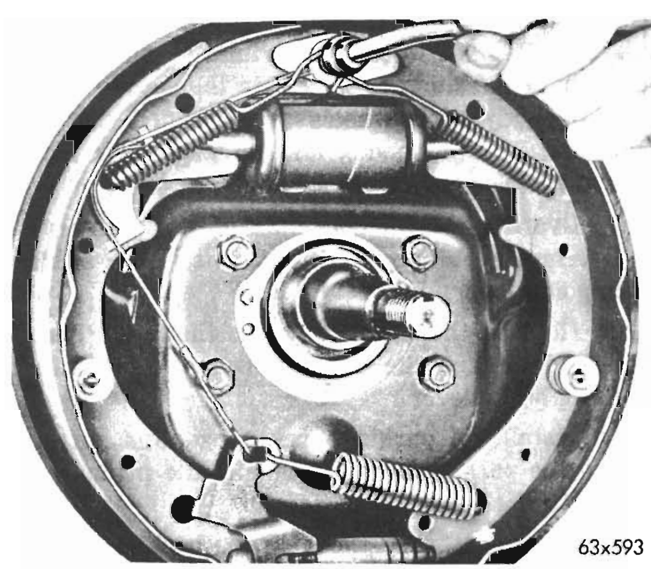


Fig. 3 – Removing shoe return spring using Tool E5C20 (typical view of right front brake).

6. BRAKE SHOES FRONT

To Remove

With the vehicle elevated on a hoist, jack or suitable stands remove the front wheels and drums. (Back-off adjustments, where required, *refer Fig. 6*).

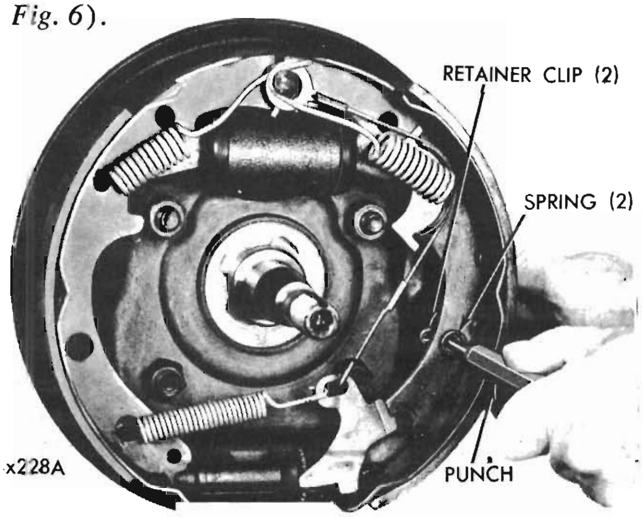


Fig. 4 – Removing or installing shoe retainer spring using Tool No. E5C20A (typical view of L.H. side).

CAUTION: Install brake cylinder piston clamps to prevent fluid leakage or air entering the hydraulic system during brake shoe removal.

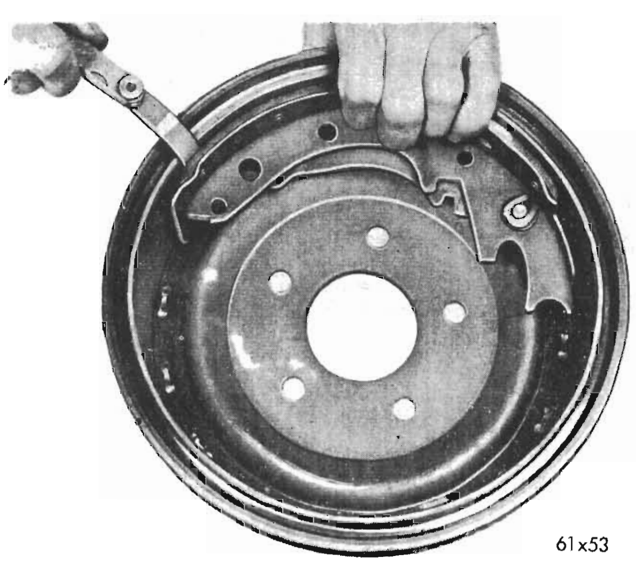


Fig. 5. – Measuring brake shoe heel and toe clearance

(1) Using Tool E5C20 remove the brake shoe return springs as shown in *Fig. 3*.

(2) Insert a small punch or tool E5C20A into the centre of the brake shoe to backing plate retainer spring, and while holding the backing plate retainer clip, press in and disconnect the spring *(Fig. 4)*.

(3) Remove the primary and secondary shoe assembly from the backing plate.

(4) Over-lap the anchor ends of the primary and secondary brake shoes and remove the adjusting screw and spring.

Remove the adjusting lever, adjusting spring, cable and cable guide.

To Install

Before assembling brake shoes to back plate lubricate back plate platforms with a high temp. lubricating grease.

(1) Match a primary and secondary brake shoe and place them in their respective position.

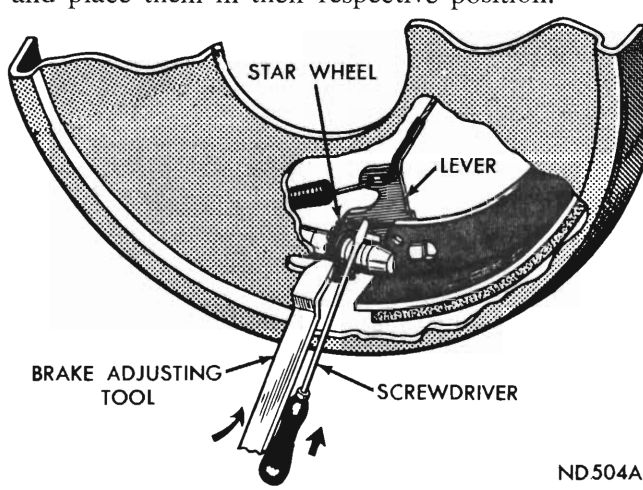


Fig. 6 – Releasing brake adjustment

(2) Lubricate the threads of the adjusting screw and install it between the primary and secondary shoes. Overlap the anchor ends of the primary and secondary brake shoes and install the adjusting spring lever. Spread the anchor ends of the brake shoes to maintain the adjusting lever and spring in position.

(3) Hold the brake shoes in their relative position and place the brake shoe assembly on the backing plate and over the anchor pin.

(4) Install the brake shoe retaining springs and attach to the retainer clips using Tool E5C20A.

(5) Install the return spring on the primary shoe and using Tool E5C20 position spring end on anchor.

(6) Install the cable guide in the secondary shoe and place the "eye" of the adjusting cable over the anchor pin. Lubricate the groove of the cable guide and place the adjusting cable over the guide and engage the hook of the cable into the adjusting lever.

(7) Install the secondary shoe return spring in the same manner.

(8) Lubricate the wheel bearing and install the brake drum and adjust the wheel bearing. Install wheels and tighten correctly *(refer Para. 9).*

(9) Test the operation of the automatic adjusters and/or adjust brakes.

REAR

To Remove

(1) Raise the vehicle on a hoist or support on suitable stands. Disconnect parking equalizer, remove rear wheels and brake drums.

(2) Using Tool E5C20 remove the brake shoe return springs *(Fig. 3).* Insert a small punch in to the centre of the brake shoe to backing plate retainer clip, press in and disconnect the spring *(Fig. 4).*

(3) Tilt the brake shoe assembly out from the backing plate.

(4) Spread the anchor ends of the primary and secondary shoes and remove the parking brake strut and spring.

(5) Disengage the parking brake cable from the parking brake lever and remove the brake assembly.

(6) Over-lap the anchor ends of the primary and secondary shoes and remove the adjusting screw and spring.

Remove the adjusting lever, adjusting spring, cable and cable guide.

NOTE: Keep the wheel cylinder assembly compressed with the aid of a brake cylinder clamp until the brake shoes are installed.

(7) Remove the parking brake lever from the secondary brake shoe.

(8) Pull back the brake cable through the backing plate so that old grease in cable housing is exposed.

(9) Clean cable and inspect for frayed or worn strands of cable. (Replace cable if found to be defective).

(10) Lubricate cable with short fibre grease and pull cable back into housing.

(11) Reconnect the cable ends to the equalizer.

To Install

Before assembling brake shoes to back plate lubricate back plate platforms with a high temperature lubricating grease.

(1) Place a secondary and primary shoe in their relative positions.

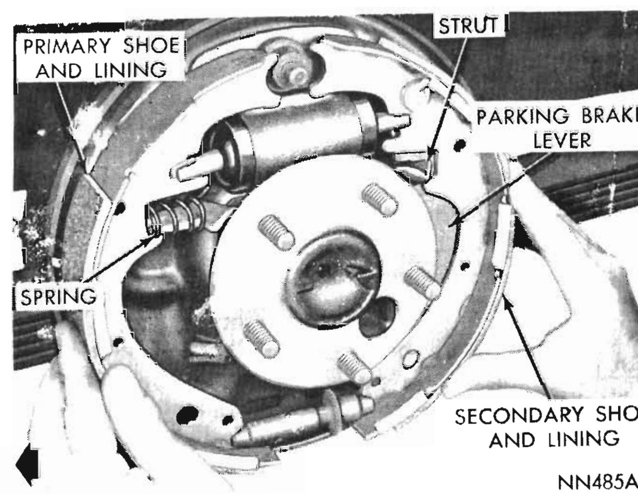


Fig. 7 – Installing brake shoes (left rear).

(2) Attach the parking brake lever to the rear (inside) of the secondary shoe.

(3) Lubricate the threads of the adjusting screw between the primary and secondary shoes. Overlap the anchor ends of the primary and secondary brake shoes and install the adjusting spring and lever.

(4) Hold the brake shoes in their relative positions and engage the parking brake cable. Place the brake shoe assembly on the backing plate and over the anchor pin.

(5) Install the brake shoe retaining springs and attach to the retainer clips.

(6) Install the parking brake strut and spring between the parking brake lever and *primary* shoe. (Spring against shoe). *Refer Fig. 7.*

(7) Install the primary brake shoe return spring between the primary shoe and the anchor pin using Tool E5C20.

(8) Install the "eye" of the adjusting cable over the anchor pin. Lubricate the groove of the cable guide and install it in the secondary shoe.

(9) Install the secondary return spring with Tool E5C20.

(10) Place the adjusting cable in the groove of the cable guide and engage the hook of the cable into the adjusting lever.

(11) Test the operation of the automatic adjusters by operating the cable, also check that the handbrake strut has end float between the brake shoes. (Re-adjust handbrake cable if necessary to obtain clearance).

(12) Install the brake drums, wheels and tighten correctly *(refer Para. 9).*

(13) Adjust brakes *(refer Para. 2).*

7. SERVICING BRAKE SHOES

(1) When re-lining or servicing the brakes, it is advisable to ensure maximum braking efficiency by selectively fitting each brake shoe to the drum in which it operates. This may best be done by grinding each shoe .010″ to .020″ under the drum diameter. To check the fit of each brake shoe, firmly hold the brake shoe in the brake drum *(see Fig. 5)*, and using a feeler gauge, check the clearance between heel, toe and drum. The clearance should be .004″.

(2) Inspect all brake shoes for distortion and alignment to ensure square contact with drum. Inspect brake support plate for evidence of high or low areas at the point of brake shoe contact that might indicate a bent support plate. This might cause misalignment of brake shoe and drum and create erratic brake operation.

Replace brake support if bent.

Do not attempt to 'Burn-in' new brake linings. Using the brakes lightly for the first 500 miles will add greatly to the brake life.

8. FLARING STEEL TUBING

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 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 rust, damage, or defective flared seats. The steel tubing is equipped with a double flare or inverted seat to ensure more positive seating in the fitting. To repair or reflare tubing proceed as follows:

(1) Using Tool E5C15 cut off the damaged seat or damaged tubing *(see Fig. 8).*

(2) Ream out any burred or rough edges showing on inside edges of tubing. This will make the ends of the tubing square and ensure better seating of the flared end of the tubing.

NOTE: Place compression nut on tubing prior to flaring tube.

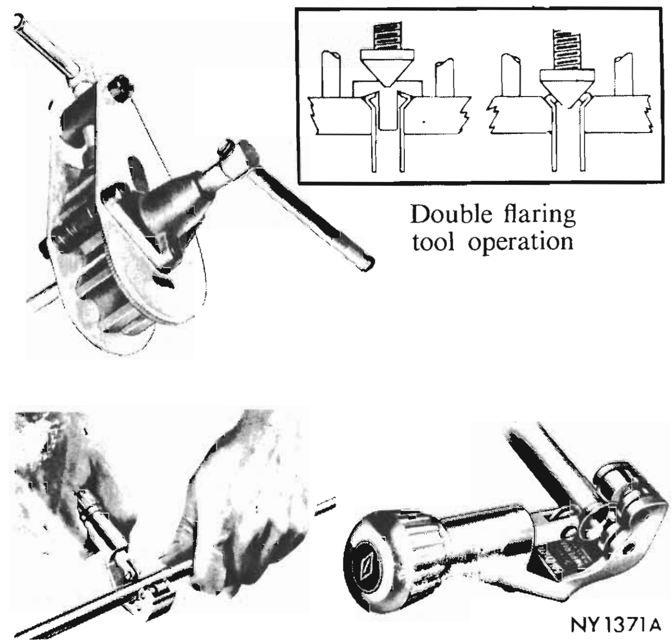


Fig. 8 – Cutting tool operations

(3) To flare tubing, open handle of flaring tool E5C15A and rotate jaws of tool until the mating jaws of tubing size are centred 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 the recessed notch of gauge matching the size of tubing.

(6) Squeeze handles of flaring tool and lock tubing in place.

(7) Place correct sized plug of gauge A down in end of tubing. Swing compression disc over gauge and centre tapered flaring screw in recess of disc.

(8) Lubricate taper of flaring screw (with brake fluid), and screw in until plug gauge has seated on jaws of flaring tool. This action has started to invert the extended end of the tubing.

(9) Remove gauge and apply brake fluid 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.

9. WHEEL STUD NUT TIGHTENING

Tightening sequence and torquing of the wheel stud nuts is of great importance to ensure efficient brake operation.

The use of an impact or long handled wrench may distort the drum. A criss-cross tightening sequence should be used. Tighten all stud nuts to one half the specified torque first (30 lbs. ft.), and then repeat the sequence of tightening to the specified torque of 55 lbs. ft.

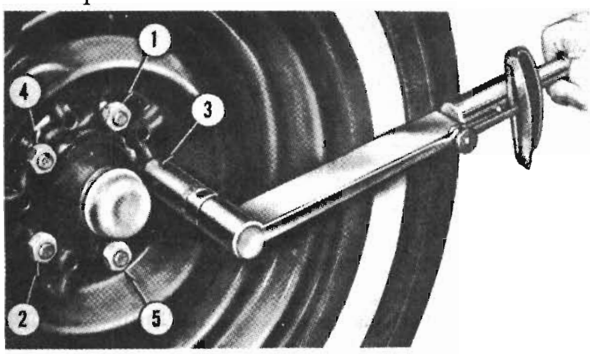


Fig. 9 – Wheel stud nut tightening sequence

10. BRAKE DRUM MACHINING

Be sure the drum lathe or grinder is in good condition — capable of giving the precision required for resurfacing drums.

Reface the drum with the correct wheel mounted to it to prevent distortion. If the lathe will not accommodate a wheel and drum assembly, use a ½″ machined steel ring bolted to the drum. *(Refer Fig. 10).* In either case, tighten the stud nuts in the right sequence and to the specified torque to avoid drum distortion.

TIGHTEN STUD NUTS CORRECTLY

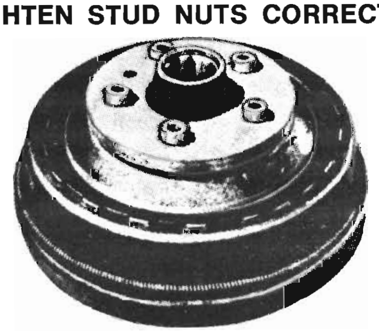


Fig. 10 – Plate supports drum

When turning or grinding, remove only enough metal to ensure the drum is truly round and free of irregularities. The maximum machining limit is .060″ over the standard drum diameter.

After refacing, break up the machining pattern with emery cloth.

Brake drums must be handled very carefully, therefore every precaution to avoid bumping or dropping brake drums must be taken, as rough handling can create braking surface irregularities.

Brake drums which have distorted centres must be rejected from further service.

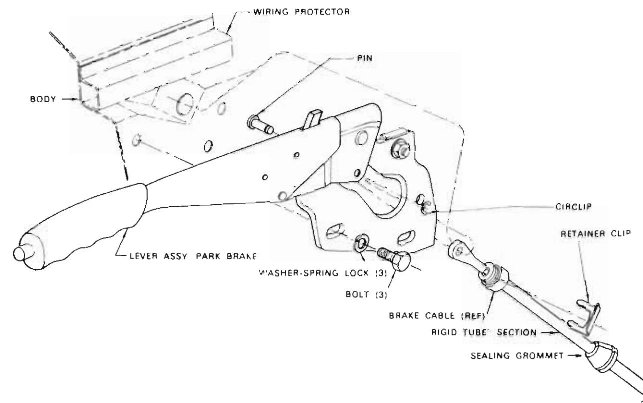


Fig. 11 – Floor mounted parking brake lever and cable assembly

11. FRONT PARKING BRAKE CABLE

To Remove *(refer Fig. 11)*

(1) Disengage front parking brake cable from equalizer bar and unclip cable return spring.

(2) Remove cover from lever mechanism — depress parking brake lever and work brake pin and cable out of brake lever linkage.

(3) Remove the two outer cable attaching bolts from the floor.

(4) Using a screw driver remove the rubber grommet from the side rail.

(5) Remove retaining circlip from forward end of cable abutment.

(6) Work the cable out of the side rail depression from under the vehicle.

To Install *(refer Fig. 11)*

(1) Insert the forward end of cable assembly into the side rail depression from beneath the vehicle.

(2) Place the split grommet over the solid conduit and work it into the side rail depression.

(3) Attach retaining circlip to the forward end of cable abutment.

(4) Install the two outer cable attaching bolts to the weld nuts on the floor pan.

(5) Depress the parking brake lever and insert the inner cable retaining pin through the cable eye to the lever mounting hole. Install circlip to pin.

(6) Attach front cable to equalizer bar and install cable return spring.

(7) Adjust service brakes and parking brake cable. (Paras. 2 and 3.)

(8) Apply brakes several times and test for free wheel rotation when parking brake is in "off" position.

PART 2 — TANDEM MASTER CYLINDERS

SERVICE INFORMATION — PROCEDURES

1. 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 containing a residual pressure valve and spring (drum brake models) or rear brake line (larger) outlet only, (disc brake models).

To Remove

(1) Disconnect front and rear brake tubes from master cylinder. Install a plug in rear line outlet, disc brake models only. (The residual pressure valves in the outlets will keep cylinder from draining). Remove tube nut fittings.

(2) Disconnect brake cylinder push rod from brake pedal lever by removing retaining nut and stepped bolt. (Non-boosted models).

(3) Remove nuts that attach master cylinder to fire wall panel or vacuum booster assembly.

(4) Slide master cylinder straight out from the mounting.

To Install

NOTE: Before the master cylinder is installed it must be "bled" of air *(refer Para. 3).*

(1) Install master cylinder on vehicle (aligning push rod with fire wall panel opening. Non-boosted models).

(2) Slide over mounting studs. Install attaching nuts and tighten to 100 lbs. in.

(3) Connect front and rear brake tubes and tighten to 85 lbs. in.

(4) Install the stepped bolt with wave washer through push rod and lever, install nut and tighten to 30 lbs. ft. torque. (Non-boosted models).

(5) Bleed brakes and wheel cylinders, using regular procedure, being sure fluid level is maintained. *(See Bleeding Hydraulic Brake System). Refer Part 1, Para. 4.*

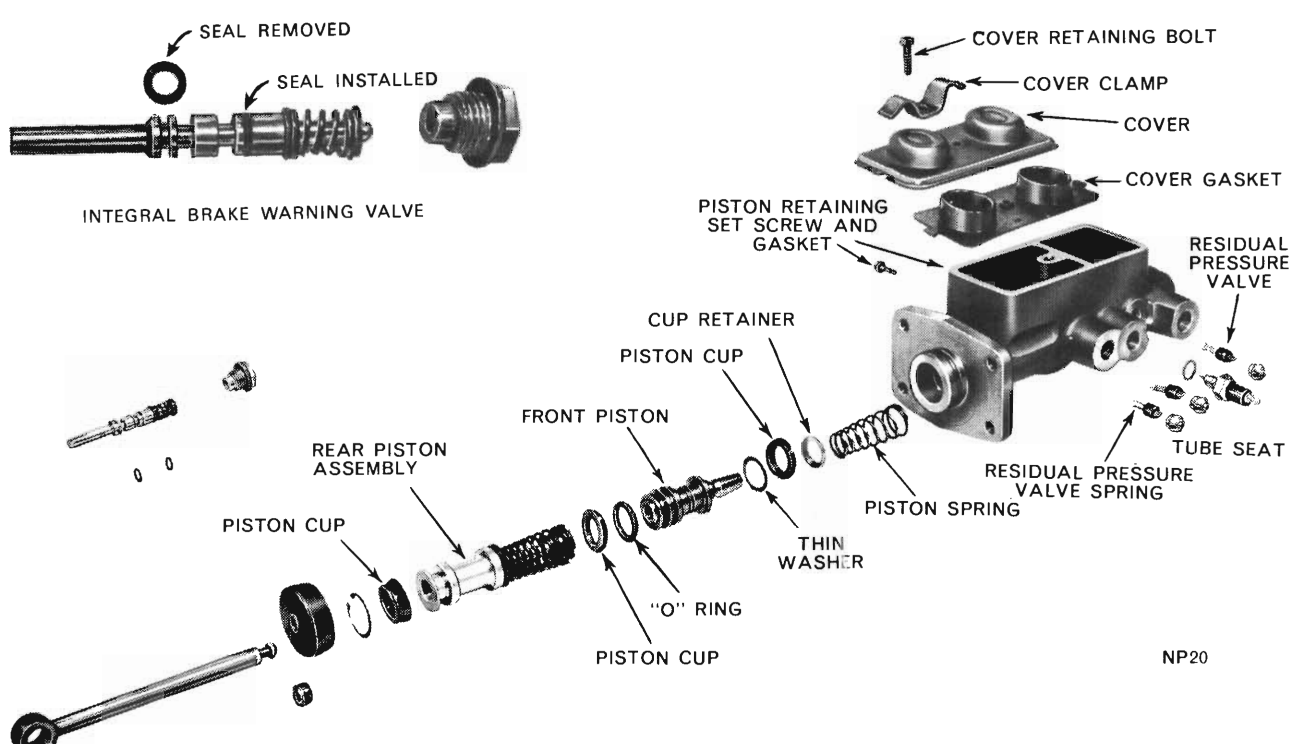


Fig. 1 – Tandem master cylinder (disassembled view) — typical assembly.

2. SERVICING THE MASTER CYLINDER

To Disassemble

(1) Clean the outside of the master cylinder thoroughly.

(2) Remove cover bolt, clamp and remove cover and gasket. Empty brake fluid from reservoirs — *refer Fig. 1.*

(3) Slide the dust boot from the end of the master cylinder and remove the piston stop snap ring. Withdraw the rear piston assembly and push rod. Do not remove the push rod from the piston at this stage (where equipped).

(4) Remove piston retaining screw and gasket *(refer Fig. 1)* then slide front piston assembly out of cylinder bore.

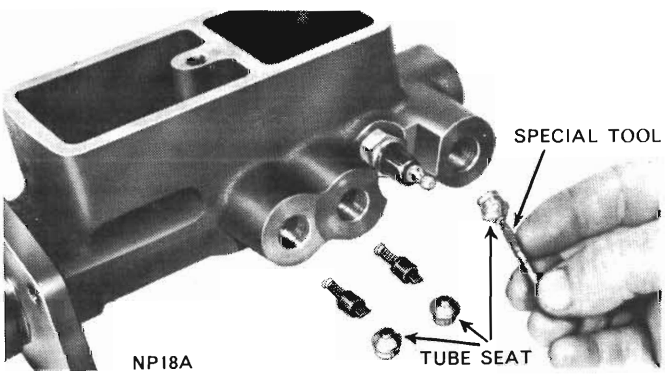


Fig. 2 – Removing tube seats (typical view) Using Tool No. E14C25A.

Up end master cylinder and tap (open end 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.

(5) Remove front piston compression spring from bore.

(6) Using Tool E14C25A (or an easy out) remove tube seats by threading tool firmly into seat,

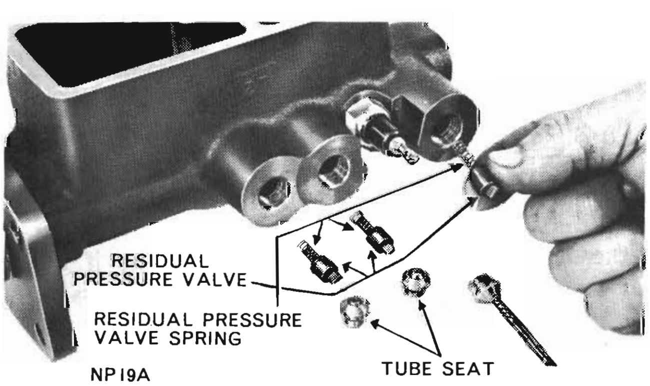


Fig. 3 – Removing or installing residual pressure valves

tap tool and seat out of cylinder body *(Fig. 2).* Discard seats.

(7) Remove residual pressure valves and springs (from "forward" outlet only, *(Fig. 3)* disc brake models).

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". If master cylinder bore does not clean up at .002" 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.

> NOTE: The primary piston is attached to the push rod by a rubber retainer in the piston.

To Replace the Piston (Non-boosted models)

(a) Carefully pull the push rod from the retainer and remove the dust boot.

(b) Install the new boot on the push rod.

(c) Install the new retainer on the push rod, in the groove provided.

(d) Lubricate retainer with brake fluid, then insert the push rod and retainer firmly into the new piston, to secure it.

The piston cups and seals should be replaced when reconditioning a master cylinder.

> NOTE: When overhauling a master cylinder, use all parts furnished in repair kit. Discard all used rubber parts, and ensure that the correct replacement parts are used as the piston assemblies are different from other models.

To Reassemble — 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) Carefully work piston cup on front end of front piston with the lip away from piston *(Fig. 1)* (toward front of cylinder).

(2) Slide "O" ring over the rear end of front piston and into correct land.

(3) Carefully work front piston rear cup *(Fig. 1)* into rear land, with the cup lip away from piston (toward rear of cylinder).

(4) Slide cup retainer over front end of piston, followed by piston spring *(Fig. 1)*.

(5) Install piston spring, piston cup retainer, piston and cups into bore of master cylinder *(Fig. 4)*. (Keep well lubricated with brake fluid, ensuring cup lips enter correctly).

Rear Piston

(1) Carefully work piston cup over rear end of rear piston with lip of cup toward front *(Fig. 1)*.

(2) Centre spring retainer of rear piston assembly over shoulder of front piston. Push piston assemblies into bore up to centre piston cup. Carefully work cup into bore then push piston in up to the rear cup. Carefully work lip of rear cup into bore, then push in on piston until seated *(Fig. 5)*.

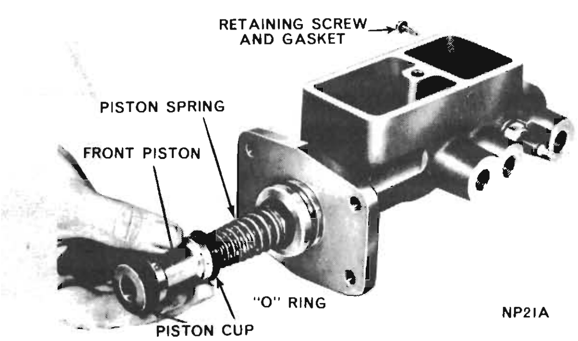


Fig. 4 – Installing front piston and spring

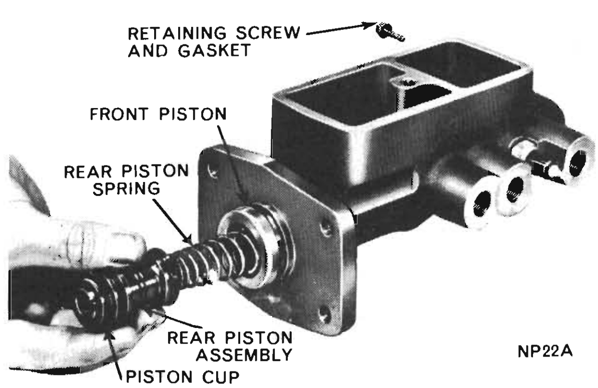


Fig. 5 – Installing rear piston assembly

(3) Holding pistons in seated position install piston retaining circlip.

(4) Install front piston retaining screw and gasket. Tighten securely *(Fig. 1)*.

(5) Install dust boot in position.

(6) Install residual pressure valves and springs *(Fig. 3)* (in "forward" outlet only on disc brake models), then install tube seats firmly. (When the bleeding tubes are attached, the tube seats will be positioned correctly).

3. BLEEDING THE MASTER CYLINDER (Out of Vehicle)

Before installing master cylinder on vehicle, it *must be bled of air* on the bench as follows:

(1) Clamp master cylinder in a vice and attach bleeding tubes (Tool E5C10) *(Fig. 6)*. Be sure that a residual pressure valve is on end of each tube in large capacity reservoir. (This keeps brake fluid from being syphoned out of reservoir during bleeding operation and assists the bleeding operation of disc brake models).

(2) Fill both reservoirs with Chrysler HD brake fluid.

(3) Fully 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. 6)*.

(4) Remove bleeding tubes from cylinder and install plugs in outlets. (As tubes are removed fluid remaining in tubes will syphon out.)

(5) Place cover and gasket correctly over reservoirs and secure with retaining clamp and screw. Tighten to 60 lbs. in. torque.

(6) Remove master cylinder from vice and install on vehicle as described in *"To Install"*.

(7) Bleed system as described in *Para. 4*, of *Part 1, Page 5 – 6*.

> NOTE: Air in a tandem hydraulic brake system does not necessarily produce a spongy pedal feel.

Testing Master Cylinder

Be sure that the master cylinder compensates at both ports. This can be done by applying the pedal lightly and observing for a geyser 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 (larger) reservoir while the pedal is raised. A disturbance in the fluid indicates that the compensating port is open.

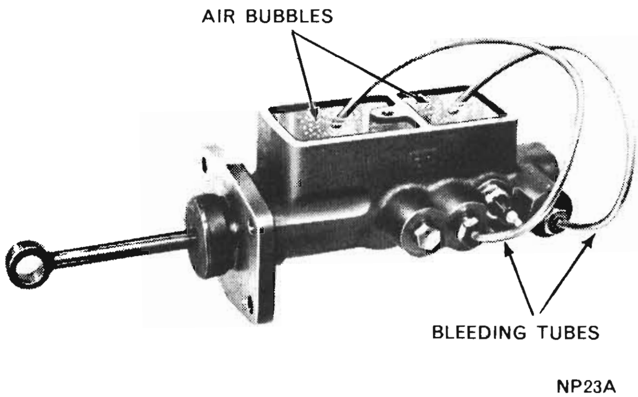


Fig. 6 – Bleeding master cylinder

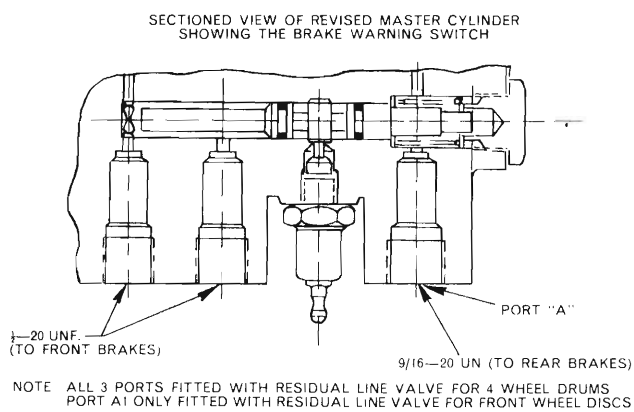


Fig. 7 – Integral Brake Warning Switch Components

4. HYDRAULIC SYSTEM SAFETY SWITCH

The hydraulic system safety switch *(Fig. 7)* 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 warning lamp to light in the instrument panel when the ignition is turned "ON", thus warning the operator of the vehicle that one of the systems has failed and should be repaired.

The integral warning switch components *(Fig. 7)* are installed in a special piston bore in the master cylinder body which functions as described above.

The terminal unit can be removed if a malfunction occurs and a new terminal unit installed.

The safety switch must be removed to "neutralize" the valve after rectification of a brake system malfunction or after brake bleeding.

This removes the switch plunger from the spool valve groove to allow the valve to centralize and hold the switch open circuited when the switch is re-installed and tightened to 130-155 lbs. in. *Refer Fig. 7.*

PART 3 — FLOATING HEAD CALIPER FRONT DISC BRAKES

SPECIFICATIONS

DISC BRAKE	
Type/Make	Automotive and Girling — Floating Head Caliper with Ventilated disc.
Location	Front Wheels only
Residual pressure check valve location	Rear brake-line port of master cylinder (Front port)
CALIPER ASSEMBLY	
Shoe and lining removal	After caliper head removal
Lining thickness	.335″-.365″
Shoe and lining thickness	.507″-.522″
Lining replacement thickness	.030″ min. thickness at any point
Lining area	35.6 square ins.
Number of pistons	1 per caliper assembly (inner side)
Piston diameter	2.375″ (nominal)
Piston bore diameter	2.376″-2.378″ (max.)
Caliper assembly location	Self centering on mounting adapter.
BRAKING DISC	
Type	Ventilated — cast iron
Diameter	11″ (nominal) — 10.905″-10.915″
Thickness (Standard)	.925″-.945″
Max. run-out allowable	.0025″ Max. T.I.R. (on face)
Max. run-out allowable	.008″ Max. (at periphery)
Disc surface finish	32 micro-inch (max.) (circumferentially)
Disc surface finish	50 micro-inch (max.) (radially)
Disc parallelism	.0005″ max. (in any direction)
Disc swept area	481.8 square inches
PROPORTIONING VALVE	
Application	Charger R-T with Track Pack Option
POWER BRAKE BOOSTER	
Application	Regal and 770 models
Type	Automotive and Girling FD50

SPECIAL TOOLS

E5C25A	Piston Reset Tool

TORQUE SPECIFICATIONS

Caliper Head assembly to adapter Pin bolts	10-15 lbs. ft.
Caliper assembly to Steering Knuckle screws	55 lbs. ft.
Dust Shield to Steering Knuckle bolts	50 lbs. in.
Front Brake hose to Caliper assembly Union bolts	15-20 lbs. ft. (max.)
Steering Knuckle Upper ball joint stud nut	55 lbs. ft.
Steering Knuckle Ball joint stud nut	100 lbs. ft.
Steering Knuckle to lower Ball joint screw	100 lbs. ft.
Brake Line Union nuts	95-115 lbs. in.
Bleeder screw	36-48 lbs. in.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

Road test the vehicle by making brake applications at 20 M.P.H. Brake defects will be evident in one or more ways as listed below, and may be easily diagnosed if the system is understood.

1. HARD PEDAL

(1) Seized piston in caliper.

(2) Seized piston in rear wheel cylinder.

(3) Binding brake pedal or linkage.

(4) Faulty air valve in brake power booster.

(5) Damaged control valve components in brake power booster.

(6) Damaged main diaphragm in brake power booster.

(7) Restricted vacuum line.

(8) Faulty check valve.

(9) Low manifold vacuum.

(10) Restricted brake fluid passage.

2. UNEVEN BRAKING

(1) Distorted disc or rear drum.

(2) Brake caliper or back plate loose on mounting.

(3) Oil or grease on disc.

(4) Worn out linings.

(5) Brake disc surfaces uneven or not parallel (includes radially) or caliper binding on support.

(6) Faulty proportioning valve operation (where equipped).

3. PULSATING PEDAL

(1) Variation in thickness of disc or drum.

4. EXCESSIVE PEDAL TRAVEL

Excessive pedal travel faults can fall in two groups:—

(a) Hydraulic (b) Mechanical

With the engine stopped, transmission in neutral, apply brakes several times to destroy vacuum. Hold foot pressure on brake pedal, if pedal moves towards the floor a hydraulic fault is indicated.

Possible sources of trouble are:—

(1) Air in system or incorrect brake fluid.

(2) Leakage past rubber seals in:—

- (a) Master cylinder.
- (b) Piston seal in caliper assembly.
- (c) Rear wheel cylinder.

(3) Defective Booster unit.

If the pedal remained hard, a mechanical fault is indicated.

Possible sources of trouble are:—

(1) Disc not running true (knocking back friction pads) or caliper assembly binding on supports.

(2) Excessive wear of linings on rear drum brakes.

(3) Cracked brake drum on rear.

5. RAPID PAD WEAR

(1) Scoring on disc brake surface.

(2) Inferior friction pads.

(3) Dragging pads.

6. EXCESSIVELY UNEVEN PAD WEAR

(1) Caliper not operating parallel to disc or binding on support bracket.

7. BRAKES FAIL TO RELEASE

(1) Seized pistons in caliper.

(2) Seized pistons in rear wheel cylinders.

(3) Blocked master cylinder compensating port/s due to:—

- (a) Swollen main cup.
- (b) Master cylinder cup covers compensating port.
- (c) Dirty brake fluid.

(4) Sticking control valve in brake power booster.

(5) Residual pressure valves in disc brake supply ports.

8. LOW PEDAL

(1) Incorrect cylinder seal rings installed.

(2) Air not completely bled from all parts of brake system.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The AUTOMOTIVE and GIRLING single piston, floating caliper disc brake assembly *(Fig. 2)* consists of the hub and disc assembly, the caliper, shoe and linings, splash shield and adapter.

The cast iron braking disc has cooling fins 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 tyre on the outboard side of all models *(Fig. 1)* except models with the A84 and A87 options (Track pack).

The single piston caliper assembly floats on four bushings on two steel guide pins threaded into the adapter. Two nylon bushings are located in the outboard portion of the caliper and two rubber on the inboard side *(Fig. 8)*. Four machined abutments on the adapter, position and align the caliper, fore and aft.

Two Spring damper fingers are screwed to the housing at each end to retain the inner pad shoe after positioning by disc pad 'knock back' (released position).

These retainers prevent inner shoe rattle in the caliper.

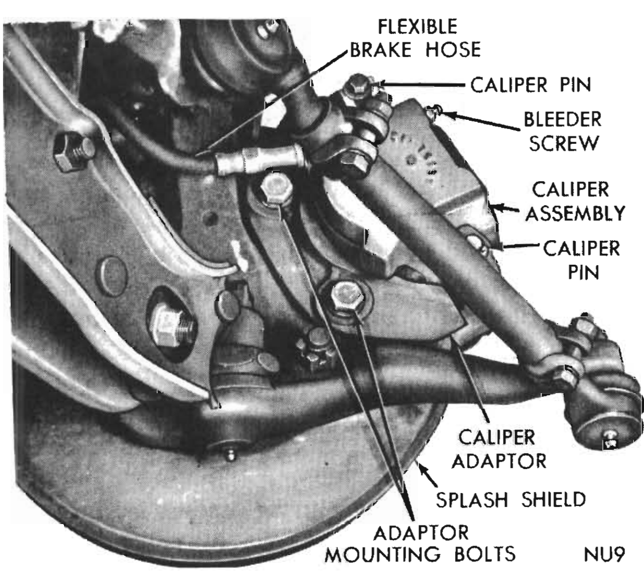


Fig. 1 – Disc Brake Caliper Mounting

The spring clips 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 machined lug *(Fig. 11)* of the adapter for inboard shoe.

The outer pad is longer than the inner pad, being supported by two lanced abutments which mate with the outboard legs of the caliper housing. A single wire spring clip locating through a projecting lance in the backplate centre and over the housing legs retains the outer pad in position.

The inner and outer pads are not interchangeable.

PAD ASSEMBLIES CAN ONLY BE REPLACED BY DETACHING THE CALIPER ASSEMBLY FROM ITS MOUNTING ADAPTER.

The caliper is a one piece casting with the inboard side containing the single piston cylinder bore. The steel piston is 2-3/8" 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.

> NOTE: The groove is machined shallower towards the bottom of the cylinder bore. This arrangement creates more compression on the edge of the seal facing the fluid and also assists in retracting the piston after pressure is released. Refer *Fig. 3*. The adapter is mounted to the steering knuckle by two special bolts and lock plates *(Fig. 2)*.

Adjustment for pad wear is automatically effected with the piston and caliper housing taking up new positions as wear takes place.

The top of the bore and piston are machined to accept a rubber boot which excludes road dirt.

The boot has a wiping lip *(Fig. 3)* that prevents contamination in the bore area.

Balancing Front Wheels (Disc Brake Equipped Vehicles)

To balance front wheels on a disc brake equipped vehicle, the normal procedure for static balancing as described under 'Wheel Balance' in the Wheels, Bearings and Tyres Group 22, of this manual, should be followed. Dynamic balancing of

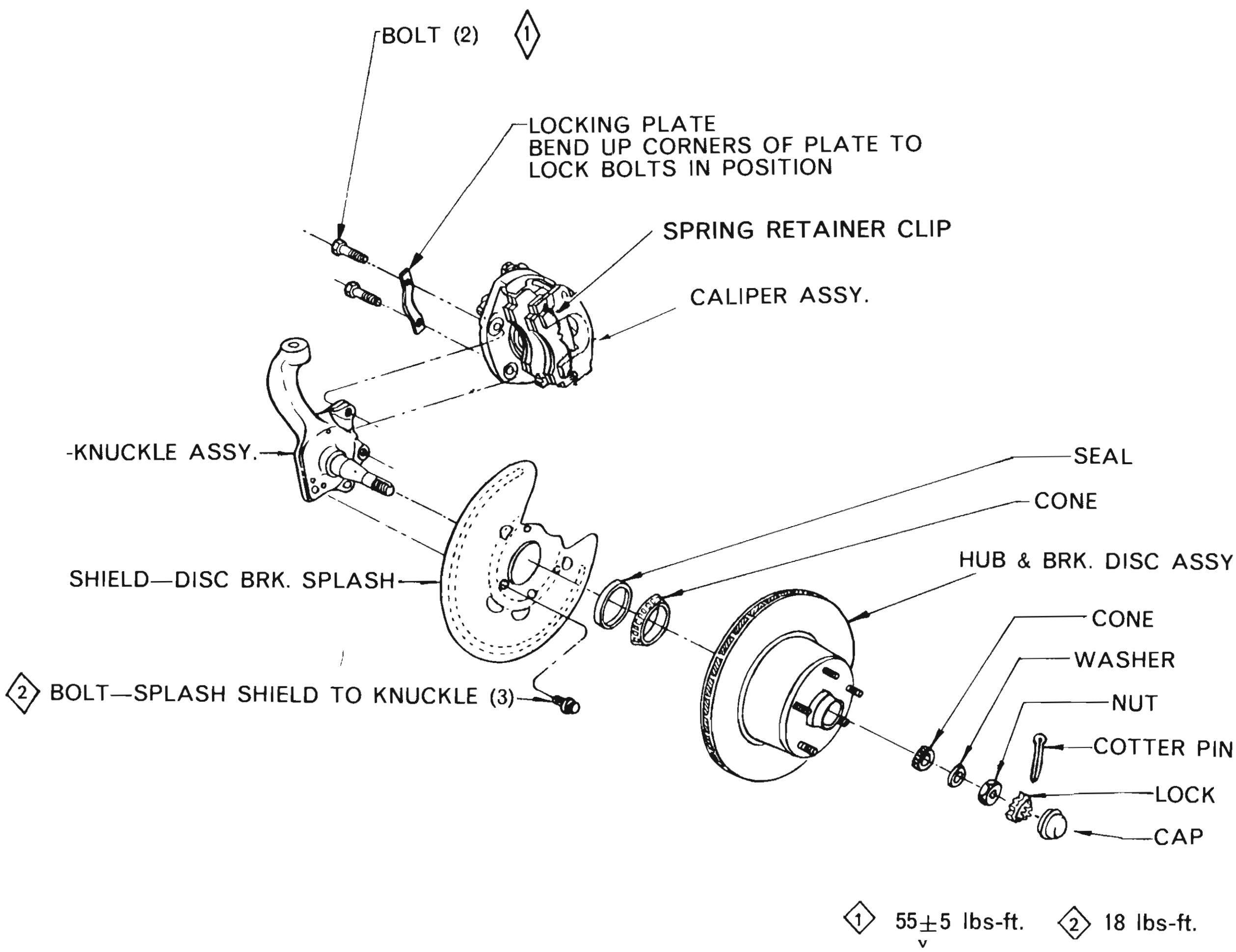


Fig. 2 – Braking Component Assembly — (Disassembled view)

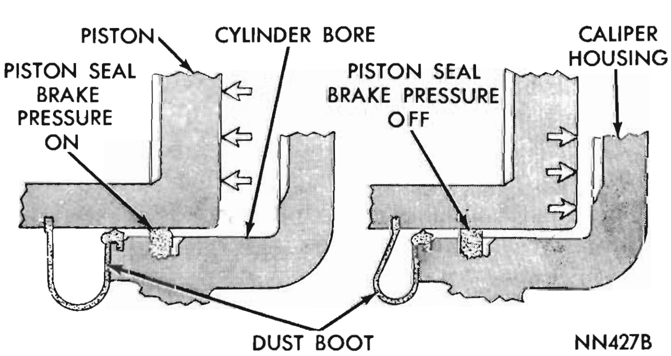


Fig. 3 – Piston seal function for Automatic Adjustment

front wheels can be accomplished by the normal procedure when wheels are removed from the vehicle, but equipment manufacturer's recommendations should be followed closely when attempting to balance wheels while on the vehicle.

Bleeding Disc Brake System

Bleeding the brake system is described in Part 1 —page 5–6 of this group.

Operation

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 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 and bushings) 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, creating a slight running clearance between outer shoe and the disc.

Automatic adjustment is obtained by outward relocation of the piston as inboard lining wears and the inward movement of the caliper as the outboard lining wears, thus maintaining correct adjustment at all times.

Pressure Proportioning Valve

Vehicles equipped with "Track Pack" (A84 and A87) options are fitted with a pressure proportioning valve. This valve is located on the right side splash shield beside the master cylinder. The proportioning valve provides a better balance of braking between the front disc brakes and the rear drum brakes. This results in improved braking and steering control on all surfaces during arduous operating conditions.

Routine Maintenance

4,000 Mile Service

When the front wheels are removed for tyre rotation, inspect the disc pads for abnormal or uneven wear.

8,000 Mile Service or every 6 months

Again inspect the disc brake pads for abnormal or uneven wear. Inspect all the brake hoses and connections for signs of leakage, rubbing or cracking of the covering.

At 12,000 and Subsequent 16,000 Mile Services (Normal Driving)

Check Brake lines, hoses and linings. Raise all four wheels. Remove the front wheel and tyre assemblies and inspect the braking disc, linings and caliper. Inspect front brake flexible hose for signs of cracking or deterioration. (The wheel bearings are inspected at this time and repacked).

The caliper head assembly must be removed in order to inspect the inner wheel bearing. (Refer to 'Brake Pad Replacement', para. 5, page 5–21.)

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 wheels 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 where required.

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 tyre assemblies, and the calipers. Remove the shoe and lining assemblies, (see 'Brake Pad Replacement' paragraph 5 page 5–21.) Three (3) thickness measurements with a micrometer should be taken across the centre of the shoe and lining; one reading at each end and one reading in the centre. When an assembly has been worn, it should be replaced. If a shoe and lining does not require replacement, reinstall, making sure each shoe and positioner is returned to its original position. (See 'Brake Shoe reassembly' paragraph 5). 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 is 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 9 page 5–26.)

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.

2. DISC BRAKE 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 immediately.

(3) During removal and installation of a wheel and tyre assembly, use care not to strike the caliper.

(4) The front wheel bearing adjustment is important and must be within specifications.

(5) Be sure vehicle is centred 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.

IMPORTANT:

(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.

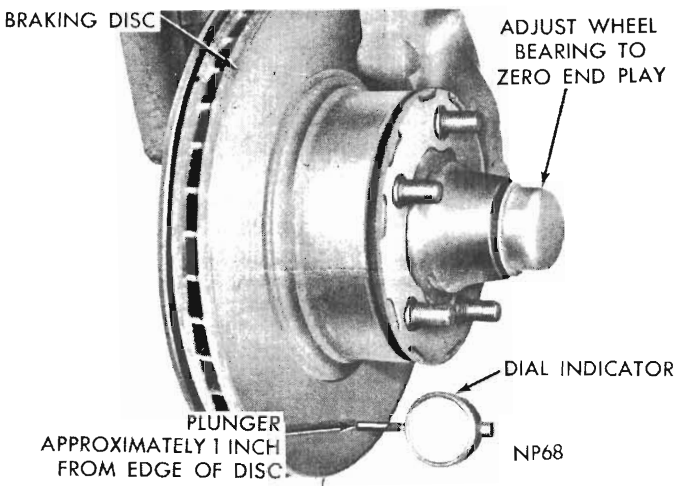


Fig. 4 – Checking braking disc for run-out

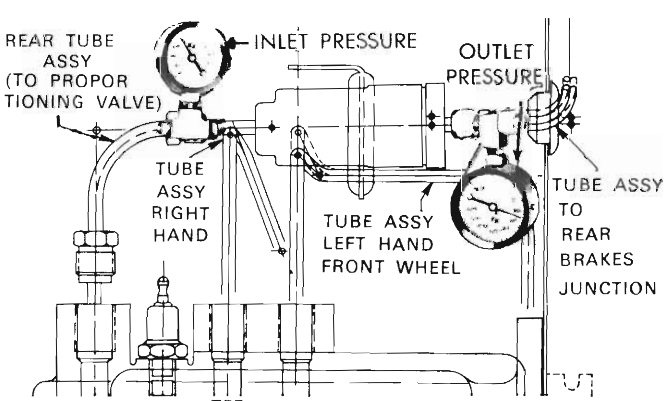


Fig. 5 — Proportioning Valve Check. (Models equipped with Track Pack.)

(8) The wheel, tyre, 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.

3. TESTING PROPORTIONING VALVE

When a premature rear wheel "slide" is obtained on brake application, it usually is an indication that the fluid pressure to the rear brakes is above the 50% reduction ratio of the rear line pressure and that a malfunction has occurred within the proportioning valve, which should be tested.

To test the proportioning valve, proceed as follows:

(1) Remove the tubes and install one gauge of Gauge Set (2) 2,000 P.S.I. gauges) and T in brake line between master cylinder and proportioning valve and remaining Gauge and 'T' at output end of proportioning valve and brake line. *(Fig. 5)*. BE SURE ALL JOINTS ARE FLUID TIGHT.

(2) Have a helper exert pressure on brake pedal (holding pressure). Obtain a reading on master cylinder output of approximately 500 P.S.I.

(3) While pressure is being held as above, reading on valve outlet Gauge should be 360-405 P.S.I.

If proportioning valve pressure readings do not meet specifications, the valve should be removed and a new valve installed.

4. SERVICING THE CALIPER ASSEMBLY

Inspection.

(1) Raise wheel and remove road wheel.
(2) Examine lining thickness at each end of the caliper housing and through the inspection hole.
(3) Replace pads when the lining has worn to a thickness of .030" at the thinnest point.

5. BRAKE PAD REPLACEMENT

NOTE: ALWAYS REPLACE PADS IN 'AXLE SETS'.

To Remove

(1) Raise the vehicle and remove the road wheels.

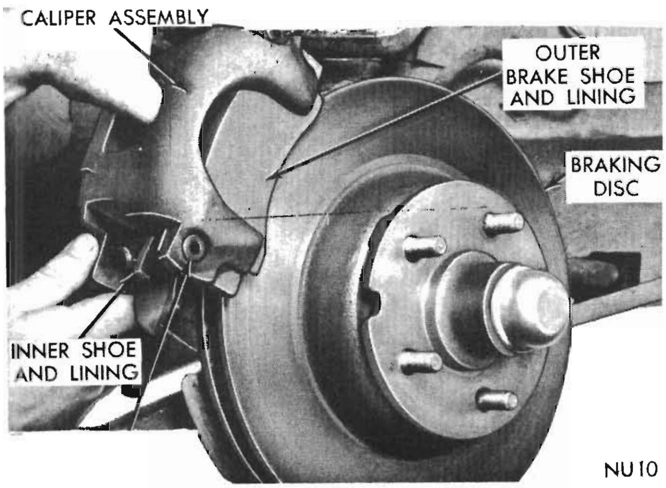


Fig. 6 – Removing or installing caliper head

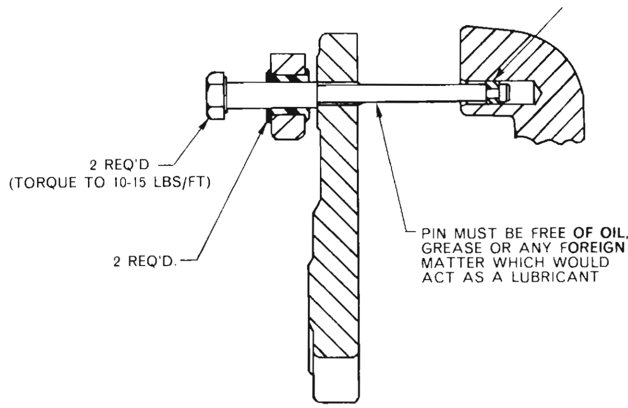


Fig. 7 – Caliper assembly head retaining bolt (sectional view)

(2) Remove caliper location pin bolts which attach caliper housing to mounting (adapter) plate.

(3) Withdraw caliper housing from over disc and suitably support housing (*Refer Fig. 6*).

> NOTE: DO NOT allow brake hose to take weight of the caliper.

(4) Remove inner pad clip screws and slide pad out of anchor plate. (*Refer Fig. 8*).

(5) Prise off outer pad retaining clip and remove pad from housing. Discard clip (*Refer Fig. 9*).

Extract inner insulators from caliper head and discard. Remove outer insulators from locating bolts and discard. (*Refer Fig. 10*).

Inspect caliper assembly seals for fluid leaks or damage. Should there be evidence of fluid leakage, the caliper must be overhauled. (Refer paragraph 6).

If the caliper is serviceable, proceed with the pad replacement.

To Re-assemble

(1) Install new locating bolt insulators to the caliper head.

(2) Press the piston in by hand, evenly into the bore of the housing, until the piston is fully bottomed. During this operation brake fluid will be displaced and this should be ejected into a container via a tube connected to the bleed screw. (Beware of escaping fluid at master cylinder where the cover is removed).

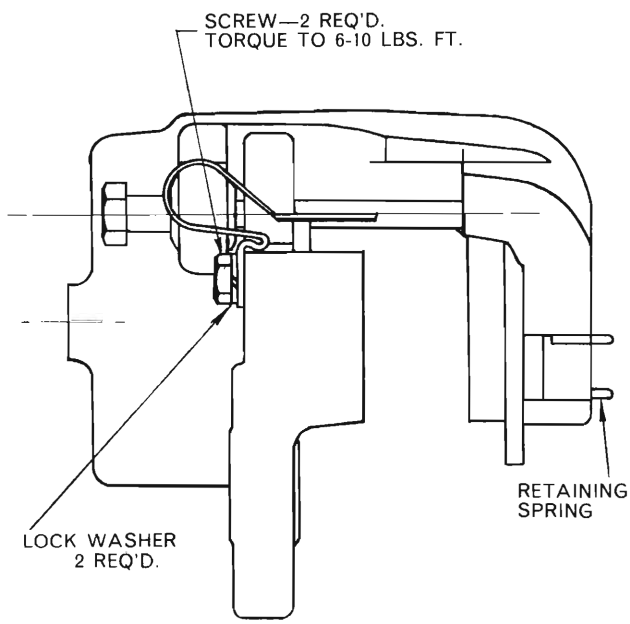


Fig. 8 – Caliper shoe anti-rattle spring diagram

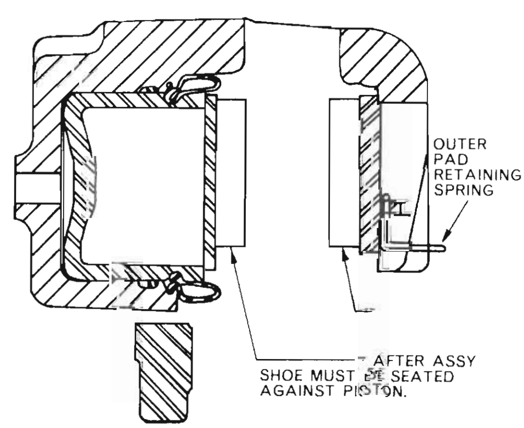


Fig. 9 – Caliper assembly diagram

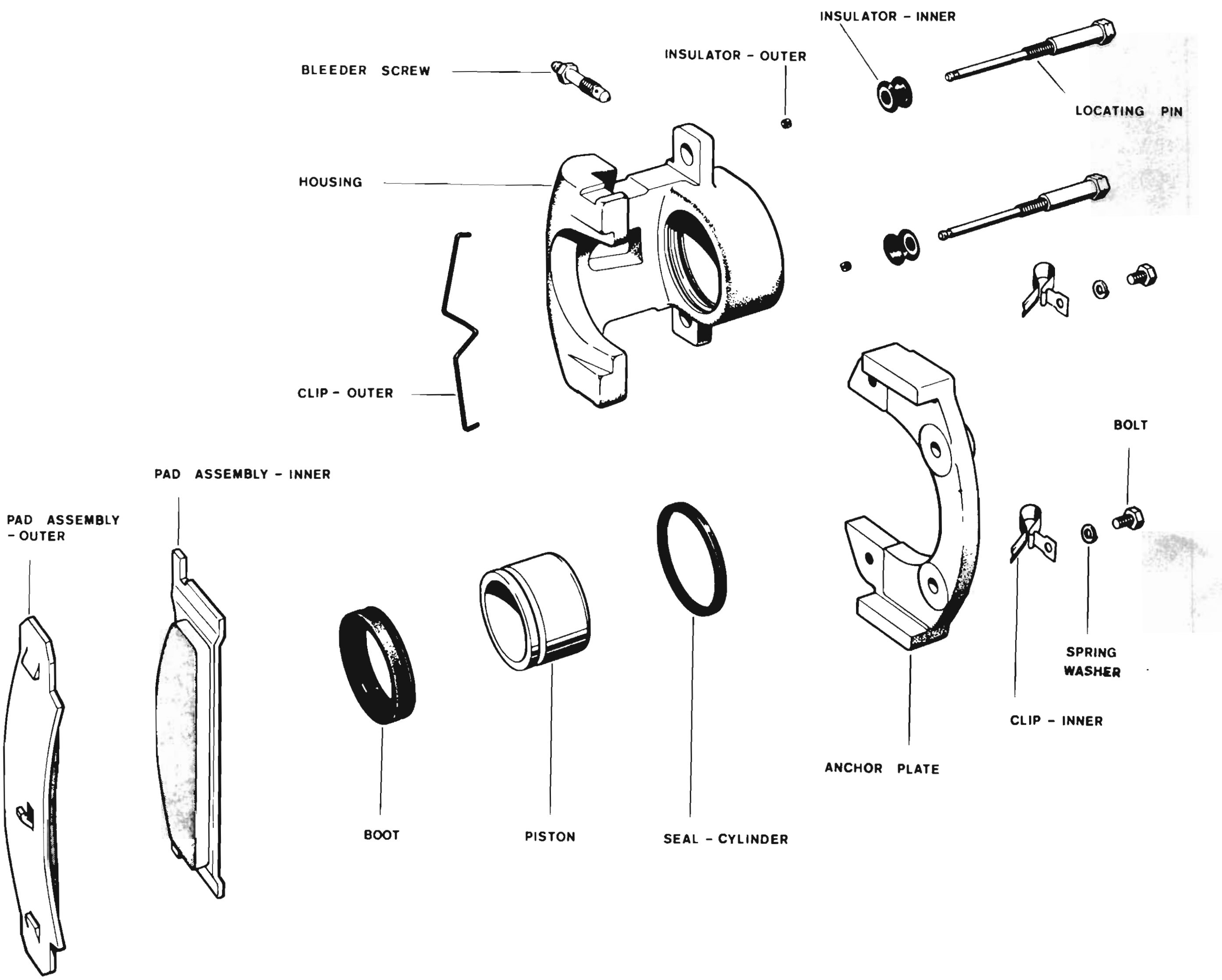


Fig. 10 – Floating head caliper assembly (Disassembled view)

Position the new outer pad to the housing and retain with *new* spring clip which locates under the raised projection (lance) in the pad backplate and over the legs of the housing. (*Refer Fig. 9*).

Install new inner pad in between disc and anchor plate and assemble new retaining clips.

To Install

(1) Position the caliper head housing over the disc and onto the anchor plate with the outer pad against the disc braking surface to prevent pinching the piston boot between the inner pad and piston.

(2) Position each new nylon insulators in the pin bolt recesses.

(3) Apply clean water to locating bolts and insert through anchor plate and into housing. Tighten locating bolts to 10-15 lbs. ft. torque.

NOTE: OIL OR GREASE MUST NOT BE USED ON THE LOCATING BOLTS OR INSULATORS. CARE MUST BE TAKEN TO ENSURE THEY ARE FREE FROM ANY LUBRICANT, OTHER THAN CLEAN WATER.

IMPORTANT

(4) Pump the brake pedal several times to actuate the piston and seal to bring the pads into position against the disc.

(5) Check master cylinder fluid level.

(6) Install road wheels and test.

6. CALIPER ASSEMBLY RECONDITIONING

To Remove

(1) Attach a tube to the bleed screw and place other end of tube in a container. Unscrew bleed screw one turn.

(2) Pump the brake pedal to discharge the fluid.

(3) Disconnect the hose from the caliper.

(4) Separate the caliper housing from the anchor plate by removing the locating bolts.

(5) Lift caliper housing from over the disc and anchor plate.

(6) Hold the caliper housing assembly carefully in a vice.

(7) Detach outer pad and retaining clip from housing.

(8) Pack a clean piece of cloth between the outer end of the piston and caliper outboard legs, and apply air pressure at the hose inlet port to eject the piston.

> CAUTION: Apply light air pressure initially then progressively increase until piston is forced out of the bore. This precaution is advisable to avoid injury as the piston may develop considerable force due to the air pressure.

(9) If the piston is seized and difficulty is found in removing it from the bore, tap lightly around the piston with a hide faced hammer, at the same time applying air pressure.

(10) Remove the rubber boot from the caliper bore.

(11) The sealing ring can now be removed from the caliper bore, but take care not to damage the bore or locating groove. Remove the bleed screw.

Cleaning and Inspection

(1) Clean all metal parts thoroughly with methylated spirits or brake fluid.

(2) Use clean dry compressed air to dry off the parts. Examine the cylinder bore and piston carefully for signs of damage, abrasion, scuffing or corrosion. Replace the piston if there is any doubt of its serviceable condition.

(3) If the cylinder bore is unserviceable, a new replacement caliper housing must be installed.

(4) Where slight corrosion exists, it may be removed with fine wet and dry paper or carefully removed using a suitable cylinder hone.

> NOTE the maximum cylinder bore size must not be exceeded, that is, 2.378" max.

To Re-assemble

(1) Lubricate cylinder bore with the Chrysler Heavy Duty Brake Fluid and carefully install new sealing ring into the groove in the bore, ensuring the seal is not twisted and is fully seated in the groove. (*Refer Fig. 12*).

(2) Install new rubber boot into the outer groove of the caliper bore, ensuring flange of the boot is squarely and firmly seated in the groove.

(3) Lubricate the outside diameter of the piston with the Brake Fluid and install in the cylinder bore with the open end of the piston and boot retaining groove facing outward. (*Refer Fig. 14*).

(4) Spread the boot over the piston as the piston is installed, taking care not to disturb the boot in the caliper groove. (*Refer Fig. 14*).

(5) Apply steady pressure, *by hand*, to the piston and press until the piston is fully seated in the caliper bore. Ensure outer lip of boot is located in piston groove. This operation is simplified by applying light air pressure to inlet port to extend boot lip into position.

(6) Place the outer pad against the inside of the caliper housing legs and secure with the spring clip under the lance on the backplate and over caliper housing legs.

(7) Install new rubber insulators in the caliper housing and the nylon insulators to the locating pin bolt recess. (*Refer Figure 2*).

(8) Position the caliper housing over the disc and onto the anchor plate with the outer pad against the disc braking surface to prevent pinching the piston boot between the inner pad and piston.

(9) Apply clean water to locating bolts and insert through anchor plate and into housing.

(10) Tighten locating bolts to 10-15 lbs. ft. torque and check positioning of each brake hose. (*Refer Fig. 16*).

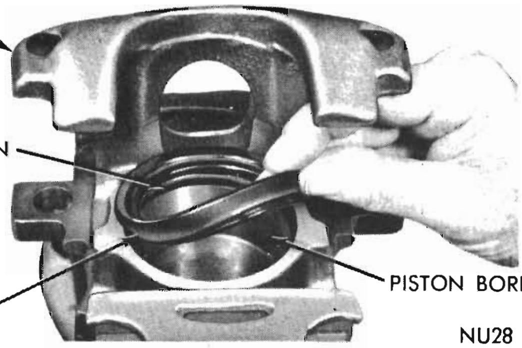


Figure 11 – Removing or installing piston dust boot

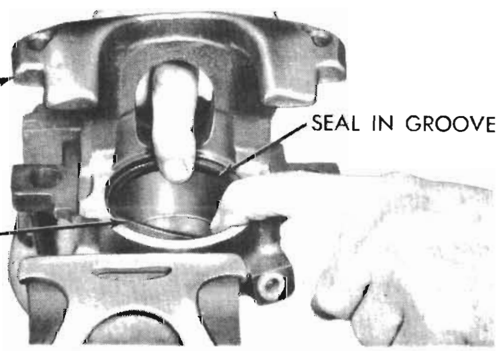


Figure 12 – Installing piston seal

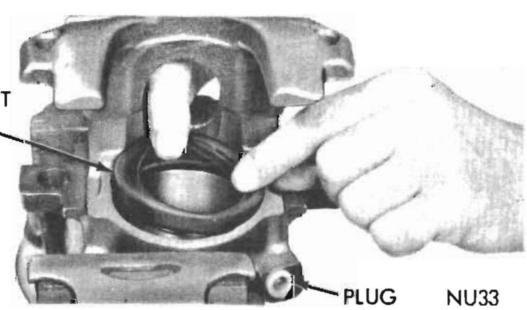


Figure 13 – Installing piston dust boot

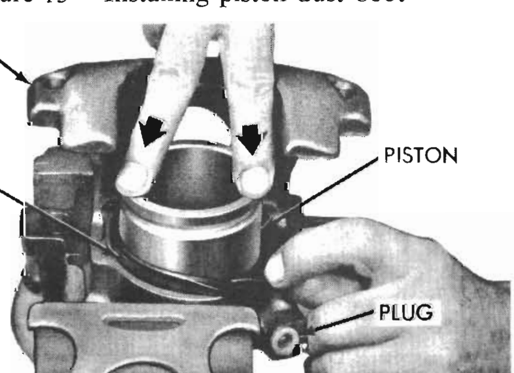


Figure 14 – Installing piston (Through boot)

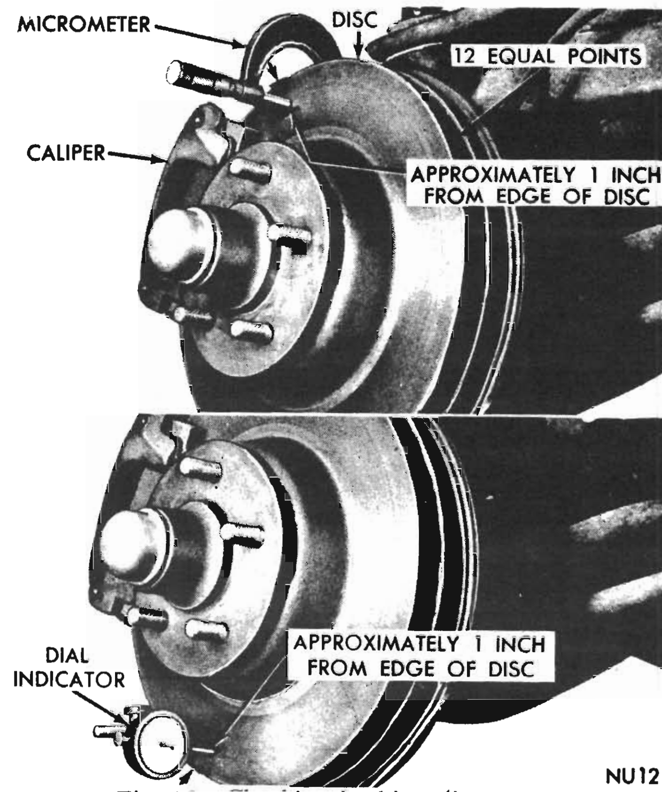


Fig. 15 – Checking braking disc run-out and thickness

> NOTE: OIL OR GREASE MUST NOT BE USED ON THE LOCATING BOLTS OR INSULATORS. CARE MUST BE TAKEN TO ENSURE THEY ARE FREE FROM ANY LUBRICANT, OTHER THAN CLEAN WATER.

(11) Pump the brake pedal several times to actuate the piston and seal, also to bring the pads into position against the disc.

(12) Check the master cylinder fluid level.

(13) Re-install the road wheels and test brake operation.

(14) 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.

7. BRAKING DISC AND HUB

To Remove

(1) Raise vehicle on hoist or jackstands. Remove wheel cover and wheel assembly.

(2) Remove caliper assembly, as described under paragraph, Brake Pad Replacement, paragraph 5, (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.

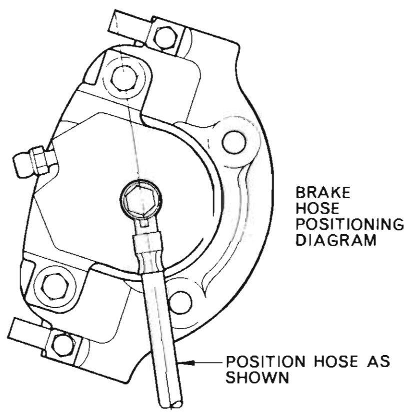


Fig. 16 – Brake hose positioning

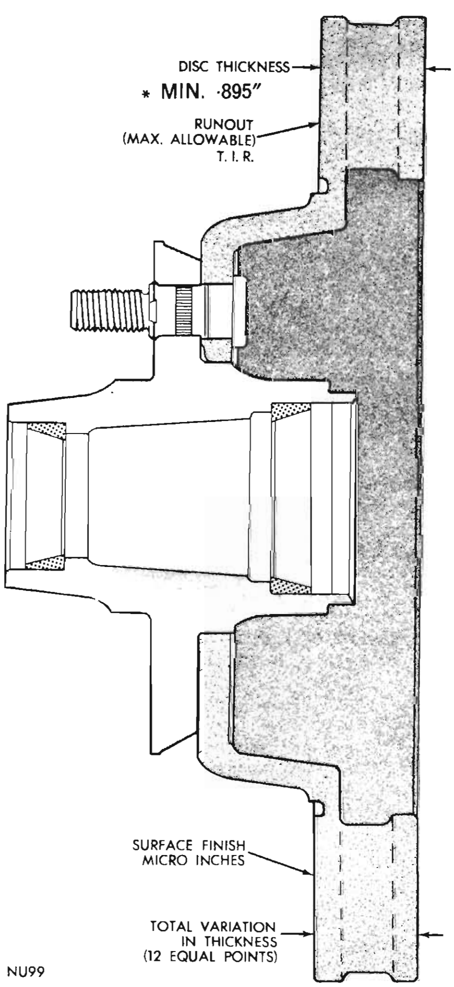


Fig. 17 – Disc specifications

To Install

(1) Slide brake disc and hub assembly on spindle.

(2) Install outer bearing, thrust washer and nut.

(3) Tighten wheel bearing adjusting nut to 70 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 on slot. Install split pin.

(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. (Brakes 5-23).

8. CHECKING BRAKING DISC RUNOUT

(1) Mount dial indicator on steering arm with plunger contacting disc approximately one (1) inch from edge of disc (*Refer Fig. 15*).

(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 the disc, being careful not to machine the disc below the specified minimum thickness of .895". Be sure to readjust the wheel bearing after the 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 a new disc and hub assembly installed.

9. BRAKE DISC REFINISHING (REFACING)

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. A run-out of .002 inch total indicator reading (T.I.R.) is the acceptable minimum tolerance, with exceptions up to .005 inch T.I.R. Thickness variation should not exceed .0005 inch at any diameter.

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. *(Refer Fig. 18).* 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 machine the disc to below the minimum thickness of .895″. 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 specifications and *Fig. 17* shows the location and tolerances of required specifications when servicing the braking disc.

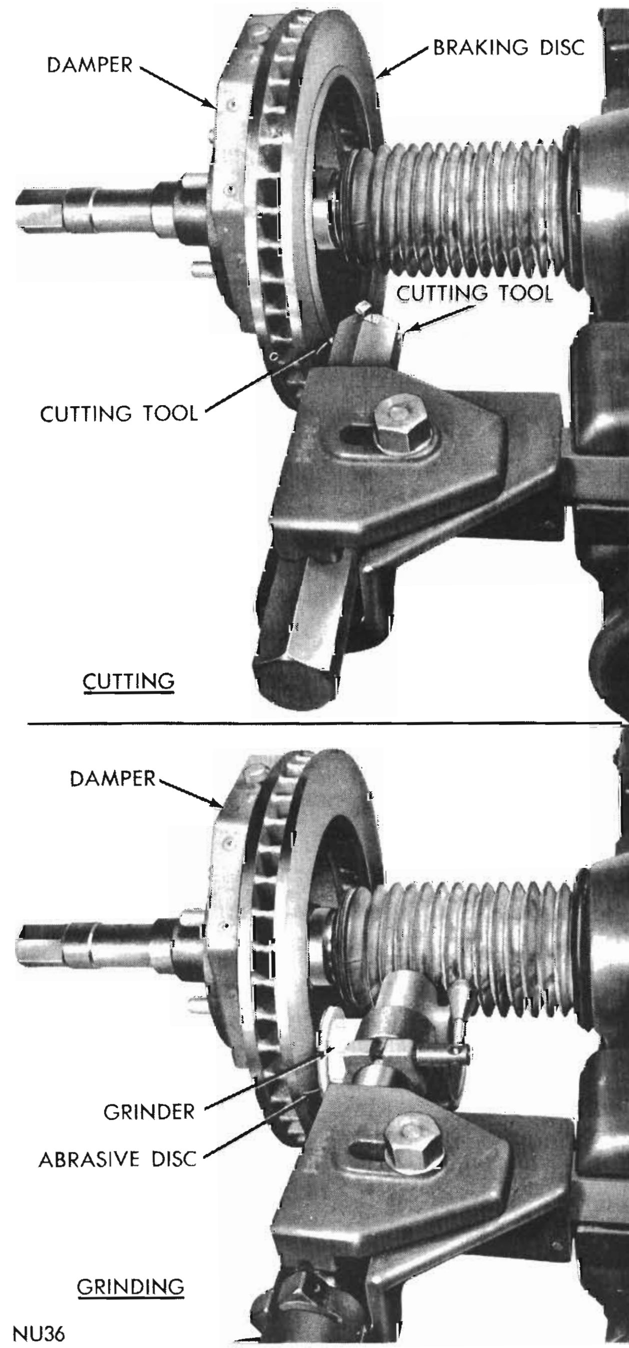


Fig. 18 – Refacing braking disc

10. BRAKE HOSE POSITIONING

To maintain adequate clearances it is imperative that the brake hoses be positioned as shown in *Fig. 16*.

PART 4 — FD50 MODEL BRAKE PRESSURE BOOSTER

SPECIFICATIONS

MAKE	Automotive and Girling	
Type	FD50 (Flexible Diaphragm 50 square ins.)	
Activated by	Engine Vacuum	
Diaphragm Diameter	9″ nominal	
Pushrod Length Setting	6 cyl. Models	8 cyl. Models
(From centre to protruding end)	8.45″-8.58″	4.46″-4.50″
Push Rod (to master cylinder protrusion)	.925″	.925″

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. DRAGGING BRAKES (ALL WHEELS)

(1) Brake shoes improperly adjusted.

(2) Brake pedal linkage binding.

(3) Excessive hydraulic seal friction.

(4) Compensator port plugged.

(5) Improper booster push rod length adjustment.

(6) Fluid cannot return to master cylinder.

(7) Parking brake not returning.

2. GRABBING BRAKES

(1) Grease or brake fluid on linings.

3. PEDAL GOES TO FLOOR (OR ALMOST TO FLOOR)

(1) Self-adjusters not operating.

(2) Air in hydraulic system.

(3) Hydraulic leak.

(4) Fluid low in master cylinder.

(5) Shoe hanging up on rough platform.

(6) Brake push rod length incorrect.

4. HARD PEDAL (POWER UNIT TROUBLE)

(1) Faulty vacuum check valve.

(2) Collapsed or leaking vacuum hose.

(3) Plugged vacuum fittings.

(4) Leaking vacuum chamber.

(5) Diaphragm assembly out of place in housing.

(6) Vacuum leak in forward vacuum housing.

PART 4 — F.D. 50 MODEL BRAKE PRESSURE BOOSTER

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

Description

The FD50 Servo Unit is designed to assist the effort applied by the driver's foot on the brake pedal. It uses the vacuum created in the engine inlet manifold to boost force applied at the master cylinder push rod in an exact and controlled manner.

Operation

The servo assembly is mounted between the brake pedal and the master cylinder, with the push rod from the rear of the unit connected to the brake pedal, and a push rod from the front of the unit abutting the master cylinder plunger.

The force which assists the pedal effort is obtained by admitting atmospheric pressure to one side of a diaphragm suspended in a vacuum. The difference in pressure moves the diaphragm and this movement is used in a controlled manner to augment the driver's pedal effort.

In the case of a vacuum failure, the valve and rod assembly of the servo and the hydraulic plunger act as a single push rod. The brakes will, therefore, work in the conventional manner, but more effort will be required on the brake pedal.

Inside the vacuum chamber there is a piston which is free to move in either direction. This piston is composed of a number of radial fingers in contact with a rubber diaphragm. A tubular member extends through a gland seal in the rear (facing the pedal) of the unit, the inner end of which forms a two-way air valve. The valve face bears on a valve plate, the shape of which is controlled by the radial fingers, allowing it to bear on one or other of the annular valve faces.

Axial movement of the valve body controls which valve is closed. At the front end of the servo (the master cylinder end) the output rod extends into the servo through a gland seal and terminates in a fulcrum plate which is in contact with the radial fingers at a fixed diameter.

Initially, there is equal vacuum on either side of the diaphragm. A force applied to the brake pedal opens an air valve which admits air to the rear of the diaphragm. The pressure difference thus obtained gives a force which augments the driver's effort.

Off Position

The vacuum chamber is connected via a non-return valve to the engine inlet manifold. The diaphragm is coned with its apex towards the input side, thus sealing on the inner valve diameter, keeping air out of the unit and allowing both sides of the diaphragm to be connected *(Fig. 1)*.

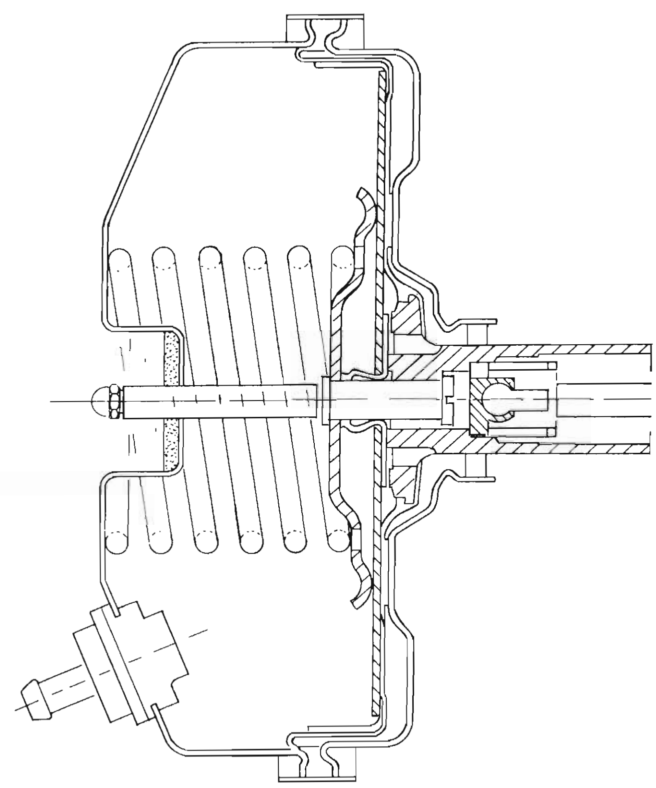


Fig. 1 – Off position

On Position

The load applied to the valve body via the pedal has caused the flexing diaphragm to move to a position where the apex is now pointing to the front of the unit. The valve members have formed a seat on the outer diameter, sealing the rear of the piston from the front and thereby allowing the rear chamber to admit the atmosphere. *(Fig. 2)*. This allows

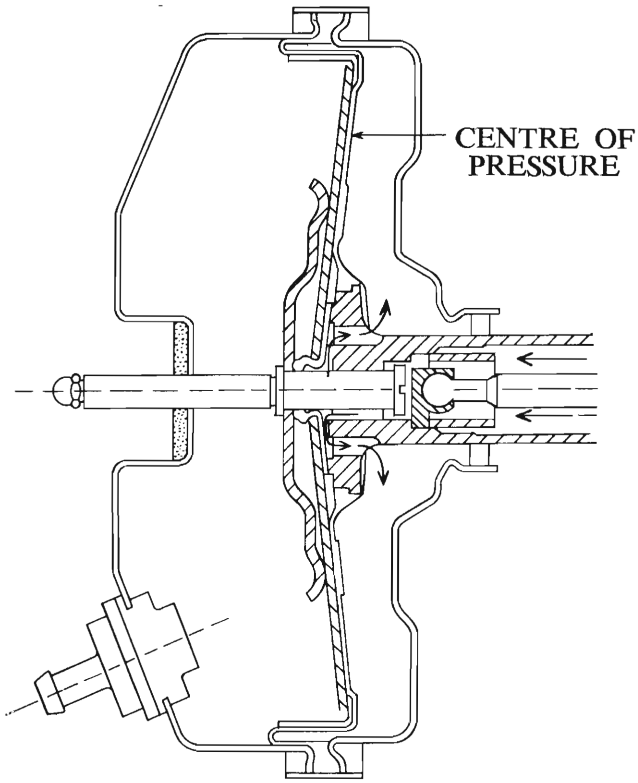


Fig. 2 – Applied position

air to enter the rear of the unit and force the piston in the direction of the master cylinder. This movement will continue until the driver ceases to increase the pedal effort. The diaphragm and fingers will move a small further distance, but because the valve body is now stationary, this movement will close the valves *(Fig. 3)* isolating both chambers. This state will continue until alteration of driver effort, causing the valve body to move either forward or backward.

2. SERVICING THE SERVO UNIT ASSEMBLY

Due to the type of assembly tooling and specialisation required in servicing this type unit it is *not* possible to recondition this unit. Where the unit is faulty the unit must be replaced.

There are three external component parts groups which can be serviced — these are:—

(a) Non-Return (vacuum) valve and grommet

(b) Output push rod seal

(c) Air filter and rubber boot.

Non-Return Valve Replacement

The vacuum Non-Return valve and grommet is accessible with the booster assembly mounted in place. When reinstalling the valve or grommet *use only clean water as a lubricant,* to aid installation.

Output Push Rod Seal Replacement

Remove the master cylinder assembly to gain access to the output push rod seal and retainer. The seal may be removed by carefully withdrawing the seal support plate (which serves as a supporting retainer).

The seal is placed over the support plate and inserted (dry) firmly into the seal recess.

Air Filter and Retainer Rubber Boot Replacement

Remove both the master cylinder and brake booster assembly to gain access to the air filter and retainer boot.

CAREFULLY pry off the rubber boot and remove the filter from the push rod. Replace filter by reversal of procedure.

3. REPLACING THE SERVO UNIT ASSEMBLY

Power brake booster.

To Remove

(1) Remove the brake master cylinder support bracket.

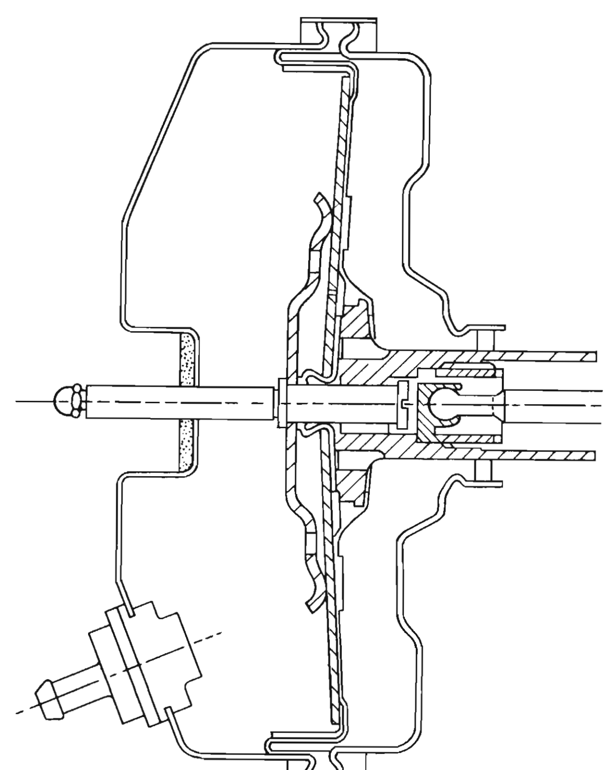


Fig. 3 – Holding position

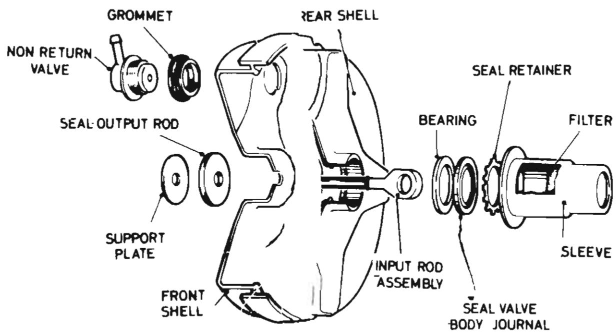


Fig. 4 – FD50 Brake booster replaceable component diagram

(2) Protect the paint work then disconnect the hydraulic tubes. (Disconnect the safety warning switch.)

(3) Remove the master cylinder retaining nuts from the master cylinder and remove the master cylinder (cautiously to avoid spillage).

(4) Disconnect the vacuum hose to the booster.

6 Cylinder Models

(5) Remove the pedal push rod bolt from the brake pedal arm.

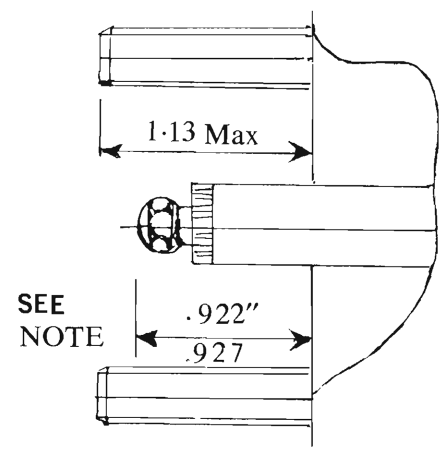
8 Cylinder Models

(6) Remove the split pin from the booster push rod pin and remove the clevis pin.

(7) Remove the nuts retaining the booster assembly from the support pedal or bracket.

To Install

Before installing a replacement booster assembly, check the master cylinder push rod protrusion by *applying 20" HG of Vacuum to booster.* The protrusion dimension should be *.992"-.927" when 7-10 pound force is applied* to the booster *push rod* (refer to illustration below).



Install the booster if satisfactory also master cylinder and bracket. Reconnect hydraulic tubes and switch wire. Bleed brakes master cylinder and test for correct brake operation.

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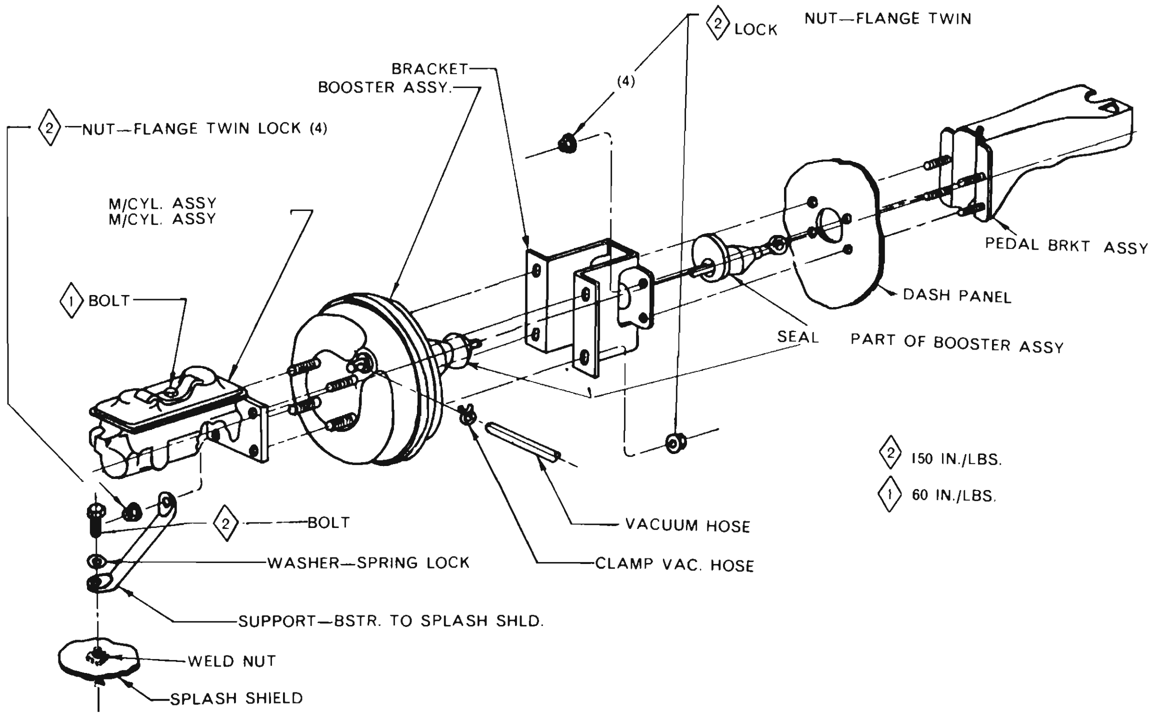
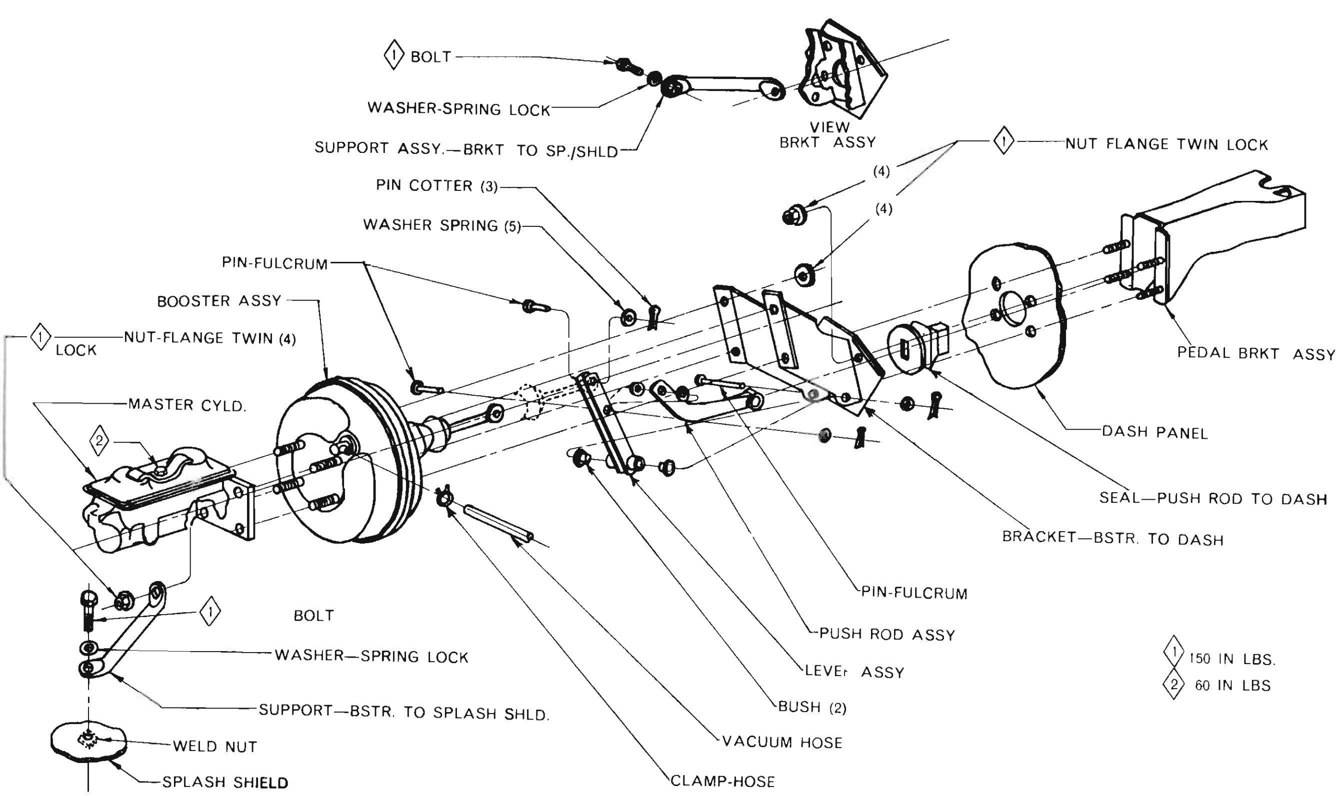


6 CYLINDER MODELS



8 CYLINDER MODELS

Fig. 5 – Brake booster mounting diagrams

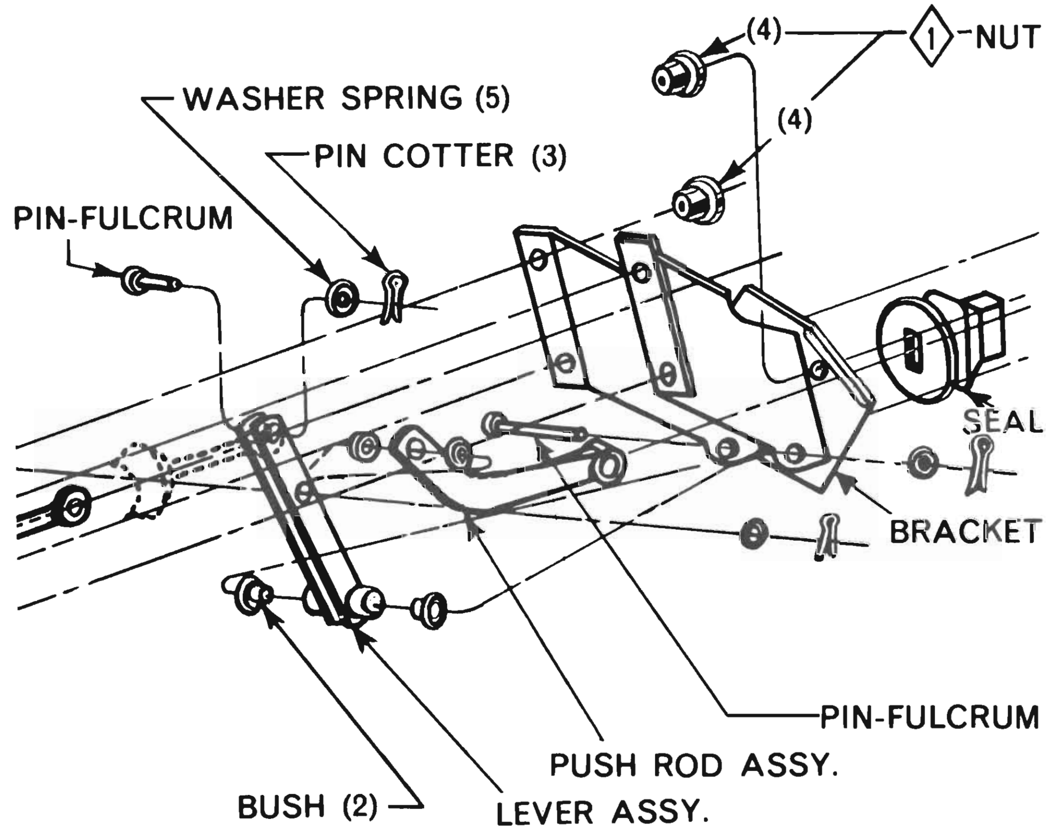


Figure 6 – Enlarged view of brake booster linkage

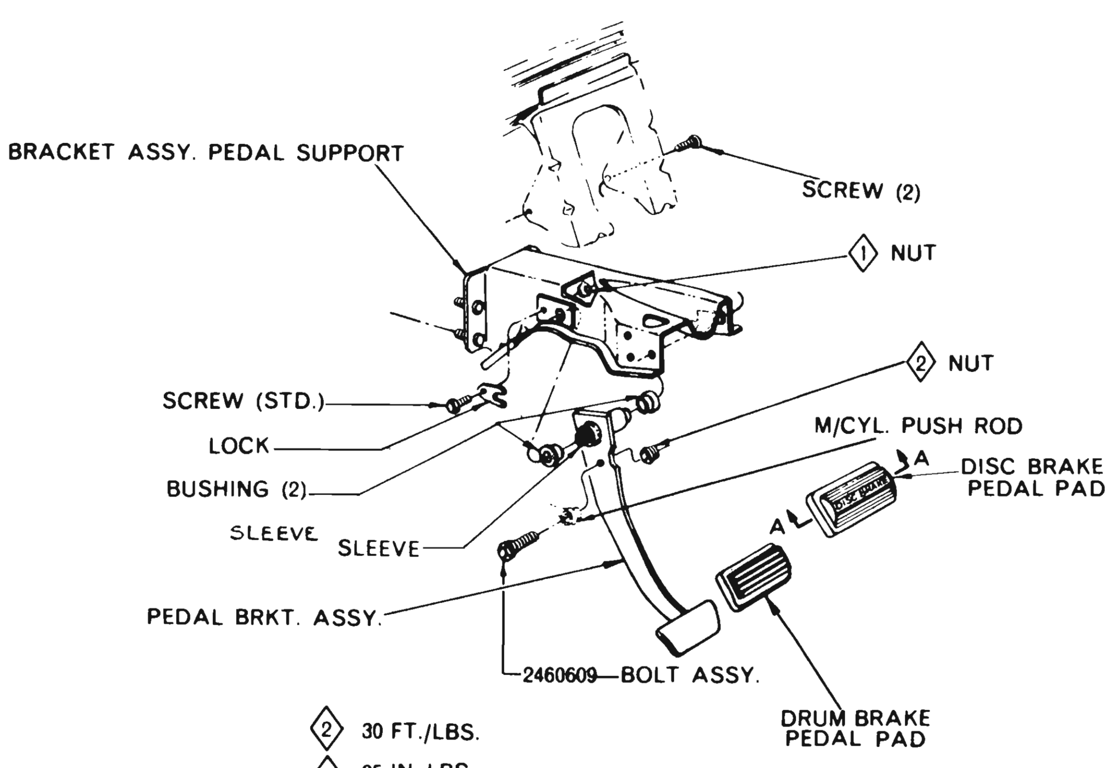


Figure 7 – Brake pedal bracket assembly diagram

GROUP 6

CLUTCH

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SPECIFICATIONS

CLUTCH

Engine Model Application	"215/245"	"265"	"265" Special
Model Variations	Standard	Heavy Duty	Twin Disc
Type	Single Dry Disc		Twin Discs
Make	"B.A.I."		"Repco"
Pedal free play	1"	1"	

CLUTCH DISC

Facing Type	Moulded Woven Asbestos		
Outside Diameter		9½"	
Thickness (each facing)	.125"		
Disc Springs		6	

CLUTCH COVER ASSEMBLY

Pressure Spring		1 Diaphragm	
Clutch Clamping Pressure	1400 lbs. (min.)	1600 lbs.	1250 lbs. (min.)
Number of diaphragm fingers	18	18	18
Height from face of flywheel (New Disc)	1.35"-1.5"	1.34"-1.49"	2.198"-2.280"
Force on fingers to free clutch (New Disc installed)	225 lbs.	320 lbs. (min.)	240 lbs.
Force on fork to free clutch (New Disc installed)	117 lbs.	166 lbs.	125 lbs.
Total effective facing areas	107.1 sq. ins.	107.1 sq. ins.	214.2 sq. ins

SPECIAL TOOLS

E6C5	Pilot Bushing
E6C5A	Pilot Bushing
E6C10	Indicator-Dial Kit
E6C15	Pilot-Aligning Tool (single disc) Pilot-Aligning Tool Adapter (Twin Disc)

TORQUE SPECIFICATIONS

Clutch pedal linkage lever nut	35 lbs. ft.
Clutch housing brace strut screws	50 lbs. ft.
Clutch housing to engine bolts	50 lbs. ft.
Clutch cover to flywheel bolts (5/16")	200 lbs. in.
Clutch cover to flywheel bolts—Allen screws (Twin Disc)	37 lbs. ft.
Clutch pan bolts	100 lbs. in.
Clutch fork pivot bolts	200 lbs. in.
Flywheel bolt nut	60 lbs. ft.
Starter Motor mounting screw/nut	40 lbs. ft.
Transmission to clutch housing bolts	50 lbs. ft.
Torque shaft pivot bracket bolts (both sides)	40 lbs. ft.
Torque shaft pivot ball stud bracket	200 lbs. in.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. SLIPPING

To test for a slipping clutch, apply hand brake, start engine, depress clutch pedal and engage top gear. Whilst accelerating the engine, slowly release the clutch pedal. The engine should stall immediately if clutch is not slipping.

(1) Pedal Free Play — Inspect for correct free play, insufficient free play will prevent complete clutch engagement.

(2) Clutch Disc — Inspect for burned, worn, or oil soaked clutch disc facings.

(3) Pressure Plate Spring — Inspect for weak or broken pressure spring. Test coil spring for weakness. If the paint on a spring is burnt, the spring is probably weak.

2. CHATTERING

This condition can be determined by vibration that may occur during clutch engagement.

(1) Clutch Disc — Inspect for oil or grease on facings. Before replacing disc, determine the source of the leak. Oil may come from a leaky rear main bearing, the transmission, or from use of excessive lubricant in the pilot bushing.

(2) Pressure Plate — Inspect for a cocked pressure plate. If the pressure plate does not meet the disc evenly, chatter may result.

3. DRAGGING

This condition exists when the clutch is slow in disengaging, or will not completely release. When this occurs, the gears may be difficult to shift without clashing.

(1) Pedal Free Play — Inspect for excessive pedal free play which might prevent the clutch from releasing completely.

(2) Clutch Disc — Inspect for a bent clutch disc. If disc is bent it will not be parallel with flywheel and pressure plate, and disengagement will not be complete.

(3) Clutch Release — Check for correct operation. Disengagement may be uneven and cause clutch drag if operation is incorrect or uneven.

(4) Clutch Disc Hub — Make sure clutch disc hub does not bind on drive pinion shaft. If it does bind, a dragging condition may be created.

4. PEDAL STIFF OR BINDING

(1) Clutch Linkage — Inspect clutch linkage for rust or corrosion. Inspect for bent or misaligned linkage.

5. NOISES

(1) Release Bearing — A high-pitched noise, occurring only with the engine running, the transmission in neutral, and the clutch pedal depressed, usually indicates that the release bearing should be replaced.

(2) Release Levers — A rattling noise may develop when an uneven release lever causes the release bearing to shuffle on its sleeve.

(3) Pilot Bushing — A high - pitched noise occurring only with engine running, transmission in gear, and clutch pedal depressed may indicate that the pilot bushing is tight, worn or dry. The noise is usually more evident in low or second gear than in top.

(4) Clutch Disc — A metallic grinding noise, similar to a rear axle gear or bearing noise, may be caused by improper functioning of the clutch disc damper unit, and the disc should be replaced. This noise is usually evident when the car is accelerated from 25 m.p.h. to 30 m.p.h. or when decelerated from 50 to 35 m.p.h.

SERVICE INFORMATION–PROCEDURES

1. GENERAL INFORMATION

The standard clutch is of the single dry disc type, with no adjustment for wear in the clutch itself. The high performance sports clutch is similar, with the exception that twin driven discs are employed, in conjunction with an intermediate plate driven by three large spacer sleeves. The whole assembly is secured with three special Allen screws to the flywheel.

2. CLUTCH PEDAL ADJUSTMENT IN THE VEHICLE

The only adjustment required whilst the clutch is assembled in the car is to obtain pedal free play. This is the movement of the pedal, required to close the clearance between the throw-out bearing and the diaphragm. Linkage adjustment is required to restore pedal free play to specification, when it has been reduced by normal wear.

Shorten or lengthen the clutch release fork rod by turning the adjusting nut until there is 5/32″ (single disc clutch), or $\frac{1}{8}''$ (twin disc clutch) free movement of the clutch fork outer end. This adjustment if correctly set, will give the necessary 1″ free play at the pedal (standard clutch).

3. REMOVAL AND INSTALLATION OF CLUTCH

Improper operation or excessive wear may impair the clutch function to a point which may necessitate its removal and overhaul. The clutch can be removed only after transmission has been removed.

To Remove

(1) Remove the transmission.

(2) Remove the clutch housing pan.

(3) Disconnect the clutch linkage and retracting spring at the clutch release fork.

(4) Pull out clutch release bearing and sleeve.

(5) Mark the clutch cover and flywheel *(see Fig. 2)* to ensure that cover and flywheel will be correctly matched in assembly. Now, remove the bolts that hold the clutch cover to the flywheel loosening each bolt a few turns (in succession) until cover is free.

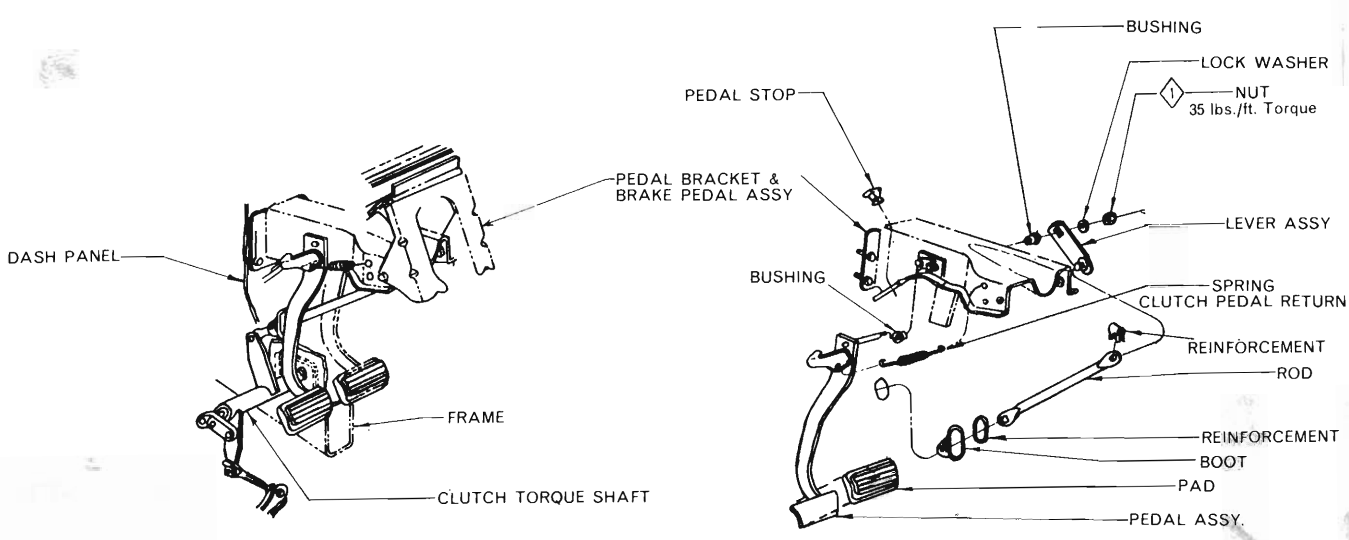


Fig. 1 – Clutch pedal and linkages

(6) the clutch disc and pressure plate assembly can then be removed from the clutch housing.

NOTE: that the twin disc intermediate plate must be related to cover — shown by white paint daubs.

CAUTION: Take care when removing the intermediate plate to prevent spring blade damage.

To Install

(1) Coat the clutch shaft pilot bushing (in the end of the crankshaft) with medium short fibre wheel bearing grease (about half a teaspoon), place grease in radius at back of bushing.

(2) Clean the surfaces of the flywheel intermediate plate (twin disc models) and pressure plate thoroughly, making certain that all oil or grease has been removed.

(3) Place the pressure assembly in a suitable fixture to operate the clutch release action, then install three wedges (approximately 3/16″ effective thickness x 3″ width) between the release "fingers" of spring and the cover, to secure the clutch in the released condition.

(4) Hold the clutch disc, pressure plate and cover in mounting position with the springs on the disc damper facing away from the flywheel (single disc models).

Twin disc type procedure variations:

NOTE: Ensure that all parts are correct application items *(refer to specifications)*.

(a) Rotate flywheel to position one mounting hole is at the lowest position.

(b) Insert the drive pilot shaft Tool E6C15 into flywheel pilot bush to hold the front plate.

(c) Slide the "Front" clutch disc onto pilot ensuring that the "flywheel side" (identified) is toward flywheel.

(d) Insert three plastic pilot dowel pins into the retaining screw threaded holes with the drive pads (sleeves) over the dowel pins.

(e) Carefully install the intermediate (centre) drive plate on to the drive sleeves (ensuring that the separator spring blades will contact the cover drive strap rivets), properly supported (by assistant).

NOTE: Separator spring blades must face "clockwise" (at flywheel).

CAUTION: These blades are very easily damaged — handle plate with care.

(f) Assemble second clutch plate to pilot shaft guide (ensuring that the rear face is branded "Pressure Plate side").

(g) Assemble pressure assembly (wedges installed) drive (sleeve) pads checking that the intermediate plate and cover plate markings (white dots) align as well as the original assembly mark. (Spring clips must engage the link rivet heads.)

(h) Progressively replace the dowel pins with the retaining screws and lockwashers, ensuring that the drive sleeves are held while tightening all the screws evenly until the required torque of 37 lbs. ft. is obtained. Then remove the three wedges.

(i) Re-install the clutch release bearing and fork, transmission and propeller shaft.

(j) Adjust the clutch release bearing clearance to .050″ - .075″ refer to para. 5 — (Free play at the yoke adjuster should be approximately ⅛″).

(k) Check clutch operating characteristic, before installing the clutch cover. Ensure both plates are releasing and the intermediate plate moves freely to centralise correctly. Correct operation will indicate that the separator springs have not been damaged during assembly.

Do not touch disc facing, as clutch chatter may result.

Single Disc Clutch

Now insert clutch disc aligning Tool E6C15 through hub of disc and onto pilot bushing, as shown in Fig. 3. (If this tool is not available, a spare transmission drive pinion clutch shaft may be used.)

(5) Insert the clutch cover attaching bolts (after aligning balance punch marks) but do not draw down.

(6) To avoid distortion of the clutch cover, the bolts should be tightened a few turns at a time (alternately) until they are all tightened to specifications. Remove aligning tool.

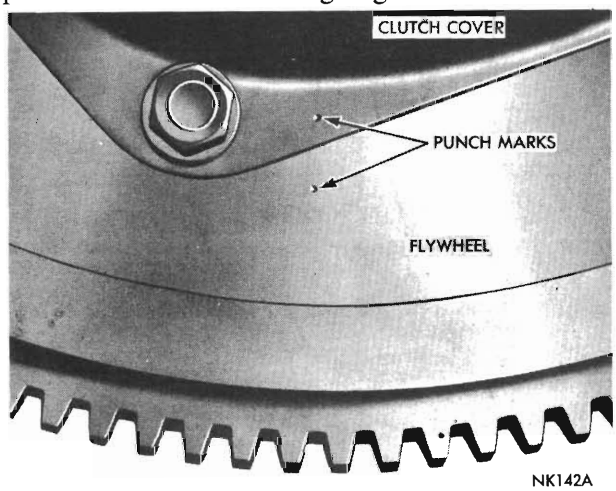


Fig. 2 – Punch marks on clutch cover and flywheel

(7) Check the clutch release bearing, if noisy, rough or dry, press off the old bearing and install a new one. Pack the recess in the sleeve (directly behind bearing) with short fibre wheel bearing grease, coat the fork contact surface on the sleeve and the pivot edge with short fibre wheel bearing grease. Slide the bearing and sleeve up into position, engaging the springs on the sleeve with the fork. *Be sure the springs have lateral freedom.* When installing the transmission, *do not lubricate* the pilot shaft or the clutch splines, this area must be kept dry.

(8) Install the transmission by guiding into position with pilot studs . Care should be taken in order not to bend the clutch disc by allowing the transmission to hang. Support the transmission with a suitable jack, then slide into place and secure with bolts.

(9) Adjust clutch linkage *(see Para. 2).*

4. SERVICING THE CLUTCH COVER

It is very important that when replacing or installing a clutch on a car, the correct clutch disc, pressure plate assembly be installed. Serious vibration, noise or grabbing, chattery clutch will result, if incorrect parts are used.

This clutch pressure assembly is serviced only by replacement.

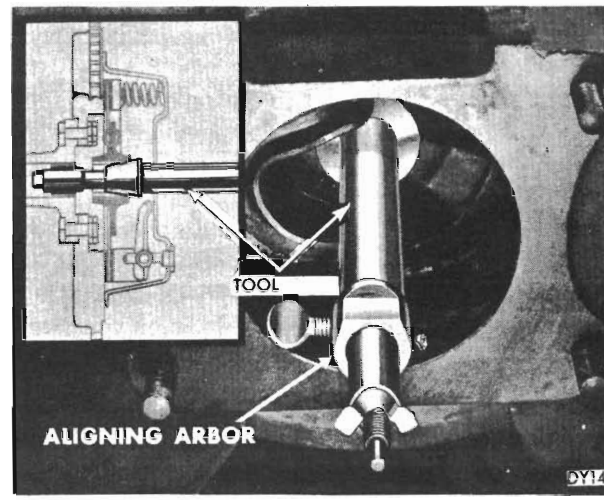


Fig. 3 – Clutch single disc aligning arbor

5. SERVICING THE CLUTCH SHAFT PILOT BUSHING

To Remove

(1) Insert the "collet-end" of Tool E6C5 into the bushing bore deep enough to grip the inner bushing face with the "claws".

(2) Tighten the collect claws sufficiently to obtain a good grip, then using the weight of the tool remove the bush by impacting.

To Install — using Special Tool E6C5A

(1) Position the new bushing on the broach end of the installer against the shoulder (ensure that the puller-nut is fully "backed-off") then carefully hammer the tool to drive the bushing until tool "bottoms" onto crankshaft.

(2) The tool must now be withdrawn from the bushing using the remover-nut and sleeve. This action burnishes the bush surface to the correct size.

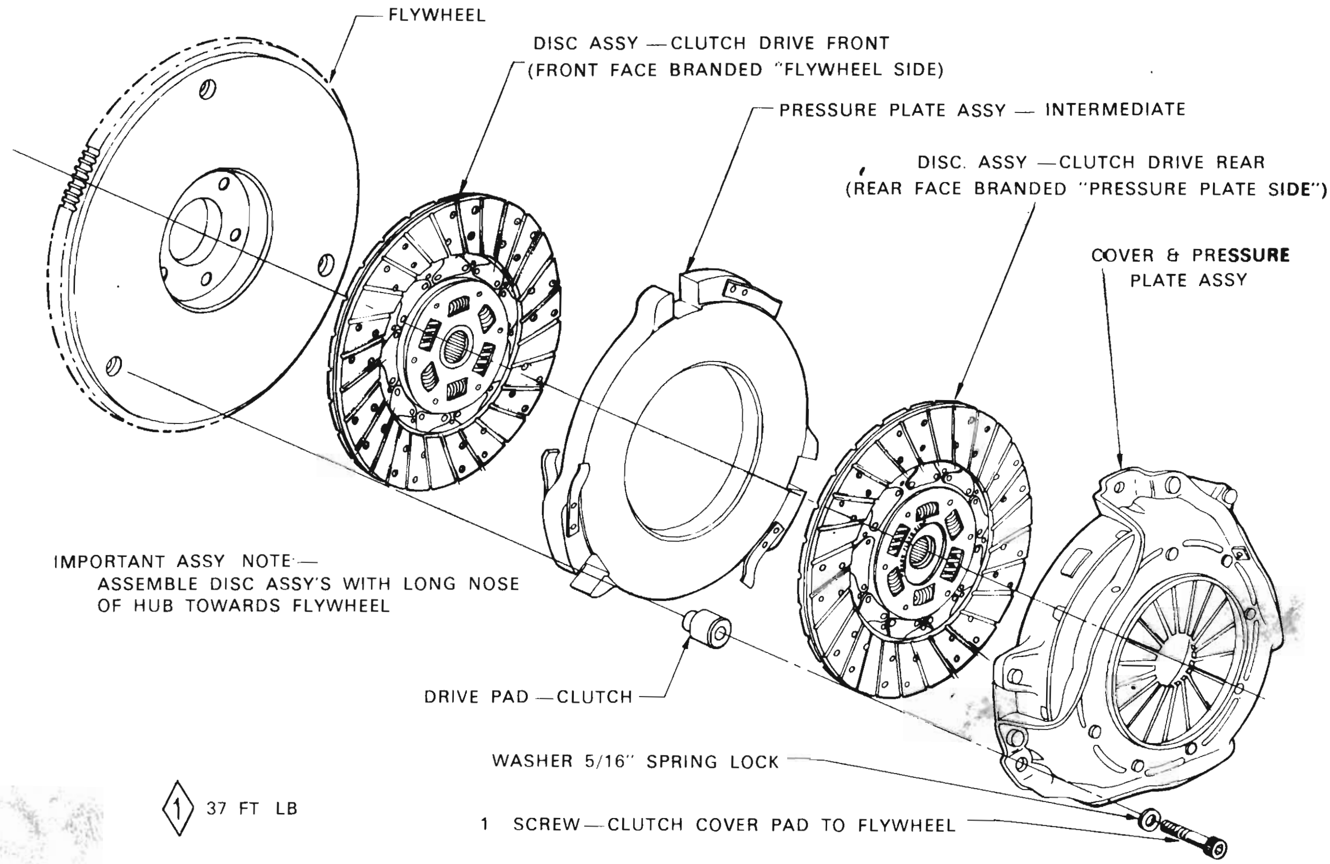
6. REMOVING OR INSTALLING CLUTCH FORK

To Remove

(1) Disconnect the clutch fork retracting spring.

(2) Disconnect clutch rod from clutch fork.

(3) Pry dust seal boot out of clutch housing and remove from clutch fork.



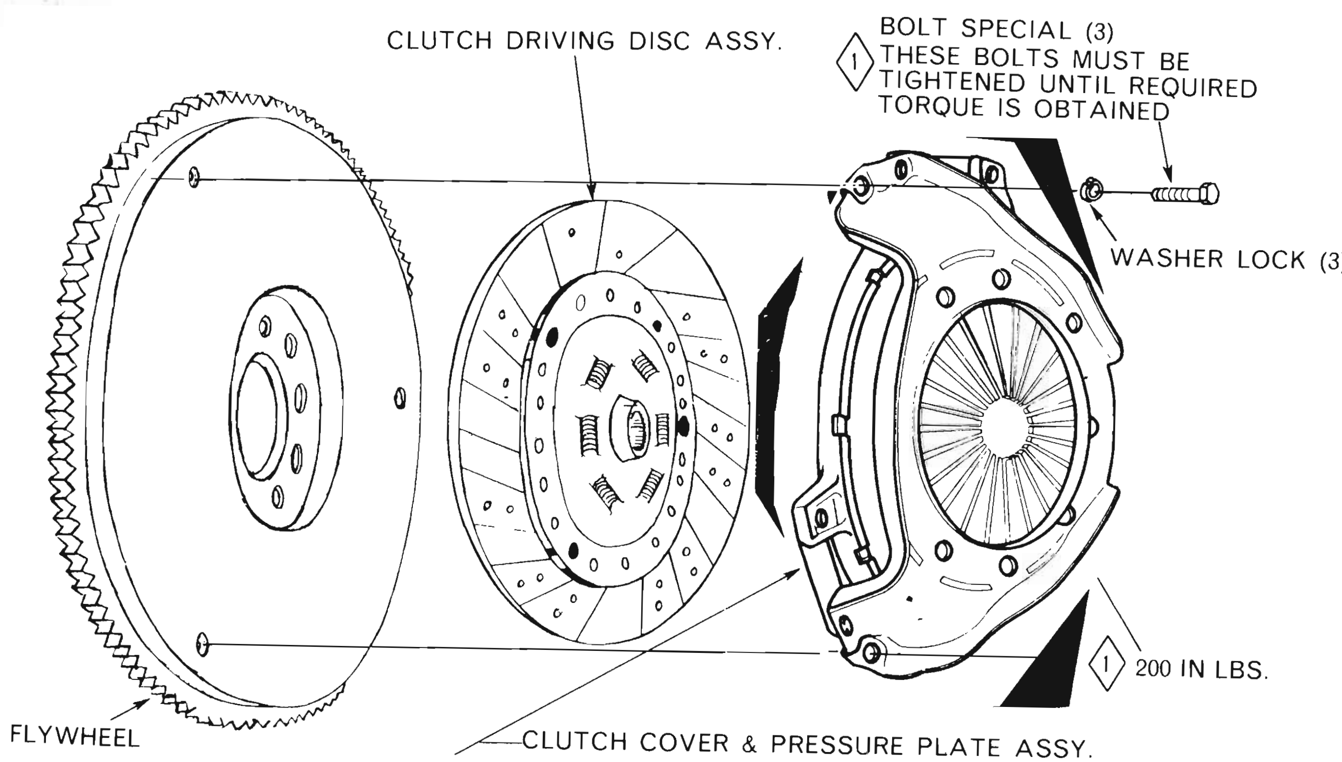


Fig. 4 – Clutch Disc and Pressure Assembly
(Disassembled View)

(4) Rotate retaining spring clips of the throw-out sleeve off the ends of the clutch fork.

(5) Grasp the outer end of clutch fork and pull clutch fork out and off knife edge pivot. The clutch fork has a riveted flat retaining spring that is engaged in a hole of the pivot bracket.

(6) Remove the clutch fork from clutch housing.

To Install

(1) Apply short fibre grease to the pivot edge and hole of pivot bracket. The clutch release fork pivot is an "L" shaped bracket bolted inside the clutch housing.

(2) Lubricate contact areas of end of clutch fork.

(3) Install clutch fork in housing, being careful to engage flat retaining spring in the hole of the pivot.

(4) Rotate retaining springs of bearing sleeve over ends of clutch fork.

(5) Install dust seal boot over release fork and engage the groove of the boot into the clutch housing.

(6) Attach clutch rod and re-hook retracting spring.

(7) Adjust clutch pedal free play *(see Para. 2)*.

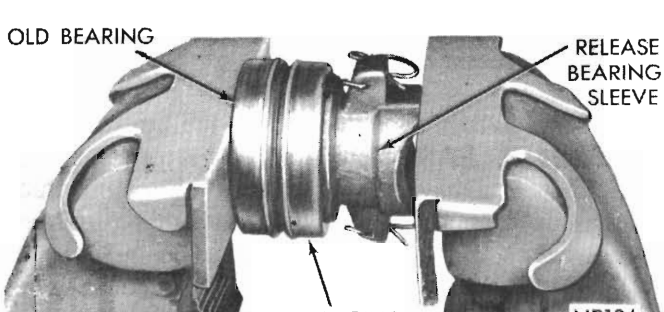


Fig. 11 – Installing clutch release bearing

7. REMOVING OR INSTALLING THE RELEASE BEARING (TRANSMISSION REMOVED)

To Remove

(1) Support the release bearing in a vice or press, and carefully press out the release bearing sleeve.

(2) Position new bearing on end of sleeve, and using old bearing against the face of the new bearing, carefully press on the bearing. Make certain bearing is seated on flange of release bearing sleeve.

Exercise care to avoid damaging the bearing race. Never drive the bearing on the sleeve with a hammer. Place the bearings and sleeve in a vice, and press the new bearing on the sleeve *(refer Fig. 11)*. Turn the bearings as the are pressed together. The new bearings must be flush with the shoulder of the release bearing sleeve.

(3) Fill the cavity of the bearing sleeve with short fibre grease prior to installation in vehicle.

To Install

(1) Slide release bearing as far forward as it will go. Slide clutch fork into housing and engage with springs on throw-out bearing, allowing retaining spring to pass around pivot stud.

Before installing clutch fork, be sure the fork fingers are lubricated with short fibre grease, and the pivot indent lubricated with Chrysler Door Ease Lubricant.

(2) Slide dust boot over outer end of clutch fork and down against clutch housing. Insert boot in housing until groove in boot fits around edge of housing opening.

(3) Engage rear end of clutch fork rod with fork, align holes. Install clevis pin and flat washer. Secure with spring retainer.

(4) Re-hook release fork pullback spring.

8. REMOVING OR INSTALLING TORQUE SHAFT PIVOT BUSHING

(1) Unhook clutch release fork return spring from the bracket and fork.

(2) Disconnect the clutch release fork rod from torque shaft.

(3) Remove the clutch release rod spring clip from the release rod and disconnect rod from torque shaft.

(4) Remove the torque tube bracket screws from the side shield and the pivot stud from the engine block and remove torque tube assembly.

(5) Remove spring retainer clamp and spring retainer from end of torque tube and pull out the two pivot bushings. Repeat procedure at other end of tube.

(6) Clean old grease from within tube and lubricate. Reassemble and re-install to vehicle.

9. CLUTCH HOUSING ALIGNMENT

When performing adjustments or repairs that involve removing the clutch housing, it will be necessary to align the face of the housing parallel with the face of the block when assembling.

Bore Runout

To correctly align the clutch housing, proceed as follows:

(1) Mount Tool E6C10 with dial indicator on flywheel as shown in Fig. 12.

(2) With flywheel turning tool, crank engine whilst noting dial indicator needle deflection.

Out-of-round of bore must not exceed .008″ (maximum) total indicator reading. If bore runout is in excess of .008″ correct as follows:

Assume that total indicator reading is .020″, in a direction which approximates 2 o'clock on engine block *(refer Fig. 13)*.

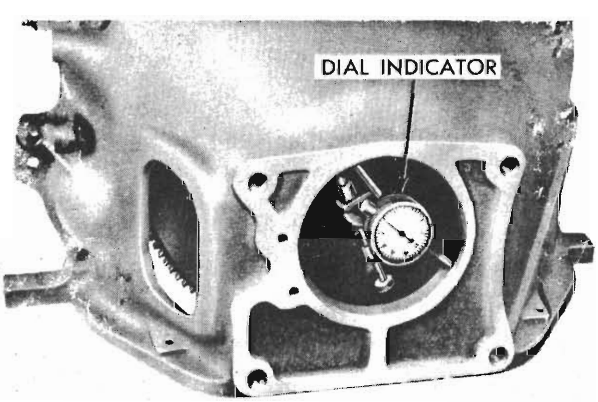


Fig. 12 – Checking clutch housing bore (Tool E6C10)

In this case the housing is off crankshaft centreline .010″ or one half total indicator reading, which is .006″ greater than allowable limit of .004″ (one half of total indicator reading).

The use of a pair of .007″ offset dowels will bring the runout well within the allowable limits of .008″ minus .007″ (offset dowels) equals .001″ runout. Dowels must be used in pairs (same part number).

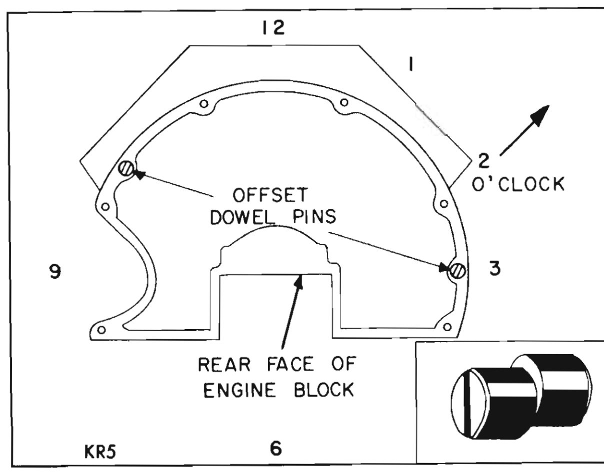


Fig. 13 – Offset dowel — diagram (Typical)

(3) To install the dowel pins (pair). Disconnect and remove starter motor, and remove clutch housing. Remove dowel pins from engine block. Select a pair of dowel pins (eccentric) from the available selection which follows. The part number and amount of offset are shown: .007″ (No. 1736347), .014″ (No. 1736348), .021″ (No. 1736353).

The amount of eccentricity of the dowel will produce a total indicator reading change of double the dowel eccentricity, therefore, a pair of dowels with the nearest to half of the total indicator runout of the bore should be selected. For runout (total indicator reading) of .012″ to .020″, use a .007″ dowel, .022″ to .034″ use a .014″ dowel, and .036″ to .052″ use .021″ dowel.

(4) Install both dowels with the slots parallel and aligned in the direction to correct the bore runout. (Slot indicates the direction of maximum dowel eccentricity.) Both dowels must be inserted into engine block, up to offset shoulder.

(5) Install and tighten clutch housing bolts to 50 lbs. ft. Re-mount dial indicator and re-check bore runout. Small corrections can be made by

removing clutch housing (if necessary) and turning dowels with a screwdriver to shift the housing and bring bore within limits *(refer Fig. 12).*

Face Runout

(1) Re-locate dial indicator, as shown in Fig. 14. Rotate flywheel using tool. If the total indicator reading is greater than .006″ note the amount of total runout and location of lowest indicator reading (i.e., the point where the indicator arm or follower is extended the furthest).

(2) To correct excessive runout, place correct thickness of shim stock between the clutch housing and engine block, or between the transmission and clutch housing. After re-checking face runout, tighten housing bolts to 50 lbs. ft. Install transmission.

10. STEAM CLEANING PRECAUTIONS

Since the clutch housing has provisions for ventilation, condensation from steam vapours tend to accumulate on the internal clutch mechanism

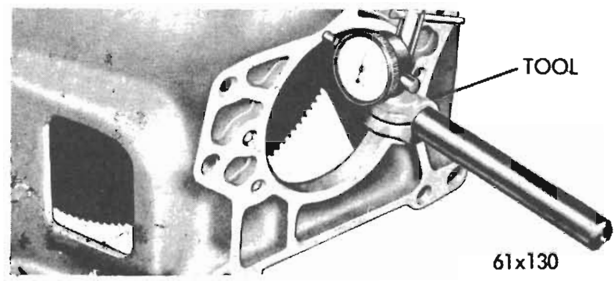


Fig. 14 – Checking clutch housing alignment (Tool E6C10)

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 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/or flywheel.*

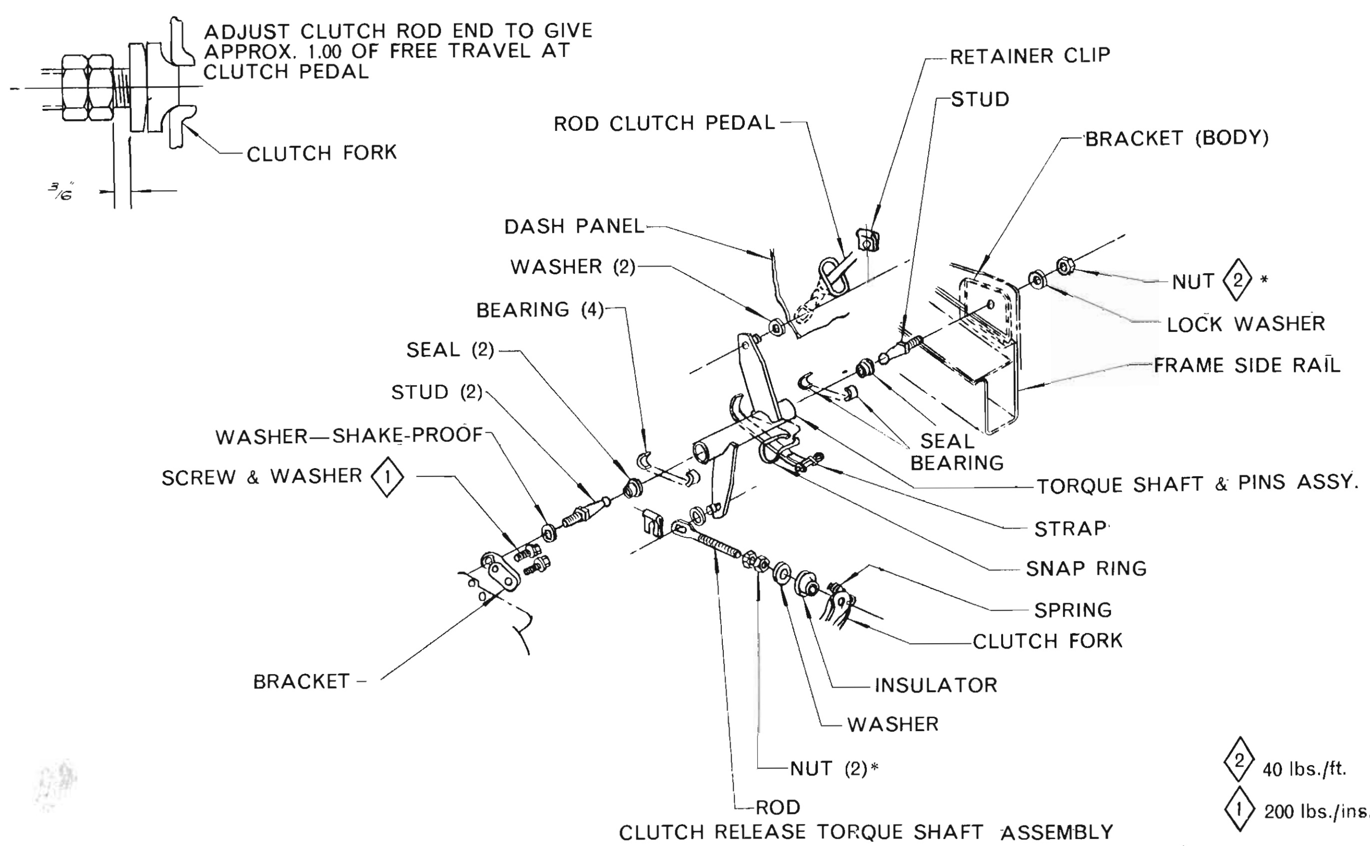


Fig. 15 – Clutch Release Shaft

GROUP 7

COOLING SYSTEM AND ACCESSORY BELT DRIVE

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

PART 1 — COOLING SYSTEM

6 CYLINDER

SPECIFICATIONS

Engine Type	215 cu. in.	245 cu. in. and	265 cu. in.
Capacity — with Heater	24 pints	24 pints	
Radiator — Type		Tube and Spacer	
— Core Dimensions	19″ x 1.5″	22″ x 1.25″	
— with Air Cond.	22″ x 1.25″	22″ x 1.50″	
— Fin Spacing (Manual)	10	10	
— Fin Spacing (Auto)	12	12	
Transmission Oil Cooler			
(Auto Trans.) — Type		Concentric Tube	
— Location		Radiator Bottom Tank	
Radiator Pressure Cap		Pressure Vent	
Radiator Pressure Setting		16 p.s.i	
Fan: (Std.) *(Pacer) △ Taxi			
Blades/OD/Projected Width)	*4 x 16″ x 1.5″ △	4 x 17″ x 1.5″	
(with Air Cond.)	4 x 18″ x 2.0″	4 x 18″ x 2.0″	
Spacer (Std.)	1.24″	1.24″	
(with Air Cond.)	1.35″	1.35″	
Thermostat — Type		Pellet	
— Setting		177°–184° F	
(with A/C)			
Water Pump — Type		Centrifugal	
— Bearing Type		Sealed Ball	

WARNING: THE COOLING SYSTEM MAY CONTAIN TOXIC (POISONOUS) INHIBITORS

8 CYLINDER

SPECIFICATIONS

Engine Type	318 cu. in.	340 cu. in.	360 cu. in.
Capacity — with Heater	26 pints		
Radiator — Type	Tube and Spacer		
— Core Dimensions	22″ x 1.25″	22″ x 1.5″	22″ x 1.5″
— (with Air Cond.)	22″ x 2″	22″ x 2″	22″ x 2″
— Fin Spacing	12 p/in:	12 p/in.	12 p/in.
— (with Air Cond.)	12 p/in:	14 p/in.	14 p/in.
Transmission Oil Cooler			
— Type	Concentric Tube		
— Location	Radiator Bottom Tank		
Radiator Pressure Cap	Pressure Vent		
Radiator Pressure Setting	16 p.s.i.		
Fan:			
Blades/OD/Proj. Width	4 x 18″ x 2″	7 x 18″ x 2.25″	7 x 18″ x 2.25″
(with Air Cond.)	7 x 18″ x 2.25″	7 x 18″ x 2.25″	7 x 18″ x 2.25″
Spacer (Std.)	1.69″	1.69″	1.69″
(with Air Cond.)	1.35″		
Thermostat — Type	Pellet		
— Setting	177°–184° F		
Water Pump — Type	Centrifugal		
— Bearing	Sealed ball		

WARNING: THE COOLING SYSTEM MAY CONTAIN TOXIC (POISONOUS) INHIBITORS

SPECIAL TOOLS

E7C10A	Remover — water pump seal
E7C15	Pressure testing gauge
E7C20	Flushing gun attachment
E7C25	Fun hub remover
E7C25A	Fan hub installer
E1119	Pliers — Hose clip remover/installer
	Water pump bearing and shaft installing sleeve

TORQUE SPECIFICATIONS

Water pump bolts	30 lbs.-ft. (3/8″)
Water pump bolts	17 lbs.-ft. (5/16″)
Fan attaching bolts	17 lbs.-ft.
Thermostat housing bolts	30 lbs.-ft.
Oil line connector union nuts	75 lbs.-in.
Radiator mounting screws	75-115 lbs.-in.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. EXTERNAL LEAKAGE

(1) Loose hose clamp.

(2) Faulty rubber hose.

(3) Leaking radiator.

(4) Worn or damaged water pump seal.

(5) Loose core hole plug.

(6) Damaged gasket if engine has been stored.

(7) Warped cylinder head.

(8) Cracked cylinder head.

(9) Cylinder head bolts loose, or tightened unevenly.

(10) Cracked cylinder block.

(11) Sandholes or porous condition in block or head.

(12) Leak at water temperature sending unit.

(13) Leak at water pumping attaching bolt.

(14) Leak at exhaust manifold stud.

(15) Cracked thermostat housing or mating surfaces not flat.

(16) Dented radiator inlet or outlet tube.

(17) Cracked or porous water pump housing.

(18) Leak ir heater system.

2. INTERNAL LEAKAGE

(1) Refer to cases (6) to (11) listed under *"External Leakage"*.

(2) Cracked cylinder wall.

(3) Cracked valve port.

(4) Crack in block into pushrod compartment.

(5) Check in head into valve compartment.

3. OVERFLOW LOSS

(1) Refer to causes listed under *"Poor Circulation"* and *"Overheating"*.

(2) Combustion gas entering system through head gasket or cracked head or block.

(3) Overfilling.

(4) Coolant foaming due to poor quality anti-freeze or corrosion inhibitor.

4. POOR CIRCULATION

(1) Restricted radiator core water passages.

(2) Restricted engine water jacket.

(3) Faulty thermostat.

(4) Low coolant level.

(5) Collapsed radiator hose. (A bottom hose with defective spring may collapse only at high engine speed.)

(6) Air leak through loose or defective bottom hose or porous water pump casting.

(7) Water pump impeller broken or loose on shaft.

(8) Fan belt glazed, oil soaked or loose.

(9) Frozen coolant.

5. CORROSION

(1) Use of water containing large concentration of lime and minerals.

(2) Poor quality anti-freeze or corrosion inhibitors.

(3) Use of anti-freeze for extended length of time.

(4) Failure to use correct corrosion inhibitors.

(5) Low coolant level.

(6) Air leak through loose or defective bottom hose or porous water pump casting.

(7) Combustion gas leak into coolant.

(8) Insufficient or incorrect service flushing procedures.

6. OVERHEATING OR APPARENT OVERHEATING

(1) Refer to causes listed under *"Poor Circulation"*.

(2) Blocked radiator air passages.

(3) Incorrect ignition timing.

(4) Incorrect valve timing.

(5) Low engine oil level.

(6) Tight engine.

(7) Restricted overflow tube.

(8) Faulty radiator pressure cap or seat.

(9) Faulty temperature sending unit.

(10) Restricted muffler, exhaust pipe or tail pipe.

(11) Dragging brakes.

(12) Driving in heavy mud or sand.

(13) Heavy trailer towing on steep grades or at high speeds.

(14) Excessive engine idling.

(15) Inaccurate temperature gauge or switch.

(16) Frozen coolant.

(17) Air conditioning equipment malfunction or overloaded.

(18) Incorrect fan installed.

(19) Incorrect water pump impeller installed.

(20) Air conditioner condenser fins blocked.

7. OVERCOOLING

(1) Faulty thermostat or not installed.

(2) Inaccurate temperature gauge.

(3) Faulty temperature sending unit.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

All engines are equipped with a thermostat as standard equipment. With this thermostat, an ethyl-glycol base type anti-freeze may be used. In order to maintain cleanliness, the cooling system should be drained, throughly rinsed and filled with the correct coolant in accordance with the lubrication and maintenance schedule.

Always discard old solutions removed. Maximum cleanliness can be assured by using a cooling system cleaner according to the directions on the label. If the system is badly rusted or clogged, it should be pressure flushed.

When draining the cooling system, the block drain plugs should be removed and the radiator drain cock opened. Refill with demineralised water (or clean rainwater) adding Chrysler Parts Corrosion Inhibitor — Pt. No. 3424491, (6 cyl.) 4 fl./ozs., (8 cyl.) 8 fl./ozs. — also anti-freeze, where required.

The quantity of anti-freeze (if required) to be added should be sufficient to protect at the lowest anticipated temperature.

2. PRESSURE TESTING THE COOLING SYSTEM

(1) For testing purposes only, fill radiator to within ½" of filler neck.

(2) Wipe filler neck sealing surface clean.

(3) Attach Tool E7C15 to filler neck and apply 17 P.S.I. *(see Fig. 1)*.

(4) If pressure gauge reading holds steady, the system is satisfactory. If pressure drops, continue test as follows:

(5) Check all points for external leaks. If no external leaks are found after the gauge dial showed a drop in pressure, continue test.

(6) Remove tester and run engine until normal operating temperature is reached.

(7) Re-attach Tool E7C15, apply 7 P.S.I. pressure and increase engine speed to half throttle.

(8) If needle on dial fluctuates, it indicates a combustion leak, generally at the head gasket.

(9) If needle on dial did not fluctuate in step (7), sharply accelerate the engine several times. If an abnormal amount of water emits from the tail pipe, it indicates a head gasket leak, cracked block or cracked head.

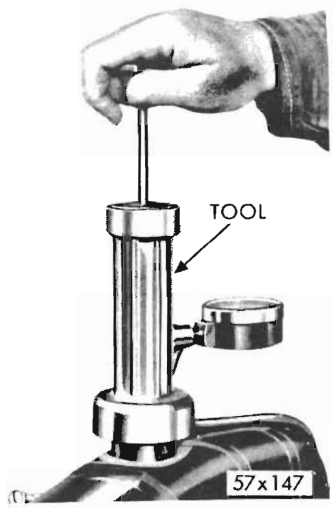


Fig. 1 – Pressure testing the cooling system (Tool E7C15)

3. PRESSURE FLUSHING THE COOLING SYSTEM

(1) Clean the system, using a cooling system cleaner according to the directions on the label.

(2) Drain the radiator and remove both radiator hoses.

(3) Remove the thermostat and re-install the housing.

(4) Connect flushing gun, Tool E7C20, to the engine thermostat housing, using a length of rubber hose.

(5) Install a drain hose in the water pump inlet.

(6) Connect a flushing gun to sources of water and air pressure.

(7) Fill the block with water by restricting the drain hose. Leave the water valve open.

(8) Open and close the air valve to agitate and force away any foreign material. Continue the operation until the water runs clear.

(9) For final block flushing, fill the block with water and remove the drain plugs. Use air pressure until the water from the block drains runs clear.

(10) To pressure flush the radiator, disconnect the two hoses from the engine and attach them to the radiator. Attach the flushing gun hose to the lower radiator tank and the drain hose to the top tank.

(11) Fill the radiator with water, leave the water valve open, and open and close the air valve until the water runs clear.

(12) For final radiator flushing, attach flushing gun to top hose and repeat flushing operation.

(13) Test the thermostat *(see Para. 5)*. If satisfactory, install with pellet toward engine, using a new gasket.

(14) Install hoses and refill cooling system to 1¼" below filler neck, using demineralised (or rain) water and adding Chrysler Parts Corrosion Inhibitor Pt. No. 3424491 (6 cyl.) 4 fl./ozs. (8 cyl.) 8 fl./ozs. — also anti-freeze, where required.

(15) Run engine until the temperature gauge indicates normal operating temperature and continue an additional five minutes to release any air trapped in system. Check coolant level and, if necessary, add additional water.

4. FAN

There are no repairs to be made on the fan. If the fan is bent or damaged, it should be replaced, straightening a bent fan blade greatly reduces its strength and is a dangerous practice.

5. THERMOSTAT

The thermostat is actuated by a pellet, containing a copper-impregnated wax *(see Fig. 2)*. As the temperature of the pellet increases, the wax expands and opens the valve. A 180°F thermostat is standard equipment on 6 cylinder — 190°F on 8 cylinder models.

If the thermostat does not close completely when cold, the engine will warm up slowly and heater performance may also be inadequate. Poor heater performance may also be due to the valve opening at too low a temperature. Too high a valve opening temperature, or a valve that will not open, can cause overheating.

To Remove

(1) Drain the cooling system down to thermostat level or below.

(2) Remove the upper hose from the thermostat housing using pliers E1119 to remove clip.

(3) Remove the thermostat housing bolts and remove the thermostat and housing.

To Test

(1) Visually inspect thermostat to make sure valve closes tightly. If valve does not close completely due to dirt, sand, or other foreign material. clean valve and heat. If valve does not close tightly when clean, install a new thermostat.

(2) Open the valve by hand or by heating in water. Insert a $\frac{1}{8}''$ wide strip of .003″ feeler stock into the opening and allow the valve to close. If the feeler stock will not hold in place, discard the thermostat.

(3) Suspend the thermostat by the feeler stock strip, in a container of water. Make sure the thermostat does not touch the sides or bottom of the container.

(4) Heat the water and stir it continuously (to ensure uniform temperature) and check the water temperature at which the thermostat falls off the feeler strip.

The thermostat should drop off at a water temperature of 175° to 185°. (180°F) or 180° to 195° (190°F) thermostats.

(5) Continue heating water to approximately 200°F. The thermostat should be fully open at this temperature.

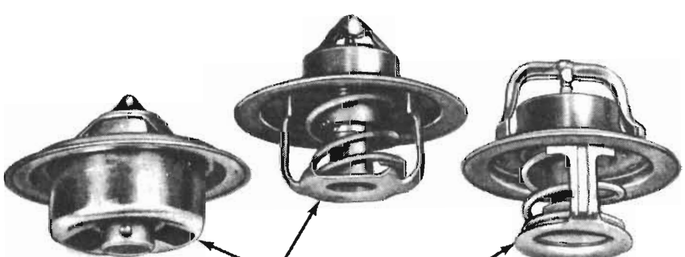


Fig. 2 – Pellet type thermostats

To Install

(1) Using a new gasket, position the thermostat so that the pellet end is toward the engine, and attach with bolts through the thermostat housing.

(2) Refill the cooling system to $1\frac{1}{4}''$ below filler neck with demineralised (or rain) water and add Chrysler Parts Corrosion Inhibitor Pt. No. 3424491 (6 cyl.) 4 fl./ozs. (8 cyl.) 8 fl./ozs — also anti-freeze, where required.

6. RADIATOR PRESSURE CAP

A 16 P.S.I. pressure-vent type radiator cap *(see Fig. 3)* is used as standard equipment.

When removing the pressure cap, turn the cap counter-clockwise to the stop, permitting any pressure to be released through the overflow tube.

This will prevent hot water from spraying out of the radiator filler opening. After pausing at the stop, continue turning counter-clockwise until the cap is released.

Vehicles Equipped with a Press Button Relief Valve

When removing the pressure cap, to prevent being scalded, press the plastic button in the centre of the radiator cap to release the build up of pressure through the radiator bypass hose.

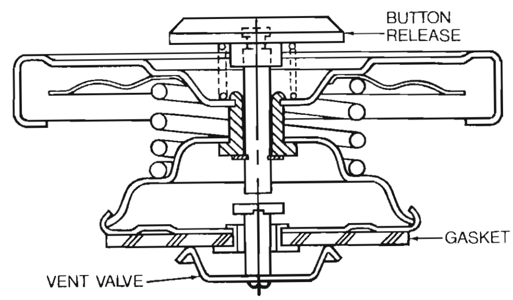


Fig. 3 – Radiator pressure cap

The brass vent valve at the bottom of the cap should hang freely. If the rubber gasket has swollen and prevents the vent valve from hanging loosely the cap should be replaced.

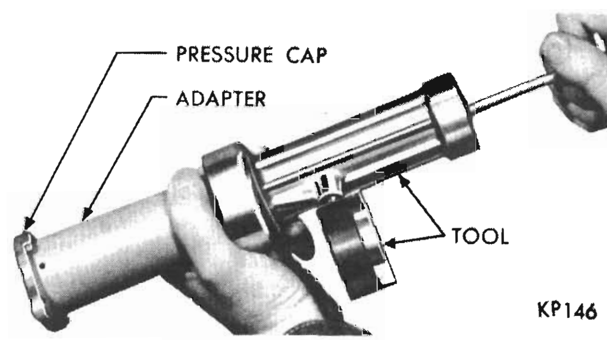


Fig. 4 – Testing the pressure cap (Tool E7C15)

To Pressure Test the Radiator Cap

(1) Attach neoprene seal and adaptor to tester E7C15 *(see Fig. 4)*.

(2) Dip the pressure cap in water and apply cap to tester adaptor.

(3) Apply pressure to cap. If pressure cap fails to hold pressure within a range of 14 to 17 P.S.I., replace with a new, tested cap.

7. RADIATOR HOSES

The hoses are removed and installed using hose clamp pliers E1119. A hardened, cracked, or swollen hose should be replaced.

The spring inside the lower hose is necessary to prevent collapsing of the hose due to suction at high engine speeds.

If this spring is weak or broken, it should be replaced.

8. RADIATOR

To Remove

(1) Drain cooling system.

(2) On cars with automatic transmission, disconnect the oil cooler lines at the radiator bottom tank.

(3) Remove radiator hoses (using pliers E1119) and radiator attaching bolts.

(4) Lift radiator straight up and out of engine compartment.

To Install

(1) Slide the radiator down into position behind the radiator support and install the attaching bolts. Tighten to 75-115 lbs.-in.

(2) Connect hoses, and connect transmission oil cooler lines (if so equipped).

(3) Refill the cooling system to 1¼" below filler including Chrysler Parts Corrosion Inhibitor Pt. No. 3424491 (6 cyl.) 4 fl./ozs. (8 cyl.) 8 fl./ozs. — also anti-freeze, where required.

(4) Check the transmission oil level (after warm-up) and add oil as required.

9. TRANSMISSION OIL COOLER

Automatic transmission equipped cars use a transmission oil cooler in the radiator bottom tank. A leaking oil cooler may permit entrance of transmission oil into the cooling system and engine coolant into the transmission.

To Test Oil Coolers for Leaks

(1) Disconnect both oil lines at the radiator.

(2) Attach a pressure gauge to one fitting, and an air line equipped with a shut-off valve to the other fitting.

(3) Coat all fitting joints with oil.

(4) Apply air pressure (up to 100 P.S.I.). Oil bubbles will identify any fitting joint leaks which should be corrected before proceeding with test.

(5) Close valve and check pressure gauge. If pressure drops off, the oil cooler is leaking.

To Service the Oil Cooler

(1) Remove radiator.

(2) Remove radiator bottom tank.

(3) Melt the soft solder holding cooler to tank.

(4) Remove spring nuts holding cooler fittings to tank and remove cooler.

(5) Install new cooler as follows, or repair old cooler with silver solder and re-install.

(6) Position cooler in tank and apply spring nuts to fittings.

(7) Use soft solder to hold cooler in tank.

(8) Attach bottom tank to radiator using soft solder.

(9) Install the radiator *(see Para. 8)*.

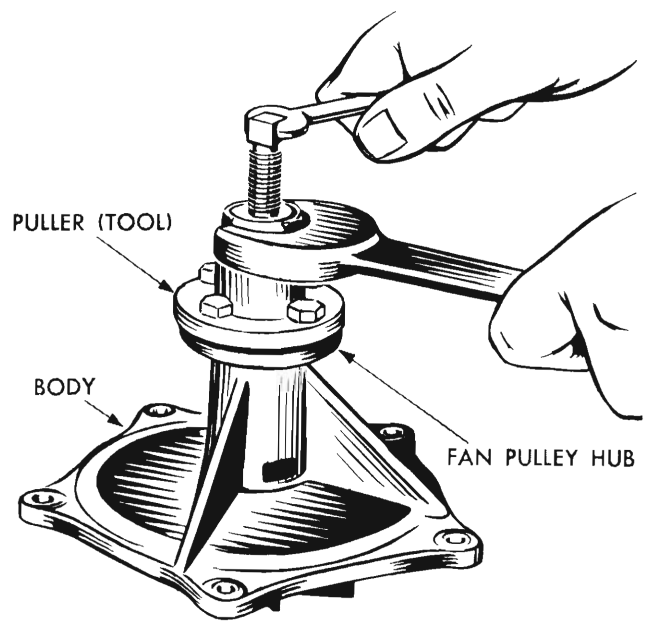


Fig. 5 – Removing the fan hub (Tool E7C25)

10. WATER PUMP

HEMI-6 CYLINDER

To Remove

(1) Drain the cooling system.

(2) Loosen the alternator and swing the alternator toward the engine, then remove the drive belt/s.

(3) Loosen the fan belt idler or power steering pump (where applicable) and remove the belt.

(4) Remove the fan, spacer and pulley, then remove the lower hose from the pump.

(5) Remove the water pump assembly retaining bolts and carefully remove the water pump.

(6) Clean off the gasket surfaces and discard gaskets.

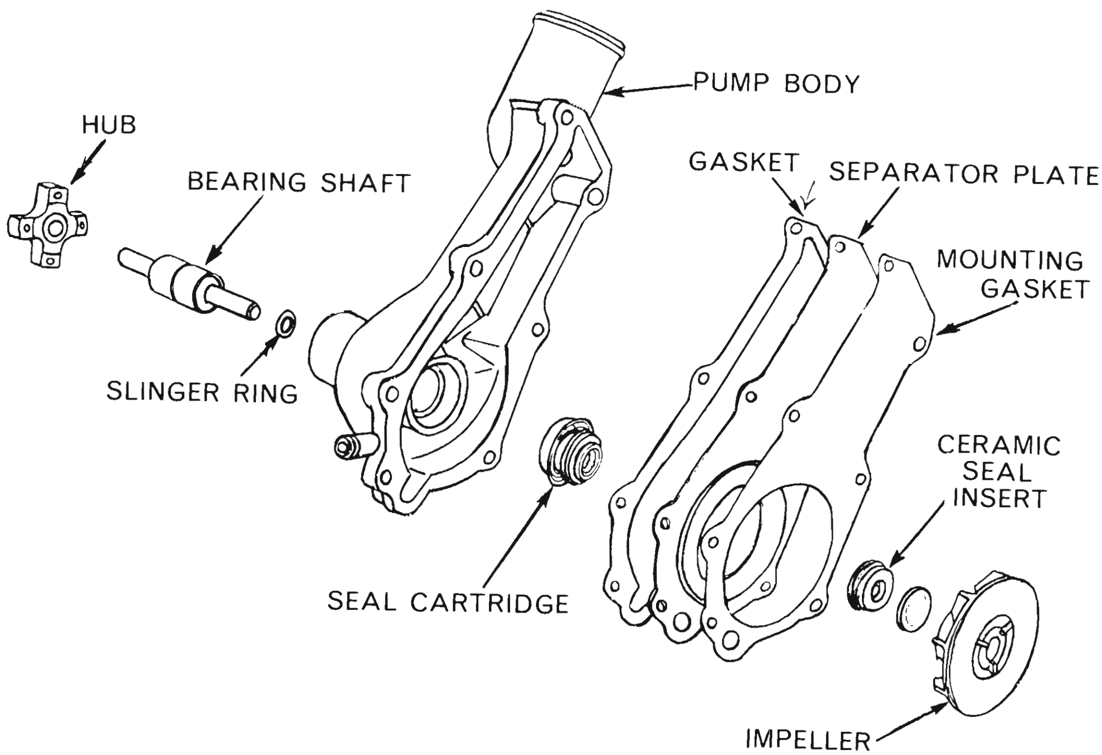


Fig. 6 – Hemi 6 cylinder water pump
(Disassembled view)

To Disassemble

(1) Remove the fan hub with puller Tool, E7C25 (or equivalent).

(2) Place the pump assembly bearing housing gasket face onto a support fixture (which will allow the Impeller, shaft and bearing to pass through).

(3) Press the impeller shaft through the housing and out of the mounting plate. The separating plate may now be removed.

(4) Using a 1⅛″ diameter drift or shaft through the shaft bearing bore, press the impeller seal cartridge from the pump housing.

(5) Clean all parts and examine carefully for housing damage, wear or corrosion.

> NOTE: Take care when cleaning the parts which have a protective coating — Discard any damaged components and the bearing shaft.

To Assemble

(1) Inspect seal retainer recess in the impeller hub to ensure that it is free of nicks, burrs, scratches or rust.

(2) Inspect the water pump housing gasket and seal recess surfaces.

(3) Clean up the gasket surface on a flat plate to ensure a good mounting surface.

> NOTE: When a rubber coated seal cartridge is used, coat the outer diameter of the cartridge with soapy water before installation into the pump body. Ensure that the flange of the cartridge is flush with the pump boss.

(4) Apply a coat of suitable sealer to the seal recess of the pump housing.

(5) Support the pump housing on the bearing housing face and press the seal assembly cartridge into the body using a 1½″ diameter tube positioned on the seal flange, until it seats on the body.

(6) With the slinger ring in position on the long end of the pump shaft, (⅛″ from the bearing), place the long end of shaft into the body from the front.

(7) Press on the bearing squarely using a 1¼″ tube placed on the bearing outer surface only and

push the shaft assembly into the bore until the bearing is flush with the front face with the pump body supported on the gasket face *(refer Fig. 8)*.

> NOTE: Do not press bearing below the housing surface or press directly on the shaft.

(8) Apply gasket cement to the body and plate gasket surfaces and install the body gasket and plate to the body (with raised area away from the body).

(9) Insert the ceramic seal into the rubber support, then install the support ring over the rubber.

(10) Lubricate the seal and shaft using a multi-purpose bearing lubricant with the ceramic seal facing inward (away from impeller) and against the seal cartridge.

(11) Support the impeller shaft on a suitable support, then press the impeller onto the shaft being careful to press only on the inner hub area.

> NOTE: Do not apply pressure to the impeller periphery.

(12) Press the shaft until the shaft is flush with the impeller hub outer surface.

(13) Again using the pad to support the impeller and shaft, press the fan hub (flat side out) onto the shaft until the shaft protrudes through the hub. Install Tool E7C25A to correctly locate the fan hub on the shaft. *Refer Fig. 8.*

To Install

(1) With the gasket surfaces clean, coat the gasket with a suitable sealer.

(2) Install the pump and gasket and tighten the 3/8″ screws to 30 lbs.-ft. or 17 lbs.-ft. for the 5/16″ screws.

(3) Install the drive pulley, correct fan spacer and fan. Tighten screws to 17 lbs.-ft.

> CAUTION: Where the water pump bearing was worn or damaged, be sure to examine the fan blades for fatigue fractures or damage.

(4) Install the radiator hoses and refill cooling system using ‘soft’ water and Chrysler Parts Corrosion inhibitor, then check for leaks.

(5) Install the drive belts and adjust tension as listed in the “Accessory Belt Drive” specifications.

8 CYLINDER

To Remove

(1) Drain the cooling system. Loosen the fan drive belt and swing the alternator in towards the water pump.

(2) Remove the fan, spacer and pulley.

(3) Remove the water pump to housing retaining bolts and washers and remove the water pump from the vehicle. Discard gasket.

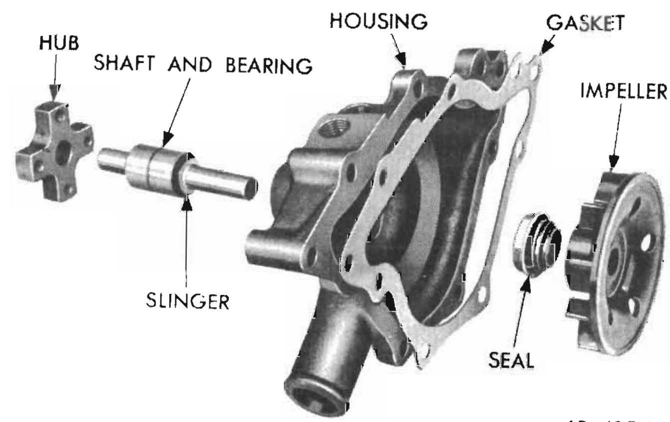


Fig. 7 – Water pump 63x405 A

To Disassemble (Plastic Impeller Type)

(Refer to Fig. 7 and proceed as follows):

(1) Break the plastic impeller and remove it from the metal insert.

(2) Split the sintered metal insert of the plastic impeller with a chisel and hammer.

(3) Remove the rubber portion of the seal and the spring.

(4) Using puller Tool E7C10A remove the retainer portion of the seal.

(5) Remove the fan hub using puller Tool E7C25 *(Fig. 5)*.

(6) Support the pump body on the front face (fan hub end) and apply pressure to the rear end of the shaft to press the shaft and bearing assembly out through the front of the pump. If an attempt is made to remove the shaft in the opposite direction, damage to the pump may result.

(7) Remove any scale, clean, air dry and inspect housing.

To Disassemble

Steel Impeller Type

(1) Remove fan hub with Tool E7C25 *(Fig. 5)*.

(2) Place pump assembly with impeller down on Tool and with Tool support centered on an arbor press.

> CAUTION: Failure to support the pump completely around the mounting flange may result in a broken water pump housing.

(3) Press water pump shaft, bearing, cartridge seal and impeller out of water pump housing as an assembly and discard.

(4) Use a wire brush to remove all rust from housing and fan hub. Clean with a suitable solvent and dry with compressed air.

To Assemble

Inspect the seal surface of the impeller hub to be sure it is free of nicks, burrs, scratches and rust. If necessary remove these blemishes using crocus cloth on a flat plate.

(1) Apply a thin coat of a suitable sealer to the seal pocket in the pump body.

(2) With the pump housing supported at the hub end, use a $1\frac{1}{4}''$ (12 point) socket to apply pressure against the outer lip of the seal retainer and press the seal assembly into the body until the retainer lip is against the pump body.

(3) With the slinger ring in position on the long end of the pump shaft (approximately $\frac{1}{8}''$ from the bearing assembly) into the fan hub end of the pump body bore.

(4) Use a 2″ length of $1\frac{1}{2}''$ OD tube and support the pump body at the seal end, and with suitable support positioned against the outer bearing race only, press the shaft and bearing into the pump body so the end bearing is flush with the housing. (Be careful not to "bottom" the shaft as damage may result).

(5) While supporting the pump on the impeller end of the shaft, press the fan hub onto the shaft so that the shaft extends 11/32″ through the fan hub.

Steel Impeller Type

Lubricate ceramic seat assembly with rubber grease to ensure proper sealing. Install with ceramic facing the cartridge seal. After installation of ceramic seal seat assembly, the rear (or outer) surface of the rubber boot should be flat and square with shaft. If it is not square with shaft, the inner lip of the boot has slipped partially out of the ceramic.

(6) Support the pump on the fan hub end of the shaft and position the new impeller on the pump shaft (blade portion down — plastic impeller).

Steel Impeller Type

Use a tool that will press against the impeller insert only, press the impeller onto the shaft (blades up) until it is flush with the end of the shaft.

To Install

(1) Use new gaskets and install the water pump. Tighten bolts to 30 lbs. ft.

(2) Install pulley, spacer and fan. Fill cooling system and check for leaks. Check belt tension as outlined in *Part 2, "Accessory Belt Drive"*.

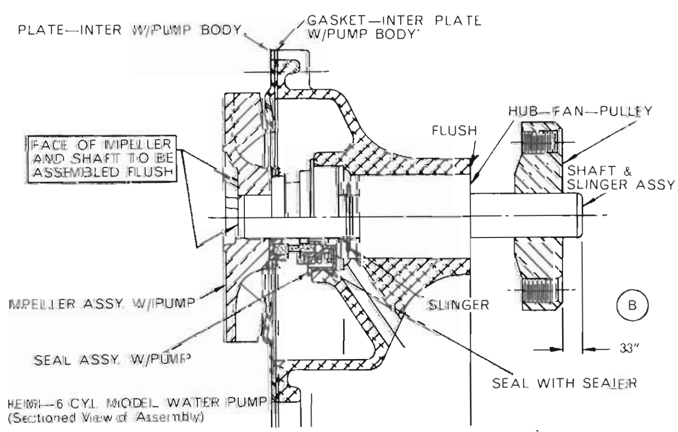


Fig. 8 – Hemi 6 Cyl. Early Type Impellor Water Pump Assembly (sectioned view)

PART 2 — ACCESSORY BELT DRIVE

BELT TENSION SPECIFICATIONS

(Belt Deflection Method)

Deflection (inches) to be applied at midpoint of the longest run of belt segment, under a 10 lb. load *(see Fig. 1)*.

Alternator	⅜″
Power Steering	3/16″
Air Conditioning —	
Hemi 6 cylinder	½″
8 cylinder	7/16″

NOTE: Any belt that has been replaced must be checked and re-adjusted within 1 week of operation to ensure that belt stretch is corrected.

SERVICE DIAGNOSIS

CONDITIONS—POSSIBLE CAUSES

1. INSUFFICIENT ACCESSORY OUTPUT DUE TO BELT SLIPPAGE

(1) Check belt tension and belt condition.

(2) If belt is excessively glazed or worn, replace and tighten as specified.

2. BELT SQUEAKS WHEN ACCELERATING ENGINE

(1) Belt glazed — replace belt.

3. BELT SQUEAK AT IDLE

(1) Misaligned pulley — align accessories.

(2) Non-uniform groove or eccentric pulley — replace pulley.

(3) Non-uniform belt — replace belt.

(4) Dirt and paint embedded in belt — replace belt.

(5) Belt too loose — re-tighten.

4. BELT ROLLED OVER IN GROOVE

(1) Broken cord in belt — replace belt.

5. BELT JUMPS OFF

(1) Belt too loose — re-tighten.

(2) Misaligned pulleys — align accessories.

SERVICE INFORMATION — PROCEDURES

1. CORRECT BELT TENSION

The satisfactory performance of the belt driven accessories depends on the maintenance of correct belt tension. If correct tensions are not maintained (see Para. 2) belt slippage may cause engine overheating, reduced accessory output and greatly reduced belt life. To avoid any such adverse effects, the following regular maintenance service should be performed.

(1) Re-tighten belt to the specified belt tension at "Car to Customer Preparation" and all subsequent services.

The new belt tension specifications *(see Para. 2)* should be used on all belt replacements and the above procedure followed thereafter.

> NOTE: Use only "matched pair" A.C. drive belts when making replacements.

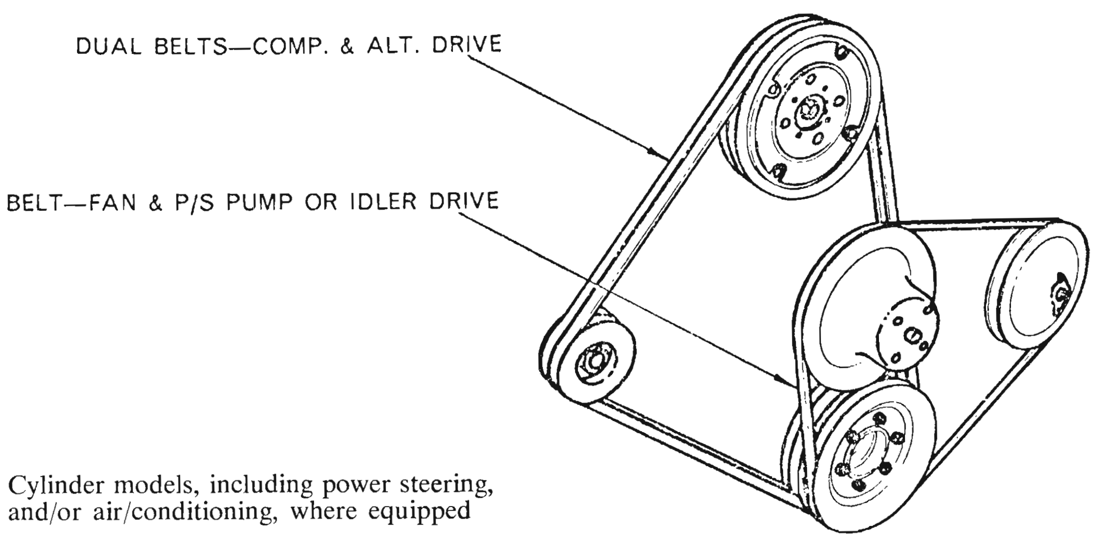
2. BELT DEFLECTION METHOD

All belts can be tensioned by measuring the deflection of the belt at midpoint between the indicated pulleys under a 10 lb. push or pull. A small spring scale can be used to establish the 10 lb. load.

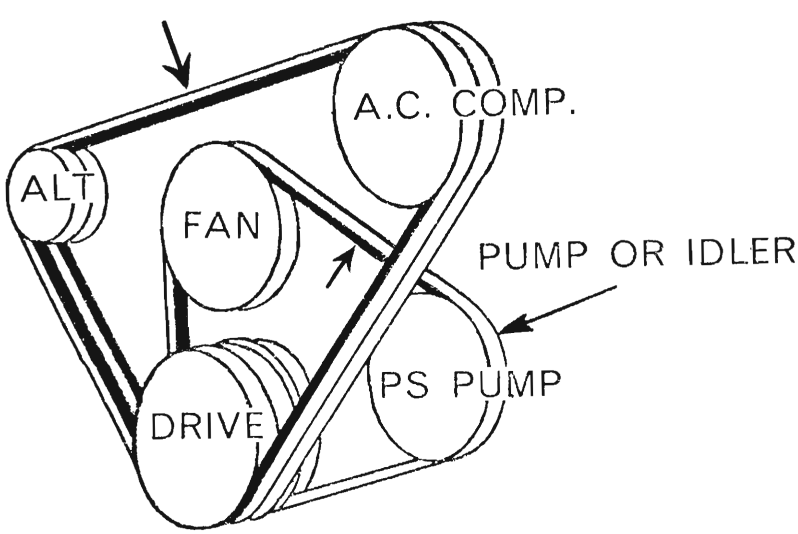
Deflection should be measured at the correct location *(see Fig. 1)*.

To tension the belts by the deflection method, loosen component mounting bolts and use a bar to apply tension to the belt, taking care not to damage the alternator when applying force on this component.

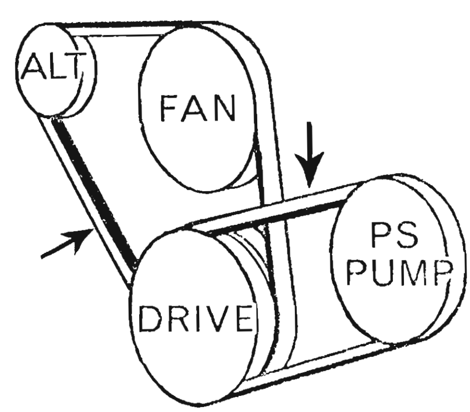
Tighten the mounting bolts and check the deflection *(see Specifications)*. It may be necessary to repeat this procedure several times to establish the correct tension. Any belt that has operated for a minimum of half an hour is considered to be used.



8 Cylinder models, including power steering, and/or air/conditioning, where equipped

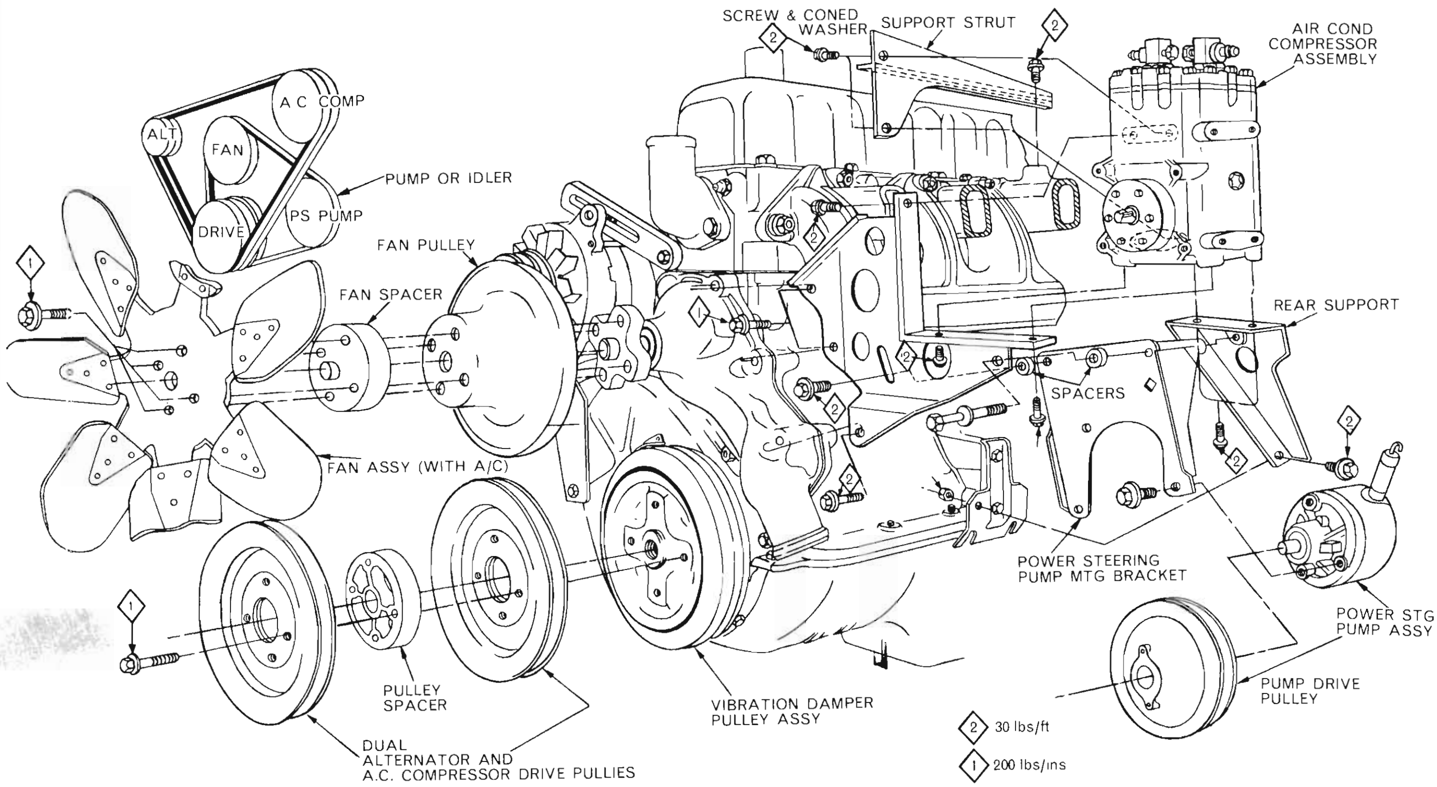


Hemi–6 cylinder models with air cond. and power steering



Hemi–6 cylinder models with power steering only.

Fig. 1 – Belt deflection locations



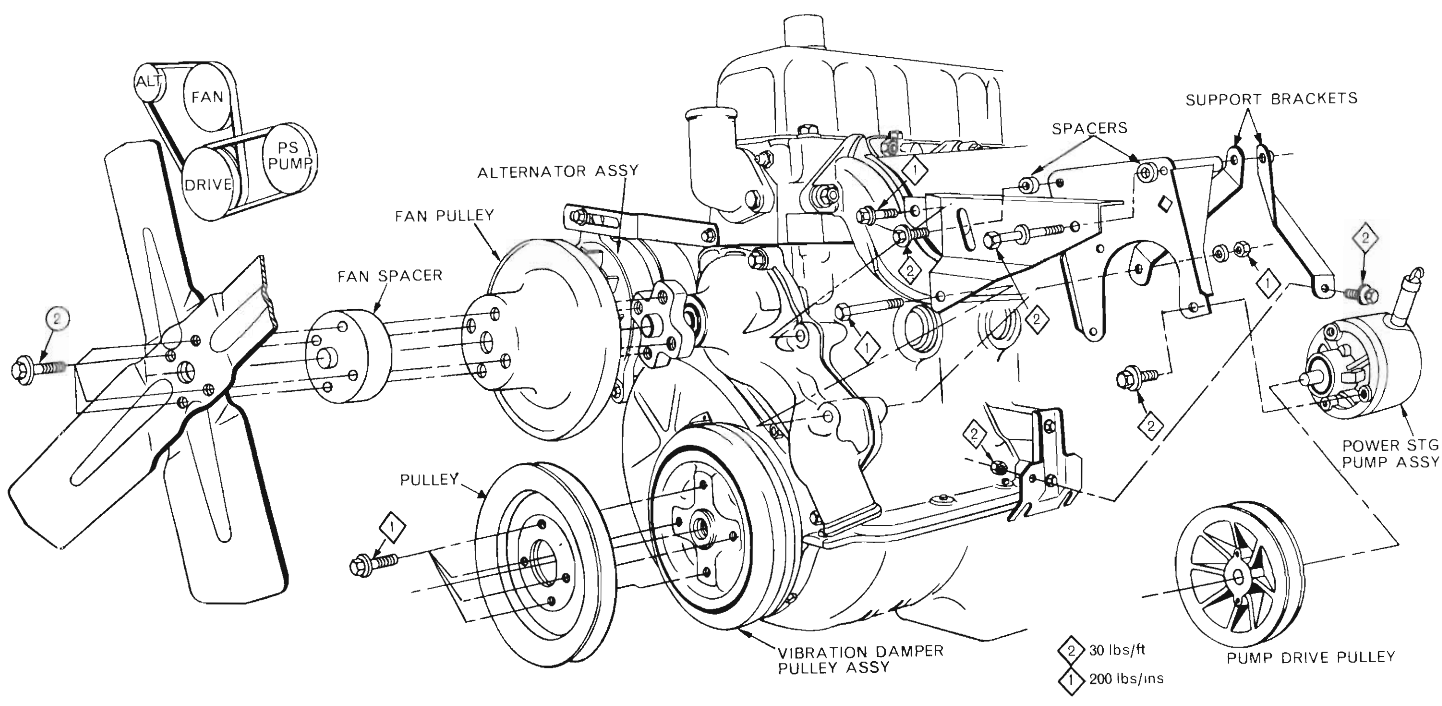


Fig. 2 – 6 Cylinder Accessory Drive Belt Layout

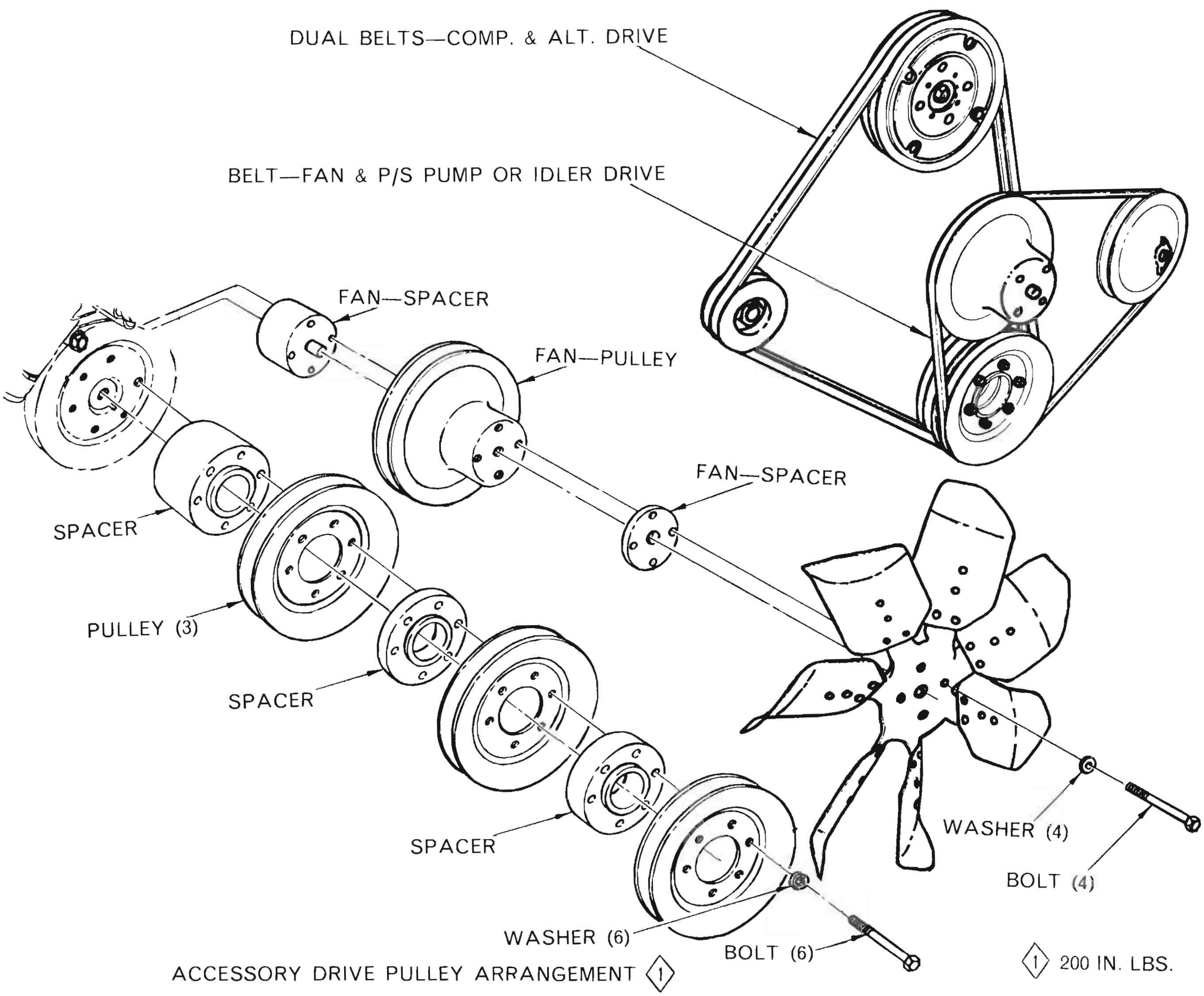


Fig. 3 – 8 Cyl. Accessory Drive Belt Layout

4. THERMAL CONTROL FAN DRIVE

(360 c.i. engine with air conditioning)

The Thermal Control Drive (Fig. 4) is a silicone fluid filled coupling, with a thermostat spring on the drive face, connecting the fan to the fan pulley. This unit allows the fan to be driven in normal manner at low speeds, while limiting the top speed of the fan to a pre-determined level at higher engine speeds.

The thermostat on the drive face is sensitive to the radiator discharge air and it engages the drive for higher fan speed if the temperature from the radiator rises above a certain point.

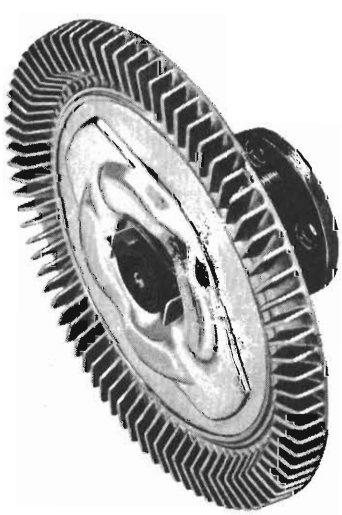


Fig. 4 – Thermal Control Fan Drive

In case of engine overheating during slow car speed or idle operation, increase the engine speed to approximately 1,000 r.p.m. in neutral gear. If the condition is not rectified by increasing engine speed, replace the fan drive unit with a unit known to be operating correctly. Test by operating the vehicle under the same condition as outlined above.

CAUTION: To prevent silicone fluid from draining into fan drive bearing and ruining the grease, ensure that the drive unit is stored with the thermostat spring facing downwards.

GROUP 8

ELECTRICAL SYSTEM

PART 1 — BATTERY

PART 2 — STARTING MOTOR

6 CYLINDER AND 8 CYLINDER

PART 3 — ALTERNATOR AND VOLTAGE REGULATOR

PART 4 — IGNITION SYSTEM

6 CYLINDER

8 CYLINDER

PART 5 — HORNS

PART 6 — WINDSHIELD WIPERS

PART 7 — GAUGES AND INSTRUMENTS

PART 8 — HEADLAMPS AND LIGHTING

PART 9 — WIRING DIAGRAMS

PART 10 — RADIO, TAPE PLAYER, ANTENNA, SPEAKERS

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

PART 1 — BATTERY

SPECIFICATIONS

Make	Chrysler
Capacity—6 CYLINDER except*	45 amp. hr. @ 20 hr. discharge rate
* Taxi Pack	55 amp. hr. @ 20 hr. discharge rate
8 CYLINDER	50 amp. hr. @ 20 hr. discharge rate
Rating	12 volts
No. of Plates—6 CYLINDER except *	7
(per cell) * Taxi Pack	9
8 CYLINDER	9
Terminal Grounded	Negative
Location	Left hand front splash shield in engine compartment
Battery Terminal Bolt Nut Torque	18–24 lbs. ins. (PVC-covered type)

PART 2 — STARTING MOTOR

6 CYLINDER AND 8 CYLINDER

SPECIFICATIONS

Make	Bosch
Model	U–GV (R) 12v. 1.6 H.P.
Rating	12 Volts
No. of Fields	4
No. of Poles	4
No. of Brushes	4
Spring Tension	42–46 ozs.
End Float (Armature)	.002″–.012″
(Pinion drive shaft)	.008″–.080″
Drive	Solenoid actuated positive pre-engaged pinion driven by reduction gear
Stall Test	700 amps @ 4.8 volts
No Load Test	12 volts–100 amps @ 2,500 r.p.m.
Load Test	8 volts–385 amps @ 700 r.p.m.
Commutator out of round	.002″
Commutator min. diam.	1.3125″
Clutch over running torque	1.1–1.6 lbs. in.
Solenoid pull-in voltage	7.5 volts
Backlash with starter ring gear	.012″–.019″

SPECIAL TOOLS

EFAW 10	Mica undercutting machine
EFAW 9	Pole shoe clamp and screw driver
EF 1244B	Spring balance — checking brush spring tension
EFAL 1	Pinion bush extractor
EFAL 3	Smoothing mandrel for bushes
EFAL 26	Torque balance (Test range 1.3–6.9 lbs. in.)
EFAL 27	Torque balance (Test range 0.3–1.0 lbs. in.)

(NOTE: Above tools available from Bosch Distributors)

SERVICE DIAGNOSIS

CONDITIONS – POSSIBLE CAUSES

1. STARTER FAILS TO OPERATE, OR TURNS TOO SLOWLY

(1) Battery discharged.

(2) Defective battery.

(3) Battery terminals loose or oxidized defective earth connection.

(4) Starter terminals or carbon brushes, earth short-circuited.

(5) Carbon brushes of starter have unsatisfactory contact with the commutator, jammed in holders, excessively worn, broken or fouled by dirt or oil.

(6) Starting switch damaged (burnt out, or loose parts impeding switching action).

(7) Excessive voltage drop in circuit, wiring damaged or loose connections.

(8) Neutral starter switch (automatic transmission) faulty.

2. PINION FAILS TO MESH ALTHOUGH ARMATURE ROTATES

(1) Pinion fouled by dirt.

(2) Pinion or ring gear damaged or burred.

3. WHEN STARTER IS OPERATED, ARMATURE ROTATES UNTIL THE PINION IS FRICTIONALLY CONNECTED, THEN STOPS

(1) Battery charge low.

(2) Insufficient pressure on carbon brushes.

(3) Excessive voltage drop in starter circuit.

(4) Over-running clutch slips.

4. STARTER CONTINUES RUNNING AFTER RELEASE OF STARTING SWITCH

(1) Starting switch fails to cut out magnetic or relay switch sticks.

5. PINION FAILS TO DISENGAGE WHEN ENGINE HAS STARTED

(1) Pinion or flywheel gear badly fouled or damaged; release spring fatigued or broken.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

The Bosch U-GV(R) 12v. 1.6 H.P. Reduction Gear Starter Motor is a compound wound, four pole, four brush machine with solenoid actuated positive pre-engaged pinion operation. The main battery supply is not connected until the pinion is in engagement unless tooth abutment occurs. The drive is taken from the armature through reduction gears to the drive shaft which carries the drive assembly. Engagement between starter armature and ring gear is automatically broken by the over-running clutch coupling, which disengages the drive as soon as the engine speed exceeds that of the starter motor.

Operation

Closing the solenoid switching circuit energises the pull-in and holding solenoid windings. The soft iron plunger is drawn in moving the engaging lever which in turn moves the drive assembly towards the ring gear. The helical splines on the armature shaft rotate the pinion slowly to assist in engagement.

Should a tooth of the advancing pinion abut a tooth of the ring gear, the engaging lever will compress the helical spring at the pinion until the switch contacts close. The pinion is then turned and engages with the ring gear under the helical spring pressure.

Before the pinion is completely in mesh the contacts in the solenoid switch are closed by the action of the soft iron plunger. The starter then rotates and cranks the engine. When the starter rotates, the pull-in winding is de-energised by the isolation of its ground connection, providing more power for cranking.

As the starting speed of the engine exceeds that of the starter, the pinion rotates freely and engine acceleration does not affect the starter. The drive is pulled back by the helical tension spring, but, the pinion remains partly engaged as long as the starter switch is operated. Once the starter switch is released, the plunger return spring moves the pinion to its rest position and the switch contacts open.

2. ELECTRICAL TEST OF STARTER MOTOR

The electrical test values depend upon the condition of the battery (capacity and charge). The testing period also plays an important part (heating of the starter and battery discharge). Long cables on the test bench also influence starter performance. The test period should therefore be as short as possible. The batteries must be in good condition and well charged or the electrical values of the faulty starter will differ considerably from the specified test data.

(1) Short-circuit Test

Clamp starter in test bench and connect in accordance with the wiring diagram *(Fig. 1)*.

The ring gear of the test bench and the starter pinion must have the same pitch; adjust backlash and out of mesh clearance.

Operate starter and apply test bench brake until pinion is almost to a standstill. At this moment read current and voltage which must conform to specifications.

(2) Load Test

Clamp starter and connect as in short circuit test. Operate starter and apply brake until the specified draw is recorded, read voltage and R.P.M.

(3) Free Running Test

Re-position starter on test bench so that pinion and ring gear cannot engage. Connect as for previous tests. Operate starter, read amperage, voltage and R.P.M.

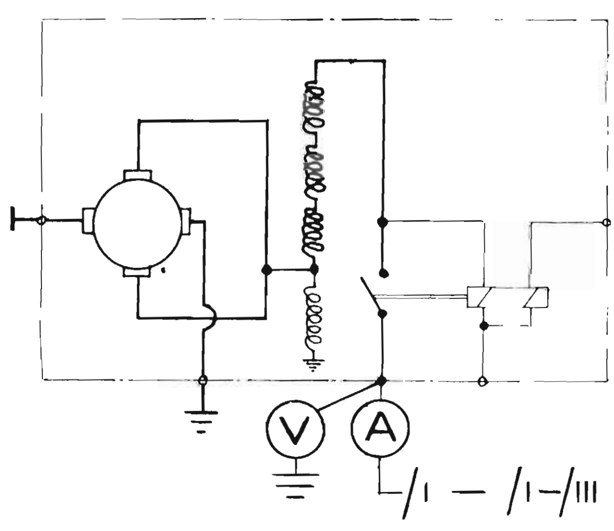


Fig. 1 – Wiring diagram for electrical tests of starter motor

3. SERVICING THE STARTER MOTOR

(1) Disconnect the solenoid switch to starter motor lead from the solenoid switch terminal *(9)*, remove ballast resistor by-pass wire from other terminal *(9A)* where applicable.

(2) Remove the two solenoid switch countersunk attaching screws (where necessary).

(3) Remove solenoid *(10)* by lifting and unhooking the plunger yoke from engaging lever *(11)*.

(4) Remove the two bearing cap screws *(1)*, pull off bearing cap *(2)* and remove circlip *(3)*. (Collect shims.)

(5) Remove through bolts *(4)*.

(6) Remove commutator end cover *(5)*.

(7) Remove four brushes *(6)* and brush holder plate *(7)*.

(8) Remove armature *(15)* with drive end assembly *(17)* and intermediate plate *(13)*.

(9) Remove engaging lever fulcrum bolt *(14)* to release engaging lever.

(10) Take intermediate end plate from drive end housing *(17)* and remove drive shaft *(21)* with drive assembly *(18, 19, 16 and 20)*.

(11) Press stop ring *(18)* on armature shaft towards drive assembly.

(12) Remove circlip *(19)* and drive assembly.

NOTE: Do not attempt to remove the gear from the drive shaft. The shaft with gear is supplied as a complete replacement assembly.

Testing Starter Components

(1) Cleaning and Inspection

Clean and inspect all parts. Check all bushings, bearing surfaces, drive assembly, engaging mechanism and electrical contacts for wear and replace worn parts. If the armature gear is worn it may be necessary to replace armature and drive shaft. A worn gear engaged with a new gear can cause noisy starter operation. Check electrical joints and connections for high resistance and repair where necessary.

(2) Field Coils

Disconnect all ground connections and connect test lamp from field winding terminal to ground. Test lamp will not light if field coil insulation is good.

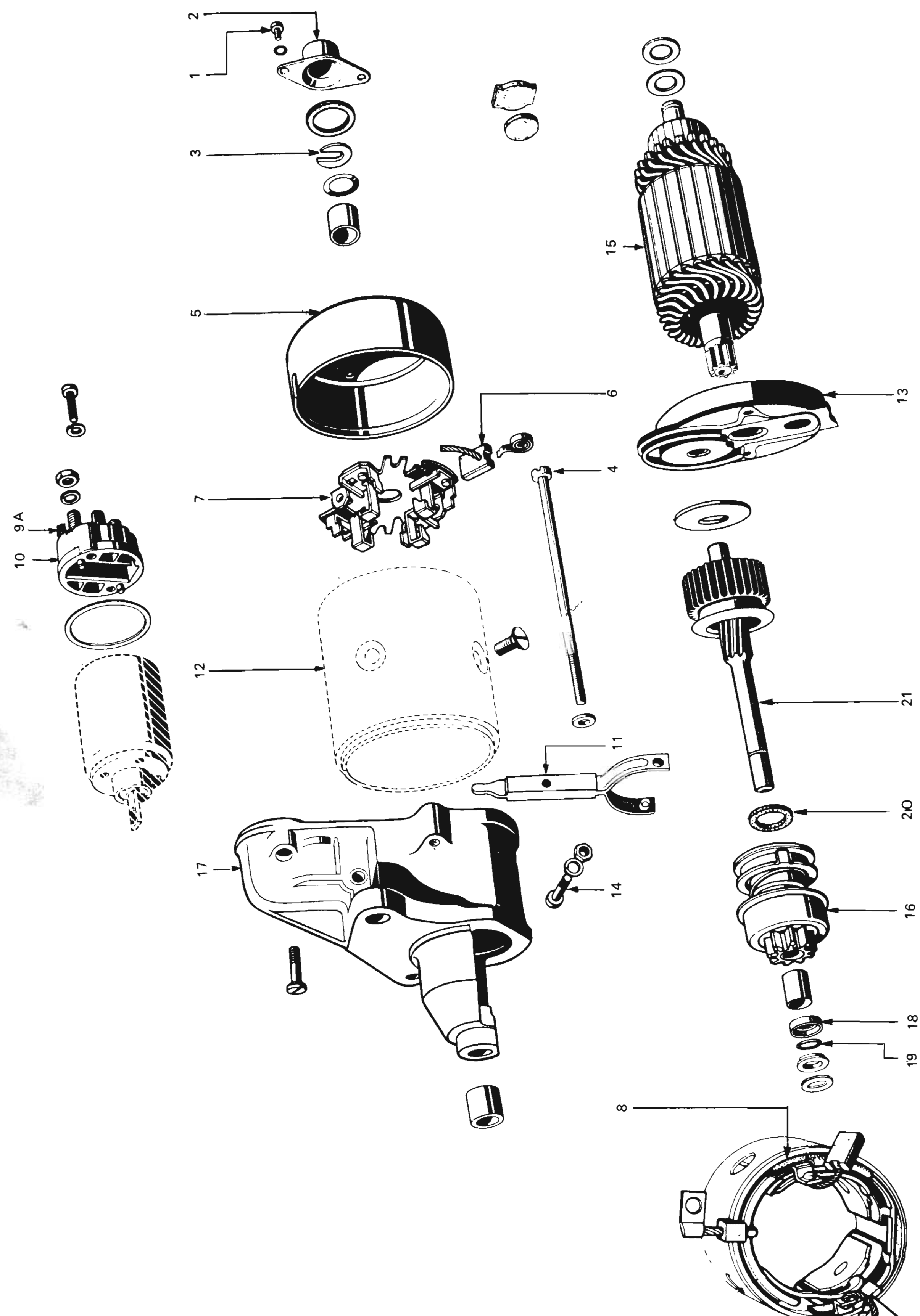


Fig. 2 – Reduction gear starter motor

Defective coils should be removed with an approved pole shoe screw driver only. (See special tools).

(3) Armature

Test armature winding for short circuits in a growler and test insulation to ground with test lamp as under (2) "Field Coils".

(4) Commutator

The commutator should not be eroded or out-of-round (max. permissible out-of-round .002″). If it is necessary to redress the commutator, ensure its minimum diameter is not less than 1-5/16″. Undercut insulation between segments to a depth of 1/32″ using a ground down hacksaw blade or undercutting machine.

(5) Carbon Brushes

Make sure that brushes slide smoothly in their holders, brushes are clean and not chipped. Brushes worn to less than ½″ long should be replaced, at which time the commutator must be machined. Always replace the complete brush set. Check brush spring tension according to the prescribed figures of 41 - 46 ozs. with a spring balance. Replace springs that do not conform to specification.

(6) Bushings

Replace worn bushings by pressing the old bushing out with a mandrel that fits the inside diameter of the brush, with a shoulder for pressing on the bush end. Press the new bushing into place making sure the bush is kept parallel with the hole receiving it. New sintered bushings should be soaked in oil for one hour before installation.

(7) Solenoid Switch

Remove switch cover fastening screws. Unsolder external joints where the winding ends are connected to the terminals and remove cover if the contact bolts are worn replace switch cover assembly.

The operation of the detached switch can be checked by connecting a battery supply through a variable resistance to both pull-in and hold-in windings. Increase the voltage gradually until at 6.0 volts or less the plunger moves into its operational position. The plunger should return to the rest position when the voltage is reduced to between 0.4 and 0.5 volts.

Re-Assembly

To re-assemble starter, reverse disassembly procedure.

Important:

(1) When performing extensive repairs always use Small Parts Set Chrysler Part No. 3542157.

(2) Brake disc must be in position between gear of drive shaft and drive pinion assembly.

(3) Ensure that a water tight seal is made at rubber packing.

LUBRICATION

Bushings: Drive end, pinion, intermediate plate, commutator end - SAE 30 Oil.

Armature shaft bearing surfaces and helical splines, drive assembly helical splines.

Engaging lever bearing surfaces and fork, use Lithium base grease No. 2.

Reduction gear, use grease Chrysler Part No. 3542158 only.

4. MECHANICAL ADJUSTMENTS

End Play

End Play is the lengthwise travel (longitudinal) of a shaft in its bearings. Too little or too much end play results in increased wear of the bearings.

Armature end play is adjusted by placing or removing shims at the commutator end between the end cover and horseshoe circlip on the armature. End play .002″ - 0.012″.

Drive shaft end play is adjusted with shims placed between the distance ring, on the drive-shaft and the drive end housing bushing. End play 0.008″ - .080″.

PART 3 — ALTERNATOR AND VOLTAGE REGULATOR

SPECIFICATIONS

ALTERNATOR

MAKE	AMPS	CURRENT OUTPUT (COLD)	ENG. TYPE	CHRYSLER P/No.
Email	35	38 amps @ 14.4 volts and 2,000 eng. R.P.M.	6 cyl.	3541585
Email	35	38 amps @ 14.4 volts and 2,000 eng. R.P.M.	8 cyl.	3541586
Email	55	53 amps @ 14 volts and 2,470 eng. R.P.M.	6 cyl.	3648005*/3650233†
Email	55	53 amps @ 14 volts and 2,470 eng. R.P.M.	8 cyl.	3650235†
* Taxi Pack only		† Chrysler Models with A/cond. only.		

Voltage	12	
Alternator Pulley Diameter	2.75″ (6 cyl.) 2.60″ (8 cyl.)	
Brushes	2	
Brush Wear Limit	⅛″	
Rotor Slip Rings Diameter	1.350″ (Min.)	
	35 AMP	55 AMP
Field Coil Draw — Cold	2.0 to 2.3 amp max. @ 10 v when rotating rotor by hand	3.3–3.6 amp @ 14V when rotating rotor by hand
— Hot	2.6 to 3.0 @ 14.2 v on full output	2.5–2.8 amp @ 14V on full output
Drive Ratio	2.43:1 (6 cyl.) 2.42:1 (8 cyl.)	

VOLTAGE REGULATOR

Make	Email
Chrysler Part Number	A.2595269
Volts	12
Ground Polarity	Negative
Point Gap	.010″ to .012″ (behind stop rivet)
Air Gap	.040″ to .043″ (behind stop rivet)
Resistors R1	9.0–11.0 ohms
R2	18.0–22.0 ohms
Coil Resistance	55 ohms (approx.)

SPECIAL TOOLS

	Bending Tool (Part of regular service kit)
	Test Lamp
E8C10	Remover—kit pulley and drive end housing bearing
E8C102	Support Installer—support drive end housing (in kit)
E8C10D	Support Remover—rectifier end housing bearing (in kit)
Vane Model 615	Alternator diode tester

ALTERNATOR AND VOLTAGE REGULATOR

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. ALTERNATOR FAILS TO CHARGE

(No output)

(1) Blown fusible wire in voltage regulator.

(2) Alternator drive belt loose.

(3) Worn brushes or slip rings.

(4) Sticking brushes.

(5) Open field circuit.

(6) Open charging circuit.

(7) Open circuit in stator windings.

(8) Open rectifiers (diodes).

2. LOW, UNSTEADY CHARGING RATE

(1) Alternator drive belt loose.

(2) High resistance at battery terminals.

(3) High resistance in the charging circuit.

(4) High resistance in the body to engine ground lead.

(5) Open stator windings.

3. LOW OUTPUT AND A LOW BATTERY

(1) High resistance in the charging circuit.

(2) Low regulator setting.

(3) Shorted rectifier: open rectifier (diodes).

(4) Grounded stator windings.

4. EXCESSIVE CHARGING RATE TO A FULLY CHARGED BATTERY

(1) Regulator set too high.

(2) Regulator contacts stuck.

(3) Regulator voltage winding open.

(4) Regulator base not properly grounded.

5. REGULATOR CONTACTS OXIDISED

(1) High regulator setting.

(2) Regulator air gap incorrectly set.

(3) Shorted rotor field coil windings.

6. REGULATOR CONTACTS BURNED

(1) High regulator setting.

(2) Shorted rotor field coil windings or circuit.

7. REGULATOR VOLTAGE COIL WINDING BURNED

(1) High regulator setting.

8. REGULATOR CONTACT POINTS STUCK

(1) Poor ground connection between the alternator and the regulator.

9. NOISY ALTERNATOR

(1) Alternator mounting loose.

(2) Worn or frayed drive belt.

(3) Worn bearings.

(4) Interference between fan, rotor, stator leads or rectifier.

(5) Rotor or rotor fan damaged.

(6) Open or shorted rectifier.

(7) Open or shorted winding in the stator.

(8) Faulty battery (causing excessive charge rate).

10. EXCESSIVE AMMETER FLUCTUATION

(1) High resistance in the field circuit to the alternator, or an incorrectly set voltage regulator.

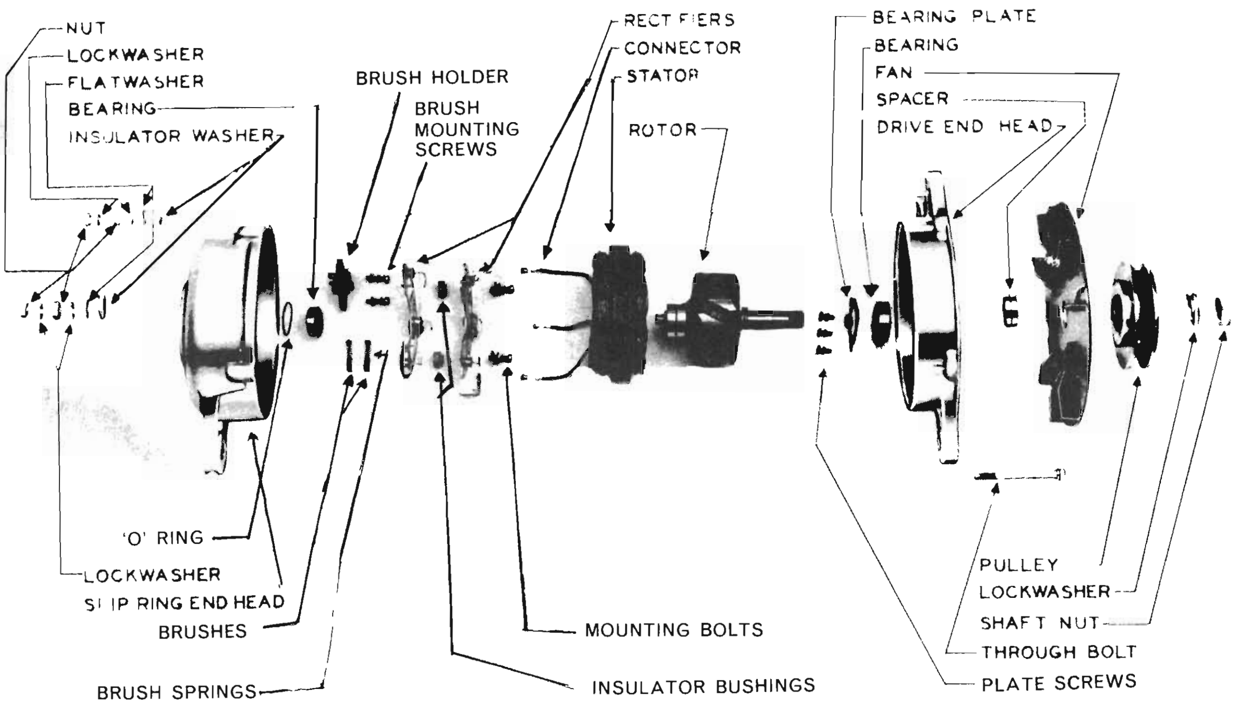


Fig. 1 – Alternator (Disassembled view—typical)

SERVICE INFORMATION — PROCEDURES

> WARNINGS:
>
> *Do not connect any power boosting type testing equipment to the output terminal of the alternator, as diode failure may be the result.*
>
> *Do not disconnect the output terminal lead when the alternator is being driven as this action may also cause diode failure.*

1. DESCRIPTION

The alternator is an A.C. current generator with six built-in silicon rectifiers that convert the A.C. current into D.C. current so that D.C. current is available at the output (BAT) terminal.

A voltage regulator is used in the field circuit to limit the output voltage. Current output is controlled automatically by inductive reactance, thereby eliminating the need of a current regulator.

Rotor

The rotor or field consists of a circular field coil, encased by two end pole pieces. The alternator pole pieces each have four protruding fingers spaced 90° apart. The fingers are evenly spaced providing 8 poles of alternate polarity. This in effect provides an 8 pole rotating electro magnet.

The ends of the field coil winding are connected to the slip rings at the rear end of the rotor. The field coil is externally excited by means of battery current, supplied through the ignition switch, the voltage regulator, the brushes, and the slip rings.

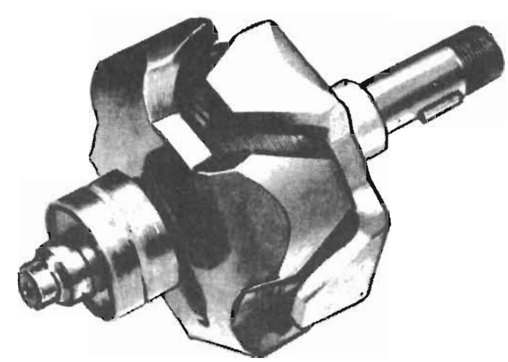


Fig. 2 – Alternator Rotor Assembly

Stator

The stator, or armature consists of an internally slotted laminated stationary armature, having three separate sets of windings. One end of each of the windings is connected to a common 'Y' connection. The other end of each winding is connected to two rectifiers.

Rectifiers

In order to convert the induced A.C. current in the stator windings into usable D.C. current, six silicon (diode) rectifiers are used. Three of the rectifiers have positive polarity cases, and are permanently contained in an insulated steel holder called a "heat sink".

The positive heat sink is connected to the output battery terminal.

The three remaining (diodes) rectifiers have negative polarity cases and are permanently contained in the (rear) steel heat sink which is grounded to the slip ring end head.

The positive and negative heat sink assemblies are separated by insulation pieces and secured to the end head by the insulated output terminal and an insulated screw.

The rectifiers permit the induced A.C. current of the stator windings to flow in only one direction to the output "BAT" terminal. This provides D.C. current at the output terminal.

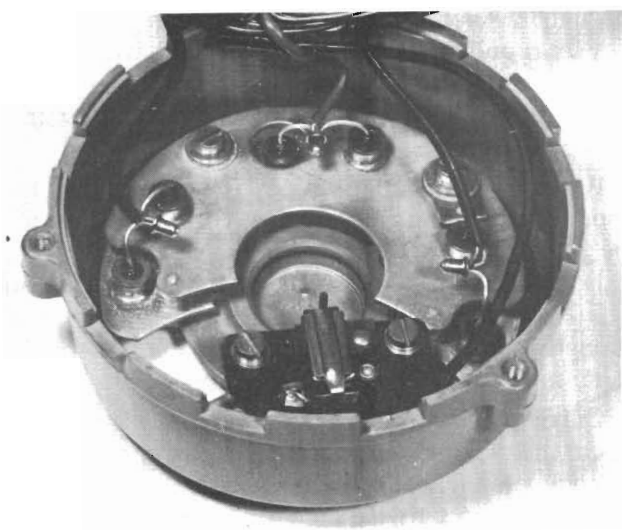


Fig. 3 – Stator and rectifier end shield assembly

Since the rectifiers permit the current to flow in one direction only, through the output terminal to the battery, and their high resistance in the opposite direction prevents flow from the battery, their use eliminates the use of a cut-out relay. For this reason the battery must *always* be connected with the negative terminal to ground.

End Housings

The two die-cast aluminium end shields support and contain the internal parts. The housings are vented at both ends and around the circumference. A centrifugal fan on the rotor shaft draws cooling air through the alternator. Both ends of the rotor shaft are supported by pre-lubricated bearings.

Pulley

The pulley which drives the alternator rotor shaft is secured by a nut.

2. OPERATION

With the ignition switch turned on, and the engine running, the flow of current through the rotor field coil winding energises the rotating electro magnet. The rotation of the rotor will cause the stator windings to cut the magnetic lines of force of the rotor. This induces an A.C. current voltage in the stator windings. The silicon rectifiers convert the (A.C.) alternating current to D.C. direct current at the output terminal, to carry the electrical load and charge the battery.

The silicon rectifiers prevent the battery from discharging through the alternator.

As the rotor speed increases, the induced voltage in the stator windings increases, causing more current to flow to satisfy the load requirements. However, there is another factor, commonly known as "inductive reactance" which has an important bearing on current control.

"Inductive reactance" is a counter voltage (voltage of opposite polarity) which is also induced in the stator windings. The voltage tends to oppose the "induced" voltage in the stator windings.

As the rotor speed increases, the counter voltage also increases. By designing the correct size and shape of rotor and stator, the selection of the correct size and number of windings, the correct air gap between the rotor poles and stator, and other design features, the alternator permits "inductive reactance" to limit output current, therefore no current regulator is needed.

3. VOLTAGE REGULATOR

The only function of the regulator used with the alternator is to limit D.C. output voltage. This is accomplished by controlling the current flowing through the field coil of the rotor.

Line voltage is applied to the ignition (IGN) terminal of the regulator through the ignition switch. Field current is controlled by the regulator and delivered through the field (FLD) terminal of the regulator to the insulated rotor brush and slip ring. The field circuit is completed by grounding the other end of the field coil through the ground brush and its slip ring.

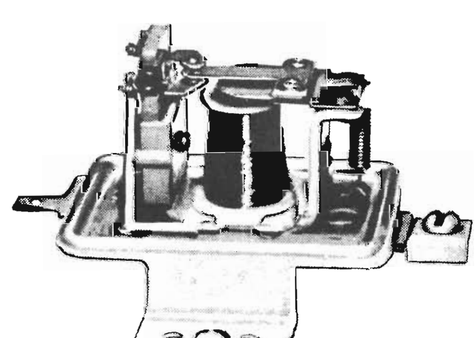


Fig. 4 – Voltage regulator (cover removed)

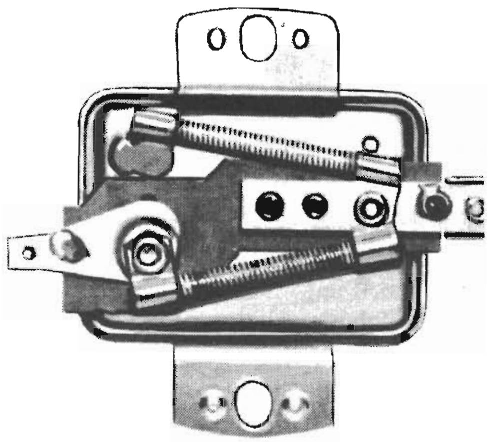


Fig. 5 – Voltage Regulator Resistance Units (Viewed from below)

Regulator Construction and Operation

Both the ignition (IGN) terminal and the field (FLD) terminal of the regulator are insulated from the regulator base. A resistor is connected between these two terminals.

The upper contact is connected to the ignition terminal and insulated from the regulator base. The lower contact is connected directly to ground through the regulator base.

The voltage coil, consisting of many turns of fine wire, is connected in series between the ignition terminal and ground. Line voltage is applied to the voltage coil when the ignition switch is on. A ground at the base of the regulator, completes the circuit. Without a good ground there would be no circuit through the voltage coil and the regulator would not function.

The movable contact point is connected electrically to the field terminal of the regulator. It is mounted on a stainless steel reed attached to the spring-loaded armature.

Resistor number two is connected in series between the field terminal and ground. The primary function of this resistor is to divert induced-voltage surges caused by the collapse of the magnetic field across the rotor coil winding. Grounding out these voltage surges reduces arcing across the regulator contact points.

In operation, the movable contact seldom stays in one position. It may rest against the upper contact, vibrate between the upper contact and open position, float between upper and lower contacts, or vibrate between the float position and the lower contact.

For purpose of explanation, let us follow current flow for each position of the movable contact.

Upper Contacts Closed

NOTE: Operation of the voltage regulator for any of the following conditions when the regulator is adjusted to specifications will depend upon:

a. The state of the battery.

b. The connected electrical load.

c. The speed of the rotor.

Line voltage is applied to the ignition terminal of the regulator and is also applied to the voltage coil circuit.

When line voltage is relatively low, current flow through the voltage coil also will be low, and the magnetic pull of the voltage coil field will not be strong enough to overcome the air gap and the spring tension holding the movable contact against the upper contact.

When the movable contact is held against the upper contact, the field circuit is completed through the movable contact to the rotor field coil. Since resistance in this circuit is low, maximum current will flow through the rotor field. Rotor field strength will be high and alternator output will be at its maximum for any given rotor speed.

Current flow through the resistor is negligible when the field circuit through the upper contact is completed. That's because more current flows through the circuit having the least resistance.

Contacts Open

As line voltage increases, the pull of the voltage coil field overcomes the armature spring tension and the air gap. The movable contact point is pulled away from the upper contact and into a "float" position. It does not touch the upper or the lower contact point. Current flows from the regulator ignition terminal through a resistor to the field terminal, and on through the rotor field coil to ground.

The resistor is now in series with the rotor field coil. This reduces field current and strength with a corresponding reduction in alternator output voltage.

Movable Contact Vibrating Against Upper Contact

Whenever alternator output voltage is reduced, and there is no change in the electrical load, line voltage will also be reduced. This in turn reduces the voltage applied to the voltage coil, with a corresponding reduction in the strength of the magnetic field produced by the voltage coil. Armature spring tension overcomes the pull of the regulator voltage coil, and the movable contact moves up until it touches the upper stationary contact.

The movable contact vibrates between the upper stationary contact and the "float" position to control voltage when the vehicles electrical system is calling for relatively high output at relatively low engine speed. It can be seen that the amount of spring tension exerted on the armature will affect movement of the vibrating contact. This in turn affects voltage control.

Movable Contact Operating in Float Position

Whenever a condition exists where load speed and battery demand, equals output voltage supplied when the field circuit is through the resistor, the movable contact will operate in the float position.

An infinite number of combinations of alternator speed, electrical load and battery conditions occur under normal driving conditions.

Lower Contact Closed

When electrical load demand is low and engine speed is high, the alternator output voltage tries to increase. However the increased voltage impressed on the voltage coil causes the voltage coil field to pull the movable contact against the lower contact.

Current flow is through the resistor to the field terminal of the regulator. Resistance through the regulator armature to the movable contact and thence through the lower contact to ground is much lower than the resistance of the rotor coil.

The alternator field circuit is *momentarily* bypassed, dropping alternator output when the lower contact circuit is completed.

Movable Contact Vibrating Against the Lower Contact

The reduction in alternator output voltage reduces current flow through the voltage coil of the regulator. The magnetic pull on the regulator armature cannot hold the movable contact against the lower contact and the movable contact moves into a "float" position between the upper and lower stationary contacts. This momentarily completes the field circuit through the resistor to the rotor field coil.

The movable contact vibrates between the "float" position and the lower contact to control line voltage within very close limits, for high-speed and light-load operation.

4. TESTING THE ALTERNATOR SYSTEM

Diagnosis of the charging system is based on a series of tests that can be made on the vehicle. Before proceeding with tests the following precautions must be observed.

1. Test the battery. If it is not fully charged, install a fully charged battery for test purposes.
2. Disconnect the battery negative cable before connecting test equipment.
3. Turn the ignition switch off before disconnecting or connecting the voltage regulator field leads.
4. Make certain that the regulator ground connection is clean and tight before testing the charging system.
5. Measure the circuit resistances before making other tests.
6. The engine to be at normal operating temperature.

Time can be saved in the diagnosis of the charging system by determining whether the alternator, the regulator, or the circuit is at fault.

The *current output test* should follow the *circuit resistance test*. The current output test will tell whether or not the alternator is capable of delivering rated output when all field regulation is removed. The *voltage regulator test* should not be made unless alternator current output is known to be correct.

CAUTION: Never ground the field circuit between the alternator and the regulator as this will result in damage to the voltage regulator.

Charging Circuit Resistance Test

To check the charging circuit, refer to *Fig. 6* and proceed as follows:

NOTE: Disconnect battery ground cable to avoid accidental shorting of charging or field circuit,—Do not disconnect the output or battery leads with the engine running—or run the engine with the leads disconnected as this can cause diode failure.

2. Connect an 0-50 ampere scale D.C. test ammeter in series with the alternator "BAT"

terminal and the wire which was disconnected from the alternator "BAT" terminal.

THE AMMETER LEADS AND THE TEST AMMETER MUST BE IN GOOD CONDITION AND ALL CONNECTIONS SHOULD BE CLEAN AND TIGHT.

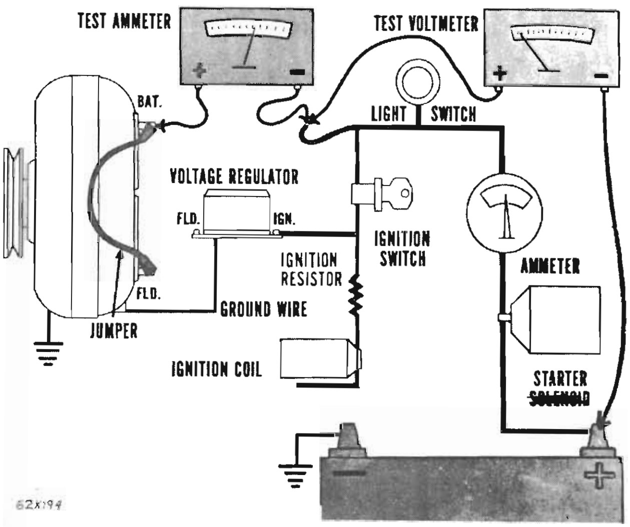


Fig. 6 – Charging Circuit Resistance Test

Connect a jumper between the alternator field terminal and alternator "BAT" terminal.

3. Connect a voltmeter (calibrated in tenths) positive lead to the "BAT" wire that was disconnected from the alternator, then connect the voltmeter negative lead to the battery positive post.

4. Re-connect the battery ground cable.

5. Start the engine and adjust the engine speed to produce 10 amperes from the alternator. The voltage reading should not exceed .3 volts.

If there is higher voltage drop, clean and tighten all connections in the charging circuit and re-check charging circuit resistance. A voltage drop test across each connection will locate any bad connections.

Field Circuit Resistance Test

Refer to Fig. 7.

1. Disconnect the ignition wire at the coil side of the ballast resistor, and connect a D.C. voltmeter between the voltage regulator FLD (field) terminal and battery positive post.

2. Turn the ignition switch on and turn voltmeter selector switch to the low voltage scale and read the meter. The voltage should not exceed .3 volt. A reading in excess of .3 volt indicates high resistance in the field circuit between the battery and the voltage regulator field terminal.

3. If high resistance is indicated, move the negative voltmeter lead to each connection along the circuit toward the battery. A sudden drop in

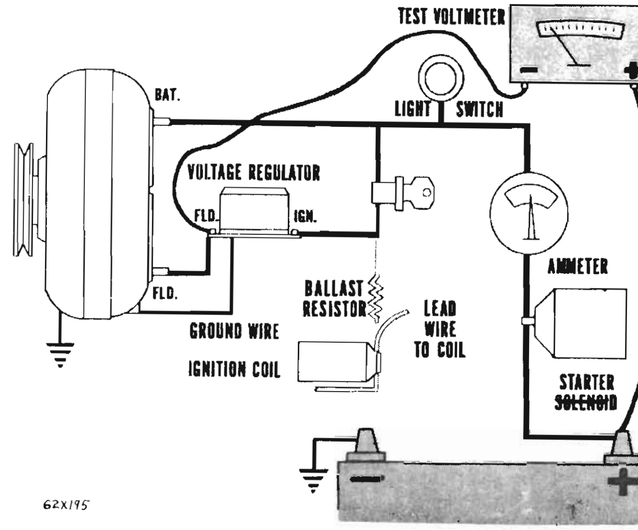


Fig. 7 – Field Circuit Resistance Test

voltage indicates a loose or corroded connection between that point and the last point tested. To test the terminals for tightness, attempt to move the terminal whilst observing the voltmeter. Any motion of the meter pointer indicates looseness.

The rotor (rotating field) circuit may be checked by connecting the ohmmeter between the field terminal (FLD) and the alternator frame. A reading of approximately 4.5 ohms should be obtained, while slowly turning the rotor.

> NOTE: Resistance in the regulator wiring circuit will cause flickering headlights and fluctuations in the ammeter.

Current Output Test

Refer to Fig. 8.

1. Disconnect the battery ground cable to avoid accidental shorting.

2. Disconnect the field lead at alternator and regulator.

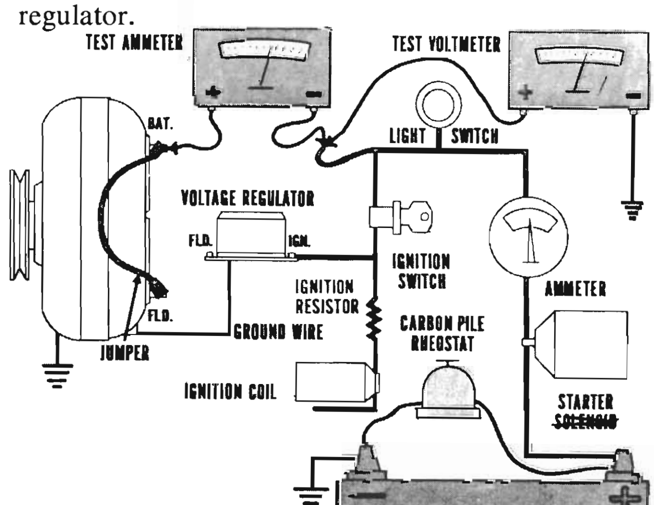


Fig. 8 – Current Output Test

3. Install a test D.C. ammeter in series with the alternator "BAT" terminal and the wire disconnected from the alternator output terminal.

4. Connect a jumper between the alternator output terminal and the alternator field terminal.

5. Connect a voltmeter positive lead to the battery wire that was disconnected from the alternator, and ground the voltmeter negative lead to the alternator housing.

6. Connect the battery ground cable.

7. Connect a carbon pile rheostat across the battery. (Make sure it is in the "off" position).

8. Install a tachometer, start engine and adjust the engine speed to 1800 RPM.

9. Adjust carbon pile to maintain 14.2 volts on the test voltmeter whilst making tests. Turn off immediately when test is completed.

The current output should be within the limits shown in specifications. If the output is slightly lower, it may be an indication of a possible "open" rectifier or other alternator internal problems.

If the output is considerably lower, it may be an indication of a possible "shorted rectifier" or other alternator internal problem. In either case the alternator should be removed and tested on the bench before disassembly. Before the alternator is removed and whilst the ammeter is connected in the circuit it is possible to test the rotor field circuit current draw.

Stop the engine and then note the reverse current reading on the ammeter and the battery voltage reading on the voltmeter.

The otor field coil draw should be 2.0 to 2.3 amps at 10 volts. (If the test ammeter does not have a reverse current scale), change the test ammeter leads at the "output" terminal and the field terminal on the alternator. A low rotor field coil draw is an indication of high resistance in the field coil circuit. The cause may be brushes, slip rings, or the field coil connections. A high rotor field coil draw indicates a possible shorted field.

Voltage Regulator Tests

Two tests are required to determine whether or not the regulator is performing properly.

The first test determines the regulator's ability to control voltage at low speed and relatively high load.

Under these conditions the regulator movable contact is vibrating against the upper contact. The second test determines the regulator's ability to control voltage at higher speeds and minimum load. Under these conditions the movable contact is vibrating against the lower contact.

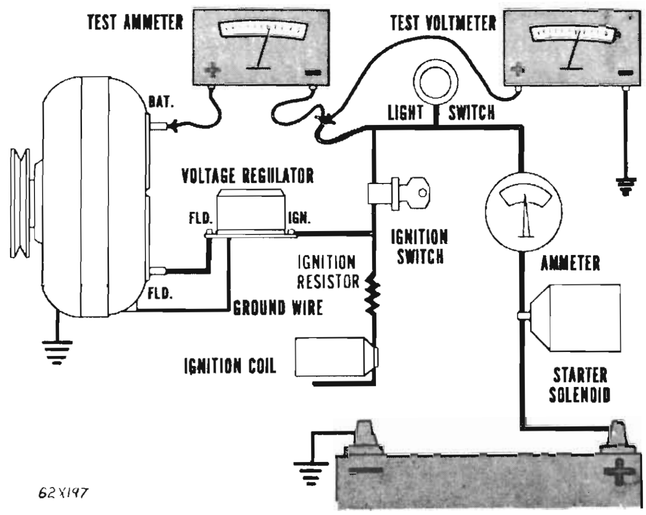


Fig. 9 – Voltage Regulator Test

Since the regulator is temperature compensated the entire charging system must be temperature-normalised and regulator temperature must be taken into consideration.

This means that there are three basic factors that affect voltage regulator performance.

1. Engine speed.

2. Electrical load or current as measured by a test ammeter.

3. Voltage regulator temperature.

Test Preparation

If the alternator has passed the current output test, stop the engine and remove the special field jumper wire. Avoid shorting the jumper to ground since this could damage the jumper and the alternator. Reconnect the field leads to the alternator and regulator field terminals.

> NOTE: THE VEHICLE IGNITION SWITCH MUST BE "OFF". If the field circuit is grounded in the field terminal side of the regulator circuit while the ignition switch is "ON", the fuse in the regulator will be blown and the regulator contacts may be damaged.

The ammeter is connected in series, and the voltmeter in parallel, as it was for the current output test and it is therefore unnecessary to move the test ammeter connections for the voltage tests.

NOTE: Except for the cover, service replacement parts are not available, therefore, should the regular 'reed' show signs of overheating, the regulator is usually unserviceable and should be replaced. Replace assemblies if contacts are excessively burned or pitted, or if coil or resistors are open circuited.

Upper Contact Test

Start engine and adjust speed to 1000 R.P.M. turn on lights and/or accessories to obtain 12 amp output as registered on test ammeter.

Operate engine at this speed and load for 15 mins. to make certain the entire system is temperature normalised and then proceed with test as follows:—

1. Cycle system.
2. Re-adjust engine speed to 1000 R.P.M.
3. Adjust light and/or accessory load to obtain 12 amps as registered on test ammeter.
4. Read and record the ambient temperature two inches from the regulator cover.
5. Read and record the voltage registered on the test voltmeter. Compare this voltage with the voltage-temperature specifications.

Refer to chart.

If the regulator operates within specifications, armature spring tension is properly adjusted. If voltage is not within specification the trouble could be armature spring tension, air gap or contact point spacing.

REGULATOR OPERATING VOLTAGE CHART

Temp.	Upper Contacts regulating					
In Deg. F.	50°	70°	90°	110°	130°	150°
Volts:						
Min.	14.0	13.9	13.8	13.6	13.5	13.4
Max.	14.6	14.5	14.25	14.2	14.1	14.0
Field current while upper contact regulating – 1.5 – 1.7 amps						
Max. Volts	Lower Contacts regulating					
	15.0	14.9	14.8	14.7	14.5	14.4

Lower Contact Test

1. Increase engine speed to 1750 R.P.M.
2. Turn off all lights and/or accessories. Voltage should INCREASE, and amperage should DECREASE considerably.
3. Measure temperature to make sure it is the same as it was for the upper contact test.
4. Read the test voltmeter and note the exact amount that voltage has increased from the voltage reading obtained with the regulator operating on the upper contacts.
5. The voltage increase should not be less than .2 volt, not more than .5 volt. If the voltage increase is not within the limits, it is an indication that the air gap and/or the contact point clearance is out of specification limits and requires adjustment.
6. If the regulator fails to pass either or both tests, it should be removed from the vehicle. The air gap and contact point clearance should be measured and adjusted if required.

The regulator should then be re-installed on the vehicle and retested. If the regulator does not control voltage within limits on the upper contact test, the spring tension should be adjusted.

Adjusting the spring tension requires removal of the regulator to remove the cover. The spring tension may then be adjusted by bending the lower spring hanger down to increase tension and increase the voltage setting, or bent up to decrease voltage.

It is recommended that adjustment procedure be performed as follows:

a. Shut the engine off before removal of the regulator. The wiring connections to the regulator can then be left connected without danger of a short circuit while the adjustment is made.

b. A very slight movement of the spring hanger makes considerable difference in tension effect on the voltage. It is possible that several adjustments will be necessary to obtain the correct voltage setting.

c. To prevent the necessity of removing and installing the regulator several times between adjustments, it is permissible to connect a ground wire (jumper) between the base of the regulator and a good ground.

NOTE: To ensure that a short circuit does not occur during tests the regulator must be insulated from the vehicle by a fender cover or other insulating material.

d. During the test the cover *must* be in place and the regulator placed in the same position *(same angle)* as when installed on the vehicle.

e. After each test the ignition switch should be turned off whilst an adjustment is being made. This will not only protect against an accidental short circuit that would damage the regulator, but also demagnetise the regulator. If the regulator is not demagnetised the meter readings after an adjustment are not accurate.

7. If the alternator and regulator tested satisfactorily, turn the ignition switch "off". Then disconnect the battery ground cable. Disconnect the test instruments. Correctly connect the leads at the alternator and the regulator. Connect the battery ground cable.

BE SURE THE NEGATIVE POST OF THE BATTERY IS ALWAYS CONNECTED TO GROUND. INCORRECT BATTERY POLARITY CAN DAMAGE THE ALTERNATOR RECTIFIERS. DO NOT GROUND THE ALTERNATOR FIELD CIRCUIT AS THIS MAY DAMAGE THE REGULATOR.

5. SERVICING THE REGULATOR

Cleaning and Resetting Regulator Points

1. Clean the contact surfaces using 400 silicon carbide paper, dulled by rubbing surfaces of paper together.

2. Remove spring and fixed contact support screw, if necessary to obtain better access, being careful not to damage the leads.

3. Thoroughly clean the unit, cleaning the contacts with lint-free gauze moistened with lighter fluid.

4. Re-install the fixed contact and spring and set the initial height of the support so that the 'reed' is approximately parallel to core head.

5. Reset the mechanical settings as follows:—

Air Gap

1. Remove the voltage regulator from the vehicle.

2. Remove the voltage regulator cover.

3. Check air gap by connecting a test light between a 12 volt battery negative terminal and the ignition (IGN) terminal of the voltage regulator. Connect a jumper wire from the battery positive terminal to the field (FLD) terminal of the voltage regulator.

4. Insert a .040 wire gauge between the armature and magnet core, next to the stop pin on the spring hanger side *(refer Fig. 10)*.

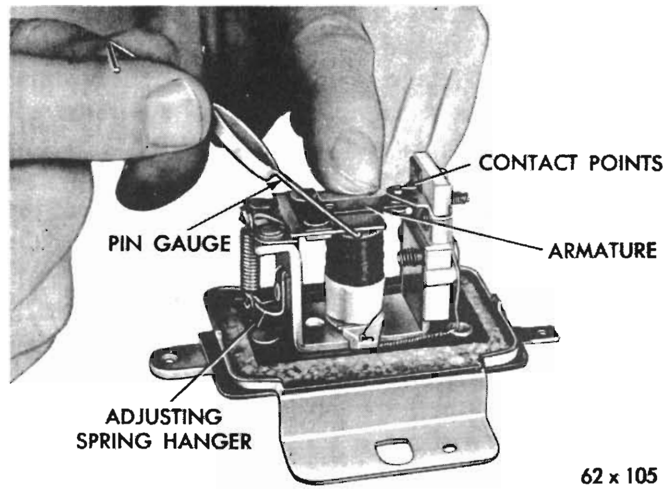


Fig. 10 – Checking Air Gap (typical view)

5. Press the armature plate down until it contacts the wire gauge. The contacts should just open and the test light should go dim. PRESS DOWN ON ARMATURE PLATE AND NOT ON CONTACT SPRING.

6. Insert a .043 gauge in the same position and depress armature plate. Upper contacts should be closed and test lamp should remain lighted. If an adjustment is required, loosen the contact bracket screw and move the contact bracket as required. MAKE SURE THE AIR GAP IS CHECKED ONLY WITH THE BRACKET SCREW SECURELY TIGHTENED.

Point Gap

1. Set lower contact gap to .010 – .012 by bending lower contact arm.

2. Press the armature plate down so that the armature rests on the nylon stop. Release and recheck contact gap. PRESS DOWN ON ARMATURE PLATE AND NOT ON CONTACT SPRING.

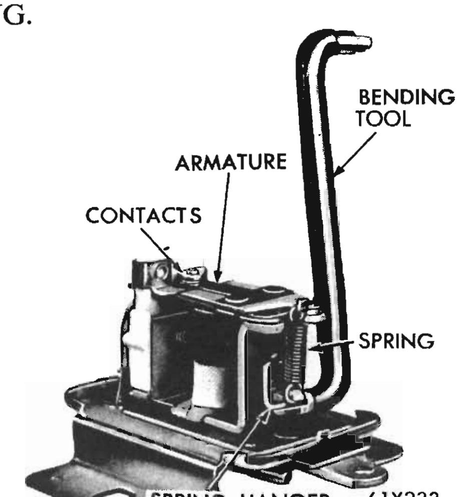


Fig. 11 – Adjusting Spring Tension (typical view)

Spring Tension

Always make this adjustment by bending the lower spring hanger. If the voltage was found to be too high, bend the lower hanger UP. If the voltage was low, bend the lower hanger DOWN.

Install the regulator and repeat the test as outlined in voltage regulator test. If further adjustment is necessary, adjust spring tension only.

If adjustment is attempted on the vehicle DO NOT SHORT CIRCUIT BETWEEN THE SPRING HANGER AND THE BASE. Grounding the hanger will damage the regulator.

Regulator Fuse Wire

1. Cut the fuse wire off above the connection at the bottom and unwind at top then remove the insulating sleeve *(refer Fig. 4)*.

> CAUTION: If an attempt is made to unsolder an old fuse, the very small wire from the voltage coil may be damaged.

2. "Tin" the end of a new fuse wire.
3. Holding the tinned end of the fuse wire into the recessed rivet at the base of the regulator and against the old piece of fuse wire that remains, cause a drop of solder from soldering iron to fall on these parts. Allow to cool sufficiently for fuse wire to stick, then install the insulator sleeve.
4. Pull the new fuse wire up enough to remove the slack and wrap it around the bracket. Solder the coiled wire to the bracket and cut off surplus fuse wire.

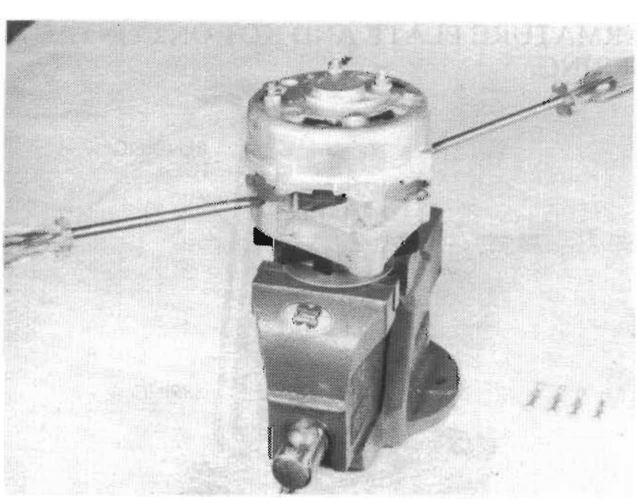


Fig. 12 – Separating the Stator and Slip Ring End-Head from the Drive-End End-Head

> NOTE: Although original fuse wire was not soldered to the bracket, soldering it will ensure good contact.

6. DISASSEMBLY OF ALTERNATOR

(1) Before disassembling, mark the stator to end shield locations then remove the through bolts and carefully separate the stator from the drive end head with the blades of two screwdrivers, 180° apart, taking care not to damage stator windings. Never pry between the stator and slip ring end head *(refer Fig. 12)*. Be careful not to lose the brushes and springs which will fall out of the holders as the rotor is withdrawn. Inspect parts for "poling" or evidence of overheating.

(2) The brush holders may be taken from the end-head by removing the two stud nuts taking care to note the assembly of insulating washers and bushes in order that these may be reassembled in the correct manner.

(3) The negative assembly is mounted within the alternator slip ring end head so as to ground the heat sink section of the assembly, and the positive assembly is adjacently located but insulated from the negative assembly *(refer Fig. 13)*.

Care must be taken to note the positioning of insulating washers and bushes to ensure correct re-assembly *(refer Fig. 1)*.

(4) The slip-ring end bearing is a push fit on the rotor shaft and will be retained on the rotor as it is withdrawn from the end-head. The outer race of this bearing is prevented from rotating in the end-head by use of an 'O' ring. This rubber 'O' ring should be replaced every time the alternator is disassembled *(refer Fig 20)*.

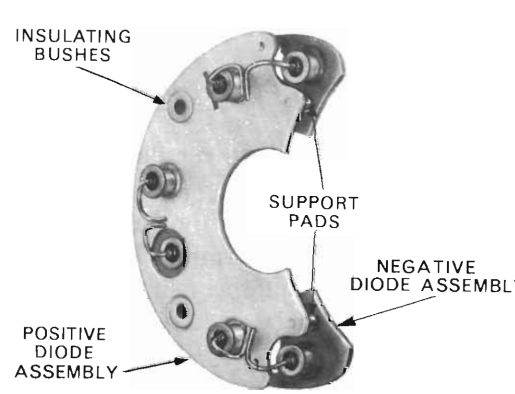


Fig. 13 – Alternator diode assemblies

NOTE: To remove the slip ring end bearing, use Tool E8C10.

(5) If the rectifiers must be replaced support the heat sink or the end-head and remove the retaining screws. Both positive and negative rectifiers are removed in the same manner. They are to be replaced as an assembly, i.e., all three negative diodes and/or all three positive diodes.

(6) To separate the drive end-head from the rotor assembly remove the pulley nut. If necessary use rope or wood to grip the pulley in a vice while removing the nut. Do not grip the rotor poles in the vice as they may be damaged *(refer Fig. 14)*.

NOTE: Where necessary to prevent the rotor rotation (where the key is not employed) carefully grip the base of a pole-finger in a soft-jawed vice—NEVER GRIP THE MACHINED CIRCUMFERENCE OF THE POLE FINGERS.

Alternatively, where the alternator is not dis-assembled, the assembly may be "twisted" while the pulley is secured by the belt *(Fig. 14)* to apply an interference force to hold the rotor, while removing the nut.

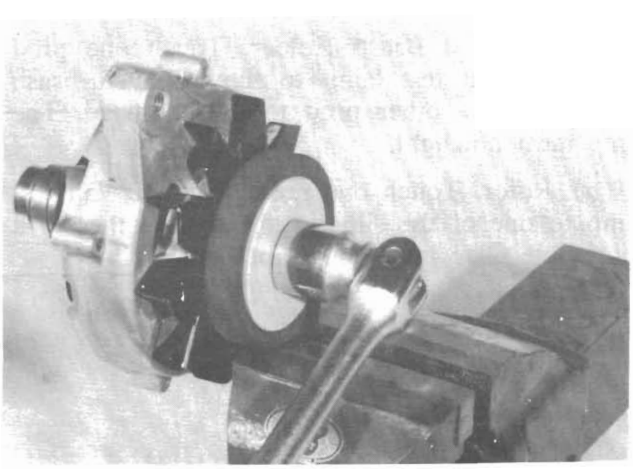


Fig. 14 – Removing the Pulley Retaining Nut

The pulley, key (where equipped), fan and spacer may now be withdrawn and the rotor assembly pulled through the bearing. This bearing is a sliding fit on the shaft and is locked in position by the shaft nut and intervening components.

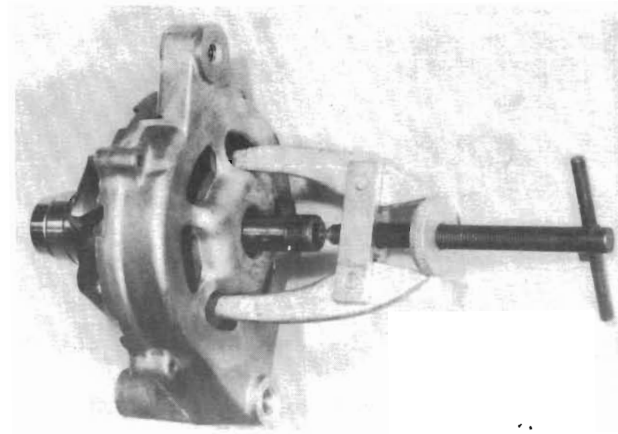


Fig. 15 — Pushing the Shaft from the Drive-End Bearing

The outer race of the bearing is clamped in the drive end-head by a plate retained by three screws, removal of these will allow the bearing to be pressed from the head *(refer Fig. 16)*.

(7) Upon completion of disassembly all parts should be wiped clean and inspected for wear, distortion or signs of overheating or mechanical interference.

(8) The stator should be inspected for insulation failures or defects. A shorted phase winding or rectifier will normally be evident by discoloration. The stator should be tested for grounds and continuity using a 240V. test lamp.

Fig. 16 – Pushing the Drive-End Bearing from the Housing using Press Adaptor

7. ALTERNATOR SERVICE

Testing the Rectifiers (with Tool Vane Model 615)

The rectifier tester, Tool Vane Model 615, provides a quick, simple and accurate method of testing the alternator rectifiers without the necessity of disconnecting the soldered rectifier leads.

With the alternator rectifier end shield separated from the drive end housing, proceed with the rectifier tests as follows:

Positive Case Rectifier Test (Fig. 17)

(a) Place the alternator on an insulated surface. Connect the test lead clip to the alternator "Bat" output terminal.

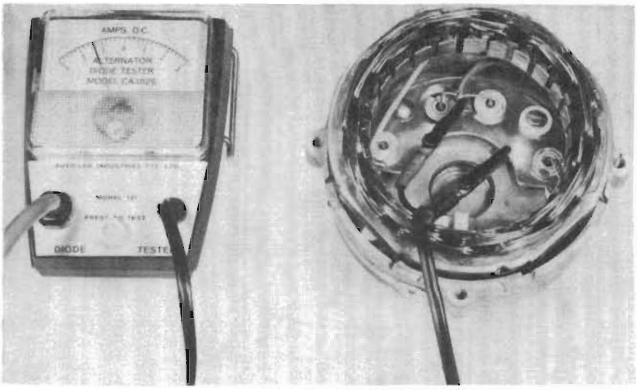


Fig. 17 – Testing Positive Case Rectifiers (typical view) (Tool Vane 615)

(b) Plug in the Tool Vane 615, power source lead into a 240 A.C. power supply. Touch the exposed bare metal connections of each of the positive case rectifiers, with a test prod.

> CAUTION: Do not break the sealing around the rectifier lead wire, or on the inner end of the rectifier. The sealing material is for protection against corrosion. Always touch the test prod to the exposed metal connection nearest the rectifier.

The reading for satisfactory rectifiers will be 1¾ amperes or more. The reading should be approximately the same for the three rectifiers.

When two rectifiers are good and one is shorted, the reading taken at the good rectifiers will be low, and the reading taken at the shorted rectifier will be zero. Disconnect the lead to the rectifier reading zero and retest. The reading of the good rectifiers will now be within the satisfactory range. When one rectifier is open it will read approximately one ampere, and the two good rectifiers will read within the satisfactory range.

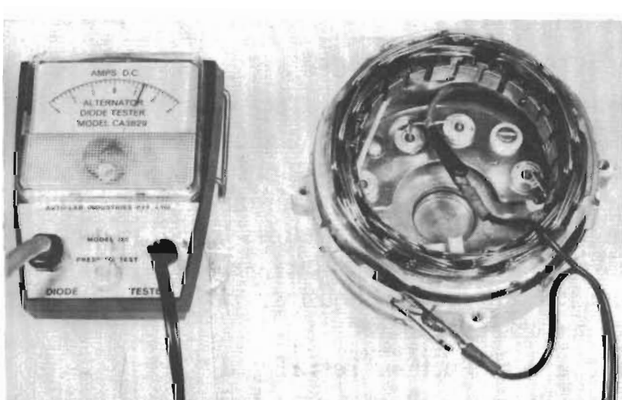


Fig. 18 – Testing Negative Case Rectifiers (typical view) (Tool Vane 615)

Negative Case Rectifier Test (Fig. 18)

(a) Connect the test lead clip to the rectifier heat sink.

(b) Touch the exposed connection of each of the negative case rectifiers with a test prod. The test specifications are the same, and the test results will be approximately the same as for the positive case rectifiers except the meter will read on the opposite side of the scale.

Field Coil Draw

(a) Connect one lead of a test ammeter to one terminal of a fully charged battery. Connect a jumper wire to the other terminal of the battery and ground it to the alternator end-head. Connect the other ammeter lead to the field terminal of the alternator.

(b) Slowly rotate the alternator rotor by hand. Observe the ammeter reading. The field coil draw should be 2.0 – 2.3 amps at 10 volts.

> NOTE: A low rotor draw indicates a high resistance in the field coil circuit (brushes, slip rings or rotor coil). A higher rotor draw indicates a possible shorted rotor coil or a grounded rotor.

Testing Alternator Field Circuit for Grounds

The alternator must be disassembled for the performance of this test which must be carried out on the rotor and insulated brush holder separately.

(a) Insulated Brush Holder. Touch one prod of a 240 volt test lamp to the insulated brush holder and the other prod to the end-head. The lamp must not light.

(b) Rotor. Touch one prod of a 240 volt test lamp to one of the slip rings and the other to a rotor pole. The lamp must not light

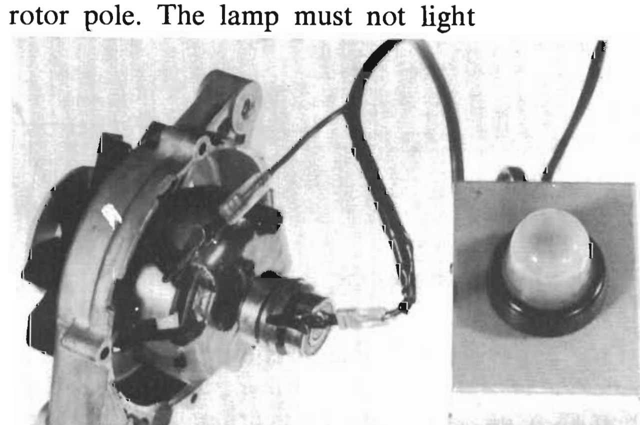


Fig. 19 – Testing Slip Rings for Ground (Using 240 volt test lamp)

Testing the Rectifiers and Stator Circuits (With Test Lamp)

(a) Separate the three stator leads at the "Y" connection.

(b) Test the rectifiers with a 12 volt battery and a test lamp equipped with a four candle power bulb by connecting one side of test lamp to the positive battery post, the other side of the test lamp to a test probe, with the other test probe connected to the negative battery post.

(c) Contact the outer case of the rectifier with one probe and the other probe to the wire in the centre of the rectifier *(Fig 21)*.

(d) Reverse the probes, moving the probe from the rectifier outer case to the rectifier wire, and the probe from the rectifier wire to the rectifier outer case. If the test lamp lights in one direction, but does not light in the other direction, the rectifier is satisfactory. If the lamp lights in both directions the rectifier is short-circuited. If the test lamp does not light in either direction, the rectifier is open circuited.

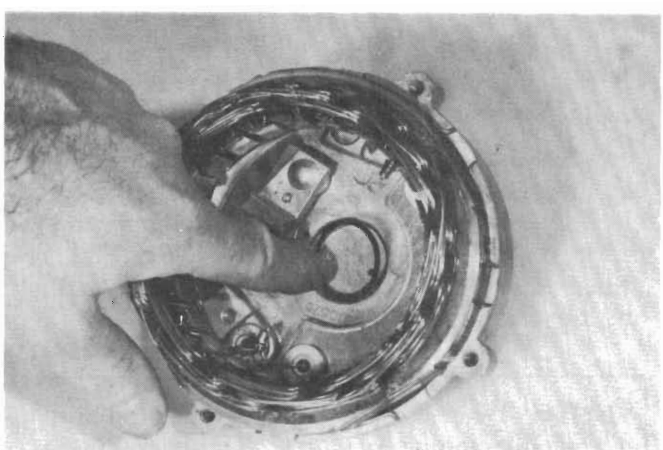


Fig. 20 – Installing the "O" Ring

> NOTE: The usual cause of an open or "blown" rectifier is a battery that has been installed in reverse polarity.

(e) Disconnect the rectifiers from the stator leads.

(f) Test the stator for grounds using a 240 volt test lamp *(Fig. 22)*. Use wood slats to insulate the stator from the rectifier end shield. Contact one prod of the test lamp to the stator pole frame, and contact the other prod to each of the three stator leads. The test lamp should not light. If the test lamp lights, the stator windings are grounded.

(g) Test the stator windings for continuity, by contacting one prod of the test lamp to all three stator leads at the "Y" connection. Contact each of the three stator leads (disconnected from the rectifier). The test lamp should light when the prod contacts each of the three leads. If the test lamp does not light, the stator winding is open *(Fig. 23)*.

(h) Install a new stator if the one tested is "grounded" or "open". If the rectifiers must be replaced, unsolder the rectifier wire at the soldered joint.

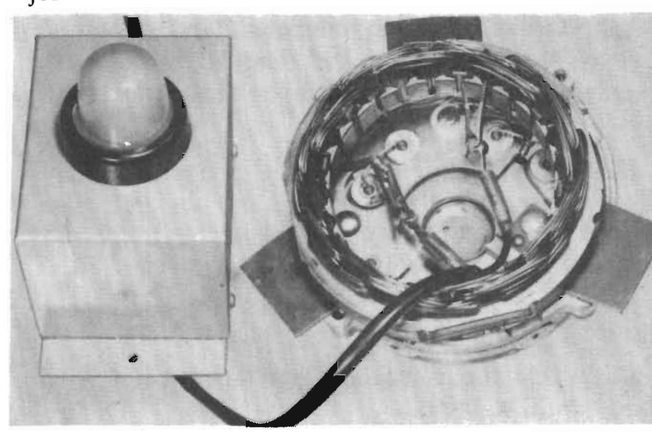


Fig. 21 – Testing Stator for Grounds (using 240 volt test lamp) (typical view)

8. ROTOR SLIP RINGS

(1) Test the slip rings for ground with a 240 volt test lamp by touching one test lead prod to rotor pole shoe, and remaining prod to slip ring. Test lamp should not light.

If lamp lights, slip rings are shorted to ground, possibly due to grounding on insulated field lead. If the rotor is not grounded, lightly clean the slip ring surface with 00 sandpaper. Test the slip rings and coil for continuity between slip rings.

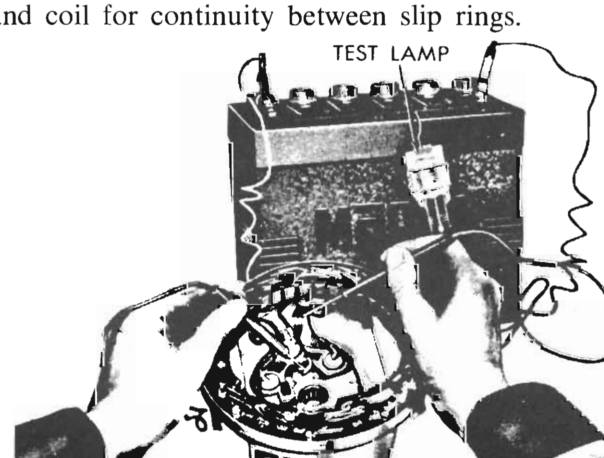


Fig. 22 – Testing Stator Windings for Continuity (Using a 12 volt test lamp)

(2) If an open circuit or a high resistance is found, it may be possible that the solder connections are not properly made. Resolder the connections.

CAUTION: Do not use acid core solder. A short circuit may result, and corrosion will definitely occur. Be sure the solder bead does not protrude beyond the surface of the plastic material.

(3) Check slip ring diameters and condition. Replace the slip rings if less than 1.350″ or when machining to recondition surfaces, reduces diameter to below minimum.

(4) Polish slip rings with special abrasive block (Cratex 6.909C or similar) or fine glass paper — DO NOT USE EMERY ABRASIVE MATERIAL.

Slip Ring Replacement

(1) Test the rotor coil resistance (3.80 – 4.0 ohms @ 20°C.).

(2) "Tin" the coil leads and clean the slip ring lead slots, solder, using 50-50 solder and a non-corrosive flux.

(3) Install the slip ring assembly using a suitable adaptor which bears on the moulded insulation but provides clearance for the outer coil lead, support the shaft on the snap ring and cover, NOT on the pole pieces.

(4) After installation, machine the separating groove using a .060″ wide parting tool, prior to machining the slip ring, as illustrated overleaf.

(5) Ensure both slip rings are insulated and machined as illustrated and a surface finish of 90 micro-inches.

(6) Deburr the groove edges.

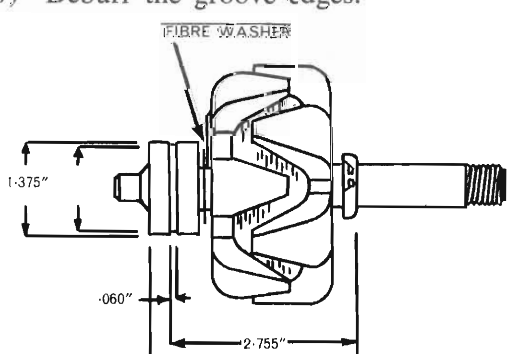


Fig. 23 – Slip ring machining dimensions

NOTE: Chuck the rotor by the drive end shaft and support rear end in a steady. Do not use shaft centres (where provided). (Maximum eccentricity is .002″.)

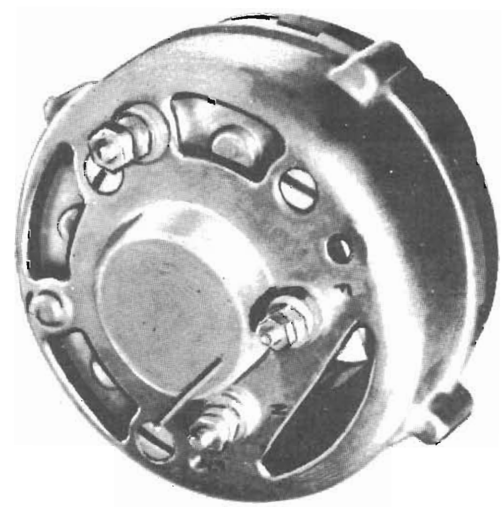


Fig. 24 – Alternator S.R. Head showing wire inserted to restrain brushes during assembly

9. REASSEMBLY

(1) Make sure that snap ring and retainer cup are in place on the rotor shaft at the drive end.

(2) Assemble drive end-head complete with bearing to the rotor then assemble spacer, fan, key (where equipped), pulley, lockwasher and shaft nut and tighten nut to 30 lbs. ft. torque.

NOTE: Where the drive key is not utilised in either pulley or shaft, the rotor may be carefully gripped by a pole finger base section in a soft-jawed vice, to enable the nut to be tightened.

NEVER GRIP THE MACHINED CIRCUMFERENCE OF THE ROTOR POLES.

While resoldering the connections to the diodes, hold the wire lead with pliers or similar tool as this will help to dissipate heat and thus protect the diode from damage due to overheating.

(4) Install the brushes and springs in the holders and retain them in position clear of the slip ring by means of a piece of stiff wire inserted through the hole in the end-head provided for this purpose *(Fig. 26)*.

NOTE: Before assembling the end-heads to the stator, check that the joining edges are not burred or damaged — the halves must assemble readily, and without fouling of connections or wire leads.

(5) Assemble the rotor and drive end-head into the stator to which the slip ring head is already connected, position lugs and alignment marks. Insert and tighten frame screws to 30 lbs. ins. — evenly.

(6) Remove wire allowing brushes to bear on slip rings and ensure that rotor turns freely and silently, by hand.

(7) Install on vehicle and test operation.

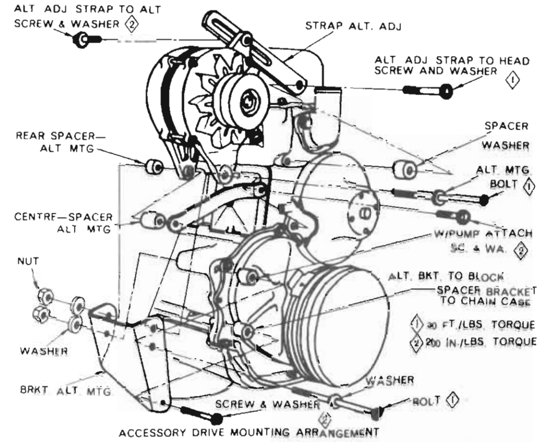


Fig. 25 – Alternator Mounting Arrangement (6 cyl. Hemi)

PART 4 — IGNITION SYSTEM

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. BURNED OR PITTED DISTRIBUTOR POINTS

(1) Dirt or oil on points.

(2) Points misaligned or gap too narrow.

(3) Defective coil.

(4) Ballast resistor not in circuit.

(5) Wrong condenser or defective condenser.

(6) Defective ignition switch.

(7) Alternator regulator setting too high.

(8) Bushings or distributor shaft worn.

(9) Touching point faces with fingers during installation.

(10) Weak contact breaker arm spring.

2. IGNITION COIL FAILURE

(1) Regulator setting too high.

(2) Coil damaged by excessive heat from engine.

(3) Coil case or tower cracked.

(4) Oil leak at tower.

(5) Ignition coil winding or series resistance defective.

3. CONDENSER FAILURE

(1) Normal fatigue.

(2) Damaged by excessive engine heat or moisture.

4. FOULED SPARK PLUGS

(1) Carburettor mixture over-rich.

(2) Excessive oil consumption.

(3) Improper plug heat range.

(4) Improper gap adjustment.

5. BURNED SPARK PLUGS

(1) Plugs loose or too tight in cylinder head.

(2) Carburettor mixture too lean.

(3) Improper plug heat range.

(4) Improper ignition timing.

(5) Leaking head gasket or cracked cylinder head.

6 CYLINDER

SPECIFICATIONS

DISTRIBUTOR

ENG. CODE	Make and Number	Chrysler Part No.
215, 245, 265 c.i.	Bosch	A2629405
265 (E37 opt)	,,	3650297
265 (E38 opt)	,,	3649348

ADVANCE – Centrifugal (Dist. degrees at Dist. R.P.M.)

215, 245, 265 c.i.	Advance	0°	5°	10°
	RPM	@ 320-480	@ 625-790	@ 1400-1850
265 c.i. (E37 opt)	,,	@ 320-480	@ 600-740	@ 1300-2200
265 c.i. (E38 opt)	,,	@ 320-480	@ 630-790	@ 1720-2530

ADVANCE – VACUUM (Dist. degrees at inches of mercury)

215, 245, 265 c.i.	Advance	0°	5.9°-9°	8.5°-11.5°
	Vacuum	@ 5"-8" hg	@ 10.5" hg	@ 12" hg
265 (E37 & E38 opt)	Advance	0°	5°	10°
	Vacuum	@ 0.4"-2.1" hg	2"-4.2" hg	@ 4.5"-6.8" hg

Breaker point gap	.012" - .016"
Dwell angle	36° to 40°
Breaker arm spring tension	17.5 - 21 ozs. 21.2-22.9 ozs. (E37 and E38 option)
Timing (@ 500 R.P.M.)	5° B.T.C.
Condenser capacity	0.175 mfd ± 15%
Shaft side play	.000" to .003"
Shaft end play (after assembly)	.003" to .010"
Rotation	Clockwise

SPARK PLUGS

Type	N 11Y Champion N 9Y Champion (E37 and E 38 option)
Size	14 m.m.
Gap	.035"
Firing Order	1 - 5 - 3 - 6 - 2 - 4

COIL

Type	U-KOW 12v
Test—Spark gap (coil)	17/32" spark when primary current is adjusted to 1.7 amps

BALLAST RESISTOR

Chrysler Part No.	A2095501
Resistance @ 70° - 75°F	0.5 - 0.6 ohms @ Nil amp

PRIMARY CURRENT DRAW (Coil and ballast resistor in circuit)

Engine stopped	3.6 - 3.9 amps @ 5.4 - 5.8v
Engine speed @ 1000 R.P.M.	2.1 - 2.3 amps @ 9.5 - 9.8v

SPECIAL TOOLS

* EFAW 57	Distributor point setting tool
* EFAW 105	Ignition tester

(Note: Above Tools Available from Bosch Distributors)

SERVICE INFORMATION — PROCEDURES

1. 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 the primary wiring make up the low voltage primary circuit.

The secondary high voltage circuit includes the coil secondary winding, the distributor cap and rotor, the high tension wiring, the spark plugs and the vehicle frame. The distributor housing contains the automatic advance mechanism and the contact breaker assembly. A vacuum control advance unit. The diaphragm being mechanically connected to the movable section of the contact breaker assembly, is mounted on the outside of the housing. An extension of the distributor housing carries the bearing bushes for the drive shaft; this part fits into the engine block and the drive is taken from the engine camshaft.

2. OPERATION

Rotation of the distributor shaft by the engine drives the distributor cam through the driving plate and centrifugal weights. The cam can rotate through a predetermined number of degrees in the direction of rotation. This operation is transmitted by the outward movement of the weights and controlled by the springs *(Fig. 1)*. The cam lobes contact the rubbing block of the contact breaker lever and open the points, breaking the primary circuit. The spark which is produced by the coil is directed to the centre tower of the distributor cap, from where it is distributed by the turning rotor, to the cap segments and then to the spark plugs.

The vacuum control unit provides an additional timing device operating in accordance with engine load. A link from the diaphragm turns the contact breaker plate against the direction of rotation *(Fig. 2)*. The relationship between degrees of advance and applied vacuum is controlled by spring tension opposing advance diaphragm movement.

3. REMOVING DISTRIBUTOR

(1) Disconnect vacuum hose at distributor.

(2) Disconnect primary lead wire at coil.

(3) Unfasten distributor cap retaining clips and lift off the distributor cap.

(4) Rotate the engine crankshaft until the distributor rotor is pointing toward the cylinder block. Scribe a mark on the block at this point to indicate the position of the rotor for reference when reinstalling the distributor.

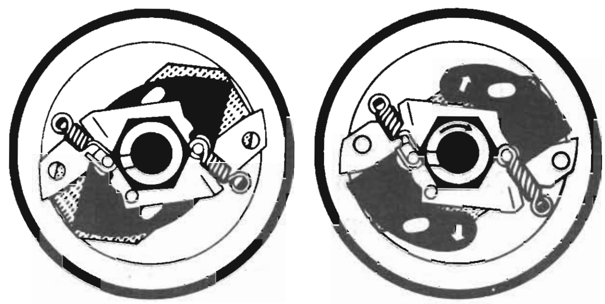


Fig. 1 – Centrifugal advance mechanism

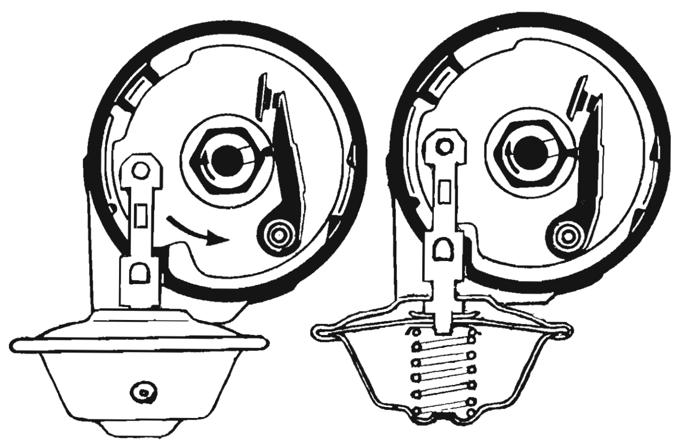


Fig. 2 – Vacuum advance mechanism (typical view)

(5) Remove the distributor hold-down lock plate screw.

(6) Carefully lift the distributor from the engine, the shaft will rotate a small amount as the distributor gear is disengaged from the camshaft gear.

4. SHAFT AND BUSHING WEAR TEST

(1) Remove the distributor rotor.

(2) Disconnect the primary lead wire at the distributor terminal. Do not loosen the movable contact arm spring retaining unit.

(3) Clamp the distributor hold down clamp in a vice equipped with soft jaws and apply only enough pressure to restrict any movement of the distributor, during the test.

(4) Attach a dial indicator to the distributor housing so that the indicator plunger arm rests

against the movable breaker arm at the rubbing block *(Fig. 3)*.

(5) With the rubbing block at the breaker arm on the highest point of a cam lobe, place one end of a wire loop around the top of the distributor shaft. Hook a spring scale in the other end of the wire loop and pull on a line with the plunger of the indicator gauge.

The wire loop must be down on the distributor shaft to ensure a straight pull; also be sure that the wire loop does not interfere with the indicator or indicator holding bracket. Apply a 5 lb. pull and read the movement of the plunger on the indicator dial. (Be sure the rubbing block of breaker arm is on the highest point of the cam lobe during this test). If the plunger movement exceeds .006″, replace the bushings and/or distributor shaft.

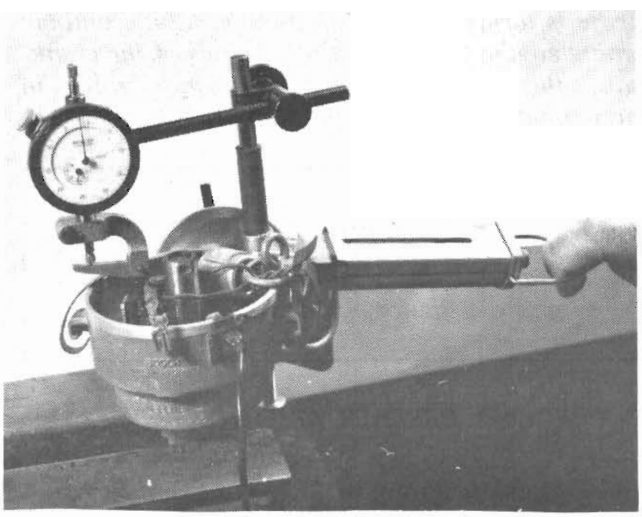


Fig. 3 – Checking distributor shaft side-play

5. DISASSEMBLY OF DISTRIBUTOR

To disassemble distributor refer to *Fig. 4* and proceed as follows:

(1) Unfasten spring clips (11) holding distributor cap (1) in place and remove cap.

(2) Carefully lift the rotor (2) from the cam spindle.

(3) Remove contact breaker cable from primary terminal flat pin connector.

(4) Remove screw fastening condenser (10), then remove condenser, primary terminal and lead from housing.

(5) Remove spring 'E' clip holding vacuum control pull rod to base plate.

CAUTION: 6 cylinder models have the earthing lead attached to the inner-nut — take care when loosening and removing this attaching screw not to damage the lead.

(6) Remove two screws (13) and detach the vacuum control unit (12) from the distributor housing (16).

(7) Remove the two screws attaching the base plate to the distributor housing and withdraw plate.

(8) Press out driving pin (14) securing drive gear and remove gear (15) (where necessary).

(9) Push shaft from housing by applying light pressure at the drive end.

(10) To remove cam (7) remove advance control springs (8).

(11) Place the shaft in a soft jaw vice to support the drive plate, then carefully lever the cam (7) from the shaft using 2 levers. (This will remove the circlip and washer (6) from the shaft also).

(12) Lift out the oil wick, washer and circlip (6) from the cam recess.

6. CHECKING DISMANTLED DISTRIBUTOR COMPONENTS

(1) Test condenser using a suitable tester *(Tool EFAW 105)*. The body of the condenser must make good contact with the distributor housing, and the connecting wire must be properly connected to the terminal together with the contact breaker lead.

(2) Contact points must not be loose or misaligned in relation to each other. Displaced or distorted contact points should be aligned using a suitable setting tool *(Tool EFAW 57)*. The rubbing block at the contact breaker lever should not show excessive wear. Burnt contact surfaces can be redressed if the pitting and piling is not in excess of .020″. Replace the points where necessary.

(3) Contact spring tension must be tested with

a spring balance and should be within 17½–21 ozs.

If the contact set cannot be serviced to meet these requirements it must be replaced. Distorted or stretched advance springs must be replaced with the correct springs as these springs determine the advance curve which is important to optimum engine performance.

(4) The vacuum control unit must be tested for leaks and in the event of a leak being found the complete unit must be replaced.

7. REASSEMBLY OF DISTRIBUTOR

To assemble distributor, reverse disassembly procedure.

NOTE: Cleanliness is essential. Oil and grease must be kept away from the electrical contact surface and insulating parts.

Hemi 6 cyl. models. The earth lead from the contact breaker plate which is connected to the earthing nut, must be in good condition.

Lubricate the felt lubrication reservoir (21) with light engine oil and insert into the housing on re-assembly.

Shaft Bushings

New sintered bushings should be soaked in light engine oil *(SAE 10W)* for one hour before installation. It is important that a correctly fitting mandrel be used for pressing out and replacing bushes. Extreme caution must be exercised not to distort the housing.

Shaft End Play

Shaft end play must be adjusted at the drive end to .003"–.010" by adding or removing shims, from between the drive gear and housing.

Contact Point Opening (Dwell)

Adjust contact point opening by loosening off the lockscrew, and with the aid of a screwdriver move the stationary point until the point gap is .012"–.016" with the rubbing block on the highest point of a cam lobe. Connect cam angle meter, start engine and adjust points to read 36°–40° of cam dwell. The contact closing period is determined by the shape of the cam and the contact point opening. Each opening should be equal. Align contacts, if necessary to provide extra centre contact by bending the stationary contact bracket. NEVER BEND MOVABLE ARM to obtain alignment.

Ignition Timing (with 12v Test Lamp)

(1) Connect 12v 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.

8. CHECKING BREAKER ARM SPRING TENSION

(1) Hook a spring scale on the breaker arm and pull in a straight line at right angles to point surfaces.

(2) Take a reading as the points begin to separate under the slow and steady pull of the scale. Spring tension should be 17½–21 ozs.

(3) If tension does not come within this specification a new contact set is required.

NOTE: Spring tension that is too great will cause excessive wear on the distributor cam and rubbing block. Spring tension that is too weak is unable to keep the points in contact with each other when they close. This becomes more apparent as the engine speed is increased, and can cause high speed misfiring.

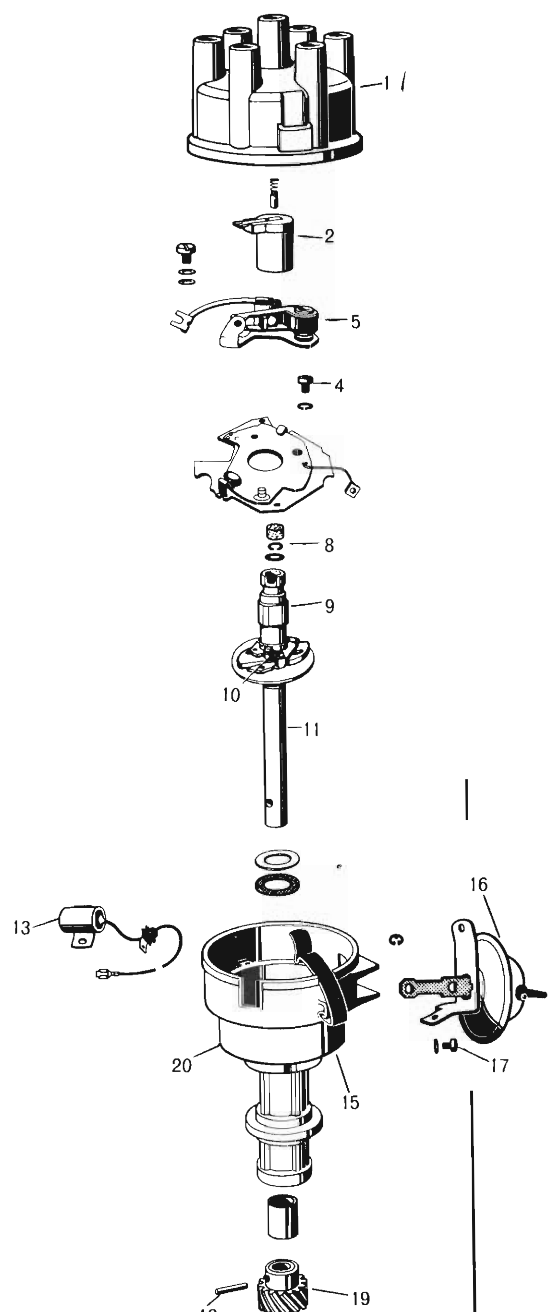


Fig. 4 – Distributor (disassembled view)

9. DISTRIBUTOR ADVANCE

Checking Advance Curve (Centrifugal)

Mount the distributor assembly in a suitable stroboscope-type distributor tester.

(1) Adjust the tester speed control to operate distributor at a slow speed (below point at which centrifugal advance starts to operate), and align the "O" of the tester degree ring with any of the arrow flashes.

(2) Adjust the tester speed control to operate the distributor at speeds called for in Specifications, and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(3) If the centrifugal advance curve does not meet specifications adjust spring tension by bending the spring mounting tabs in the required direction.

Bending the spring tab towards the distributor cam decreases the tension, whilst bending away increases the spring tension. The lighter spring controls the initial advance and the combination of both springs controls the advance at the higher speeds.

To Test Vacuum Diaphragm Leak

With the distributor mounted in a distributor tester and with the vacuum unit attached to the distributor, proceed as follows:

(1) Place thumb over end of vacuum pump hose and adjust the regulator control knob to give a reading of 20" of vacuum with hose closed off to ensure tester hose does not leak.

(2) Attached vacuum pump hose to the tube on the vacuum unit. Vacuum gauges should hold on maximum vacuum obtainable if no leaks exist.

(3) Observe the breaker plate whilst performing leak test to check response of breaker plate to vacuum advance. There should be instant response to the pull of the diaphragm, moving the plate without drag, bind or jerk in either direction.

(4) If leakage is indicated, replace the vacuum unit assembly.

To Check Vacuum Advance Curve

If only the vacuum advance curve is to be checked, connect tester vacuum pump hose to distributor vacuum advance unit and perform operation 1 of centrifugal advance, curve test, then proceed as follows:

(1) Turn tester vacuum pump ON. Adjust vacuum pump regulator to vacuum test specifications. Refer to Specifications and observe arrow flashes on tester degree ring to determine degrees of advance.

(2) If the vacuum advance is below or above specifications *(no adjustment is provided)*, the vacuum unit must be replaced.

10. INSTALLATION OF DISTRIBUTOR

(1) Position the distributor on engine.

(2) Engage the distributor drive gear with the camshaft drive gear so that when distributor is fully seated, the rotor will be in line with the line scribed previously on the cylinder block.

(3) Install the hold down lock plate screw and tighten finger tight.

(4) Install the distributor cap (make sure all high tension wires are firmly seated in cap towers).

(5) Attach primary lead to coil.

NOTE: Do not connect the distributor vacuum hose at this time.

(6) Connect a power timing light to the No. 1 spark plug *(using proper adaptor).*

WARNING:

Where a "Power Timing Light" is used, DO NOT connect the "Battery Lead" connection to the alternator output terminal, as this could cause alternator diode failure.

(7) Start the engine and run at a slow idle.

(8) Rotate the distributor housing so that the timing mark on the crankshaft damper is aligned with the appropriate mark on the chain case cover. Refer to specifications. *(Moving distributor housing counter-clockwise advances the timing, and clockwise retards it).*

(9) Tighten the distributor lock plate screw after timing has been set and recheck the timing adjustment with a power timing light.

(10) When the timing is correct, reconnect vacuum hose at distributor.

(11) Remove timing light from engine.

11. SPARK PLUGS

Remove the spark plugs, examine the firing ends of plugs for evidence of oil fouling, gas fouling, burned or over-heating conditions. Clean and reset gaps to .035".

Oil fouling is usually identified by wet, sludgy deposits, caused by excessive oil consumption.

Gas fouling is usually identified by dry, black, fluffy deposits, caused by incomplete combustion.

Burned or overheated spark plugs are usually identified by a white, burned or blistered insulator nose and badly burned electrodes. Improper fuel, inefficient cooling, or improper ignition timing normally are the causes.

Normal conditions are usually identified by white powdery deposits or rusty brown to greyish-tan deposits.

Test the spark plugs following the manufacturer's instructions. Reject any sub-standard spark plugs.

NOTE: When installing spark plugs, tighten to 30 lbs./ft.

12. IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor. When testing the coil for output, include the resistor in tests.

Inspect the coil for external leaks and arcing. Always make two tests when checking the coil — one when coil is cold, and the other after the coil has been warmed up.

Test the coil according to the 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.

NOTE: Under certain extreme conditions it may be desirable to use a colder plug than that fitted as standard. This should not be necessary unless the vehicle is used for sustained speeds in excess of 85 m.p.h. or for long distance towing of heavy trailers, in which case N 9Y-14 mm spark plugs are recommended.

8 CYLINDER

SPECIFICATIONS

DISTRIBUTOR

ENG.	TRANS.	MAKE	CHRYSLER PART No.
318	AUTO	LUCAS	3542088
340	AUTO	,,	3430519
360	AUTO	,,	3542067

Advance — Centrifugal (distributor degrees @ Dist. R.P.M.) / Advance-Vacuum (distributor degrees @ inches of mercury)

318C.I. ENG. WITH AUTOMATIC TRANSMISSION

ADVANCE R.P.M.	0° @ 375-510	3°-5° @ 700	9°-11° (Max.) @ 2,100

Advance Vacuum	0° @ 7″ H.G.	0°-3.25° @ 9″ H.G.	2°-5.25° @ 10″ H.G.	4°-7° @ 11″ H.G.	6.75°-9.75° @ 12.5 H.G.	10°-13.5° @ 14.5″	10.5°-13.5° @ 18″ H.G.

340 C.I. ENG. WITH AUTOMATIC TRANSMISSION

ADVANCE R.P.M.	0° @ 485-565	5° @ 650-750	8.5° (Max.) @ 850

Advance Vacuum	0° @ 6.5″-8.5″ H.G.	5° 10.1″-11″ H.G.	8.5° @12″-14″ H.G.

360 C.I. ENG. WITH AUTOMATIC TRANSMISSION

ADVANCE R.P.M.	0° @400-495	5° @545-630	8° 10° @ 700	14°-16° @ 2,100

Advance Vacuum	0° @5.75″-8.60″ H.G.	5° @10.75″-11.75″ H.G.	8.5°-10.5° (Max.) @ 14.75″-16″ H.G.

Breaker point gap	.014″ - .019″
Dwell angle	26° - 28°
Breaker arm spring tension	18 - 24 ozs.
Timing	B.T.C. 10° 318 auto. 2.5° 340 7.5° 360 auto.
Condenser capacity	.18 - .25 mfd.
Shaft side play (new or rebuilt)	.000″ - .003″
Service wear limit	.006″
Shaft end play (after assembly)	.002″ - .010″
Rotation	Clockwise

SPARK PLUGS

TYPE	MAKE	SIZE	GAP	ENGINE
N 14Y	Champion	14 mm	.035″	318 c.i.
N 9Y	,,	,,	.035″	340 c.i.
N 11Y	,,	,,	.034″	360 c.i.

Firing Order .... 1 - 8 - 4 - 3 - 6 - 5 - 7 - 2

COIL

Make and Number	Lucas type 8C12 (2630436)
Primary resistance @ 70°F.	1.48 - 1.58 ohms
Secondary resistance @ 70°F.	6,400 - 7,000 ohms

BALLAST RESISTOR

Make and Number	Chrysler (2095501)
Resistance @ 70°F.	0.5 - 0.6 ohms @ Nil amps
Current draw (coil and ballast resistor in circuit)	
Engine stopped	*2.87 amps @ 11.75v
Engine idling @ 500 R.P.M.	*1.6 amps @ 12v
Engine running @ 2,500 R.P.M.	*1.02 amps @ 13v

* at stabilised saturation temperature

TORQUE SPECIFICATIONS

Distributor cam retaining screw	40 lbs./ins.
Breaker arm spring anchor terminal nut	20 lbs./ins.

SERVICE INFORMATION — PROCEDURES

1. 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 the primary wiring make up the low voltage primary circuit. The secondary high voltage circuit includes the coil secondary winding, the distributor cap and rotor, the spark plug cables, the spark plugs and the vehicle frame.

2. CHECKING THE SECONDARY CIRCUIT

The coil to distributor cap wire and the spark plug wires should make good, clean contact in the ignition coil, the distributor cap towers and on the spark plugs. Wires that are loose or that are not inserted all the way into the towers or on the plugs will corrode and increase the resistance as well as cause carbon tracking of the coil or cap towers.

The ignition coil tower, if oily or dirty, should be wiped clean and inspected for cracks, carbon tracking or oil leaks. Replace the coil if faulty.

Inspect the distributor cap for oil film, dirt or metal particles on the inside surface. Any contamination, however slight, can become conductive and cause hard starting in wet weather. Thoroughly wash the cap and rotor in a weak solution of liquid soap or detergent in warm water. Do not use a concentrated solution or soak the cap in the solution. Scrub the inner surfaces with a stiff bristle nylon brush to clean between the ribs and the crevices. Rinse well in hot water, shake out excess water and dry thoroughly. Do not use compressed air to dry or blow out the water. Carefully inspect for cracks or carbon tracking on the inner and outer surfaces. Replace the cap if faulty.

The secondary cables, cap and rotor should be tested, using an electric leakage detector. This tester provides high voltage which is sufficient for testing secondary insulation.

Test the resistance of the spark plug cables. Replace the cable if resistance is more than 30,000 ohms, or if the terminal has pulled off the cable.

NOTE: Jerking the wires to disconnect them from the plugs can stretch them and increase secondary resistance. To remove the wire, grasp the boot at the end of the wire and rotate the boot slightly to break the adhesion between it and the spark plug insulator. Then use a straight pull to remove the spark plug lead.

The rotor and distributor cap electrodes should be inspected for burning. Replace the rotor if the electrode is burned on the top or if the electrode is worn too short.

3. 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 the selector switch of a tach-dwell unit to the CALIBRATE position and adjust the dwell calibrator until the dwell meter reads on the set line (test leads separated).

(2) Leave the selector switch in the CALIBRATE position, connect the tach-dwell red lead to the distributor terminal of the coil and the black lead to a good ground.

(3) Turn ignition switch "ON". Observe the dwell meter reading. Meter point should be well within the black bar marked "DISTRIBUTOR RESISTANCE". If the reading is zero or outside of black bar, crank the engine with the starter until the pointer moves as far right as possible. (This will indicate that the contacts are closed.) A reading now within the black indicates a normal distributor primary circuit.

If the reading is outside the black bar, high resistance is present in the distributor primary circuit.

(4) Remove the test lead from the 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 contacts.

(e) Distributor housing.

(5) Repeat the test at each connection until a noticeable change occurs in the meter reading. If a poor connection or faulty lead is indicated, clean, tighten or replace as necessary and repeat test (3).

If faulty contacts are indicated, remove the distributor for complete inspection, service testing and calibration.

4. IDLE R.P.M. SETTING TEST

The engine idle R.P.M. 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.

Test procedures are as follows:

(1) Turn the Selector Switch to the CALIBRATE position and adjust the Dwell Calibrator until the dwell meter reads on the SET line (test leads separated).

(2) Connect the red lead of the test unit to the distributor primary terminal at the coil and the black lead to a good ground.

(3) Turn the Selector Switch to the 8 LOBE position.

(4) Turn the tachometer R.P.M. switch to the 1,000 R.P.M. position.

(5) With the 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 the idle speed screw is against its stop.

(6) Note engine R.P.M. on 1,000 R.P.M. scale and adjust carburettor idle speed to specifications. *(See "Fuel System" Specifications.)*

5. DISTRIBUTOR POINT 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) Connect the Tach-dwell red lead to the distributor terminal of coil and black lead to a good ground.

(2) Turn the Selector Switch to the 8 LOBE position.

(3) Start the engine and operate at 550 R.P.M.

(4) Observe the 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 the dwell reading is not within specifications, incorrect contact gap, worn cam, worn rubbing block or distorted contact arm may be indicated.

6. 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 the engine at idle speed, the vacuum hose disconnected, and with the test leads connected as in Point Dwell Test, turn the Tachometer R.P.M. switch to the 5,000 R.P.M. position.

(2) Slowly increase the engine speed to 1,500 R.P.M. then slowly reduce to idle speed while observing the dwell meter reading.

If the dwell reading varies more than 2° from initial reading between the idle speed and 1,500 R.P.M., 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.

> NOTE: Dwell variation at speed above 1,500 R.P.M. 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 the wrong contacts are installed or the rubbing block or cam lobes are badly worn or movable contact is distorted.

7. IGNITION TIMING

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give the proper ignition timing.

The ignition timing test will indicate the timing of the spark at No. 1 cylinder at idle (only).

Test procedures are as follows:

NOTE: Do not puncture the wires, boots or nipples with test probes. Always use adaptors. Puncturing spark plug wires with a probe will damage the wires. The probe can separate the conductor and cause high resistance. In addition, breaking the rubber insulation may permit secondary current to arc to ground.

(1) Disconnect the vacuum hose at the distributor.

(2) Connect the secondary lead of the power timing light to the No. 1 spark plug, red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

WARNING: Where a "Power Timing Light" is used, DO NOT connect the "Battery Lead" connection to the alternator output terminal, as this could cause alternator diode failure.

(3) Start the engine and set the idle to 500 R.P.M., engine at normal operating temperature (transmission in neutral and air/conditioning OFF).

(4) Using a timing light, observe the positions of the timing mark on the crankshaft damper and check against the specifications.

(5) Loosen the distributor hold down clamp screw and rotate the distributor housing so that the specified timing mark on damper aligns with the specified "BTC" mark on the timing plate. Moving the distributor housing against shaft rotation advances the timing and with shaft rotation retards the timing.

(6) Tighten the distributor hold down clamp screw after the timing has been set and recheck the timing adjustment with a power timing light.

(7) When the ignition timing is correct, connect the vacuum hose to the distributor. As the engine speed is increased, the timing mark should move down on the vibration dampener below the pointer if advance units are functioning.

Ignition Timing (with 12 volt Test Lamp)

(Fig. 1) connect 12 volt 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.

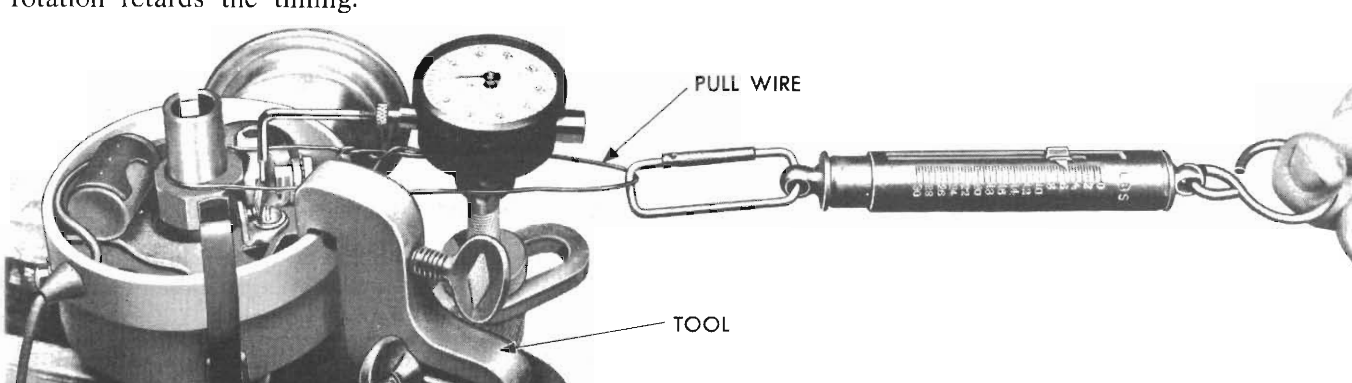


Fig. 1 – Shaft and Bushing Wear Test (typical view)

8. DISTRIBUTOR

To Remove

(1) Disconnect the vacuum hose at distributor.

(2) Disconnect the primary lead wire at the coil.

(3) Unfasten the distributor cap retaining clips and lift off the distributor cap.

(4) Scribe a mark on the edge of the distributor housing to indicate the position of the rotor as reference when re-installing the distributor.

(5) Remove the distributor hold-down clamp screw and the clamp.

(6) Carefully lift the distributor from the engine.

9. SHAFT AND BUSHING WEAR TEST

(1) Remove the distributor rotor.

(2) DO NOT LOOSEN the inner nut that holds the movable contact arm tension spring to the terminal post.

(3) Clamp the ribbed section of the distributor housing lightly in a vice equipped with soft jaws and attach the dial indicator to the body of the distributor with the indicator plunger arm resting against the movable contact arm at the rubbing block and with the rubbing block of the contact arm on the highest point of the cam lobe *(Fig. 1).*

(4) Place one end of a wire loop around the top of the distributor shaft. Hook a spring scale in the other end of the plunger of the indicator gauge. Be sure the wire loop on the shaft end is down on the shaft to ensure a straight pull and also that the wire loop does not interfere with the indicator or holding bracket. Apply a 5 lb. pull and read the movement of the plunger on the indicator dial. (Be sure the rubbing block of the contact arm is on the highest point of the cam lobe during this test). If the plunger movement exceeds .006 inch, replace the housing and/or distributor shaft *(see Distributor Disassembly).*

10. DISASSEMBLY OF DISTRIBUTOR (refer Fig. 2)

Contact Points

(1) Remove the distributor cap (where not previously removed).

(2) Remove the rotor.

(3) Remove the contact breaker spring terminal retaining insulator nut and insulator.

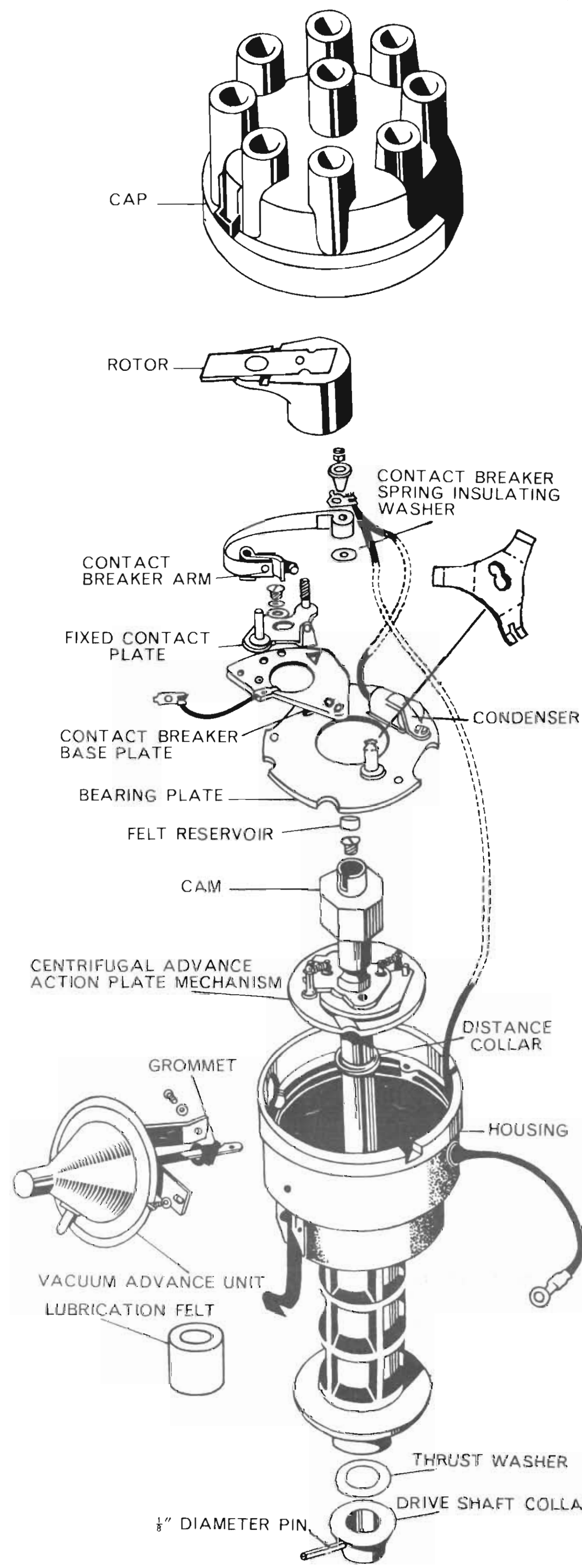


Fig. 2 – 8 cylinder distributor (disassembled view)

(4) Disconnect the condenser and L.T. leads and lift off the contact breaker arm and the fibre insulating washer from the terminal post.

(5) Remove the cheese head screw and washers retaining the fixed contact plate.

Contact Breaker Base Plate

(1) Remove the clip retaining the star spring washer which retains the contact breaker base plate.

(2) Remove the screw which earths the advance (base) plate to the housing and remove the contact base plate "peg" carefully from the vacuum advance link.

Vacuum Control Unit

(1) Remove the two screws securing the vacuum unit bracket to the distributor body.

(2) Remove the unit with the rubber grommet, noting the related position.

Contact Breaker Bearing Plate

Remove the two remaining screws from the bearing plate, and remove the plate from the housing, complete with condenser.

Advance Springs, Weights and Cams

(1) Remove the centrifugal advance control springs from the cam and action plate anchors.

(2) Remove the lubricator from the cam centre.

(3) Remove the cam retaining screw from the upper end of shaft and remove the cam. Note the direction of the rotor cut-out to the shaft relationship for reassembly. (The cam may be positioned 180° from the original position.)

Shaft and Action Plate

(1) Suitably support the drive shaft collar and drive out the ⅛" diameter pin. Retrieve the thrust washer.

(2) Remove the drive shaft from the body, retrieving the distance collar from below the action plate.

(3) Retrieve the lubrication felt, positioned between the bushings. This felt is not serviced and should not be cleaned in solvents.

> NOTE: Replacement bushings are not serviced.

(4) Clean and inspect the components. (It is not necessary to remove the L.T. lead from the housing or the condenser from the base plate — unless to replace them — as they may be tested in position.)

(5) Test the condenser and its security to base plate.

(6) Test all the L.T. leads for damage and high resistance.

(7) Check the distributor cap and clean the H.T. lead ends.

(8) Check the rotor and clean the rotor tip.

(9) Check the cap rotor carbon contact and spring.

11. ASSEMBLING THE DISTRIBUTOR (refer Fig. 2)

Shaft and Action Plate

(1) Lubricate the shaft using a "molybdenum" type grease.

(2) Install the distance collar on the shaft below the action plate.

(3) Lubricate the felt with light engine oil and re-install in housing (where removed).

(4) Re-install the drive shaft in housing and install the thrust washer and collar (when re-installing the drive shaft).

(5) Install a new retaining pin to secure the collar then check the end float, which should be within .002" – 0.10". Add sufficient thrust washers to obtain this specification.

To Install Replacement Shaft

a. Drill the shaft through the hole in the thrust collar with an additional washer (approx. .004" to provide clearance) installed.
b. Apply force to shaft and collar to remove any end float while drilling the .125" –.129" diameter pin hole.
c. Remove the temporary (clearance) washer and re-assemble, installing the new pin as described in sub-para (5).

(6) Ensure that the pin is tight in the shaft and the collar.

Advance Weights, Springs and Cam

(1) Lubricate the cam to shaft surfaces, weight pivots and contact surfaces, cam and action plate contact surfaces using a molybdenum type grease.

(2) Install the weights on the action plate pivots.

(3) Install the cam on shaft and engage the advance slots in the weights (aligning the respective action plate position to the rotor cut-out location).

(4) Install the screw in the cam to secure it to the shaft, tighten to 40 lbs./ins. torque. Install the felt wick in cam.

(5) Install the advance control springs to the anchor points of the cam and action plate.

(6) Install the L.T. lead grommet into the housing hole (remote from the vacuum assembly hole).

Contact Breaker Bearing Plate

Install the bearing plate to the distributor housing and install the retaining screws adjacent to the pivot and the condenser.

Vacuum Control Unit

Re-install the vacuum unit housing and the grommet using two retaining screws. (Ensure that the grommet and the link are correctly positioned by holding the link down over the clearance slot in the base plate while tightening the screws.)

Contact Breaker Base Plate

(1) Lubricate the breaker plate pivot post, the bearing contacts and the vacuum control link connection using a molybdenum type grease.

(2) Engage the contact breaker base plate "peg" in the vacuum advance link hole and re-install the contact breaker base plate, base plate star spring, washer and retaining clip.

(3) Re-install the base plate earth lead and screw and tighten all screws securely.

Contact Points

(1) Lubricate the contact breaker pivot post by lightly applying a multi-purpose type grease.

(2) Install the contact breaker spring insulating washer on the terminal post, then install the breaker point arm with the spring over the terminal post, and install the contact breaker fixed contact plate retaining screw and washer, check the alignment of the points, remedy mis-alignment by carefully bending the stationary contact if necessary.

(3) Attach the L.T. lead and condenser lead terminals under the insulator and install the washer and nut and tighten carefully.

(4) Adjust the breaker point gap to .014 - .019" which should provide 26° - 28° dwell angle. Tighten the retaining screw securely.

(5) Check the contact breaker spring tension (18 – 24 ozs.). (Reset spring loop if necessary to adjust.)

(6) Check distributor rotor tip and H.T. terminals for erosion or scale — clean off as required.

(7) Lubricate the cam wick and install the rotor.

> NOTE: The shaft should rotate freely without any binding, etc., and the contact points must be clean to prevent premature burning of the contacts.

12. TESTING CONTACT ARM SPRING TENSION

(1) Hook a spring scale (Tool MTU-36) on the contact arm and pull in a straight line at right angles to the contact surfaces *(Fig. 3)*. Take a reading as the contacts start to separate under the slow and steady pull of the scale. The spring tension should be 18 – 24 ounces. If the reading is outside these limits, loosen the nut which holds the end of the movable arm spring and rotate the end of the spring as necessary to adjust tension.

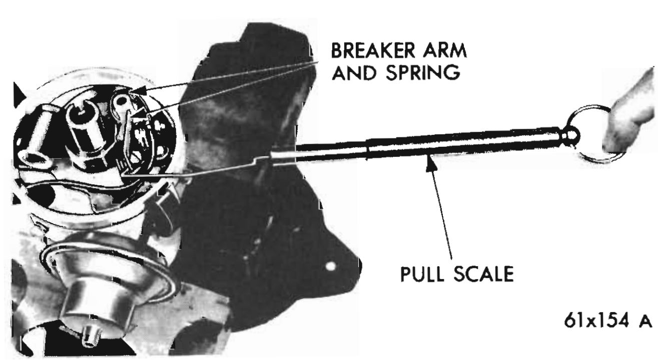


Fig. 3 – Testing contact arm spring tension

(2) Retighten the nut and measure the spring tension.

NOTE: Spring tension that is too great, will cause excessive wear on the distributor cam and on the rubbing 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.

13. INSTALLATION AND ALIGNMENT OF CONTACT POINTS

(1) Remove the old contacts and install a new set. Touching the contact faces with fingers during installation will cause burning of points during operation.

(2) Align the contacts to obtain centre contact by bending the stationary contact bracket only. Never bend the movable arm to obtain alignment.

(3) After aligning the contacts, readjust the contact clearance to specifications using a dial indicator *(Fig. 4)*.

(4) Test the dwell angle to show proper degrees of closure. *(See Distributor Point Dwell.)* The lock screw should be loosened just enough so that the stationary bracket can be moved with a slight drag; otherwise it will be difficult to set the contacts accurately. After setting the contacts to correct the gap, tighten the lock screw.

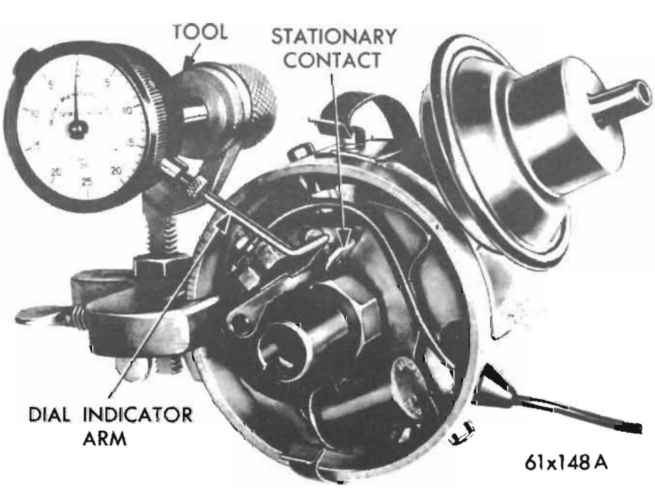


Fig. 4 – Adjusting contact clearance with indicator (typical view)

14. DISTRIBUTOR LUBRICATION

(1) Lubricate the felt pad under the rotor in the top of the distributor cam with 3 to 5 drops of SAE 10W oil.

(2) Wipe all old grease from surface of the distributor cam. Apply a light film of multi-purpose cam lubricant.

NOTE: Do not over-lubricate. Excess grease will be thrown from the distributor cam when the engine is running. Should this grease strike the contact faces, arcing and burning of the contacts will result and ignition trouble will be experienced.

15. DISTRIBUTOR ADVANCE

To check Automatic Advance Curve (centrifugal)

Mount the distributor assembly (less cap and rotor) in a reliable stroboscope-type distributor tester and proceed with tests as follows:

NOTE: Clamp around the rib section of the distributor housing. The bottom section of the distributor housing is not a machined surface and concentricity would be affected, causing a wobble.

(1) Turn the Tach-Dwell switch to the 8 LOBE position and the motor switch to clockwise rotation.

(2) Turn the battery switch ON.

(3) Regulate the tester speed control to operate the distributor at 200 distributor R.P.M.

(4) Hold the distributor contact plate in the full retard position and align the 0 of the distributor tester degree ring with any one of the arrow flashes.

(5) Adjust the tester speed control to operate the distributor at speeds called for under Specifications and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(6) If the advance is not according to specifications the advance control springs should be replaced, and the advance rate rechecked.

NOTE: The light tension spring controls the lower end of the advance curve, and the heavier spring controls the upper end of the advance curve.

To Test Vacuum Diaphragm Leak

With the distributor mounted in distributor tester with the vacuum unit attached to the distributor, proceed as follows:

(1) Place the thumb over the end of the vacuum pump and hose and adjust the regulator control knob to give a reading of 20 inches with hose closed off to be sure tester hose does not leak.

(2) Attach the 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 the contact plate while performing the leak test to test the response of the 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 the vacuum unit assembly.

To Check Vacuum Advance Curve

Connect the vacuum pump hose to the distributor vacuum advance unit and perform operations (1) through (5) under *"Centrifugal Advance Curve"*. Then proceed as follows:

(1) Turn the vacuum pump ON. Adjust the vacuum pump regulator to vacuum test specifications *(see Specifications)* and observe the arrow flashes on the tester degree ring to determine the degrees of advance.

(2) If the vacuum advance is above or below specifications, replace the vacuum advance unit. Retest the vacuum advance rate.

16. INSTALLATION OF DISTRIBUTOR

(1) Position the distributor on the engine. Align the rotor with marks previously scribed on the distributor housing.

(2) Engage the tongue of the distributor shaft with the slot in the distributor and the oil pump drive gear.

> NOTE: If the engine has been cranked while the distributor is removed it will be necessary to establish the proper relationship between the distributor shaft and the No. 1 piston position as follows:

a. Rotate the crankshaft until the number one piston is at top of the compression stroke.

b. Rotate the rotor to the position of the number one distributor cap terminal.

c. Lower the distributor into the opening, connect the primary lead and install the distributor cap. Make sure all high tension wires "snap" firm in the cap towers. Install the distributor hold-down clamp screw. Tighten the screw finger tight.

d. Connect the secondary lead of a power timing light to the No. 1 spark plug (using the proper adaptor).

> NOTE: Do not puncture the cable nipples or the spark plug covers to make contact.

Connect the red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

> NOTE: Do not connect to the alternator output terminal.

e. Start and operate the engine at idle speed. Rotate the distributor housing so that the specified timing mark and the pointer are in alignment. (Moving the distributor housing against the shaft rotation advances the timing and with the shaft rotation retards the 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.

17. SPARK PLUGS

Examine the firing ends of spark plugs for evidence of oil fouling, gas fouling, burned or overheating conditions. Clean and reset gaps to .035".

Oil fouling is usually identified by wet, sludgy deposits caused by excessive oil consumption.

Gas fouling is usually identified by dry, black, fluffy deposits caused by incomplete combustion.

Burned or overheated spark plugs are usually identified by a white, burned or blistered insulator nose and badly burned electrodes. Improper fuel, inefficient cooling or improper ignition timing normally are the causes.

Normal conditions are usually identified by white powdery deposits or rusty brown to greyish tan deposits.

> NOTE: When installing spark plugs, tighten to 30 lbs./ft. torque.

18. IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor. When testing the coil for output, include the resistor in tests. *(Refer to the Specifications.)*

See illustration for correct routing of leads and position of additional separators, shown in part 9 "Wiring Diagrams".

PART 5 — HORNS

SPECIFICATIONS

Models	Type	Chrysler P/No.	No. Installed	Max. Current Draw @ 12v
Ranger	RVB Low Note (1200-266)	3429161	1	8-11 amps
Ranger XL	RVB Low Note (1200-266)	3429161	1	8-11 amps
Pacer	RVB Extra High Note (1470-205)	3428925	1	6.5 amps
	RVB Ultra High Note (1470-206)	3428926	1	6.5 amps
Regal, Regal 770 and Chrysler	RVB High Note (1450-237)	3429159	1	6.0 amps
	RVB Low Note (2000-248)	3429160	1	6.5 amps
Charger and Charger XL	RVB Low Note (1200-266)	3429161	1	8-11 amps
	RVB Low Note (1200-266)	3429161	1	8-11 amps
Charger RT and Charger 770	RVB Extra High Note (1470-205)	3429925	1	6.5 amps
	RVB Ultra High Note (1470-206)	3428926	1	6.5 amps
Utility	RVB Low Note (1200-266)	3429161	1	8-11 amps

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. HORNS WILL NOT BLOW

(1) Incorrect adjustment.

(2) Broken or defective wiring.

(3) Faulty horn.

(4) Defective horn ring switch.

(5) Low battery.

2. HORNS BLOW CONTINUOUSLY

(1) Shorted wiring.
(2) Grounded horn ring.

3. HORN NOTE OR TONE UNSATISFACTORY

(1) Horn loose on mounting.
(2) Horn out of adjustment.
(3) Internal fault.
(4) Loose or broken connection in wiring.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

For models equipped with single or double horns: Refer to above chart.

2. TESTING HORNS

If horn or horns are not operating, test as follows:

At the horn, earth the terminal with the black lead on it. If the horn operates, the switch is defective. If horn fails to operate, fault is in the wire to the horn, or in the horn.

> NOTE: Violet lead is power to horn and the black lead is earthed via switch.

3. ADJUSTMENT

(1) With the horn removed from the vehicle connect in series with ammeter and horn button and apply the appropriate nominal voltage.

(2) The 5/16″ adjusting screw situated on back of horn should be turned slowly to give a reasonable performance on 10 to 14 volts.

(3) After adjustment the current draw should not exceed required amperages at 12 volts. *Refer to Specifications for recommended current draw.* Do not adjust larger nut and screw in centre of horn.

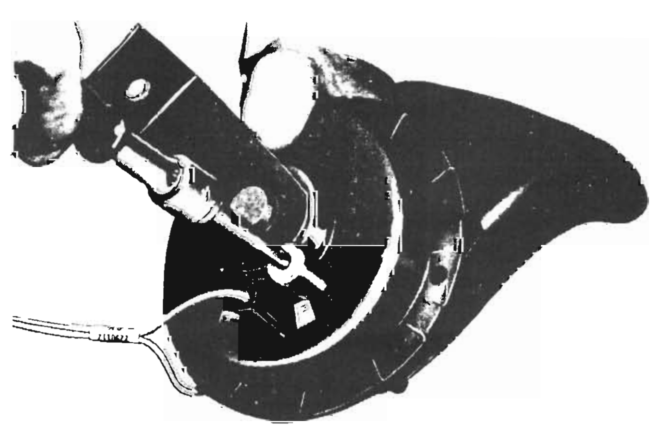


Fig. 1 – Adjusting horn (R.V.B.) typical

PART 6 — WINDSHIELD WIPERS

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. WIPER OPERATES SLOWLY

(1) Binding linkage.

(2) High resistance in brush to commutator contact or carbon deposits in slots. Test armature commutator and brushes.

(3) Faulty control switch.

2. WIPER FAILS TO OPERATE

(1) Binding linkage.

(2) Faulty switch *(See Para. 14 for test procedure).*

(3) Faulty motor.

(4) Open or grounded wiring.

(5) Blown fuse.

3. BLADES FOUL WINDSHIELD MOULDINGS

(1) Distorted or damaged wiper linkage.

(2) Incorrectly positioned wiper arms.

4. BLADES CHATTER

(1) Twisted arm. DO NOT ATTEMPT TO STRAIGHTEN BENT OR TWISTED ARM.

(2) Wrong type blades used.

(3) Wax on glass.

(4) Incorrect arm spring tension.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

The Lucas windshield wiper motor incorporates dual speed operation, providing satisfactory wiping operation for heavy or light rain. The parking switch is integral with the motor and gives satisfactory parking under all conditions, as the motor will always be on slow speed prior to the parking position being selected.

Consequently, this reduces the amount of overrun.

A three-position switch on the instrument cluster face covers both speeds "High" and "Low", and the "Parked" position.

As the windshield wiper assembly is pre-set during manufacture, there is no provision for adjustments. The parking position is also predetermined and does not require adjustment.

Incorporated in the wiper switch assembly is the windshield washer (push-button) operating switch, which will operate the washer pump motor, independent of the wiper motor operation.

2. WIPER MOTOR REMOVAL

(1) Disconnect the wiper link at the wiper motor.

(2) Disconnect the wiper motor lead wires at the wiper motor.

(3) Remove the three screws attaching the wiper motor to the dash panel and remove the motor.

3. DISASSEMBLY OF WIPER LINKS

(1) Remove the clip holding the drive link to the crank arm.

(2) Remove bevel washer and disconnect drive link *(Fig. 1).*

(3) Remove the connecting link by disconnecting the retainers and washers from the right and left pivot assemblies.

4. DISASSEMBLY OF WIPER MOTOR

(1) Remove the loom clip and gear case cover plate.

(2) Hold crank firmly when removing whizlock nut to prevent damage to the internal gears.

(3) Lift out the fibre gear.

(4) Remove the end through bolts and carefully pull off the end plate.

(5) The armature can then be removed.

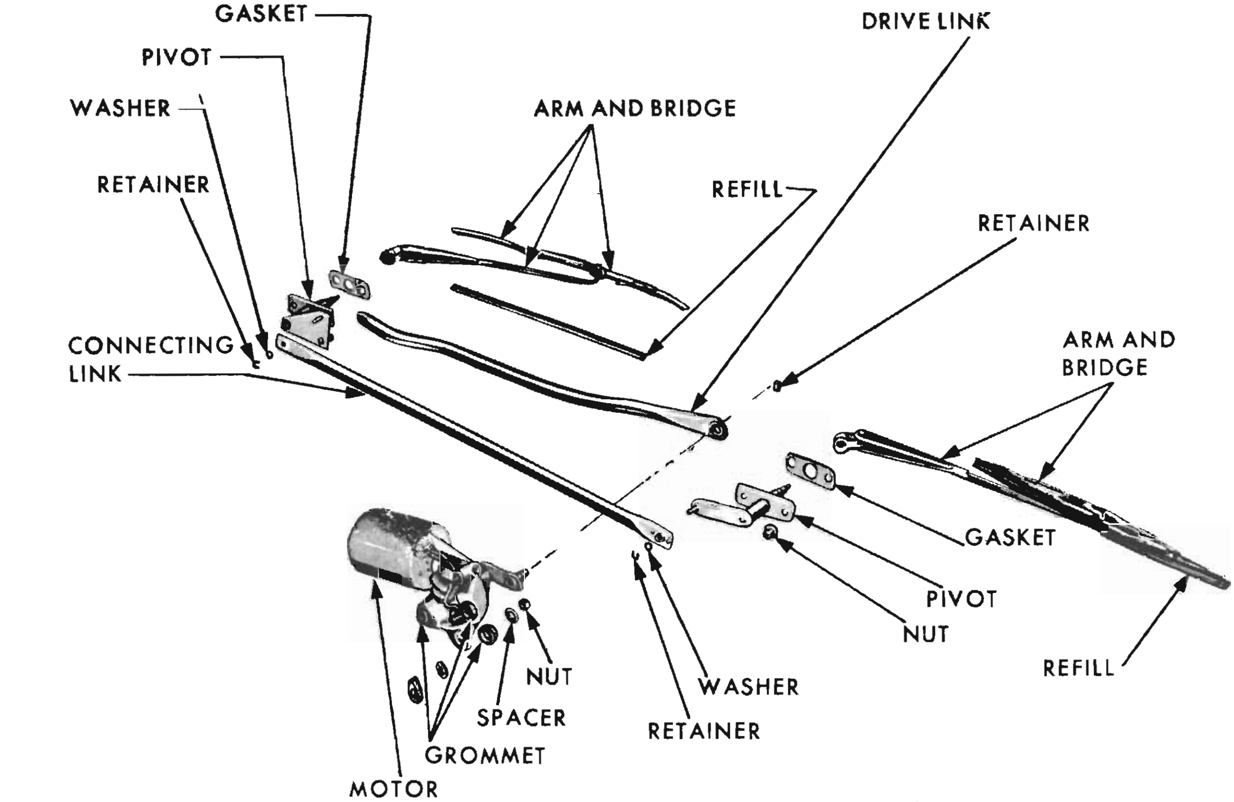


Fig. 1 – Windshield wiper (disassembled) (typical)

5. INSPECTION OF WIPER MOTOR (Lucas)

(1) Thoroughly inspect the motor parts for wear, corrosion or damage.

(2) Clean the armature commutator with 00 or 000 sandpaper or if necessary, turn down the commutator.

(3) Replace worn or oil soaked brushes.

(4) Check the armature and crankshaft in their respective bushings and replace worn parts if any looseness is detected.

(5) Inspect gear for worn or broken teeth and replace if showing damage or excessive wear.

6. REFACING THE COMMUTATOR

If the armature commutator is rough or out of round, burned, or the moulding material is even with, or extends above, the surface of the commutator bars, the commutator should be turned down.

Remove only enough metal to provide a clean, smooth surface. Operation can be performed on a suitable lathe or by using an undercutting tool.

7. UNDERCUTTING THE SEGMENTS

Under-cut the moulded segments to a depth of 1/16″ using an undercutting Tool *(see Fig. 3)*. Be sure to undercut squarely. After undercutting, polish the commutator with 00 to 000 sandpaper to remove burred edges.

CAUTION: Be sure the commutator is clean and free from oil or grease. A dirty, greasy commutator will cause a high resistance and greatly impair the efficiency of the wiper.

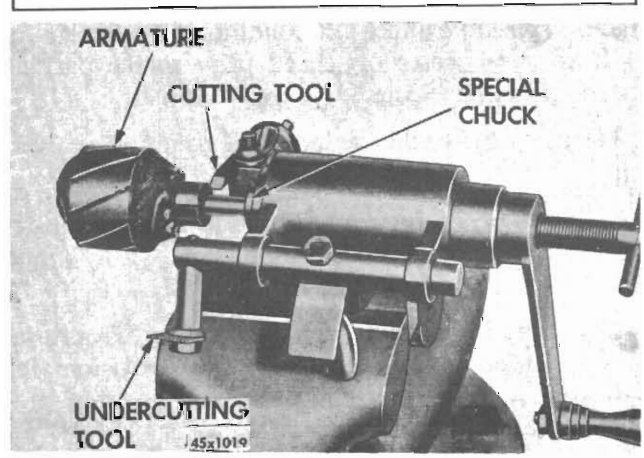


Fig. 2 – Refacing commutator (typical)

8. ASSEMBLING THE WIPER MOTOR

(1) Install the armature and the end plate. (Care should be taken to ensure that the brushes seat properly on the commutator).

(2) Install the through bolts and tighten securely.

(3) Install the fibre gear, crank arm, washer and nut and tighten securely. (Crank arm has a master spline).

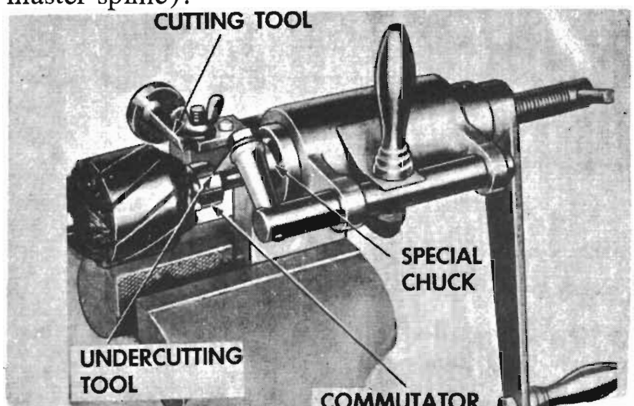


Fig. 3 – Undercutting moulded segments

NOTE: Make sure the gear teeth are adequately covered with long fibre grease.

(4) Replace the gear case cover plate and the connector and install the attaching screws.

9. END PLAY ADJUSTMENT

To adjust the armature shaft end play, turn adjustment screw in until it bottoms and back off one-quarter turn *(Fig. 4)* (lock by staking with centre punch).

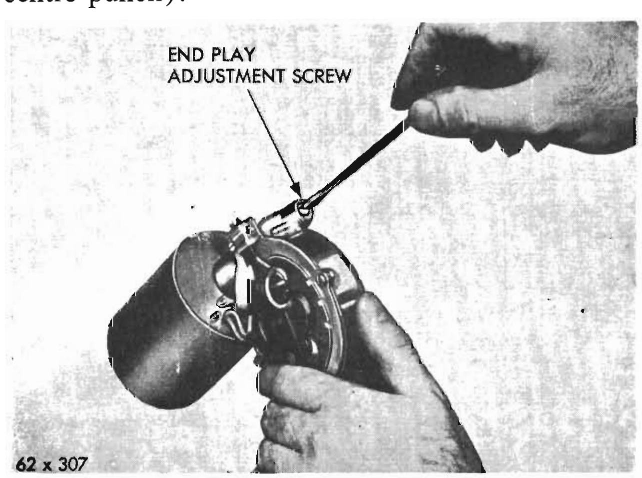


Fig. 4 – End play adjustment (typical)

10. BENCH TESTING WIPER MOTOR

Before bench testing the motor, the lead connectors should be inspected for open- or short-circuits and for poor connections.

To Test

(1) Connect a positive lead from a test battery to the terminal marked "batt" on motor (blue lead).

(2) Connect a negative lead from test battery to the terminal marked "SW1" (dk. green lead). The motor should then run at low speed.

(3) Connect a negative lead from test battery to the terminal marked "SW2" (yellow lead). The motor should then run at high speed.

(4) For wiring diagram refer *(Fig. 6)*.

11. ASSEMBLING THE WIPER LINKS

(1) Install the connecting link, washers and retaining clips to the right and left hand pivot assemblies *(Fig. 1)*.

(2) Install the drive link to the left hand pivot crank.

12. WIPER MOTOR INSTALLATION

(1) Place large MTG plate and insulating rubber gasket on wiper motor mounting bosses.

(2) Mount on dash panel, and from the passenger compartment side of dash panel, install the small rubber gaskets, steel washers, and screws and tighten securely.

(3) Connect the wiper motor lead wires.

(4) Connect the wiper drive link to the motor crank arm and install the washer and retaining clip.

13. REPLACING WIPER PIVOT

(1) Remove wiper arm.

(2) Disconnect the connecting link from the pivot.

(3) Remove the pivot attaching nuts and remove pivot and gasket.

(4) Install a new pivot and gasket and tighten the attaching nuts securely.

(5) Reconnect the connecting link to the pivot crank pin and install the washer and retainer clip.

(6) When installing the wiper arm and blade assembly, the distance between the lower edge of the windscreen and the lower edge of the driver side and passenger side blades should be 1.4″ and 1.9″ respectively (i.e. approximately parallel with the lower edge of the windscreen). The distance at the top of the wipe pattern between the upper tip of the driver side wiper blade and the weatherstrip should then be 0.6″.

NOTE: The wipe pattern should be tested with a wet screen to achieve optimum results.

14. WIPER SWITCH

To Remove

(1) Remove wiper switch control knob by removing the attaching screw with an Allen key.

(2) Remove the slotted retaining nut and the bezel from the switch, and pull the switch rearward and down from under the dash panel.

(3) Disconnect the lead wires from the switch.

To Test

(1) Connect earth strap on switch to negative terminal on battery. Connect test light to positive terminal.

(2) With switch in first ("low") postition, test terminals with test lamp. The lamp should light only on the "L" terminal.

(3) With switch in second ("high") position test terminals with test lamp. The lamp should light only on the "H" terminal.

(4) With switch in "off" position and one lead connected to "P" terminal, globe should light only when other terminal is connected to "L" terminal.

(5) If the switch is faulty or inoperative, replace the switch. (The switch is serviced only as an assembly).

To Install

(1) Reconnect the lead wires to the switch and place the switch into position in the dash panel.

(2) Replace the retaining nut and tighten.

(3) Replace the wiper switch control knob and tighten the attaching screw.

15. WASHER SWITCH

To Test

When switch shaft is depressed, and one lead connected to earth strap, globe should light when connected to "W" terminal irrespective of rotary position of switch.

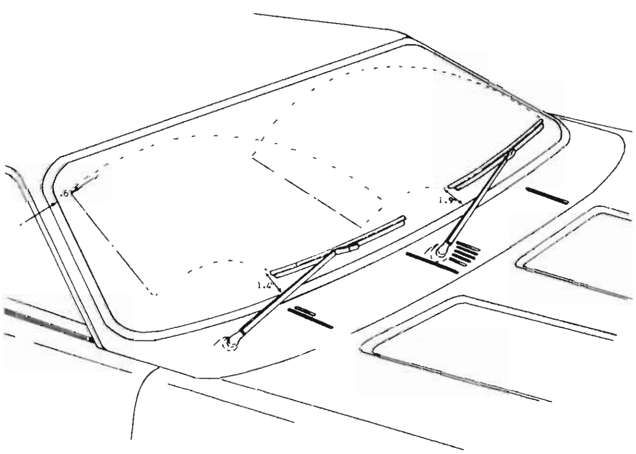


Fig. 5 – Showing correct wiper arm installation

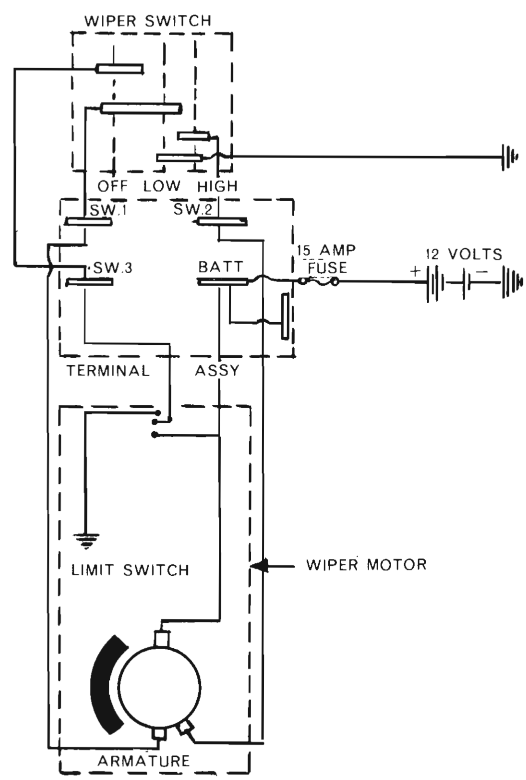


Fig. 6. Wiring Diagram—Lucas.

PART 7 — GAUGES AND INSTRUMENTS

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

The VH/CH model range contains five cluster assembly combinations, with three basic type clusters. They are listed below in model application:

(1) RANGER, RANGER XL, CHARGER, CHARGER XL, AND UTILITY

Have a horizontal strip type instrument contained in die cast bezel housing.

(2) PACER AND CHARGER RT

Have small round instrument dials with tachometer at the left hand side of speedometer contained in a die cast bezel housing.

(3) REGAL, REGAL 770

Has large round dials contained in individual pressed metal cans, attached to a wood grain finish die cast bezel with a clock mounted at the left hand side of the speedometer.

(4) CHARGER 770

Has the same round instrument dials as Regal model, with the exception of the clock which is replaced by a tachometer at left hand side of the speedometer.

(5) CHRYSLER MODELS

Have square-faced instrument dials (in a similar arrangement to the Regal bezel) with a clock at the left hand side of the speedometer.

2. INSTRUMENT CLUSTER

(Ranger, Ranger XL, Pacer, Charger, Charger XL, Charger RT, Utility)

To Remove

(1) Disconnect battery negative terminal.

(2) Disconnect speedometer cable at rear of instrument cluster.

(3) Remove glove box.

(4) Remove crash pad by removing the five holding nuts securing the crash pad to the instrument panel.

(5) Remove the four screws holding the bezel to the front bottom of the instrument cluster.

(6) Remove the seven screws attaching the cluster to the instrument panel.

(7) Remove all wiring connections from gauges.

(8) Remove the instrument cluster from the instrument panel.

Regal, Regal 770, Charger 770, Chrysler

(1) Disconnect battery negative terminal.

(2) Remove right hand side air duct and vent cable assembly.

(3) Remove the two bolts attaching the steering column to the instrument panel.

(4) Remove heater control knobs.

(5) Remove the three screws attaching the instrument cluster (upper half) to the instrument panel.

(6) Disconnect the light switch control knob *(refer headlight and wiper switch replacement)* and, from the rear of the instrument panel, the light switch plug connector.

(7) Lower the fuse box from its mounted position.

(8) Disconnect speedometer cable at rear of instrument cluster.

(9) Remove the right hand demister tube.

(10) From rear of instrument panel, remove the four nuts attaching the instrument cluster to the instrument panel.

(11) Caulking compound between the top of the instrument cluster and the crash pad may act as an adhesive to hold the cluster in position. It may be necessary to break this seal in order to facilitate removal of the instrument cluster.

(12) Remove the instrument cluster from the instrument panel.

> NOTE: Where an air-conditioner unit is fitted *refer to page 24 – 14 (Panel Control Assembly removal).*

To Install (on all models)

(1) Replace gauges into instrument cluster (if removed).

(2) Reconnect the speedometer cable and reposition wiring correctly.

(3) Replace instrument cluster into instrument panel and secure nuts and/or screws.

(4) Reposition crash pad and glove box (where applicable.

(5) Reconnect battery negative cable.

(6) Check the dash lights and the speedometer for correct operation, upon termination of reassembly.

HEADLIGHT AND WIPER SWITCH REPLACEMENT

(1) Disconnect the battery negative terminal lead.

(2) Disconnect the terminal plug from back of switch.

A. Headlight Switch: Press in the small plunger located on the left side of the switch assembly, then carefully withdraw the knob and rod from switch.

B. Wiper Switch: Loosen the small "Allen" screw in the knob, then withdraw knob off shaft.

(3) Using a suitable key-spanner, remove the securing ring-nut from the switch, then remove switch from under instrument panel.

Instrument Panel Lights

All bulbs in the instrument panel are contained in plug-in sockets. The bulbs can be reached from under the instrument panel.

3. REMOVAL OF INDIVIDUAL GAUGES (Ranger, Ranger XL, Pacer, Charger, Charger XL, Charger RT, Utility)

To Remove

(1) Remove instrument cluster *(refer Para. 2).*

(2) Remove eight hex. head screws, attaching lens and mask to die cast housing.

(3) From rear of die cast housing remove gauge attaching nuts.

Regal, Regal 770, Charger 770, Chrysler

(1 Remove instrument cluster and bezel housing assembly *(refer Para. 2).*

(2) Remove can attaching screws (two per can).

(3) For the side gauges only, remove pressed steel bezel by bending up tabs.

(4) Remove lens.

(5) Remove gauge attaching nuts.

To Install (on all models)

(1) Reverse above procedures.

(2) For installation of instrument cluster *refer to Installation Para. 2.*

4. TEMPERATURE GAUGE

The temperature gauge consists of two units. The dash unit situated in the instrument panel, and the thermo sender unit screwed into the cylinder block. One wire is used to connect the panel unit and sender unit.

If the temperature gauge is inoperative, or erratic, check all electrical connections at the dash unit and sender unit. Test the connecting wire for continuity or grounding by the use of a jumper lead between the dash unit and sender unit (disconnect connecting wire first).

If the above preliminary checks fail to locate the fault, test dash and sender units as follows:

To Test Sender and Dash Units

To make this test, procure a spare sender unit of known accuracy. Disconnect the wire from the sender unit in the cylinder block and connect it to the sender unit. Use a jumper wire to earth the case.

Immerse the spare sender unit in hot water (in a container) and watch the dash unit gauge. If the condition has been rectified, the sender unit in the block should be replaced.

If the condition still exists when the spare sender unit is heated, then the dash unit should be replaced.

If a new dash unit was fitted in conjunction with the above test, and operation is still unsatisfactory when reconnected to the original sender unit, it indicates that both units were faulty *before* the test, and a new sender unit will also have to be fitted.

5. FUEL GAUGE

The fuel gauge consists of two units. The dash unit is situated in the instrument panel, and the tank unit is located in the petrol tank. One wire is used to connect the dash unit and tank unit.

The tank unit comprises a rheostat, the contact finger of which moves as the float rises and falls (according to the amount of fuel in the tank). The rheostat controls the needle movement by varying the resistance in the fuel gauge electrical circuit.

If the fuel gauge is inoperative, or erratic, check all electrical connections at the dash and tank units.

Check the tank unit for a good earth — check the fuel tank for a good earth. Test the connecting wire between the dash unit and the tank unit for continuity or grounds, by the use of a jumper lead (with connecting wire disconnected).

If the above preliminary checks fail to locate the fault, test the dash and tank units as follows:

To Test Sender and Dash Units

Procure a spare tank unit of similar type and of known accuracy.

(1) Disconnect the wire from the tank unit.

(2) Connect the wire to the test unit and, using a jumper wire, earth the case.

(3) Move the float arm of the spare tank unit up and down.

(4) If the dast unit registers in accordance with the movement of the float arm, it indicates that the original tank unit is faulty and should be replaced.

(5) If the dash unit does not register correctly when flat arm is moved, the dash unit is faulty and will have to be replaced.

6. SPEEDOMETER

To Remove

(1) Disconnect speedometer drive cable from speedometer head and remove instrument cluster *(refer Para. 2).*

(2) Remove speedometer attaching nut and washer and remove the speedometer.

To Install

(1) Replace speedometer in the instrument cluster and install the attaching nut and washer.

(2) Replace the instrument cluster and reconnect the speedometer drive cable.

Speedometer Cable

Cable breakages may be caused by:—

(1) Kinked inner flexible cable.

(2) Distorted or damaged outer flexible casing.

(3) Speedometer head mechanism tight.

To Test Speedometer Head

Disconnect the flexible cable from the speedometer head. Take a short length (6 inches) of flexible cable with a tip to suit the speedometer head. Insert the test cable into the head and spin several times. If the cable tends to bind, then the speedometer head should be removed and serviced by an Authorised Speedometer Agent.

To Test Inner Flexible Cable

Remove the inner cable and lay on a flat surface. To check for any kinks, twist one end of the cable. If the cable turns over smoothly, then it is not kinked. But if any part of the cable flops over as it is twisted, then it is kinked and should be replaced.

Before inserting a new inner cable, check the outer casing for any distortion or breaks and replace if necessary. A wavering indicator needle is usually caused by a kinked flexible cable.

Installation of Flexible Cable

Take a clean piece of rag and add some cable lubricant to it. Holding the lubricant covered rag in the hand, pull the inner cable through it. By this means a fine film of lubricant will be deposited on the flexible cable. It is most important not to over-lubricate the cable. Wipe the uppermost 12" of cable free of lubricant. *Refer to Group 1, Lubrication and Maintenance, Para. 25.* Insert the inner cable into the outer casing. Use wide and gradual curves where the cable comes out of the transmission.

7. TACHOMETER

The tachometer assembly is an electrical type and is mounted in the cluster assembly, located to the left of the speedometer.

This instrument is available as standard equipment on certain model vehicles and requires a different instrument panel wiring system.

If tachometer is inoperative:—

(1) Check the coil and power lead for correct wiring connection.

(2) If above check fails, remove the instrument and have it tested by an instrument specialist.

> NOTE: Do not test on distributor test rig as damage will occur to the transistorised movement.

8. OIL PRESSURE INDICATING LAMP

The oil pressure indicating lamp is connected between the oil pressure sending unit screwed into the oil gallery on the cylinder block adjacent to the oil filter and the ignition terminal of the ignition switch.

When the oil pressure exceeds 8 to 12 P.S.I. the contacts in the sending unit open and the indicator light goes out. If the oil pressure indicator is inoperative:—

(1) Check the circuit for possible loose connections, broken wire or burned-out globe.

(2) If the above checks fail to locate the fault, replace the oil pressure sending unit.

9. OIL PRESSURE GAUGE

Pacer, Charger RT

The oil pressure gauge consists of two units. The dash unit situated in the instrument cluster, and the variable resistance sender unit screwed into the cylinder block. One wire is used to connect the dash unit and the sender unit.

If the oil gauge is inoperative, or erratic, check all electrical connections at the dash unit and sender unit. Test the connecting wire for continuity or grounding by the use of a jumper lead between the dash unit and sender unit (disconnect connecting wire first).

If the above preliminary checks fail to locate the fault, test dash unit and sender units as follows:—

To Test Sender and Dash Units

To make this test, procure a spare sender unit of known accuracy. Replace vehicle oil pressure gauge sender unit with new sender unit, connect wire and check. If the fault is remedied, then the sender unit should be replaced. If the fault still exists, the dash unit should be replaced.

10. CLOCK

The clock is an electro-mechanical unit which rewinds electrically approximately every one minute. It can be advanced or retarded by turning a small protruding screw at rear of unit. It can also be reset by pulling the knob on the shaft that protrudes from the clock face and turning it. If clock is inoperative, send unit to an instrument specialist for rectification.

NOTE: *DO NOT* remove clock from can.

11. BRAKING SYSTEM WARNING LAMP

The warning lamp is common to both the dual braking system pressure switch circuit and the handbrake engaged operation warning circuit switch which is mounted on the handbrake bracket contacting the handbrake lever to open-circuit the lamp switch circuit when lever is fully "off".

The dual braking system warning switch contact terminal is mounted on the dual master cylinder assembly, containing a spring centred, hydraulic balanced spool-valve. This valve, when caused to move from its central position sufficiently by an unbalance of pressures, will contact the terminal, thus completing the lamp circuit.

To Test

Handbrake Engaged Warning Circuit and Switch

(1) Turn ignition switch ON.

(2) Engage handbrake lever. This operation should cause the lamp to light.

Lamp Inoperative — Tests

(3) Check the switch operation and lead connections for open-circuit.

(4) Check the bulb for blown or broken condition or faulty circuit connection.

Dual Service Brake Warning Circuit and Switch

(1) Release handbrake (to open-circuit handbrake circuit).

Circuit Test

(2) Earth dual system switch terminal — lamp should light.

Switch Operation Test

(3) Connect a brake bleeder tube to a wheel cylinder bleeder valve.

(4) While the brake pedal is operated, release the pressure from the system as in brake system bleeding — the lamp should light, if switch is functioning.

(5) Replace switch body or assembly and re-test if required. *Refer to Group 5, Brakes, Part 2, Para. 4.*

12. COMBINATION IGNITION SWITCH/ STEERING COLUMN LOCK

General Information

The switch contains the five different following positions:—

(1) LOCK—Denotes steering "locked and ignition off.

(2) AUX—The auxiliary position allows operation of the windshield wiper/washer, turn signal, stop lamps, horns, and accessories such as air-conditioning, radio, etc.

(3) OFF—Denotes ignition "off" but steering not locked.

(4) IGN—The ignition and accessories are switched on.

(5) START—Denotes ignition start position.

> NOTE:
>
> (1) Under no circumstances should the key be turned to the "'Lock" position or any attempt be made to withdraw the key while the vehicle is in motion. The lock can be operated with the road wheels facing in any direction, but the transmission must be in "Park" for automatic models, and in "Reverse" for manual models with column-mounted gear selectors. Models with floor-mounted gear selector levers can have the steering column locked with the vehicle in any gear.
>
> (2) When towing a disabled car, the ignition switch must be placed in "Aux" position, so that the stop lights, turn signal, wiper/washer system and horns can be used. This position also unlocks the steering gear.

IGNITION SWITCH

To Remove

(1) Disconnect battery negative terminal.

(2) Remove the small screw on the underside of the steering column lock housing.

(3) Pull the switch clear of steering column lock and disconnect at the four-pin connector.

(4) The ignition switch is non-servicible; if faulty, the switch unit should be replaced.

To Install

(1) Installation is the reverse to the above procedure.

(2) Check the switch for positive operation after fitment.

STEERING COLUMN LOCK

To Remove

(1) Disconnect battery negative terminal.

(2) Remove the four attaching bolts holding the steering column support plate to the floor.

(3) Remove the two bolts attaching the steering column to the instrument panel.

(4) Remove the ignition switch loom at the four-pin connector.

(5) Lower the steering column two or three inches and support it.

(6) Remove the four screws attaching the wiring cover to the steering column.

(7) Remove the four bolts attaching the lock to the steering column.

To Install

(1) Installation is the reverse to the above procedure.

(2) Ensure correct operation upon termination of reassembly.

> NOTE: The steering column lock assembly can only be serviced as a complete package with door lock barrels. Upon replacement of column lock, the door lock barrels must be replaced if common key is to be maintained.

PART 8 — HEADLAMPS AND LIGHTING

SPECIFICATIONS

MODELS	HEADLAMP SEALED BEAM UNITS	MAKE	WATTAGE	
RANGER (all)	2 dual beam rectangular	Lucas	75 (High)	60 (Low)
PACER	2 dual beam rectangular	Lucas	75 (High)	60 (Low)
REGAL and REGAL 770	2 dual beam rectangular	Lucas	75 (High)	60 (Low)
CHARGER (all)	2 dual beam rectangular	Lucas	75 (High)	60 (Low)
DODGE UTILITY	2 dual beam round	Lucas	75 (High)	60 (Low)
CHRYSLER MODELS	2 dual beam outer (round)	Lucas	60 (High)	37½ (Low)
	2 single beam inner (round)	Lucas	37½ (High)	

MODELS	DRIVING LIGHTS	MAKE	WATTAGE
770 MODELS	Quartz Halogen Driving Lights	Hella	55 w.
CHARGER RT	Quartz Halogen Driving Lights	Hella	55 w.

VEHICLE BULB APPLICATION

	RATING	TRADE P/N	QUANTITY
Headlamp High Beam Indicator	2CP WP	158	1
Instrument Illumination	2CP WP	158	4 (Pacer 5)
Turn Signal Indicators	2CP WP	158	2
Oil Press and Brake Wng. Indicators	2CP WP	158	2
Dome Lamp	12v 10w Festoon	—	1
Front Floor Lamps	2CP MMC	57X	2
Glove Box Lamp	2CP MCC	57X	1
Ash Tray Lamp	1CP MCC	53X	1
Luggage Compartment Lamp	12W SBC DC	1004	1
Console Gearshift Lamp (auto. only)	2CP MMC	57X	1
Column Gearshift Lamp (auto. only)	2CP MBC	1445	1
Park and Front Turn Signal Lamps	32/4 CP DC	1157	2
Tail and Stop Lamps	32/4 CP DC	1157	2
Reversing and Rear Turn Signal Lamps	32CP SCC	1156	2
Licence Lamp (Sedan)	6W Festoon	258	1
Licence Lamp (Wagon)	2CP MBC	1895	2
Cargo Area Lamp (Wagon)	10W Festoon	265	1
Licence Lamp (Utility)	12V 2CP	1895	1
Reading "C" Pillar Lamp (Chrysler only)	12V 6W	—	2
Side Marker Lamps (Chrysler only)	12V 2CP	57X	2
Turn Signal Repeater Lamp (Chrysler only)	12V 5CP	330	2

SERVICE DIAGNOSIS

CONDITIONS—POSSIBLE CAUSES

HEADLIGHTS DIM
(Engine Running Above Idle)

(1) High resistance in lighting circuit.
(2) Faulty sealed beam units.
(3) Faulty voltage regulator.

LIGHTS FLICKER

(1) Loose connections or damaged wires in lighting circuit.

(2) Light wiring insulation damaged, producing momentary short.

LIGHTS BURN OUT FREQUENTLY

(1) High voltage regulator setting.
(2) Loose connections in light circuit.

LIGHTS WILL NOT LIGHT

(1) Discharged battery.
(2) Loose connections in lighting circuit.
(3) Burned out lamps.
(4) Open or corroded contacts in headlight switch.
(5) Open or corroded contact in dimmer switch.

HEADLIGHTS DIM
(Engine Idling or Turned Off)

(1) Partly discharged battery.
(2) Faulty battery.
(3) High resistance in light circuit.
(4) Faulty sealed beam units.
(5) Corroded battery terminals.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

Single Headlamp System

The single headlamp unit is of the double filament type for high and low beam operation. The low beam is intended for congested areas when meeting oncoming traffic.

Vertical and horizontal adjustments are provided for the purpose of aiming of both systems.

Dual Headlamp System (Chrysler models only)

The dual headlamp system consist of four sealed beam units. The two outer units are of the two filament type for low and high beam operation. The two inner bulbs are of the single filament type for high beam operation only.

These units are not interchangeable with the dual filament units due to different mounting location lug positioning.

NOTE: When aiming the headlamps on utility models, allowance must be made for different loading conditions the vehicle is likely to meet in service. It is recommended that adjustment be made with the utility subject to the load representative of the average loading conditions under which the vehicle will be operating. Due regard must be given to any special State law regarding headlamp aiming and any special regulations called for should be complied with.

2. AIMING THE HEADLAMPS (With Aimers)

Pre-Aiming Procedure

(1) Before adjustment, the suspension height and tyre pressure should be checked and adjusted if necessary.

(2) Check dipper switch for faulty operation.

(3) Check high beam indicator for correct operation.

(4) Check for badly rusted or faulty headlamp assemblies. These must be corrected before a satisfactory adjustment can be made.

(5) Place vehicle on a level floor.

(6) Rock vehicle to allow vehicle to assume its normal position.

(7) If petrol tank is not full, place a weight in the boot of vehicle to simulate the weight of a full tank ($7\frac{1}{4}$ lbs. per gallon). There should be no other load in the vehicle other than the driver or a substituted weight of approximately 150 lbs. placed in the driver's position.

(8) Thoroughly clean headlamp lenses.

(9) For use of aimer equipment, refer to aimer makers' specifications.

3. AIMING THE HEADLAMPS (With Aiming Screen)

Rectangular — Low Beam

The following is an alternative method of aiming the headlamps if aimers are not available.

To aim the headlamps, use an aiming screen or a light-coloured wall as shown in *Fig. 1.*

(1) Place the car on a level floor, 25 feet from the aiming screen, and directly in line with the centre of the screen.

(2) Jounce the vehicle, first in the front end and then in the rear, to ensure the vehicle is in normal position.

NOTE: The vehicle should contain no passengers, driver or trunk load, and the vehicle should have a full tank of petrol.

(3) The adjustment screws can be reached through holes provided in the headlamp bezel. The screw at the bottom of the lamp raises or lowers the lamp in vertical plane and the screw on the outside of the lamp adjusts the lamp along the horizontal plane.

(4) With the headlamps on low beam, adjust the lights so that the junction of the horizontal and

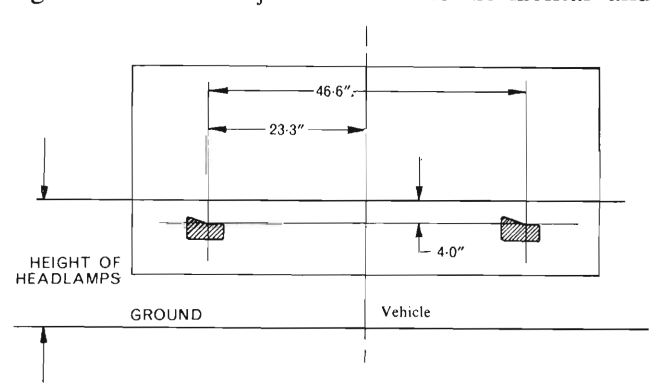


Fig. 1. Low beam adjustment pattern (rectangular).

inclined portions of the beam from each headlamp lies on the vertical line 4″ (10.2 cm) below the horizontal centreline of headlamps *(as shown in Fig. 1)*.

3A. ROUND HEADLAMPS (Dual)

Low Beam (Outer Pair)

(1) Follow steps (1) and (2) of Para. 3.

(2) With headlamps on low beam, the top of the high intensity portion of the beam pattern should be at the horizontal centreline and the right edge at the vertical centreline *(as shown in Fig. 2)*.

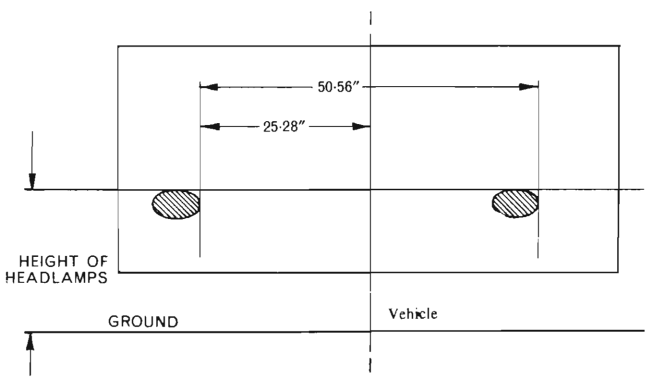


Fig. 2. Low beam adjustment pattern (dual round).

(3) The adjustment screws can be reached through holes provided in the headlamp bezel. The screw at the top of both outer lamps adjusts the lamps along the horizontal plane, and the screw at the left of lamps adjusts the lamps in the vertical plane.

High Beam (Inner Pair)

(1) Follow steps (1) and (2) of Para. 3.

(2) Switch to high beam, mask off the outer pair and adjust the inner pair *(as shown in Fig. 3)*.

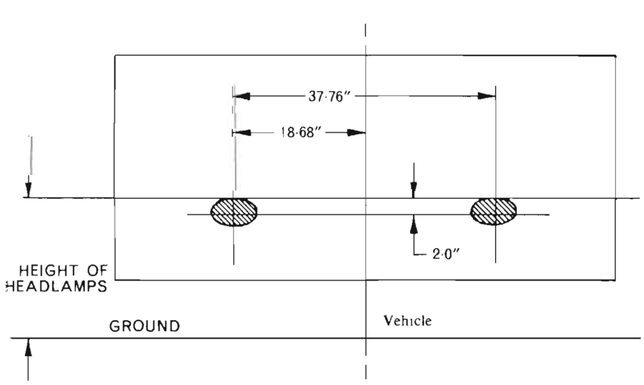


Fig. 3. High beam adjustment pattern (dual round).

3B. ROUND HEADLAMPS (Single)

Low Beam

(1) Follow steps (1) and (2) of Para. 3.

(2) Adjust low beam of headlights to match the pattern in *Fig. 4*.

(3) The adjustment screws can be reached through holes provided in the headlamp bezel.

(4) The screw at the bottom of the lamp raises or lowers the lamp in the vertical plane.

(5) The screw on the inboard edge of the lamp adjusts the lamp along the horizontal plane.

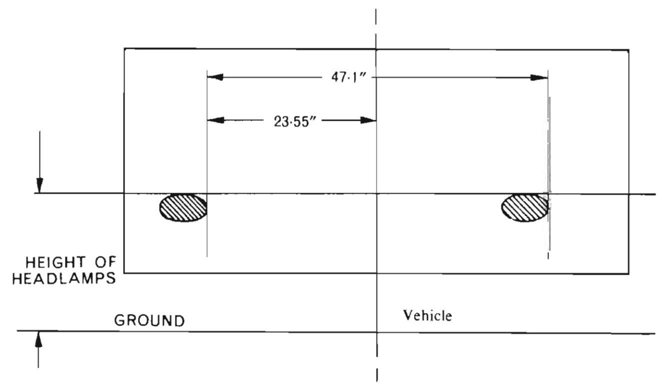


Fig. 4. Low beam adjustment pattern (single round).

4. HEADLAMP SEALED BEAM REPLACEMENT

Lens, filament and reflector are sealed into one unit which can be removed as follows:

Rectangular Headlamps (see Fig. 5)

(1) Remove the two screws holding the inner pressed metal bezel to the grille.

(2) Remove the two screws that retain the upper portion of the outer headlamp bezel to the panel above the grille.

(3) Reach under the front bumper bar and remove the nut from the stud in the lower edge of the outer bezel.

(4) Pull the outer bezel forward and away from the front of the car until the stud in the lower edge of the bezel clears the body panel.

(5) Remove the inner and outer bezels.

(6) Unscrew the four screws that retain the headlight retaining frame.

(7) Remove the sealed beam from the fender well and pull the wire connector from the unit.

(8) Fit the new sealed beam and assemble by reversing the above procedure.

(9) Re-check headlamp aiming if necessary.

Single Round Headlamps (See Fig. 6)

(1) Remove the two screws holding the inner metal bezel to the grille and remove the bezel.

(2) Remove the two screws that retain the upper portion of the outer headlamp bezel to the panel above the grille.

(3) Reach under the front bumper bar and remove the nut from the stud in the lower edge of the outer bezel.

(4) Pull the outer bezel forward and way from the front of the car, until the stud in the lower edge of the bezel clears the body panel.

(5) Remove the outer bezel, unscrew the three screws that retain the headlamp rim.

(6) Remove the sealed beam from the fender well and pull the wire connector from the unit.

(7) Fit the new sealed beam and assemble by reversing the above procedure.

(8) Re-check headlamp aiming if necessary.

Dual Round Headlamps (See Fig. 7)

(1) Remove the five screws attaching the headlamp bezel to the panel and remove bezel.

(2) Remove the three attaching screws holding the ring and lug assembly to the headlamp seat.

(3) Pull out the sealed beam unit and unplug the connector.

(4) Install the new sealed beam unit and assemble by reversing the above.

(5) Re-check headlamp aiming if necessary.

NOTE: Do not disturb the headlight aiming screws.

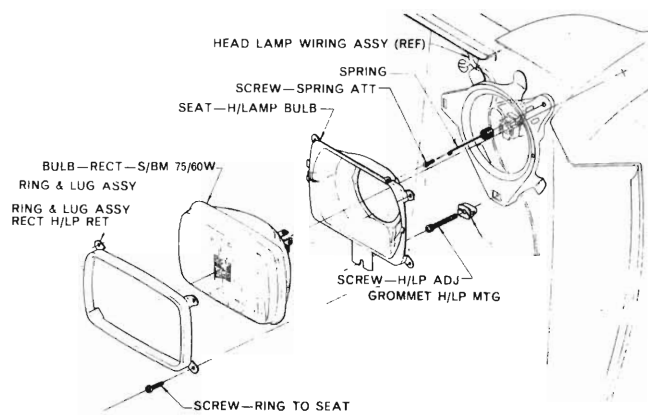


Fig. 5 – Rectangular headlamps (exploded view)

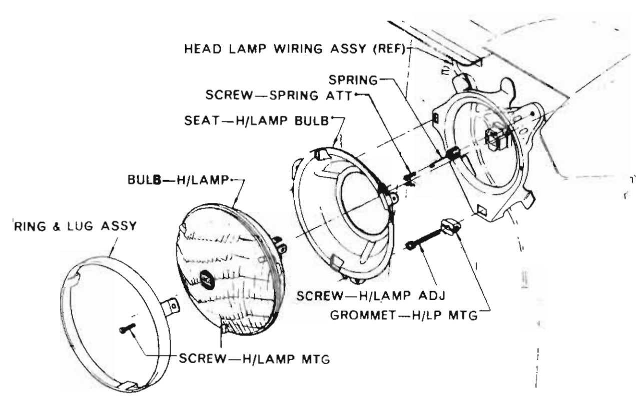


Fig. 6 – Round headlamps single (exploded view)

5. DRIVING LIGHTS

General Information

The driving lights are fitted with a replaceable 55 watt Quartz Halogen globe. These lamps are operated by an instrument cluster mounted switch. A relay is incorporated in the wiring loom to give maximum efficiency and to allow automatic dipping via the dip switch.

To Operate

Switch the headlights on, select high beam, and then turn the driving light switch clockwise. The driving lights are automatically extinguished when the low beam is selected by the foot-operated dip switch.

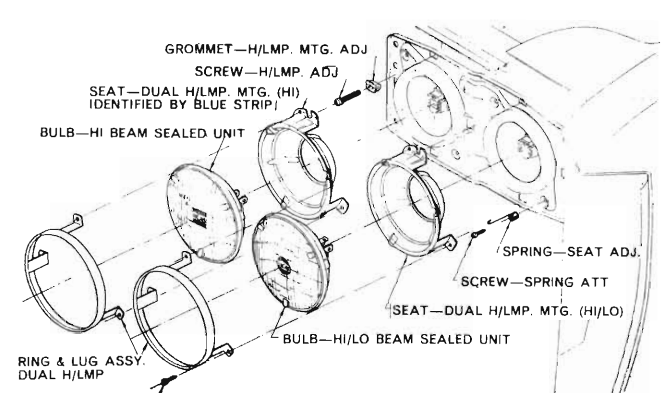


Fig. 7 – Round headlamps dual (exploded view)

6. AIMING QUARTZ HALOGEN DRIVING LAMPS

Switch on the headlamps and the driving lamps, mask off the headlamps and adjust the driving lamps to the pattern as shown in *Fig. 8*. Adjusting screws are provided on the upper and lower edges of the lamp toward the centre of the car. Adjusting the two screws equal amounts provides horizontal adjustment for the lamps. Clockwise or anti-clockwise movement of only one of the screws provides vertical adjustment for the lamps.

7. QUARTZ HALOGEN DRIVING LAMP BULB REPLACEMENT

Remove the two screws in the bezel of the lamp. The whole lamp assembly can now be removed from the grille. Press down on the wire retaining clip and lift it from beneath the element. Fit the new element ensuring that it is mounted correctly into the element holder. Locate the square cut-out in the element to the raised square section in the element holder and the round cut-out to the round section in the holder. Reposition the retaining clip and re-assemble the lamp assembly to the grille.

> NOTE: DO NOT hold the replacement element in your fingers. When handling, use a clean, soft cloth.

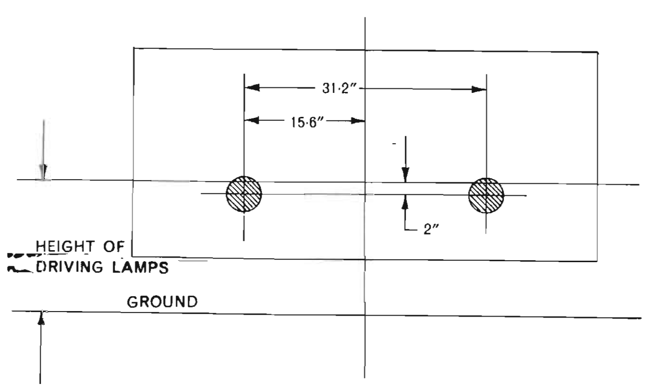


Fig. 8 – Driving lamps adjustment pattern

8. DRIVING LIGHT SWITCH

General Information

The driving light switch is mounted in the instrument cluster and is a self-earthing ON/OFF switch having a single terminal at the rear.

To Remove

(1) Remove driving light switch control knob by removing the attaching screw with an Allen key.

(2) Using a suitable key spanner, remove the securing ring nut from the switch.

(3) Pull the switch rearward and down from under dash panel.

(4) Disconnect the wire from the switch.

To Test

(1) Connect earth strap on switch to negative terminal of a test battery. Connect test light between the positive terminal of the battery and the terminal on the back of the switch.

(2) With the switch in "ON" position, the test lamp should light.

(3) If the test lamp fails to light, the switch should be replaced.

To Install

(1) Reconnect the wire to the switch and place the switch into position on the instrument cluster.

(2) Replace the retaining ring nut and tighten.

(3) Replace the switch control knob and tighten the attaching screw.

9. DRIVING LIGHT/HIGH BEAM RELAY

General Information

The relay is located on the left hand splash shield near battery. This relay operates the High Beam and Quartz Halogen Driving Lamps, and contains fuses for these circuits. The relay unit is non-serviceable except for the replacement of the fuse. The fuses are of the porcelain type and are protected by two rubber covers.

To Test

(1) Remove the two screws attaching the relay to the splash shield.

(2) Disconnect the wire from terminal marked 85 and place jumper lead between battery positive and terminal 85.

(3) By earthing the short black wire from terminal 86 the high beam relay should click, causing the high beam lights to come on.

(4) Remove the wire from the other terminal marked 86 and with a jumper lead earth this terminal. This should cause the driving lights relay to click, and the driving lights to come on.

(5) If either relay does not function, the unit should be replaced.

10. FUSE BLOCK

General Information

The fuse block is located below the instrument panel at the right hand side of the steering column.

In the fuse block, mounted from top to bottom, are the following fuses:

(1) The heater circuit (15 amp) *(See Note (1) below).*

(2) Windshield wiper /washer circuit and reversing lamps (15 amp).

(3) Accessories *(see Note (2) below)* (7.5 amp).

(4) Turn signal circuit (7.5 amp).

(5) Cigar lighter, glove box lamp circuits (15 amp).

(6) Stop lamp circuit (7.5 amp).

(7) Exterior lamps (excluding headlamps), interior lamps and instrument panel lamps (15 amp).

NOTE:

(1) When optional air-conditioning is fitted, a (25 amp) fuse is used.

(2) When any electrical accessories are added to the vehicle, they must be connected on the output side of the fuse block (the rear left hand side of the fuse block as viewed from the driver's seat) which is provided with a 7.5 amp fuse. Dependent on the current draw of the added accessories, it may be necessary to change to a higher value fuse to safeguard the electrical circuits from possible damage. It is important that the maximum value fuse does not exceed 25 amp.

11. DIMMER SWITCH

General Information

The dimmer switch is a push button unit located on the front floor pan. It alternates the headlights between "high" and "low" beam. When the "high" beam is selected, a small blue light glows in the instrument cluster.

To Remove:

(1) Pull back the front floor mat.

(2) Remove the two bolts attaching the switch to the floor pan.

(3) Remove the wire connector and remove the switch.

To Install

(1) Reconnect the wire connector.

(2) Reposition the switch and tighten the two attaching bolts.

(3) Reposition the front floor mat.

(4) Re-check the operation of switch upon termination of assembly.

12. FRONT PARK AND TURN SIGNAL LAMP

All Models (except Chrysler)

Bulb Replacement

(1) Remove the two screws attaching the lens to the lamp assembly and remove lens.

(2) Push in and turn bulb anti-clockwise, and remove bulb from holder *(refer Fig. 9).*

Lamp Replacement

Remove the four screws attaching the lamp assembly to the front fender. Pull the lamp assembly out from the front fender and disconnect wire connections from bulb holder at rear of lamp assembly *(refer Fig. 9).*

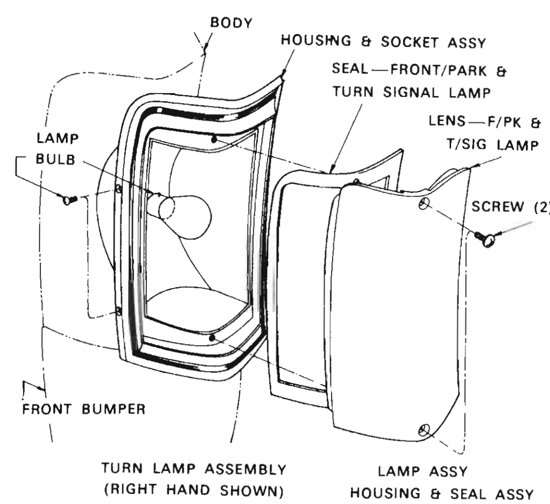


Fig. 9 – Front park and turn signal lamp (disassembled view)

CHRYSLER MODELS

Bulb Replacement

From rear of stone deflector, pull the socket out of the rear of the lamp assembly and remove bulb *(refer Fig. 10).*

Lamp Replacement

From rear of stone deflector, remove the three screws attaching the lamp assembly to the stone deflector. The lens can then be removed by removing the two screws attaching the lens to the lamp assembly *(refer Fig. 10).*

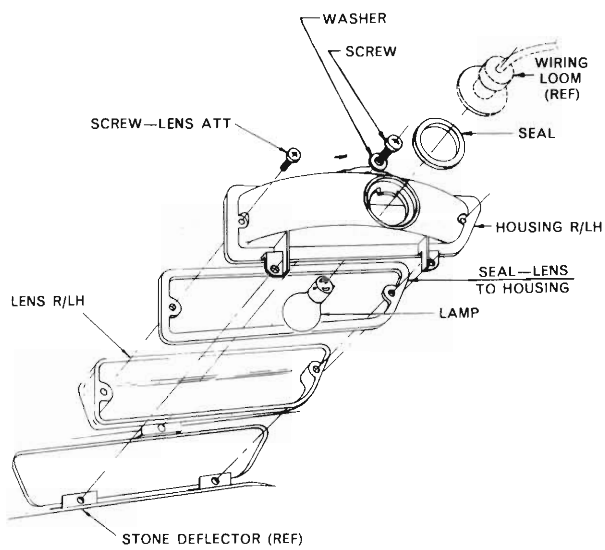


Fig. 10 – Chrysler front park and turn signal lamp (disassembled view)

TURN SIGNAL INDICATOR LAMP CHRYSLER MODELS

Bulb Replacement

(1) From under front fender remove the two screws securing the headlamps splash shield to the front fender.

(2) Remove the one screw attaching the lamp assembly to the front fender.

(3) Remove the front fender moulding retaining nut (at centre of moulding) and carefully remove moulding.

(4) Lift lamp assembly away from locating boss, and remove the screw attaching the socket and cable assembly to the lamp housing and remove the bulb *(refer Fig. 11)*.

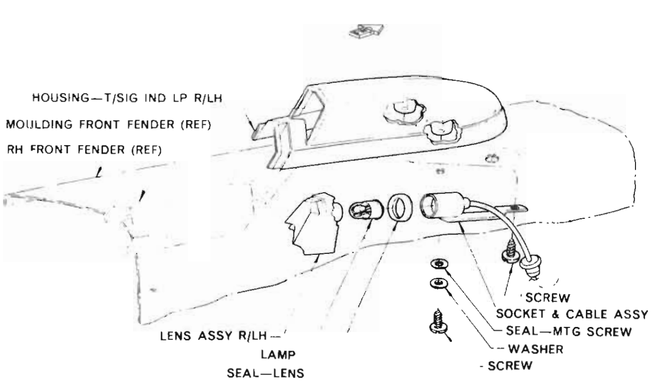


Fig. 11 – Chrysler turn signal indicator lamp (disassembled view)

13. TAIL LAMPS

Ranger, XL, Pacer, Regal, 770, and Valiant Hardtops

Bulb Replacement

All bulbs are accessible from within the luggage compartment.

Lens Replacement

(1) Remove the four screws attaching the **rear** lamp bezel (where fitted) to the rear fender.

(2) From inside luggage compartment remove the four screws attaching the lens to the lamp assembly and remove the lens *(refer Fig. 12)*.

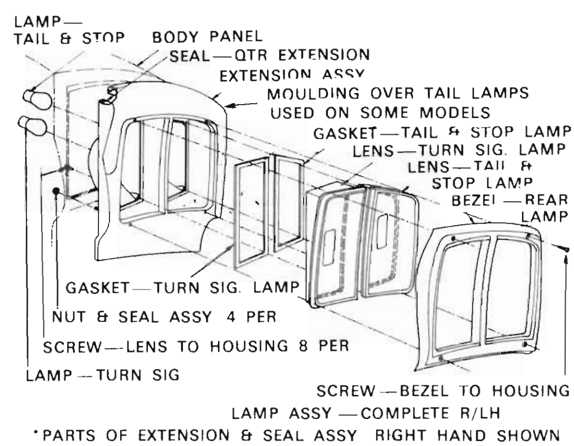


Fig. 12 – Tail lamp assembly, sedan models (disassembled view)

STATION WAGON COMBINATION ASSEMBLY

To gain access to the lamp bulbs, remove the six screws attaching the lamp assembly to the rear fender. Pull the lamp assembly clear of body and remove the bulb by turning the socket. The lens can now be removed by removing the lens attaching screws. *(ref. Fig. 13)*.

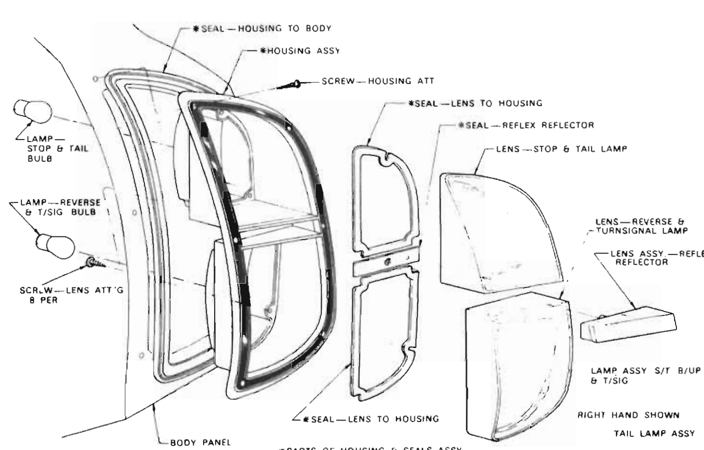


Fig. 13 – Station wagon tail lamp assembly (disassembled view)

CHARGER MODELS

Bulb Replacement

All bulbs are accessible from within the luggage compartment.

Lens Replacement

(1) From inside the luggage compartment remove the six nuts attaching the rear lamp bezel assembly to the lower deck panel.

(2) Pull out the bezel assembly and remove lens from lamp assembly locating pins *(refer Fig. 14)*.

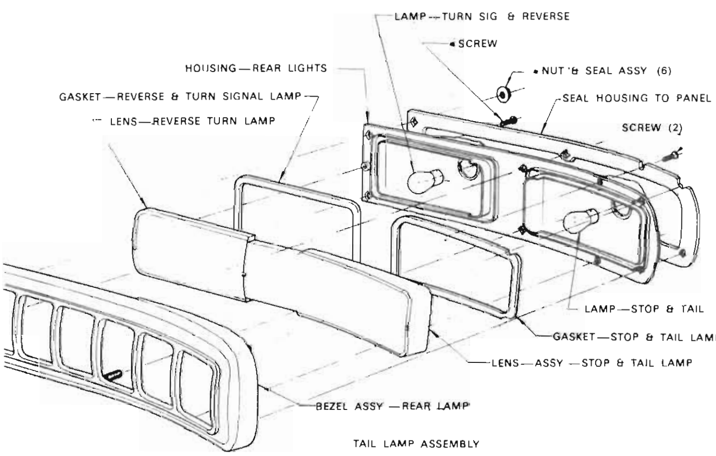


Fig. 14 – Charger tail lamp assembly (disassembled view)

CHRYSLER MODELS

Stop/Tail Backup/Turn Signal and Sidemarker Lamps

Bulb Removal

All bulbs are accessible from within the luggage compartment, but to remove the turn signal bulbs remove the three screws holding the partition board to the lower deck panel.

Lens Removal (Turn Signal)

(1) From inside the luggage compartment remove the partition board, remove the six screws attaching the lens to the lamp housing, and remove lens.

Lens Removal (Stop/Tail and Side Marker)

(1) From inside luggage compartment remove the partition board and remove the six nuts attaching the lamp assembly to the lower deck panel.

(2) Remove the eight retaining nuts holding the applique to the lower deck panel.

(3) Loosen the bumper bar attaching bolts (both sides) to enable sufficient clearance for removal of lamp assembly from deck panel.

(4) Having removed the lamp assembly from the deck panel, the tail-stop lens can be removed by removing the six screws attaching the lens to the lamp assembly. The side marker lens can now be removed by removing the two lens attaching screws to the housing *(refer Fig. 15)*.

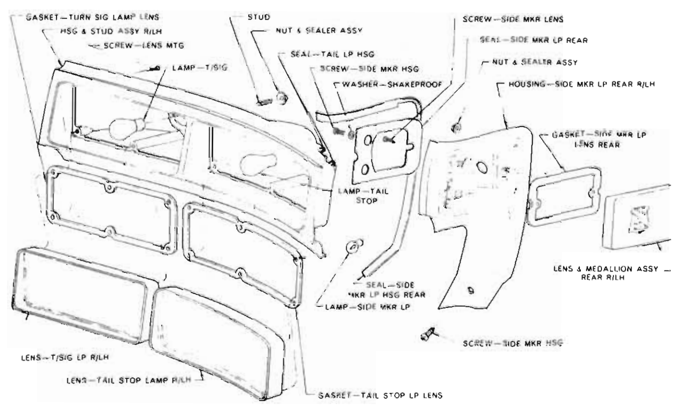


Fig. 15 – Chrysler tail-stop, back-up and turn signal, and side marker lamp assembly (disassembled view)

UTILITY COMBINATION ASSEMBLY

Bulb Replacement

To gain access to the lamp bulbs, the lens assemblies must be removed from the lamp. Ensure that seals are water-tight when re-installing the lens assemblies *(refer Fig. 16)*.

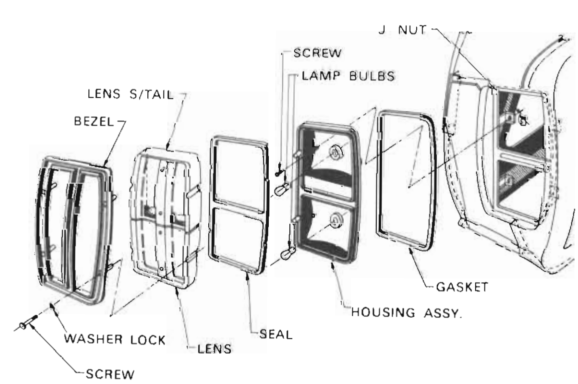


Fig. 16 – Utility tail lamp assembly (disassembled view)

PART 9 — WIRING DIAGRAMS

1. INSTRUMENT PANEL WIRING LOOM

IDENTIFICATION COLOUR CHART

MODEL		COLOUR	NOTES
Ranger	Sedan	Yellow	See *Fig. 1*
Ranger XL	Sedan	Yellow	
Ranger	S/Wagon	Yellow	
Ranger XL	S/Wagon	Yellow	
Charger	Coupe	Yellow	
Charger XL	Coupe	Yellow	
Ranger	Utility	Yellow	
Valiant	Utility	Yellow	
Dodge	Utility	Yellow	
Pacer	Sedan	Blue	See *Fig. 2*
Charger RT	Coupe	Blue	
Regal	Sedan	Red	See *Fig. 3*
Regal	S/Wagon	Red	
Regal	Hardtop	Red	
Regal 770	Hardtop	Red	
Regal 770	Sedan	Green	See *Fig. 3*
Charger 770	Coupe	Green	
Chrysler	Hardtop	Nil	See *Fig. 3*
Chrysler	Sedan	Nil	

The identification colour band for the wiring looms pertaining to the above models is located at the right hand side of the instrument panel before the splice leading to the fuse box.

2. INSTRUMENT PANEL WIRING ILLUSTRATIONS

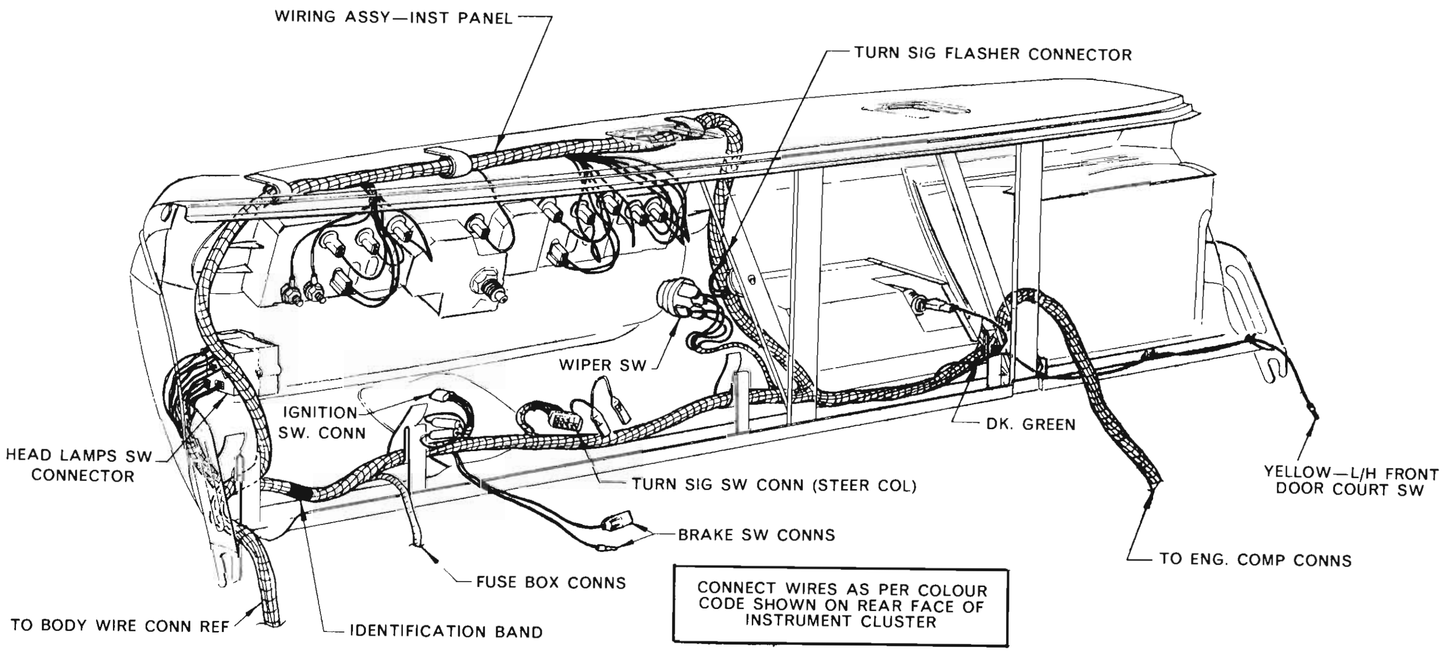


Fig. 1 – (For model identification refer colour chart)

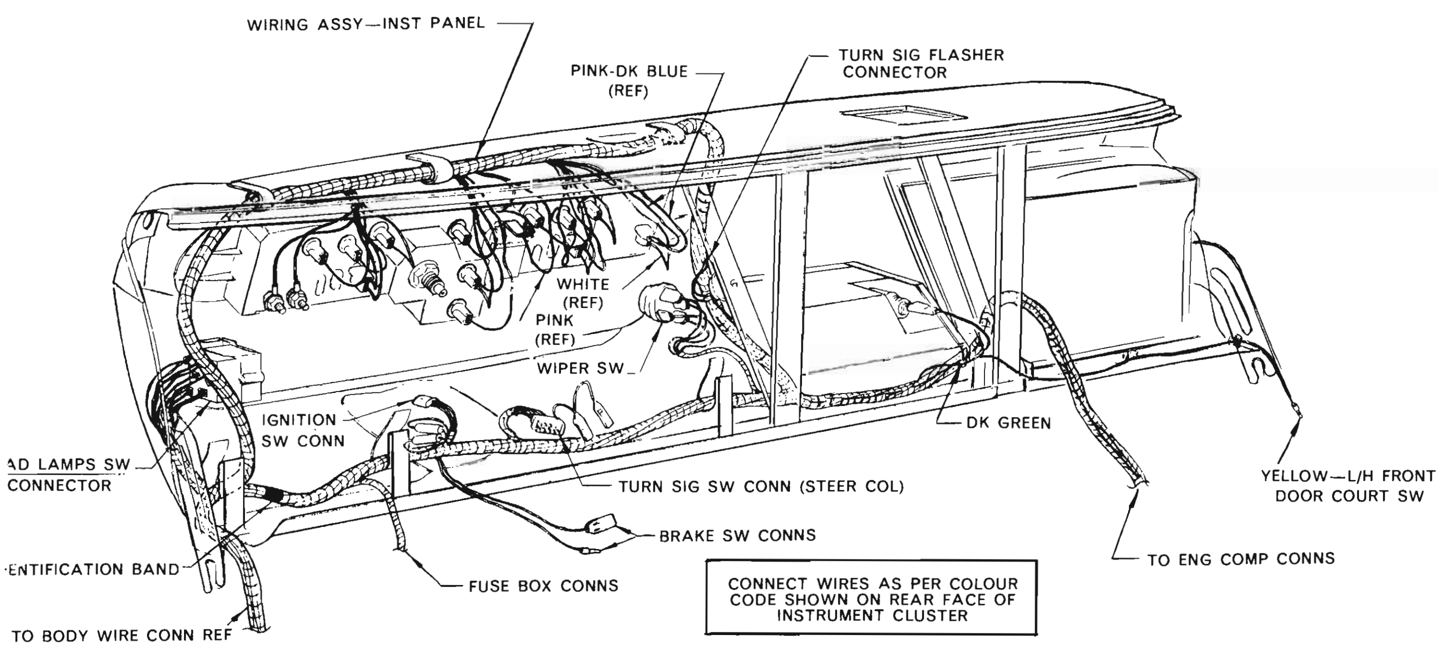


Fig. 2 – (For model identification refer colour chart)

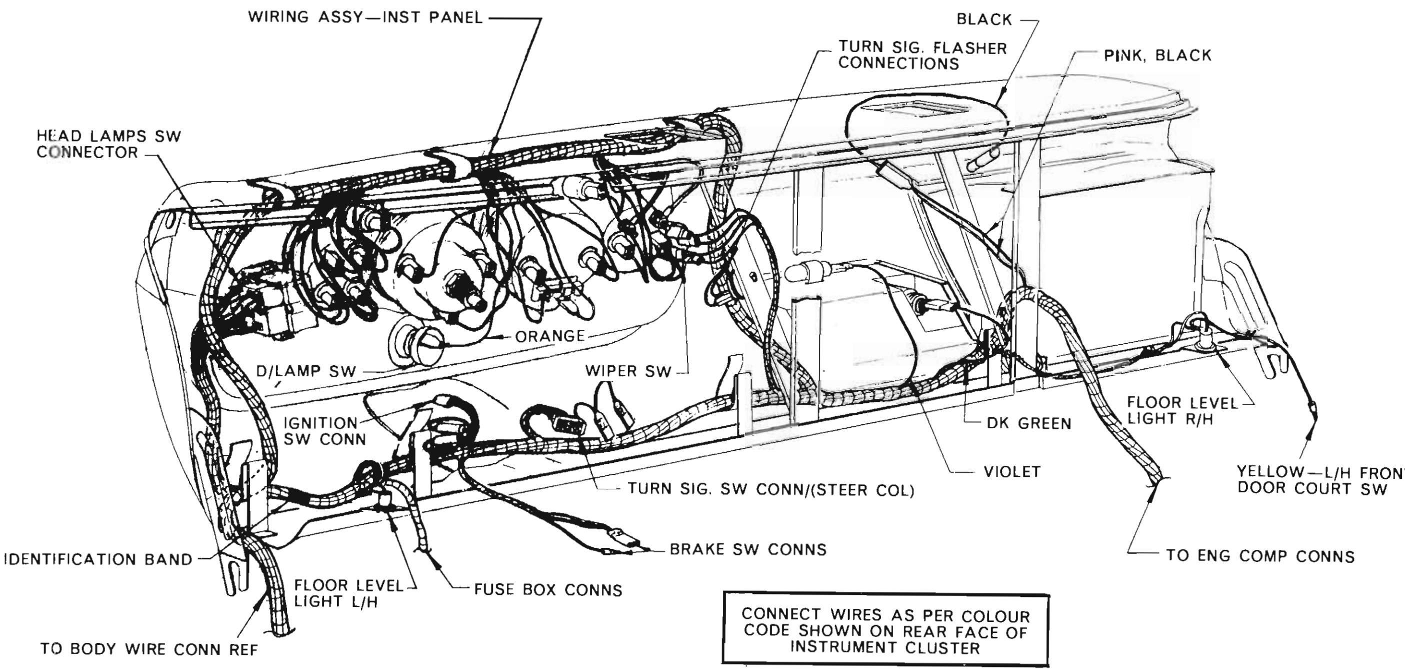
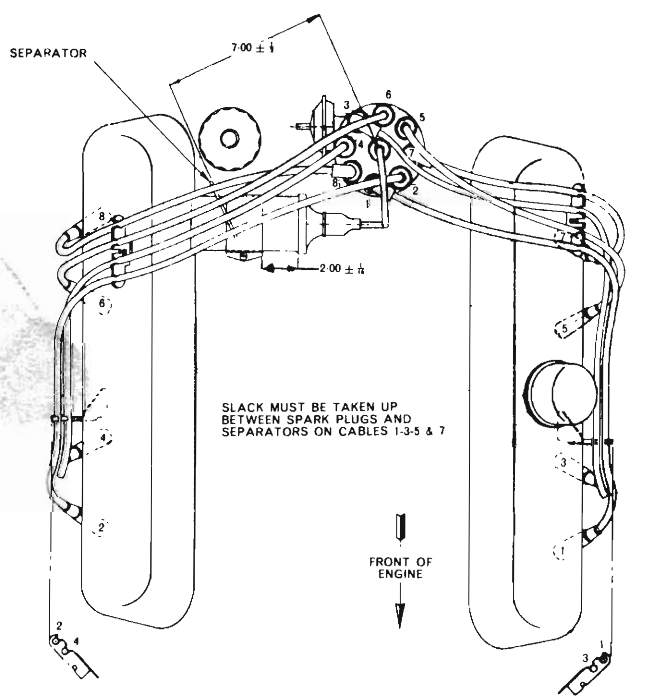


Fig. 3 – (For model identification refer colour chart)



8-CYLINDER SPARK PLUG LEAD ROUTING

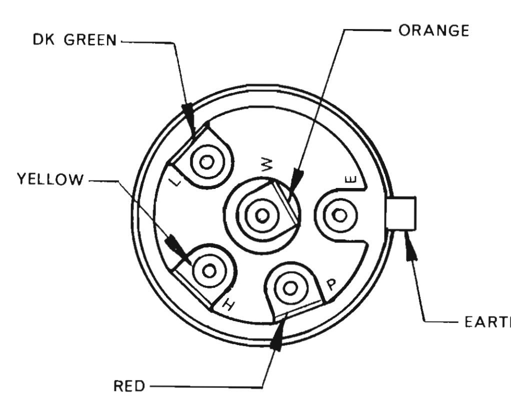
IMPORTANT

SPARK PLUG LEAD ROUTING

Where the spark plug leads are permitted to lie parallel and touching one another, cross-firing between cylinders may occur due to self-induction of the E.M.F. in the leads.

This self-induction and resulting cross-firing may be prevented by separating the leads as much as possible.

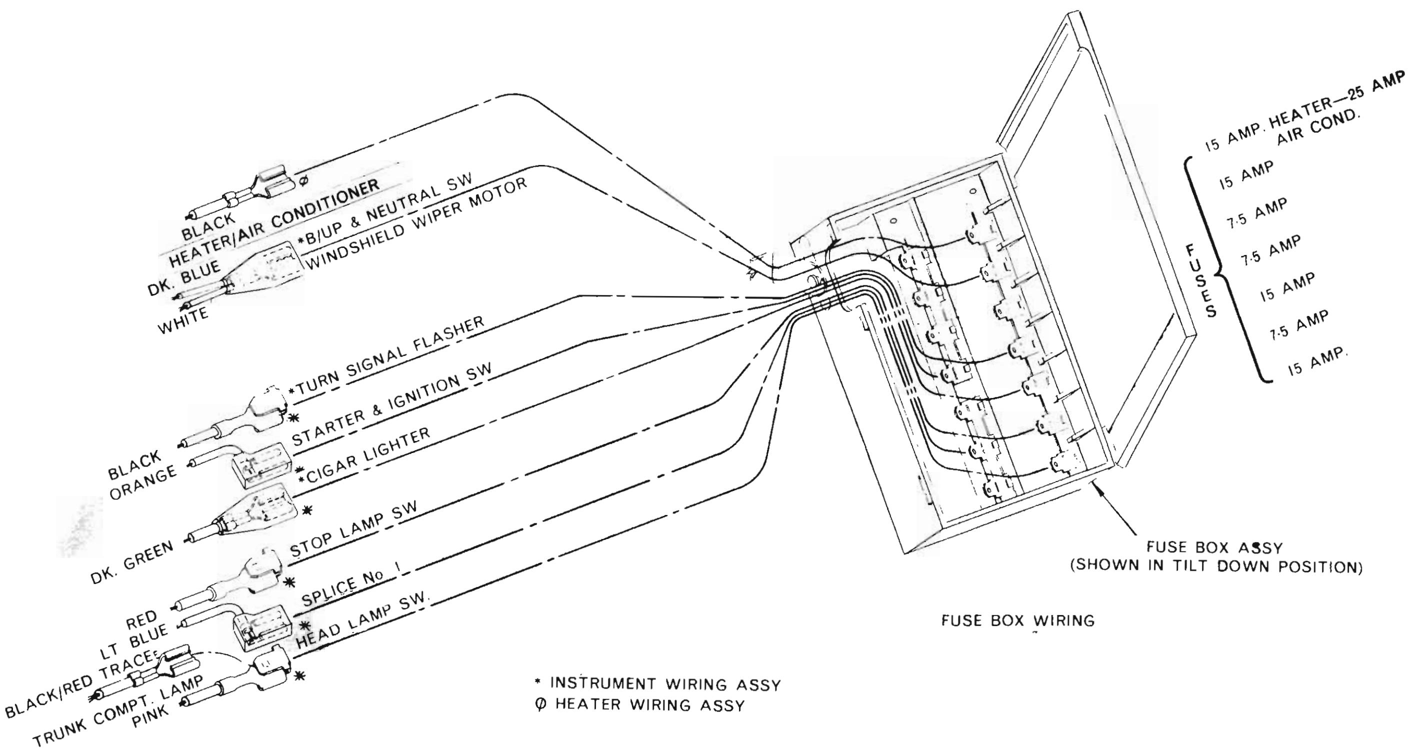
Two additional separators are installed in conjunction with the rocker cover separators.



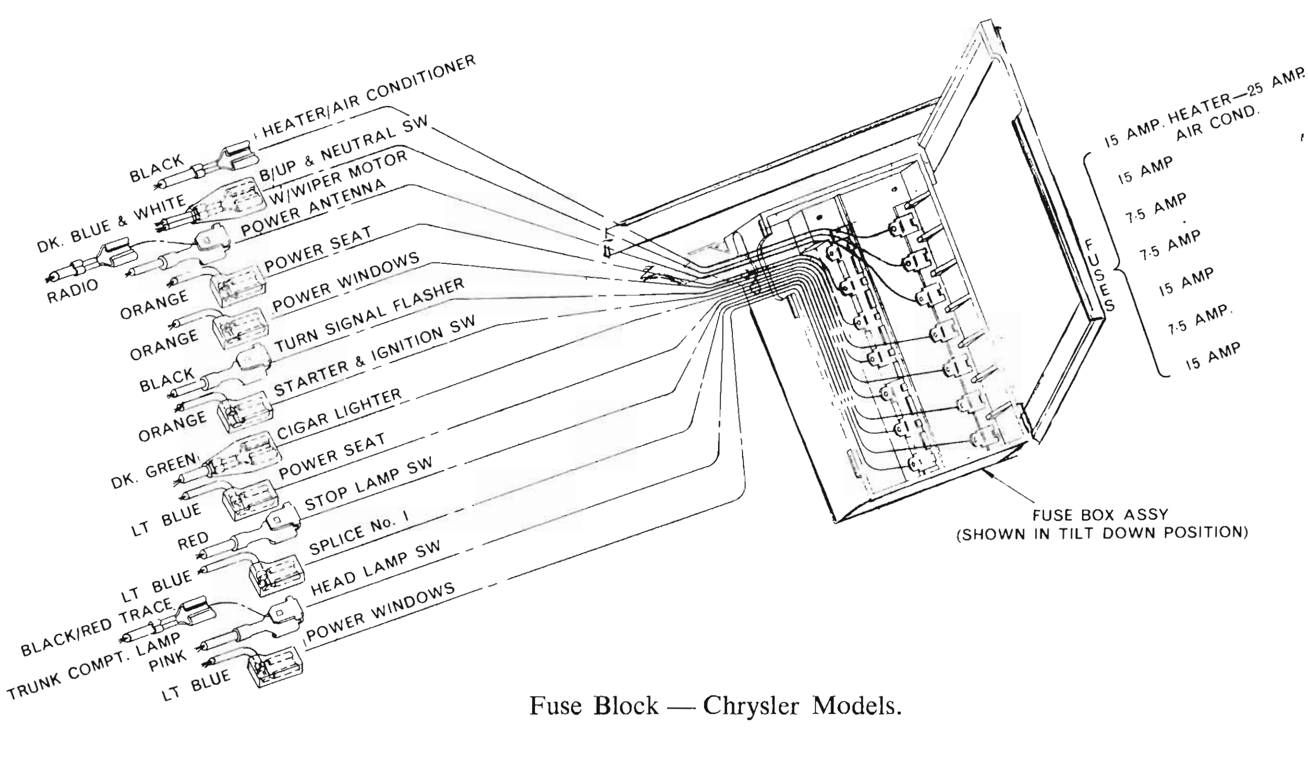
WIPER SWITCH CONNECTIONS

NOTE: The air-conditioning diagram is contained in *Group 24, page 24 – 12.*

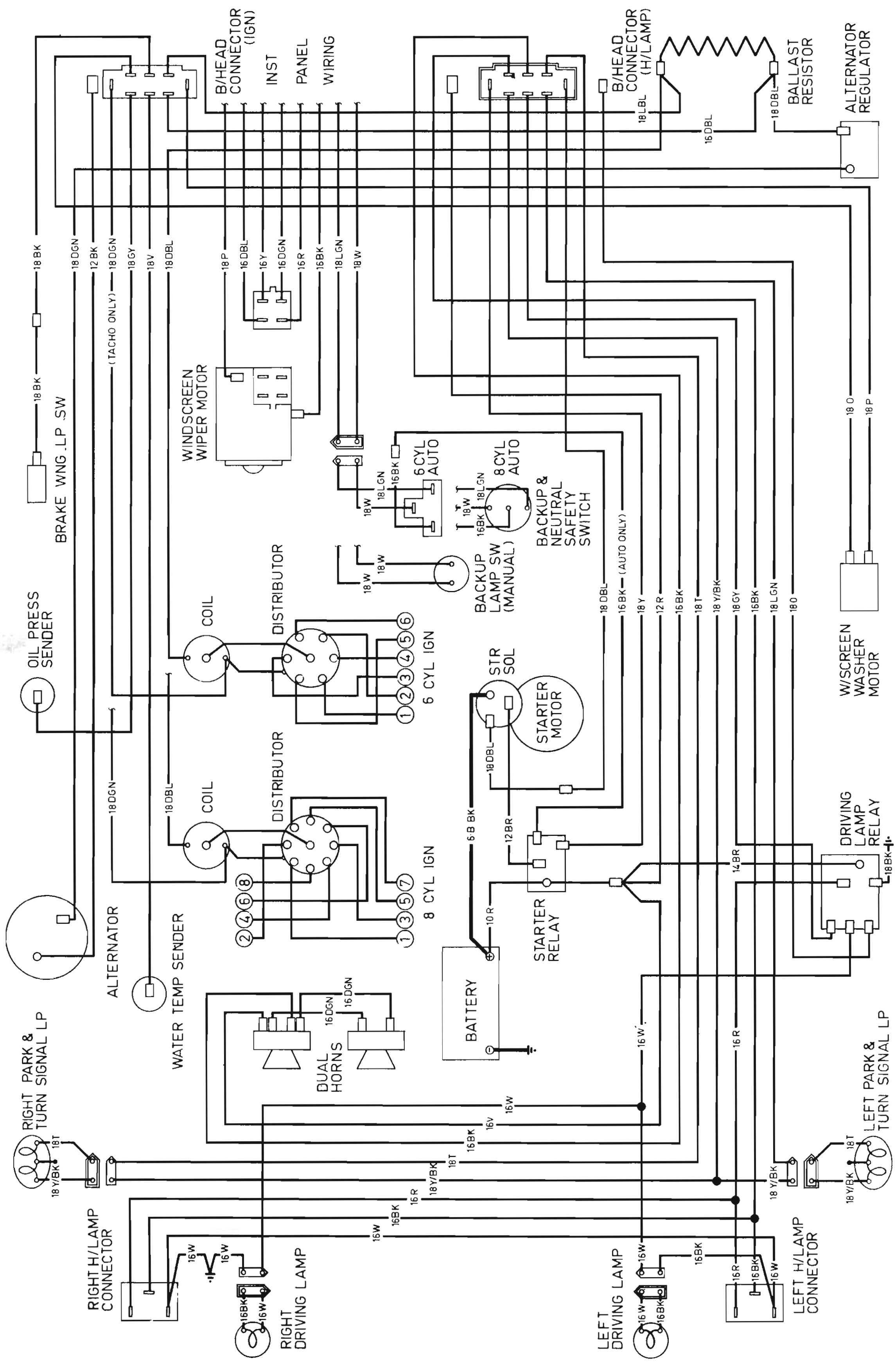
3. FUSE BLOCKS



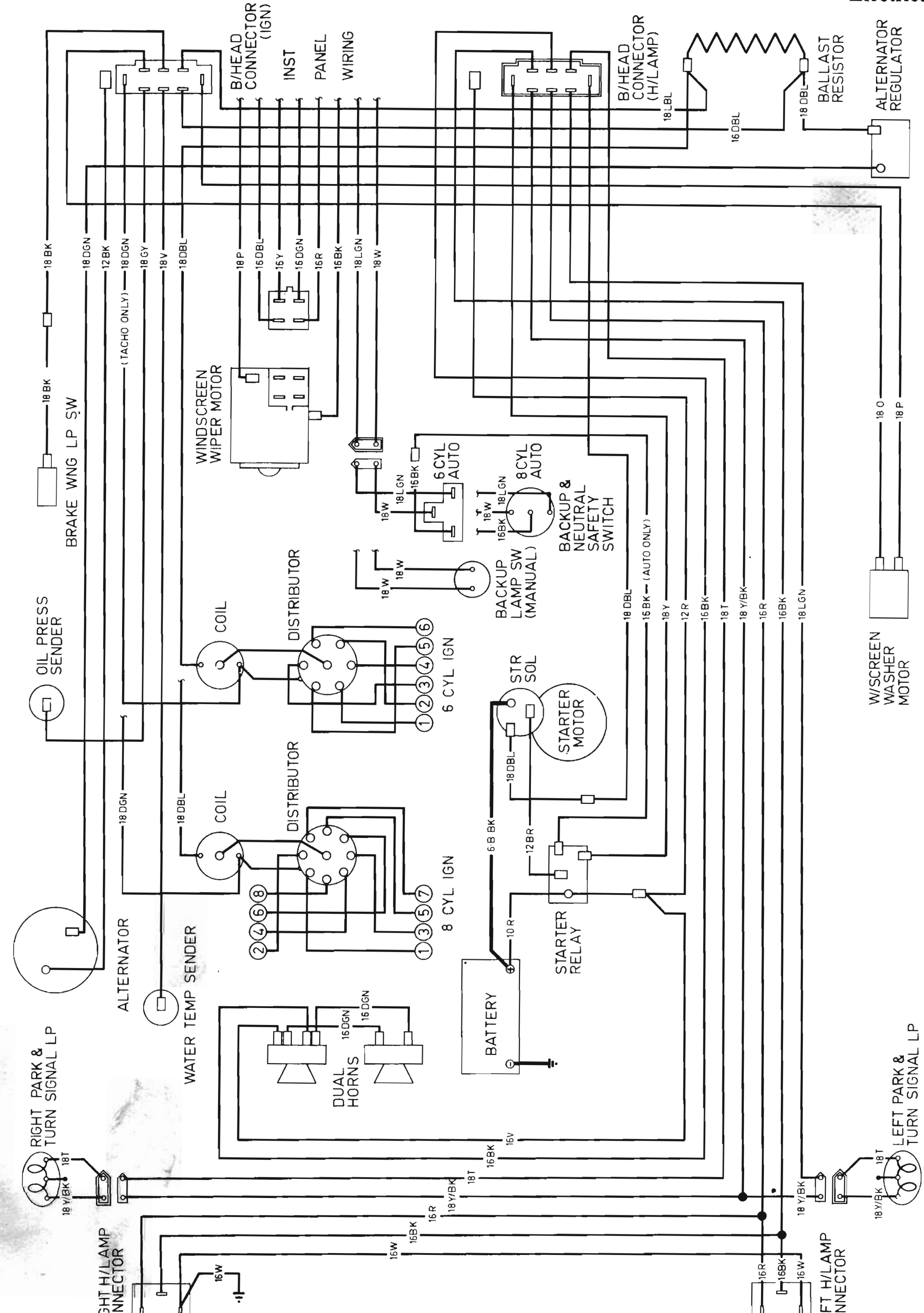
Fuse Block — All VH Models.



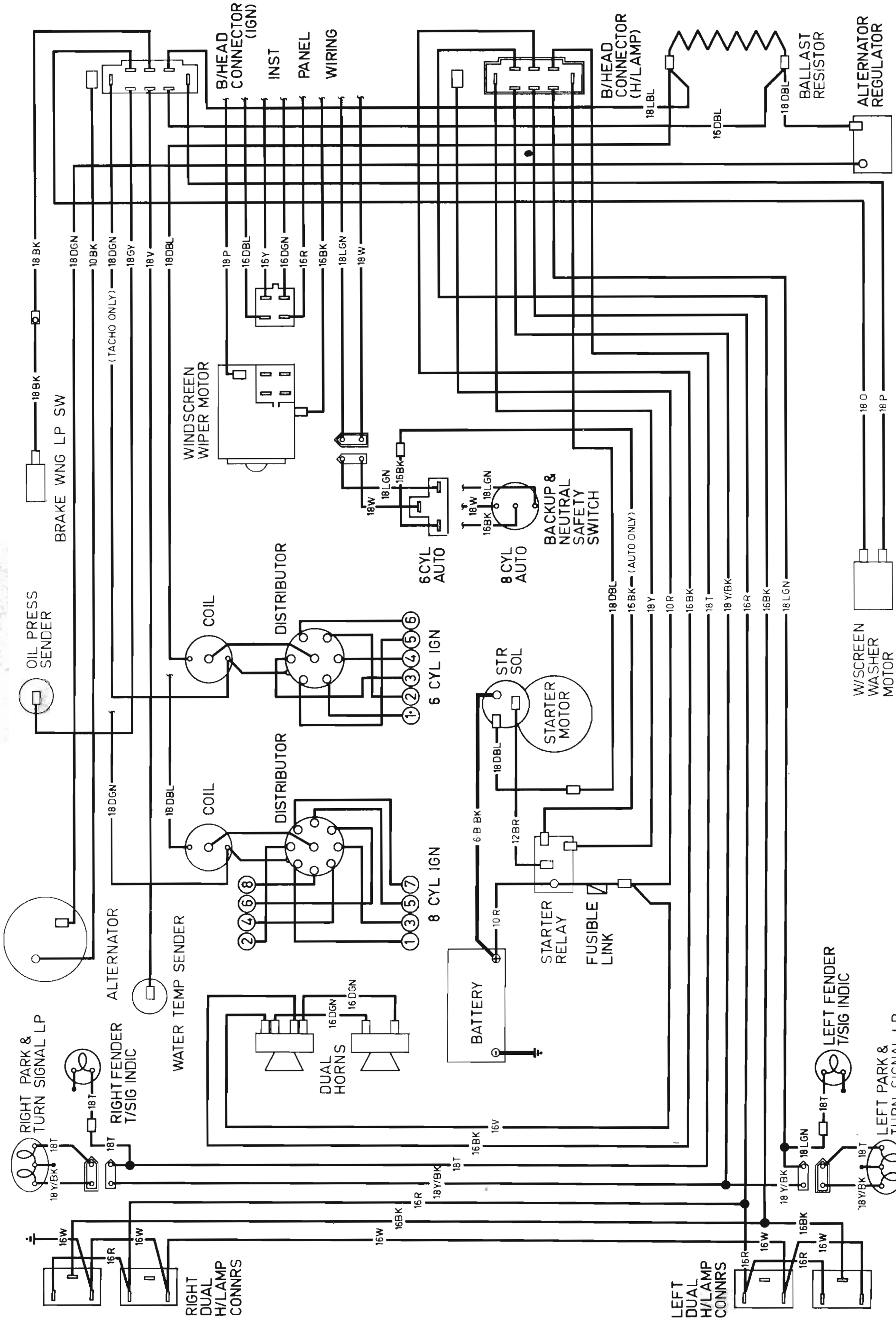
Fuse Block — Chrysler Models.



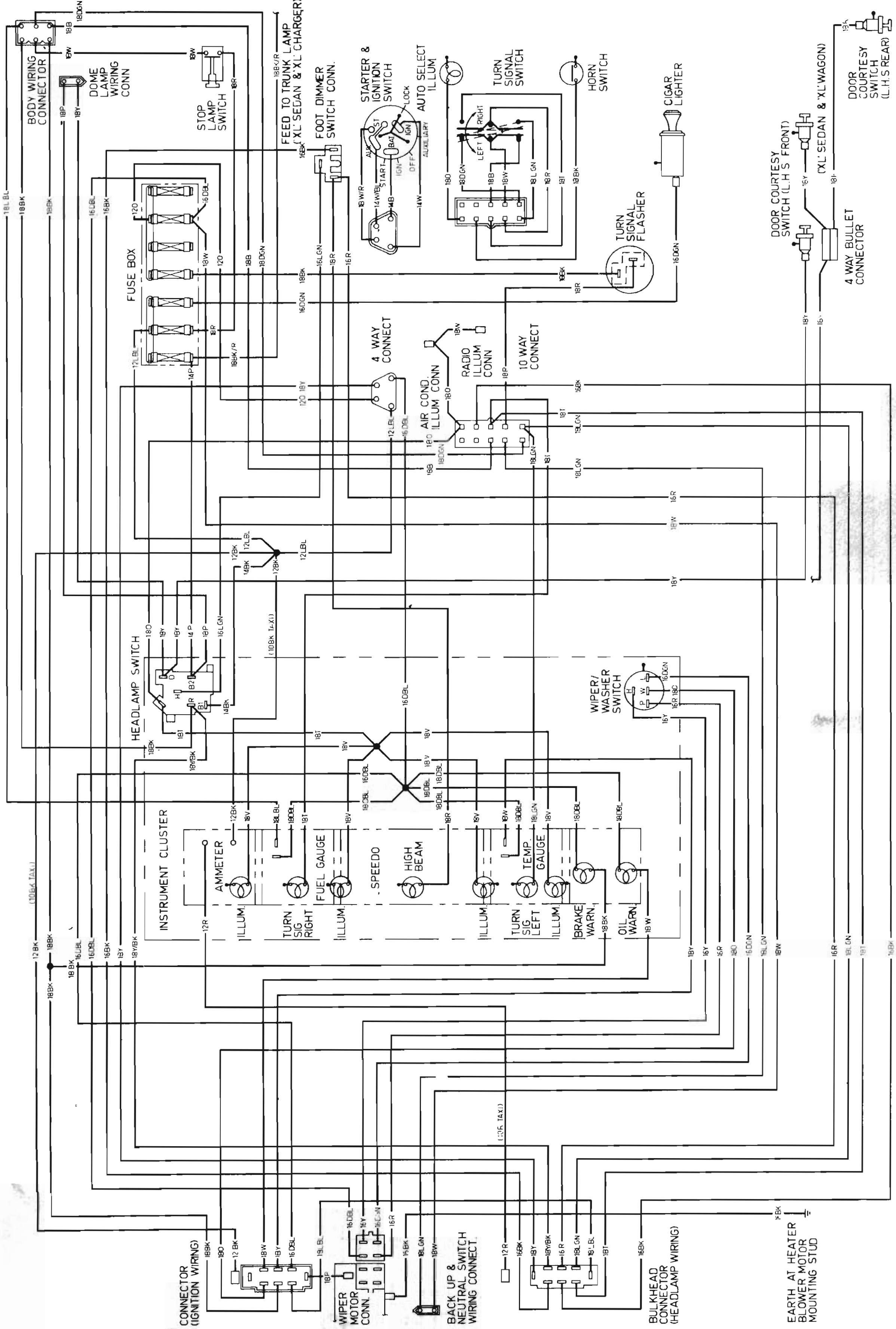
Engine compartment wiring diagram 6 and 8 cylinder (manual and automatic).
Model application: Regal 770 Charger RT, 770



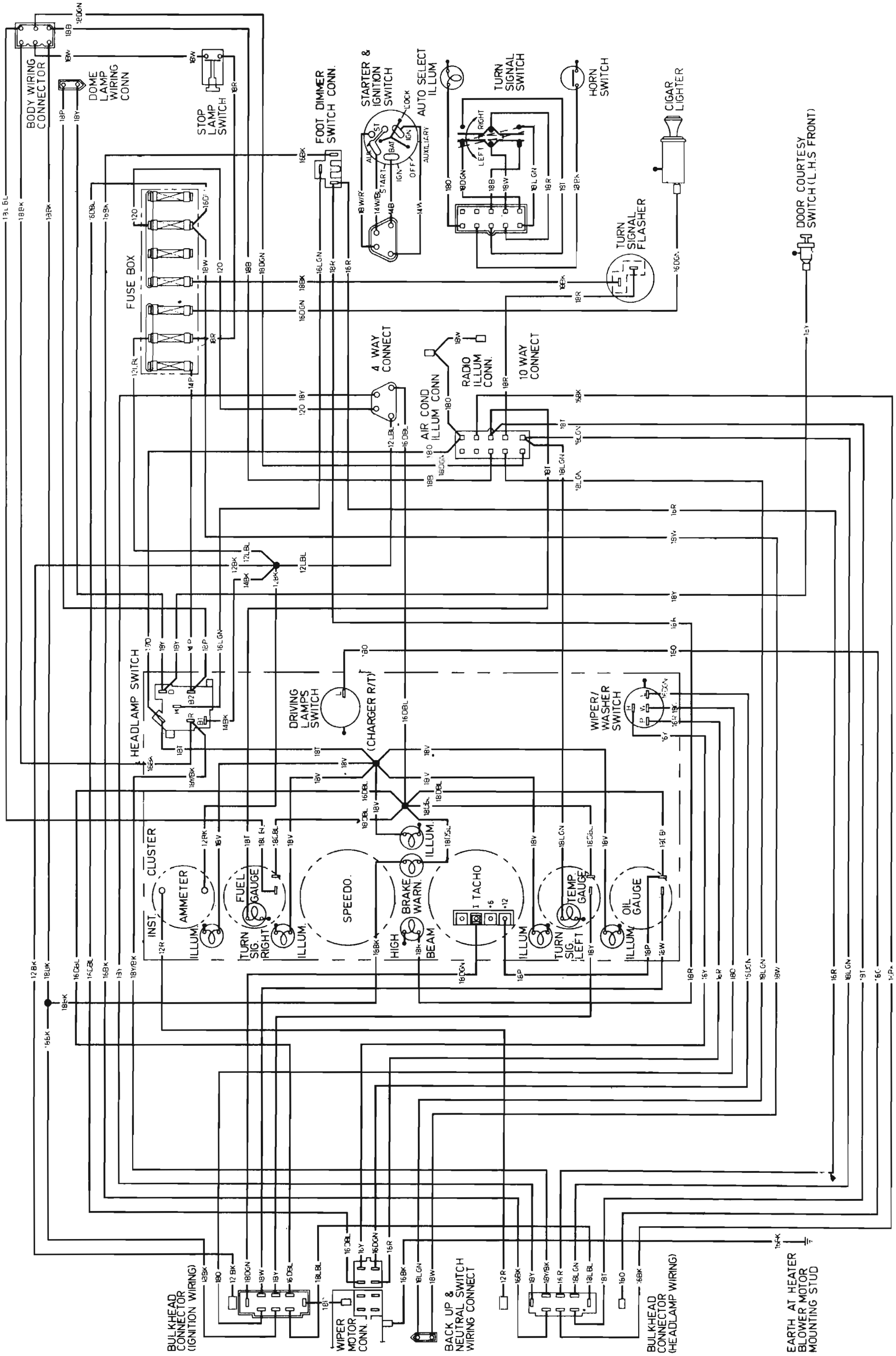
Engine compartment wiring diagram — 6 and 8 cylinder (manual and automatic).
Model application: All Ranger, Pacer, Regal Charger, XL, Utilities.



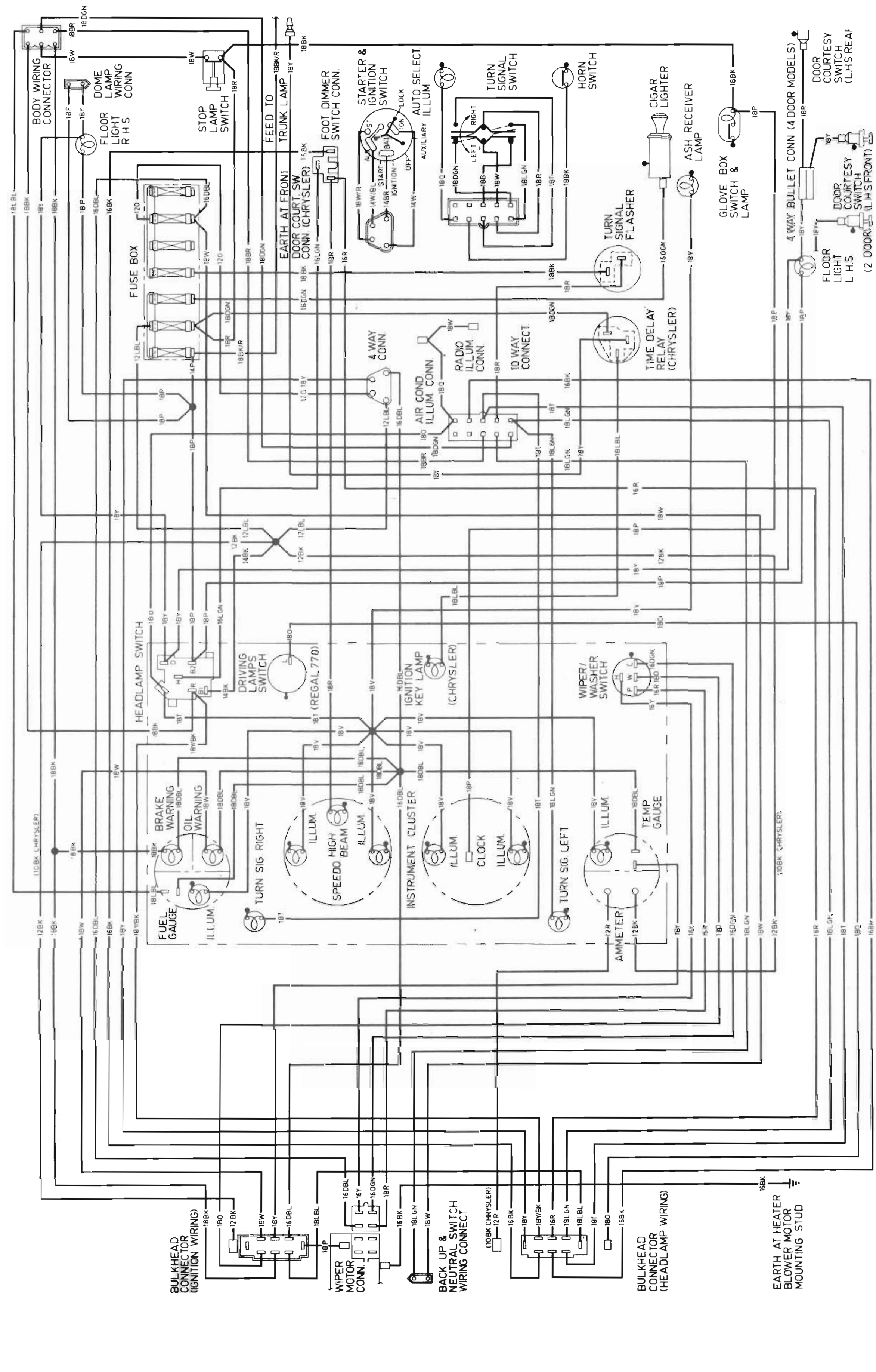
Engine compartment wiring diagram — 6 and 8 cylinder.
Model application: Chrysler models only.



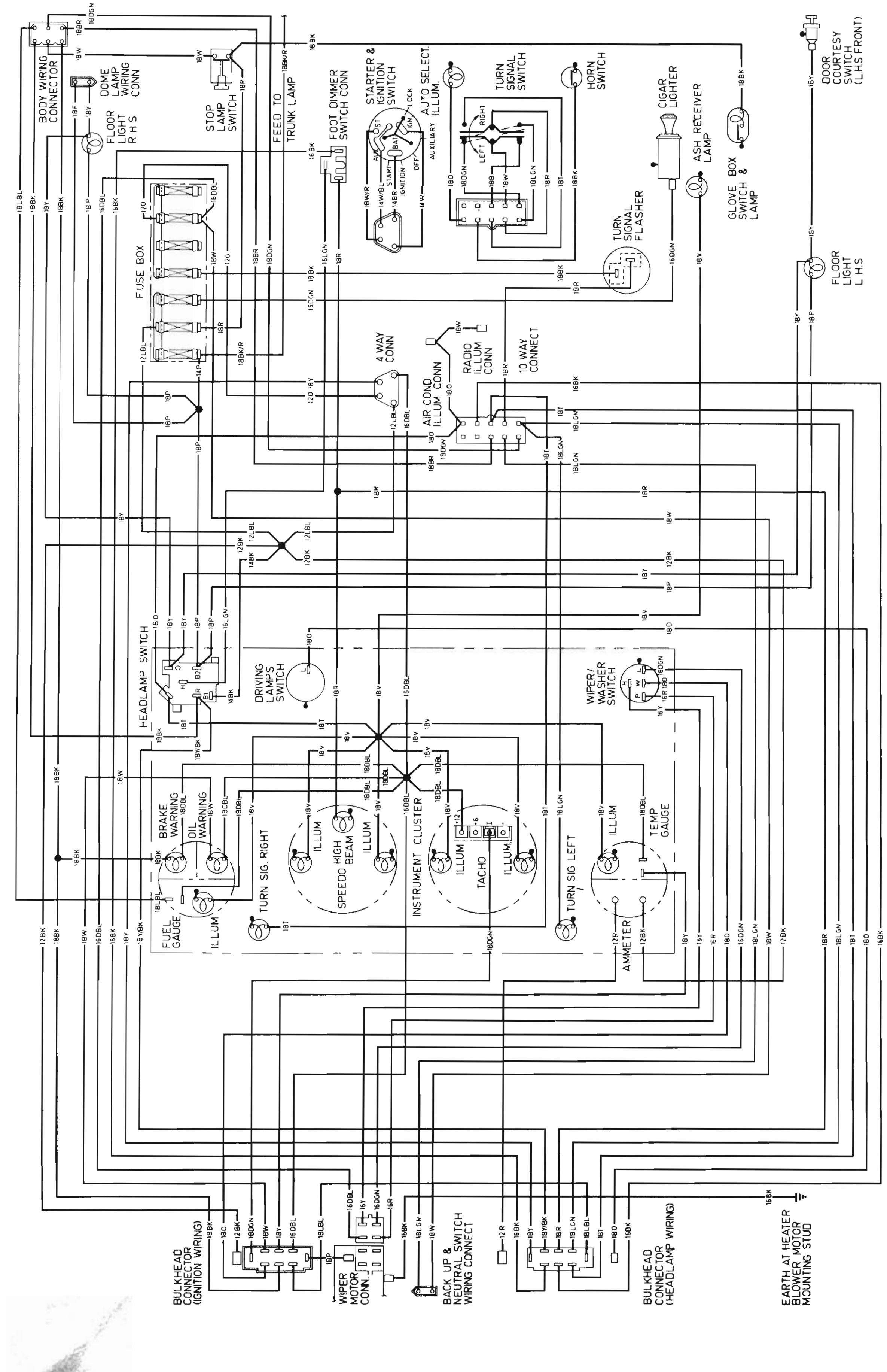
Instrument compartment wiring diagram.
Model application: Ranger (all), Charger, XL, and Utilities.



Instrument compartment wiring diagram.
Model application: Pacer, Charger RT.

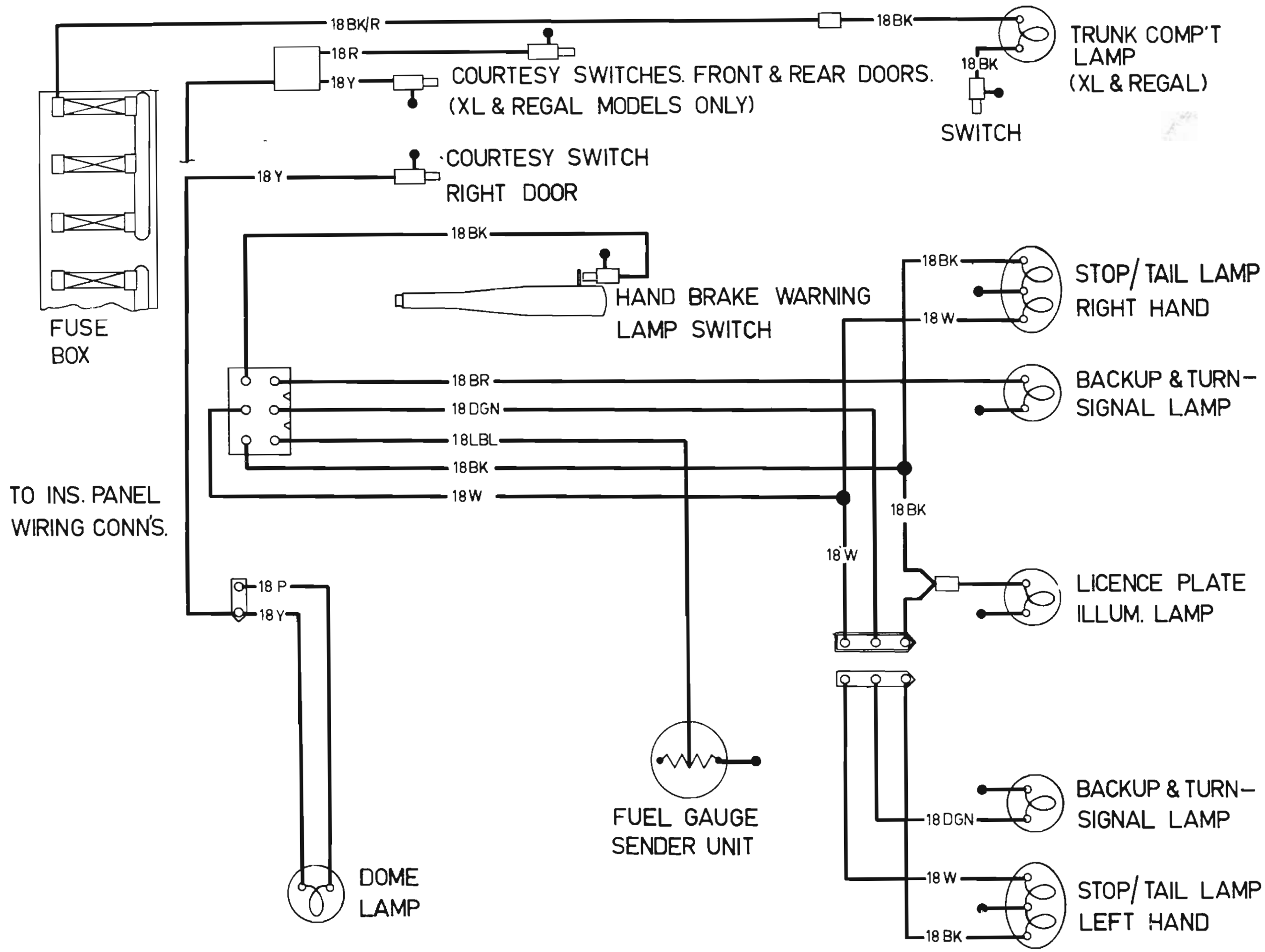


Instrument compartment wiring diagram.
Model application: Regal, Chrysler (with clock)



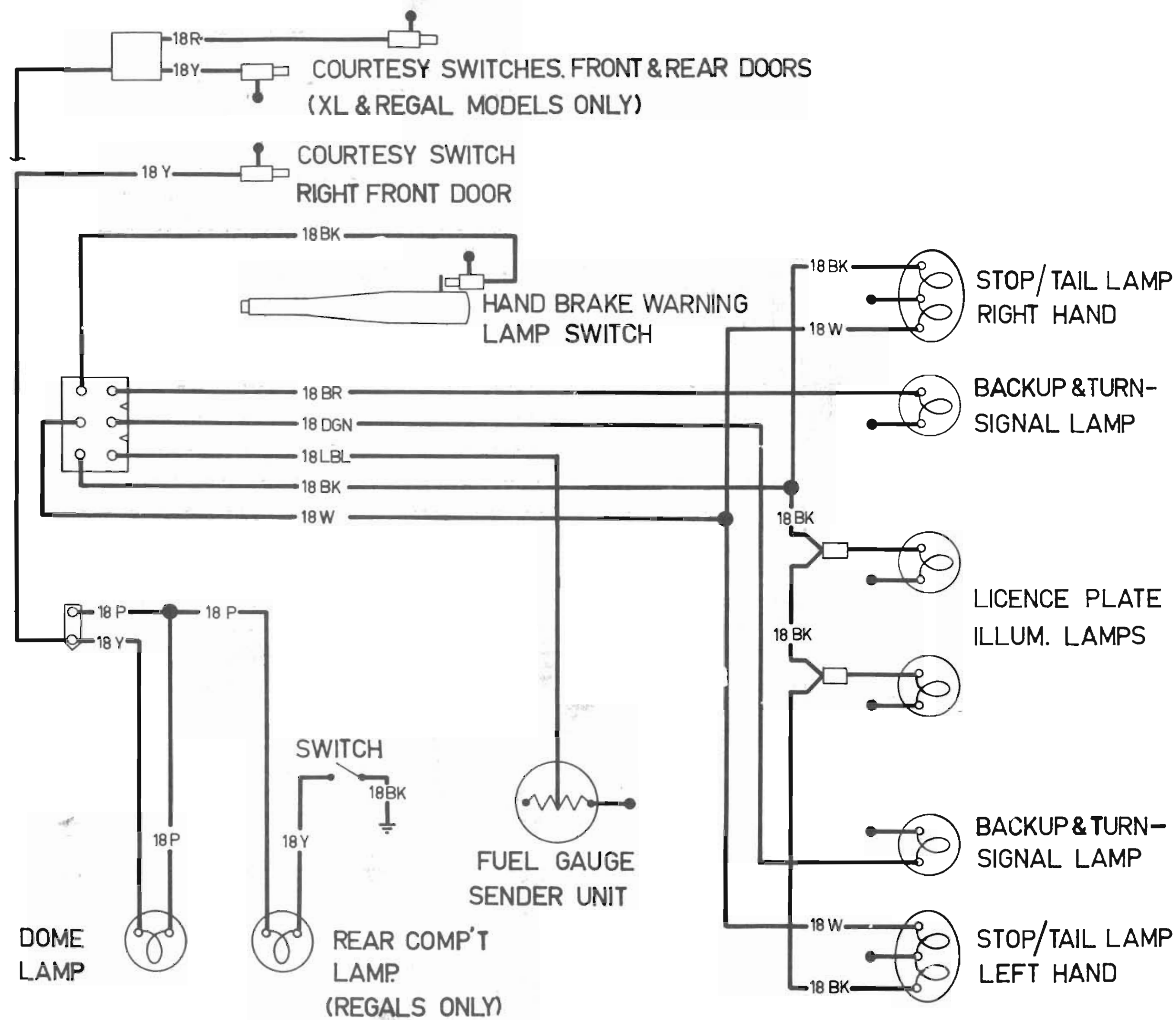
Instrument compartment wiring diagram.
Model application: Regal 770, Charger 770, (with tachometer).

COLOUR CODE	
BK	BLACK
BR	BROWN
D BL	DARK BLUE
DGN	DARK GREEN
GY	GREY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
Y/BK	YELLOW/BLACK TRACE
SPLICE	



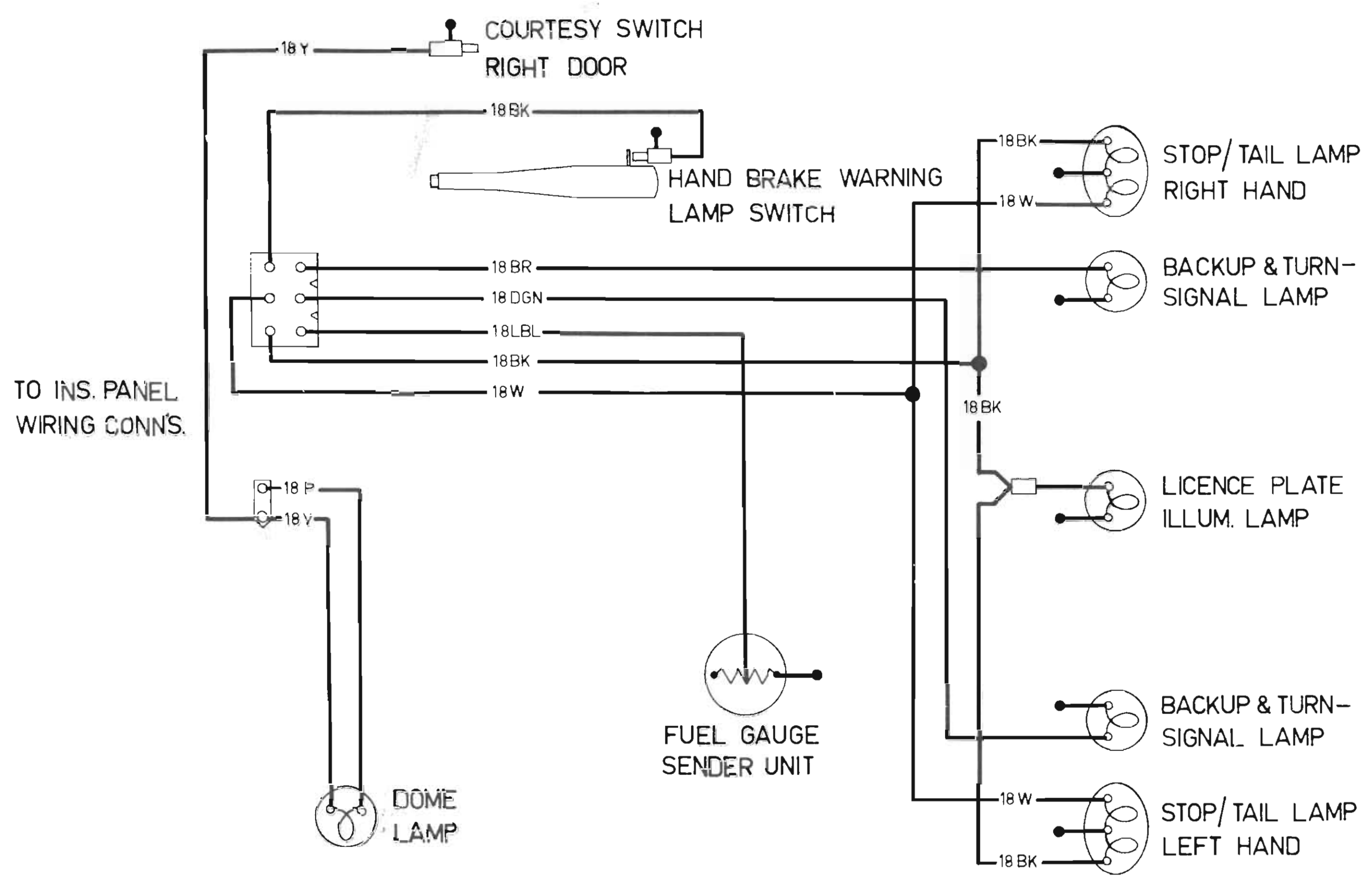
Body wiring diagram.
Model application: All models except Station wagons, utilities, and Chrysler models

COLOUR CODE	
BK	BLACK
BR	BROWN
D BL	DARK BLUE
DGN	DARK GREEN
GY	GREY
LBL	LIGHT BLUE
L GN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
Y/BK	YELLOW/BLACK TRACE
SPLICE	

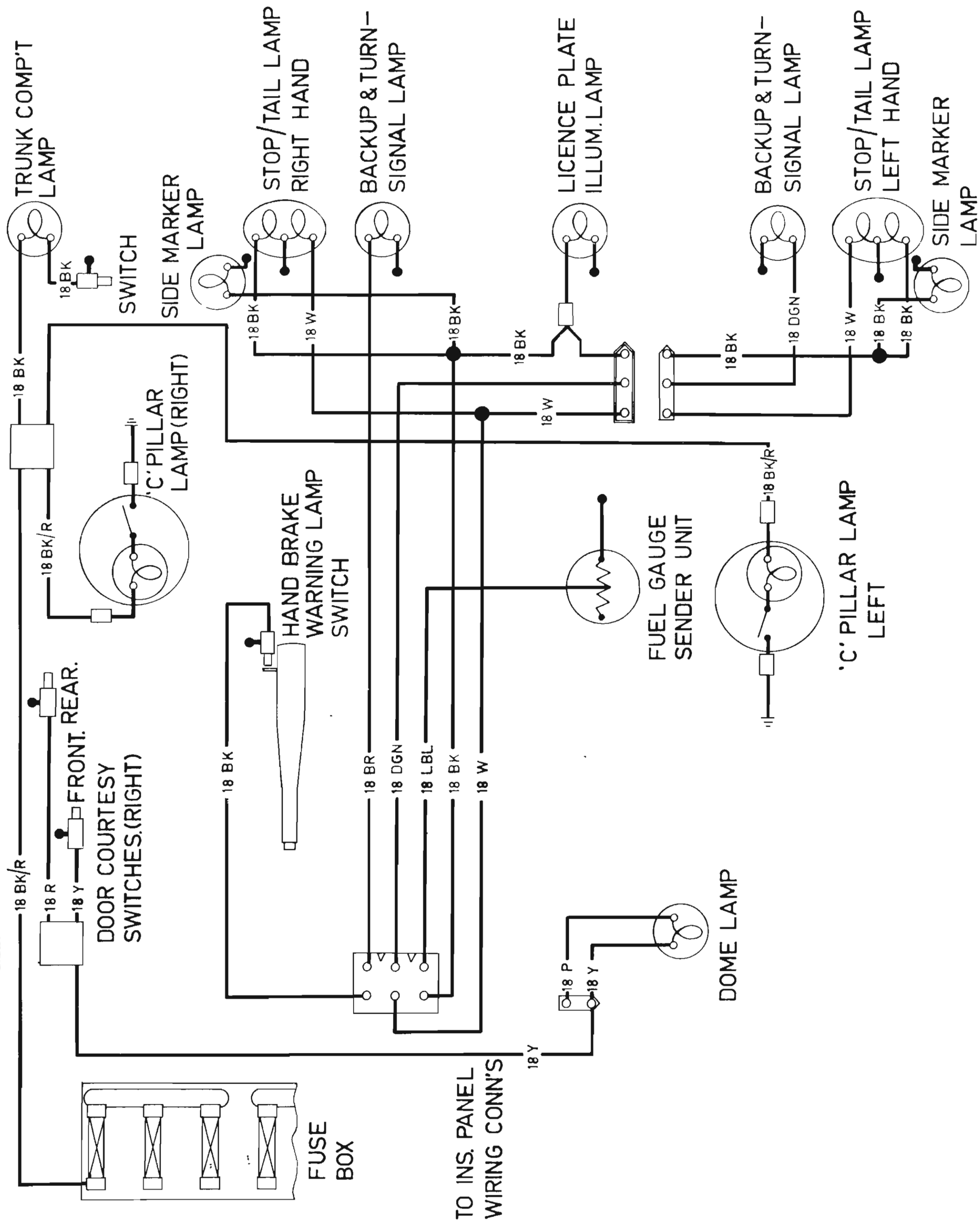


Body wiring diagram.
Model application: Station wagons.

COLOUR CODE	
BK	BLACK
BR	BROWN
DBL	DARK BLUE
DGN	DARK GREEN
GY	GREY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
Y/BK	YELLOW/BLACK TRACE
SPLICE	



Body wiring diagram.
Model application: Utilities. models only.



COLOUR CODE	
BK	BLACK
BR	BROWN
DBL	DARK BLUE
DGN	DARK GREEN
GY	GREY
LBL	LIGHT BLUE
LGN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
Y/BK	YELLOW/BLACK TRACE
SPLICE	

Body wiring diagram.
Model application: Chrysler models only.

PART 10 — RADIO, TAPE PLAYER, ANTENNA, SPEAKERS

General Information

Radio

The radio is a 13 transistor unit with push buttons and thumbwheel controls.

The illumination of the radio dial is controlled by the panel lights dimmer. The radio is fitted with a 7″ x 5″ oval speaker mounted in the instrument panel, and is equipped with a power antenna mounted on the left hand front fender, and operated by an instrument panel mounted switch.

Stereo Cassette-Radio

This unit is a 20 transistor combined stereo cassette and mono radio, with full stereo controls mounted in the instrument panel. The illumination of the dials is controlled by the panel lights dimmer. It is fitted with two speakers located in the rear shelf panel with the speaker wiring following the body wiring down the right hand side of the vehicle, and is equipped with a power antenna operated by an instrument panel mounted switch (at left of steering column).

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. RADIO INOPERATIVE

(A) BLOWN FUSE: Replace fuse, check for short or open in wiring harness.

(B) ANTENNA OPEN OR SHORTED: 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, replace original antenna.

(C) RECEIVER OR SPEAKER CONNECTIONS LOOSE OR FAULTY: 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.

2. RADIO RECEPTION WEAK

(A) UNBALANCED ANTENNA TRIMMER: Carefully adjust the antenna trimmer for maximum volume on a weak station at approximately 1,000 KHZ frequency with antenna at half height.

(B) SHORTED ANTENNA LEAD-IN: Turn on radio and wiggle antenna. If speaker static is heard, check antenna for mounting tightness. If speaker static is still heard after tightening, disassemble antenna and test for faulty insulators, or presence of moisture. 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 O.K., remove radio receiver for servicing.

3. RADIO NOISY

(A) OUTSIDE ELECTRICAL INTERFERENCE: Move the car or eliminate interference.

(B) INSUFFICIENT OR FAULTY INTERFERENCE SUPPRESSION: Install effective capacitor in ignition system.

(C) FAULTY ANTENNA: Turn on radio, wiggle antenna lead and listen for speaker static. If static is heard, disassemble antenna and check for faulty insulators or presence of moisture. If no static is heard, start engine and slowly accelerate engine speed. If a whining noise is heard, check the suppressors, check the alternator for burnt-out diodes, check voltage regulator setting. If O.K., remove radio receiver for servicing.

4. RADIO RECEPTION DISTORTED

(A) SPEAKER VOICE COIL LEADS RUBBING ON SPEAKER CONE: Install an auxiliary speaker and compare. Replace if improved.

(B) TORN SPEAKER CONE: Replace the speaker.

5. INTERMITTENT RECEPTION

(A) BROKEN OR SHORTED ANTENNA LEAD-IN WIRE: Test with a substitute antenna and replace if necessary.

(B) FAULTY RADIO: Send radio to authorized radio dealer for repair.

RADIO

1. OPERATION

To operate the radio the ignition switch must be in the "ON" or "ACCESSORY" positions. Operation is by the five push buttons and four thumbwheels. The left outside thumbwheel is an ON-OFF filter control; the left inside thumbwheel is for station selection The right inside thumbwheel controls tone quality, and the right outside thumbwheel controls the volume. Station selection can also be accomplished by pushing buttons fully in.

2. REMOVAL

(1) Disconnect battery negative cable.

(2) From under instrument panel remove the bracket from rear of radio and of instrument panel.

(3) Remove the two hexagon head screws attaching the base of radio to the instrument panel and pull radio away from instrument panel.

(4) Remove the speaker and antenna leads at radio rear end.

(5) Disconnect the radio power and illumination leads from main wiring and remove radio.

(6) Installation is the reverse of the above procedure.

3. SPEAKER

To Remove (Front)

(1) Remove the heater/demister tubes *(see Note below).*

(2) From beneath the instrument panel loosen the speaker baffle attaching nuts. With the speaker screw heads located in the instrument panel by key hole slots, the speaker can now be removed by sliding the unit backwards.

> NOTE: If fitted with air-conditioning, remove the two bolts attaching the outlet duct (containing louvres) to the instrument panel, and remove the three self-tapping screws attaching the heater/demister duct and tubing to the air-conditioner.

4. STEREO CASSETTE-RADIO

Operation

(1) The ignition switch must be in the "ON" or "ACCESSORY" positions.

(2) The right centre knob is the radio switch (ON) and volume control knob.

(3) The right outer knob controls the tone quality.

(4) The left centre knob controls the radio automatic tuning.

(5) The left outer knob is the manual tuning knob.

(6) The button marked "R-SEN" alters the automatic tuner sensitivity.

TAPE PLAYER

(1) The ignition switch must be in the "ON" or "ACCESSORY" positions.

(2) The tape player has no separate ON-OFF switch, but is switched on when a tape is played.

(3) Insert the tape-cassette in the cassette input slot, and push down the tape play lever. This will automatically switch the unit on and begin playing the tape.

(4 The volume and tone controls operate as per radio, with the balance knob controlling the volume of sound between the left and right speakers for optimum stereo effect.

(5) The left hand centre knob controlling the automatic tuning will now function as a tape reversal switch; lightly tapping this knob will reverse the tape at any time. However, the tape will reverse automatically at the end of each pair of tracks (4 total).

(6) To eject the tape, push the reject button in fully and the cassette can be removed. The tape player is now off.

5. REMOVAL

(1) Disconnect battery negative cable.

(2) Disconnect speaker leads from the rear of unit.

(3) Disconnect antenna lead-in cable.

(4) From under the instrument panel remove the support strap from rear end of radio and instrument panel.

(5) Remove all knobs and the two nuts on the control spindles, and withdraw the unit from the instrument panel.

> NOTE: DO NOT LOSE THE SPACERS AND WASHERS.

(6) Installation is the reversal of the above procedure.

6. SPEAKERS

To Remove (Rear)

(1) Disconnect the speaker leads from inside the trunk compartment.

(2) Remove the four screws attaching each speaker to the rear shelf trim board, and remove the speakers.

(3) Installation is the reverse of the above procedure.

7. POWER ANTENNA

To Remove (All Models)

(1) Disconnect battery negative cable.

(2) Unplug antenna lead from radio receiver.

(3 Remove mud shield from left hand front inner wheel housing.

(4) Remove the support strap from bottom of antenna.

(5) Remove the chrome mounting nut from the top of antenna assembly, and withdraw the unit from the inside of the front fender pulling lead in grommet out of the cowl side panel.

(6) Installation is the reverse to the above procedure.

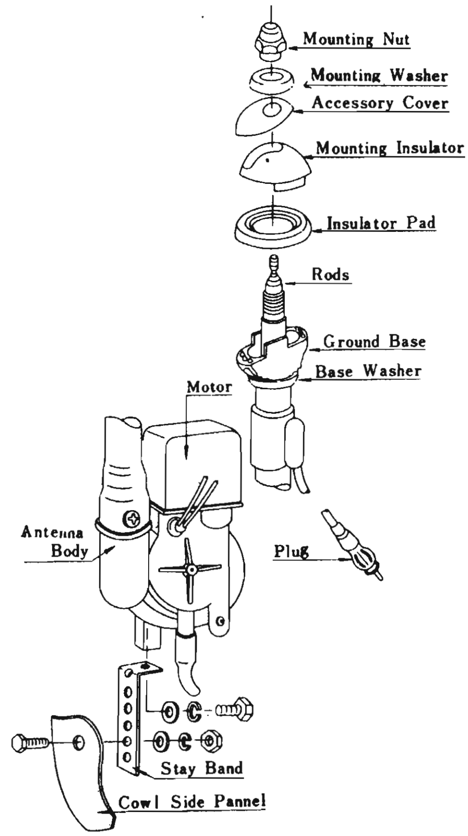


Fig. 1. Power Antenna (exploded view).

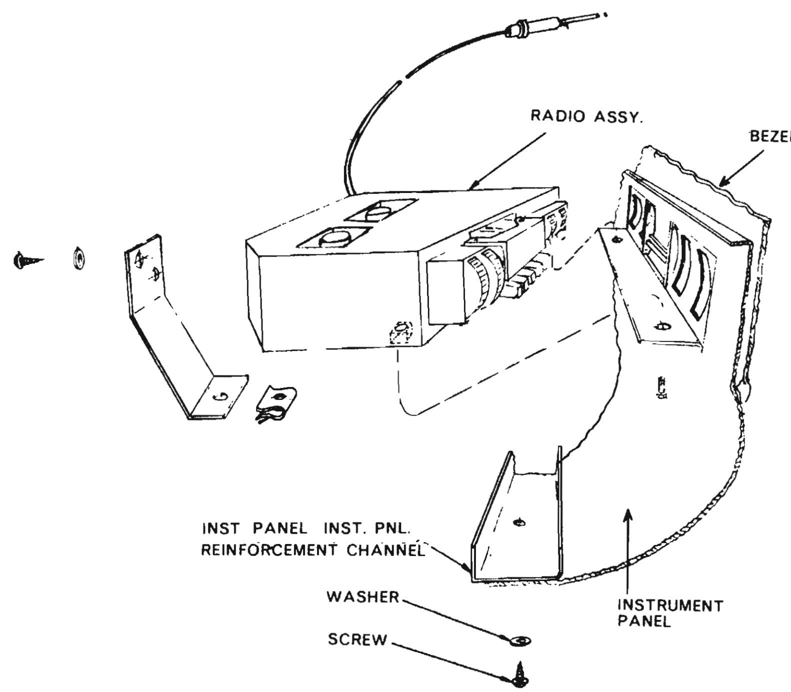


Fig. 2. Radio Installation Diagram.

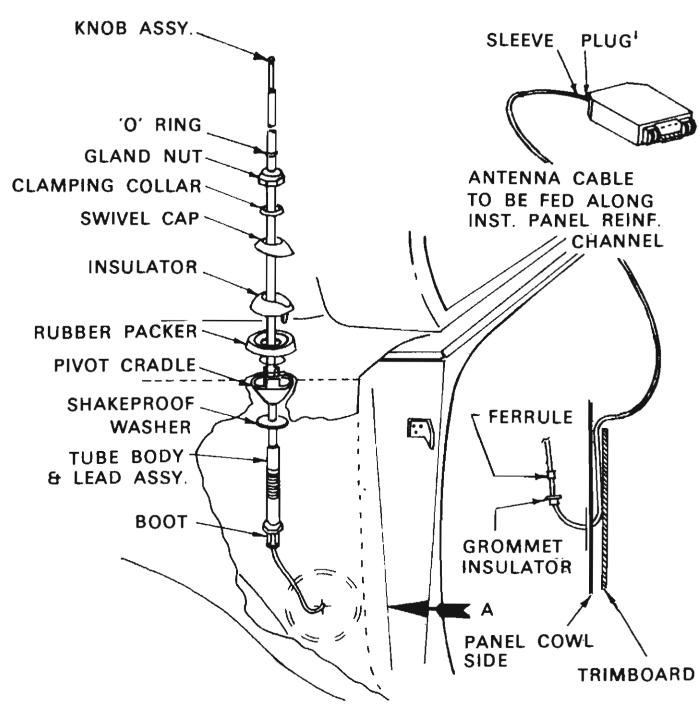


Fig. 3. Radio Aerial Mounting Diagram Manual.

GROUP 9

ENGINE

PART 3B — ENGINE ASSEMBLY

8 CYLINDER

PART 4 — ENGINE OILING SYSTEM

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SERVICE DIAGNOSIS

CONDITIONS—POSSIBLE CAUSES

1. ENGINE WILL NOT START — NORMAL CRANKING

(1) Dirty or corroded distributor points.

(2) Carburettor flooded.

(3) Moisture on ignition wires and distributor cap.

(4) Dirt or water in the fuel line or carburettor.

(5) Incorrect spark plug gaps.

(6) Faulty coil or condenser.

(7) Faulty ignition cables.

(8) Vapour lock.

(9) Faulty fuel pump.

(10) Incorrect timing (ignition).

(11) Shorted out pigtail lead in distributor.

2. ENGINE WILL NOT START — (WEAK, SLOW OR ERRATIC CRANKING)

(1) Weak battery or faulty terminals.

(2) Faulty starter solenoid.

(3) Faulty starting motor.

3. ENGINE STALLS

(1) Idle speed set too low.

(2) Idle mixture too lean or too rich.

(3) Improper choke adjustment.

(4) Incorrect carburettor float setting.

(5) Faulty coil or condenser.

(6) Valve lash below specified setting.

(7) Leak in intake manifold. (Check intake manifold gasket).

4. ENGINE MISFIRES WHILST IDLING

(1) Dirty or incorrectly gapped spark plugs.

(2) Burned or pitted contact points.

(3) Broken or loose ignition wires.

(4) Incorrect carburettor idle adjustment.

(5) Burned, cracked distributor rotor.

(6) Moisture on ignition wires, distributor cap or spark plugs.

(7) Distributor cap cracked.

(8) Weak battery.

(9) Incorrect carburettor float level.

(10) Faulty coil or condenser.

(11) Excessive play in distributor shaft.

(12) Burned, warped or pitted valves.

(13) Insufficient tappet clearance.

5. ENGINE MISFIRES ON ACCELERATION

(1) Distributor contact points dirty or incorrectly gapped.

(2) Spark plugs dirty or set too wide.

(3) Dirt in Carburettor.

(4) Accelerator pump in carburettor not operating correctly.

(5) Coil or condenser defective.

(6) Incorrect ignition timing.

(7) Burned, warped, or pitted valves.

6. ENGINE MISFIRES AT HIGH SPEED

(1) Distributor contact points dirty or incorrectly gapped.

(2) Spark plugs dirty or gap set too wide.

(3) Dirt or water in fuel line or carburettor.

(4) Burned, cracked distributor rotor.

(5) Defective coil or condenser.

(6) Dirty jets in carburettor.

(7) Incorrect ignition timing.

(8) Excessive play in distributor shaft.

(9) Distributor shaft cam worn.

(10) Fuel pump delivery insufficient.

7. ENGINE HAS LOSS OF POWER

(1) Dirty or incorrectly gapped spark plugs.

(2) Dirt or water in fuel line or carburettor. (includes fuel filter).

(3) Incorrect ignition timing.

(4) Incorrect carburettor float level.

(5) Defective fuel pump.

(6) Incorrect valve tappet lash.

(7) Incorrect mechanical or vacuum advance (distributor).

(8) Plugged or restricted muffler or tail pipe.

(9) Defective coil or condenser.

(10) Distributor rotor burned or cracked.

(11) Excessive play in distributor shaft.

(12) Worn distributor cam.

(13) Incorrect valve timing.

(14) Burned, warped or pitted valves.

(15) Blown cylinder head gasket.

(16) Low compression.

(17) Cross firing due to ignition cable routing incorrect.

8. NOISY VALVES

(Hydraulic Type Tappets)

(1) High or low oil level in crankcase.

(2) Thin or diluted oil.

(3) Low oil pressure (below specs.).

(4) Dirt in tappets.

(5) Bent push rods.

(6) Worn rocker arms.

(7) Worn tappets.

(8) Worn valve guides.

(9) Excessive run-out of valve seats or valve faces.

(10) Incorrect tappet assembly.

(11) Broken or tilted valve springs.

9. CONNECTING ROD BEARING NOISE

(1) Low oil pressure.

(2) Insufficient oil supply. (Inspect oil pump relief valve and spring).

(3) Thin or diluted oil.

(4) Excessive bearing clearance.

(5) Connecting rod journals out-of-round.

(6) Misaligned connecting rods.

10. MAIN BEARING NOISE

(1) Loose vibration damper or crank pulley.

(2) Low oil pressure.

(3) Insufficient oil supply.

(4) Excessive bearing clearance.

(5) Loose flywheel or torque converter.

(6) Excessive end play.

(7) Crankshaft journals out-of-round.

11. EXCESSIVE OIL CONSUMPTION

(1) Oil leaks.

(2) Cracked valve stem oil shields.

(3) Excessive valve guide to stem clearance.

(4) Worn, scuffed or broken rings.

(5) Rings tight, stuck in grooves or inadequate radial tension.

(6) Excessive side clearance between rings and grooves.

(7) Compression rings installed upside down.

(8) Clogged oil ring slots.

(9) Excessive cylinder bore taper and/or out-of-round.

(10) Improper seating of rings during break-in.

(11) Incorrect cylinder bore honing.

(12) Cylinder head oil drain-back holes clogged.

(13) Excessive bearing clearance.

12. OIL PRESSURE DROP

(1) Low oil level.

(2) Thin or diluted oil.

(3) Oil pump relief valve stuck.

(4) Excessive bearing clearance.

(5) Worn parts in oil pump.

(6) Oil pump suction tube not aligned or bent.

(7) Air leak into oiling system.

PART 1 — ENGINE TUNING

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

Engine tuning is one of the most important of the maintenance services, it determines whether or not the vehicle will perform with maximum economy and efficiency. It is therefore important that this service be performed on the engine every spring and autumn, or more often if conditions warrant.

The following paragraphs outline in general the tuning procedures. Also, specifications are included for the subject wherever possible. In some paragraphs the specifications are included in the procedures.

Minor Engine Tuning consists of:

(a) Clean and test spark plugs.

(b) Compression test.

(c) Distributor points check/adjust (includes Reset timing).

(d) Inspect carburettor operation and check mechanical settings.

2. COMPRESSION TEST

An engine without reasonably high and uniform compression cannot be effectively tuned. The compression of each cylinder should be tested before any other tuning operations are performed. The engine must be at operating temperature when performing the compression test.

Compression pressure with engine warm, spark plugs removed, wide open throttle at minimum cranking speed of 130 R.P.M. should be within the specified limits.

(1) Remove any foreign matter from around spark plugs by blowing out plug area with compressed air, then loosen all plugs one turn.

(2) Start the engine and accelerate to 1000 R.P.M. to blow out loosened carbon. Stop engine and remove plugs, note cylinder from which each plug was removed for future reference.

> NOTE: Clearing out carbon in this manner is important in preventing false compression readings due to particles of carbon becoming lodged under the valves.

(3) Remove air cleaner and block throttle and choke in wide open position.

(4) Connect remote control starter switch to the starter solenoid.

(5) Insert the compression gauge firmly in spark plug opening, and crank engine through at least four compression strokes to obtain highest possible reading.

(6) Test and record compression of each cylinder. Compression should read within the limits indicated in the specifications.

(7) If one or more cylinders read low or uneven, inject about a tablespoon of engine oil on top of pistons in low reading cylinders. Crank engine several times and re-check compression. If compression comes up but does not reach normal, rings are worn. If compression does not improve, valves are sticking or seating poorly. If two adjacent cylinders show low compression, and injecting oil does not improve condition, the cause may be a head gasket leak between the cylinders.

3. VALVE CLEARANCE

(Automatic Hydraulic Adjustment)

An engine will not perform efficiently if the valve clearance is not correct. Also it might cause low readings during compression test.

Should the compression pressures be very uneven — first check that the hydraulic tappets are providing sufficient running clearance (by applying pressure on the pushrod end of the rocker arm) using a suitable tool, while another test is made on the uneven cylinder(s).

4. IGNITION SYSTEM

Spark Plugs

(1) Remove the spark plugs. Examine firing ends of plugs for evidence of oil fouling, gas fouling, burned or over-heating conditions. Oil fouling is usually identified by wet, sludgy deposits caused by excessive oil consumption. Gas fouling is usually identified by dry, black fluffy deposits, caused by incomplete combustion. Burned or over-heated spark plugs are usually identified by a white burned or blistered insulator nose, and badly burned electrodes. Incorrect fuel, inefficient cooling, incorrect ignition timing, or incorrect spark plug heat range for operating conditions, normally are the cause. Normal conditions are usually identified by white, powdery deposits, or rusty-brown to greyish-tan powdery conditions.

(2) Clean the spark plugs with a suitable sand blast cleaner following the manufacturer's instructions.

(3) Remove carbon and other deposits from the threads with a stiff wire brush.

(4) Dress the electrodes with a small file to secure flat, parallel surfaces on both the centre and the side electrode.

(5) Adjust the spark plug gap by bending the ground electrode, use a wire gauge, and adjust the gap to the specified clearance.

(6) Install and tighten to 30 lbs. ft. torque.

Distributor Cap, Rotor and Wires

(1) Remove wires from distributor cap and examine cap and rotor for cracks, carbon tracks, electrode wear or other damage. Use a small round stiff bristle brush if necessary, to clean corrosion from the wire terminal towers.

(2) Using a weak solution of liquid soap or detergent diluted with warm water, thoroughly scrub the inner and outer surfaces of the distributor cap. Flush with hot water, shake out excess water and dry thoroughly. Do not use compressed air to dry or blow out the water.

(3) Inspect the spark plug cables and coil high tension cable for worn, cracked or damaged insulation, or any condition that may cause current leakage. Check cables for open circuit, loose terminals and high resistance. Replace cable if the resistance is more than 12,000 ohms per foot or if the terminal has pulled off. Check for hardened or split cable nipples, replace as required.

Distributor Resistance

Excessive resistance of the ignition primary circuit from the distributor side of the coil, through the points and the distributor ground will prevent the coil from producing sufficient output for good over-all ignition.

> NOTE: The following service operations can best be performed with the distributor mounted in a reliable distributor tester.

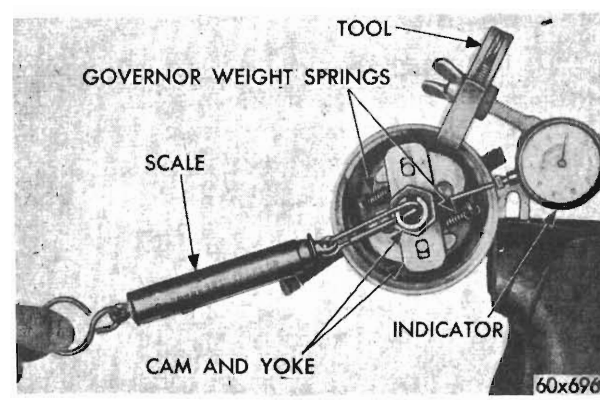


Fig. 1 – Measuring distributor shaft side play (typical)

Distributor Point Replacement

If the distributor shaft appears to have excessive side play, measure and replace parts as necessary *(Fig. 1) (see Group 8 – Electrical)*.

Excessive wear changes the point gap, causing dwell variations which will affect ignition timing and engine performance.

(1) Remove the old contact points and install a new set.

(2) Align the contacts to provide centre contact by bending the stationary contact bracket only. NEVER BEND MOVABLE ARM TO OBTAIN ALIGNMENT.

(3) After aligning the points, adjust the point gap to specifications using a dial indicator.

(4) Test and adjust the breaker arm spring tension, by hooking a spring scale on the breaker

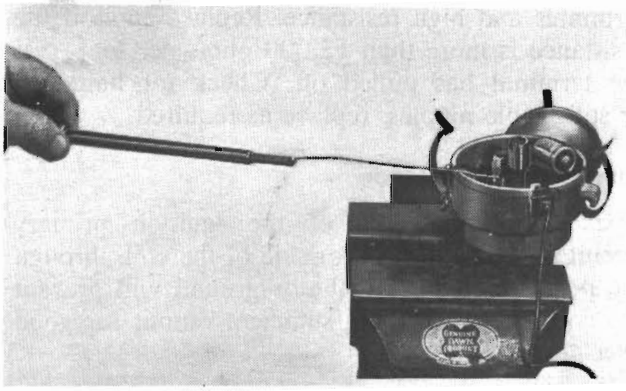


Fig. 2 – Testing breaker arm spring tension

arm. Pull the scale in a straight line at right angles to the point surfaces *(Fig. 2)* and read the scale as the points start to separate.

(5) If the spring tension is not within specifications ($17\frac{1}{2}$-21 ozs.) 6 cylinder, and (18-24 ozs.) 8 cylinder, a new breaker arm must be installed. E37 and E38 optional engines require 21.2 to 22.9 ozs. tension.

(6) Lubricate the breaker lever pivot with one drop of light engine oil. Apply a small amount of heat resisting grease to a clean cloth and very lightly wipe over the distributor cam.

> CAUTION: Excessive lubricant on the cam may be thrown off when hot and finds its way between the contact points, causing ignition failure.

Point Dwell Test

The degrees of dwell of the distributor breaker points, are the degrees of rotation through which the breaker points remain closed. This is also commonly referred to as "cam angle" or "dwell angle".

Correct distributor point dwell is essential for good ignition performance and point life. Test procedures are as follows:

(1) Connect the tach-dwell red lead to the distributor terminal of the coil, and black lead to a good ground.

(2) Turn the selector to the 6 lobe position (6 CYLINDER) or 8 lobe position (8 CYLINDER).

(3) Turn motor switch to correct rotation position. Adjust speed control until tachometer reads 200 R.P.M. and observe meter reading. This should be within specifications if contact opening is correct and cam, rubbing block, and breaker arm are in satisfactory condition. If the reading is not within specifications, incorrect point gap, defective cam, worn rubbing block or distorted breaker cam are indicated.

Distributor Advance (Test and Adjustments)

Mount the distributor assembly (less cap and rotor) in a reliable stroboscope-type distributor tester and proceed with test.

For centrifugal advance, connect the tach-dwell lead to the distributor primary lead or terminal and proceed as follows:

(1) Turn the selector to the 6 lobe position (6 CYLINDER) or 8 lobe position (8 CYLINDER).

(2) Turn the motor switch to correct rotation position. Adjust the speed control until the tachometer reads 100 R.P.M.

(3) Align the "O" of the distributor tester degree ring with any one of the arrow flashes.

(4) Adjust the tester speed control to operate the distributor at speeds called for in specifications and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(5) If the advance is not according to specifications new springs should be installed.

Increasing the spring tension DECREASES the rate of advance.
Decreasing the spring tension INCREASES the rate of advance.

Vacuum Diaphragm Leak Test

For vacuum diaphragm leak test, mount the distributor in distributor tester and with vacuum unit attached to the distributor, proceed as follows:

(1) Place thumb over end of vacuum pump hose and adjust the regulator control knob to give a reading of 20" with hose closed off to ensure tester hose does not leak.

(2) Attach the vacuum pump hose to the tube on the vacuum unit. The vacuum gauge should hold on maximum vacuum obtainable if no leak exists.

(3) Observe breaker plate whilst performing the leak test, to check response of breaker plate to vacuum advance. There should be instant response to the pull of the diaphragm, moving the plate without drag or bind.

(4) If leakage is indicated, replace the vacuum unit. *(Refer "Distributor Overhaul" in Group 8).*

Vacuum Advance

For vacuum advance connect tester vacuum pump hose to distributor vacuum advance unit and perform steps 1 to 5 of Centrifugal Advance. Then proceed as follows:

(1) Turn the tester vacuum pump ON. Adjust the vacuum pump regulator to vacuum test specifications. *See Specifications* and observe the arrow flashes on the tester degree ring to determine the degrees of advance.

(2) If the vacuum advance is above or below specifications, the unit must be replaced as no adjustment is provided.

The link which joins the diaphragm to the distributor plate is pre-set at manufacture and should not be altered.

Replace distributor carefully on engine. (See Group 8 - Ignition System.)

Coil and Condenser

The ignition coil is designed to operate with an external ballast resistor. When testing the coil for output, include the resistor in tests. Check the coil for external leaks and arcing. Always make two tests when checking the coil, one when coil is cold and again with coil warm.

To check the high tension circuit, pull the high tension cable from the distributor centre tower. Hold the end of the cable about ¼" away from the cylinder head and crank engine with the iginition switch turned on. If spark jumps the ¼" gap, the coil can be considered satisfactory.

Test the capacity of the condenser with a reliable condenser tester. Refer to specifications for condenser capacity in microfarads.

Ignition Timing

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give correct ignition timing.

The ignition timing test will indicate the timing of the spark at No. 1 cylinder at idle (only). Test procedures are as follows:

(1) Disconnect the vacuum hose at distributor.

(2) Connect the secondary lead of Power Timing Light to No. 1 spark plug, red primary lead to positive terminal of battery and black primary lead to the negative battery terminal.

> NOTE: Do not puncture the wires, boots or nipples with test probe — always use adapters. Breaking of the rubber insulation may permit secondary voltage to arc to ground.

(3) Start the engine and set the idle to specified R.P.M., engine at normal operating temperature (transmission in neutral where specified).

(4) Using a timing light, observe the position of timing mark on the crankshaft damper, and check against specifications.

(5) Loosen the distributor hold down lock plate screw and rotate the distributor housing so that the specified timing mark on damper aligns with the specified "B.T.C." mark on timing plate.

(6) Tighten the distributor hold down lock plate screw after the timing has been set and re-check timing adjustment with the timing light.

(7) When the spark timing is correct re-connect the vacuum hose to the distributor.

> NOTE: As the engine speed is increased, the timing mark should move forward on vibration damper before the pointer, if advance units are functioning.

(8) At low altitudes the engine will give its best performance if timed according to specifications. When using lower grade fuels or after carbon has accumulated, objectionable pinging may occur with the specified timing. In cases of this nature, ignition timing should be retarded but not to exceed 5° of crankshaft rotation later than specified.

Ignition System Specifications

(6 CYLINDER)	215, 245 & 265	E37 & E38 opt.
Spark Plug Type	N11Y, *N9Y	UN12Y, *N9Y
Gap	.035″	.035″
Breaker Point Gap	.012″ to .016″	.012″ to .016″
Dwell Angle	36° to 40°	36° to 40°
Breaker Arm Spring Tension	17½ oz. to 21 oz.	21.2 oz. to 22.9 oz.
Distributor Rotation	C/wise	C/wise
Timing (Manual Transmission)	5° BTC	5° BTC
Timing (Auto. Transmission)	5° BTC	—
Condenser Capacity	.175 MFD ± 15%	.175 MFD ± 15%

* Continous Fast Driving.

Distributor Advance Specifications

(See Group 8)

Ignition System Specifications

(8 CYLINDER)	318	340	360
Spark Plug Type	N14Y	N9Y	N11Y
Gap	.035″	.035″	.034″
Breaker Point Gap	.014″-.019″	.014″-.019″	.014″-.019″
Dwell Angle	26°-28°	26°-28°	26°-28°
Breaker Arm Spring Tension	18-24 oz.	18-24 oz.	18-24 oz.
Distributor Rotation	C/wise	C/wise	C/wise
Timing	10° BTC	2½° BTC	7½° BTC
Condenser Capacity	.18-.25 MFD	.18-.25 MFD	.18-.25 MFD

5. BATTERY

Electrolyte Test

The specific gravity of the battery electrolyte indicates the state of charge of the battery. Do not take hydrometer readings immediately after refilling the battery with distilled water. Always use the temperature correction as indicated on the thermometer scale. Draw electrolyte into the hydrometer several times to obtain accurate readings. A fully charged battery has a temperature corrected gravity reading of 1.255 to 1.275. A reading of 1.220 or lower indicates that the battery should be recharged. A difference of .015 between any two cells in a battery needing a recharge indicates that the battery should be cycled at least once in order to decrease this difference.

Voltage Test

Freshly charged batteries have a "surface charge" which causes high and inaccurate readings unless properly dissipated.

If battery is in vehicle, turn headlights on for one to three minutes to remove surface charge. Then turn lights off and wait several minutes before taking another reading.

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

The individual cell reading should not vary more than 0.15 volt between any two cells. A battery varying more than this should be recharged and a high rate discharge tester used to check battery before discarding battery as unsuitable for further use.

High Rate Discharge Test

Satisfactory capacity tests can be made only when battery equals or exceeds 1.220 specific gravity at 80°F. If reading is below 1.220, the battery should be slow charged in order to secure correct test results.

(1) Turn control knob of battery starter tester to the "Off" position.

(2) Turn voltmeter selector switch to the 16 volt position.

(3) Connect test ammeter and voltmeter positive leads to battery negative terminal and ammeter and voltmeter negative leads to battery positive terminal *(Fig. 3)*.

> NOTE: The voltmeter clips must contact the battery posts or cable clamps and not the ammeter clips.

(4) Turn control knob clockwise until ammeter reading is equal to three times the amp-hour rating of the battery.

(5) Maintain load for 15 seconds. Voltmeter should read 9.5 volts or more, which will indicate battery has good output capacity.

(6) Turn control knob to "Off" position.

6. STARTER AND CABLES

Current Resistance and Current Draw Test

Test the battery. If it tests 1.210 specific gravity or less, engine at normal operating temperature, charge the battery. Test the circuit resistance and the starter current draw as follows:

(1) Disconnect the positive battery lead from the battery terminal post.

(2) Connect an 0 to 300 scale ammeter between the disconnected lead and the battery terminal post.

(3) Connect a test voltmeter with .10 volt scale divisions between the battery positive post and the starter switch terminal at the starter.

(4) Crank the engine and observe the readings of the voltmeter and the ammeter. The voltage should not exceed .12 volt per 100 amperes of current. The current should not exceed specifications. A reading of voltage that exceeds .12 volt per 100 amperes indicates there is high resistance caused by loose circuit connections, defective cables, burned starter relay or solenoid switch contacts. A current that is high and is combined with

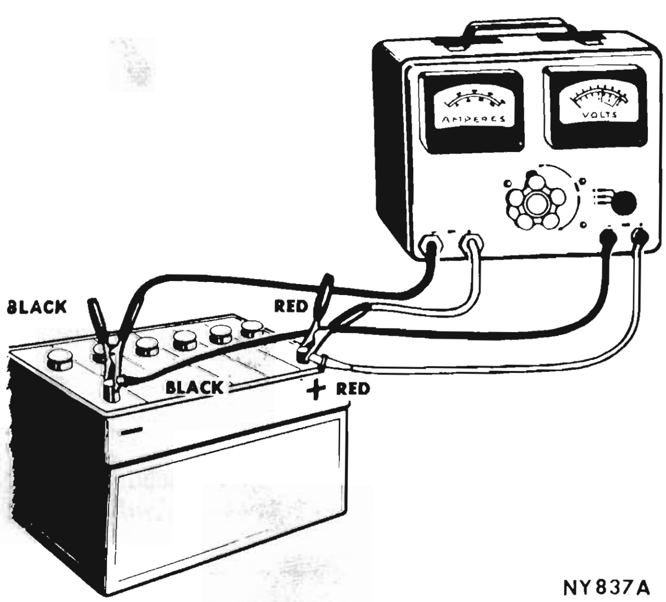


Fig. 3 – High rate discharge test

slow cranking speed, indicates that the starter should be removed and repaired *(refer Group 8 – "Electrical"* for details of starter repair).

7. COOLING SYSTEM AND BELTS

(1) Check level of coolant, inspect the entire system for leaks. Inspect the condition of the hoses and replace soft or cracked hoses.

(2) Inspect belts and adjust tension if required *(refer Group 7 – Cooling).*

8. MANIFOLD AND HEAT CONTROL VALVE

Inspect for evidence of leaking intake manifold gaskets. With the engine idling, squirt kerosene or light engine oil around the gasket areas. A leak will generally be indicated by a change in engine R.P.M. and/or excessive smoke from the exhaust. Tighten manifold bolts or replace gaskets as necessary.

Inspect heat control valve for free operation by working the shaft back and forth until the shaft moves freely. Open control valve by moving the shaft weight approximately ½", the weight should return freely to its normal position.

> NOTE: Both 6 and 8 cyl. models have exhaust vent holes, which should be clear, to relieve pressure at the heat control shaft bushings *(refer Exhaust Group 11 diagrams).* These holes are not for lubrication.

9. FUEL SYSTEM

Carburettor Air Cleaner

(1) Remove the air cleaner assembly from the carburettor and remove cover and filter element.

(2) Clean the housing and cover with compressed air.

(3) Using low pressure compressed air, gently clean paper element by holding air nozzle at least two inches from the inside screen *(Fig. 4).*

Examine the paper element for punctures. Discard an element that has even a pin-point puncture. Replace soft plastic sealer if sealing surfaces are not smooth and uniform.

Oil Filler Pipe Air Cleaner

(1) Clean the air cleaner in kerosene and re-oil with S.A.E. 30 engine oil.

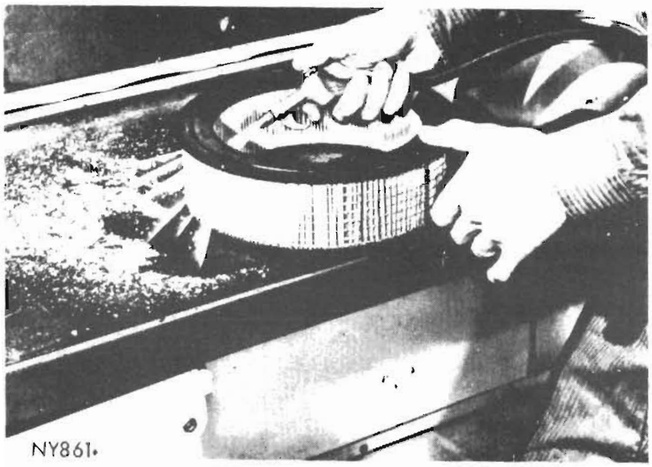


Fig. 4 – Cleaning air filter

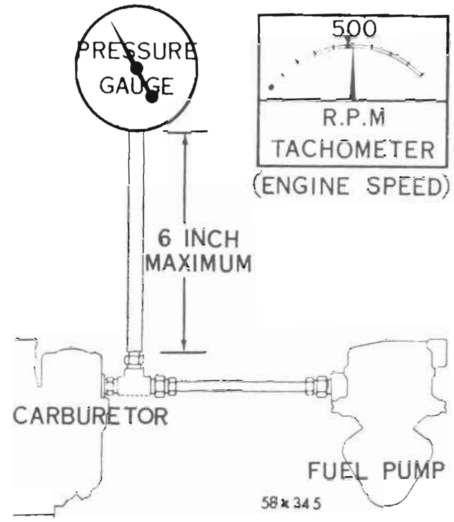


Fig. 5 – Pressure testing fuel pump

Throttle Linkage

(1) Before setting the throttle linkage, make sure no binding exists in any part of the linkage. Make sure the choke is fully open and the fast idle cam is released.

(2) Adjust the linkage *(refer Group 14 – Fuel System).*

Automatic Choke Unit

To function correctly, it is important that all parts be clean and move freely.

(1) Move the choke valve open and closed, to check for free movement, and possible interference between the choke arm and bottom of air cleaner.

(2) If choke plate is difficult to operate, free-up the choke shaft and/or linkage with a suitable solvent.

Apply the solvent through the opening in the carburettor air horn. Operate the choke plate back and forth until gum formation is flushed out and the choke plate moves freely.

Fuel Pump

If the fuel pump fails to supply fuel properly to the carburettor, the following test should be made before removing it from the vehicle:

If leakage is not apparent, test pump pressure as follows:

(1) Insert a "T" fitting in the fuel line at the carburettor, as shown in *Fig. 5.*

(2) Connect a 6″ piece of hose between the "T" fitting and gauge (E14C 35). (The hose should not exceed 6 inches. A longer hose may collect fuel and the additional weight of the fuel would result in an inaccurate reading.)

(3) Connect a tachometer, then start the engine and run at 500 R.P.M. The reading should be from 4 to 5½ P.S.I. (6 CYLINDER) or 6-7½ P.S.I. (8 CYLINDER) and remain constant or return to zero very slowly when the engine is stopped. An instant drop to zero indicates a leaky outlet valve.

If the pressure is too low a weak diaphragm main spring or incorrect assembly of the diaphragm may be the cause. If the pressure is too high, the main spring is too strong.

Carburettor

(1) Warm up engine to normal operating temperature, then using a tachometer, set the engine idle speed with idle speed adjusting screw, with air conditioner turned off (where equipped).

(2) Adjust the idle mixture screw until the engine operates smoothly, then re-set idle speed if necessary.

(3) Adjust the fast idle speed to specifications. Refer to procedure set out in *"Fuel System", Group 14.*

> It is important that the fast idle speed is correctly adjusted *for cold weather operation.*

(4) Check the bowl vent adjustment as set out in *Group 14 – "Fuel System".*

PART 2 — CRANKCASE VENTILATION SYSTEM

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

Crankcase ventilation is effected by means of air drawn into the crankcase through the oil filler cap, 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 *(Fig. 1)*.

The system consists of a ventilation valve installed in the outlet vent cap on the cylinder head cover, and a tube (capable of withstanding 20 inches of vacuum).

The tube is connected between the outlet vent cap and the lower part of the carburettor throttle body. The function of the valve is to regulate the flow of crankcase ventilation at various throttle positions.

The system will operate effectively as long as normal maintenance is applied. The valve and tube are subject to fouling with sludge and carbon formation due to the nature of the material carried by the ventilating system.

2. SERVICING

The crankcase ventilator valve is sealed and cannot be disassembled for cleaning. Service procedures for this sealed type valve are as follows:

8,000 Miles (Or at every Engine Oil Filter Change)

With the engine running at idle, remove the ventilator valve assembly from the 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. Replace the ventilator valve assembly and remove the oil filler breather cap. With the engine still running at idle, loosely hold a piece of stiff paper or cardboard over the oil filler pipe. It should be sucked against the oil filler pipe with a noticeable force after approximately one minute when crankcase pressure has been reduced. If this occurs, a final test should be made to be certain the valve shuttle is free. A clicking noise should be heard when the valve is shaken (engine not running). If the noise is heard, the unit is satisfactory and no further service is necessary.

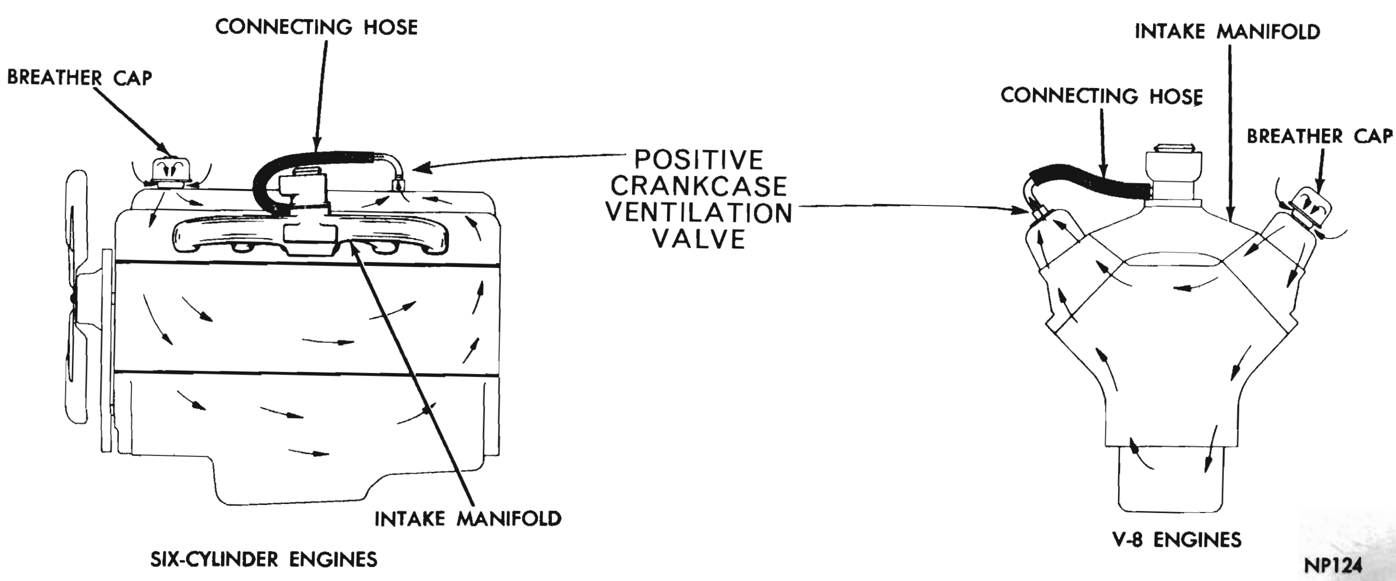


Fig. 1 – Crankcase Ventilation system (typical view)

To Clean:

If valve is plugged with sludge, detach valve and cap assembly from the ventilator hose and soak valve assembly in lacquer thinners then blow out with compressed air.

> NOTE: The only solvent recommended for this cleaning operation is lacquer thinners.

If the valve has been correctly cleaned, the shuttle valve will click when the unit is shaken, and the outlet passage should be clean. If the valve is badly plugged and cannot be cleaned by this procedure, it will be necessary to replace the valve assembly.

Whilst the ventilator valve and cap assembly is removed for cleaning, place a finger over the open end of the ventilator hose and have the engine started. If the ventilator hose and carburettor passages are open and operating normally, a strong suction will be felt and there will be a large change in engine idle quality when the end of the hose is uncovered. If these conditions are not observed, the carburettor passages and/or ventilator hose are plugged and must be cleaned by dipping the lower part of the carburettor in solvent. A pipe cleaner or wire can be used to aid in cleaning the passages. It is not necessary to disassemble carburettor for this cleaning operation.

Every 16,000 miles (Replace valve)

Remove the valve and cap assembly from the rocker cover and install a new ventilator valve. Check the operation of the system as outlined previously.

Clean ventilator hose if necessary.

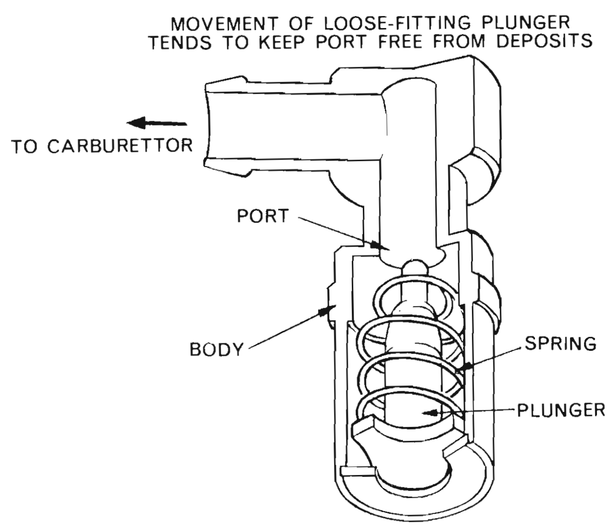


Fig. 2 – "Reeves" crankcase ventilator valve (cut-away typical view)

PART 3A — ENGINE ASSEMBLY

6 CYLINDER

SPECIFICATIONS

Specifications are common unless otherwise shown.

When ordering parts for E37 and E38 optional engines, it is essential to quote all of the numbers on the vehicle compliance plate. Some of these items may have the appearance of normal engine parts, but they differ greatly in material type.

ENGINE

ENGINE	215	245	265
Type		In line O.H.V. Upright	
No. of Cylinders		SIX	
Bore x Stroke	3.520″ x 3.680″	3.760″ x 3.680″	3.910″ x 3.680″
Piston Displacement	215 cu. ins.	245 cu. ins.	265 cu. ins.
Compression Ratio (nominal)	8.0:1	9.5:1	9.5:1
Optional E37 Engine			9.7:1
Optional E38 Engine			10.0:1
Compression Pressure (nominal)	120-155 p.s.i.	160-205 p.s.i.	160-205 p.s.i.
Optional E37 Engine			160-205 p.s.i.
Optional E38 Engine			160-205 p.s.i.
Max. variation between Cylinders		20 p.s.i.	
Firing Order		1, 5, 3, 6, 2, 4	

CRANKSHAFT AND MAIN BEARINGS

Type	Fully counter-balanced
Material	Nodular Cast-Iron
Optional E37 Engine	"Selected Hardness"
Optional E38 Engine	"Shot Peined"
No. of Main Bearings	Seven
Main Bearing Material	Steel backed babbit-lead base No. 6 bearing tin base
Optional E37 and E38 Engines	Steel backed babbit-lead/high tin
Main bearing journal diam.	2.5000″ Nominal (2.4995″ to 2.5005″)
Main bearing journal length	1.000″ to 1.010″ (No. 6 1.0515″ to 1.0545″)
Con-rod journal diameter	2.000″ Nominal (1.999″ to 2.000″)
Con-rod journal length	.978″ to .982″
Max. ovality permissible	.0010″
Max. taper permissible	.0005″
Clearance desired	.0005″ to .0015″
Max. clearance allowed	.0025″
Crankshaft end-float	.0035″ to .0095″
Thrust taken by	No. 6 main bearing
Finish at rear seal surface	Diagonal Knurling
Main bearings for service	STD, .001″, .002″, .003″ .010″, .012″, .020″, .030″

CONNECTING RODS AND BEARINGS

	215	245	265
Type		Drop forged "I" beam	
Optional E38 Engine		"Shot peined" coloured white	
Length centre to centre		5.750"	
Weight less bearing shells			
(Large end)		510 ± 2 gms (E37 & E38 535 gms)	
(Small end)		195 ± 2 gms (E37 & E38 242 gms)	
Con-rod bearing material		Steel backed babbit-copper/tin/lead	
Opt. E37 and E38 Engines		Steel backed tin/lead/sintered-copper	
Bearing diameter x width		2.001" x .980"	
Clearance desired		.0004" to .0024"	
Opt. E37 and E38 Engines			.0005" to .0014"
Max. out of round or taper		.0010"	
Max. clearance allowed		.0025"	
Side clearance		.0070" to .0130"	
Rod bearing bore diameter		2.1252" to 2.1257"	
Rod bearing "crush"		.0020" to .0060"	
Rod small end bore diameter		.9206" to .9211"	
Opt. E37 and E38 Engines (fully floating gudgeons)			.9221" to .9224"
Bearings for service		STD, .001", .002", .003", ~~.010"~~, .012", .020" & .030"	

CAMSHAFT

	215	245	265
Type		Hardened chrome alloy cast iron	
Drive		Silent chain with double sided guide	
Sprocket material		Cast iron alloy	
Optional E38 Engine		Machined Steel	
Thrust taken by		Cylinder block	
Number of bearings		Four	
Nominal tappet lift	.233"	.233"	.245"
Camshaft bearing material		Steel-backed babbit	
Bearing clearance		.0010" to 0.0030"	
Max. clearance allowable		.0050"	
Camshaft journal sizes:			
Diameter No. 1		1.998" to 1.999"	
2		1.982" to 1.983"	
3		1.967" to 1.968"	
4		1.951" to 1.952"	
Camshaft bearing sizes:			
Diameter No. 1		2.000" to 1.999"	
2		1.984" to 1.985"	
3		1.969" to 1.970"	
4		1.953" to 1.954"	
Timing Chain			
Number of links		44	
Pitch		.50"	
Width		.88"	

TAPPETS

	215	245	265
Type		Hydraulic with metering valve	
Clearance in block		.0010" to .0018"	
Body diameter		.9040" to .9045"	
Clearance between valve stem and rocker tip (tappet bled down)		.057" to .229"	
Tappet stroke		.167" min.	
Rocker Ratio (all Hemi 6)		1·7	

PISTONS

	215	245	265
Type		Horizontal slot with strut (autothermic)	
Piston crown design	"Bowl"	"Flat"	"Flat"
Optional E37 Engine			.014" to .020" Crown
Optional E38 Engine			.034" to .040" Crown
Diametral land clearance		.0210" to .0280"	
Opt. E37 and E38 Engines			.0215" to .0285"
Clearance at top of skirt		.0005" to .0015"	
Optional E38 Engine			.0010" to .0020"
Weight (std. to .040" oversize)	490 ± 2 gms	547 ± 2 gms	562 ± 2 gms
Optional E37 Engine			625 ± 2 gms
Optional E38 Engine			633 ± 2 gms
Piston length (overall)		3.409" to 3.414"	
Pin-hole diameter		.92250" to .92225"	
Ring groove depth No. 1		.194" to .202"	
No. 2		.194" to .202"	
No. 3		.188" to .196"	
Pistons for service		STD., .005", .020" and .040" O/S.	

PISTON PINS

Type		Press fit in rod	
Opt. E37 and E38 Engines			Fully floating
Diameter		.9219" nominal (.9218" to .9220")	
Length		2.980"	
Clearance in piston		.00045" to .00075"	
Interference in rod		.0009" to .0012"	
Pins for service		Standard only	
Direction offset in piston		Towards right side of engine .060"	

PISTON RINGS

Number of rings per piston (Two upper rings for compression, lower ring for oil control)		Three	
Oil ring type		3 piece steel rail, chrome faced with stainless steel expander.	
Ring width:			
Compression		.1775" to .1875"	
Oil-steel rails		.1500" to .1560"	
Ring gap:			
Compression		.010" to .020"	
Oil-steel rails		.015" to .055"	
Service rings:			
Ring gap:			
Compression		.010" to .040"	
Oil-steel rails		.015" to .060"	
Ring side clearance:			
Compression		.0015" to .0040"	
Oil-steel rails		.0000" to .0050"	

VALVES:

INTAKE:			
Material		XK1340 Carbon Manganese Steel	
Head diameter	1.835" to 1.845"	1.835" to 1.845"	1.960"
Overall length		4.964" to 4.999"	
Std. stem diameter		.3720" to .3730"	

	215	245	265
Stem to guide clearance		.0010″ to .0030″	
Max. allowable clearance using "wobble method"		.017″	
Valve face angle		45° to 45.5°	
Adjustment		None (Hydraulic)	
Valve lift	.400″	.400″	.420″
EXHAUST:			
Material		21-2N Nitrogen treated Manganese Chromium Nickel Steel with hardened steel tip welded to stem	
Head diameter	1.500″	1.500″	1.600″
Overall length		4.985″ to 5.010″	
Std. stem diameter		.3710″ to 3720″	
Stem to guide clearance		.0010″ to .0030″	
Max. allowable clearance using "wobble method"		.017″	
Valve face angle		47° to 47.5°	
Adjustment		None (Hydraulic)	
Valve lift	.400″	.400″	.420″
Valves for service		STD., .005″ and .015″	

VALVE SPRINGS

Number	Twelve
Free length	1.92″
Opt. E37 and E38 Engines	2.08″
Load when compressed to 1.65″ (valve closed)	110 to 120 lbs.
Opt. E37 and E38 Engines	108 to 118 lbs.
Load when compressed to 1.23″ (valve open)	209 to 223 lbs.
Opt. E37 and E38 Engines	208 to 228 lbs.
Valve spring installed: Height	1-5/8″ to 1-11/16″

VALVE TIMING

				E38 Option
Intake opens BTC	12°	12°	15°	18°
Intake closes ABC	56°	56°	61°	75°
Duration	248°	248°	256°	272°
Exhaust open BBC	54°	54°	57°	62°
Exhaust closes ATC	10°	10°	15°	30°
Duration	244°	244°	252°	272°
Overlap	22°	22°	30°	48°

CYLINDER HEAD

Valve seat run-out (max.)	.002″
Intake valve seat angle	44.5° to 45°
Finished seat width	.080″
Exhaust valve seat angle	44.5° to 45°
Finished seat width	.050″
Max. allowable gasket face "bowing" before refacing	.012″
Max. metal removal tolerance when refacing	.020″

CYLINDER BLOCK

Bore size (std.)	3.520″	3.760″	3.910″
Max. ovality allowed		.005″	
Max. taper allowed		.010″	
Reconditioning limits		.001″	
Max. oversize cylinder bore		+ .040″	
Tappet bore diameter		.9050″ to .9058″	
Main bearing tunnel bore diam.		2.6925″ to 2.6933″	
Main bearing tunnel bore test bar diameter		2.6920″ to 2.6918″	
Optional E38 Engine		Stronger main bearing caps are used with longer bolts and a flat washer between the bolt and cap	

ENGINE LUBRICATION

Pump type	Rotary full pressure
Drive	Skew gear from camshaft
Operating pressure	40 to 70 p.s.i. @ 2,000 r.p.m.
Min. pressure drop for effective tappet function	15 p.s.i.
Pressure drop with clogged filter	7-9 p.s.i.
Oil filter type	Full flow — replaceable — incorporating a non-return valve.

SPECIAL TOOLS

E2C5A	*Puller — Steering Arm
E6C15A	Fixture — Spring Testing
E9C5	Stand — Universal Repair
E9C10A	Adaptor — Engine mounting
E9C10B	Adaptor — Engine mounting
E9C10C	Adaptor — Engine mounting
E9C15B	Plate — Engine lifting adaptor
E9C25	Fixture — Cylinder head repair
E9C28	Fixture — Cylinder head repair
E9C30B	*Sleeve — Valve guide wear checking
E9C33B	*Reamer — Valve Guide (+ .015″ O.S.)
E9C33C	*Reamer — Valve guide (+ .005″ O.S.)
E9C35C	*Gauge — Valve stem length (1.888″ to 1.928″)
E9C40A	Reamer Set — Valve Tappet bore (+ .008″ and .030″)
E9C40C	*Tester — Hydraulic Tappet operation
E9C40G	Bleeder Tool — Hydraulic tappet (Rocker arm attaching)
E9C40H	Remover — Hydraulic tappets
E9C45	Ridge Remover — Cylinder bore
E9C45D	Hone — Cylinder bore deglazing
E9C50B	*Remover/Installer Piston Pin
E9C50D	*Remover/Installer Piston and Rod
E9C50H	Pilot Only. (Used with E9C50B for 265 c.i. engine only)
E9C55D	*Remover — Vibration damper
E9C55E	*Installer — Vibration damper
E9C57	*Remover/Installer — Timing case cover Oil Seal
E9C57A	*Adaptor, Remover — Timing case cover Oil Seal
E9C57C	*Adaptor, Installer — Timing case cover Oil Seal
E9C60	*Remover — Crankshaft gear
E9C60A	*Installer — Crankshaft gear
E9C60C	*Rear Main Seal Installer
E9C70A	*Adaptor Collets, Remover — Oil Pump drive gear
E9C70B	*Screw adaptor, Remover — Oil Pump drive gear
E9C70C	*Installer — Oil Pump drive gear
E9C70D	*Remover — Oil Pump drive gear (complete)
E9C75A	Installer — Welch plug
E9C80	Lever — Flywheel turning attachment
E0092	*Compressor — Valve spring
E188	*Expander — Piston Ring, Remover/Installer
E193	*Compressor — Piston Ring
E1150	Tester — Hydraulic tappet, leakdown
E1151	Test Fluid (for E1150)
E1174	Rack — Tappet and push rod

UNIVERSAL TOOLS

Dial Indicator Set
Test Indicator — Cylinder bore
Cleaner — Valve guide
Remover/Installer — Camshaft bearing
Test Light
Timing Light

* Essential Tools.

TORQUE SPECIFICATIONS

	TORQUE	THREAD SIZE
*Connecting rod nut (oiled)	45 lbs. ft.	3/8″–24 T.P.I.
Cylinder head bolt	65	7/16″–14 T.P.I.
*Main bearing cap bolt (oiled)	55–60	7/16″–14 T.P.I.
Spark plug	30	14 mm.
Camshaft lock screws	30	3/8″–14 T.P.I.
Carburettor to manifold bolt (2)	20 lbs. ft.	3/8″–16 T.P.I.
Carburettor to manifold bolt (4)	200 lbs. in.	3/8″–16 T.P.I.
Chain case bolt	96 lbs. in.	1/4″–20 U.N.C.
Torque converter housing bolt	30	3/8″–16 T.P.I.
Converter brace to aluminium housing	40	7/16″–14 T.P.I.
Converter brace to engine block	30	3/8″–16 T.P.I.
Converter brace to engine block (dual line)	50	7/16″–14 T.P.I.
Clutch housing bolt	30	3/8″–16 T.P.I.
Cylinder head cover screw	40 lbs. in.	1/4″–20 T.P.I.
Distributor clamp bolt	200	5/16″–18 T.P.I.
Engine crankshaft pulley attachment screws	30 lbs. ft.	3/8″–16 T.P.I.
Engine front mounting to frame nut	75	1/2″–20 T.P.I.
Engine front mounting to block screw	50	7/16″–14 T.P.I.
Engine front mounting to bracket nut	35	7/16″–20 T.P.I.
Engine rear mount bolts	35	7/16″–14 T.P.I.
Engine A.C. compressor and pump brackets	30	3/8″–24 T.P.I.
Exhaust manifold nut	10	5/16″–24 T.P.I.
Exhaust pipe connection nut	30	7/16″–20 T.P.I.
Exhaust pipe clamp bolt	20	3/8″–24 T.P.I.
Exhaust pipe support clamp bolt	20	3/8″–24 T.P.I.
Fan attaching bolt	200 lbs. in.	5/16″–18 T.P.I.
Flywheel/flexplate to crankshaft bolt	55 lbs. ft.	7/16″–20 T.P.I.
Flywheel housing to cylinder block bolt	50	7/16″–14 T.P.I.
Flywheel housing cover bolt	7	1/4″–20 T.P.I.
Fuel Pump attaching bolt	30	3/8″–16 T.P.I.
Alternator bracket bolt	30	3/8″–16 T.P.I.
Alternator mounting nut	20 lbs. ft.	5/16″–18 T.P.I.
Alternator adjusting strap bolt	15	5/16″–18 T.P.I.
Alternator adjusting strap mounting bolt	30	3/8″–16 T.P.I.
Intake to exhaust manifold bolt	25	3/8″–16 T.P.I.
Oil pan drain plug	20	1/2″–20 T.P.I.
Oil pan bolt	230 lbs. in.	5/16″–18 T.P.I.
Oil pan bolt	95	1/4″–20 T.P.I.
Oil pump cover screw	30	1/4″–20 T.P.I.
Oil pump attaching bolt	200	5/16″–19 T.P.I.
Oil strainer tube attaching screw	30	1/4″–20 U.N.C.
Oil pressure gauge sending unit	60	1/8″ N.P.T.F.
Rocker arm retaining screw	45 lbs. ft.	3/8″–16 T.P.I.
Starter mounting bolt	50	7/16″–14 T.P.I.
Temperature gauge sending unit	180 lbs. in.	1/4″ N.P.T.F.
Tappet chamber cover screws	50 lbs. in.	1/4″–20 T.P.I.
Water pump to housing bolt	30 lbs. ft.	3/8″–16 T.P.I.
Water pump to housing bolt	17 lbs. ft.	5/16″–18 T.P.I.
Manifold (Assy.) to cylinder head nuts	10	5/16″–18 T.P.I.

Torque figures quoted are for clean, dry threads in good condition.

* (Except where threads *must be* lubricated)

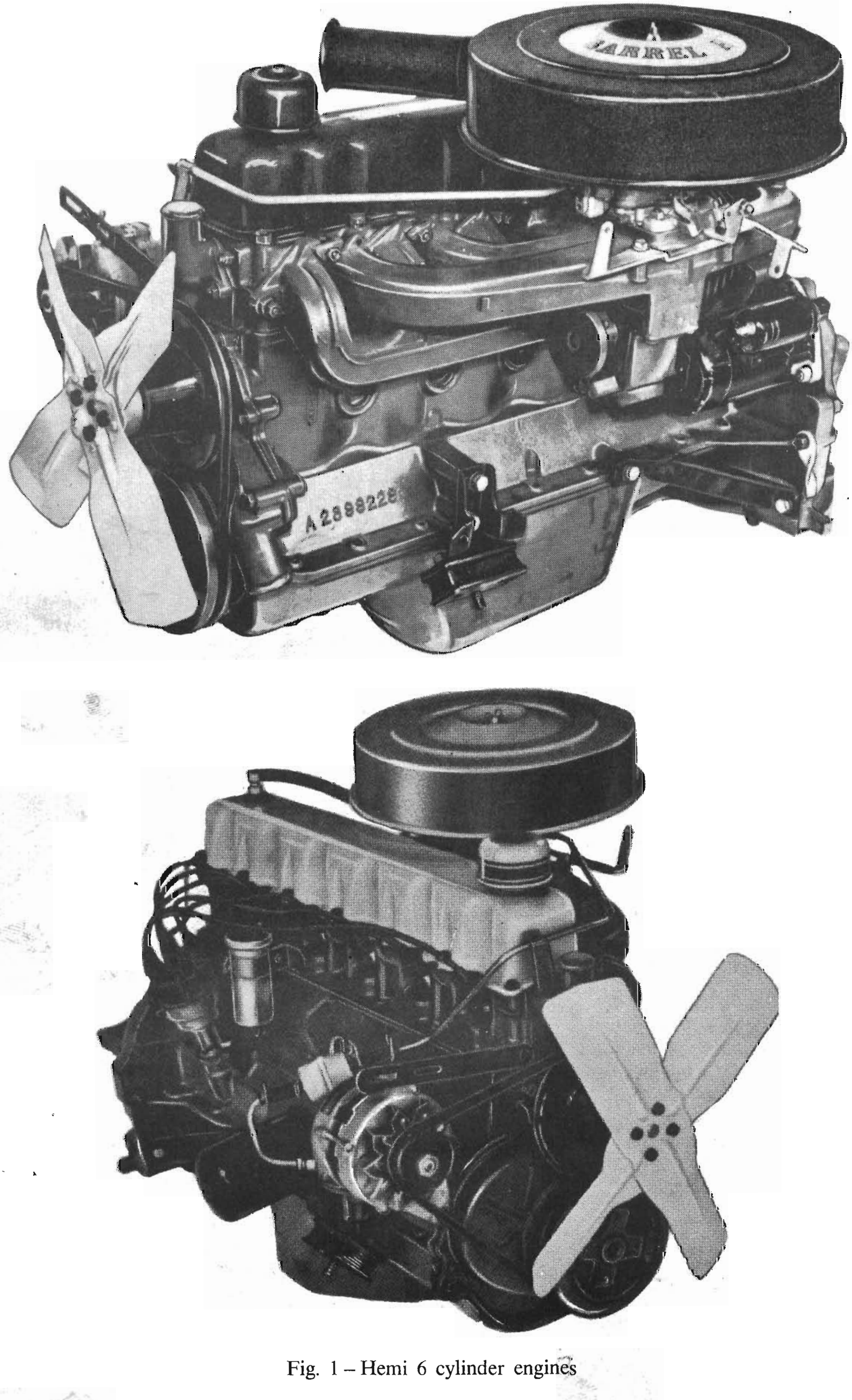


Fig. 1 – Hemi 6 cylinder engines

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

The six cylinder Valiant engine is a modern light-weight, push rod operated overhead valve type engine with a low hemispherical combustion chamber, the engine is mounted vertically on the support frame. Three different bore sizes give displacements of 215, 245 and 265 cubic inches.

The Nodular Iron crankshaft is carried on 7 main bearings and is driven by short length connecting rods which mount heavy duty big end bearings.

Intake and exhaust ports are of large cross section, supplied by the robust, free breathing, 'fan' branched, ram-tube intake manifold.

Lubrication is provided by large galleries supplied by an internally mounted rotor type oil pump.

The valve rocker arms and valve surfaces are lubricated by engine oil conveyed from the hydraulic tappet metering valves, through the hollow pushrods to the rocker arms where oil-splash ensures generous overall lubrication.

The replaceable type oil filter assembly is mounted directly to the right side engine block wall adaptor. (This filter assembly is equipped with a non-return valve to prevent drain-back).

Cooling is provided by generous coolant passages throughout, which includes an internal by-pass passage between the head and cylinder block. The water pump impellor seal is a rubber mounted ceramic insert mounted in a cast iron impellor. A protective coating is applied internally and externally to the aluminium bodies of the water pump housing and the thermostat housing.

CRANKSHAFT RECONDITIONING INFORMATION

> NOTE: Care must be taken to CORRECTLY finish the bearing surfaces as detailed below when regrinding and polishing the Nodular iron Journals, in order that undue wear does not occur to the bearing material.

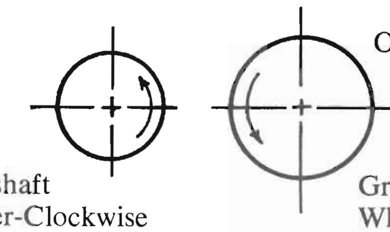
Finishing details

(a) The finishing grind operation of crankshaft journals should be in the opposite direction from normal rotation in the engine. *Refer Fig. A.*

(b) Using 320 grit paper (i.e. Norton Adalex 320 or equivalent) to final polish the journal surface.

Nodular Cast Iron Crankshaft Journal Finishing Directions

GRINDING OPERATION

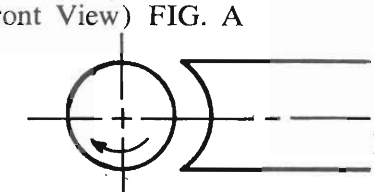


Crankshaft Counter-Clockwise Rotation

Grinding Wheel Counter-Clockwise Rotation

(Front View) FIG. A

POLISHING OPERATION



Paper Stationary

Crankshaft Clockwise Rotation

(Front View) FIG. B

Note that the final journal polish must be made with the crankshaft rotating in the normal operating rotation when assembled in the engine (i.e. Clockwise from front). THIS IS VERY IMPORTANT for engine bearing material wear-life.
Refer Figure B.

It is also important that the crankshaft when assembled in the engine, is NOT rotated backwards, (anti-clockwise from front of engine) as this may harm the bearing material.

CRANKSHAFT AND BORE SIZE IDENTIFICATION

A Maltese Cross stamped on the engine, numbering pad on right side of block forward of the distributor, indicates that the engine is equipped with a crankshaft which had one or more connecting rods and/or main bearing journals finished .001″ undersize. The position of the undersize journal or journals is stamped on the No. 1 counterweight of crankshaft.

Connecting rod journals will be identified by the letter 'R' and main bearing journals by the letter 'M'. For example 'M-1' indicated that No. 1 main bearing is .001″ undersize.

A Maltese Cross and X (Roman Ten) stamping indicates that the crankshaft journals are .010″ undersize.

Cylinder blocks having .020″ oversize bores are identified with the letter 'A' stamped on the engine number pad.

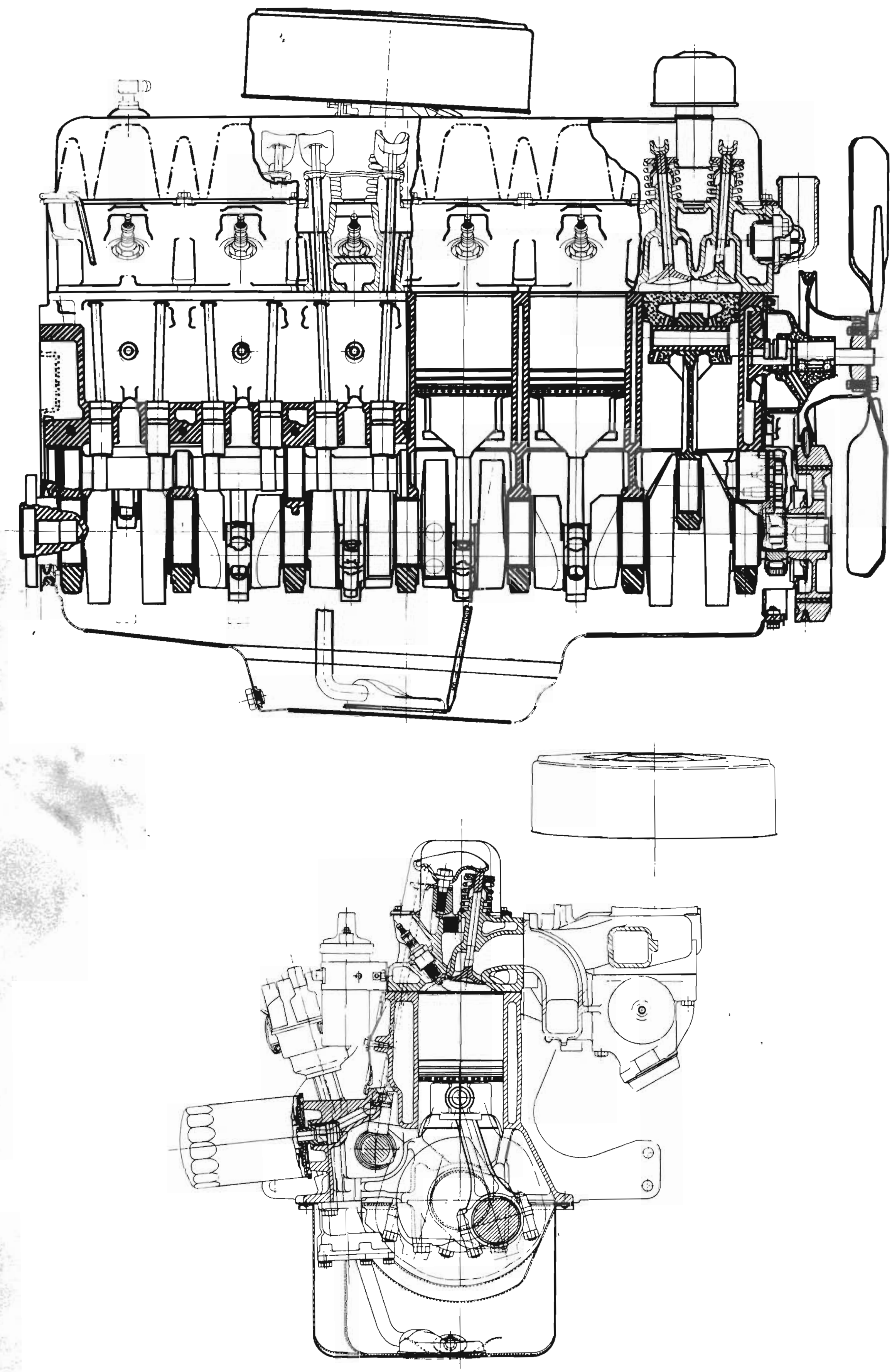


Fig. 2 – Hemi 6 cylinder engine

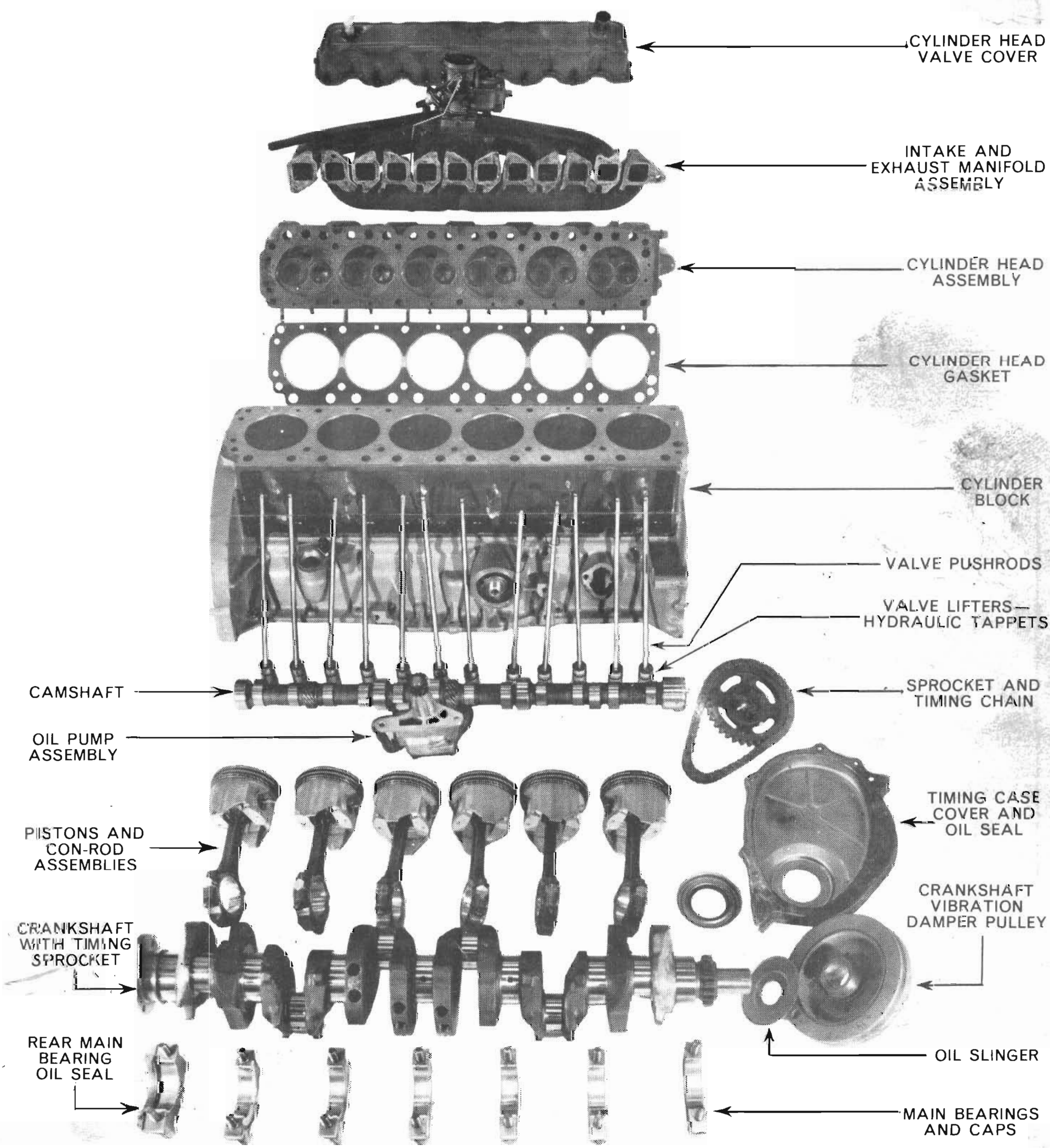


Fig. 2a – The Hemi 6 cylinder engine components
(disassembled view)

2. ENGINE REPLACEMENT

> NOTE: Vehicles equipped with air conditioning unit. Before attempting to remove the engine assembly the air conditioning system MUST be slowly discharged. Refer to Group 24.

To Remove

(1) Scribe the hood hinge outline on hood and remove hood.

(2) Drain the cooling system and remove battery. (Remove the fan blades on AC equipped models.)

(3) Remove the radiator and heater hoses and remove radiator.

(4) Disconnect the brake booster vacuum hose from the manifold (where equipped).

(5) Air conditioned models — Disconnect the AC tubes at body and condenser and plug openings. Remove the outlet vent valve from cylinder cover.

(6) Disconnect the fuel lines, carburettor controls and wiring from engine components.

(7) Disconnect the exhaust pipe(s) at the manifold, move exhaust pipe(s) and muffler assembly aside to provide clearance.

(8) Raise vehicle on hoist (where used).

(9) Drain the converter (where equipped with drain plug) and the automatic transmission. Remove oil cooler lines, filler tube and gear selection rod *(automatic transmission models).*

(10) Remove the clutch torque shaft *(manual transmission models).*

(11) Remove the speedometer cable and gear shift rods *(manual transmission models).*

(12) Remove the propellor shaft and carefully install plug in output shaft seal to prevent spillage.

(13) Install the engine support fixture (or equivalent) to support rear of engine.

(14) Remove the engine rear support crossmember *(See Fig. 4).*

(15) Remove the transmission bolts from clutch housing (manual transmission models) or remove housing bolts (automatic transmission models).

(16) Remove transmission.

(17` Lower the vehicle (where raised).

(18) Install the engine lifting fixture (Tool E9C15B) to the cylinder head and attach a hoist to the fixture front loop.

(19) Remove the engine rear support fixture.

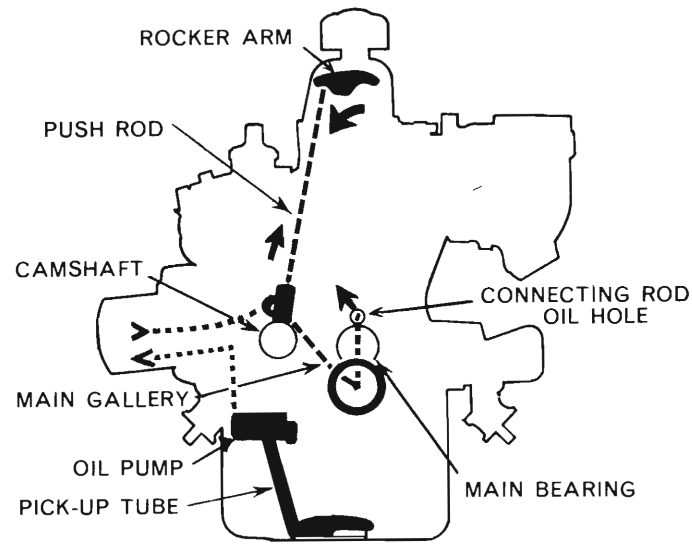


Fig. 3 – Engine oiling system

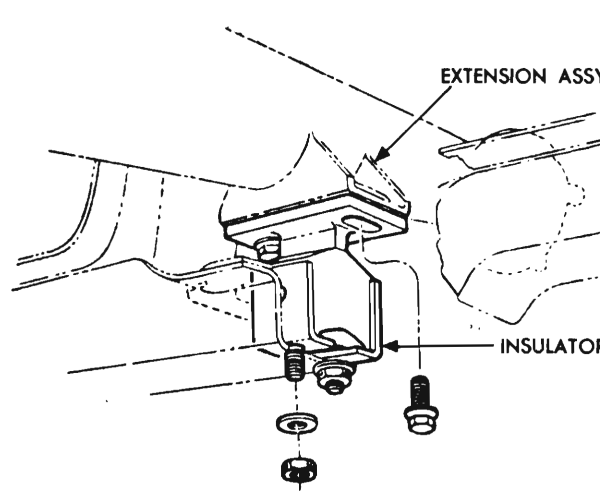


Fig. 4 – Rear engine support

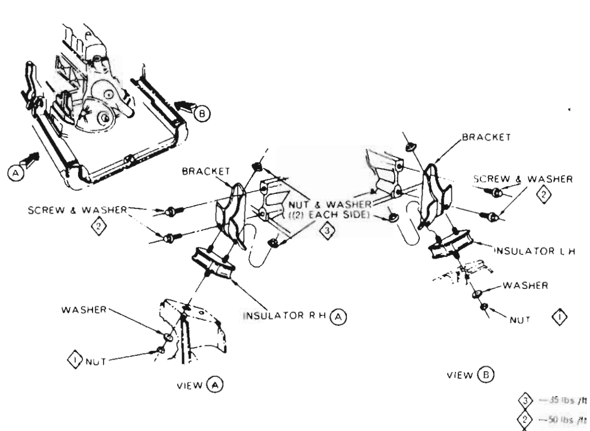


Fig. 5 – Front engine mountings

(20) Remove the front engine mount bolts *(Fig. 5)* and disconnect (and cap) the convenient AC tube connection. DO NOT BEND TUBES.

(21) Lift the engine from the engine compartment holding the AC compressor hoses carefully away from the body (where equipped) and install on engine repair stand.

To Install

(1) Install the engine lifting fixture Tool E9C15B, and attach a hoist to fixture loop.

(2) Lower the engine into the engine compartment, being careful to clear the AC compressor hoses (where equipped), until front of engine is positioned on front engine mounts.

(3) Install the front engine mount bolts.

DO NOT TIGHTEN

(4) Install engine support rear fixture.

(5) Remove the lifting hoist and engine lifting fixture (Tool E9C15B).

(6) Raise vehicle on hoist (where used).

(7) Position rear of engine and install the transmission.

(8) Install the engine rear support crossmember making sure that bush is in good condition.

(9) Install the propellor shaft into the transmission.

(10) Install the speedometer cable and gear shift rods.

(11) Install clutch torque shaft (manual transmission).

(12) Install oil cooler lines and transmission breather and filler tubes (automatic transmission).

(13) Lower vehicle and remove the lifting bracket. Remount the AC compressor to the brackets (where removed).

(14) Tighten front engine mount stud nuts to 75 lbs. ft.

(15) Connect the exhaust pipe(s) at manifold.

(16) Connect the fuel lines, carburettor linkage and wiring to engine components.

(17) Install the outlet vent valve in cylinder head cover grommet.

(18) Install radiator hoses, brake vacuum hose (where equipped) and carburettor air cleaner.

(19) Fill the cooling system, transmission and engine oil pan. (Refer to Group 1 Lubrication and Maintenance).

(20) Install the hood and re-check alignment with scribed hinge outline.

(21) Start engine, and allow to idle. (Do not 'raise' the engine speed until the tappets have quietened, to ensure proper functioning of tappets).

(22) Recharge the AC system where necessary and inspect all connections (where equipped).

3. CYLINDER HEAD

The chrome alloy cast iron cylinder head, as shown in Figure 6 is mounted on the cylinder block, by 14 bolts. The spark plugs are located toward the centre from the right side of the chamber.

To Remove

(1) Drain the cooling system.

(2) Remove the carburettor air cleaner and fuel line.

(3) Disconnect the accelerator cable connections (including transmission cable) (where equipped).

(4) Disconnect the vacuum control tubes at the carburettor and distributor, also the vent valve tube from the carburettor.

(5) Disconnect the spark plug wires by pulling connector *grommet* straight out in line with plug, then remove spark plugs.

(6) Disconnect the radiator hose and heater hoses.

(7) Disconnect the heat indicator sending unit wire and remove the alternator adjusting strap from cylinder head.

(8) Disconnect exhaust pipe(s) at exhaust manifold flanges and brake vacuum hose (where equipped).

(9) Remove the intake and exhaust manifold with carburettor (as an assembly) then remove the valve cover (with vent valve and tube) and the vacuum advance tube.

(10) Remove the individual rocker arms, pivot bolts and guide plates (and place them in order in Tool E1174 or a suitable tray).

(11) Remove the push rods carefully (to prevent lifting tappets from their bores) and place them in their respective slots in holder with rocker arms, bolts and plates, to retain the order of assembly.

(12) Remove 14 head bolts and remove cylinder head, taking care not to damage the AC tubes (where equipped).

> NOTE: Take care not to damage the gasket sealing surfaces if the head is prised free of the block.

(13) Place cylinder head in holding fixture Tool E9C25 or similar.

(14) Clean off completely and inspect for damaged surfaces and leaking coolant plugs etc.

To Install

(1) Clean all gasket surfaces of cylinder block and cylinder head.

(2) Check all surfaces with a straight edge (ensure flatness is within .012").

(3) Install gasket and cylinder head correctly on the dowels.

> NOTE: The head gasket used on 265 C.I.D. engines may be identified by a 3/8 inch "V" slot cut in the outside edge between No. 2 and 3 cylinder. It is imperative that the correct gasket is used.

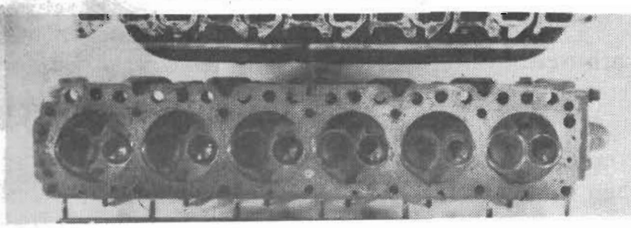


Fig. 6 – Cylinder head assembly

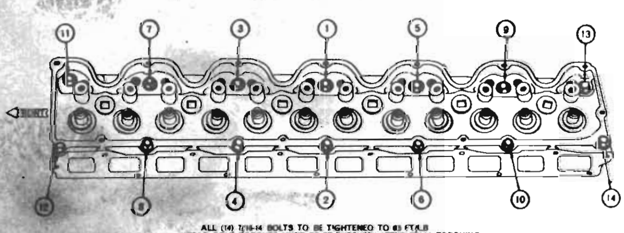


Fig. 7 – Cylinder head tightening sequence

(4) Lubricate the cleaned bolt threads and install cylinder head bolts; (short bolts nearest the push rods). Starting at the centre bolt, tighten all cylinder head bolts evenly to 50 lbs. ft. in sequence (*refer Fig. 7*). Repeat the procedure re-tightening all head bolts to 65 lbs. ft. (max.)

DO NOT OVERTIGHTEN THESE BOLTS as bolt damage may result.

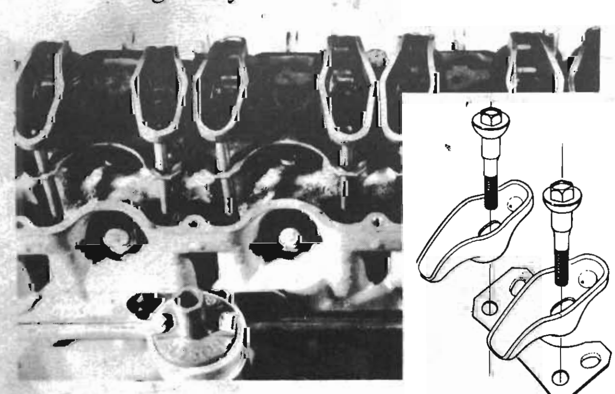


Fig. 8 – Valve rocker arms, pushrods and pushroc guide plates (insert shows dis-assembled view)

(5) Re-install the push rods in the tappet cups in the same order as they were removed. Examine the rocker arm and bolt pivot surfaces for scuffing or scores — replace both if the surfaces are less than 75% of circular contact.

(6) Lubricate the rocker arm contact surfaces, then re-install the pushrod guide plates, valve rocker arms and pivot bolts.

> NOTE: Do not use guide plates which show any indication of indentation by the ball pivot bolts. Replace both bolts and the guide plate.

(7) Install the spark plugs, torquing to 30 lbs. ft. then install the valve cover and gasket using Chrysler Parts Gasket Sealer on upper surface of gasket, tightening screws to 40 lbs. in. in order shown in *Fig. 9*.

(8) Loosen the 4 bolts holding the intake manifold to the exhaust manifold in order to maintain proper mounting face alignment.

> NOTE: Each bolt is secured with a lock plate tang.

(9) Install intake and exhaust manifold and carburettor assembly to cylinder head with the cup side of conical washer of front stud, against manifolds (triangular plates between the manifold separations).

Tighten nuts to 10 lbs. ft. evenly commencing from the centre.

(10) Tighten the four bolts holding the intake manifold to the exhaust manifold to 25 lbs. ft. (Tighten inner bolts first, then the outer two bolts) —Bend over the lock plate tangs to secure.

(11) Connect the radiator and heater hoses.

(12) Connect the heat indicator sending unit wire, the accelerator control cables (includes transmission cable, where equipped) and the spark plug wires.

(13) Install the brake vacuum tube to carburettor and distributor.

(14) Connect the exhaust pipe(s) to exhaust manifold flange(s).

(15) Install the fuel line and carburettor air cleaner, then reconnect the vent valve hose to the carburettor connection.

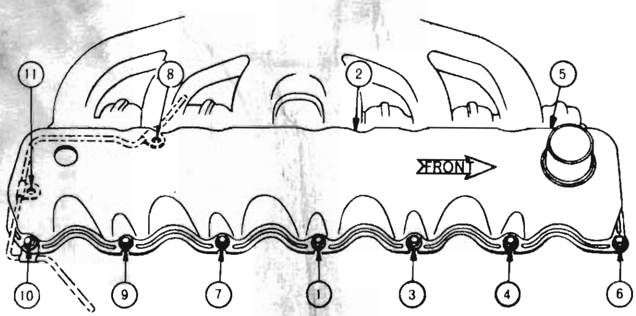


Fig. 9 – Valve cover tightening diagram

(16) Re-install the alternator bracket screw and adjust the drive belt.

(17) Refill the cooling system using "demineralized" (soft) water adding Chrysler Parts Corrosion Inhibitor.

(18) Operate the engine until normal operating temperature is reached. DO NOT speed up the engine until the valve tappets have quietened (self adjusted).

NOTE: The cylinder head bolts do not require additional re-torquing.

4. ROCKER ARMS AND PUSH ROD ASSEMBLIES

Stamped steel rocker arms are retained on individual integral 'ball-pivot' type mounting bolts. These are not adjustable and must be carefully hand tightened to 45 lbs. ft. upon assembly to ensure security and prevent push rod bending, particularly where a valve is lifted.

A hardened push rod guide plate is located under each pair of rocker pivot bolts, to ensure that the push rods and rocker arms are correctly located.

Rocker and valve lubrication is provided through the hydraulic tappet metering valve and up the hollow push rod to the rocker arm reservoir to be splashed about the rocker mechanism.

NOTE: Evidence of good valve rocker lubrication is the oil washed stripes on the valve cover inner surface.

(1) Remove the crankcase ventilator valve from the valve cover grommet.

(2) Remove the valve cover screws and carefully remove the cover from the head and away from the distributor vacuum tube.

(3) Remove the individual rocker arms, pivot bolts and push rod guide plates. Place them in Tool E1174 or similar (to retain the assembly location).

(4) Remove the push rods (carefully, to prevent lifting the tappet from its bore) and place in holder tool to maintain the assembly order.

(5) Inspect all rocker arms and pivot bolts for excessive wear, scores or insufficient contact surface which should be 75% of circular contact. Push rod guide plates should not show heavy push rod contact wear or pivot bolt indentation.

NOTE: Replace rejected rocker arms and pivot bolts as paired assemblies.

To Install

(1) Clean the push rods and ensure that the lubrication holes are clear.

(2) Re-install the push rods to their original locations.

(3) Lubricate the rocker arm pivot and contact surfaces and with the push rod guide plate install the rocker assembly to the cylinder head.

CAUTION: Take extreme care tightening rocker screws to prevent bending push rods. Tighten finger tight until resistance is encountered then rotate crankshaft until tappets are on back of cam before tightening remaining screws as described.

(4) Tighten rocker pivot bolts to 45 lbs. ft.

(5) Apply Chrysler Parts Gasket Sealer (red) to the new cylinder head valve cover gasket upper surface and place in position on head.

(6) Re-install the valve cover and the vacuum advance tube brackets. Tighten the screws evenly, in the order shown in *Fig. 9*, to 40 lbs. in. torque.

(7) Re-install the crankcase vent valve to the cover grommet.

(8) Start engine and check the valve operations.

DO NOT speed up the engine until the valve tappets have quietened (self adjusted).

5. TAPPET COVER SIDE PLATE

To Remove

(Refer Fig. 10).

(1) Remove the ignition coil to provide access.

(2) Remove the 6 retaining screws and lift off the side plate.

> CAUTION: As cover is removed oil will be released from the tappet chamber recesses.

To Install

(1) Ensure that the gasket surface of the cylinder block is clean.

> NOTE: That this surface is not machined.

(2) Coat both gasket surfaces with the red Chrysler Parts Gasket Sealer then install the composition gasket on the side cover.

(3) Position the side plate and gasket onto the block and install the 6 retaining screws.

(4) Tighten the screws evenly to 50 lbs. in. torque, commencing at the centre and progressing outwards *(refer to Fig. 10)*.

(5) Re-install the ignition coil.

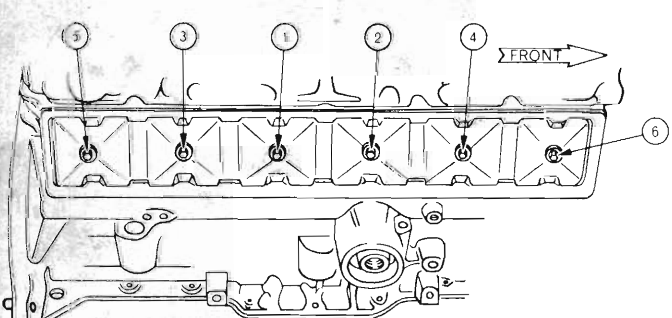


Fig. 10 – Tappet side plate tightening diagram

6. VALVES AND VALVE SPRINGS

Valves are arranged in line in the cylinder head and operate in guides that are integral with the cylinder head.

The valves are inclined together, providing a more efficient hemi-spherical combustion chamber shape.

The exhaust valve stem tips are hardened to ensure long valve stem tip life.

To Remove

(1) With cylinder head removed, compress valve spring (using a suitable valve spring compressor), *Fig. 11.*

(2) Remove the valve retaining locks, valve spring retainers, valve stem cup seals and valve springs.

(3) Remove any burrs from valve stem lock grooves to prevent damage to the valve guide when valves are removed. Identify valves to ensure installation in original location.

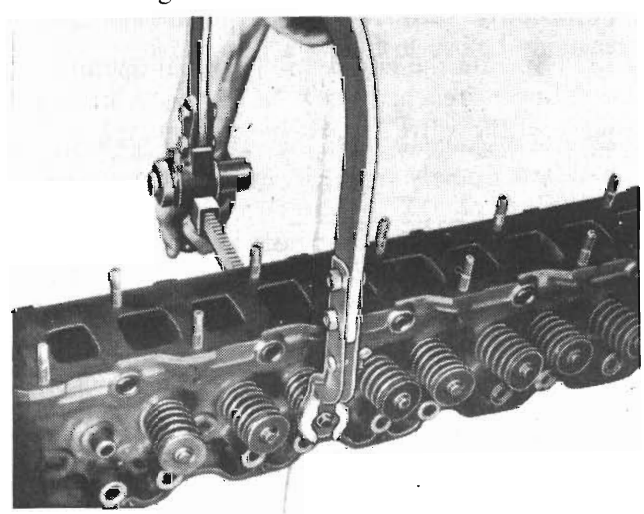


Fig. 11 – Compressing the valve spring

Valve Inspection

(1) Clean the valves thoroughly and discard burned, warped and cracked valves.

(2) Measure valve stems for wear. Intake valve stem diameter (new valve) should measure .372″ to .373″ and exhaust valve stem diameter (new valve) should measure .371″ to .372″. If the wear exceeds .002″ replace the valve. Also inspect the exhaust valve hardened tip for wear — ensure that only the correct valve is re-installed in this position.

(3) Remove carbon and varnish deposits from the inside of valve guides with valve guide cleaner.

(4) Measure the valve stem guide clearance as follows:

To check wear use a new valve and Tool E9C30B *(Fig. 12)*. This special sleeve places the valve at correct height for checking with dial indicator.

(5) Attach the dial indicator to the cylinder head and set it at right angles to the valve stem being measured *(Fig. 13)*.

(6) Move valve to and from indicator. The total dial indicator reading should not exceed .017″. Ream the guides and fit valves with over-size stems if dial indicator reading is excessive, or if the stems are scuffed or scored. Service valves are available in standard .005″ and .015″ oversize.

Reamers to accommodate the oversize valve stems are as follows:

Reamer Tool E9C33B (.005″ oversize).

Reamer Tool E9C33C (.015″ oversize).

(7) Slowly turn reamer by hand and clean thoroughly before installing a new valve.

Do not attempt to ream the valve guides from standard directly to .015″ oversize. Use step procedure of .005″, then .015″ in that order so that the valve guides may be reamed true in relation to the valve seat.

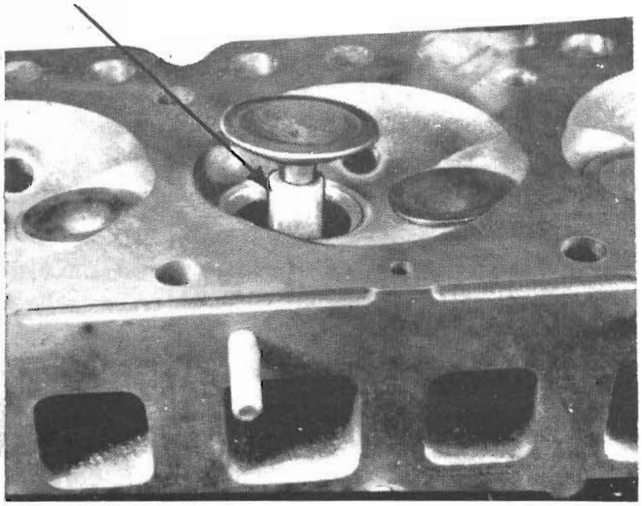


Fig. 12 – Installing valve guide wear checking sleeve E9C30B

7. REFACING VALVES AND VALVE SEATS

(1) All the valve faces and seat angles, have a nominal angle of 45°. It is preferred that the specified valve seating angle variation be ½° to 1° smaller than the seat angle to obtain greater seat contact at the outer edge of the inlet seat, to crush away deposits, while the exhaust valve seating variation seating angle desired is 2° to 3°. *Refer to Fig. 14*.

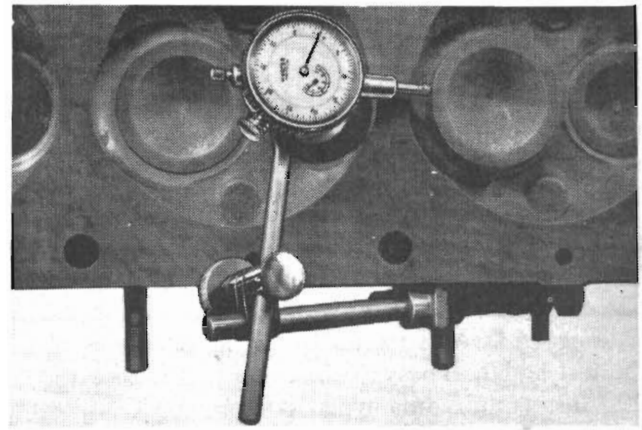
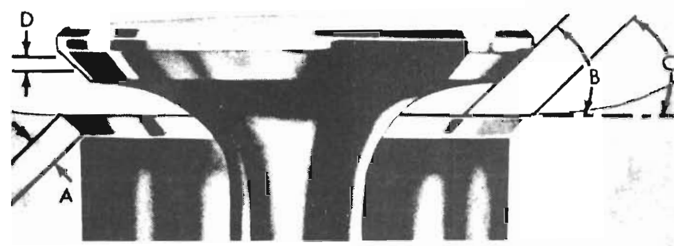


Fig. 13 – Measuring valve and guide wear



A. SEAT WIDTH INTAKE .080″
EXHAUST .050″
B. FACE ANGLE INTAKE 45°-45.5°
EXHAUST 47°-47.5°
C. SEAT ANGLE INTAKE 44.5°-45°
EXHAUST 44.5°-45°

Fig. 14 – Valve face and seat angles

(2) Inspect the remaining margin after the valves are re-faced *(Fig. 15)*. Valves with less than 3/64″ margin should be discarded.

(3) When refacing the valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(4) Measure the concentricity of the valve seat using a dial indicator. The total run-out should not exceed .002″ (total indicator reading). When the seat is properly positioned, the width of the intake seats should be .080″. The width of the exhaust seats should be .050″.

(5) Test valve contact on seat using a film of "prussian blue" on valve face, which is then oscillated 1/8″ (while lightly contacting the seat) to obtain a mark, which should be central on valve face.

8. TESTING VALVE SPRINGS

(1) Whenever the valves have been removed for inspection, reconditioning or replacement, the valve springs should be tested. To test a spring, first determine the length at which the spring is to be tested. As an example, the compressed length

of the spring to be tested is 1-15/64″. Turn the table of testing tool until surface is in line with the 1-15/64″ mark on the threaded stud and the zero mark to the front. (Fractional measurements are indicated on the table of finer adjustments).

Place spring over stud on table and lift the compression lever to set the tone device. Pull on torque wrench until 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. The valve springs should test above 200 lbs. (minimum) when compressed to 1.230″. Discard springs which do not meet this specification.

NOTE: New valve spring force is 209-223 lbs. @ 1.230″.

(2) Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends as shown in *Fig. 16*.

To Install

(1) Coat the valve stems with lubrication oil and insert them into cylinder head.

If the valves or seats are reground, test valve stem height with Tool E9C35C. If valve is too long, grind off the tip until length is within limits of 1.888″–1.928″ from the valves spring seat, *refer to Fig. 17*. Replace the valve should the hardening be removed from the exhaust valve stem.

(2) Install new cup seals on all valve stems and over valve guides *(Fig. 18)*. Install valve springs and retainers. Install springs so that closed coils are against cylinder head (where applicable).

(3) Compress the valve springs with a valve spring compressor, install locks and release tool.

NOTE: Inlet valves have only one groove and the exhaust valve stem tip is hardened (.030–.060″ depth).

If the valves and/or seats are re-ground measure the installed height of springs.

Make sure measurement is taken from the bottom of the spring seat in cylinder head to the bottom surface of spring retainer. (If spacers are installed, measure from the top of spacer). If height is greater than 1-11/16″ remove spring and install 1/16″ spacer in head counterbore to bring spring height back to normal 1-5/8″ to 1-11/16″.

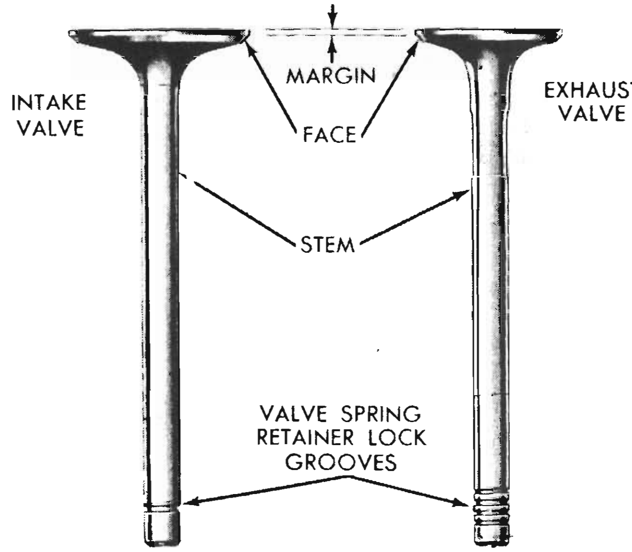


Fig. 15 – Intake and exhaust valves

9. HYDRAULIC TAPPETS

Preliminary to checking the Hydraulic Tappets, note that it is normal for the tappets to be noisy for approximately 1-2 minutes after starting the engine, while the air is being bled from the tappet system. Where tappets are installed "dry" (unprimed), the bleed time could be as long as 10 minutes.

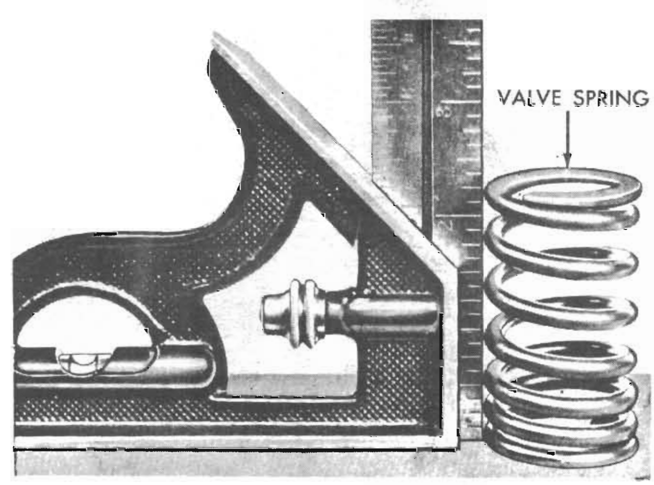


Fig. 16 – Checking valve spring squareness

Before disassembling any part of the engine to correct tappet noise, check the oil supply and check the oil level in the oil pan.

The pressure should be between 40-70 P.S.I. at 2,000 R.P.M.

Minimum pressure allowable is 15 P.S.I. @ 600 R.P.M. engine hot.

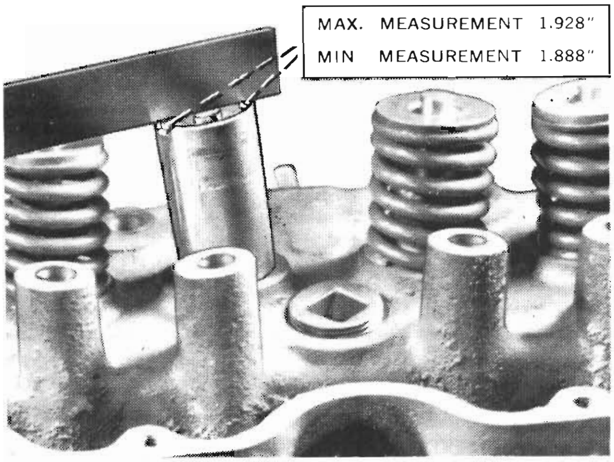


Fig. 17 – Measuring valve stem length using Tool No. E9C35C

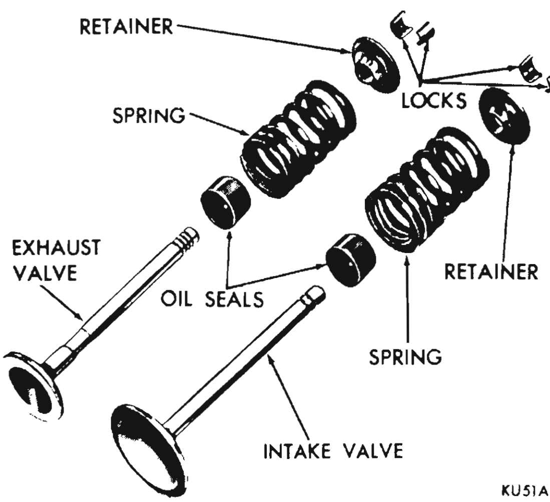


Fig. 18 – Valve assembly

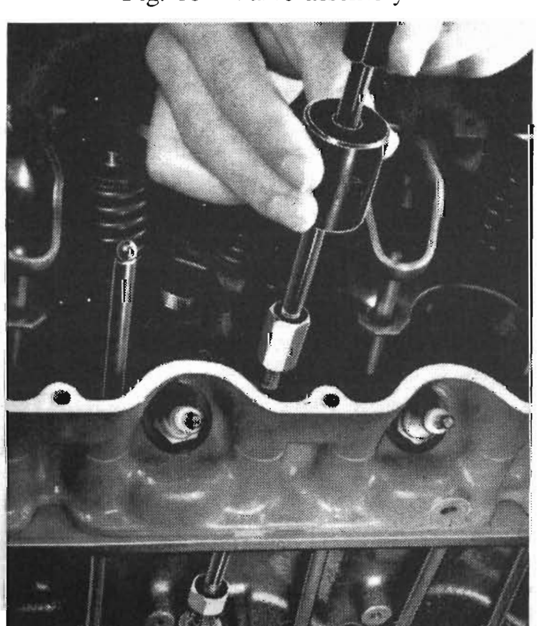


Fig. 19 – Removing hydraulic tappets using Tool No. E9C40H

> NOTE: The low oil pressure light may flicker at idle, but should not glow continually.

The oil level in the pan should never be above the 'full' mark on the dipstick, or below the 'add oil' mark. Either of these two conditions could be responsible for noisy tappets.

Oil Level Too High

If oil level is above the full mark on dipstick, it is possible for the connecting rods to dip into the oil while the engine is running and create foam. Foam in the oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow the valves to seat noisily.

Oil Level Too Low

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 the intake side of the oil 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 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 cover removed, observing the oil released from each pushrod. Note — Reduced oil release coincidental with a noisy tappet could indicate a restricted oil supply to tappet.

> CAUTION: Cover the rocker arms to prevent oil spraying from rockers.

(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.

> NOTE: Worn valves, 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 the 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 leak down 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 the valve closes. In either case, tappet assembly should be removed for inspection and cleaning.

Tappet Removal

The tappets can be removed without removing cylinder head.

(1) Remove cylinder head cover and tappet (side plate) cover.

(2) Remove rocker arms and guide plate assembly by removing the rocker pivot bolts.

(3) Remove push rods and identify to ensure installation in original location, by using Tool E1174 (Push Rod Rack).

(4) Slide pick-up Tool No. E9C40H through the pushrod opening and seat tool firmly into the tappet opening, tightening clamp screw to grip tappet.

(5) Withdraw tappet with a twisting motion or 'tap' upwards with the sliding weight on the puller — Loosen the tool clamp and remove the tappet through side opening. *(See Fig. 19).*

If all tappets are to be removed, identify tappets to ensure installation in original location by using Tool E1174 (tappet rack).

> NOTE: A diamond marking stamped on the engine numbering pad indicates that some tappet bodies are .008" oversize. Always check tappet body diameter before installing a replacement tappet assembly.

> 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 the parts. Mixed parts are not compatible. Do not disassemble a tappet on a dirty work bench.

Also ensure that only the tappet assembly incorporating the metering valve, is used in this engine. This valve supplies the overhead valve train with lubricant.

Disassembly

(Refer Fig. 20).

(1) Pry out plunger retainer spring clip.

(2) Clean varnish deposits from inside of tappet body above plunger cap.

> CAUTION: Note the metering valve arrangement.

(3) Invert tappet body and remove plunger cap, metering valve plate, plunger, flat check valve, check valve spring, check valve retainer and plunger spring.

Cleaning and Assembly — IMPORTANT

(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 in order shown in *Fig. 20.*

Testing (by hand)

(Refer Fig. 21).

(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 metering valve and cap, (dimple toward the cap).

(5) Place tappet upright in Tool E9C40C as shown in *Fig. 21.*

> NOTE: Metering valve "dimple" contacts the plunger cap.

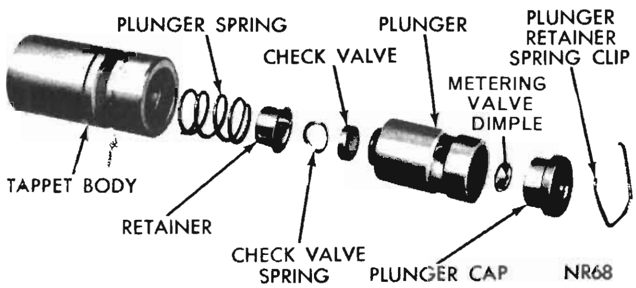


Fig. 20 – Hydraulic tappet assembly (Disassembled view)

(6) Engage push rod of tool with top of tappet plunger. Test leak down by pressing on the Tool arm. If plunger collapses instantly as pressure is applied, disassemble tappet, clean and test again *(Fig. 21)*.

(7) If tappet still does not operate satisfactorily after cleaning, install a new tappet assembly.

NOTE: If the tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream the bore to next oversize, the tappet bore and the oil gallery intersection must be free of any burrs or damage.

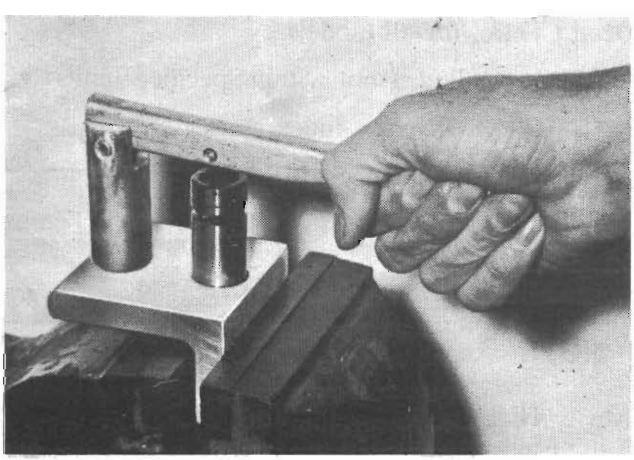


Fig. 21 – Hydraulic tappet assembly testing by hand, using Tool E9C40C

Testing

(Using testing Tool No. E1150 *(Refer Fig. 22)*.)

(1) Disassemble plunger assembly from tappet body and clean all parts thoroughly, described as above.

(2) Insert plunger spring in body.

(3) Fill body with clean leakdown fluid at room temperature.

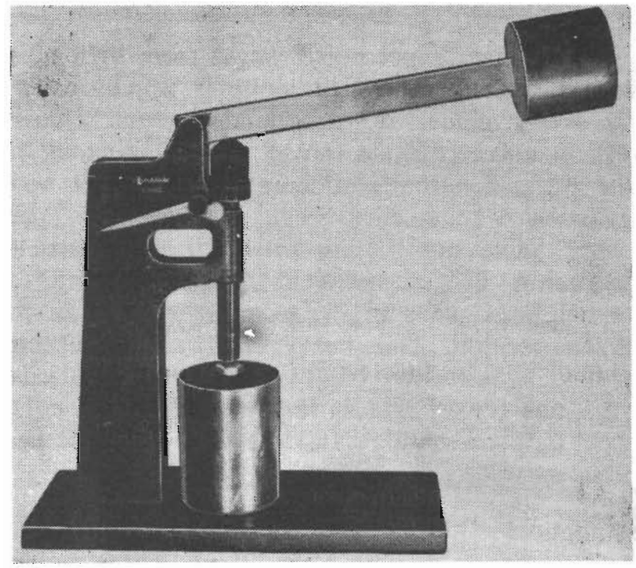


Fig. 22 – Testing tappet using Tool E1150

(4) Insert the plunger assembly then the metering valve, plunger cap and retainer spring clip.

(5) Thoroughly clean the cup of the test fixture and install in position on the test fixture.

(6) Place tappet in cup with pushrod socket facing upwards.

(7) Pour test fluid into cup until the tappet is submerged.

(8) Place steel ball (supplied with test fixture) in pushrod socket.

(9) Lower weight so that ram rests on steel ball.

(10) Alternately raise and lower weight so that tappet plunger is moved through its full stroke several times in a pumping action. This will expel all air from the tappet, continue this action until lifter becomes 'solid'.

(11) Lift weight and arm leaving ram resting on tappet plunger.

(12) Adjust ram length to bring the indicator pointer into line with the "SET VAL" mark.

(13) Lower weight on to ram.

(14) With a stop watch check and record the time taken by the indicator pointer to travel from the "Start" mark to the .125" mark. This time should fall between 20 seconds and 130 seconds for a serviceable tappet assembly.

NOTE: ABSOLUTE cleanliness must be observed when carrying out this test procedure.

FLUID: Approved fluids for the purpose of these tests are listed below:

Valvoline	E103
Valvoline	E104
B.P.	H.T. Fluid
Caltex	Leakdown Fluid
Ampol	41/M.S. 3255
Mobil	Velocite 3

Fluids used for this test must meet the required material standards specified by CHRYSLER AUSTRALIA LIMITED.

Installation

(1) Lubricate tappets, (be sure that only correct Metering Valve replacement tappets are installed in this engine).

(2) Install tappets and push rods in their original positions.

(3) Install rocker arm and guide plate assembly, also tappet cover side plate. Lubricate the valve rockers and push rods.

NOTE: Cover the valve rockers to prevent oil splash.

(4) Start and run the engine to normal operating temperature and inspect for correct valve lubrication from push rods.

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.

(5) Stop engine and remove the 'oil splash cover'. Check valve rocker lubrication, then reinstall valve rocker cover and gasket as described in *Para. 3.*

10. CHECKING VALVE TIMING

(1) Turn crankshaft until the No. 6 exhaust valve is closing and No. 6 intake valve is opening.

(2) Insert a 1/4" spacer between rocker arm pad and stem tip of No. 1 intake valve. Allow spring load to bleed tappet down (giving in effect a solid tappet) using Tool E9C40G attached to rocker arm.

NOTE: Loosen the rocker arm bolt to provide additional clearance for the spacer, (where necessary) then slightly retighten to bottom the tappet. DO NOT OVER TIGHTEN as this may cause the push-rod to bend.

(3) Install a dial indicator so plunger contacts valve spring retainer as nearly perpendicular as possible. Zero the indicator.

(4) Rotate crankshaft clockwise (normal running direction) until the valve has lifted .013" then read the crankshaft timing indicator.

CAUTION: Do not turn crankshaft any further clockwise than TDC as valve spring might bottom and result in serious damage.

The timing of the crankshaft pulley should now read from 12° Before Top Dead Centre to Top Dead Centre, for all models.

(5) If reading is not within specified limits:

(a) Check sprocket index marks

(b) Inspect timing chain for wear

(c) Check accuracy of D.C. mark on Timing Indicator.

NOTE: At T.D.C. the standard engine camshaft provides .023" valve lift while the High Performance engine camshaft provides .028" valve lift. Optional E38 camshaft provides .037" lift.

11. TIMING SPROCKETS AND CHAIN

To Remove

(1) Drain the cooling system.

(2) Remove radiator, fan and accessory drive belts, pulleys with spacers noting the arrangement (where applicable).

(3) Install Tool E9C55D only and pull the vibration damper assembly off the end of the crankshaft *(Fig. 23)*. Do not pry or pull on the pulley except on the hub area, as damage can occur.

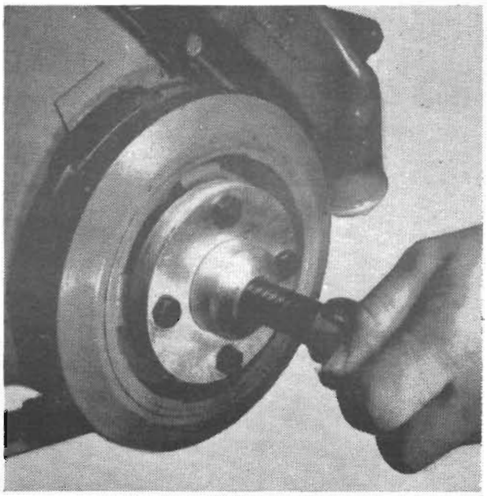


Fig. 23 – Removing damper pulley assembly (Tool E9C55D)

> NOTE: E37 and E38 engines use a larger vibration damper.

(4) Loosen oil pan bolts to allow clearance and remove chain case cover and gasket.

(5) If chain movement exceeds 3/16" install a new timing chain.

(6) Slide the crankshaft oil slinger off the end of the crankshaft.

(7) Remove the camshaft sprocket attaching bolts.

(8) Remove the timing chain with camshaft sprocket.

(a) Where required, remove the crankshaft chain sprocket using Tool E9C60—Replace gear using Tool E9C60A.

To Install

(1) Turn crankshaft to line up centre-line of camshaft and crankshaft with the timing mark on crankshaft sprocket.

(2) Install camshaft sprocket and timing chain.

(3) Line up the timing marks on the sprockets with the centreline of the crankshaft and camshaft *(Fig. 24)*.

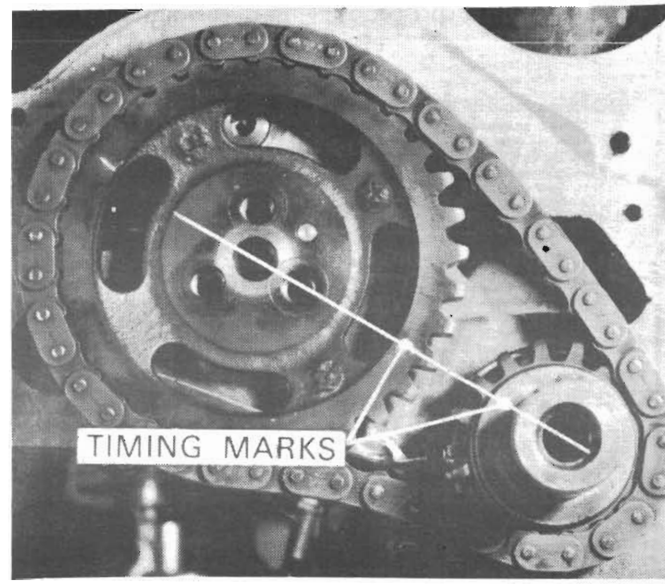


Fig. 24 – Alignment of timing marks

(4) Tighten the (3) camshaft sprocket retaining bolts to 30 lbs. ft. Slide the crankshaft oil slinger over the shaft and against sprocket (Flange away from sprocket).

Checking Timing Chain for Stretch

(1) Place a scale next to timing chain so that any movement of chain may be measured.

(2) Place a torque wrench and socket over a camshaft sprocket bolt and apply torque in the direction of crankshaft rotation to take up the slack; 30 lbs. ft. (cylinder head installed) or 15 lbs. ft. (cylinder head removed).

> NOTE: With a torque applied to camshaft sprocket bolt, the crankshaft should not be permitted to move. It may be necessary to block the 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 lbs. ft. (cylinder head installed) or 15 lbs. ft. (cylinder head removed) and note the amount of chain movement *(Fig. 25)*.

(4) If the chain movement exceeds 11/64" install a new timing chain.

(5) If the chain is satisfactory, slide the crankshaft oil slinger over shaft and up against the sprocket (flange away from sprocket — where removed).

(6) Continue procedures as described in para. 12.

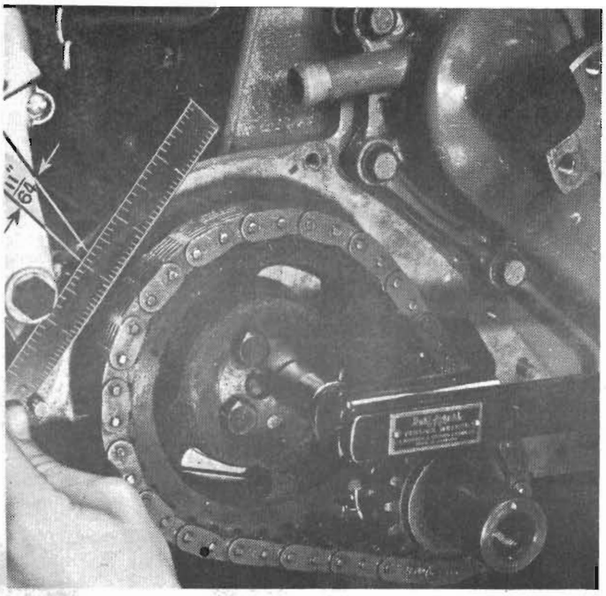


Fig. 25 – Measuring chain stretch (typical view)

12. TIMING CHAIN CASE COVER OIL SEAL REPLACEMENT

To Remove

> NOTE: It is normal to find particles of neoprene collected between the seal retainer and crankshaft oil slinger after seal has been in operation.

(1) Position puller screw of Tool E9C57 through cover, the inside of cover up. Position the puller blocks No. E9C57C directly opposite each other, and force the angular lip between neoprene and flange of the seal retainer.

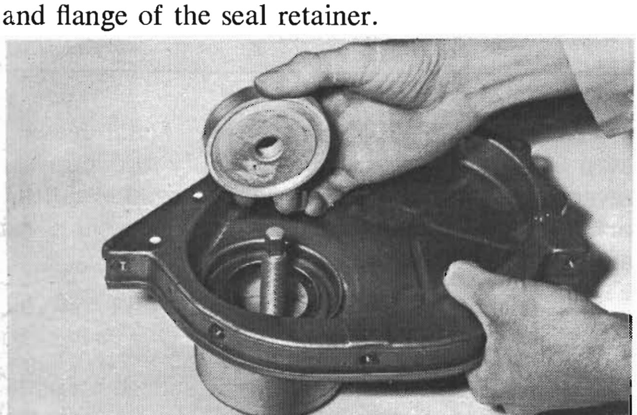


Fig. 26 – Puller blocks No. E9C57C expanded to puller position (Tool E9C57)

(2) Place washer and nut on puller screw. Tighten the nut forcing blocks into gap to a point of distorting the seal retainer lip *(Fig. 26)*. Puller is only positioned at this point.

(3) Place sleeve over retainer and place removing and installing plate into sleeve.

(4) Place the flat washer and nut on puller screw. Hold the centre screw and tighten lock nut to remove seal *(Fig. 27)*.

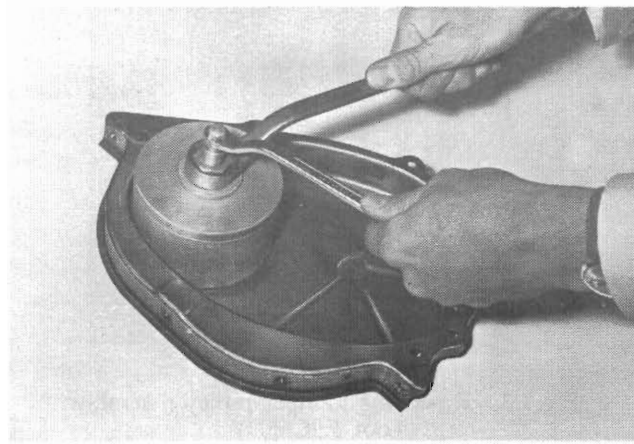


Fig. 27 – Removing oil seal (Tool E9C57 and Sleeve No. E9C57C)

Installation of Oil Seal

(1) Insert puller screw through removing and installing plate so that the thin shoulder will be facing up.

(2) Insert puller screw with plate through the seal opening (inside of chain case facing up).

(3) Place the seal in cover and place the seal installing plate into the new seal, with protective recess toward lip of seal retainer *(Fig. 28)*.

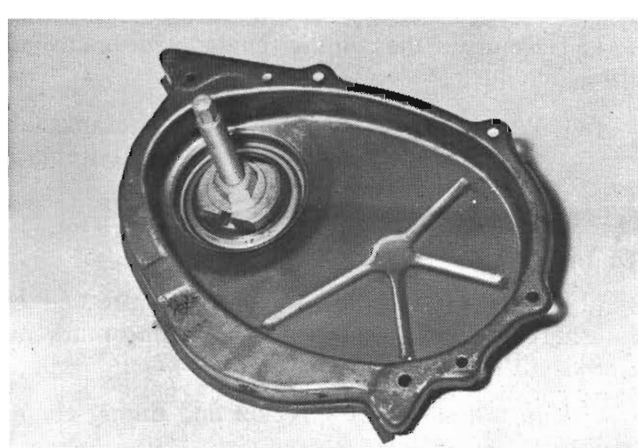


Fig. 28 – Positioning installer plate (Tool No. E9C57D)

(4) Install the flat washer and nut on puller screw; hold screw and tighten nut *(Fig. 29)*.

(5) The seal is properly installed when it is tight against the face of cover and the seal retainer is bottomed in the cover. Ensure that the seal housing is *bottomed* in the chain case cover.

Fig. 29 – Installing new seal (Tool No. E9C57D)

Installing Timing Chain Cover (Oil Pan Loosened)

(1) Ensure that the mating surfaces of timing chain cover and cylinder block are clean and free from burrs.

(2) Using a new gasket, slide the timing cover over the locating dowels and tighten bolts to 15 lbs. ft. Make sure all oil pan gaskets are in place and tighten the 5/16" oil pan bolts to 230 lbs. in. and the 1/4" screws to be tightened to 95 lbs. in.

Installing Vibration Damper and Pulley Assembly

(1) Place the damper pulley assembly hub key in slot in crankshaft, lubricate seal with Chrysler Door Ease Lubricant and slide hub on crankshaft.

(2) Place the installing Tool E9C55E in position and press the damper pulley assembly hub on the crankshaft *(Fig. 30)*.

(3) Re-install the accessory drive pulleys and spacers in the correct location and direction — **Note** that spaced spigots must face FORWARD — **Check** the final assembly alignment of all the drive pulleys — refer to diagrams in Group 7 — Accessory Drive Belts.

13. CAMSHAFT

The chrome alloy cast iron camshaft has separate integral oil pump and distributor drive gears and a fuel pump eccentric. Rearward camshaft thrust is taken by the rear face of the camshaft sprocket hub, bearing directly on the front of the cylinder block, eliminating the need for the thrust plate.

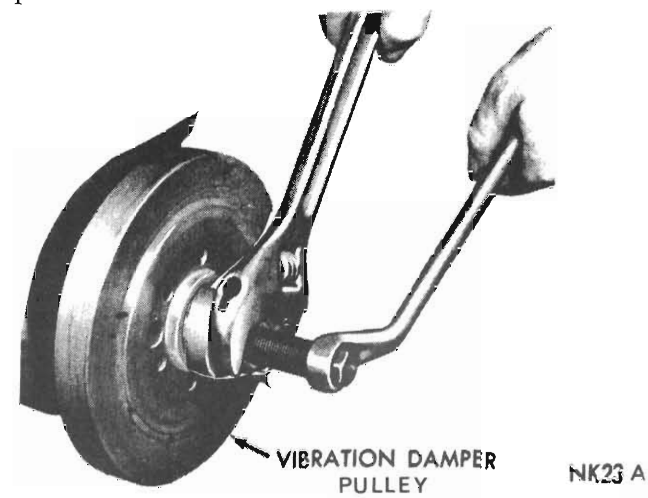


Fig. 30 – Installing damper pulley assembly
Tool No. E9C55E

The helical oil pump, distributor drive gear and the camshaft lobe taper, both tend to produce only a rearward thrust.

To Remove

(1) Remove the oil pan as described in Part 4 "Engine Oiling System."

(2) Remove the tappets using Tool E9C40H (after removal of rockers, push rods and side plate cover).

(3) Remove timing sprockets, oil pump, distributor and fuel pump.

(4) Remove the camshaft, being careful not to damage the cam bearing with the cam lobes.

To Install

(1) Lubricate the camshaft lobes and camshaft bearing journals and insert the camshaft in the cylinder block *(Fig. 32)*.

NOTE: Whenever an engine is rebuilt and a new camshaft and/or new tappets are installed, the sump should be filled to correct level with a premium grade oil of recommended viscosity. When replacing camshaft, all of the tappet faces must be inspected for crown with a straight edge. If any negative crown (dish) is observed, tappet must be replaced. Tappet must have a definite crown.

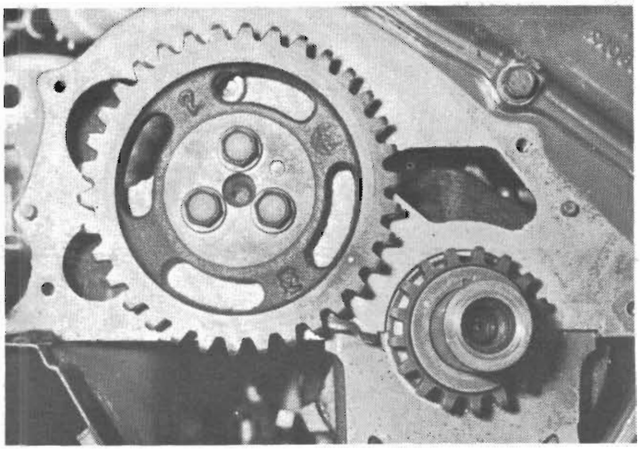


Fig. 31 – Camshaft sprocket assembly

CAUTION: Whenever the camshaft cam lobes are reground or after a degreasing process, the camshaft should be lubricated using Molibdenum Disulphide or similar treatment to protect cam surface from scoring at initial starting.

Installation of Distributor

NOTE: The distributor rotates clockwise. Before installing the distributor, time the engine as follows:

(1) Rotate the crankshaft until mark on inner edge of crankshaft pulley is in line with the 'O' (T.D.C.) mark on timing chain cover. (No. 1 cylinder compression stroke).

(2) With distributor 'O' ring in position, hold distributor over the mounting pad.

(3) Turn the rotor to point forward, corresponding to 4 o'clock.

(4) Install distributor so that when fully seated on engine, the gear has spiralled to bring rotor to a 5 o'clock position.

(5) Turn the housing until the ignition points are separating and rotor is under No. 1 cap tower.

(6) Install hold down bolt and connect primary wire.

(7) Adjust timing to specification, using a timing light. Connect vacuum line, after correct setting is obtained.

14. CAMSHAFT BEARING REPLACEMENT (ENGINE REMOVED FROM VEHICLE) (Using a reliable Camshaft Bearing Tool)

(1) With the engine completely disassembled, drive out the rear cam bearing welch plug.

(2) Install suitable size adaptors and horseshoe washers at the back of each bearing shell to be removed, and drive out all the bearing shells.

To Install

(1) Install the new camshaft bearings using a suitable tool by sliding the new camshaft bearing shell over the correct adaptor.

(2) Position bearing in the tool. Install horseshoe lock and drive bearing shell into place *(Fig. 33).*

The camshaft bearing oil hole must be in exact alignment with the drilled oil passage from the main oil gallery.

(3) Install remaining shells in like manner. Install No. 1 camshaft bearing 3/32" inward from front face of the cylinder block (to provide thrust face lubrication).

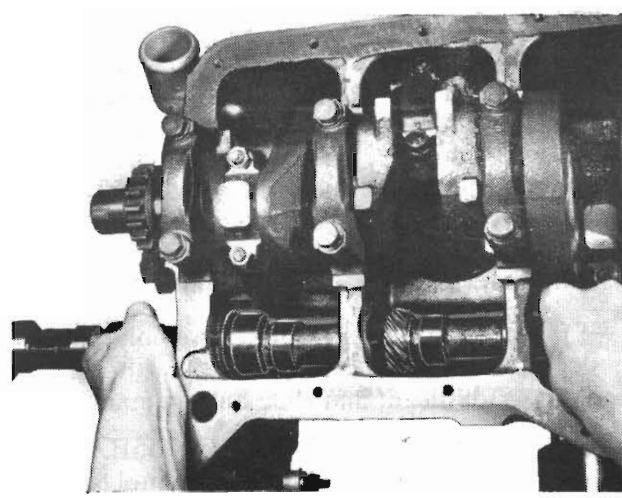


Fig. 32 – Installing camshaft

(4) Apply sealer and use Tool E9075A to install new welch plug at the rear of camshaft.

15. CYLINDER BLOCK

(1) Remove the top ridge of cylinder bores using E9C45 or a suitable ridge removing tool to prevent distortion of the piston ring lands, before removing pistons from the cylinder block.

NOTE: Keep the tops of the pistons covered during this operation.

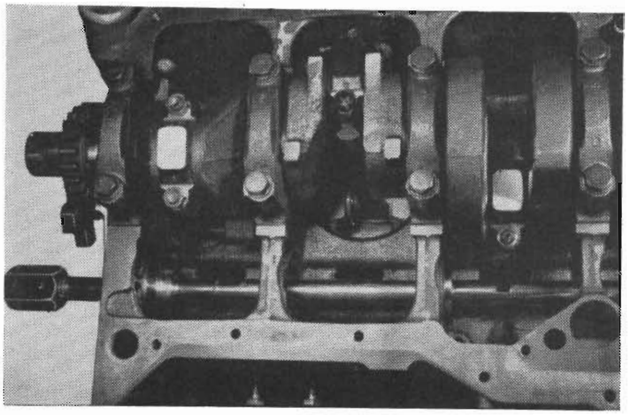


Fig. 33 – Removing and installing camshaft bearings (typical view)

(2) Pistons and connecting rods must be removed from the top of cylinder block. Rotate crankshaft so that each connecting rod is centred in the cylinder bore.

(3) Remove connecting rod cap.

(4) Install Tool E9C50D on one connecting rod bolt and protector over the other bolt. Push each piston and rod assembly out of cylinder bore.

> CAUTION: Be careful not to nick the crankshaft journals as the surface is readily marked.

(5) Install bearing caps on mating rods and check that the rods and caps are correctly identified.

Cleaning and Inspection

(1) Clean cylinder block thoroughly and check all 7 core hole plugs for evidence of leaking.

(2) If new core hole plugs are installed coat edges of plug and core hole with a suitable sealer and drive plugs in place with driver, Tool E9C75A or equivalent.

(3) Examine block for cracks or fractures.

Inspection of Cylinders

The cylinder walls should be checked for out of round and taper with a cylinder wear checking gauge. If the cylinder bores show more than .005″ out of round, or 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 oversize pistons and rings fitted. Whatever type of boring equipment is used, boring and honing operating should be closely co-ordinated with the fitting of pistons and rings in order that specified clearances may be maintained.

Honing Cylinder Bores

Before honing, pack 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 E9C45D (or similar tool) equipped with 220 grit stones, 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, equipped with 280 grit stones. 20-60 strokes depending on bore condition, will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes. Use a light honing oil. Do not use engine or transmission oil, mineral spirits or kerosene.

(3) Honing should be done by moving the hone up and done fast enough the produce a cross-hatch pattern. When hone marks intersect at 60° the cross-hatch angle is most satisfactory for proper seating of rings *(see Fig. 34)*.

(4) After honing, it is necessary that the block be cleaned again to remove all traces of abrasives.

> CAUTION: Be sure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and water be used with a brush and the parts thoroughly dried. The bore can be considered clean when it can be wiped with a white cloth and cloth remains clean. Oil bores after cleaning to prevent rusting.

16. 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. The expansion forces the pin bosses away from each other and the piston assumes a more round shape. Check pistons for taper and elliptical shape before they are fitted into the cylinder bores *(see Fig. 35)*.

Finished Pistons

All pistons are machined to the same weight in grams, regardless of oversize to maintain the piston

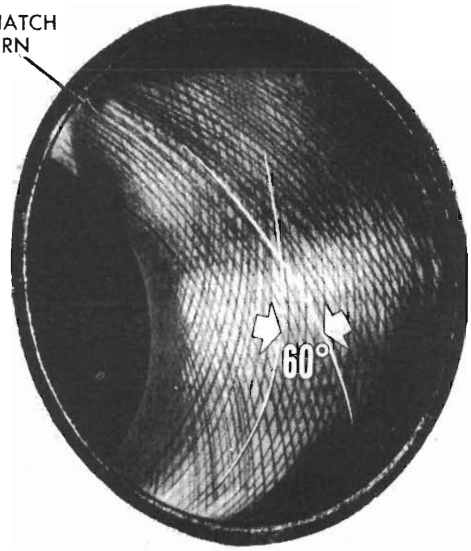


Fig. 34 – Cross hatch pattern

balance. For cylinder bores which have been honed or rebored, all service pistons include pins and are available in standard and the following oversizes, .005″, .020″, .040″ (maximum).

Fitting Pistons

The piston and cylinder wall must be clean and dry. The clearance between the piston and the cylinder wall is given in engine specifications.

NOTE: Minimum clearances are desirable.

(1) Pistons and cylinder bores should be measured at normal room temperature, 70°F.

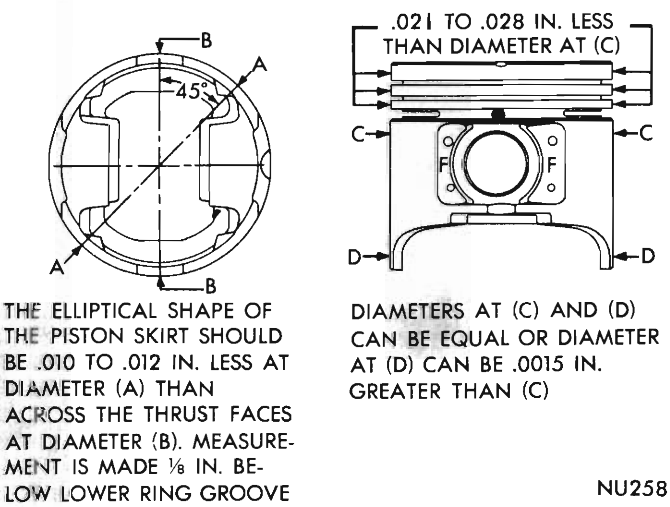


Fig. 35 – Piston measurement

(2) Measure the piston diameter at the top of skirt 90° to the piston pin axis.

(3) Measure the cylinder bores half way down the bore and transverse to the engine crankshaft centre line.

Fitting Piston Rings
(Service Set)

(1) Measure the 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 the rings down to ensure positioning them squarely with the cylinder wall).

(2) Insert the feeler stock in gap. The ring gap should be .010″ to .020″ for compression rings, and .015″ to .055″ for the oil ring steel rails in standard size bores. Maximum gap in .005″ oversize bores should be .060″ for compression rings and .070″ for oil ring steel rails.

(3) Measure the side clearance between piston rings and ring land *(see Fig. 36).* The clearance should be .0015″ to .004″ for the top compression ring, and .000″ to .005″ for the oil control ring.

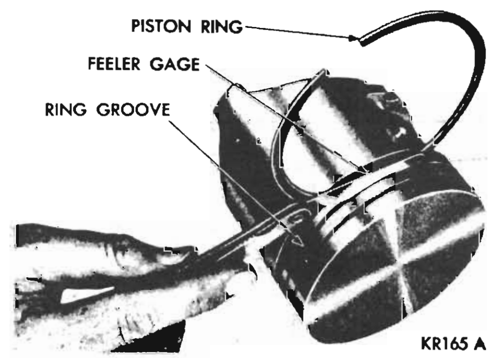


Fig. 36 – Measuring piston ring clearance

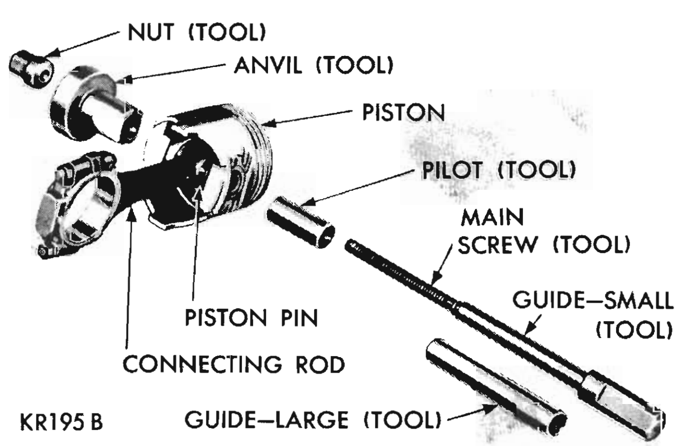


Fig. 37 – Tool arrangement for removing piston pin (Tool E9C50B)

(4) Starting with the oil ring expander, place expander ring in the lower ring groove and install oil control ring using instruction in package.

(5) Ensure that the oil ring expander is correctly positioned with abutment tangs (lance key) in the hole provided for location, in the front side of the piston.

(6) Install the compression rings in middle and top grooves, using a ring installer. Ensure that the mark 'TOP' or a dot on each compression ring is to the top of the piston.

17. PISTON PINS

To Remove

(1) Arrange Tool E9C50B parts for the removal of piston pin *(see Fig. 37).*

(2) Install pilot on the main screw. (Use pilot No. E9C50H on 265 engine.)

(3) Install the screw through the piston pin.

(4) Install anvil over the threaded end of the main screw with small end of anvil against the piston boss.

Be sure spring is removed from anvil.

(5) Install nut loosely on the main screw and place the assembly on press *(Fig. 38).* Press the piston pin out of the connecting rod.

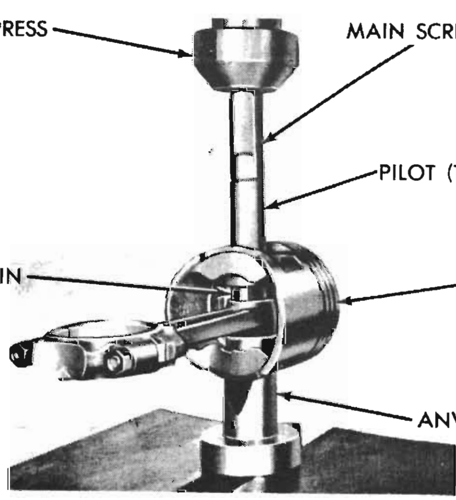


Fig. 38 – Removing piston pin (Tool E9C50B)

NOTE: When the pin falls free from connecting rod, stop the press to prevent damage to bottom of anvil.

(6) Remove the tool from piston.

To Install

(1) Check the piston pin fit in the piston. It should be a sliding fit in the piston at 70°F.

Piston pins are supplied in standard size only.

(2) Lubricate the piston pin holes in the piston and connecting rod.

(3) Arrange the tool parts for the installation of piston pin *(Fig. 39).*

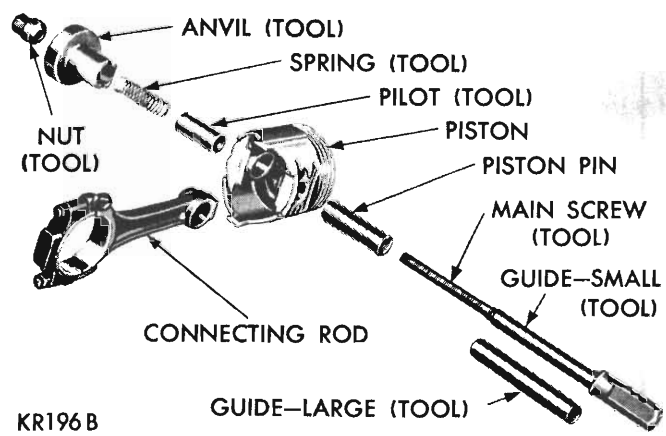
(4) Install the spring inside the pilot and install the spring and pilot in the anvil. (Use pilot No. E9C50H on 265 engine.)

(5) Install the piston pin over main screw.

(6) Place piston with 'Notch Front' up over pilot so that the pilot extends through the piston pin holes.

(7) Position connecting rod over the pilot which extends through the piston hole.

The oil hole in the connecting rod must point toward the direction shown in *Fig. 40.* (Toward the right hand side of the engine when installed).



KR196B

Fig. 39 – Tool arrangement for installing piston pin (Tool E9C50B)

(8) Install the main screw and piston pin in the piston *(Fig. 39).*

(9) Install the nut on main screw to hold assembly together. Place assembly on a press *(Fig. 41).*

(10) Press in the piston pin until it bottoms on the pilot, correctly positioning the pin in the connecting rod.

(11) Remove the Tool and arrange the tool parts and piston assembly in the same manner as shown in *Fig. 37* for checking pin fit.

(12) Place assembly in a vice *(Fig. 42).*

(13) Attach the torque wrench to nut and check torque up to 15 lbs. ft. If the connecting rod moves downward on the piston pin, reject this connecting rod and piston pin combination. Install a

new connecting rod and piston pin and repeat the installation and checking procedure.

If the connecting rod does not move under 15 lbs. ft. torque, the piston and connecting rod interference is satisfactory.

(14) Remove the tool.

18. CONNECTING RODS

Crankshafts with .010″ main or con-rod journals have an identifying Maltese cross and Roman ten "X" stamped on the engine number pad.

The crankshaft has a machined pad on No. one counter weight. This carries M 10 (Mains .010″) or R 10 (Rods .010″). No crankshaft will have rods and mains undersize .010″.

.001 Undersize ROD Journals (1.999/1.998) are colour identified by YELLOW PAINT around the outer diameter of the FRONT counterweight.

The machined (location) pad on the front counterweight is stamped "R—followed by the U/size rod journal number—1/2/3/4/5/6".

Installing Connecting Rod Bearing

(1) Install connecting rod bearings so that small formed tang fits into machined groove in connecting rod.

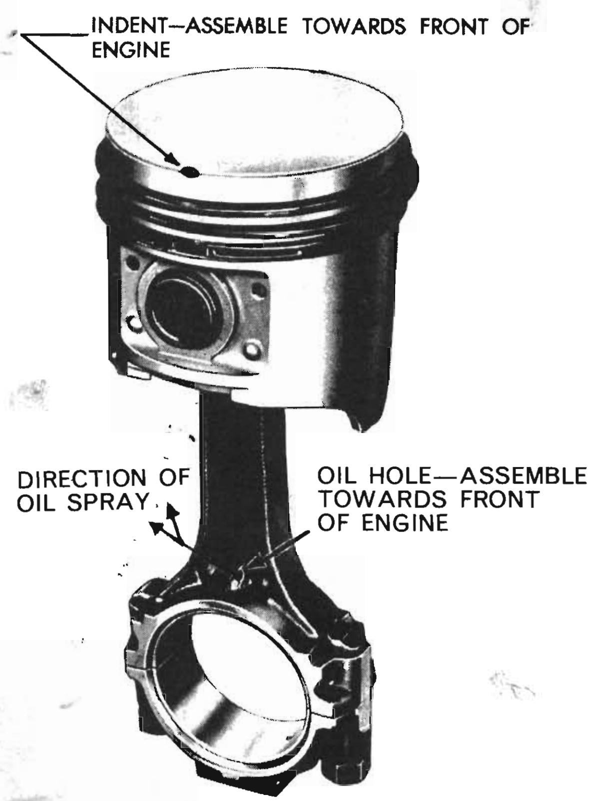


Fig. 40 – Connecting rod oil hole

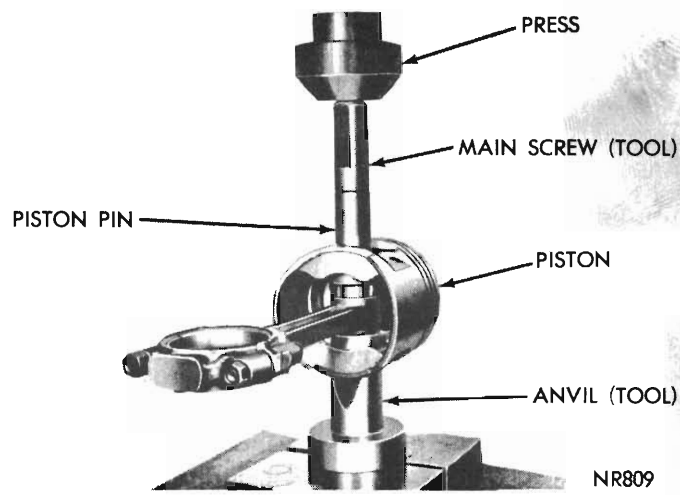


Fig. 41 – Installing piston pin (Tool E9C50B)

(2) Limits of taper or out-of-round on any crankshaft journal should be held to .001″. Bearings are available in standard, .001″, .002″, .003″, .010″ and .012″, .020″, .030″ undersize.

(3) Install the bearings in pairs.

Do not use a new bearing with an old bearing.

Do not file the rods or bearing caps.

19. CONNECTING ROD BEARING CLEARANCE CHECKING

Plastigage Method

Connecting rod bearing clearance measurements can be made by the use of Plastigage.

After removing the connecting rod cap, wipe off the oil from the crankpin journal and bearing in-

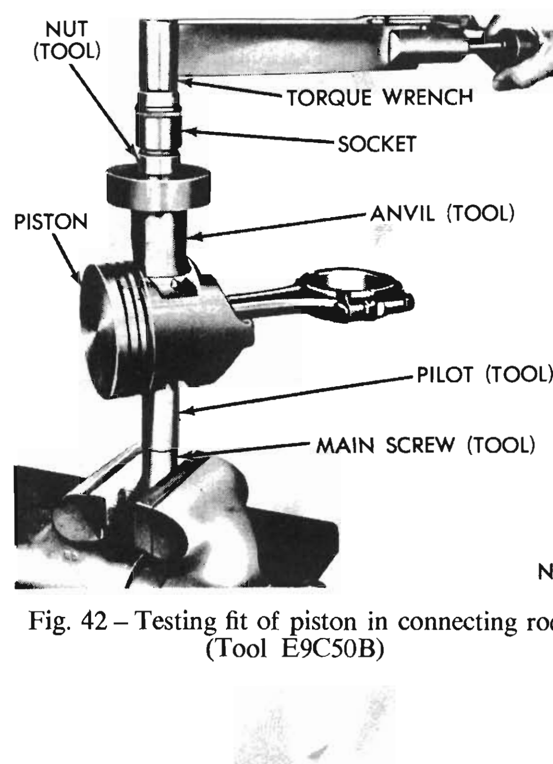


Fig. 42 – Testing fit of piston in connecting rod (Tool E9C50B)

serts. Place the plastigage on bearing parallel with crankshaft. Re-install the cap and tighten attaching nuts alternately to specified torque.

Remove cap and measure the width of the compressed material with the graduated scale to determine the bearing clearance. Desired clearance is included in specifications. If taper of the compressed material is evident, measure with graduated scale. If taper appears to exceed .0005″ the journal should be checked with a micrometer.

Shim Stock Method

(1) Place a piece of oiled .001″ feeler stock (½″ wide and ¾″ long) between bearing and connecting rod journal.

(2) Install bearing cap and tighten to 45 lbs. ft.

(3) Turn connecting rod ¼ turn in each direction. A slight drag should be felt which indicates clearance is satisfactory. The correct clearance is shown in engine specifications.

(4) The side play should be from .007″ to .013″.

Installing Piston and Connecting Rod Assembly in Cylinder Block

(1) Compression ring gaps should be located on the left side of the engine staggered about 60° apart. Neither gap should line up with the oil ring rail gaps.

(2) Rotate steel rails so that the gaps are approximately opposite lance key and positioned above the piston pin holes.

(3) Immerse the piston head and rings in clean engine oil. Slide the ring compressor over the piston and tighten. Position of rings must not change during this operation.

(4) The notch on the top of the piston must point toward the front of the engine, so that squirt hole in the connecting rod points towards the right side of the engine.

NOTE: Identification numbers are stamped on the connecting rods on the same side as the squirt hole direction, so that the numbers are readily visible from the underside when the oil pan is removed.

(5) Install connecting rod bolt protectors (E9C50D) on rod bolts, the long protector installed on squirt hole direction side of connecting rod.

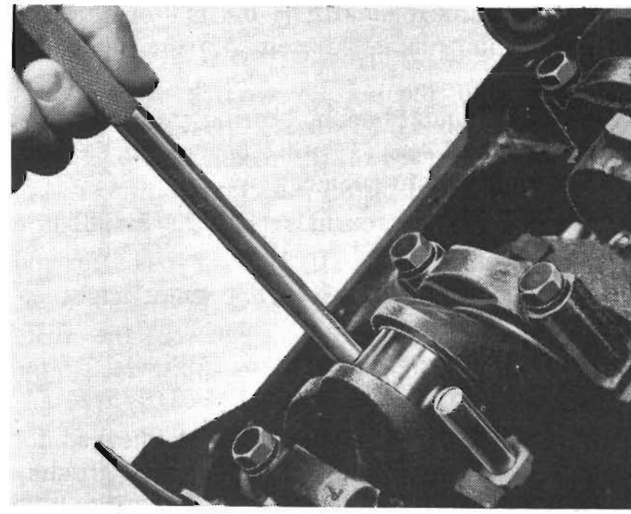


Fig. 43 – Removing and installing connecting rod (Tool E9C50D)

Failure to use suitable protectors may cause the journal surface to be damaged.

Rotate the crankshaft so that connecting rod journal is on centre of cylinder bore.

(6) Insert rod and piston into cylinder bore and guide rod over the crankshaft journal *(Fig. 43)*. Be careful not to nick connecting rod journals.

NOTE: Any small surface defects which are less than 3/16″ x 1/16″ deep are deemed acceptable for service except where they occur in the region of the crankshaft fillets or adjacent journal "overlap" areas. Hand polishing of the journal surfaces is NOT permitted, to safeguard against upsetting the surface finish in a harmful manner.

(7) Tap piston down in cylinder bore, using the handle of a hammer. At the same time guide connecting rod into position on crankshaft journal.

(9) Install the rod caps, tighten nuts to 45 lbs. ft.

20. CRANKSHAFT MAIN JOURNALS

Crankshafts with .010″ main or con-rod journals have an identifying Maltese cross and Roman ten "X" stamped on the engine number pad.

The crankshaft has a machined pad on No. one counterweight. This carries M 10 (Mains .010″) or R 10 (Rods .010″). No crankshaft will have rods and mains .010″.

.0005 U/S Main Journals (2.4995/2.5000).

Colour identified by BLUE PAINT on the side of the counterweight adjacent to the undersize journals.

One (1) Standard main bearing must be fitted in the block and one (1) .001 bearing in the cap, when assembled into engine.

.001 U/S MAIN Journals (2.4995/2.4985).

Colour identified by YELLOW PAINT around the outer diameter of the REAR counterweight.

The machined (location) pad on the front counterweight is stamped "M — followed by the U/Size Main JournalNumber—1/2/3/4/5/6/7".

The crankshaft journals should be checked for excessive wear, taper and scoring. Journal grinding should not exceed .030", under the standard journal diameter. Do not grind the thrust faces of main bearing. Do not nick the connecting rod or main bearing journal fillets. After regrinding, remove the rough edges from crankshaft oil holes and clean out all oil passages and balance drillings to ensure that all swarf has been removed.

21. CRANKSHAFT MAIN BEARINGS

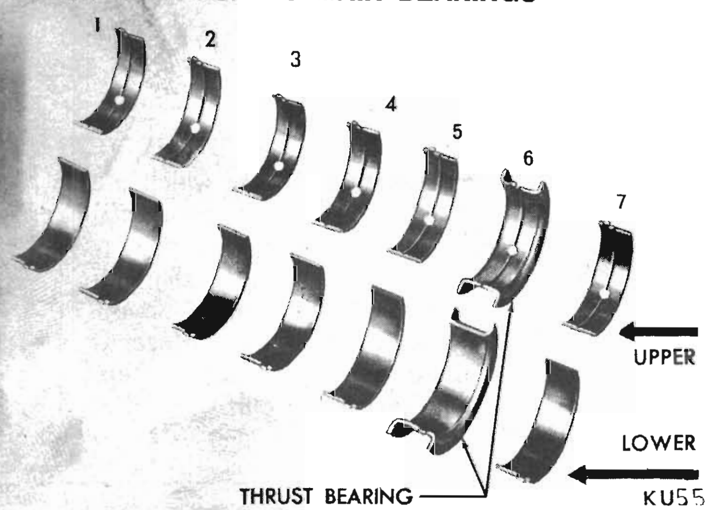


Fig. 44 – Main bearing identification

All the main bearings, except the No. 6 (thrust) are interchangeable. The upper and lower bearings are NOT interchangeable as the upper bearing material is grooved for lubrication supply.

Bearings that are not badly worn or pitted should be re-installed in the same bearing bore.

The bearing caps are not interchangeable and numbers should be checked at removal to ensure correct assembly. Bearings are available in standard and the following undersizes: .001", .002", .003", .010", .012", .020" and .030". Never install an undersize bearing that will reduce the clearance below minimum specifications.

To Remove

(1) Remove the oil pan and check the bearing cap numbers.

(2) Remove the bearing caps one at a time. Remove upper bearing by inserting a suitable tool. *(see Fig. 45)* into the oil hole on crankshaft.

(3) Slowly rotate crankshaft clockwise forcing out upper bearing.

> NOTE. DO NOT rotate the crankshaft "backwards". (Refer comments Page 9–24).

(4) Install the replacement bearing carefully using a soft material tool to protect the bearing.

22. MAIN BEARING CLEARANCE CHECKING

Plastigage Method

Use the same technique described in "Connecting Rod Bearing Clearance Checking *(para. 19)*.

> CAUTION: If bearings are measured with the engine in the vehicle, the crankshaft must be supported in order to take up clearance between the upper bearing insert and the crankshaft journal. This can be done by snugging bearing caps of the adjacent bearings with a strip of .005" to .015" cardboard between lower bearings and journal.
>
> Use extreme caution when this is done to avoid unnecessary strain on the crankshaft or bearings, or false readings may be obtained. Do not rotate crankshaft whilst plastigage is installed. Be sure to remove cardboard before re-installing oil pan.

It is permissabe to use one .001" undersize bearing shell with one standard bearing shell, or one .002" undersize bearing shell with one .001" undersize shell.

Always use the smaller diameter bearing half as the upper. Do not use a new bearing with a used bearing, and never use an upper bearing half more than .001" smaller than the lower bearing half.

Shim Stock Method

(1) Position crankshaft in block.

(2) Smooth the edges of a ½ x 1 inch piece of soft copper or brass shim stock, .001" in thickness.

(3) Lubricate the main bearing journals and position on the shim stock across the centre main journal.

(4) Install bearing in centre main bearing cap, bearing tang in groove on cap, lubricate bearing, and seat cap on block. Tighten bolts to 65 lbs. ft. torque.

(5) If a slight drag is felt as the crankshaft is rotated the clearance is .001″ or less and is considered satisfactory. If, however, no drag is felt, the bearing is too large; or if the crankshaft cannot be rotated the bearing is too small and should be replaced with the correct size.

(6) Check crankshaft end play. This should be .0035″-.0095″. If end play is more than .0095″ install a new bearing.

(7) Fit the remaining bearings in a similar manner.

NOTE: Do not rotate crankshaft "backwards". (Refer comments Page 9–24).

REPLACEMENT ENGINE MAIN BEARING CAPS

Crankshaft bearing caps are line reamed to each individual engine at manufacture, however, interchangeable replacement caps are supplied with oversize stud holes and the overall length 1/32″ shorter and must be fitted by shimming or removing metal from face of caps, as required. (when line reaming equipment is not available), to obtain the same fitting condition as the original cap.

When removing metal from face of cap, DO NOT FILE, use fine emery cloth on face plate.

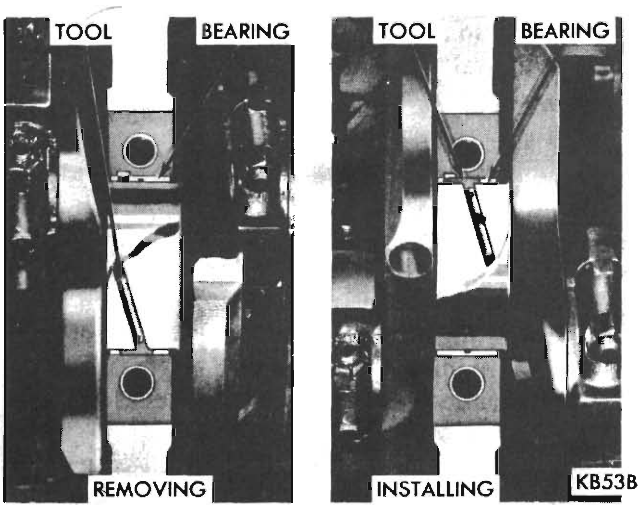


Fig. 45 – Replacing upper main bearings using special tool (or suitable equivalent)

23. REPLACEMENT REAR MAIN BEARING OIL SEAL (CRANKSHAFT REMOVED)

Cylinder Block

(1) Install a new oil seal in the cylinder block so that both ends protrude.

(2) Tap seal down into position, using Tool E9C60C until the tool is seated in bearing bore.

(3) Hold tool in this position and cut off portion of seal that extends above the block on both sides.

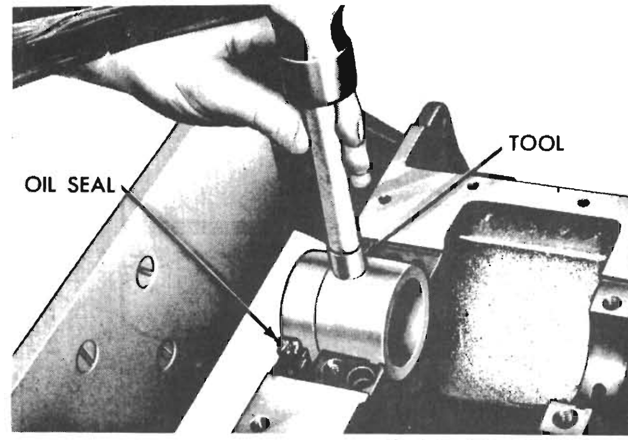


Fig. 46 – Installing rear main bearing oil seal (Tool E9C60C)

Bearing Cap

(1) Install a new seal in retainer groove of the main bearing cap so that the ends protrude.

(2) Install bridge on tool and tap the seal down into the position until tool is seated.

(3) Trim off the portion of the seal that protrudes above the cap *(Fig. 47)*.

(4) Apply a coat of Chrysler Parts Gasket Sealer (Red) to the block and No. 7 main bearing contact surfaces before re-installing the bearing cap.

When trimming the seal with the crankshaft installed in lieu of Tool E9C60C, EXTREME CARE must be used to prevent nicking the crankshaft bearing surface.

(5) Lubricate the bearing surfaces of bearing and seal and carefully install the cap. Tighten the cap retaining bolts to 60 lbs. ft. (max.) torque.

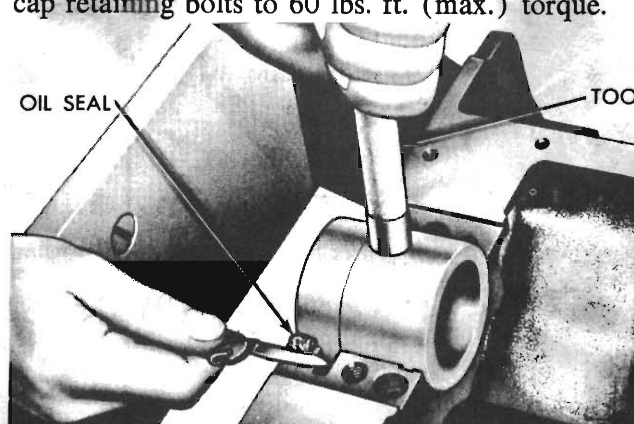


Fig. 47 – Trimming rear main bearing oil seal

PART 3B — ENGINE ASSEMBLY

8 CYLINDER

SPECIFICATIONS

All specifications are common unless otherwise shown.

ENGINE	318	340	360
Type		90° Vee — O.H.V.	
Number of cylinders		Eight	
Bore x Stroke	3.910″ x 3.310″	4.040″ x 3.310″	4.000″ x 3.580″
Piston displacement	318 cubic ins.	340 cubic ins.	360 cubic ins.
Compression ratio (nominal)	9.2:1	10.5:1	8.8:1
Compression Pressure (nominal)	125-185 p.s.i.		120-145 p.s.i.
Maximum variation between cylinders	25 p.s.i.	40 p.s.i.	40 p.s.i.
Firing Order		1 - 8 - 4 - 3 - 6 - 5 - 7 - 2	
Cylinder numbering (F. to R.):			
Left bank		1 - 3 - 5 - 7	
Right bank		2 - 4 - 6 - 8	

CRANKSHAFT	318	340	360
Type	Fully Counterbalanced	Fully Counterbalanced	Externally balanced
Number of main bearings	Five	Five	Five
Bearings	Steel backed babbit	Steel backed Aluminium on Nos. 1, 2, 3 and 4	Steel backed babbit
Main bearing journal diameter	2.4995″ to 2.5005″	2.4995″ to 2.5005″	2.8095″ to 2.8105″
Con rod bearing journal diameter	2.1240″ to 2.1250″	2.1240″ to 2.1250″	2.1240″ to 2.1250″
Max. ovality permissable	.001″	.001″	.001″
Max. taper permissable	.001″	.001″	.001″
Clearance desired	.0005″ to .0015″	.0005″ to .0020″	.0005″ to .0020″
Max. clearance allowed	.0025″	.0025″	.0025″
Crank shaft end float (desired)	.002″ to .007″	.002″ to .007″	.002″ to .007″
Crank shaft end float (max.)	.010″	.010″	.010″
Trust taken by		No. 3 main bearing	
Finish at rear oil seal surface		Diagonal Knurling	
Main bearings for service		STD., .001″, .002″, .003″, .010″, .012″, .020″ and .030″	

CONNECTING RODS AND BEARINGS

	318	340	360
Type		Drop-forged "I" Beam	
Length centre to centre	6.123″	6.123″	6.123″
Weight less bearing shells	735 gms.	758 gms.	758 gms.
Con rod bearing material	Steel backed grid	Steel backed Aluminium	Steel backed grid
Bearing diameter x width	2.126″ x .842″	2.126″ x .842″	2.126″ x .842″
Clearance desired	.0005″ to .0015″	.0005″ to .0020″	.0005″ to .0020″
Maximum allowable clearance	.0025″	.0030″	.0025″
Side clearance (2 rods)	.009″ to .017″	.009″ to .017″	.009″ to .017″
Piston pin bore diameter	.9829″ to .9834″	—	.9829″ to .9834″
Piston pin bush diameter		.9844″ to .9847″	
Bearings for service	.001″, .002″, .003″, .010″, .012″, .020″, .030″ & STD.	.001″, .002″, .003″, .010″, .012″, and STD.	.001″, .002″, .003″, .010″, .012″, and STD.

CAMSHAFT

	318	340	360
Method of drive	Silent chain	Roller chain	Silent chain
Bearings	Steel backed babbit	Steel backed babbit	Steel backed babbit
Number of bearings	Five	Five	Five
Trust taken by	Thrust plate	Thrust plate	Thrust plate
Bearing clearance	.001″ to .003″	.001″ to .003″	.001″ to .003″
Maximum clearance allowable	.005″	.005″	.005″
End float (desired)	.002″ to .006″	.002″ to .006″	.002″ to .006″
End float (maximum)	.010″	.010″	.010″
Camshaft journal sizes:			
Diameter No. 1	1.998″ to 1.999″	1.998″ to 1.999″	1.998″ to 1.999″
2	1.982″ to 1.983″	1.982″ to 1.983″	1.982″ to 1.983″
3	1.967″ to 1.968″	1.967″ to 1.968″	1.967″ to 1.968″
4	1.951″ to 1.952″	1.951″ to 1.952″	1.951″ to 1.952″
5	1.5605″ to 1.5615″	1.5605″ to 1.5615″	1.5605″ to 1.5615″
Camshaft bearing sizes:			
Diameter No. 1	2.000″ to 2.001″	2.000″ to 2.001″	2.000″ to 2.001″
2	1.984″ to 1.985″	1.984″ to 1.985″	1.984″ to 1.985″
3	1.969″ to 1.970″	1.969″ to 1.970″	1.969″ to 1.970″
4	1.953″ to 1.954″	1.953″ to 1.954″	1.953″ to 1.954″
5	1.5625″ to 1.5635″	1.5625″ to 1.5635″	1.5625″ to 1.5635″
Timing Chain:			
Number of links	68	68	68
Pitch	.375″	—	.375″
Width	.625″	.870″	.625″

	318	340	360
TAPPETS			
Type	Hydraulic	Hydraulic	Hydraulic
Clearance in block	.0010″ to .0018″	.0011″ to .0024″	.0011″ to .0024″
Body diameter	.9040″ to .9045″	.9035″ to .9040″	.9035″ to .9040″
Dry lash	.060″ to .210″	.060″ to .210″	.060″ to .250″
Service tappets		STD., .001″, .008″, .030″.	
PISTONS			
Type material		Tin-coated Auto-thermic alloy	
Land clearance (diametral)	.0190″ to .0270″	.0190″ to .0270″	.0190″ to .0270″
Clearance at top of skirt	.0005″ to .0015″	.0005″ to .0015″	.0005″ to .0015″
Weight (std. to .040″ oversize)	592 gms.	719 gms.	584 gms.
Piston length (overall)	3.210″	3.545″	3.190″
Ring groove depth No. 1	.205″	.210″	.210″
No. 2	.205″	.210″	.210″
No. 3	.194″	.198″	.199″
Pistons for service		STD., .005″, .020″ and .040″.	
PISTON PINS			
Type	Press fit in rod	Fully floating	Press fit in rod
Diameter	0.9841″ to 0.9843″	0.9841″ to 0.9843″	0.9841″ to 0.9843″
Length	2.990″ to 3.000″	2.990″ to 3.000″	2.990″ to 3.000″
Clearance in piston (light thumb push at 70°F)	0.0000″ to 0.0005″	0.0000″ to 0.0005″	0.00025″ to 0.00075″
Clearance in rod bushing		0.0000″ to 0.0005″	
Interference in rod	.0007″ to .0012″		.0007″ to .0012″
End Play	.0040″ to .0026″	.0040″ to .0026″	.0040″ to .0026″
Pins for Service	STD. ONLY	STD., .003″, .008″, O.S.	STD. ONLY
PISTON RINGS			
Number of rings per piston (Two upper rings for compression, lower ring for oil control)	3	3	3
Oil ring type		3 piece steel rail chrome face	
Ring width:			
Compression	.0775″ to .0780″	.0775″ to .0780″	.0775″ to .0780″
Oil-steel rails	.0250″	.0250″	.0250″
Ring gap:			
Compression	.010″ to .020″	.010″ to .020″	.010″ to .020″
Oil-steel rails	.015″ to .055″	.015″ to .055″	.015″ to .055″

	318	340	360
Ring side clearances:			
Compression	0015″ to .0030″	0015″ to .0030″	0015″ to .0030″
Oil-steel rails	.0002″ to .0050″	.0002″ to .0050″	.0002″ to .0050″
Service rings:			
Ring gap:			
Compression	.010″ to .020″	.010″ to .020″	.010″ to .020″
Oil-steel rails	.015″ to .062″	.015″ to .062″	.015″ to .062″
Ring side clearances:			
Compression	.0015″ to .0040″	.0015″ to .0040″	.0015″ to .0040″
Oil-steel rails	.0002″ to .0050″	.0002″ to .0050″	.0002″ to .0050″

VALVES

	318	340	360
INTAKE			
Head diameter	1.780″	2.020″	1.880″
Length (to centre of face)	4.900″	4.900″	4.900″
Std. Stem diameter	.3720″ to .3730″	.3715″ to .3725″	.3720″ to .3730″
Stem to guide clearance	.0010″ to .0030″	.0015″ to .0035″	.0010″ to .0030″
Max. allowable clearance using "wobble method"	.017″	.017″	.017″
Valve face angle	45°	45°	45°
Valve lift (zero lash)	.373″	.429″	.410″
Valves for service		STD., .005″, .015″ and .030″	
EXHAUST			
Head diameter	1.500″	1.600″	1.600″
Length (to centre of face)	4.900″	4.900″	4.900″
Std. stem diameter	.3710″ to .3720″	.3705″ to .3715″	.3710″ to .3720″
Stem to guide clearance	.0020″ to .0040″	.0025″ to .0045″	.0020″ to .0040″
Max. allowable clearance using "wobble method"	.017″	.017″	.017″
Valve face angle	43°	43°	43°
Valve lift (zero lash)	.399″	.444″	.412″
Valves for service		STD., .005″, .015″ and .030″	

VALVE SPRINGS

	318	340	360
Number		Sixteen	
Free length	2.00″	1.94″	2.00″
Load when compressed to 1-11/16″ damper removed	78 to 88 lbs.	80 to 90 lbs.	78 to 88 lbs.
Load when compressed to 1-5/16″ damper removed	170 to 184 lbs.	231 to 245 lbs.	170 to 184 lbs.

	318	340	360
Valve spring inside diameter	1.010" to 1.030"	1.070" to 1.090"	1.010" to 1.030"
Valve spring installed height	1-5/8" to 1-11/16"	1-5/8" to 1-11/16"	1-5/8" to 1-11/16"
Max. allowable out of square	1/16"	.080"	1/16"
VALVE TIMING			
INTAKE			
Opens BTC	10°	22°	16°
Closes ABC	50°	66°	56°
Duration	240°	268°	252°
EXHAUST			
Opens BBC	58°	74°	60°
Closes ATC	10°	22°	16°
Duration	248°	276°	256°
Overlap	20°	44°	32°
CYLINDER HEAD			
Valve seat run-out maximum	.002"	.002"	.002"
Intake valve seat angle	45°	45°	45°
Finished seat width	.060" to .085"	.060" to .085"	.060" to .085"
Exhaust valve seat angle	45°	45°	45°
Finished seat width	.040" to .060"	.040" to .060"	.040" to .060"
Cylinder head gasket thickness (compressed)	.038"	.038"	.048"
CYLINDER BLOCK			
Cylinder diameter (std.)	3.910" to 3.912"	4.040" to 4.042"	4.000" to 4.002"
Maximum ovality allowed	.005"	.005"	.005"
Maximum taper allowed	.010"	.010"	.010"
Maximum oversize cylinder bore	+.040"	+.040"	+.040"
Reconditioning limits	.001"	.001"	.001"
Tappet bore diameter	.9051" to .9059"	.9051" to .9059"	.9051" to .9059"
Dist. drive lower shaft bushings (interference in block)	.0005" to .0040"	.0005" to .0040"	.0005" to .0040"
Reamed size	.4865" to .4880"	.4865" to .4880"	.4865" to .4880"
Shaft to bushing clearance	.0007" to .0027"	.0007" to .0027"	.0007" to .0027"
ENGINE LUBRICATION			
Pump type		Rotary full pressure	
Pump drive		camshaft	
Operating pressure			
at 500 r.p.m.		20 p.s.i.	
at 1000 r.p.m.		45 to 60 p.s.i.	
Pressure drop with clogged filter		7 to 9 p.s.i.	
Oil filter type		Full flow	

TORQUE SPECIFICATIONS

	TORQUE	THREAD SIZE
Connecting rod nut—plain	45 lbs. ft.	3/8″–24 T.P.I.
Cylinder head bolt (steel gasket)	85	1/2″–13 T.P.I.
Cylinder head bolt (composition gasket)	95	1/2″–13 T.P.I.
Main bearing cap bolt	85	1/2″–13 T.P.I.
Camshaft lock bolt	35	
Camshaft thrust plate	210 lbs. in.	5/16″–18 T.P.I.
Chain case cover (cast)	35 lbs. ft.	3/8″–16 T.P.I.
Crankshaft pulley bolt (Damper)	100	3/4″–16 T.P.I.
Cylinder head cover	40 lbs. in.	
Exhaust manifold bolts and stud nuts (318 —360)	24 lbs. ft.	
(340)	50 lbs. ft.	
Engine front mounting to engine bosses	55	
Engine front mounting to frame	75	
Engine frount mounting to frame bracket-stud	20	
Engine rear mountings to transmission	40	
Engine rear mounting to frame	35	
Transmission housing to cylinder block	50	
Transmission housing cover	100 lbs. in	1/4″–20 T.P.I.
Intake manifold	35 lbs. ft.	3/8″–16 T.P.I.
Intake manifold (refer Procedures)	18 lbs. ft.	
Oil pan drain plug	20 lbs. ft.	1/2″–20 T.P.I.
Oil pan bolt	15	5/16″–18 T.P.I.
Oil pump cover bolt	8	1/4″–20 T.P.I.
Oil pump attaching bolt	30	3/8″–16 T.P.I.
Oil filler tube	30	
Rocker shaft bracket bolt	18	5/16″–18 T.P.I.
Spark plug	30	14 m.m.
Vibration damper bolt	200 lbs. in.	5/16″–24 T.P.I.
Clutch housing bolt	30 lbs. ft.	3/8″–16 T.P.I.
Torque converter/flywheel bolt	55	

SPECIAL TOOLS—V8 ENGINES

E2C5A	*Puller — Steering Arm
E6C15A	Fixture — Spring Testing
E9C5	Stand — Universal Repair
E9C10A	Adaptor — Engine mounting
E9C10B	Adaptor — Engine mounting
E9C10C	Adaptor — Engine mounting
E9C15	Plate — Engine lifting
E9C25	Fixture — Cylinder Head repair
E9C28	Fixture — Cylinder Head repair
E9C30B	*Sleeve — Valve guide wear checking
E9C33A	*Reamer — Valve guide (+ .030″ O.S.)
E9C33B	*Reamer — Valve guide (+ .015″ O.S.)
E9C33C	*Reamer — Valve guide (+ .005″ O.S.)
E9C35D	*Gauge — Valve stem length (1.875″-1.960″)
E9C40A	Reamer Set — Valve tappet bore (+ .008″ and .030″)
E9C40C	*Tester — Hydraulic tappet operation
E9C40H	Remover — Hydraulic tappet
E9C45	Ridge Remover — Cylinder bore
E9C45D	Hone — Cylinder bore, deglazing
E9C50C	Remover Installer — Piston Pin — 318 c.i.
E9C50E	Remover Installer — Piston Pin Anvil & Pilot Only — 318 c.i. (Can be used with 6 Cyl. Tool E9C50B)
E9C50F	Remover Installer — Piston Pin — 360 c.i.
E9C50G	Remover Installer — Piston Pin Anvil Only — 360 c.i. (Use with Pilot E9C50C & Tool E9C50B)
E9C50D	*Remover/Installer — Piston and Rod
E9C55B	*Remover — Vibration damper pulley
E9C55C	*Installer — Vibration damper pulley
E9C57A	*Remover/Installer — Timing case cover oil seal
E9C60C	*Installer — Rear main bearing oil seal
E9C65F	*Holding Tool — Camshaft Gear — Installing
E9C65G	*Remover — Distributor drive shaft, lower bushing
E9C65H	*Installer — Burnisher drive shaft, lower bushing
E9C70	Aligning tool — Oil pump drive gear
E9C80	Lever — Flywheel turning, attachment
E0092	*Compressor — Valve spring
E188	*Expander — Piston ring, Remover/Installer
E193	*Compressor — Piston ring
E1150	Tester — Hydraulic tappet, leakdown
E1151	Test Fluid (for E1150)
E1174	Rack — Tappet and pushrod
	Test Indicator — Cylinder bore
	Cleaner — Valve guide
	Dial Indicator Set
	Remover/Installer — Camshaft bearings
	Test light
	Timing light

* Essential Tools

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

The V8 Valiant engine is a lightweight, valve in head, high efficiency unit. Engine profile has been lowered by means of a flat single-plane intake manifold design and a reduction in the height of the carburettor air cleaner. Engine is designed for the increased performance with the manoeuvrability of a compact car *(see Fig. 1)*.

CRANKSHAFT JOURNAL SIZE IDENTIFICATION

IMPORTANT: A Maltese Cross stamped on the engine numbering pad indicates that engine is equipped with a crankshaft which has one or more connecting rods and/or main bearing journal finished .001 inch undersize. The position of the undersize journal or journals is stamped on the machine surface of the No. 8 counterweight. 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.

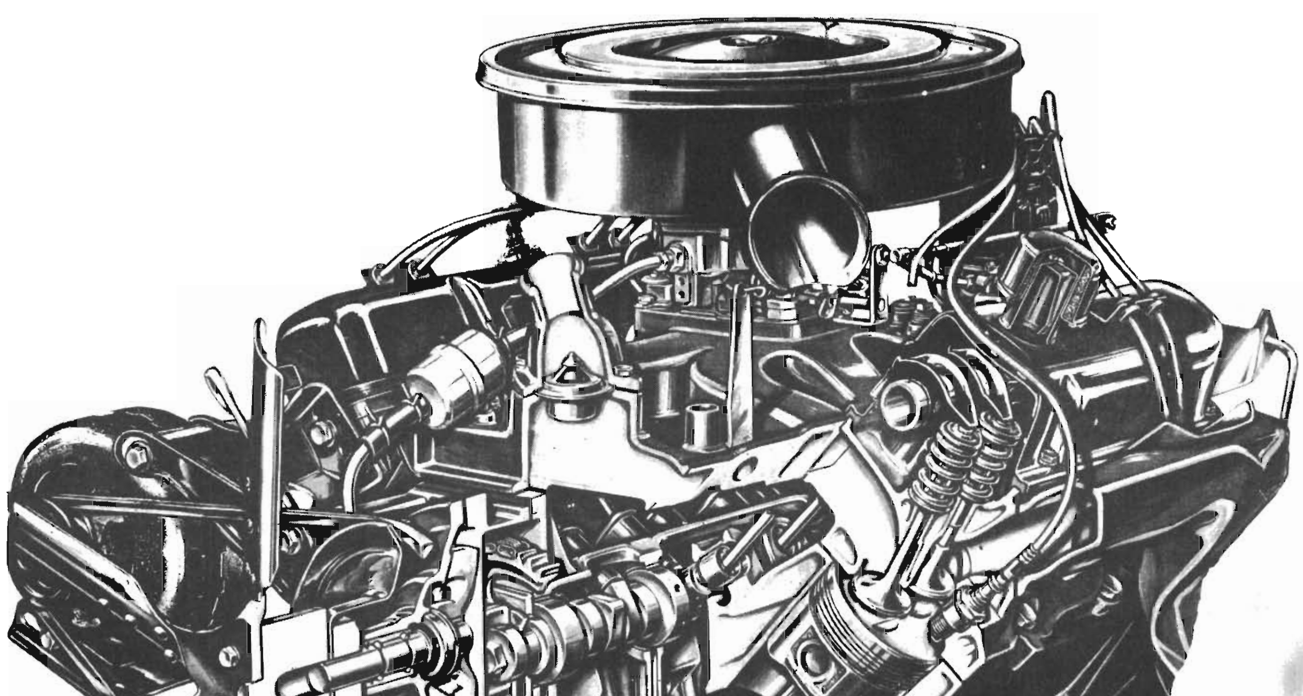


Fig. 1 – Engine Assembly (cut-away — typical view)

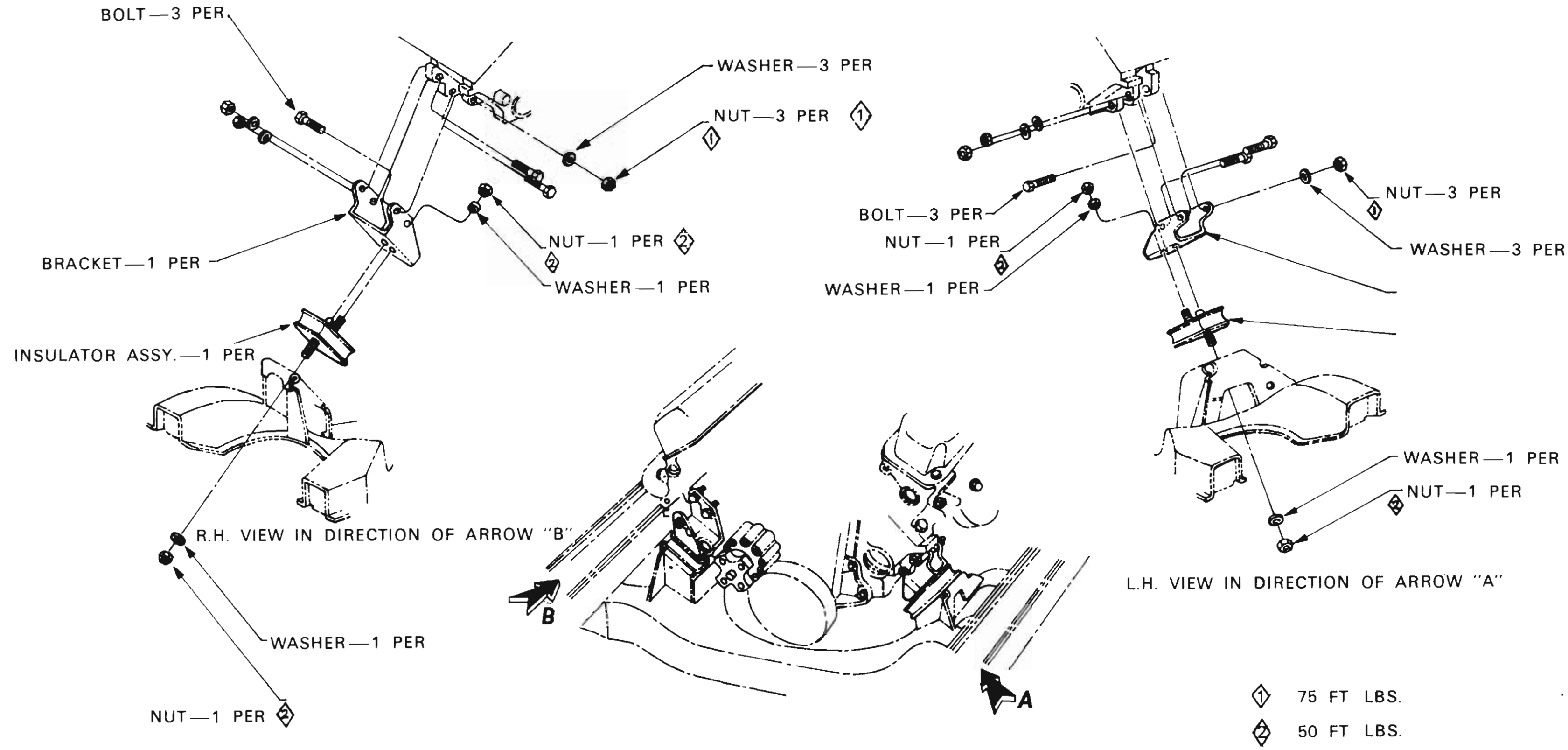


Fig. 1A 8 Cylinder engine supports (front)

2. ENGINE REPLACEMENT

To Remove

(1) Scribe outline of hinge brackets on the hood to assure proper adjustment when installing. Remove hood. Carefully discharge Air Conditioning (where equipped) – *Group 24, Page 24–33.*

(2) Drain cooling system and remove battery.

(3) Remove all hoses, fan shroud (if so equipped), oil cooler lines and radiator.

(4) Disconnect fuel lines, linkage and wires attached to engine units and remove air cleaner and carburettor.

(5) Attach engine lifting Tool E9C15 to carburettor flange .on intake manifold *USING HI-TENSILE CAP SCREWS ONLY.*

(6) Install engine support fixture on the body to support rear of engine.

(7) Drain transmission and torque converter.

(8) Disconnect exhaust pipes at the manifolds, propeller shaft, wires, linkage, speedometer cable and oil cooler lines at transmission.

(9) Attach a crane or other suitable lifting tool to fixture eyebolt.

(10) Remove engine rear support crossmember.

(11) Remove engine front mounts. Raise engine with lifting tool and work engine out of body.

(12) Place engine in repair stand E9C5 and adaptor for disassembly using transmission mounting bolts.

To Install

(1) Attach engine lifting fixture Tool E9C15 to carburettor flange on intake manifold. *USING HI-TENSILE CAP SCREWS ONLY.*

(2) Attach a crane or other suitable lifting tool to fixture eyebolt and install transmission assembly.

(3) Remove assembly from repair stand and lower carefully until positioned in the body with the front engine mounts in place.

(4) Install engine support fixture on body to support rear of engine. Remove the crane or lifting tool.

(5) Install the transmission, rear support crossmember, tighten front engine mounts, remove the engine support fixture.

(6) Connect propeller shaft, wires, linkage speedometer cable, oil cooler lines at transmission, connect exhaust pipes to manifolds. Install transmission filler tube.

(7) Remove engine lifting fixture Tool E9C15 from engine. Install carburettor and fuel lines.

(8) Install radiator and fan shroud (where equipped) hoses, oil cooler lines and connect all wires and linkages.

(8a) Refer *Group 24, Page 24–26,* for Air Conditioning installation and charging procedure.

(9) Install hood using scribe marks for proper alignment.

(10) Close all drain cocks and fill cooling system, install battery.

(11) Fill engine crankcase and transmission. Refer to "Lubrication" group 1 for quantities and lubricant to use. Inspect entire system for leaks and correct as necessary.

(12) Start engine and run until normal operating temperature is reached.

(13) Test timing (with vacuum advance line removed) and adjust carburettor and transmission linkage as necessary. Connect vacuum lines, install air cleaner and road test the vehicle.

3. ROCKER ARMS AND SHAFT ASSEMBLY

To Remove

(1) Disconnect spark plug wires by pulling on the boot straight out in line with plug.

(2) Disconnect vent system hose from right cylinder head cover.

(3) Remove cylinder head cover and gasket.

(4) Remove five rocker shaft bolts and retainers.

(5) Remove rocker arms and shaft assembly.

To Install

(1) Install rocker arm and shaft assemblies with "NOTCH" on end of rocker shaft pointing to centre-line of engine and toward front of engine on the left bank and to the rear on right bank, making sure to install the long stamped steel retainers in the number two and four positions, tighten to 18 lbs. ft.

(2) Install cylinder head cover and tighten to 40 lbs. in.

(3) Install closed crankcase ventilation system.

4. CYLINDER HEADS

The chrome alloy cast iron cylinder heads are held in place by 10 bolts. The spark plugs are located in peak of the wedge between the valves.

To Remove

(1) Drain cooling system and disconnect battery ground cable.

(1a) Remove compressor R.H. bracket and suitably support where it will not obstruct removal of cylinder head. (Right hand side — where equipped).

(2) Remove alternator, carburettor air cleaner and fuel line.

(3) Disconnect accelerator linkage.

(4) Remove vacuum control hose between carburettor and distributor.

(5) Remove distributor cap and wires.

(6) Disconnect coil wires, heat indicator sending unit wire, heater hoses and by-pass hose.

(7) Remove closed vent system and cylinder head covers.

(8) Remove intake manifold, ignition coil and carburettor as an assembly.

(9) Remove exhaust manifolds.

(10) Remove rocker arm and shaft assemblies. Remove push rods and place them in their respective slots in holder Tool E1174 to identify for installation.

(11) Remove the 10 head bolts from each cylinder head and remove cylinder heads.

(12) Place cylinder heads in holding fixture Tool E9C25, and remove spark plugs.

To Install

(1) Clean all gasket surfaces of cylinder block and cylinder heads.

(2) Inspect all surfaces with a straight-edge if there is any reason to suspect leakage.

(3) Coat new gaskets with a suitable sealer where necessary and install on cylinder block.

(4) Remove cylinder heads from holding fixtures and place heads on engine.

(5) Install cylinder head bolts. Starting at top centre, tighten all cylinder head bolts to 50 lbs. ft. in sequence, as shown in *Fig. 2*. Repeat procedure, retighten all cylinder head bolts to 95 lbs. ft. on all engines with composite gasket or 85 lbs. ft. with steel gasket.

(6) Inspect push rods and replace worn or bent rods.

(7) Install push rods, rocker arm and shaft assemblies with the "NOTCH" on the end of rocker-shaft pointing to centreline of engine and toward front of engine on the left bank and to the rear on right bank, making sure to install the long stamped steel retainers in the number two and four positions, tighten to 18 lbs. ft.

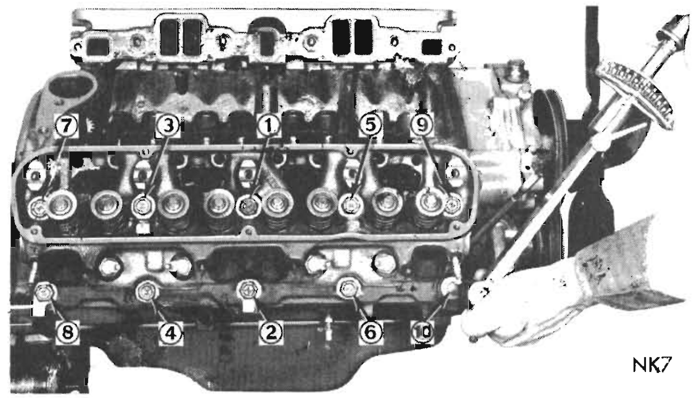


Fig. 2 – Cylinder head tightening sequence (typical)

(8) Cut the three inch strip of sealer material into four equal parts and install under cylinder head gasket lock tabs. Do not use sealer or cement.

(9) Position rubber seals over rails at front and rear of cylinder block. Centre hole in seals must engage dowel pins and end holes locked in tangs of head gasket.

(10) Coat intake manifold side gaskets lightly with part number AP100054 "Pink" sealer or equivalent. Install gaskets with the bead down.

(11) Position intake manifold on engine and install the twelve attaching cap screws "finger tight" in the tightening sequence shown in *Fig. 3*. Tighten cap screws one through four to 25 lbs. ft. and tighten remaining cap screws to 25 lbs. ft. then retighten cap screws one through four to 35 lbs. ft. and follow by retightening the remaining cap screws to 35 lbs. ft. in sequence shown.

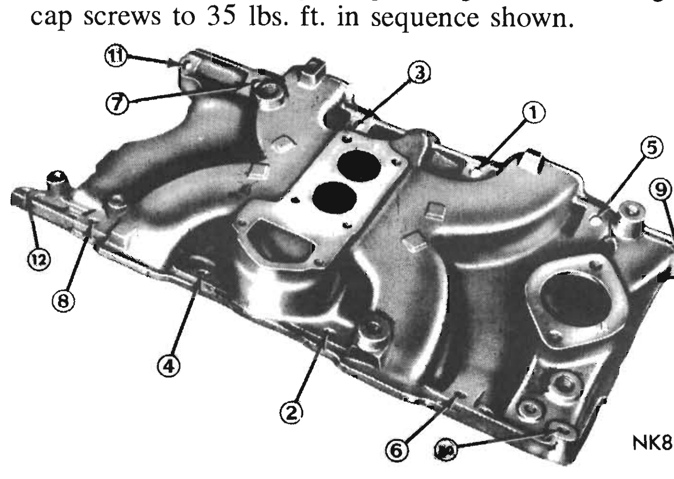


Fig. 3 – Intake manifold tightening sequence

(12) Install exhaust manifolds with new gaskets, the extended shield is used on left side, tighten to 30 lbs. ft.

(13) Adjust spark plug gaps and install the plugs, tightening to 30 lbs. ft.

(14) Install coil wires, heat indicator sending unit wire, heater hoses and by-pass hose.

(15) Install vacuum control hose between carburettor and distributor.

(16) Install accelerator linkage and adjust as necessary.

(17) Install distributor cap and wires.

(18) Re-install A.C. compressor bracket to engine and tighten attaching bolts (where equipped).

(19) Install fuel line, alternator and drive belts. Tighten alternator/pump bracket bolts to 30 lbs. ft. and adjusting strap mounting bolt to 30 lbs. ft. *See Cooling, Group 7, Part 2.*

(20) Place new cylinder head cover gaskets in position and install cylinder head covers. Tighten to 40 lbs. in.

(21) Fill cooling system using demineralized "soft" water and corrosion inhibitor and install battery ground cable.

(22) Install closed crankcase ventilation system.

5. VALVES AND VALVE SPRINGS

Valves are arranged in line, and have valve guides integral with the heads and are inclined at 18°.

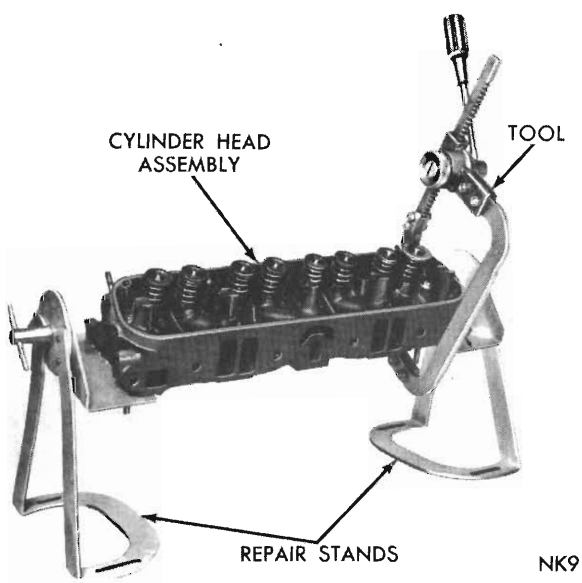


Fig. 4 – Compressing valve spring (typical)

To Remove

(1) With cylinder head removed, compress valve springs using Tool E0092 as shown in *Fig. 4*.

(2) Remove valve retaining locks, valve spring retainers, valve stem cup seals and valve springs. Remove any burrs from the valve stem lock grooves to prevent damage to the valve guide when valves are removed. Identify valves for original installation positions.

To Inspect

(1) Check valves thoroughly and discard burned, warped and cracked valves.

(2) Measure valve stems for wear. New intake valve stem diameter should measure .372″ to .373″ and exhaust valve stem diameter should measure .371″ to .372″. If wear exceeds specifications replace valve.

(3) Remove carbon and varnish deposits from inside of valve guides with a guide cleaner.

(4) Measure valve stem guide clearance as follows: (Using a new valve).

(a) Install sleeve Tool E9C30B over valve stem *(Fig. 5)* and install valve. The special sleeve places the valve at the correct height for checking with a dial indicator.

(b) Attach dial indicator to cylinder head and set it at right angle of valve stem being measured *(Fig. 6)*.

(c) Move valve to and from the indicator. The total dial indicator reading should not exceed .017″. Ream the guides for valves with oversize stems if dial indicator reading is excessive or if the stems are scuffed or scored.

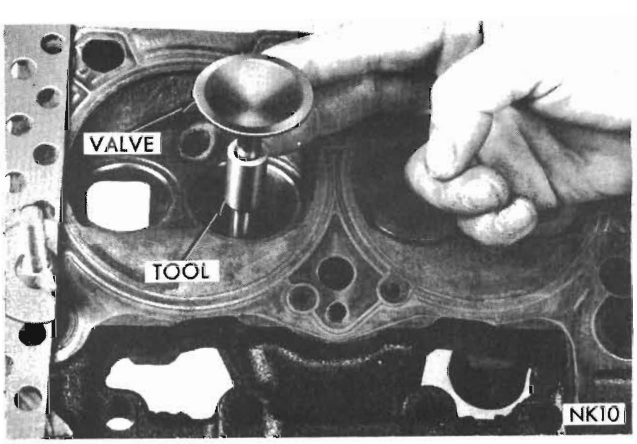


Fig. 5 – Installing valve and Tool E9C30B (typical)

(d) Service valves with oversize stems are available in .005″, .015″ and .030″ oversize. Reamers to accommodate the oversize valve stem are as follows:

Reamer Tool E9C33C (.379 to .380 inch)

Reamer Tool E9C33B (.389 to .390 inch)

Reamer Tool E9C33A (.404 to .405 inch)

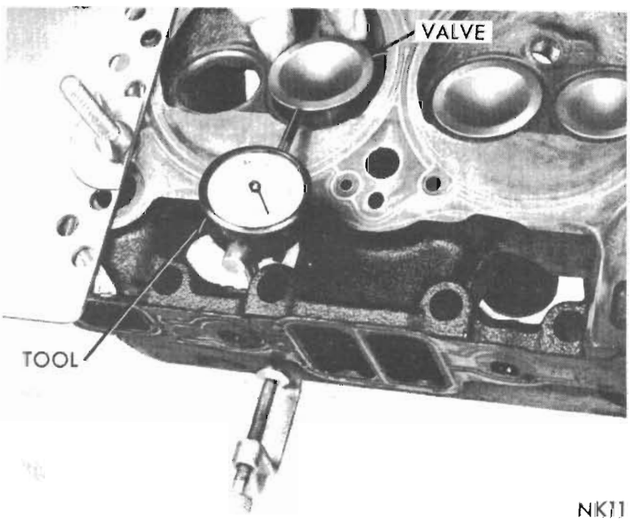


Fig. 6 – Measuring valve guide wear

(e) 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.

6. REFACING VALVES AND VALVE SEATS

(1) The intake and exhaust valve seats and intake valve face have a 45 degree angle. The exhaust valve face has a 43 degree angle.

(2) Inspect the remaining margin after the valves are refaced *(Fig. 7)*. Valves with less than 3/64 inch margin should be discarded.

(3) When refacing valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(4) Measure the concentricity of valve seat using dial indicator. Total run-out should not exceed .002″ (total indicator reading).

(5) Check the valve seat with Prussian blue to determine where the valve contacts the seat. To do this, coat the valve seat lightly with Prussian blue then set valve in place. Oscillate the valve ⅛″ with light pressure applied. If the blue is transferred to the centre of the valve face, contact is satisfactory. If the blue is transferred to top edge of valve face, lower seat with a 30° stone. If the blue is transferred to bottom edge of valve face raise valve seat with a 60° stone.

(6) When seat is properly positioned the width of intake seats should be .060″ to .085″. The width of the exhaust seats should be .040″ to .060″.

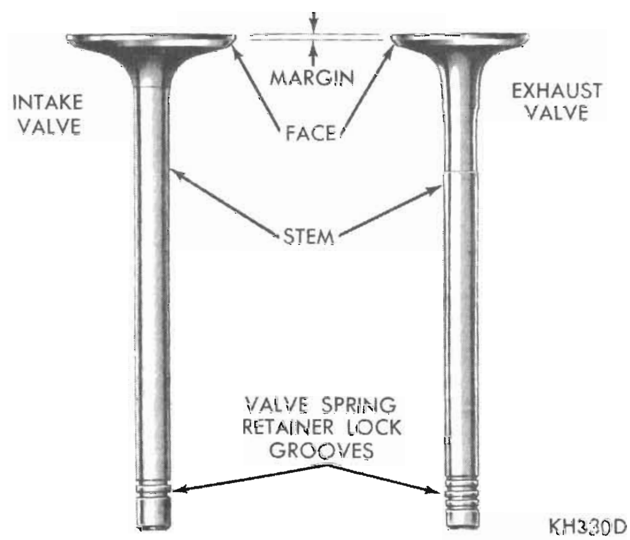


Fig. 7 – Intake and exhaust valves

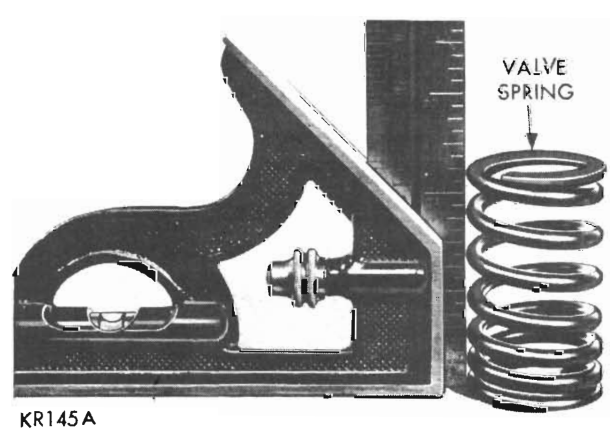


Fig. 8 – Checking valve spring squareness

7. TESTING VALVE SPRINGS

(1) Whenever valves have been removed for inspection, reconditioning or replacement, the valve springs should be tested. Valve springs should meet the specifications shown on Page 9–53.

(2) Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends *(Fig. 8)*. If the spring is more than 1/16 of an inch out of square, install a new spring. 340 C.I.D. engines have a limit of .080″ max. out of square.

To Install

(1) Coat valve stems with oil and insert them in cylinder head.

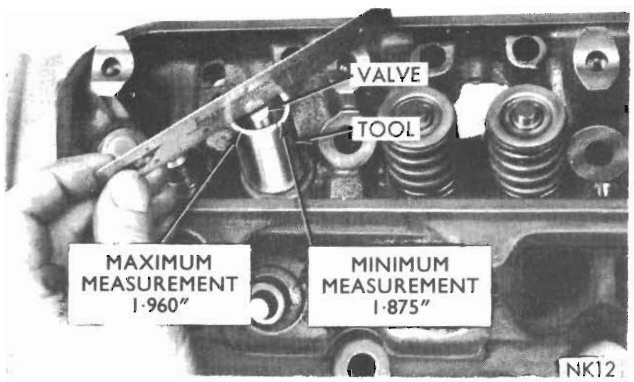


Fig. 9 – Measuring valve stem length (typical)

(2) If valves or seats are reground, check valve stem height with Tool E9C35D *(Fig. 9)*. If valve is too long, grind off the tip until length is within limits of 1.875″–1.960″.

(3) Install new cup seals on all valve stems and over valve guides *(Fig. 11)*. Install valve springs and retainers. Install springs so that closed coils are against cylinder head.

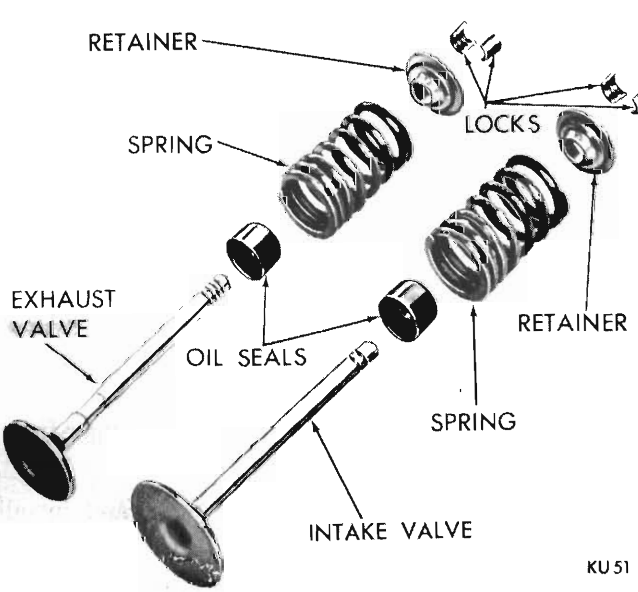


Fig. 10 – Valve assembly (Disassembled view)

(4) Compress valve springs with Tool E0092 install locks and release tool. If valves and/or seats are reground, measure the installed height of springs. Make sure measurement is taken from bottom of spring seat in cylinder head to the bottom surface of spring retainer (if spacers are installed measure from the top of spacer). If height is greater than 1-11/16 inches, install 1/16 inch spacer in head counterbore to bring height back to normal 1⅝ inches to 1-11/16 inches.

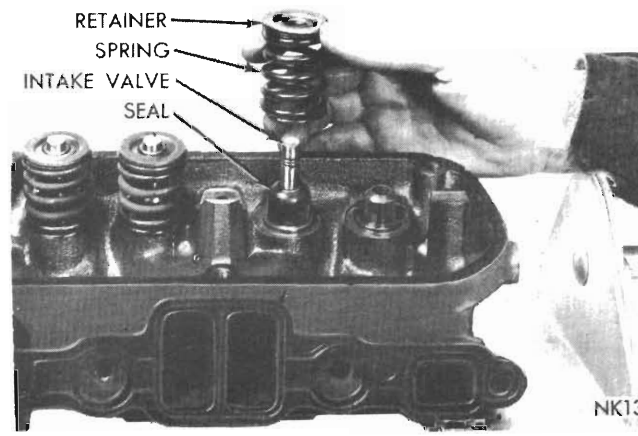


Fig. 11 – Installing valve and cup seals

8. HYDRAULIC TAPPETS

Preliminary to Checking the Hydraulic Tappets

Preliminary to checking the hydraulic tappets, note that it is normal for the tappets to be noisy for approximately 2 minutes after starting the engine, while the air is being bled from the tappet system.

Before disassembling any part of the engine to correct tappet noise, check the oil pressure and check the oil level in the oil pan.

The pressure should be between 45-60 P.S.I. at 1,000 R.P.M.

The oil level in the pan should never be above the "full" mark on the dipstick, or below the "add oil" mark. Either of these two conditions could be responsible for noisy tappets.

Oil Level too High

If oil level is above the full mark on dipstick, it is possible for the connecting rods to dip into the oil while the engine is running and create foam. Foam in the oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow the valves to seat noisily.

Oil Level too Low

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 the intake side of the 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.

> NOTE: Worn valves, 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 the 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 leak down 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 the valve closes. In either case, tappet assembly should be removed for inspection and cleaning.

Tappet Removal

The tappets can be removed with out removing cylinder heads.

(1) Remove cylinder head covers.

(2) Remove rocker arms and shaft assembly.

(3) Remove push rods and *identify to ensure installation in original location.*

(4) Slide pick-up tool E9C40H through 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 ensure installation in original location.*

> NOTE: A diamond-shaped marking stamped on the engine numbering pad indicates that some tappet bodies are .008″ 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 (refer Fig. 12)

(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. 12).*

Testing — Method 1 (Using E9C40C)

(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) Place tappet upright in Tool E9C40C as shown in *Fig. 13*.

(6) Engage push rod of tool with top of tappet plunger. Test leak down by pressing on the tool arm. If plunger collapses instantly as pressure is applied, disassemble tappet, clean and retest *(see Fig. 13)*.

(7) If tappet still does not operate satisfactorily after cleaning, install a new tappet assembly.

NOTE: If the tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream the bore to the next oversize.

Testing — Method 2 (Using Test Fixture E1150)

(1) Disassemble plunger assembly from tappet body and clean all parts thoroughly.

(2) Insert plunger spring in body.

(3) Fill body with clean leakdown fluid at room temperature. (Fluid No. E1151.)

(4) Insert plunger assembly and plunger retainer spring clip.

(5) Thoroughly clean the cup of the test fixture and install in position on the test fixture.

(6) Place tappet in cup with pushrod socket facing upwards.

(7) Pour test fluid into cup until the tappet is submerged.

(8) Place steel ball (supplied with test fixture) in pushrod socket.

(9) Lower weight so that ram rests on steel ball.

(10) Alternately raise and lower weight so that tappet plunger is moved through its full stroke several times in a pumping action. This will expel all air from the tappet, continue this action until lifter becomes "solid".

(11) Lift weight and arm leaving ram resting on tappet plunger.

(12) Adjust ram length to bring the indicator pointer into line with the "SET VAL" mark.

(13) Lower weight onto ram.

(14) With a stop watch check and record the time taken by the indicator pointer to travel from the "Start" mark to the .125" mark. This time should fall between 20 seconds and 130 seconds for a serviceable tappet assembly.

NOTE: ABSOLUTE cleanliness must be observed when carrying out this test procedure.

FLUID: Approved fluids for the purpose of these tests are listed below:

Valvoline	E103
Valvoline	E104
BP	H.T. Fluid
Caltex	Leakdown Fluid
Ampol	41/M.S. 3255
Mobil	Velocite 3

Fluids used for this test must meet the required Material Standards specified by Chrysler Aust. Ltd.

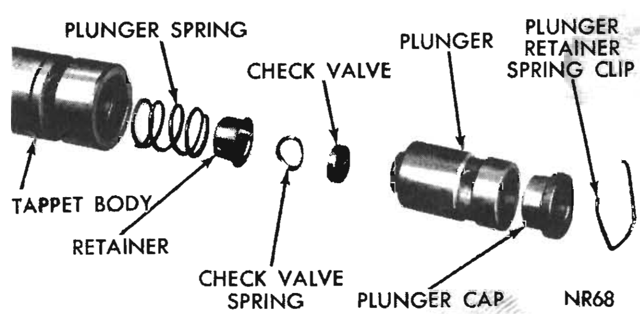


Fig. 12 – Hydraulic tappet assembly (disassembled view)

Installation

(1) Lubricate tappets.

(2) Install tappets and push rods in their original positions.

(3) Install rocker arm and shaft assembly.

(4) Start and run engine 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.

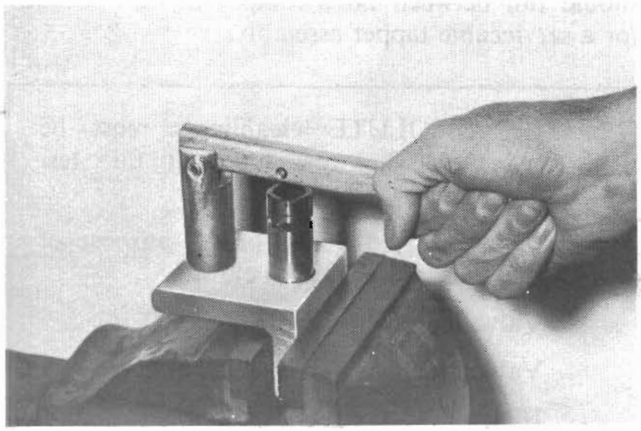


Fig. 13 – Testing tappet using Tool E9C40C

9. CHECKING VALVE TIMING

(1) Turn crankshaft until the No. 6 exhaust valve is closing and No. 6 intake valve is opening.

(2) Insert a ¼ inch spacer between rocker arm pad and stem tip of No. 1 intake valve. Allow spring load to bleed tappet down giving in effect a solid tappet.

(3) Install a dial indicator so plunger contacts valve spring retainer as nearly perpendicular as possible. Zero the indicator.

(4) Rotate crankshaft clockwise (normal running direction) until the valve has lifted .010" for 318, .020" for 360, .030" for 340 engines.

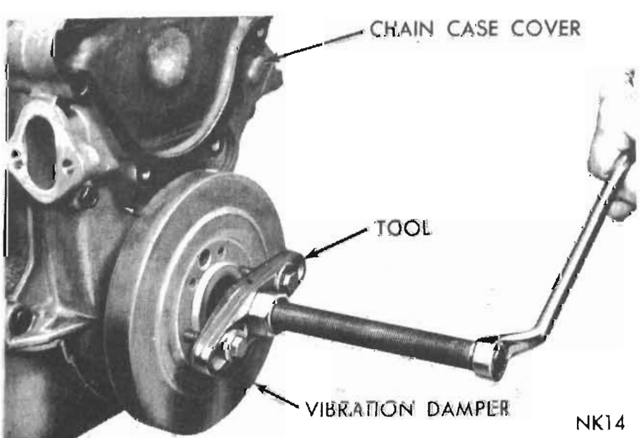


Fig. 14 – Removing vibration damper assembly (Using Tool E9C55B)

CAUTION: Do not turn crankshaft any further clockwise as valve spring might bottom and result in serious damage.

The timing of the crankshaft pulley should now read from 10 degrees before top dead centre to 2 degrees after top dead centre. Remove spacer.

(5) If reading is not within specified limits:

(a) Check sprocket index marks.

(b) Inspect timing chain for wear.

(c) Check accuracy of D.C. mark on timing indicator.

10. TIMING SPROCKETS AND CHAIN

To Remove

(1) Drain cooling system and remove radiator, fan and belt and water pump assembly. Where equipped with air conditioning it may be necessary to move the condenser forward to provide access.

(2) Remove pulley from vibration damper and bolt and washer securing vibration damper on crankshaft.

(3) Install Tool E9C55B and pull vibration damper from end of crankshaft *(Fig. 14)*.

(4) Remove fuel lines and fuel pump.

(5) Loosen oil pan bolts and remove the front bolt at each side.

(6) Remove chain case cover and gasket using extreme caution to avoid damaging oil pan gasket.

It is normal to find particles of neoprene collected between the crankshaft seal retainer and crankshaft oil slinger.

(7) Slide crankshaft oil slinger from end of crankshaft.

Testing Timing Chain for Stretch

(a) Place a scale next to timing chain so that any movement of chain may be measured.

(b) Place a torque wrench and socket over camshaft sprocket attaching bolt and apply torque in direction of crankshaft rotation to take up slack; 30 lbs. ft. (with cylinder heads installed) or 15 lbs. ft. (cylinder heads removed).

With a torque applied to the camshaft sprocket bolt, crankshaft should not be permitted to move. It may be necessary to block crankshaft to prevent rotation.

(c) Holding a scale with dimensional reading even with edge of chain link, apply torque in the reverse direction 30 lbs. ft. (with cylinder heads installed) or 15 lbs. ft. (cylinder heads removed) and note amount of chain movement *(Fig. 15)*.

(d) Install a new timing chain, if its movement exceeds 3/16 inch.

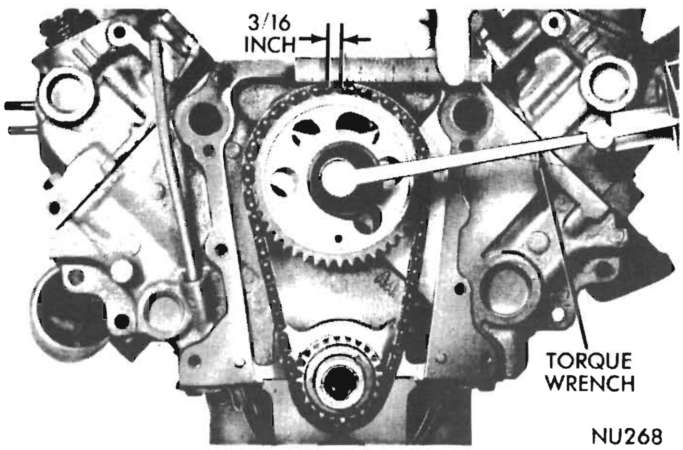


Fig. 15 – Measuring timing chain stretch

(8) Remove camshaft sprocket attaching bolt cup washer and fuel pump eccentric.

(9) Remove timing chain with crankshaft and camshaft sprockets.

To Install

When installing timing chain, use Tool E9C65F 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. 16).*

(1) Turn crankshaft and camshaft to line up with keyway location in crankshaft sprocket and in camshaft sprocket.

(2) Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary centre line through both camshaft and crankshaft bores.

(3) Place timing chain around both sprockets.

(4) Lift sprockets and chain (keep sprockets tight against the chain in position as described).

(5) Slide both sprockets evenly over their respective shafts and use a straight edge to check alignment of timing marks *(Fig. 17).*

(6) Install the fuel pump eccentric, cup washer and camshaft bolt. Tighten bolt to 35 lbs. ft.

(7) Check camshaft for .002 to .006 inch end play with a new thrust plate and up to .010 inch end play with a used thrust plate. If not within these limits install a new thrust plate.

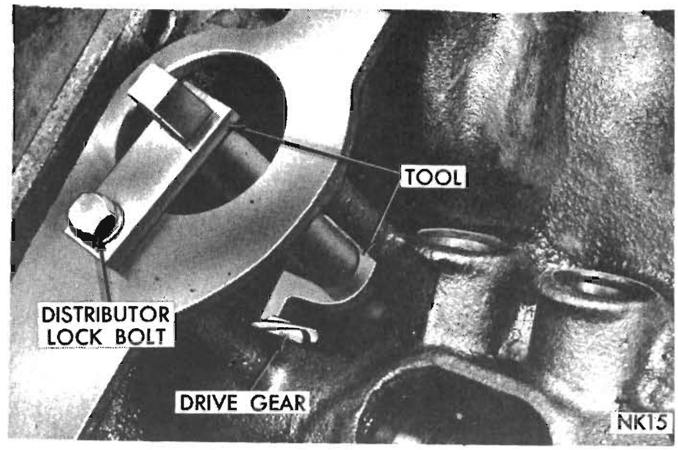


Fig. 16 – Camshaft holding tool E9C65F

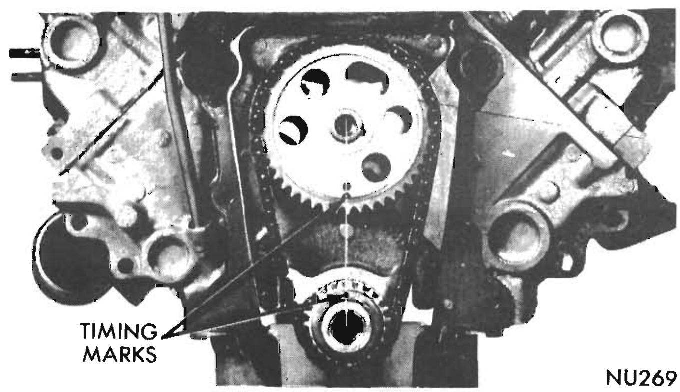


Fig. 17 – Alignment of timing marks

(8) If satisfactory, slide the crankshaft oil slinger over shaft and up against sprocket (flange away from sprocket).

(9) Be sure mating surfaces of chain case cover and cylinder block are clean and free from burrs. Lubricate seal.

(10) Using a new gasket carefully install chain case cover to avoid damaging oil pan gasket. Tighten chain case cover cap screws to 30 lbs. ft. first then tighten oil pan cap screws to 15 lbs. ft. (Make sure that all stud holes are sealed).

(11) Position damper hub slot on key in crankshaft, and slide hub on crankshaft.

(12) Place installing tool part of Puller set E9C55C in position and press damper hub on crankshaft *(Fig. 18).*

(13) Slide pulley over the shaft and attach with bolts and lock washers. Tighten the bolts to 15 lbs. ft.

(14) Install damper hub retainer washer and bolt.

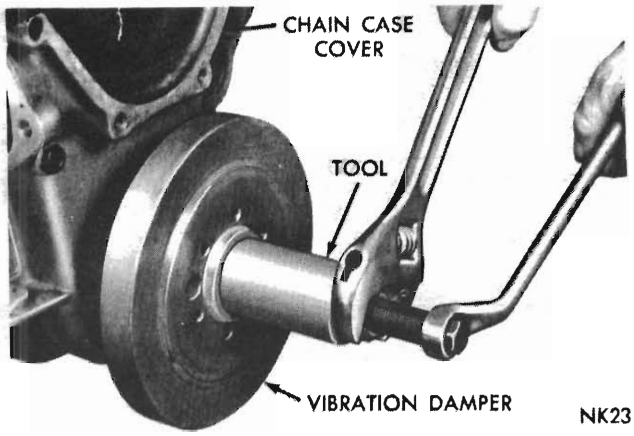


Fig. 18 – Installing vibration damper assembly (Using Tool E9C55C)

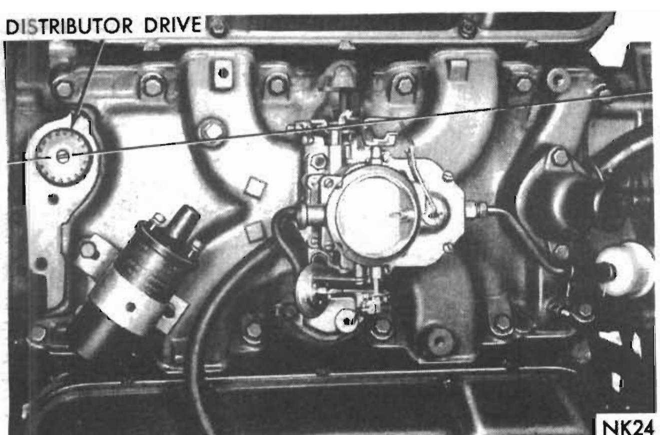


Fig. 19 – Position of distributor drive shaft

(15) Install fuel pump and fuel lines.

(16) Install water pump and housing assembly using new gaskets. Tighten bolts to 30 lbs. ft.

(17) Re-install A/C Condenser (where applicable).

(18) Fill cooling system with demineralized (soft) water, adding Chrysler Parts Corrosion Inhibitor.

(19) With timing indicator on "O" install distributor drive gear with slot pointing to the first intake manifold bolt on left side of engine *(Fig. 19).*

11. TIMING CHAIN CASE COVER OIL SEAL REPLACEMENT (COVER REMOVED)

To Remove

(1) Position remover screw of Tool E9C57A through case cover with inside of case cover up. Position puller blocks directly opposite each other, and force the angular lip between the neoprene and flange of the seal retainer.

(2) Place washer and nut on remover screws. Tighten nut as tight as possible by hand, forcing the blocks into the gap to a point of distorting the seal retainer lip *(Fig. 20).* This is important, remover is only positioned at this point.

(3) Place sleeve over the retainer and place removing and installing plate into sleeve.

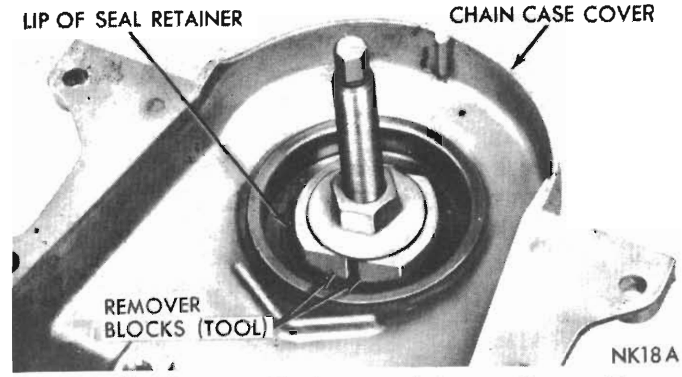


Fig. 20 – Remover block expanded to puller position (Tool E9C57A)

(4) Place flat washer and nut on remover screw. Hold tool centre screw and tighten tool lock nut to remove seal *(Fig. 21).*

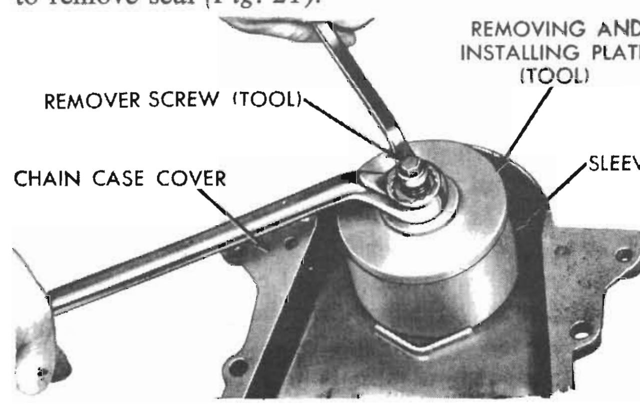


Fig. 21 – Removing oil seal (Tool E9C57A)

To Install

(1) Insert remover screw through removing and installing plate so that the thin shoulder will be facing up.

(2) Insert remover screw with plate through the seal opening (inside of chain case cover facing up).

(3) Place seal in the cover opening, with neoprene down. Place the seal installing plate into the new seal, with protective recess toward lip of seal retainer *(Fig. 22).*

(4) Install flat washer and nut on remover screw, hold screw and tighten the nut *(Fig. 23).*

DO NOT OVER COMPRESS NEOPRENE.

12. CAMSHAFT (Engine Removed from Vehicle)

To Remove

The camshaft has an integral oil pump and distributor drive gear and bolt on fuel pump eccentric. With engine in repair stand, intake manifold, cylinder head covers and timing chain removed.

(1) Remove rocker arm and shaft assemblies.

(2) Remove push rods and tappets and place them in order, since each part should be replaced in its original location.

(3) Remove distributor and lift out the oil pump and distributor drive shaft.

(4) Remove camshaft thrust plate and carefully withdraw the camshaft, being careful not to damage cam bearings with the cam lobes.

To Install

(1) Lubricate camshaft lobes and camshaft bearing journals and insert the camshaft to within 2 inches of its final position in cylinder block.

(2) Install Tool E9C65F with tongue back of distributor drive gear *(Fig. 16)*.

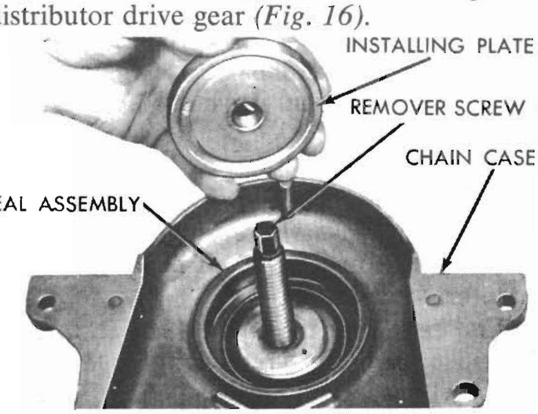


Fig. 22 – Positioning installer plate on a new seal (Tool E9C57A)

(3) 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 rear of cylinder block. Tool should remain installed until the camshaft and crankshaft sprockets and timing chain have been installed.

> Whenever an engine has been rebuilt and a new camshaft and/or new tappets have been installed, the sump should be filled with a recommended oil. When the camshaft is replaced, all of the tappet faces must be inspected for crown with a straight edge. If any negative crown (dish) is observed, tappet must be replaced.

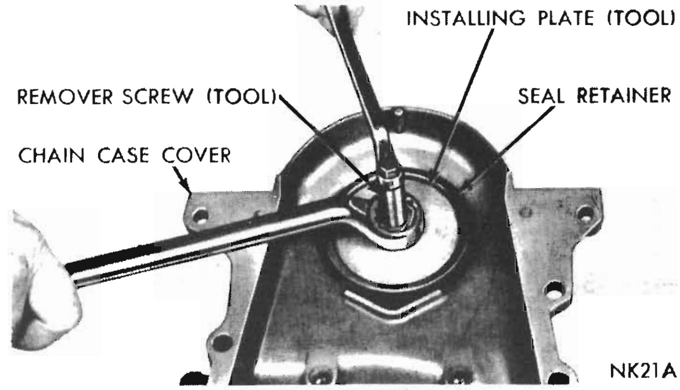


Fig. 23 – Installing a new seal (Tool E9C57A)

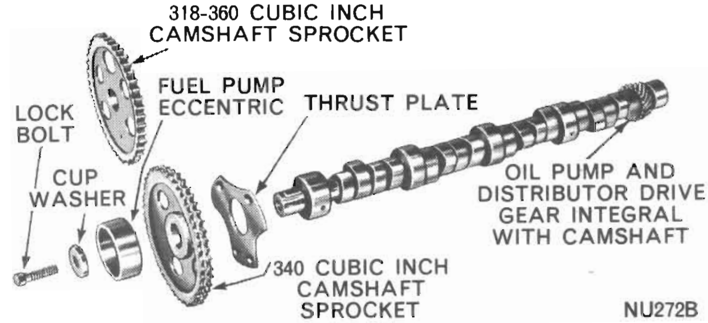


Fig. 24 – Camshaft and sprocket assembly (Disassembled view)

13. CAMSHAFT BEARINGS (Engine Removed from Vehicle) Using a Reliable Camshaft Bearing Tool

To Remove

(1) With engine completely disassembled, drive out rear cam bearing welch plug.

(2) Install proper size adapters and horse shoe washers at back of each bearing shell to be removed and drive out bearing shells *(Fig. 25)*.

To Install

(1) Install new camshaft bearings by sliding the new camshaft bearing shell over proper adapter.

(2) Position rear bearing in the tool. Install horse shoe lock and by reversing removal procedure, carefully drive bearing shell into place.

(3) Install remaining bearings in the same manner.

Bearings must be carefully aligned to bring oil holes into full register with oil passages from the main bearings. Also number two bearing must index with the oil passage to the left cylinder head and number four bearing must index with the oil

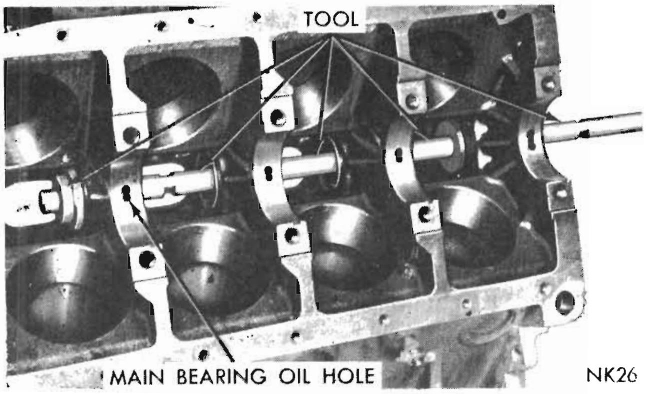


Fig. 25 – Removing camshaft bearings

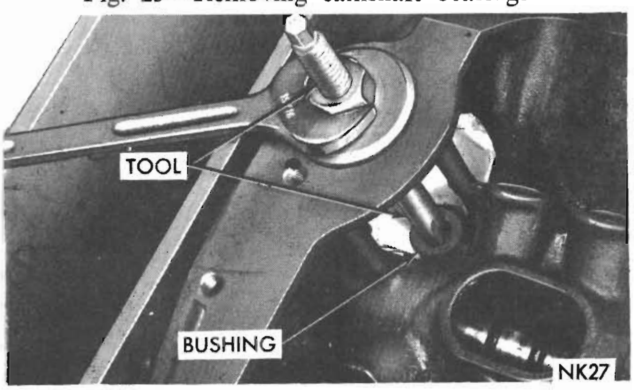


Fig. 26 – Removing distributor drive shaft bushing

passage to the right cylinder head. If the camshaft bearing shell oil holes are not in exact alignment, remove and re-install them correctly. Install a new core hole plug at the rear of camshaft. Be sure this plug does not leak.

Distributor Drive Shaft Bushings

To Remove

(1) Insert Tool E9C65G into old bushing and thread down until a tight fit is obtained *(Fig. 26)*.

(2) Hold Puller screw and tighten Puller nut until bushing is removed.

To Install

(1) Slide new bushing over burnishing end of Tool E9C65H and insert the tool and bushing into the bore, as shown in *Fig. 27*.

(2) Drive bushing and tool into position using a soft hammer.

(3) As the burnisher is pulled through the bushing by tightening the puller nut, the bushing is expanded tight in block and burnished to correct size *(Fig. 28)*. Do not ream this bushing.

Distributor Timing

Before installing the distributor and oil pump drive shaft, time engine as follows:

(1) Rotate crankshaft until No. 1 cylinder is at top dead centre on the firing stroke.

(2) When in this position, the straight line on vibration damper should be under ("O") on the 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 point to the first intake manifold bolt on left side of engine as shown in *Fig. 19*.

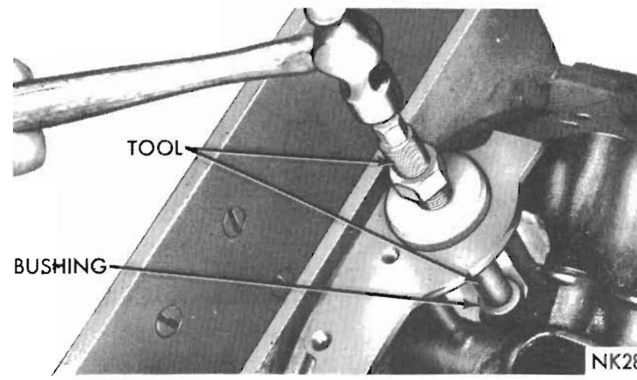


Fig. 27 – Installing distributor drive shaft bushing (Using Tool E9C65H)

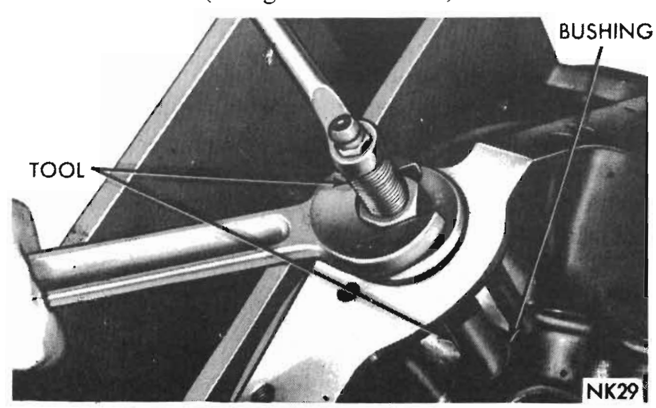


Fig. 28 – Burnishing distributor drive shaft bushing (Using Tool E9C65H)

To Install Distributor

(1) Hold the distributor over the mounting pad on cylinder block with vacuum chamber pointing toward right of engine.

(2) Turn rotor until it points forward and to approximate location of No. 1 tower terminal in distributor cap.

(3) Place distributor gasket 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 and install hold down clamp.

14. CYLINDER BLOCK

Cleaning and Inspection

(1) Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.

(2) If new core hole plugs are installed coat edges of plug and core hole with a suitable sealer and drive plugs in place with driver.

(3) Examine block for cracks or fractures.

(4) Remove top ridge of cylinder bores with E9C45 ridge reamer before removing pistons from cylinder block. Be sure to keep tops of pistons covered during this operation. Pistons and connecting rods must be removed from the top of cylinder block. When removing piston and connecting rod assemblies from the engine rotate crankshaft so that each connecting rod is centred in cylinder bore.

(5) Remove connecting rod cap.

(6) Install Tool E9C50D on one connecting rod bolt and protector over the other bolt and push each piston and rod assembly out of cylinder bore. Taking care not to mark journals.

(7) After removal, install bearing cap on the mating rod.

Cylinder Bore Inspection

The cylinder walls should be checked for out-of-round and taper. 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 co-ordinated with the fitting of pistons and rings in order that specified clearances may be maintained.

Honing Cylinder Bores

Before honing, stuff plenty of clean rags under the bores, over the crankshaft to keep abrasive materials from entering the crankcase area.

(1) Used carefully, the cylinder bore resizing hone equipped with 220 grit stones 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, E9C45D, equipped with 280 grit stones if the cylinder bore is straight and round. 20-60 strokes depending on the bore condition will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes. Use a light honing oil available from major oil distributors. Do not use engine or transmission oil, mineral spirits 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°, the cross-hatch angle is most satisfactory for proper seating of rings *(Fig. 29)*.

(4) After honing, it is necessary that the block be cleaned again to remove all traces of abrasives.

CAUTION: Be sure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil the bores after cleaning to prevent rusting.

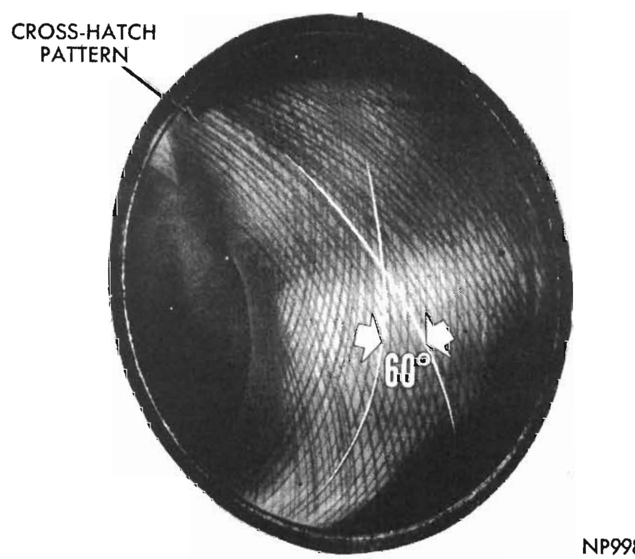


Fig. 29 – Cross-hatch pattern

15. PISTONS AND PINS

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 temperature, expansion forces the pin bosses away from each other, thus causing the piston to assume a more nearly round shape. It is important that pistons be checked for taper and elliptical shape before they are fitted into the cylinder bore *(Fig. 30, 30b)*.

Finished Pistons

All pistons are machined to the same weight in grams, regardless of oversize to maintain piston balance. For cylinder bores which have been honed or rebored, pistons are available in standard and the following over-sizes: .005 .020 and .040 inch.

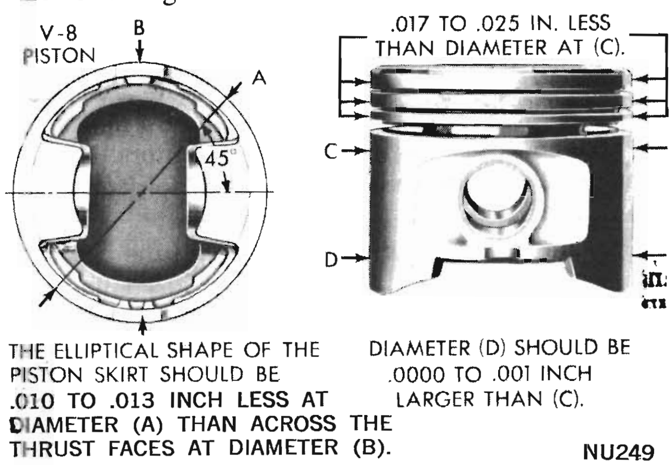


Fig. 30 – Piston measurements 318 CID

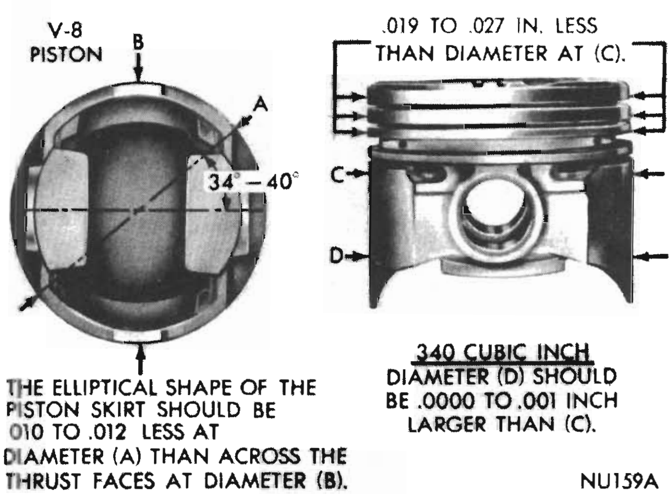


Fig. 30a – 340 cubic inch piston measurements

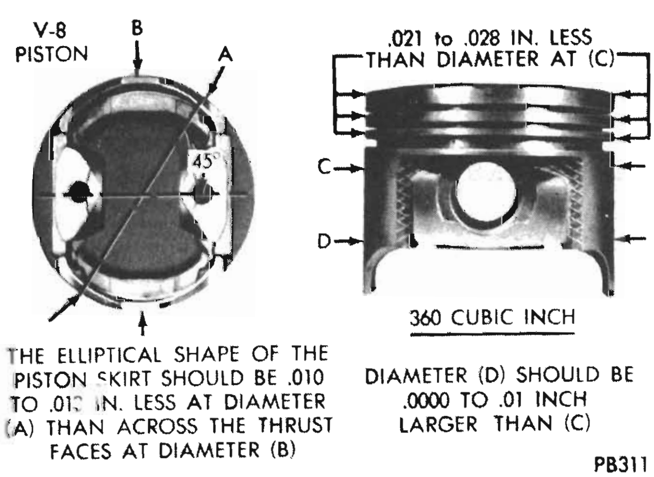


Fig. 30b – 360 cubic inch piston measurements

Piston Fitting

Piston and cylinder bores should be measured at normal room temperature, 70°F. Piston and cylinder wall must be clean and dry. Specified clearance between the piston and the cylinder wall is .0005″ to .0015″. Piston diameter should be measured at the top of skirt 90° to piston pin axis. Cylinder bores should be measured halfway down the cylinder and transverse to the engine crankshaft centreline.

Piston Pins

On 340 cubic inch engines, the piston pin is full floating and is retained by piston pin lock rings.

(1) On 360 and 318 cubic inch engines, the piston pin rotates in piston only, and is retained by the press interference fit of the piston pin to the small end of connecting rod.

340 Cubic Inch Model

With new piston and new pins at room temperature, 70 degrees F., pin should be a light thumb push fit in the piston and connecting rod. Replacement is necessary if there is excessive clearance between the pin and the piston. Ream piston and connecting rod to next oversize. Install piston pin lock rings with the bevelled edge away from the piston pin, using circlip pliers.

(2) Assemble piston and rods for the left hand cylinder bank (1-3-5-7) with piston boss marked "Front" and indent on piston head on the same side as the larger chamfer on large end of connecting rod. Assemble pistons and rods to be used in the right cylinder bank (2-4-6-8) with "Front" and indent opposite.

(3) On 318 or 360 Cubic Inch Engine, the keys on the spacer expander must be inserted into the hole in the oil ring groove over the piston pin front boss.

On 340 Cubic Inch Engine, install the spacer keys into one of the drain holes on the outboard side of the engine.

(4) Install compression rings in middle and top grooves using ring installer Tool E188.

Be sure the mark "Top" on each compression ring is to the top of piston when ring is installed.

Piston Pin Removal

(1) Arrange the tools E9C50C (318 c.i.) and E9C50F (360 c.i.) for removal of the piston pins as shown in (Fig. 31).

(2) Install pilot on main screw.

(3) Install main screw through piston pin.

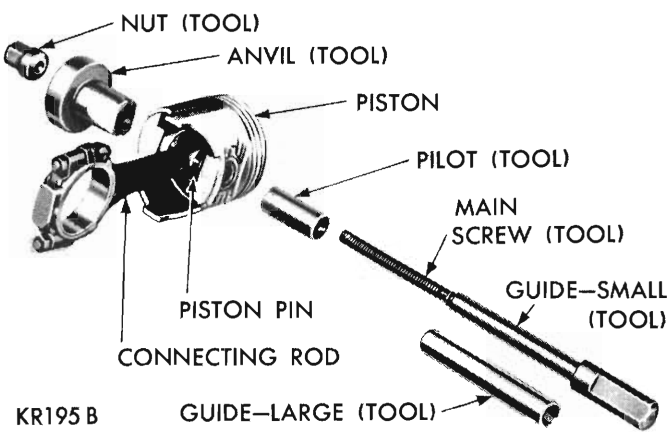


Fig. 31 – Tool arrangement for removing piston pin

(4) Install anvil over threaded end of main screw with small end of anvil against piston boss. Be sure spring is removed from anvil.

(5) Install nut loosely on main screw and place assembly on a press *(Fig. 31a).*

(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.

To Install

(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 the tools E9C50C (318 c.i.) and E9C50F (360 c.i.) for installation of the piston pin as shown in (Fig. 32).

(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 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. 32).*

(8) Install nut on puller screw to hold assembly together. Place assembly on a press *(Fig. 32a).*

(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. 33).*

(11) Place assembly in a vice *(Fig. 33).*

(12) Attach torque wrench to nut and tighten up to 15 lbs. ft. If the connecting rod moves downward on piston pin, reject this connecting rod and piston pin combination. Obtain a connecting rod with proper small end bore diameter and repeat the installation and tightening procedure.

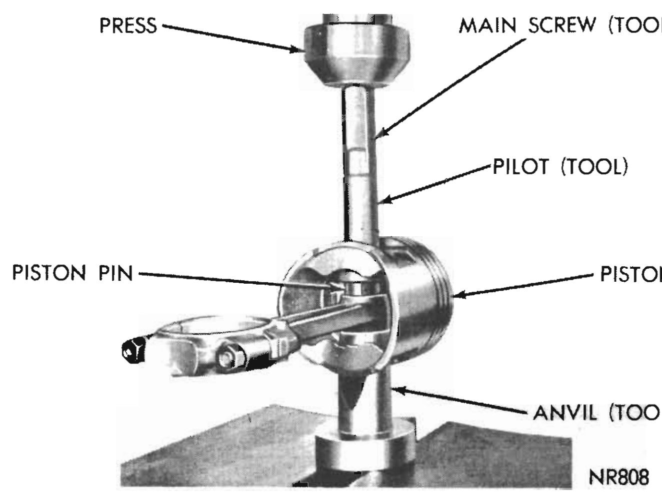


Fig. 31a – Removing piston pin.

(13) If connecting rod does not move under 15 lbs. ft., piston pin and connecting rod interference is satisfactory, remove tool.

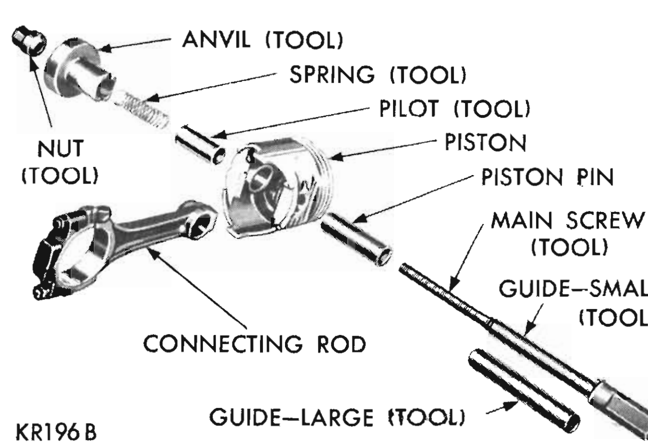


Fig. 32 – Tool arrangement for installing piston pin

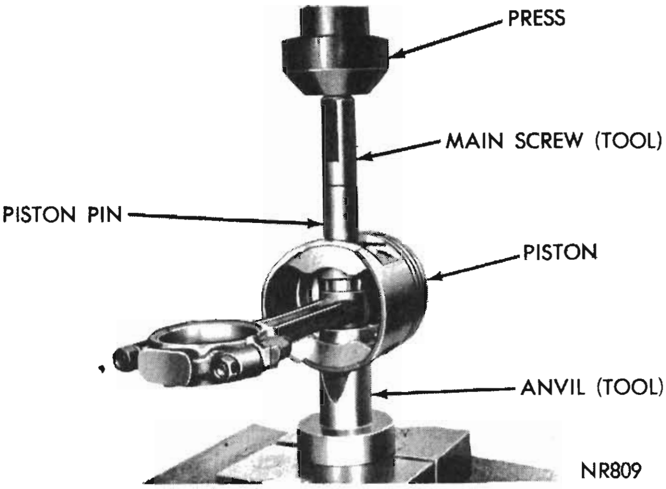


Fig. 32a – Installing piston pin

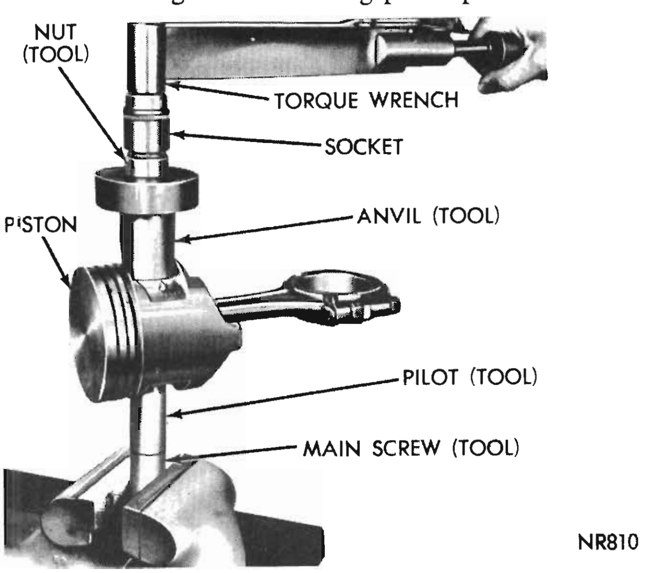


Fig. 33 – Testing fit of piston pin in connecting rod

Fitting Rings

(1) Measure piston ring gap about 2 inches from bottom of cylinder bores in which it is to be fitted (an inverted piston can be used to push the rings down to ensure positioning rings squarely in the cylinder wall before measuring).

(2) Insert feeler stock in the gap. The ring gap should be between .010 to .020 inch for compression rings and .015 to .062 for oil ring steel rails in standard size bores (for new service rings). Maximum gap in .005 inch O/S bores should be .060 inch for compression rings and .070 inch for oil ring steel rails.

(3) Measure side clearance between piston ring and ring land *(Fig. 34)*. Clearance should be .0015 to .003 inch for the top compression ring and the intermediate ring. Steel rails service oil ring should be free in groove, but should not exceed .005 inch side clearance.

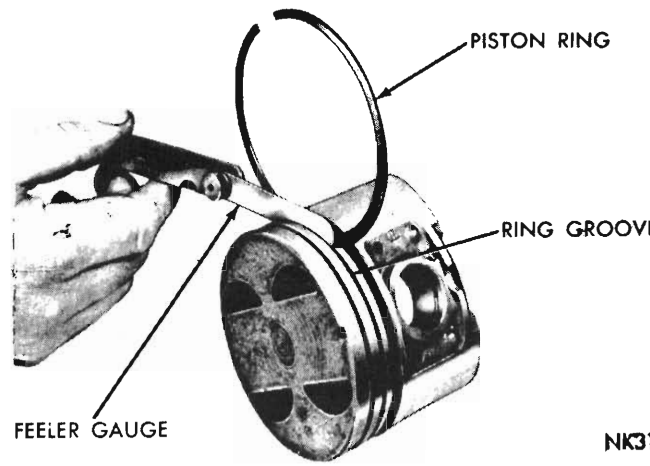


Fig. 34 – Measuring piston ring clearance

NOTE: The keys on the spacer expander must be inserted into the hole in the oil ring groove over the piston pin front boss.

(4) Install the oil ring in lower ring groove using instructions in service ring package.

(5) Install compression rings in middle and top grooves, using ring installer Tool E188. Be sure the mark "Top" on each compression ring is to the top of piston when ring is installed.

CRANKSHAFT JOURNAL SIZE IDENTIFICATION

A crankshaft which has one or more connecting rod or main bearing journals undersize will have stamped on the milled flat on the 1 and 8 crankshaft counterweights:—

Undersize Journal	(Rod) Identification Stamp
.001 inch	R1-R2-R3 or R4
.010 inch	RX
.001 inch	(Main) M1-M2-M3-M4 or M5
.010 inch	MX

A crankshaft which has .010 inch undersize journals will have all rod journals or all main journals resized.

Outward identification is given by a Maltese Cross and Roman number ten "X" stamped on the engine number pad.

16. CONNECTING RODS

Installation of Connecting Rod Bearings

Fit all rods on one bank until completed. Do not alternate from one bank to another, because when the rods are assembled to pistons correctly, they are not interchangeable from one bank to another.

The bearing caps are not interchangeable and should be marked at removal to ensure correct assembly.

Each bearing cap has a small "V" groove across the parting face. When installing the lower bearing shell, make certain that the "V" groove in the shell is in line with the "V" groove in the cap. This provides lubrication of the cylinder wall in the opposite bank.

The bearing shells must be installed so that the tangs are in the machined grooves in the rods and caps. Side clearance with 2 rods installed should be .009″ to .017″.

Limits of taper or out-of-round on any crankshaft journals should be held to .001 inch. Bearings are available in .001, .002, .003, .010 and .012 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.

17. CHECKING CONNECTING ROD BEARING CLEARANCE

Plastigage Method

Connecting rod bearing clearance measurements can be made by the use of Plastigage.

After removing the connecting rod cap, wipe off the oil from the crankpin journal and bearing inserts. Place the Plastigage on bearing parallel with crankshaft. Re-install the cap and tighten attaching nuts alternately to specified torque.

Remove cap and measure the width of the compressed material with a graduated scale to determine the bearing clearance. Desired clearance is included in specifications. If taper of the compressed material is evident, and it exceeds .0005″, check the journal with a micrometer.

Shim Stock Method

(1) On 318 or 360 cubic inch engine, place an oiled .001 inch brass shim stock (½ inch wide and ¾ inch long between the bearing and connecting rod journal.

(2) Install bearing cap and tighten to 45 lbs. ft.

(3) Turn connecting rod ¼ turn in each direction. A slight drag should be felt which indicates clearance is satisfactory. 318 or 360 cubic inch engine correct clearance is from .0005 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, and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.

(2) The oil ring expander ends must butt and the oil ring gaps located as shown in *Fig. 35.*

(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, Tool E193, over the piston and tighten with the special wrench (part of Tool E193).

> CAUTION: Before removal of connecting rods, ensure that they are correctly stamped for identification.

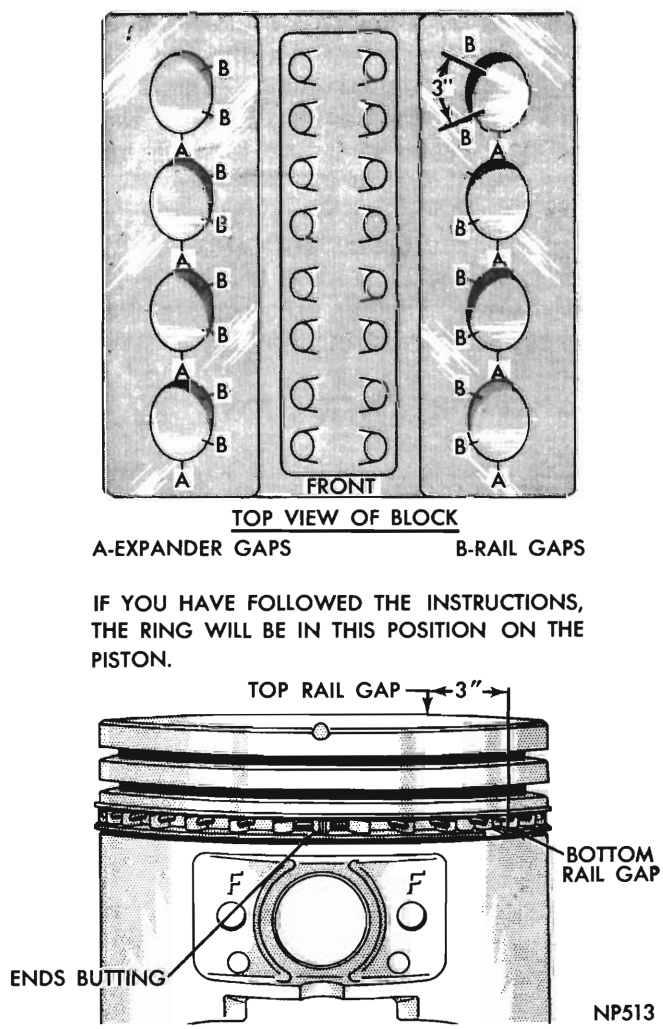


Fig. 35 – Proper oil ring installation

(4) Be sure position of rings does not change during this operation. Screw the connecting rod bolt protector (part of Tool E9C50D) on one rod bolt, and insert rod and piston into cylinder bore. Rotate crankshaft so connecting rod journal is on the centre of cylinder bore.

(5) Attach puller part of Tool E9C50D on the other bolt, and guide the rod over the crankshaft journal *(Fig. 36)*.

(6) Tap the piston down in the cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on crankshaft journal.

(7) The notch or groove on top of piston must be pointing towards front of engine and the larger chamfer of the connecting rod bore must be installed toward crankshaft journal fillet.

(8) Install rod caps, tighten nuts to 45 lbs. ft.

18. CRANKSHAFT MAIN JOURNALS

(Refer to Journal Identification on previous page)

The crankshaft journals should be checked for excessive wear, taper and scoring. Limits of taper or out-of-round on any crankshaft journals should be held to .001 inch. Journal grinding should not exceed .012 inch under the standard journal diameter. Do NOT grind thrust faces of No. 3 main bearing.

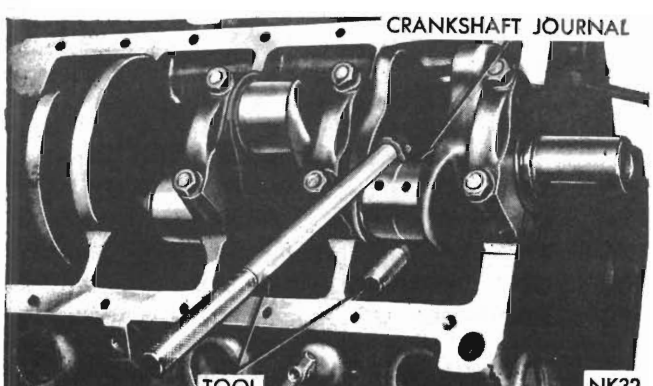


Fig. 36 – Removing or installing connecting rod

Do NOT nick crank pin or main bearing fillets. After regrinding, remove rough edges from crankshaft oil holes and clean out all oil passages.

19. CRANKSHAFT MAIN BEARINGS

Bearing caps are not interchangeable and should be marked at removal to ensure correct assembly. Upper and lower bearing halves are NOT interchangeable. Lower main bearing halves of 1, 2 and 4 are interchangeable. Upper main bearing halves of 1, 2 and 4 are interchangeable.

Upper and lower number 3 bearing halves are flanged to carry the crankshaft thrust loads and are NOT interchangeable with any other bearing halves in the engine *(Fig. 37)*. Bearing shells are available in standard and the following undersizes .001, .002, .003, .010 and 012 inch. Never install an undersize bearing shell that will reduce clearance below specifications.

To Remove

(1) Remove oil pan and mark bearing caps before removal.

(2) Remove bearing caps one at a time. Remove upper half of bearing by inserting a tool *(Fig. 38)* into the oil hole of crankshaft.

(3) Slowly rotate crankshaft clockwise, forcing out upper half of bearing shell.

20. CHECKING MAIN BEARING CLEARANCE

Plastigage Method (See Para 17 Page 9-73)

Shim Stock Method

> NOTE: Only one main bearing should be selectively fitted while all other main bearing caps are properly tightened.

(1) Smooth edges of a $\frac{1}{2}$ x $\frac{3}{4}$ inch piece of brass shim stock, .001 inch thickness.

(2) Lubricate main bearing journals and position shim stock across centre main journal.

(3) Install bearing in centre main bearing cap, bearing tang in groove in cap, lubricate bearing and seat cap in block. Tighten bolts to 85 lbs. ft.

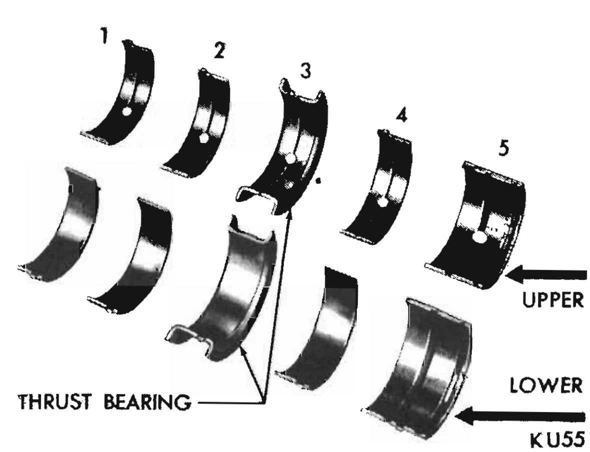


Fig. 37 – Main bearing identification

(4) If a slight drag is felt as the crankshaft is turned (move no more than ¼ 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 the crankshaft cannot be rotated, the bearing is too small and should be replaced with correct size.

(5) Check crankshaft end play is .002–.007 inch. If end play is less than .002 inch or more than .007 inch, install a new No. 3 main bearing.

(6) Fit the remaining bearings in same manner. Selectively fitting one main bearing at a time while all other main bearing caps are properly torqued.

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 a new bearing half more than .001 inch smaller than the lower bearing half.

Installation of Upper Main Bearing

When installing a new upper bearing shell, slightly chamfer the sharp edges from the plain side.

(1) Start bearing in place, and insert a tool into the oil hole of crankshaft *(Fig. 38).*

(2) Slowly rotate the crankshaft counter-clockwise sliding bearing into position.

(3) After all bearings have been fitted, tighten all caps to 85 lbs. ft. The crankshaft end play, should be .002 to .007 inch.

REPLACEMENT ENGINE MAIN BEARING CAPS

Crankshaft bearing caps are line reamed to each individual engine at manufacture, however, interchangeable replacement caps are supplied with oversize stud holes and the overall length 1/32" shorter and *must be fitted by shimming or removing metal from face of caps,* as required (when line reaming equipment is not available) to obtain the same fitting condition as the original cap.

When removing metal from the face of cap, DO NOT FILE, use fine emery cloth on face plate.

21. REPLACEMENT OF REAR MAIN BEARING OIL SEALS (Crankshaft Removed)

Upper Seal

(1) Install a new rear bearing oil seal in the cylinder block so that both ends protrude.

(2) Using Tool E9C60C tap seal down into position until tool is seated in bearing bore. *(Fig. 39).*

(3) Hold tool in this position and cut off the portion of seal that extends above the block on both sides. *(Fig. 40).*

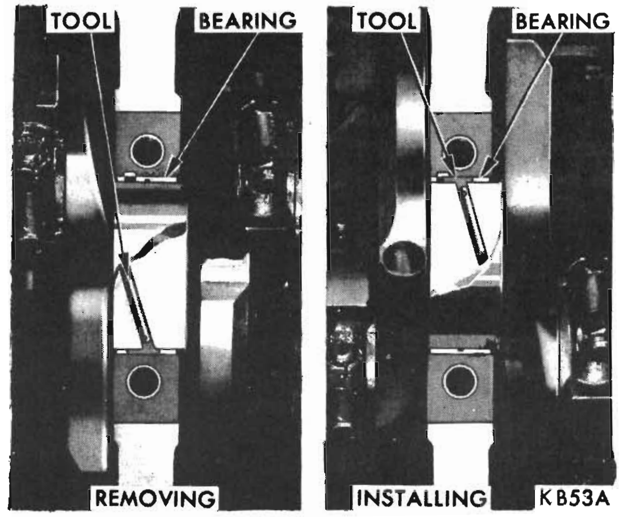


Fig. 38 – Removing or installing upper main bearing

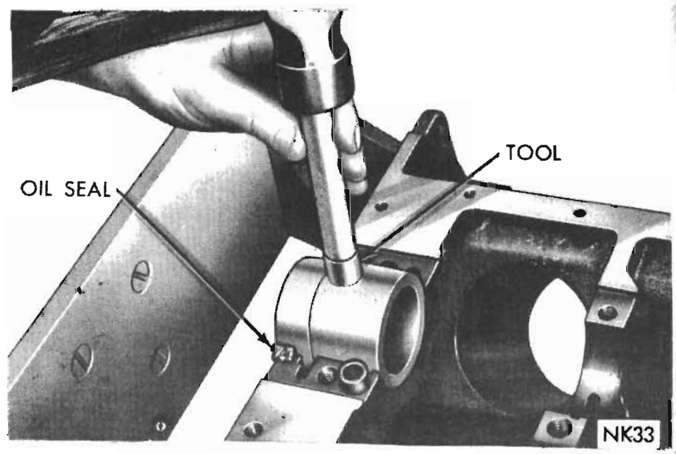


Fig. 39 – Installing rear main upper oil seal

Lower Seal

(1) Install a new seal in bearing cap so that ends protrude.

(2) Using Tool E9C60C tap the seal down into position until tool is seated in bearing bore.

(3) Hold tool in this position and cut off the portion of seal that extends above the cap on both sides.

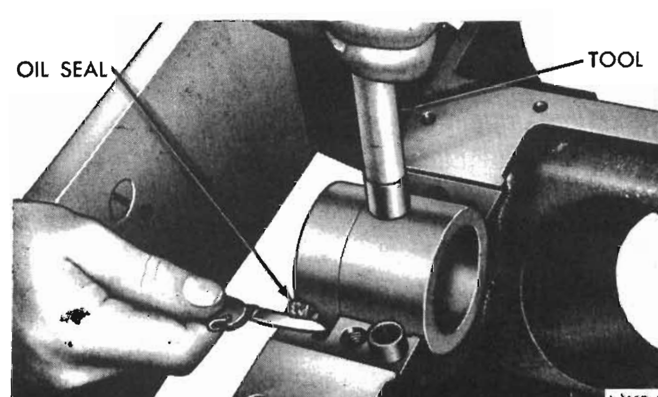


Fig. 40 – Trimming rear main upper oil seal

PART 4 — ENGINE OILING SYSTEM

6 CYLINDER and 8 CYLINDER

SPECIFICATIONS

	8 Cylinder	6 cylinder
Crankcase capacity	6.6 pints	6.6 pints
with filter	8.3 pints	8.3 pints
Oil filter	Replaceable	Replaceable
Oil Pump:		
Drive	Camshaft	Camshaft
Operating pressure @ 1,000 R.P.M.	45-65 p.s.i.	
Operating pressure @ 2,000 R.P.M.		40-70 p.s.i.
Type	Rotary–full pressure	Rotary–full pressure
Pressure drop resulting from clogged filter	7-9 p.s.i.	7-9 p.s.i.
Oil pick-up tube alignment clearance		7⅛" (6 cyl.) from block oil pan surface

TORQUE SPECIFICATIONS

	8 cylinder	6 cylinder
Oil filter bracket attaching stud	17 lbs. ft.	—
Oil pan bolt	15 lbs. ft.	230 lbs. in. 95 lbs. in.
Oil pan drain plug	20 lbs. ft.	
Oil pump attaching bolt	35 lbs. ft.	
Oil pump cover bolt	15 lbs. ft.	30 lbs. in.
Oil pick-up tube retaining screw		30 lbs. in.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. OIL PRESSURE DROP

(1) Low oil level.

(2) Clogged oil filter.

(3) Worn parts in oil pump.

(4) Excessive bearing clearance.

(5) Thin or diluted oil.

(6) Oil pump relief valve stuck.

(7) Oil pump suction tube not aligned.

(8) Oil pump suction tube gasket admitting air.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

The 6 cylinder engine and the 8 cylinder engine have an internally mounted rotor type pump.

2. OIL PAN

6 CYLINDER

To Remove

(1) Disconnect negative (ground cable) from battery.

(2) Drain cooling system and disconnect both radiator hoses.

(3) Loosen alternator adjusting strap and move alternator toward engine as far as possible.

(4) Disconnect exhaust pipe(s) at manifold and remove the fan shroud (where equipped).

(5) Disconnect any other tubes, hoses or wires in engine compartment that might interfere or be damaged by raising front of engine.

(6) Remove steering and idler arm ball joints from steering linkage centre link.

(7) Remove two stud nuts attaching the two engine supports to the K member.

(8) Using a block of wood positioned under forward end of oil pan (over bolt heads) raise front end of engine approximately 2″ with a jack.

> Do not raise engine by jacking it up at vibration damper.

(9) After engine is raised, place short 4″ x 2″ wood blocks between engine supports and the K member then lower engine and remove jack.

(10) Remove clutch lower and front covers or converter cover plate.

(11) Drain oil and remove oil pan. Where difficulty is experienced in the removal of the engine oil pan, of some models equipped with the automatic transmission, the following additional procedures are recommended.

(a) Loosen the two transmission extension housing to support insulator screws.

(b) Lever the transmission forward on the insulator, to the limit of the slots.

(c) Tighten the screws to hold this position.

(d) Raise the engine and place the blocks in position (as described above).

This procedure provides more clearance from the engine compartment.

(12) Manoeuvre the oil pan forward then lower rear end of pan and remove, rotating crankshaft to clear counterweight where necessary.

(13) Note that the oil screen and pipe is flange mounted to the oil pump body. This flange retains the oil pressure relief valve and spring.

(14) Remove the oil screen and pipe taking care not to loose the relief valve and spring.

To Clean and Inspect

(1) Clean oil pan in solvent and wipe dry with a clean cloth.

(2) Scrape all gasket material from the mounting surface of pan and crankcase *(see Fig. 1)*.

(3) Inspect oil drain plug and plug hole for stripped or damaged threads and repair as necessary. Install a new drain plug gasket.

(4) Inspect oil pan mounting flange for bends or distortion. Straighten flange if necessary.

(5) Clean oil screen and pipe thoroughly in clean solvent. Check condition of screen.

(6) Re-install the relief valve and spring if in serviceable condition (replace if worn), checking that the valve slides freely.

(7) Re-install the oil strainer pipe using a new seal (air leakage at this point will cause loss of 'prime' and aerated lubricating oil). Tighten the retaining screws to 30 lbs. in. torque.

(8) Check that the oil tube dimension from the block oil pan surface to the bottom of the strainer is 7-1/8″ (to ensure that the strainer is in contact with the pan, when installed, without excessive interference) *(refer Fig. 1)*.

To Install

(1) Using a new pan gasket, install oil pan and tighten bolts to 200 lbs. in. in sequence *(see Fig. 1a)*.

> NOTE: Only the correct retaining screws with thick washers MUST be used to ensure a tight joint.

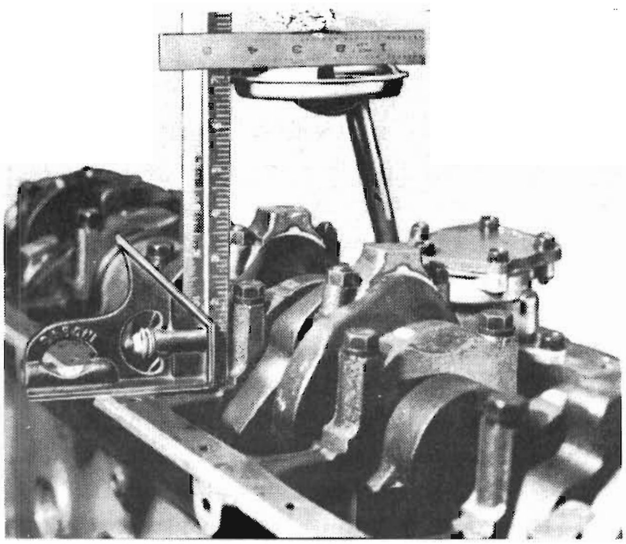


Fig. 1 – Positioning oil pick-up tube (6 cylinder models)

(2) Install lower and front clutch covers or converter cover plate.

(3) Position wood block under forward end of oil pan (over bolt heads), raise front end of engine with a jack.

(4) Remove wood blocks from under engine supports. Lower engine and install the two engine supports to K member studs. Tighten remaining nuts to 75 lbs. ft.

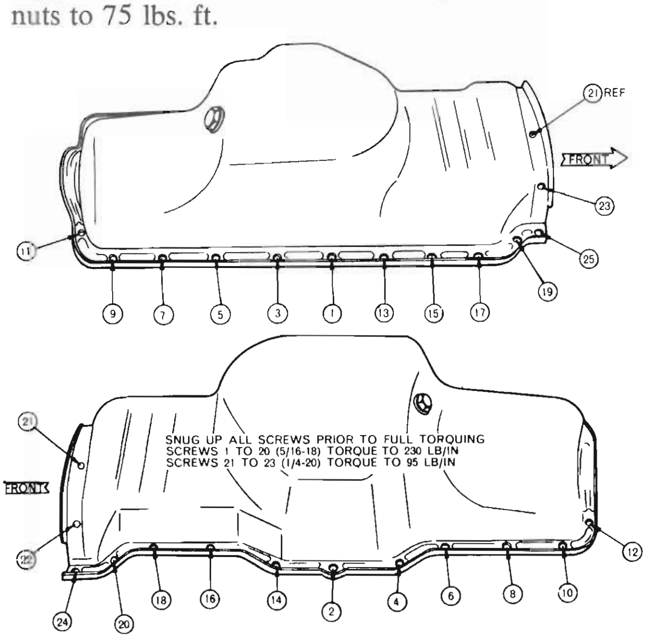


Fig. 1a – Sequence for tightening 6 cylinder model oil pan screws

(5) Connect steering and idler arm ball joints to centre link. Tighten retaining nuts to 40 lbs. ft. and secure with cotter pins.

(6) Connect exhaust pipe(s) to manifold.

(7) Re-position alternator and adjust belt tension (where necessary).

(8) Connect radiator hoses and fill cooling system. Re-install fan shroud (where equipped).

(9) Connect battery cable and any other tubes, hoses, wires where disconnected.

(10) Fill with correct grade and quantity of engine oil and replace dipstick.

Automatic Transmission Models

(a) After re-installation of the engine oil pan, and the re-positioning of the engine supports in the (K) frame brackets, the extension mounting screws must be loosened to allow the assembly to re-position.

(b) Re-tighten the transmission support screws to 35 lbs. ft. torque.

8 CYLINDER

To Remove

(1) Disconnect the negative (ground) cable from the battery and remove the dipstick.

(2) Raise the vehicle on a hoist, drain the oil. Remove the engine to torque converter left housing brace. Remove wires from starting motor.

(3) Remove the steering and idler arm joints from the steering linkage and centre link.

(4) Remove the exhaust cross-over pipe from the exhaust manifolds.

(5) Remove the oil pan bolts and the oil pan.

To Clean and Inspect

(1) Clean oil pan in solvent and wipe dry with a clean cloth.

(2) Scrape all gasket material from the mounting surface of the pan and crankcase.

(3) Inspect oil drain plug and plug hole for stripped or damaged threads and repair as necessary. Install a new drain plug gasket.

(4) Inspect oil pan mounting flange for bends or distortion. Straighten flange if necessary.

(5) Clean oil screen and pipe thoroughly in clean solvent. Check condition of screen.

(6) The bottom of the screen must be parallel with the machined surface of the cylinder block. The bottom of the screen must touch the bottom of the oil pan.

To Install

(1) Using a new pan gasket set, install oil pan, tighten screws to 200 lbs. in. Be sure notches on side gaskets are installed as shown in figure 2 on 360 cubic inch engines.

(2) Re-connect exhaust cross-over pipe to manifolds.

(3) Re-connect the steering and idler arm ball joints to the steering centre link.

(4) Re-connect wires to starting motor and lower vehicle to floor.

(5) Install the dipstick, fill with the proper grade and quantity of motor oil, connect battery ground cable.

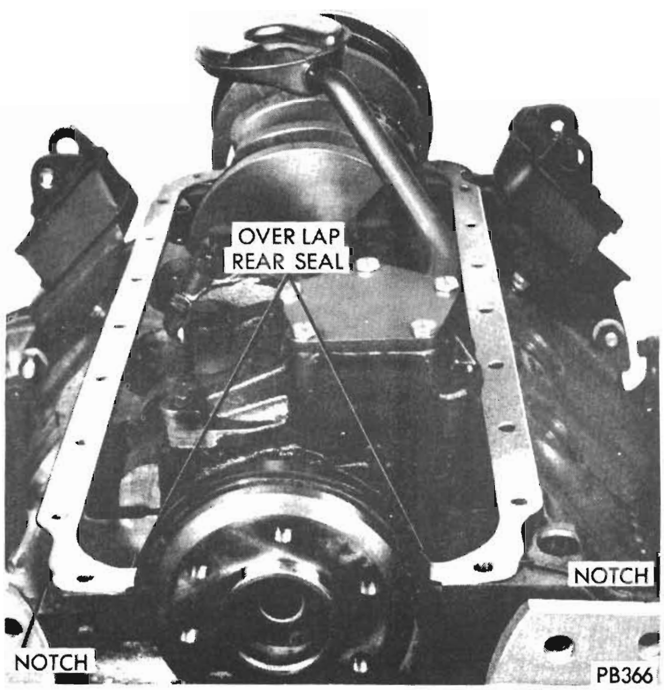


Fig. 2 – Pan side gaskets and rear seal installation (360 c.i.d. engines)

3. OIL PUMP (6 Cylinder)

To Remove

> NOTE: Remove the oil pan as described in paragraph 2 to gain access to oil pump.

(1) Remove oil pump inside engine crankcase by removing 2 retaining screws.

To Disassemble

(Refer Fig. 3)

(1) Remove the 2 screws retaining the oil pick-up tube and strainer. Note, this tube retains the oil pressure relief plunger and spring.

(2) Tip-out the pressure relief plunger and spring from housing intake bore.

(3) Clamp housing carefully in a vice.

(4) Remove the oil pump cover screws and washers.

(5) Remove the cover and oil seal ring.

(6) Lift out the outer rotor sleeve.

(7) Remove the drive gear using Tool E9C70D.

(8) Clean all parts in a suitable solvent and inspect for wear or damage.

Inspection and Repair

(1) The mating face of the oil pump cover should be smooth. If cover is excessively scratched or grooved, it should be replaced.

(2) Check for excessive cover to rotor wear by laying a straightedge across cover surface. If a .0015″ feeler gauge can be inserted between the cover and straightedge, discard cover.

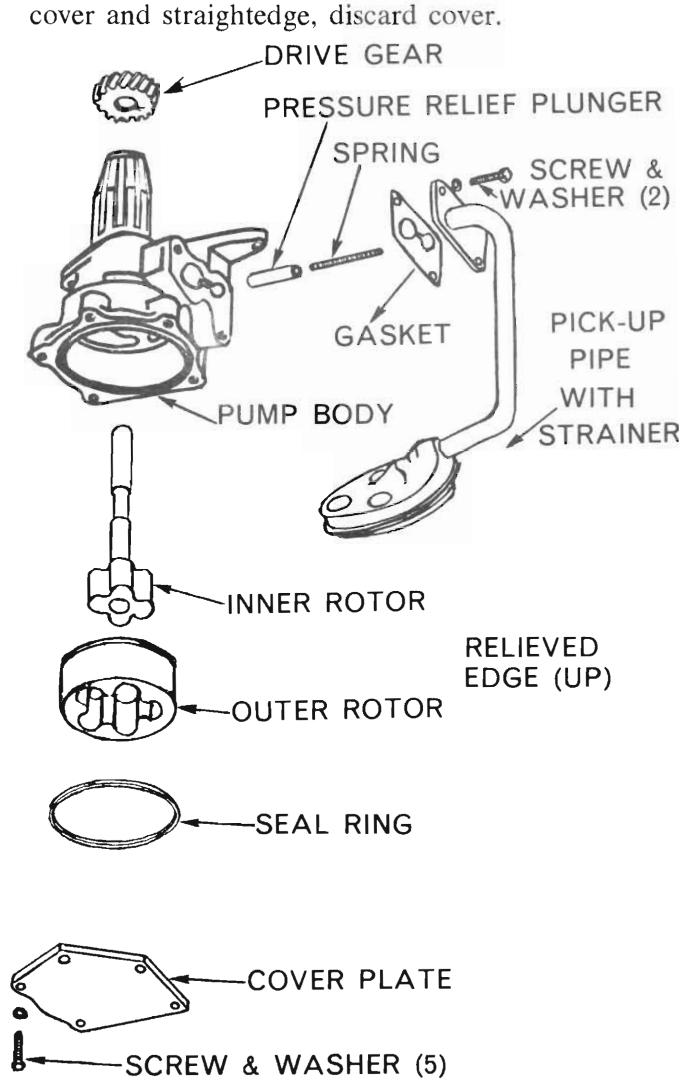


Fig. 3 – Oil pump assembly (Disassembled view)

(3) Measure diameter and thickness of outer rotor. If outer rotor measures less than .825" *(Fig. 4)* and the diameter is less than 2.469", install a new outer rotor.

(4) Measure thickness of inner rotor and lift out the inner rotor and shaft.

(5) If inner rotor measures less than .825" a new inner rotor should be installed *(Fig. 6)*.

(6) Slide outer rotor into pump body, press to one side with fingers and measure clearance between outer rotor and pump body *(Fig. 5)*. If measurement is more than .014", replace oil pump body.

(7) Install inner rotor and shaft into pump body. If clearance between inner and outer rotors *(Fig. 7)* is more than .010", replace inner and outer rotors.

(8) Place a straightedge across the face (between the bolt holes). If a feeler gauge of more than .004" can be inserted between rotors and straightedge, replace pump body.

(9) Inspect oil pump relief valve plunger for scoring and for free operation in its bore. Small scores may be removed with 400 grit wet or dry paper.

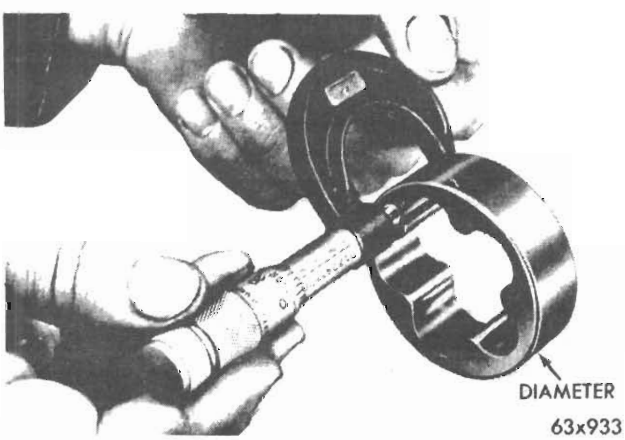


Fig. 4 – Measuring outer rotor thickness (typical)

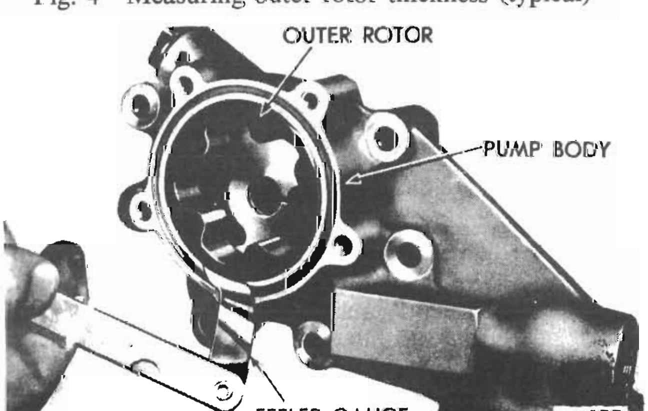


Fig. 5 – Measuring outer rotor clearance (typical)

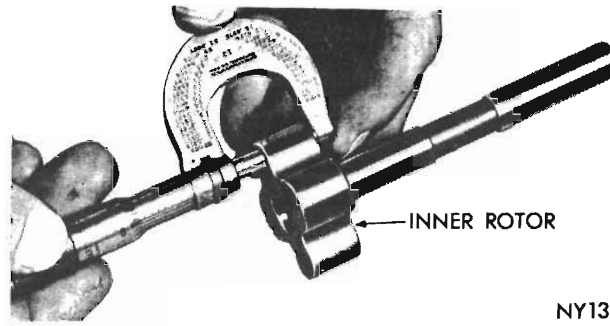


Fig. 6 – Measuring inner rotor thickness (typical)

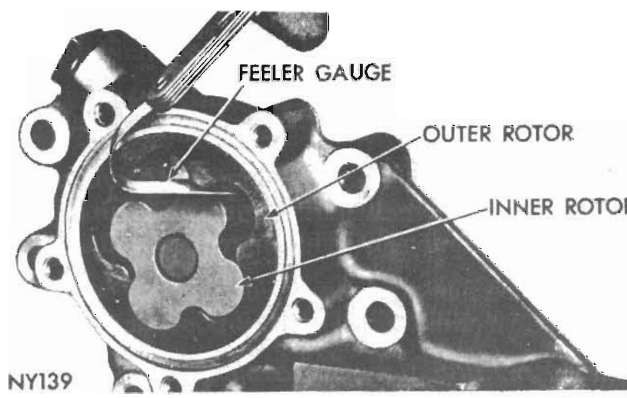


Fig. 7 – Measuring clearance between rotors (typical)

(10) The relief valve spring has a free length of 2.065" to 2.115" and should test 16.2 to 17.2 lbs. when compressed to 1.38 inch. Discard any spring that fails to meet specification.

NOTE: Some assemblies may have spacer shims installed which should be reinstalled to maintain the correct spring compression.

(11) If oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of oil pressure.

To Assemble

(1) Install the oil pump drive gear using Tool E9C70C which ensures that the gear is correctly located on the shaft.

(2) When assembling oil pump, be sure to use a new oil seal ring between cover and body.

(3) Tighten cover bolts to 30 lbs. in.

(4) Prime oil pump and install relief valve and spring.

(5) Install oil pump strainer to pump body. Tighten bolts to 30 lbs. in.

Servicing the Oil Pressure Relief Valve

It is necessary to remove the oil pan and remove the oil pump assembly from the engine to service the relief valve. Remove the oil pick-up tube and strainer retaining screws from the housing then tip-out the relief valve and spring.

Clean parts thoroughly and inspect the plunger for deep scoring and free movement in the valve bore.

Minor scoring may be removed using 400 grit wet or dry paper, taking care not to round-off the sharp edges of the valve.

Check that the relief valve spring free length is 2.065″ to 2.115″ and provides 16.2 to 17.2 lbs. force when compressed to 1.38″. Replace where necessary.

> NOTE: Some assemblies may have spacer shims installed which should be re-installed to maintain the correct spring compression.

Re-install clean serviceable parts to pump housing then secure the spring using the pick-up tube with a new gasket and tighten the screws to 30 lbs. in. torque.

Re-install the oil pump and check the oil strainer distance from the pan gasket face, as described in para. 2.

OIL PUMP (8 Cylinder)

It is necessary to remove the oil pan, and remove the oil pump from rear main bearing cap to service the oil pump.

Disassembly

(1) To remove the relief valve, proceed as follows:

(a) Remove cotter pin, drill a 1/8 inch hole into the relief valve cap and insert a self-threading sheet metal screw into cap.

(b) Clamp screw into a vice and while supporting oil pump, remove cap by tapping pump body using a soft hammer. Discard cap and remove spring and relief valve *(Fig. 8)*.

(2) Remove oil pump cover bolts and lock-washers, and lift off cover.

(3) Discard oil seal ring.

(4) Remove pump rotor and shaft, and lift out outer rotor.

(5) Wash all parts in a suitable solvent and inspect carefully for damage or wear.

Inspection

(1) The mating face of the oil pump cover should be smooth. If cover is excessively scratched or grooved, it should be replaced.

(2) Check for excessive cover to rotor wear by laying a straightedge across cover surface. If a .0015 inch feeler gauge can be inserted between the cover and straightedge, discard cover and install a new one.

(3) Measure diameter and thickness of outer rotor. If outer rotor measures less than .825 inch *(Fig. 4)* and the diameter is less than 2.469 inches, install a new outer rotor.

(4) Measure thickness of inner rotor.

(5) If inner rotor measures less than .825 inch, a new inner rotor shoul be installed *(Fig. 6)*.

(6) Slide outer rotor into pump body, press to one side with fingers and measure clearance between outer rotor and pump body *(Fig. 5)*. If measurement is more than .014 inch, replace oil pump body.

(7) Install inner rotor and shaft into pump body. If clearance between inner and outer rotors *(Fig. 7)* is more than .010 inch, replace inner and outer rotors.

(8) Place a straightedge across the face (between the bolt holes). If a feeler gauge of more than .004 inch can be inserted between rotors and straightedge, replace pump body.

(9) Inspect oil pump relief valve plunger for scoring and for free operation in its bore. Small

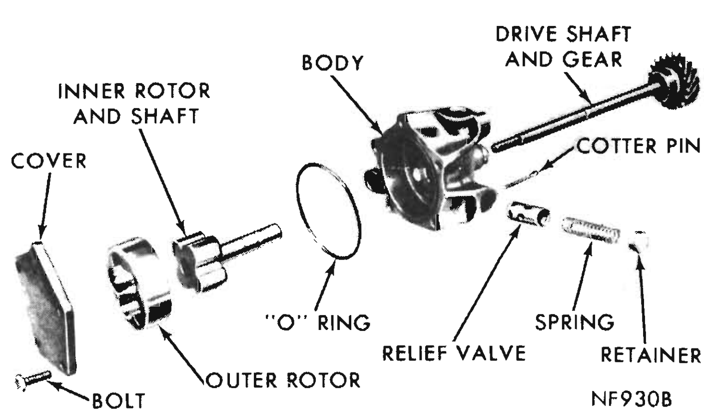


Fig. 9 – Oil pump assembly (disassembled view)

scores may be removed with 400 grit wet or dry paper.

(10) The relief valve spring has a free length of 2-1/32 to 2-3/64 inch and should test 16.2 to 17.2 lbs. when compressed to 1-11/32 inch. Discard springs that fails to meet specifications.

(11) Install the relief valve, spring, and a new retainer cap. (Spring seats inside retainer cap). Press retainer in housing so that top of retainer cap is within the relief valve bore diameter as shown in *Fig. 8*. Install cotter pin.

(12) If oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of oil pressure.

Assembly

(1) When assembling oil pump, be sure to use a new oil seal ring between cover and body *(Fig. 7)*.

(2) Tighten cover bolts to 95 lbs. in.

(3) Prime oil pump.

(4) Install oil pump and strainer to rear main bearing cap. Tighten bolts to 35 lbs. ft.

OIL FILTER (6 Cylinder)

(1) Using a suitable tool, unscrew filter from oil filter bracket and discard.

(2) Wipe base clean — lubricate seal.

(3) Install new filter on base until gasket contacts base. CAUTION: Filter MUST incorporate a No-Flow Back Valve.

(4) To obtain an efficient seal, tighten filter by HAND the additional number of turns indicated on replacement filter.

(5) Start engine and inspect for leaks.

Servicing the Oil Pressure Relief Valve (8 Cylinder Only)

It is necessary to remove the oil pan, and remove oil pump from rear main bearing cap to service the pressure relief valve.

To remove the relief valve, proceed as follows:

(1) Remove cotter pin, drill a 1/8 inch hole in the relief valve cap and insert a self-threading sheet metal screw into cap.

(2) Clamp screw into a vice and while supporting oil pump, remove cap by tapping pump body using a soft hammer. Discard cap.

(3) Remove spring and plunger.

(4) Clean parts thoroughly. Inspect oil pump relief valve 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.

(5) The relief valve spring has a free length of 2-1/32 to 2-3/64 inch and should test 16.2 to 17.2 lbs. when compressed to 1-11/32 inch. Discard spring that fails to meet specifications.

(6) Install the relief valve, spring, and a new retainer cap. (Spring seats inside retainer cap). Press retainer in housing so that top of retainer cap is within the relief valve bore diameter as shown in *Figure 8*. Install cotter pin.

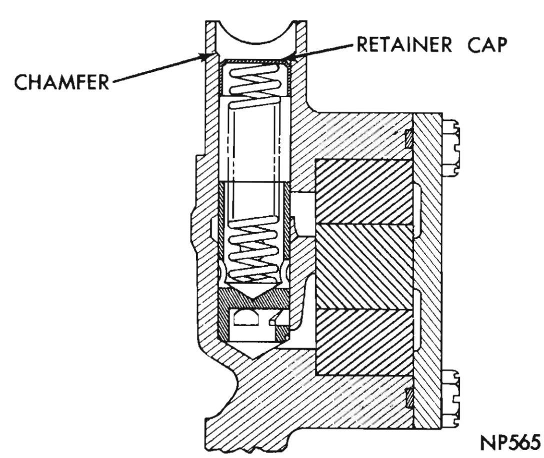


Fig. 8 – Proper retainer cap installation

GROUP 11

EXHAUST SYSTEM

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

TORQUE SPECIFICATIONS

	6 Cylinder	8 Cylinder
Exhaust Pipe Flange Nuts	24 lbs. ft.	24 lbs. ft.
Intake to exhaust manifold bolts	25 lbs. ft.	—
Exhaust manifold to cylinder head nuts	10 lbs. ft.	15 lbs. ft.
Intake manifold to cylinder head screws	10 lbs. ft.	270 lbs. in.
Heat control valve counterweight clamp bolt	—	50 lbs. in.
Exhaust pipe clamp nuts	100 lbs. in.	100 lbs. in.
Hanger clamp screws	95 lbs. in.	95 lbs. in.
Hanger attaching screws	—	200 lbs. in.

SERVICE DIAGNOSIS

CONDITIONS—POSSIBLE CAUSES

1. EXCESSIVE EXHAUST NOISE OR VIBRATION

(1) Check for interference of exhaust pipe, muffler or tail pipe.

(2) Check hangers for looseness or damage and position hangers to ensure free movement of system.

(3) Check engine mounts for looseness, deterioriation of rubber from oil or excessively hard rubber mounts.

(4) Check muffler for loose internal baffles.

(5) Loosen entire exhaust support system, road test to permit self alignment and re-tighten.

2. LEAKING EXHAUST GASES

(1) Mating faces of manifold to cylinder head should be checked and held to within .008″ alignment.

(2) Check muffler and connections for leakage.

(3) Check tail pipe for restrictions.

(4) Check leaks at pipe joints and manifold connections.

(5) Check for cracked manifold.

(6) Remove manifold and install new gaskets if necessary, after carefully inspecting both cylinder head and manifold mating surfaces. Tighten manifold nuts evenly, working from centre to outer ends of manifold.

(7) Check for bent or pinched exhaust or tail pipes. Such conditions will retard the flow of exhaust gases. Install new parts as required.

(8) Tighten clamp at rear muffler connection.

3. ENGINE HARD TO WARM UP

(1) Check operation of heat control valve and make necessary repairs.

(2) Check for choke sticking.

4. MANIFOLD HEAT CONTROL VALVE RATTLE

(1) Check for broken thermostatic spring and make any necessary corrections.

(2) Check for weak or broken anti-rattle spring and make any necessary repairs or replacements.

(3) Check shaft for looseness in manifold.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

6 CYLINDER

The intake manifold consists of six long, curved tubes which supply fuel and air to each individual cylinder from a single down-draught carburettor. The exhaust manifold located on the same side of the cylinder head as the intake manifold, has large-radius curves, which permit exhaust gases to leave the cylinders with a minimum of back pressure and power loss. A thermostatic heat control valve is incorporated to direct exhaust heat to a heat chamber beneath the carburettor to help vaporize the fuel for better warm-up performance. *(Fig. 2).*

Vehicles equipped with E37 & E38 options

Vehicles equipped with E37 option packs have three twin choke side-draught Weber carburettors and an extractor exhaust manifold. Removal and installation is similar to the conventional system, except that the intake and exhaust manifolds are separate and the exhaust pipe connects to the manifold by means of a clamp instead of a flange fitting.

Vehicles equipped with E38 option packs have a similar carburettor and intake manifold system. However, the extractors are of the dual type feeding into a complete dual system. Removal and installation procedures are the same as for the E37 equipped vehicle, excepting the fact that the system is duplicated.

Inlet manifolds are of the short ram type and are removed in a similar manner to a standard manifold, except that a manual choke is used. Care should be taken when handling Weber carburettors not to damage the throttle spindles and discs.

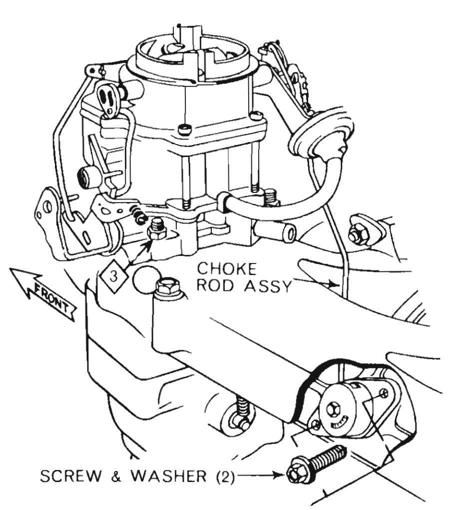


Fig. 1 – Choke coil housing and rod.

A stove type automatic choke is standard equipment on all models. Its sensing element is installed in a housing on the exhaust manifold *(6 cyl. Fig. 1)* and on the inlet manifold *(8 cyl. Fig. 3)*. Here it receives sufficient heat to make the choke open quickly for good warm-up fuel economy.

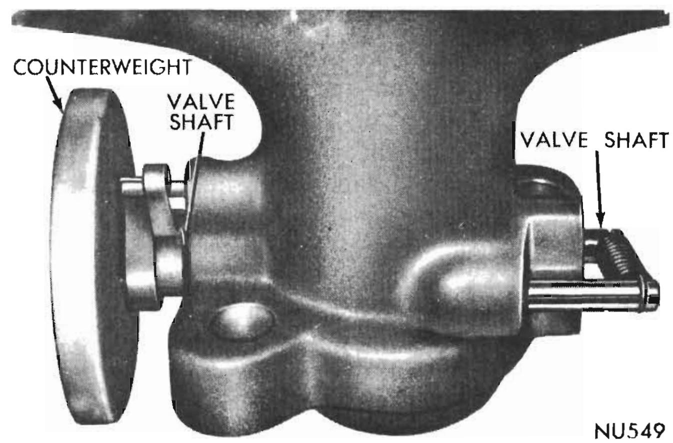


Fig. 2 – Exhaust manifold heat control valve.

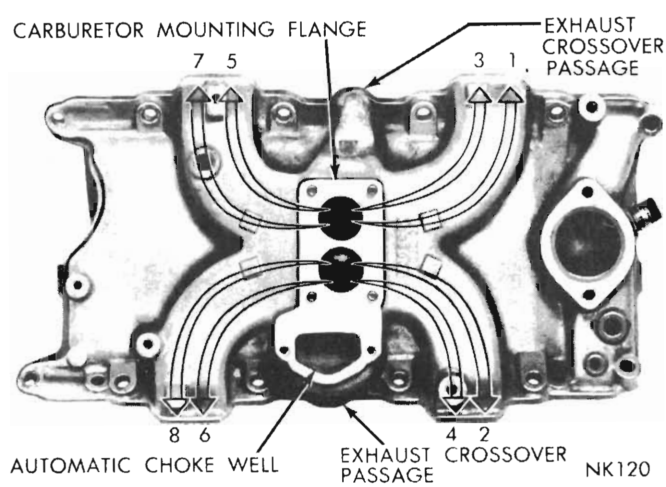


Fig. 3 – Intake manifold (8 cyl.)

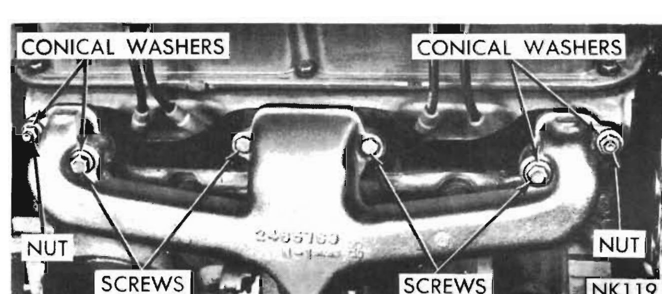


Fig. 4 – Exhaust manifold (8 cyl.)

2. INTAKE AND EXHAUST MANIFOLD ASSEMBLY

6 CYLINDER

To Remove

(1) Remove air cleaner.

(2) Remove vacuum control tube at carburettor.

(3) Disconnect fuel line, automatic choke, connections, accelerator linkage and remove carburettor from engine.

(4) Disconnect the exhaust pipes at exhaust manifold outlet connections.

(5) Remove nuts and washers holding intake and exhaust manifolds to the cylinder head.

(6) Remove the assembly from the cylinder head and then carefully bend the lock tabs from the four bolts holding the manifolds together.

(7) Remove the bolts holding intake manifold to exhaust manifold.

(8) Separate the manifolds and discard gasket.

(9) Clean the manifolds in solvent and dry with compressed air.

(10) Check the mating surfaces of the manifolds with a straightedge. Surfaces should be flat within .008".

(11) Inspect manifolds for cracks or distortion.

(12) Test operation of manifold heat control valve, *refer Para. 3*.

To Install

(1) Install a new gasket between intake and exhaust manifolds.

(2) Install the four bolts holding the intake and exhaust manifolds together (new locktabs if required). Do not tighten at this stage.

(3) Position the intake and exhaust manifolds on the cylinder head using a new gasket.

(4) Install the brass washers and special nuts on the front and rear manifold studs.

(5) Install the triangular washers on the remainder of the studs.

The triangular washers should be positioned squarely on the machined surfaces of both the intake and exhaust manifold retaining pads. These washers must be installed with the conical side pointing away from the manifold. Install the washers and nuts only when engine and exhaust system is cold.

(6) Tighten all manifold nuts to 10 lbs. ft. Do not overtighten these nuts as they can be easily stripped.

(7) Tighten the four bolts holding the intake manifold to the exhaust manifold to 25 lbs. ft.

(8) Connect the exhaust pipe to the exhaust manifold flange and tighten nuts to 24 lbs. ft.

(9) Install carburettor and connect the fuel line, throttle linkage, automatic choke and vacuum control tube.

(10) Install the air cleaner.

8 CYLINDER

To Remove Intake Manifold

> NOTE: Remove the intake manifold as outlined in *Group 9, "Engine", 8 Cylinder, Para. 4*. Item (1) - (8).

(1) Clean the manifold in solvent and blow dry with compressed air. Inspect the manifold for cracks.

(2) Inspect the mating surface of the manifold for parallelism with a straight-edge.

(3) Inspect the exhaust crossover passages through the manifold *(Fig. 3)*. If passages are coated with hard, black carbon, they should be scraped clean and sand blasted to remove the carbon deposits.

(4) Install the intake manifold, using new gaskets. Tighten the manifold screws to 270 lbs. in. in the sequence shown.

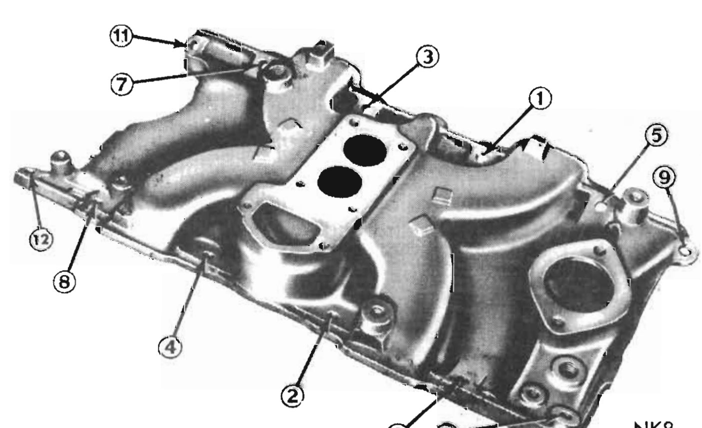


Fig. 5 – Intake manifold tightening sequence.

To Remove Exhaust Manifolds

(1) Remove the bolts and the nuts attaching the exhaust pipe to the manifold.

(2) Remove the bolts, nuts and washers attaching the manifolds to the cylinder heads. Remove the manifolds from the cylinder heads.

(3) Clean the gasket surfaces on the cylinder heads and the manifolds, wash with solvent and blow dry with compressed air. Inspect the manifolds for cracks.

(4) Inspect the mating surfaces of the manifold for parallelism with a straight-edge. Gasket surfaces must be flat within .008 inch.

(5) On the left hand manifold, test the manifold heat control valve for free operation. If necessary the valve can be lubricated with a special graphited penetrating oil to prevent seizure.

To Install

(1) Position the two out-board arms of the manifolds on the two studs on cylinder heads, using new gaskets. Install the conical washers and nuts on the studs *(Fig. 4)*.

(2) Install the two screws and the conical washers at the inner ends of the out-board arms of the manifold. Install the two screws without washers on the centre arm of the manifold *(Fig. 4)*. Tighten the screws and nuts to 15 lbs. ft., starting at the centre arm and working outward.

(3) Assemble the exhaust pipe to the manifold and secure with bolts, nuts and washers. Tighten the nuts to 24 lbs. ft.

3. EXHAUST MANIFOLD HEAT CONTROL VALVE

The purpose of the manifold heat control valve, is to direct hot exhaust gas to a heat chamber in the intake manifold and pre-heat the fuel-air mixture. Thus, the fuel is vaporized to a greater degree before entering into the combustion chamber, providing quicker warm-up.

When engine is cold, the exhaust gases are deflected to the heat chamber of the intake manifold, and then circulate to the exhaust manifold. As the thermostatic coil heats, it loses tension and the valve closes the heat chamber, permitting exhaust gas to flow directly through the exhaust manifold. The heat control valve should be checked and lubricated with graphited penetrating oil at every lubrication or engine "tune" as follows:

With the engine idling, accelerate momentarily to wide open throttle.

The counterweight should respond by moving counter-clockwise approximately $\frac{1}{2}$″ and return to its normal position. If no movement is observed, the shaft is "frozen" or the coil spring is weak or broken. To free shaft or replace coil spring, proceed as follows:—

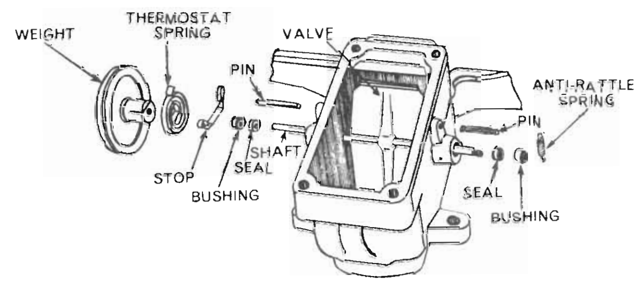


Fig. 6 – Heat control valve layout.

6 CYLINDER AND 8 CYLINDER

To Remove

(1) Remove exhaust pipe from manifold.

(2) Remove exhaust manifold from engine.

(3) Position valve plate, grind off spot welds from valve plate and shaft.

(4) Remove counterweight and shaft assembly, valve plate. Press out bushings and seals from manifold *(Fig. 6)*.

(5) Inspect vent holes and clean out if necessary.

To Install

(1) Press in a new seal with the cupped end facing outward, on counterweight side of exhaust manifold, to a depth of .690 inch *(Fig. 7)*.

(2) Press in bushing flush with outer edge of exhaust manifold.

(3) Press in a new seal in other side until there is a dimension of 1.565 inch between right and left hand seals.

(4) Press in front bushing flush with manifold.

(5) Line ream bushings and seals, .3095 to .3110 inch diameter. Test for free fit of shaft in bushings and seals.

(6) Press counterweight on plain end of shaft until flush with end of shaft.

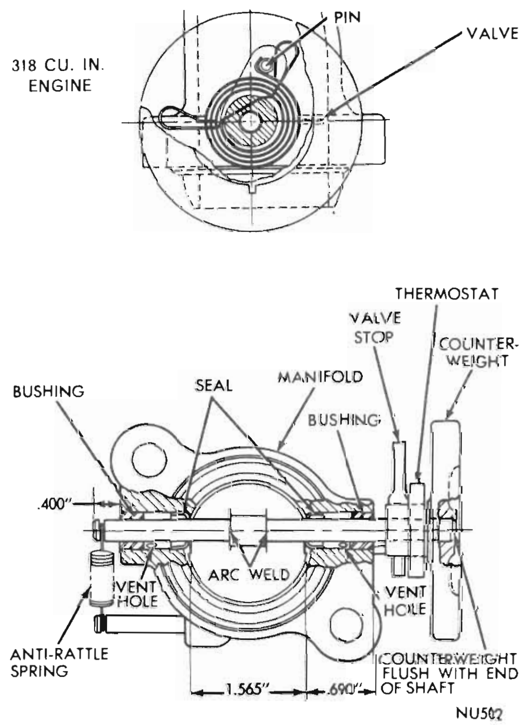


Fig. 7 – Proper manifold heat control valve installation

(7) Position thermostat so centre end or tab is pointing left and hook or outer end points down, install thermostat on counterweight.

(8) Install valve stop on counterweight so looped ends face away from thermostatic spring hook end.

(9) Holding thermostatic spring wrapped 140 degrees in a counterclockwise direction viewed from counterweight end, install shaft assembly through the outer bushing, seal and valve plate with the strap facing the flange end of the manifold; attach hook end of thermostatic spring to stop pin.

(10) With forward end of shaft positioned .400 inch through the manifold with valve plate closed and the counterweight stop against stop pin as shown in *Fig. 7*, arc weld valve plate to shaft. *Arc welder ground connection must be made at counterweight.*

(11) Test for free operation. Install anti-rattle spring.

(12) Position new gasket on studs, install exhaust manifold and tighten to 15 lbs. ft.

(13) Install exhaust pipe to manifold and tighten to 24 lbs. ft.

4. EXHAUST PIPE, MUFFLER AND TAIL PIPE

6 CYLINDER

To Remove

(1) Disconnect support clamps at rear end of tail pipe, and muffler slip joint.

(2) Disconnect exhaust pipe/s at exhaust manifold/s.

(3) Disconnect muffler from tail pipe and remove muffler and extension pipe assembly.

(4) Raise rear of car to relieve body weight from rear springs.

(5) Remove tail pipe.

To Install

(1) Reverse above procedure and assemble exhaust system loosely.

(2) Connect exhaust pipe/s at exhaust manifold/s and tighten nuts to 24 lbs. ft.

(3) Adjust hanger heights (if required).

(4) Tighten slip joint and rear support clamp to 100 lbs. in.

8 CYLINDER

To Remove

> NOTE: If removing front exhaust pipe, disconnect battery ground cable and remove lead at starting motor.

(1) Loosen front clamp and disconnect support clamps at rear end of tail pipe and muffler slip joint.

(2) Disconnect exhaust pipe at manifolds.

(3) Disconnect muffler from tail pipe and remove muffler and extension pipe assembly.

(4) Remove exhaust pipe.

(5) Raise rear of car to relieve body weight from rear springs.

(6) Remove tail pipe.

To Install

(1) Reverse above procedure and assemble exhaust system loosely.

(2) Connect exhaust pipe to exhaust manifolds loosely.

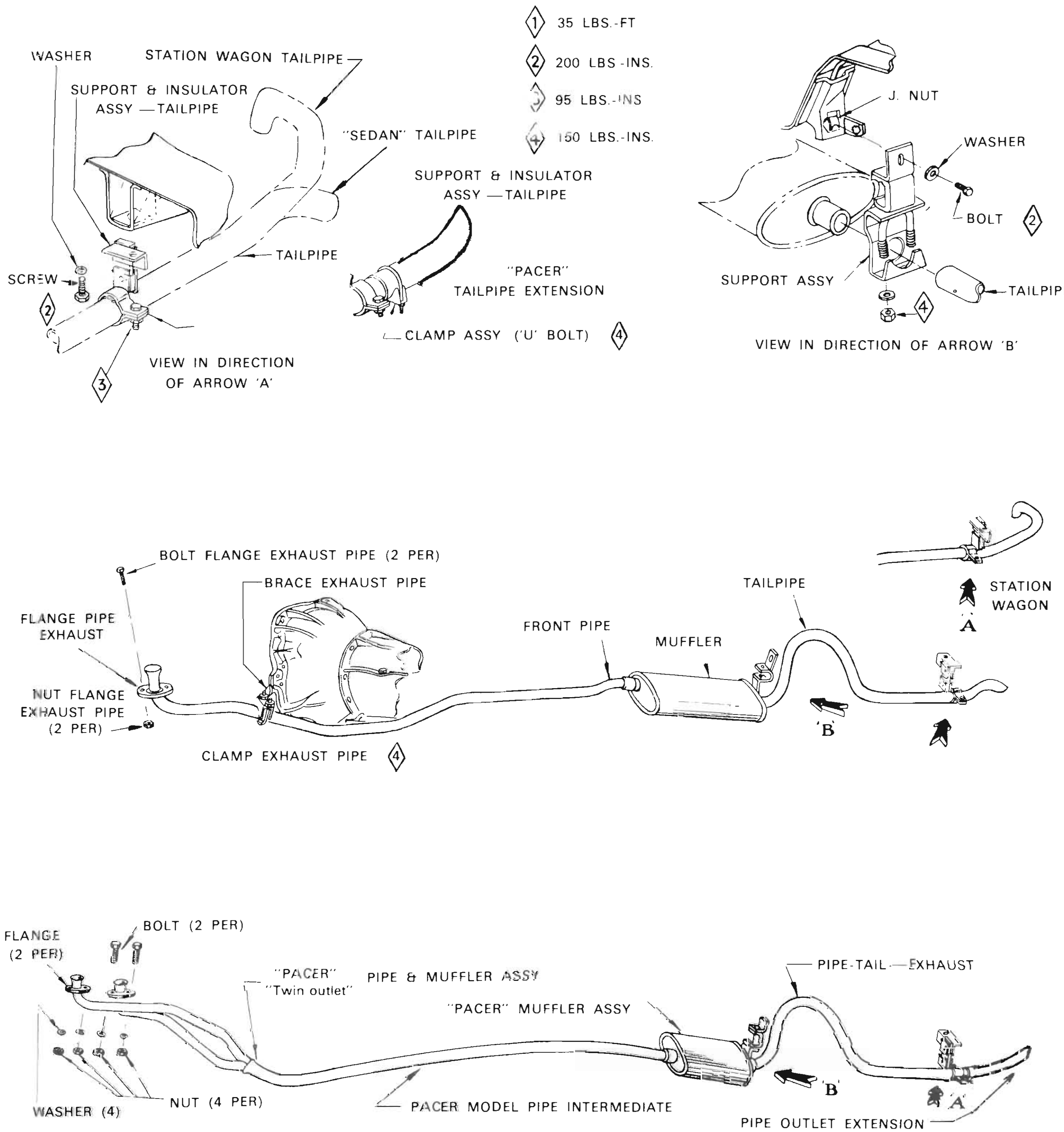
(3) Adjust hanger heights (if required).

(4) Tighten all slip joint clamp bolt nuts to 100 lbs. in. working from rear to front.

(5) Tighten all support and hanger attaching bolts and nuts to 95 lbs. in.

(6) Tighten the ball joint connection bolt nuts to 24 lbs. ft. Alternate tightening between bolts.

(7) Reconnect starting motor lead and battery ground cable.



6 CYL. MODEL EXHAUST SYSTEM MOUNTING DIAGRAMS

*Refer to Parts Listings for model applications

Fig. 8 – Exhaust systems (typical views)

GROUP 14

FUEL SYSTEM

PART 1 — CARBURETTORS

6 CYLINDER
SINGLE THROAT CARBURETTOR

6 CYLINDER AND 8 CYLINDER DUAL THROAT CARBURETTORS

WEBER DCOE45 CARBURETTORS (As fitted to E37 and E38 optional engines)

360 V8 2BBL HOLLEY CARBURETTOR

PART 2 — FUEL PUMPS

PART 3 – FUEL TANK

PART 4—EMISSION CONTROLS

PART 5 — CARTER AVS SERIES CARBURETTOR

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

PART 1 — CARBURETTORS

SERVICE DIAGNOSIS

CONDITIONS—POSSIBLE CAUSES

1. POOR IDLING

(1) Incorrect air idle adjustment.

(2) Idle air bleed carbonized or of incorrect size.

(3) Idle discharge hole plugged or gummed.

(4) Throttle body carbonized or worn throttle shaft.

(5) Air leak at mounting between carburettor and manifold.

(6) Damaged or worn idle mixture needle.

(7) Incorrect fuel or float level.

(8) Choke does not completely open.

(9) Carburettor icing.

(10) Distributor advance vacuum leak.

(11) Loose distributor base plate bearing.

(12) Corroded wire ends or distributor towers.

(13) Incorrect distributor point gap.

(14) Fouled spark plugs.

(15) Incorrect ignition timing.

(16) Incorrect spark plugs gap.

(17) Overheated spark plugs.

(18) Incorrect valve timing.

(19) Compression not within limits.

(20) Intake manifold leak.

(21) Manifold heat control valve stuck.

(22) Internal coolant leak.

(23) Low grade fuel.

Positive Battery to Positive coil
Ballast coil.

2. POOR PERFORMANCE —MIXTURE TOO LEAN

(1) Damaged main metering jet.

(2) Vacuum piston worn or stuck (in closed position).

(3) Incorrect fuel or float level.

(4) Automatic choke not operating properly.

(5) Incorrect fuel pump pressure.

(6) Blocked fuel filter.

3. POOR PERFORMANCE — MIXTURE TOO RICH

(1) Restricted air cleaner.

(2) Excessive fuel pump pressure.

(3) High fuel or float level.

(4) Damaged needle and seat.

(5) Leaking float.

(6) Worn main metering jet.

(7) Sticking choke mechanism.

(8) Vacuum piston stuck (in open position).

4. EXCESSIVE FUEL CONSUMPTION

(1) Overloading (pulling trailers, etc.).

(2) Incorrect speedometer pinion.

(3) Brakes dragging.

(4) Driving at excessive speeds.

(5) Low tyre pressures.

(6) Short trip or heavy traffic driving.

(7) Driving in sand or mud.

(8) Driving in high winds.

(9) Unnecessary use of accelerator.

(10) Sticky choke mechanism.

(11) Incorrect ignition timing.

(12) Incorrect distributor advance.

(13) Incorrect valve timing.

(14) High fuel level in carburettor.

(15) Stuck manifold heat control valve.

(16) Detonation or pre-ignition.

(17) Low engine compression.

(18) Worn camshaft lobes.

(19) Vacuum piston stuck (in open position).

(20) Sticking valves.

(21) Elevation and atmospheric conditions.

(22) Restricted muffler or tail pipe causing back pressure.

5. CARBURETTOR FLOODS OR LEAKS

(1) Cracked body.

(2) Defective gaskets.

(3) High float or fuel level.

(4) Worn needle valve and seat.

(5) Leaking float.

(6) Excessive fuel pump pressure.

NOTE: Presence of fuel dye around carburettor gaskets does not necessarily denote a leak or a flooding condition.

6. POOR ACCELERATION

(1) Accelerator pump piston (or plunger) leather too hard worn, or loose on stem.

(2) Faulty accelerator pump discharge jet.

(3) Accelerator pump inlet check ball faulty.

(4) Incorrect fuel or float level.

(5) Worn accelerator pump and throttle linkage, or incorrect settings.

(6) Automatic choke system not operating properly.

(7) Carburettor gummed up.

(8) Faulty coil.

(9) Loose distributor base plate bearing.

(10) Distributor not advancing properly.

(11) Incorrect ignition timing.

(12) Incorrect spark plug gap.

(13) Fouled spark plugs.

(14) Overheated spark plugs.

(15) Manifold heat control valve stuck.

(16) Low fuel pump pressure or vacuum.

(17) Compression not within specifications.

(18) Incorrect valve timing.

(19) Low grade of fuel.

(20) Detonation or pre-ignition.

(21) Vacuum piston stuck (in closed position).

(22) Blocked fuel filter.

6 CYLINDER
SINGLE THROAT CARBURETTOR

SPECIFICATIONS

Type	Single Throat Down Draught	
Make	Email - Carter	
Model Number		
Manual Transmission	RBS 4649 S	
Automatic Transmission		RBS 4650 S
Bore (Throttle)	1.69"	
Venturi	1.44"	
Main Metering Jet		
Standard (Chrysler No.)	3426550	
Step-up Needle (Standard) (Chrysler No.)	3543315	
Adjustments:		
Float setting (dimple to bowl joint surface)	(.725±.030")	
Fast Idle Cam Position Drill Size	No. 50 (.070")	No. 35 (.110")
	Choke opening (Tang on 2nd cam step)	
Choke Unloader (wide open throttle)	1/4"	
Vacuum Choke Relief (drill size)	No. 31 (.120")	No. 35 (.110")
	7" HG Vacuum Applied	
Pump Stroke Adjustment	9/32" (from underside pump arm to stop collar)	
Bowl Vent Valve Setting	.078" (from underside of valve to seat)	
Idle Mixture Screws (turns open)	1–1½	
Idle—Speed R.P.M. (curb idle) Headlights OFF and Air Cond. OFF)	600	600 ("N" Selected)
Fast Idle R.P.M. (tang on 2nd highest cam step)	1500	
Choke:		
Control	Thermostatic Coil Spring	
Type	Stove (on manifold side)	
Setting	2 notches rich	

SPECIAL TOOLS

E14C5	Stand Carburettor repair (Universal)
E14C10 (or T109213)	Bending Tool — Linkage (⅛" wire)
E14C10A	Bending Tool — Throttle tang (.200" opening)
E14C15B	Gauge — Float Setting
E14C20A	Pin Gauge Kit (4 ranges)
E14C25A	Extractor — Jets and Plugs (Ezy-out)
E14C25B	Installer — Main Jet
E14C30	Driver — Pump Plunger/ Check Valve Seat
E14C30A	Installer — Accelerator Pump Check Needle Seat
E14C30B	Installer — Set-up Diaphragm Retainer

TORQUE SPECIFICATIONS

Carburettor Retaining Screws	100 lbs./in.
Fuel Line Union Nuts	125 lbs./in.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

These carburettors are of monolithic construction, which means that *major components,* such as carburettor body, air horn, and replaceable parts in previous carburettors *will not be serviceable as individual items in the R.B.S. Carburettors.*

Each carburettor is individually adjusted and tested by EMAIL LIMITED before delivery and should give a very long trouble-free life, provided the fuel system is regularly and correctly serviced.

> DISMANTLING of this model carburettor requires special tools and *should not be attempted in Warranty Servicing.* During the Warranty Period of the vehicle concerned, the carburettor must not be repaired but returned to the manufacturer, where the carburettor is found to be faulty after all external settings have been checked and reset where necessary.

2. SERVICING THE CARBURETTOR

Often the carburettor is blamed for a great variety of trouble which is classed as poor vehicle performance. Therefore, be sure that the trouble is not located elsewhere before disassembling the carburettor.

The following sets out the basic checks which should be made if problems are encountered in the Warranty Period. If these checks do not correct the problem, the carburettor should be replaced with a new unit (and new flange gaskets) and the displaced carburettor returned to Email.

Service Checks to be made during Warranty Period.

If the carburettor shows symptoms of malfunction during the Warranty Period, the following procedure should be followed:

(1) Check for obvious faults in installation, such as loose mounting, fuel leakage, throttle or choke controls jammed, etc. Depress the accelerator pedal and check that throttle is full open.

(2) Confirm that problem is in the carburettor (by trying new unit or trying suspect carburettor on another vehicle). This check is important, as many apparent carburettor faults can, in fact, be caused by other factors (e.g., ignition).

(3) Remove the carburettor bowl, check float level and look for dirt (care should be taken to avoid dislodging the bowl sealing ring, as this tends to expand when wet with fuel and is then difficult to replace).

(4) Replace the bowl and fill with petrol. Operate the throttle lever several times through to full travel and check that a spurt (about 1¼ c.c.) is shot from the accelerator pump nozzle at each stroke.

(5) Install the carburettor to the engine with new flange gaskets and reconnect the throttle and choke control.

(6) If the problem is still apparent, install an Exchange Carburettor, Part Number EX 430449, and return the displaced unit to EMAIL LIMITED (under) Warranty procedure.

> NOTE: In removing and replacing the carburettor, it is necessary to disconnect the automatic choke. This should be done with care to avoid bending the operating rod which connects the choke to the carburettor, as this will affect the adjustment of the automatic choke.

When checking the carburettor, several items of importance should be observed to assure a good job:

(1) The carburettor must be removed, described below.

(2) All parts should be cleaned in a suitable solvent, then inspected for damage or wear.

(3) Use air pressure only to clean the various orifices or channels. Do not use wire or probes to clean jets.

(4) Replace questionable parts with new parts. When checking parts removed from the carburettor, it is at times difficult to be sure they are satisfactory for further service. It is therefore recommended that, in such cases, new parts be installed.

(5) Service replacement kits contain all the necessary parts to re-assemble the carburettor when replacements are required. Ensure all the parts are carefully installed, using the special servicing tool kit, where indicated, to maintain original factory specifications.

Exchange replacement carburettors are serviced under Part No. EX430449. This carburettor is basically a manual transmission application model which may be reset to the automatic transmission setting when required.

3. DISASSEMBLING THE CARBURETTOR

To disassemble the carburettor for cleaning proceed as follows:

(1) With carburettor inverted remove the four screws retaining the float chamber bowl and remove the bowl.

(2) Remove the 2 screws retaining the float lever fulcrum and lift out the float assembly.

(3) Unscrew the float needle and seat from the main casting.

(4) With clean dry compressed air blow all parts and passages clean and dry and re-assemble carburettor.

As the main body of the carburettor is a one-piece casting, normally (unless the linkage requires attention) there is no need to disturb this part of the carburettor.

Adjustment of the linkage will be covered later in this section.

The accelerator pump seating is a press fit into the base casting and should not normally be disturbed. (Similarly the step-up rod and diaphragm assembly is retained by an inverted cup and washer pressed in from the top side of the carburettor.

Normally these components should not be disturbed. They can however be replaced should occasion arise by following these instructions.

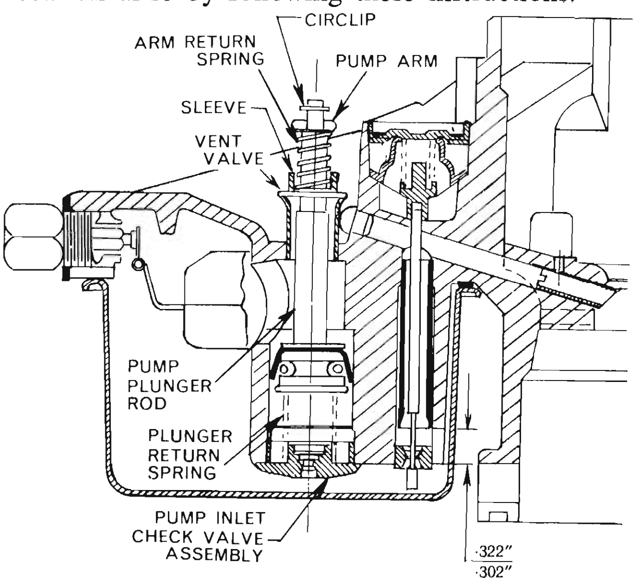


Fig. 1 – Sectioned view of carburettor showing the accelerator pump and step-up needle assembly

4. COMPONENT REPLACEMENT

(A) Accelerator Pump Replacement

(1) Remove the accelerator pump arm retaining circlip.

(2) Carefully remove the accelerator pump arm to allow the spring, sleeve and vent valve plate to be removed. (Note that the spring is stronger than the step-up spring — where removed).

(3) Press or carefully drive out the accelerator plunger and spring using driver tool E14C30 over rod, to push the check valve seat assembly plug from the bore, *refer Fig. 1.*

(4) Lift out the spring and the accelerator piston assembly.

(5) Re-assemble by reversing the above procedure after careful cleaning, then press in the new inlet check valve assembly plug.

(B) Accelerator Pump Check Valve Replacement

(1) Drill a 9/64″ diameter hole in the aluminium sealing plug *(refer Fig. 2)* which seals the passage.

(2) Screw in the plug extracting tool E14C25A securely into the plug and extract the plug with the impacting tool.

(3) Carefully drill the valve seating to enlarge the aperture to accept the extracting tool E14C25A Note: Prevent the drill plunging through the seating to jam onto the check valve needle.

(4) Insert the removing tool point into the seat drilling, screwing the tool carefully to prevent breaking the point.

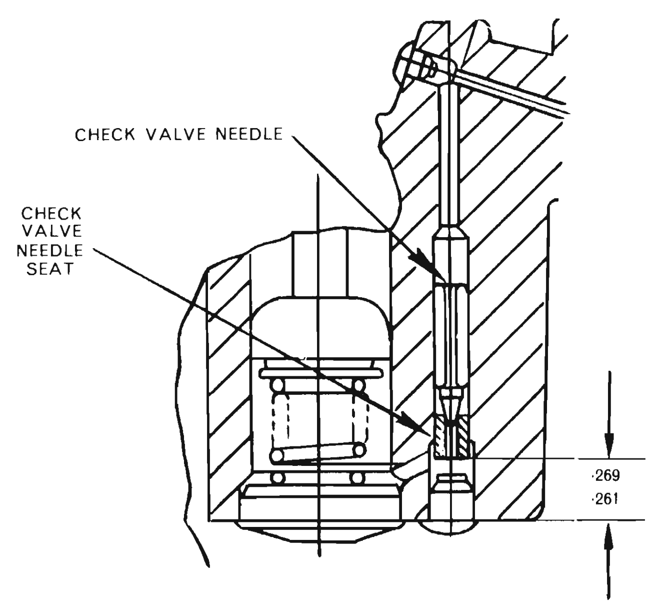


Fig. 2 – Accelerator check valve needle components

(5) Carefully draw the check valve seat from the bore by impacting, using the sliding weight.

(6) Shake out the check valve needle from the bore.

(7) Re-assemble after careful cleaning and install the new needle valve with the point outwards *(refer Fig. 2).*

(8) Install the check valve seat toward the needle and drive the seat in the required depth using Tool E14C30A, until tool bottoms on body (i.e. .261″–.269″).

(9) Install a new plug to seal the drilling.

(C) Step-up Cylinder Components

If it becomes necessary to renew the components of the step up cylinder the following procedure should be followed:

(1) Prise the lock washer from the top cover using a suitable screwdriver. Discard the washer. *Refer Fig. 3.*

(2) Levering against the body of the carburettor throat at its thick section with a screwdriver, distort the top cover. (Once distorted the cover will become loose and can be lifted out with a pair of round nosed pliers).

(3) Remove the step-up rod, diaphragm and spring and discard only where necessary.

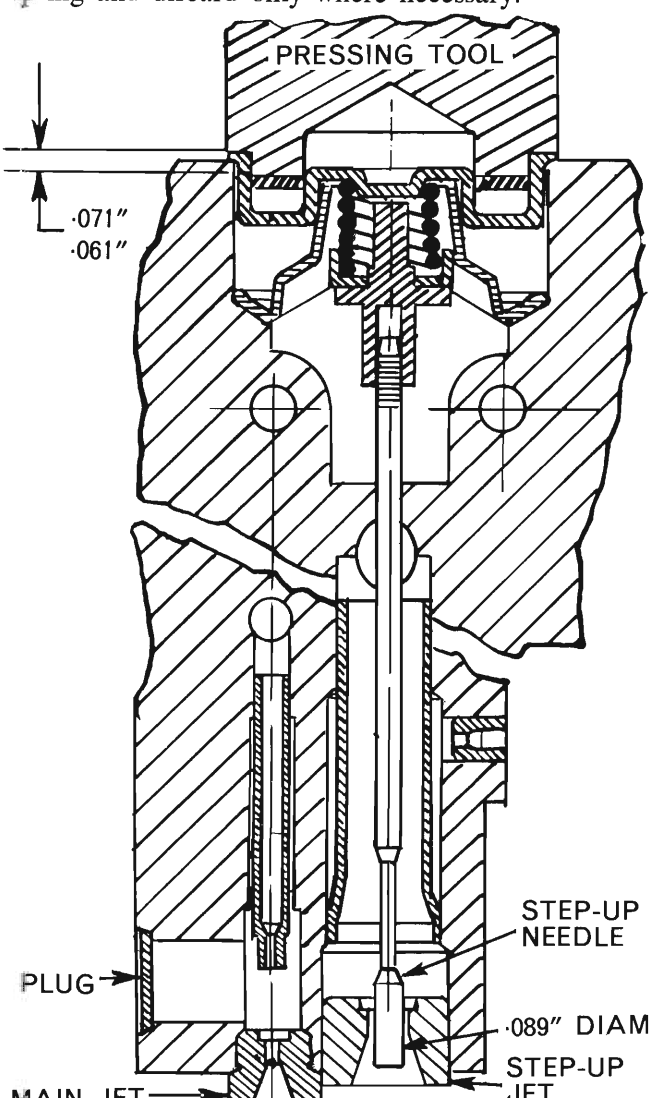


Fig. 3 – Step-up cylinder components

(4) Remove the step-up needle jet by screwing in the extractor tool and withdraw by impacting. Discard the jet.

(5) To re-assemble — place the new step-up needle with diaphragm attached into position.

(6) Place the compression spring and tower in place and press the top cover and lock washer firmly into position, using the special driver Tool E14C30B provided in the carburettor kit *(Fig. 3).*

Replace the step-up needle jet using the special driver Tool E14C25B (after removing the idle fuel jet).

5. CARBURETTOR ADJUSTMENTS

Float Level

With carburettor inverted, bowl and gasket ('O' ring) removed, adjust float to .725″±.030″ vertical height from "dimples" on float to float housing surface. *Refer Fig. 4* by carefully bending the tab contacting the float needle valve. Do not over-tighten fuel line union as float level setting can be altered.

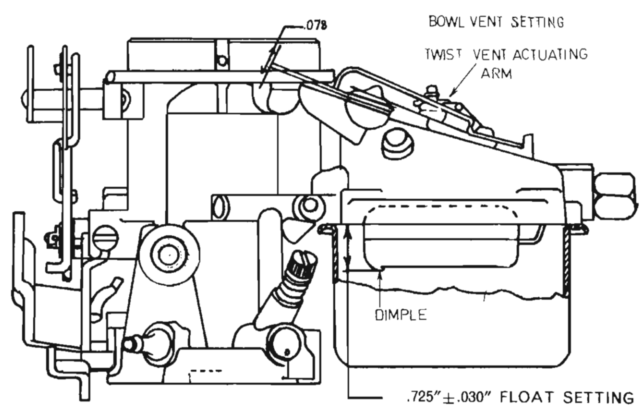


Fig. 4 – Side view showing fuel float setting and vent valve opening setting

NOTE: DO NOT PRESS THE NEEDLE VALVE FIRMLY INTO THE SEAT. Allow only the weight of the float to press on the valve, otherwise a false setting will be made.

Pump Linkage Adjustment

(1) With curb idle screw backed off, hold throttle valve tightly closed.

(2) Adjust nut on connecting rod to give measurement of 9/32″ from underside of pump

actuating rod at pump plunger, to top of arm travel stop. *Refer Fig. 5.*

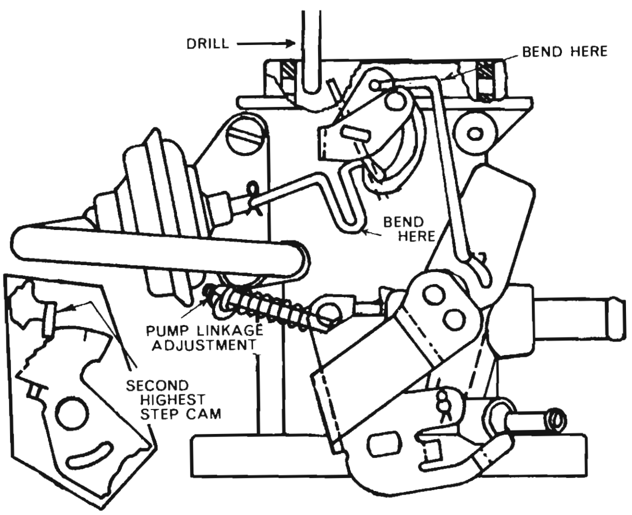


Fig. 5 – Fast idle cam position for choke setting pump adjustments

> NOTE: Whenever using a drill for checking carburettor settings, always use the shank of a new drill.

With fast idle tang on second highest step and against the shoulder of the highest step of fast idle cam, adjust fast idle link to obtain opening between air horn wall and short side of choke valve of .110″ (No. 35 drill) for automatic and .070″ (No. 50 drill) for manual transmission carburettor. *Refer Fig. 5.*

Choke Unloader (Wide Open Kick)

Bend unloader tang on throttle lever to give ¼″ choke valve opening at wide open throttle. *Refer Fig. 6.* (Bend where tang contacts choke mechanism at wide open throttle.)

Fast Idle Throttle Valve Clearance

(This setting is normally made during manufacture of the carburettor and should require alteration only where related components are replaced.) With fast idle tang on second highest step and against the shoulder of the highest step of the fast idle cam, bend tang to obtain an opening of .019″ (No. 75 drill) between lower edge of throttle valve and bore.

Vacuum Kick Setting

With minimum of seven inches of vacuum applied to the diaphragm and a choke closing torque of approximately one pound applied to link, adjust choke diaphragm link to obtain choke valve opening of .110″ (No. 35 drill) for automatic models and .120″ (No. 31 drill) for manual transmission models. *Refer Fig. 5.*

Idle Speed Adjustments—Prior to 1/1/72.
(For vehicles built after 1/1/72—refer to Emission Control Section).
Fast Idle Speed (Engine at normal operating temperature).
1500 R.P.M. in Neutral with fast idle tang on the second highest step of cam, Air Cleaner installed, Air/Cond. & Headlights OFF.
Curb Idle Speed (Engine at normal operating temperature).
600 R.P.M. in Neutral with Air Cleaner installed, Air/Cond. & Headlights OFF.

Fuel Bowl Vent

After curb idle has been set on car, twist vent actuating rod to give vent opening of .078″ (No. 47 drill) *(Fig. 4).*

6. AUTOMATIC CHOKE (External Stove type)

To function properly, it is important that all parts be clean and move freely. Other than an occasional cleaning, the choke requires no servicing. However, it is very important that the choke control unit works freely in the housing and at the choke shaft.

Move the choke rod up and down to check for free movement in the pivot. If the unit binds, a new choke unit should be installed. *Refer Fig. 6.*

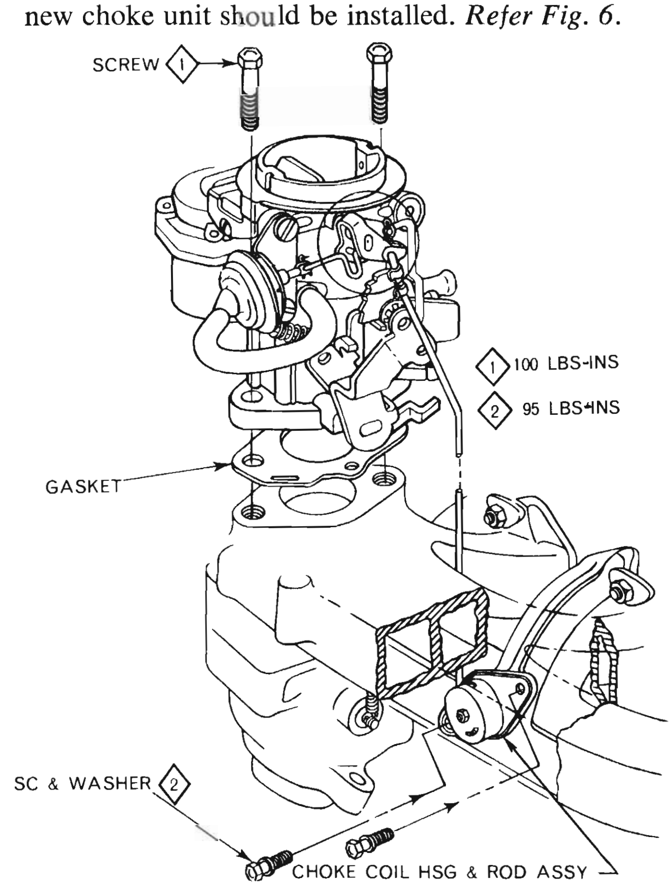


Fig. 6 – Automatic choke

NOTE: THE STOVE TYPE CHOKE UNIT is serviced as an assembly. Do not attempt to repair.

The correct setting is with the index notch opposite the No. 2 calibration mark on the rich side.

When installing the stove type choke unit, be certain that the coil does not contact the sides of the exhaust manifold. Any contact at this point will affect choke operation. DO NOT lubricate any parts of the choke or the control unit. This causes an accumulation of dirt which will result in binding of the mechanism.

7. CRANKCASE VENT SYSTEM

The crankcase ventilator valve is located in the valve cover grommet and is connected to the carburettor throttle body via a rubber tube.

The function of the valve is to regulate the flow of unburned hydrocarbons from the crankcase and return them to the intake manifold. From here they enter the combustion chamber and exit via the exhaust system as completely burned exhaust products.

For servicing procedures of this valve, *refer to Group 1—Lubrication and Maintenance (Para. 20).*

8. THROTTLE CABLE AND TRANSMISSION THROTTLE CABLE ADJUSTMENT

6 CYLINDER MODELS

Manual Transmission

(1) Apply a thin film of multi-purpose grease on accelerator shaft where it turns in bracket, anti-rattle spring where it contacts shaft, ball end and pocket at rear end of throttle cable.

(2) Disconnect choke at the carburettor or block choke valve in fully open position. Open the throttle slightly to release fast idle cam, then return carburettor to curb idle.

(3) Loosen the cable clamp nut, then adjust the position of the cable housing ferrule in the clamp so that all slack is removed from the cable with the carburettor at curb idle. To remove slack from the cable, move the ferrule in the clamp in the direction away from the carburettor lever.

(4) Back off ferrule ¼″. This provides ¼″ cable slack at idle.

(5) Connect choke rod or remove blocking fixture.

6 CYLINDER MODELS

Automatic Transmission

(1) Apply a thin film of multi-purpose grease on accelerator shaft where it turns in bracket, anti-rattle spring where it contacts shaft, ball end and pocket at rear end of throttle cable, and the bell crank pin of the accelerator pedal mechanism, *refer Fig. 8.*

(2) Disconnect choke at carburettor or block choke valve in full open position. Open throttle

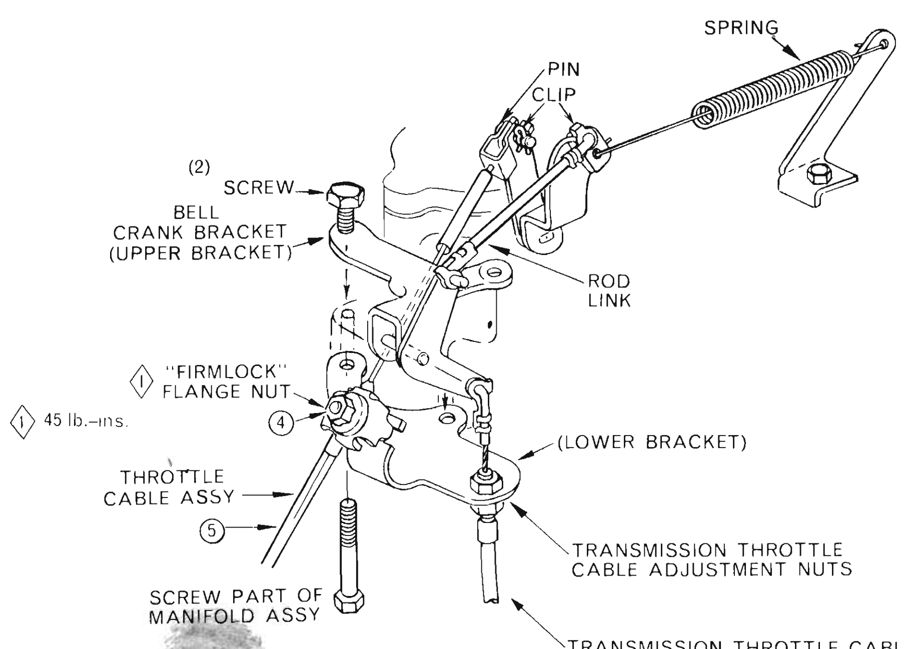


Fig. 7 – Throttle cable and transmission cable adjustments

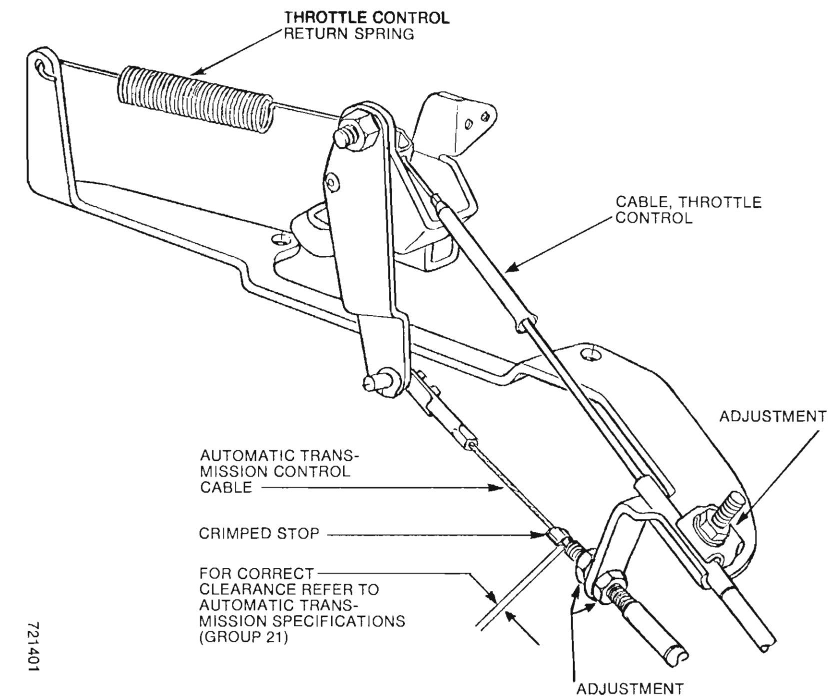


Fig. 7A – Throttle cable and transmission cable adjustments (dual-barrel 6 cylinder models)

slightly to release fast idle cam, then return carburettor to curb idle.

(3) Loosen the throttle cable clamp nut, then adjust position of cable housing (housing ferrule) in the clamp so that all slack is removed from cable with carburettor at curb idle. To remove slack from cable, remove ferrule in the clamp in direction away from carburettor lever.

(4) Back off ferrule ¼". This provides ¼" cable slack at idle.

(5) Tighten cable clamp nut to 45 lbs. in.

(6) Connect choke rod or remove blocking fixture.

Transmission Throttle Cable

This cable is pre-lubricated and does not require additional lubrication.

Check that the wide open throttle position is obtained with the throttle pedal clear of the floor. Correct adjustment of the transmission throttle cable is most important and should be checked whenever a throttle cable, transmission throttle cable, engine, transmission or carburettor removal and or replacement is conducted. Adjustment of this cable should be conducted in accordance with the procedure set out in the transmission section of this manual.

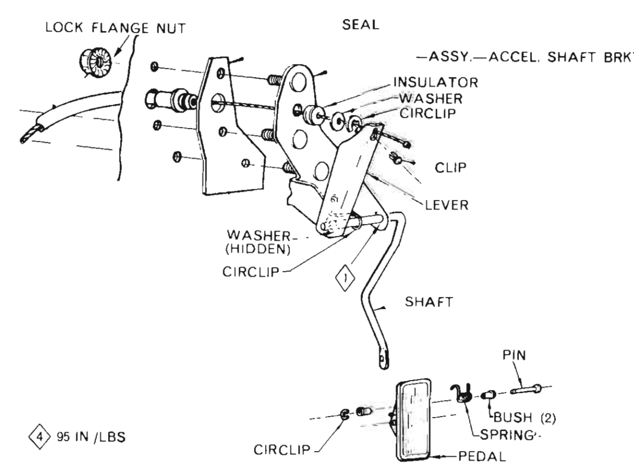


Fig. 8 – Accelerator pedal assembly (disassembled view)

6 CYLINDER

DUAL THROAT CARBURETTOR

SPECIFICATIONS

CARBURETTOR

	Manual Trans.	Auto. Trans.
Type	Dual Throat Down Draught	
Model	BBD6285SL	BBD6286SL
Bore	1–7/16″	
Venturi	1–3/16″	
Main Metering Jet	Part No. 120–309	
Standard Size	.0465″	
Step-up Wire (standard) Diameter	.025″–.029″	
Adjustments		
Float Setting (at centre of floats)	$\frac{1}{4}$″	
Choke Unloader (drill size) (Throttles wide open)	"E" (.250″)	
Fast Idle Linkage (cam position) (drill size — at top of choke valve)	.095″	
Bowl Vent Valve Setting (from under side of valve to bowl cover bushing)	.040″±.010″ (.060″ nom.)	
Fast Idle Throttle Valve Clearance (at lower edge of valves)	.015″	
Vacuum Kick (drill size)	No. 36 (.105″)	No. 41 (.095″)
Idle Mixture Screws (turns open)	$\frac{1}{4}$–$1\frac{3}{4}$ (See Note)	
Idle Speed R.P.M. (curb idle)	600 (A.C. "OFF" where equipped)	600 (A.C. "OFF" where equipped) ("N" selected)
Fast Idle Speed R.P.M.	1500 (second highest step)	
Choke:		
Control	Thermostatic Coil Spring	
Type	Manifold Contact	
Setting	2 Notches Rich	

NOTE: The final settings of the idle mixture screws must be within $\frac{1}{4}$ of a turn of each other.

SPECIAL TOOLS

E14C10	Bending Tool
E14C15A	$\frac{1}{4}$″ Float Gauge
E14C5	Repair Stand

TORQUE SPECIFICATIONS

Carburettor Retaining Nuts	100 lbs. in.
Fuel Line Union Nuts	125 lbs. in

8 CYLINDER

SPECIFICATIONS

CARBURETTORS

Type	Dual Throat Down Draught
Model	BBD–6023S
Bore	1–7/16″
Venturi	1–3/16″
Main Metering Jet	
Standard	No. 120–309S
One Step Lean	No. 120–299S
Two Steps Lean	No. 120–300S
Step-up Wire	
Standard Two Stage dia.	0.025″–0.028″
Adjustments	
Float Setting (at centre of floats)	¼″
Choke Unloader (wide open throttle)	¼″
Fast Idle Cam Position (drill size)	No. 41 (.095″)
Vacuum Kick (drill size)	No. 20 (.161″)
Bowl Vent Valve Setting (throttle closed)	.040″±.010″
Idle Mixture Screw (turns open) approx.	1 (See Note)
Idle Speed R.P.M. (curb idle)	650 (A.C. "OFF", where equipped) ("N" selected)
Fast Idle Speed R.P.M. (2nd highest step)	1500
Choke:	
Control	Thermostatic Coil Spring
Type	Well
Setting	2 Notches Rich

NOTE: The final settings of the idle mixture screws must be within ¼ of a turn of each other.

SPECIAL TOOLS

E14C10	Bending Tool
E14C15A	¼″ Float Gauge
E14C5	Repair Stand

TORQUE SPECIFICATIONS

Carburettor Retaining Nuts	100 lbs. in.
Choke (well) Thermostat Retaining Screws	40 lbs. in.
Fuel Line Connection Union Nuts	125 lbs. in.

SERVICE INFORMATION — PROCEDURES

1. SERVICING THE CARBURETTOR

Often the carburettor is blamed for a great variety of trouble which is classed as poor car performance. Therefore, be sure that the trouble is not located elsewhere before disassembling the carburettor.

When overhauling the carburettor several items of importance should be observed to assure a good job:

(1) The carburettor must be completely disassembled.

(2) All parts should be cleaned in a suitable solvent then inspected for damage or wear.

(3) Use air pressure only, to clean the various orifices or channels.

(4) Replace questionable parts with new parts. When checking parts removed from the carburettor, it is at times difficult to be sure they are satisfactory for further service. It is therefore recommended that in such cases, new parts be installed.

2. DISASSEMBLING THE CARBURETTOR

To disassemble the carburettor for cleaning or overhaul proceed as follows:

(1) Place the carburettor assembly on repair block Tool E14C5 or similar. (This protects throttle valves.)

(2) Remove the hairpin clips and disengage the accelerator pump operating rod. The accelerator pump rod is located in the inner hole of the accelerator pump rocker arm.

(3) Remove the hairpin clip and disengage the fast idle connector rod from the fast idle cam and choke lever.

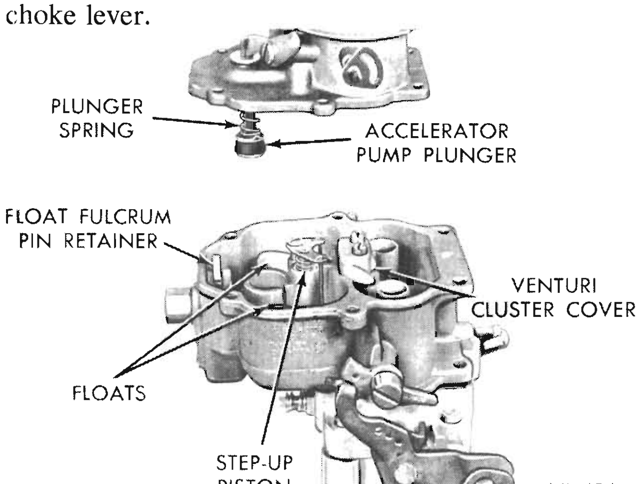


Fig. 1 – Removing or installing air horn

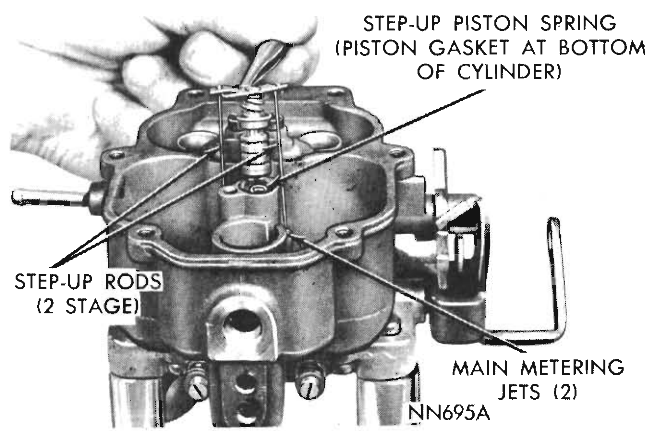


Fig. 2 – Removing or installing step-up piston

(4) Remove the vacuum hose between the carburettor main body and the vacuum diaphragm.

(5) Remove the clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever.

(6) Remove the choke 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 the air horn retaining screws and lift air horn straight up and away from main body, as shown in *Fig. 1*. Discard the gasket.

(8) Disengage the accelerator pump plunger from the rocker arm by pushing up on the bottom of plunger and sliding plunger shaft off hook. Slide plunger out of air horn and remove the bowl vent valve, spring seat and spring.

If the old plunger can be used again, or if a new plunger is to be installed, place the plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(9) Remove the fuel inlet needle valve, seat and gasket from the main body.

(10) Lift out the float fulcrum pin retainer, then lift out the floats and fulcrum pin.

(11) Remove the step-up piston retaining screw, and slide step-up piston and rods out of well, as shown in *(Fig. 2)*. Now, lift out the step-up piston spring. Remove the step-up piston gasket from the bottom of the well.

(12) Remove the main metering jets, as shown in *(Fig. 3)*.

(13) Remove the venturi cluster screws, then lift the venturi cluster and gaskets up and away from main body, as shown in *(Fig. 4)*. Discard the gaskets.

Do not remove the idle orifice tubes or main vent tubes from the cluster. They can be cleaned in a solvent and dried with compressed air.

(14) Invert the carburettor and drop out the accelerator pump discharge and intake check balls.

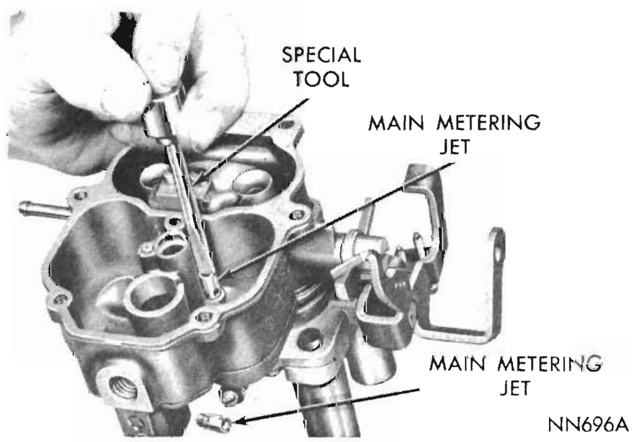


Fig. 3 – Removing or installing main metering jets

(15) Remove the idle mixture adjusting screws and springs from the throttle body.

(16) Remove the screws that attach the throttle body to the main body. Separate the bodies.

(17) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearings, or appears to be gummed from deposits in the air horn, a thorough cleaning will be required.

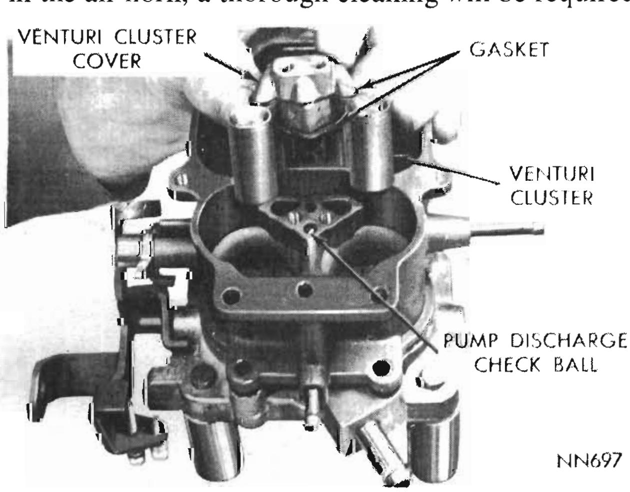


Fig. 4 – Removing or installing venturi cluster

The carburettor now has been disassembled into three main units, namely the air horn, main body and throttle body and the component parts 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.

3. INSPECTION AND REASSEMBLY

Throttle Body

(1) Check the throttle shaft for excessive wear in the throttle body. (If wear is extreme, it is recommended that the throttle body assembly be replaced rather than installing a new shaft in the old body).

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. *(See Fig. 5)*.

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. However, if it has been determined that a new shaft or valves is to be installed, adhere to the following instructions:

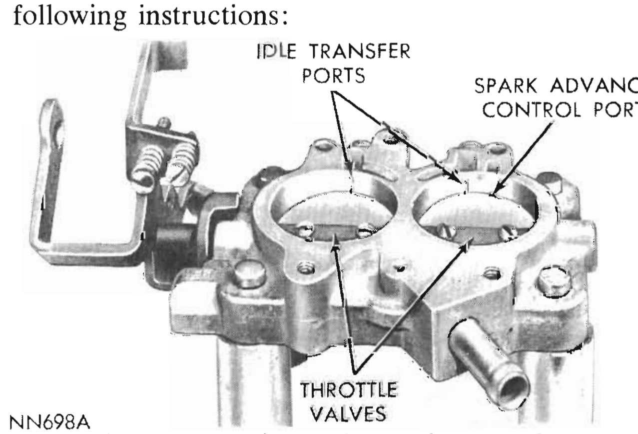


Fig. 5 – Ports in relation to throttle valves

(2) Mark the position of the throttle valves to the shaft, then slide the valves out of the bores.

> CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft.

(3) Slide the throttle shaft out of the throttle body. Remove the fast idle speed screw lever.

(4) Slide the fast idle speed screw lever over new throttle shaft and insert into throttle body.

(5) Install throttle valves in their respective bores (with the valve numbers toward manifold flange). Install NEW screws but do not tighten. Hold the valves in place, with the fingers pressing on the high sides of the valves. Tap the valves lightly with a screwdriver to seat valves in the throttle bores. Tighten the screws securely and stake by squeezing with pliers.

(6) Install the idle mixture screws and springs in the throttle body. (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, new idle mixture screws should be installed to ensure having correct idle mixture control.)

Do Not Use a Screwdriver.

Turn the screws lightly against their seats with the fingers, back off 1 full turn for approximate adjustment.

Main Body

(1) Invert the main body and place the insulator in position, then place the throttle body on main body and align. Install screws and tighten securely.

(2) Install the accelerator pump discharge check ball (5/32 inch diameter) in the discharge passage, as shown in *(Fig. 6)*. Drop the accelerator pump intake check ball (3/16 inch diameter) into the bottom of the pump cylinder.

To check the accelerator pump system; fuel inlet and discharge check balls, proceed as follows:

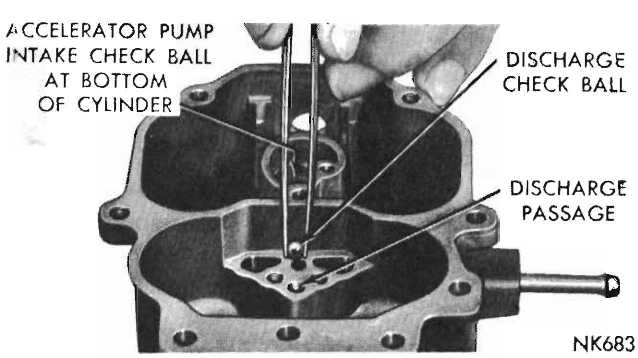


Fig. 6 – Installing accelerator pump discharge check ball

(3) Pour clean gasoline into the carburettor bowl, approximately ½ inch deep. Remove the pump plunger from the jar of gasoline and slide down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expel air from the pump passage.

(4) Using a small clean brass rod, hold the discharge check ball down firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in *(Fig. 7)*. If any fuel does emit from either passage, it indicates the presence of dirt or damaged check ball or seat. Clean the passage again and repeat test. If leakage is still evident, install new check balls. The fuel inlet check ball is located at the bottom of the plunger well. Remove fuel from bowl.

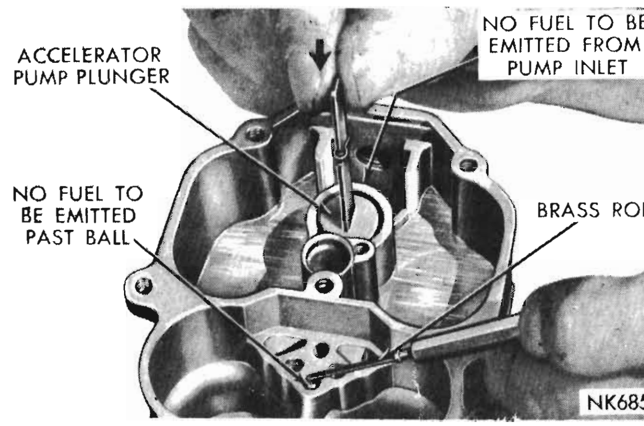


Fig. 7 – Testing accelerator pump intake and discharge check balls

(5) Install new gasket on venturi cluster, then install in position in the main body. Refer to *(Fig. 4)*. Install the cluster screws and tighten securely.

(6) Install the main metering jets and tighten securely. Refer to *(Fig. 3)*.

(7) Before installing the step-up piston, be sure the step-up rods are able to move freely each side of the vertical position, as shown in *(Fig. 8.)* The step-up rods must be straight and smooth.

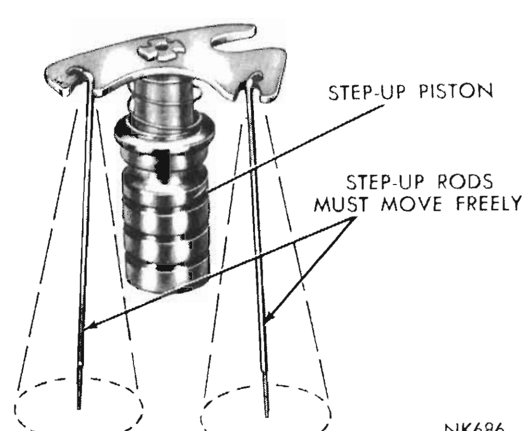


Fig. 8 – Step-up piston and 2 stage rods

(8) Slide the step-up piston gasket down into position in the piston well, then install the step-up piston spring and step-up piston and rods. Carefully guide the step-up rods into the main metering jets. *(Refer to Fig. 2).* Install retaining screw and tighten securely.

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 the float Setting

The Carburettors are equipped with a synthetic rubber tipped fuel inlet needle. 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 needle requires a new procedure in adjusting the float setting. Care should be taken to perform this accurately in order to secure the best performance and fuel economy.

To correctly set the float height, when the carburettor is being overhauled, proceed as follows:

(1) Install the floats with the fulcrum pin and pin retainer in the main body.

(2) Install the needle, seat and gasket in the body and tighten securely.

(3) Invert the main body (catch the pump intake check ball) so that the weight of the floats only, is forcing the needle against the seat. Hold finger against retainer to fully seat the fulcrum pin.

(4) Using Tool E14C15A or a "T" scale, check the float, as shown in *Fig. 9.* There should be ¼ inch from the surface of the fuel bowl to the crown of each float at the centre.

If an adjustment is necessary, hold the floats on the bottom of the bowl and bend the float lip toward

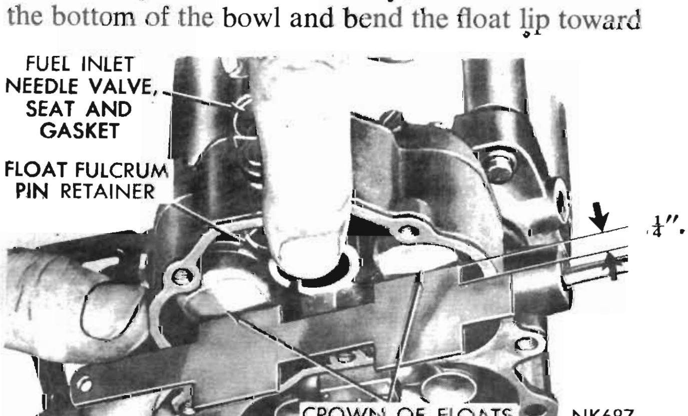


Fig. 9 – Measuring the float setting

or away from the needle. Recheck the ¼ inch setting again then 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 synthetic 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 tip is very slow to recover its original shape.

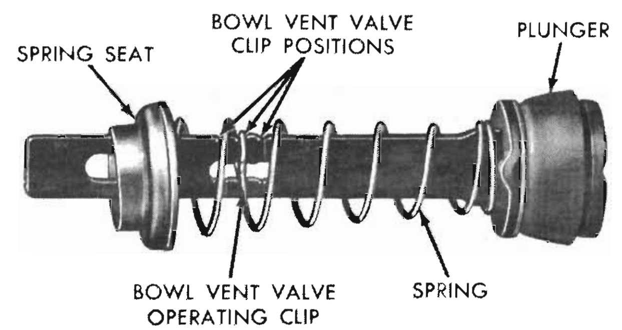


Fig. 10 – Accelerator pump assembly

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 is set correctly.

Air Horn

(1) Assemble the pump plunger, spring and spring seat, as shown in *(Fig. 10).* Slide plunger shaft through opening in air horn. Install bowl vent valve over plunger shaft, then engage with pump rocker arm.

(2) Place a new gasket on the main body, then install the air horn. Refer to *(Fig. 1).* Install attaching screws and tighten securely. (When installing air horn be sure the leather on the plunger does not fold back.)

(3) Engage the fast idle connector rod in the choke lever and fast idle cam. Secure with hairpin clip.

(4) Engage the accelerator pump operating rod in the inner hole in the rocker arm and in the centre hole in the throttle lever. Install clips to secure.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to ensure 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 10 seconds, the leakage is excessive and the assembly must be replaced.

Install the diaphragm assembly on the air horn as follows:

(1) Assemble to the airhorn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the rubber hose for cracks before placing it on the correct carburettor fitting. Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburettor Adjustments.)

4. CARBURETTOR ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburettor, and in the sequence listed.

Accelerator Pump and Bowl Vent

When assembling the accelerator pump to the air horn, note that the hair pin clip (which opens the bowl vent) can be placed in any one of the three positioning notches. These notches correspond to the long, medium and short pump stroke holes in the throttle lever. Normally, the bowl vent clip on the pump stem will be at the middle notch and the pump operating rod in the medium stroke hole.

The proper procedure is to adjust the amount of bowl vent opening instead of measuring and setting the height of the pump plunger.

To check or set the adjustment proceed as follows:

(1) Back off the idle speed adjusting screw. Open the choke valve so that the fast idle cam allows the throttle valves to be completely seated in the bores.

(2) Be sure the pump operating rod is in the medium stroke hole in the throttle lever, and the inner hole of the pump arm, and that the bowl vent clip on the pump stem is in the centre notch.

(3) Close the throttle valves tightly. It should be just possible to insert a .060″ drill between the bowl vent and its seat, as shown in *Fig. 11*.

If an adjustment is necessary, bend the pump operating rod, using Tool E14C10, at the lower angle, until the correct bowl vent opening has been obtained.

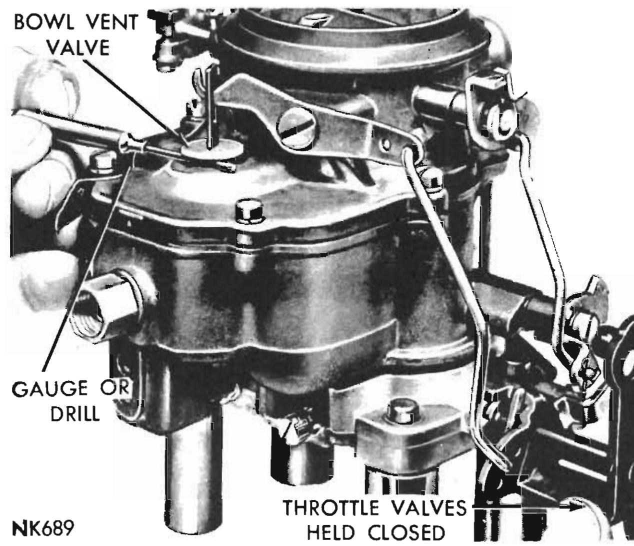


Fig. 11 – Measuring bowl vent opening (Typical).

This is an important adjustment, since too much lift at the bowl vent will result in considerable loss in low speed fuel economy.

Remember that if the pump operating rod is moved to either the short or long stroke position a corresponding change must be made in the location of the bowl vent clip, and the amount of lift of the bowl vent rechecked and adjusted.

Fast Idle Speed and Cam Position Adjustments

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 be sure that the speeds of each cam step occur at the proper time during the warm-up. Adjust as follows:

(1) With the fast idle speed adjusting screw contacting the 2nd step on the fast idle cam shown in *(Fig. 12)*, move the choke valve toward the closed position with light pressure. Insert a No. 41 drill (.095″) or 3/32″ gauge between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend fast idle connector rod at angle, using Tool E14C10, until correct valve opening has been obtained. *Refer to Fig. 12.*

Vacuum Kick Adjustment—(This test can be made On or Off the 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 another vehicle. Adjust as follows:

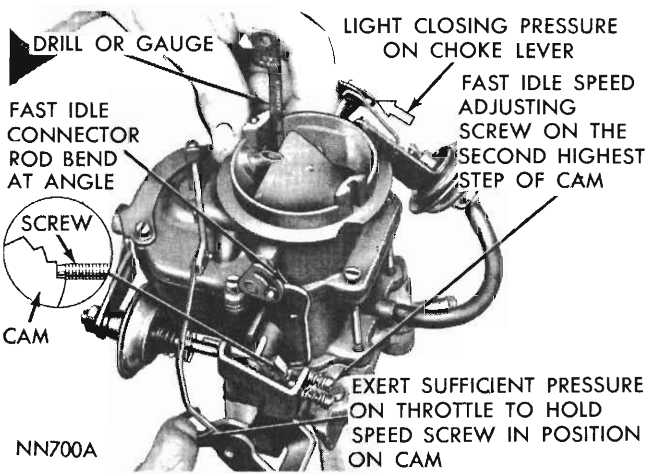


Fig. 12 – Fast idle cam position adjustment (Typical)

(1) With the engine NOT running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply as shown in *Fig 13*. (A minimum of 10 inches of mercury will be required.)

(3) Insert the specified gauge .105" (manual 6 cyl. models), .095" (automatic 6 cyl. models) or .161" for 8 cyl. models, between choke valve and

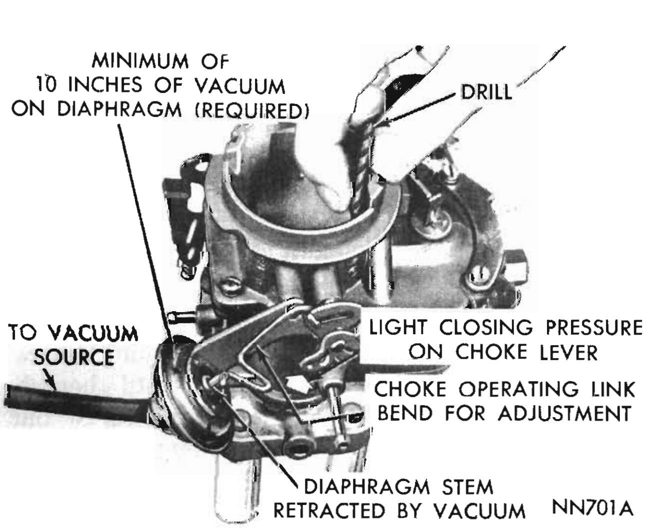


Fig. 13 – Measuring the choke vacuum kick setting

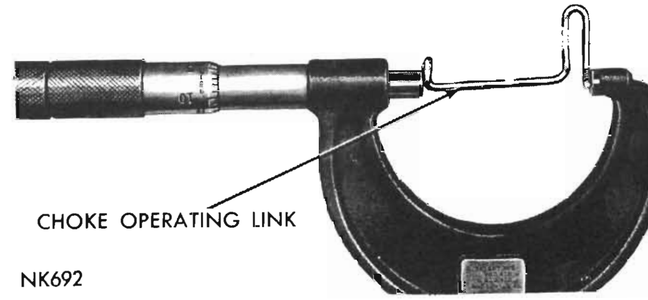


Fig. 14 – Choke operating link measurements

wall of the air horn. Apply sufficient closing pressure on the choke shaft lever to provide the smallest choke valve opening possible without distortion of the diaphragm link. Note that the cylindrical stem of the diaphragm will extend as an internal spring is compressed. The spring must be fully compressed for proper measurement of the kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

> CAUTION: Damage to the diaphragm and the choke level slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the diaphragm stem, then disengage the link from the choke lever. (The best bending results will be obtained by using a vice and a pair of pliers.)

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

> CAUTION: A correction in the length of the link of .010 inch, will result in a change of .015 inch in the choke valve opening.

As an example, if the choke valve opening is 0.015 inch in error, the correction in the link length would be .010 inch.

A 2" micrometer will be helpful in establishing the original length of the link, as shown in *(Fig. 14)*, before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a gauge or drill. Refer to *(Fig. 13)*.

(8) Reinstall the vacuum hose to the diaphragm and with no vacuum applied to the diaphragm, some clearance should exist between the choke operating

link and the choke lever slot, in both the open and closed choke valve positions, *(as shown in Fig. 15). This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.*

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke unloader (wide open kick)

(1) Hold the throttle valves in the wide open position. Insert ¼" drill shank between the upper edge of the choke valve and the inner wall of the air horn, as shown in *Fig. 16.*

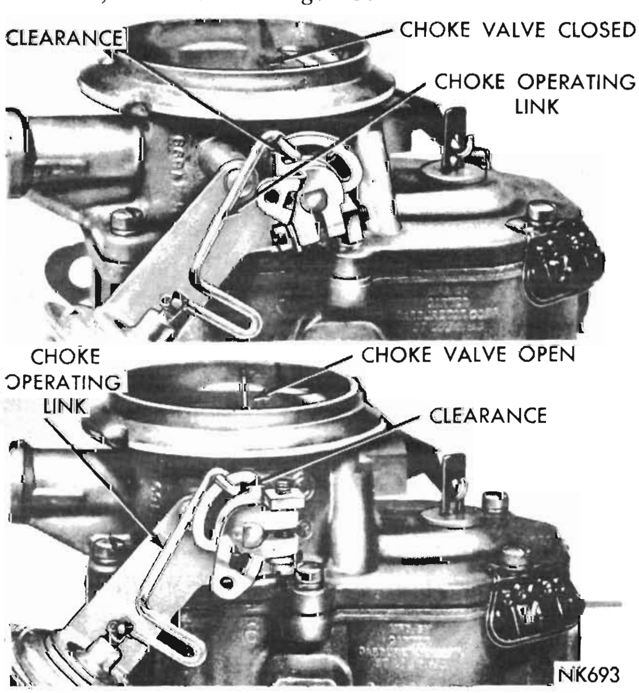


Fig. 15 – Choke operating link clearances

(2) If no drag is felt, or if too much drag is apparent, bend the unloader, tang on the throttle lever, until correct clearance has been obtained.

Idle Speed Adjustments—Prior to 1/1/72.

(For vehicles built after 1/1/72—refer to Emission Control Section).

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more

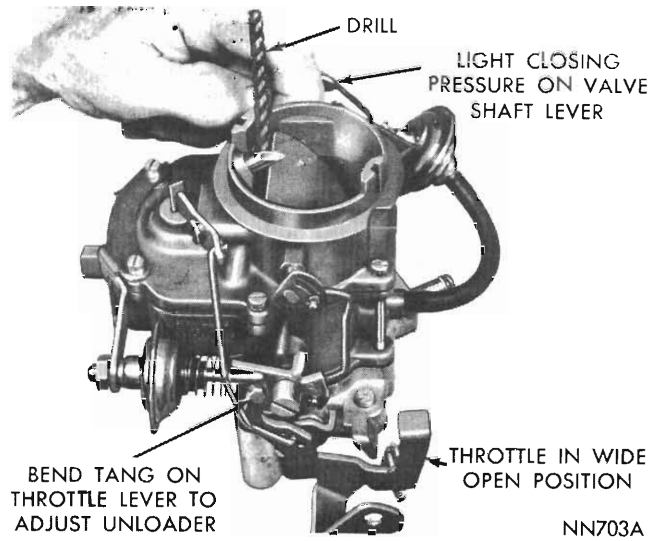


Fig. 16 – Measuring the choke unloader setting (Typical)

reliable idle adjustment can usually be obtained if the car has been driven a minimum of five miles.

To ensure an accurate Curb Idle and/or fast idle speed adjustment, it is recommended that a tachometer be used, the Air Cleaner installed, Air/Cond. & Headlights turned OFF.

Curb Idle Speed

(1) Turn the idle speed screw in or out to obtain 600 R.P.M. for automatic 6 cyl., 600 R.P.M. for manual 6 cyl. or 650 R.P.M. for 8 cyl. models. Be sure that the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw to obtain the highest r.p.m. While making the adjustment, watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest r.p.m. reading

(3) Re-adjust to specified R.P.M. with the idle speed screw.

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in r.p.m. Now, turn each screw out counter-clockwise (richer) just enough to regain the lost r.p.m.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle.

This setting is very important.

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(5) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 4 if necessary. After the proper idle speed has been obtained, refer to *Para. 7.* Throttle Cable and Linkage Adjustment, for the procedure on adjusting the transmission control rod.

Fast idle speed

To set the fast idle speed on the car, connect a tachometer, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

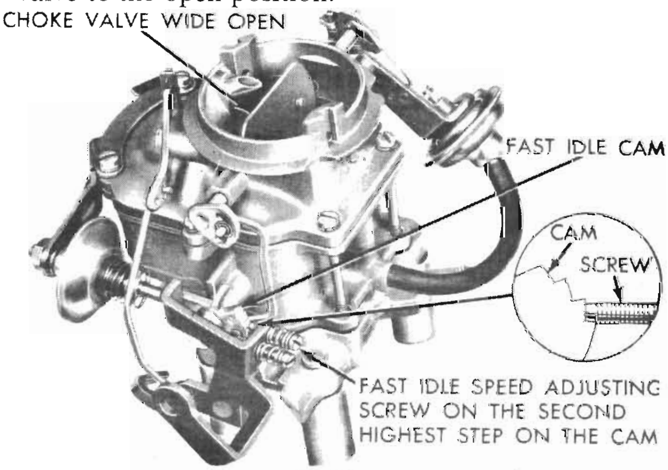


Fig. 17 – Fast idle speed adjustment (on the vehicle)

(3) The fast idle speed adjusting screw should be contacting the 2nd fastest speed step on the fast idle cam, as shown in *(Fig. 17).*

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw IN or OUT to obtain 1500 R.P M.

5. AUTOMATIC CHOKE (WELL AND STOVE TYPE)

To function properly it is important that all parts be clean and move freely. Other than an occasional cleaning, the choke requires no servicing. However, it is very important that the choke control unit works freely in the well and at the choke shaft. Move the choke rod up and down to check for free movement in the pivot. If the unit binds, a new choke unit should be installed.

> NOTE: The thermostatic choke unit is serviced as an assembly. Do not attempt to repair.

The correct setting is with the index notch opposite the "2 notches rich" mark.

When installing the thermostatic choke unit, be certain that the coil housing does not contact the sides of the well in the manifold. Any contact at this point will affect choke operation. DO NOT lubricate any parts of the choke or the control unit. This causes an accumulation of dirt which will result in binding at the mechanism.

6. CRANKCASE VENT SYSTEM

The crankcase ventilator valve is located in the crankcase vent tube cap and is connected to the carburettor throttle body via a rubber tube.

The function of the valve is to regulate the flow of unburned hydrocarbons from the crankcase and return them to the intake manifold. From here they enter the combustion chamber and exit via the exhaust products. For servicing procedures of this valve, refer to Group 1 — Lubrication and Maintenance.

7. THROTTLE CABLE AND LINKAGE ADJUSTMENT (REFER FIG. 18)

(8 cyl. models)

> NOTE: 6 cyl. model throttle and transmission Cable Adjustments are continued on Page 14 – 11.

(1) Apply a thin film of multi-purpose grease on accelerator shaft (2) where it turns in the bracket, anti-rattle spring (1) where it contacts shaft, pivot points of both upper (9) and lower (15) linkage ball cranks, ball end of cable and pocket (3) at rear end of cable.

(2) Disconnect choke (4) at carburettor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburettor to curb idle.

(3) Hold or wire transmission lever (14) firmly forward against its stop while performing adjustments in the next four steps. It is important that the lever remains firmly against the stop during these steps to insure a correct adjustment.

(4) With a 3/16" diameter rod (7) placed in the holes provided in upper bellcrank and lever, adjust length of intermediate transmission rod (13) by means of the threaded adjustment at upper end. The ball socket (8) must line up with the ball end with a slight downward effort on rod.

(5) Assemble ball socket (8) to ball end and remove 3/16" rod (7) from upper bellcrank and lever.

(6) Disconnect return spring (11), clip and washer, then adjust length of carburettor rod (5) by pushing rearward on rod with a slight effort and turning the threaded adjustment (12). The rear end of slot should contact carburettor lever pin without exerting any forward force on pin when slotted adjuster link (12) is in its normal operating position against lever pin nut.

(7) Assemble slotted adjustment (12) to carburettor lever pin and install washer and retainer pin. Assemble transmission linkage return spring (11) in place.

(8) Remove wire securing transmission lever, then check transmission linkage freedom of operation, move slotted adjuster link (12) to the full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(9) Loosen cable clamp nut (6), adjust the position of the cable housing ferrule (10) in the clamp so that all slack is removed from the cable with the carburettor at curb idle. To remove slack from the cable, move the ferrule (10) in the clamp in direction away from the carburettor lever.

(10) Back off ferrule (10) ¼". This provides ¼" free play between the front edge of the accelerator shaft lever and the dash bracket. Tighten cable clamp nut (6) to 45 lbs./in.

(11) Route cable so that it does not interfere with the transmission rod THROUGHOUT ITS FULL TRAVEL.

(12) Connect choke rod (4) or remove blocking fixture.

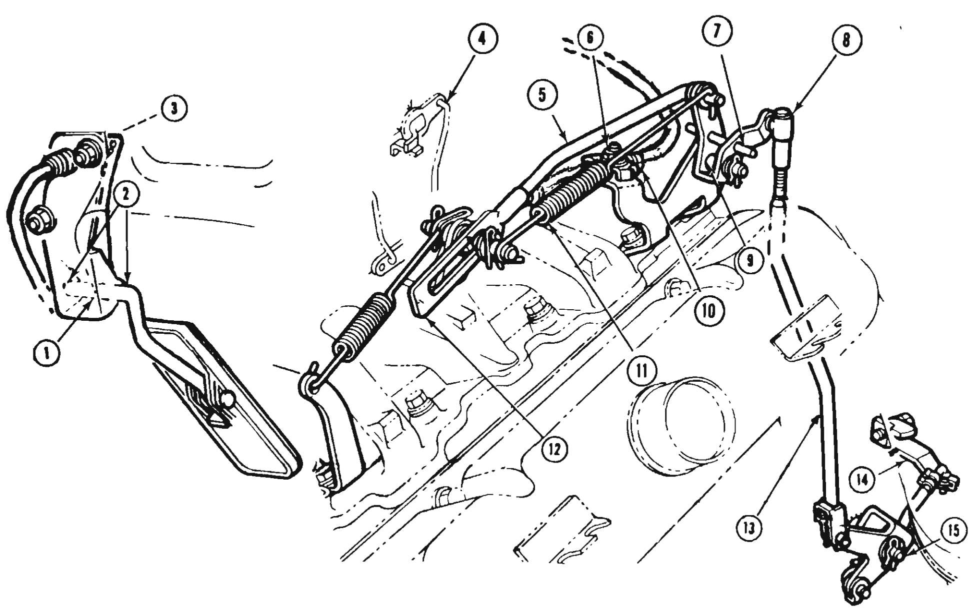


Fig. 18 – Throttle cable and linkage adjustment (8 cyl. models)

E37 AND E38 OPTIONAL ENGINES

WEBER CARBURETTORS

SPECIFICATIONS

Type	Dual Throat Side Draught	
Make and Model	Weber 45 DCOE	
Engine Application	E37	E38
Model Number	Front & Centre 55	Front & Centre 53
	Rear 54	Rear 56
Main Venturi	38 mm	40 mm
Auxiliary Venturi	4.5 mm	4.5 mm
Main Metering Jet	135	145
Idling Jet	F9/55	F9/55
Starting Jet	F5/40	F5/40
Acc. Pump Jet	50	50
Air Correction Jet	180	180
Emulsion Tube	F2	F2
Float Level	7.5 mm	7.5 mm
Float Weight	26 grams	26 grams
Choke Mixing Bush	100	100
Idle Speed	700 R.P.M.	750 R.P.M.
Choke	Manually operated by cable interconnected between the three choke levers.	

SPECIAL TOOLS

	Vacuum Gauge Kit
E14C15C	Float Level Gauge

TORQUE SPECIFICATIONS

Carburettor Retaining Nuts	200 ins. lbs.
Fuel Line Union Nuts	120 ins. lbs.

1. GENERAL INFORMATION

The Weber 45DCOE Carburettor has been selected in conjunction with a tuned length cast aluminium intake manifold as the most suitable fuel system for high performance versions of the Hemi engine. After a considerable development programme, the three dual-barrel side draft Webers were tuned to meet the specific requirements of these engines. Reference is made to the flow diagrams of this carburettor which, together with the schematic diagrams and the following detailed description, enable its operation to be fully understood.

Multi-barrel Carburettors

To improve engine performance at full power, the trend in automotive design is to adopt more than one carburettor on the same engine so that each carburettor or barrel feeds a limited number of cylinders, or even a single cylinder. In this way volumetric efficiency (or combustion chamber charge) is improved with the added advantage that the fuel feed to each cylinder, or group of cylinders, is unaffected by the intake stroke of the others, thus ensuring a more uniformly blended mixture distribution.

The same result can be achieved by adopting a number of single-barrelled carburettors, but for reasons of simplicity and control positivity carburettors with two barrels incorporated in a single body casting, having a single constant-level float chamber, are preferred.

Individual barrels of the three 45DCOE carburettors feed separate cylinders through the tuned length intake manifold. The throttles in each carburettor are on the same spindle, which is mounted on ball races. In order to equalize the flow rate in each carburettor barrel during idle operation, a compensating passage is provided.

This is used to synchronize the carburettors at idle as detailed in the tuning procedure. The linkage between carburettors, when adjusted properly, ensures equal opening of each pair of throttle valves.

Air Bleed Correction

In a simple spray carburettor the fuel/air ratio in the venturi will vary as the engine speed varies and draws in more air.

Modern engines require a ratio of about 15 pounds of air to one pound of fuel for complete combustion. To maintain this ratio at different air flows through the carburettor, a device known as an emulsioning tube can be employed.

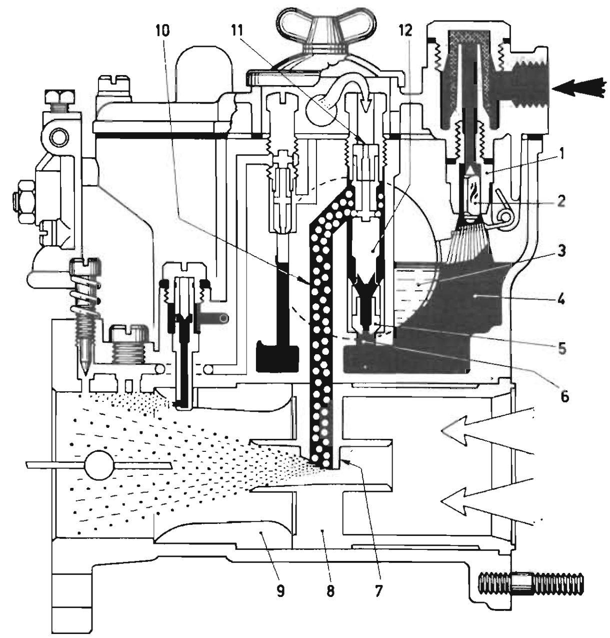


Fig. 1 – Schematic view of carburettor at full power.

This feature is employed on the Weber 45DCOE for correct mixture control. Fuel feeds from the float bowl through the main fuel jet *(No. 5, Fig. 1)* and up the outside of the emulsion tube, while outside air enters via the air jet *(No. 11, Fig. 1)* and travels down the inside of the tube where it bleeds into the fuel through the lateral holes in the emulsioning tube *(No. 12, Fig. 1)*.

The vacuum in the venturi becomes stronger following an increase in engine R.P.M. and the mixture strength tends to increase. This is corrected by the bleeding of air into the fuel so that an air and fuel mixture feeds to the venturi. By careful development and testing, the fuel supply curve can be corrected by this device to achieve the correct mixture strength at varying speed and load conditions. The size of the supply to the venturi and the clearance of the emulsioning tube in its well also have an effect on the mixture strength due to their restriction.

The air bleed principle also provides better atomization of the fuel, enabling the jet size to be increased because the jet is no longer subjected to the full action of the vacuum in the venturi. This makes the jet easier to manufacture accurately and less likely to be affected by possible impurities in the fuel.

This principle is also used for the idle and choke system on the Weber 45DCOE.

Full Power Operation

At wide open throttle the fuel is supplied via the main air jet and fuel jet to the emulsioning tube which feeds the venturi. In order to boost the depression in the main venturi, a second venturi *(No. 8, Fig. 1)* surrounds the fuel outlet, thus improving the mixing of the fuel with the incoming air.

Idle Speed (or slow running) Device

The idle speed device allows a warm engine to operate at the lowest R.P.M. rate at which it will keep running. Under this condition the throttle is nearly closed and the degree of vacuum in the venturi is too low to draw any fuel from the nozzle. A high vacuum exists in the intake manifold at lower air flow rates under idle conditions. This high

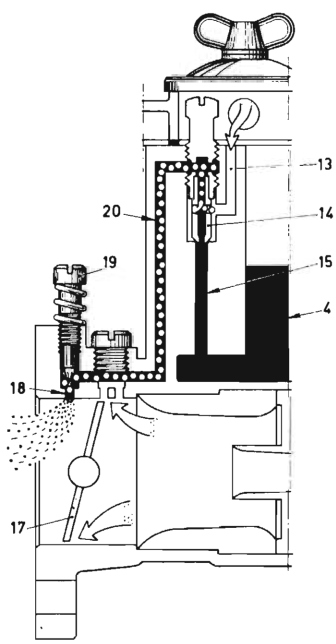


Fig. 2 – Schematic view of carburettor idling system

vacuum is, therefore, exploited for the idling engine feed circuit by connecting the throat area downstream of the throttle to the fuel jet which also incorporates an air jet. The air/fuel mixture thus formed is drawn into the throat through an orifice *(No. 18, Fig. 2)*, whose bore is varied by a taper-pointed screw called the "idle mixture adjusting screw" *(No. 19, Fig. 2)*. The air bleed at the fuel jet has a secondary function of preventing any fuel syphoning action when the engine is not idling.

Acceleration Progression

As described so far, the carburettor can operate equally well at both idle and normal speeds, with part or wide open throttle. However, if the throttle is opened slightly from its idle setting, fuel starvation results and the engine will stop. This occurs because

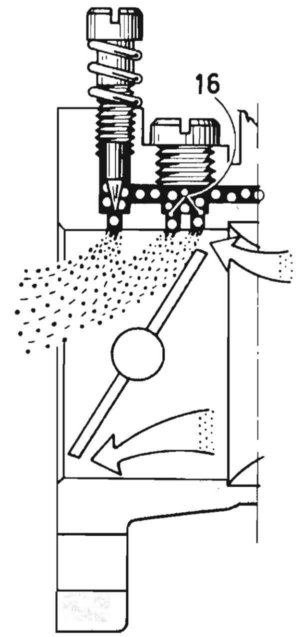


Fig. 3 – Schematic view of progressive action

the wider gap around the throttle valves lets in a greater amount of air, while the mixture from the taper-pointed screw orifice, instead of increasing proportionally, tends to reduce with the decreasing vacuum.

To ensure a progressive action during acceleration, a transition orifice is drilled through the idle mixture duct directly in line with the upper edge of the throttle when it is in its idle speed position. As the throttle opens, this orifice will be located partially or totally in the area downstream of the throttle where the vacuum is higher. The fuel is then supplied to the throat in parallel with the idle mixture.

To prolong the progression stage on the 45DCOE carburettor, two transition orifices are provided to accompany the opening of the throttle valve *(No. 16, Fig. 3)*.

In addition to the transition orifices, the emulsioning tube at the main jet becomes an important factor. With the engine idling, there is a certain amount of fuel in the well of the emulsioning tube which, by capillary action, is above the fuel level in the float bowl. When the throttle is opened, a slight vacuum is sufficient to draw fuel into the passage to the venturi and prime the mixture supply for the main circuit.

Acceleration Pump

In spite of the design features described, there are cases in which an acceleration pump must be

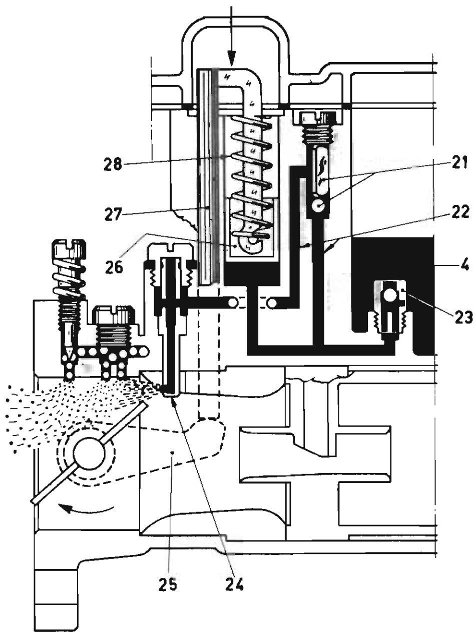


Fig. 4 – Schematic view of accelerator pump system

used to inject an additional amount of fuel at very quick opening of the throttle. The quick opening of the throttle may cause a temporary leaning out of the mixture strength as a result of the faster rate at which air is consumed by the carburettor. This depends on the different densities and circuiting of the air and fuel inside the carburettor.

The mechanically operated pump is of the plunger type *(No. 26, Fig. 4)* with ball check valves *(Nos. 21 and 23, Fig. 4)*. As the throttle is opened, fuel is pumped from the float bowl to the carburettor throat. Jets aim the fuel in such a direction that it does not strike the opening throttle valves *(No. 24, Fig. 4)*.

The main features of acceleration pump operation are the amount of fuel injected at each stroke and the promptness and duration of each injection. When the engine operates at high r.p.m., the pump jet is subject to a vacuum sufficient to produce an uninterrupted flow of fuel, that is, it also performs as a high speed jet complementing the main fuel supply *(see Fig. 1)*. If the pump supply ceases, faltering acceleration will result with back-firing in the carburettor, followed by possible stalling of the engine. If the pump supply is excessive, acceleration will still falter and an emission of black smoke at the exhaust will occur.

Cold Starting Device or Choke

When a cold engine is started, and especially at low ambient temperatures, the following phenomena take place:

Only a weak vacuum in the intake manifold acts on the jets because the starter-cranked engine turns slowly.
Owing to the extremely low vacuum, an inadequate mixture is supplied from the idle speed circuit and no mixture at all from the main jet.
Fuel condensation on the intake manifold and cylinder walls occurs as a consequence of the low vacuum and temperature.

The cylinders receive a lean and poorly blended mixture containing a high percentage of fuel which is still in the liquid state and difficult to ignite.

To ensure prompt starts and smooth operation during engine warm-up, the carburettor must supply a rich mixture which is obtained with a "choke". Once the engine reaches its normal operating temperature, the choke is not required.

The 45DCOE series carburettor is provided with a cold starting device of the progressive-action type consisting of two separate circuits (one to each barrel) in which two manually operated plungers govern the mixture *(Fig. 5)*. The choke jet *(No. 30, Fig. 5)* incorporates an emulsioning tube and an air jet.

Fuel Level

Through the needle valve the float regulates the flow of fuel into the bowl to keep the level constant, independent of the varying engine requirements.

The needle taper point and seat are finished and checked as a pair and are not interchangeable with

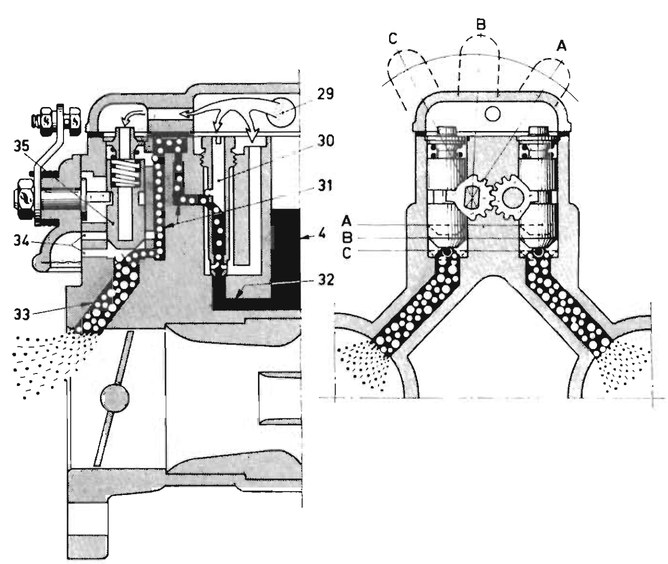


Fig. 5 – Schematic view of cold starting system

the respective parts of other valves. A spring and ball in the needle valve dampens pulses from the fuel pump. The fuel height in the bowl must be kept at a lower level than the spray nozzle bore; to prevent fuel emissions when the engine is inoperative and the car is on an inclined surface.

Fuel level variations have greater influence during acceleration, idle speed and part-load/low r.p.m. operation.

Throttle Linkage

The throttle linkage is of robust design and provides the synchronized operation for the three carburettors.

The main throttle linkage shaft runs in sealed ball bearings in a machined steel housing mounted on the inlet manifold. A lever at each end of the main throttle linkage shaft directly operates the front and centre carburettors via adjustable rods with ball and

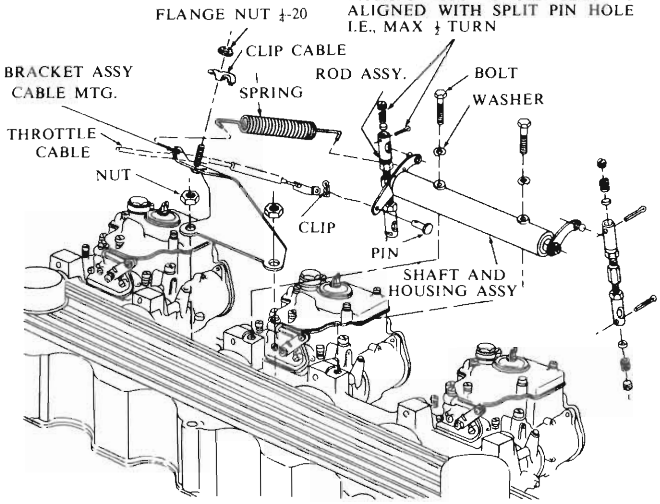


Fig. 6 – Exploded view of throttle linkage

socket ends. The rear carburettor is a slave to the centre one, its throttle adjustment being controlled by a synchronizing screw linking it with the centre carburettor.

Air Cleaners

An individual pancake type air filter is used on each of the three carburettors. They are of the low restriction type and of adequate size so as not to restrict the carburettor air horns.

Positive Crankcase Ventilation (PCV) System

A PCV system is used to eliminate the emission of fumes caused by piston ring blow-by and oil fuming. Air enters the crankcase via an inlet filter in the front of the rocker cover and is drawn off the rear of the rocker cover through a flame trap into the air filters. This flame trap is a safety device which consists of a barrier of wire gauze to prevent any backfire into the crankcase.

Also the shape of the flame trap is such that oil vapours condense back to oil droplets and fall back into the rocker cover, thus allowing only the lighter gaseous hydrocarbon vapours to be drawn back into the engine through the carburettors and burnt off.

2. ENGINE TUNING PROCEDURE (PRIOR TO CARBURETTOR ADJUSTMENT)

It must be pointed out that these engines cannot be tuned correctly without the proper equipment, namely a dwell indicator, a tachometer, a timing light, a compression gauge, a fuel pressure gauge, and a carburettor adjusting instrument consisting of six calibrated vacuum gauges with capillary tube dampers, connecting hoses and vacuum bleed hole adaptors. Other methods have proved undependable in tuning these engines and, in order to obtain peak performance and drivability, the following instructions should be thoroughly understood and carefully followed. Many of the problems with poor running, etc., are blamed on the carburettor, whereas it is often attributable to other factors.

Engine Compression

Before attempting any adjustments, a check of the individual cylinder compression pressure must be made. The correct procedure is to run the engine to the rated operation temperature, remove the spark plugs and fit a compression gauge to the front cylinder. Keeping the accelerator open, crank the engine with the starter motor until the gauge gives a maximum reading; repeat for the other cylinders and record the readings. If the pressure in any cylinder is very low, this probably indicates the valves, piston rings or cylinder head gaskets do not provide the necessary compression sealing. Engine performance will suffer and it will not be possible to satisfactorily adjust the idle nor synchronize the carburettors until the cause of the low compression is located and corrected.

Distributor

The distributor should be removed from the vehicle and the contact breakers inspected. If badly pitted or worn they should be replaced and the gap set to .012–.016 inch. The condenser should be tested and replaced if necessary. It is advisable to check the centrifugal and vacuum advance on a distributor tester. (Advance specifications appear in Electrical Group 8, Part 4.)

Install the distributor and set the dwell by adjusting the contact breaker point gap. Using a timing light, adjust the ignition timing to 5° B.T.C. at 600 R.P.M., with the vacuum advance line disconnected. Ensure that the distributor cap is clean and undamaged and inspect the high tension ignition wires. Note that carbon-filled wires are used on these engines and are recommended.

Fuel Pump

Check the fuel pump for correct operation, and the line filter for cleanliness. Fuel pump pressure should be 5 p.s.i. minimum at idle and return to zero slowly when engine is stopped.

Spark Plugs

The recommended plugs are Champion N9Y 14 mm ¾″ reach with .035″ gap. For tuning the carburettors it may be necessary to fit a hotter running plug, e.g., N11Y or N14Y since these will not foul during prolonged idling. It is most important that hot plugs are NOT used for high speed motoring or else the ensuing pre-ignition can cause piston burning or cracking.

NOTE: When new plugs are not fitted, the old plugs should be carefully cleaned, the electrodes filed and then regapped to .035 inch.

3. CARBURETTOR FLOAT LEVEL

Fuel level variations have considerable influence on carburettor performance. The float level is checked by removing the float well cover assembly. Check the float level with the special gauge (Tool No. E14C15C for adjusting the float. Any necessary correction may be made by bending delicately the two tongue plates located in the proximity of the fulcrum pin. Note that adjustment is made with the gasket installed. The float should be 7.5 mm (.295 in.) with the needle valve closed, and 14 mm (.551 in.) with it open.

4. TUNING AND SYNCHRONIZING TRIPLE CARBURETTORS

To comply with the 1972 Emission Control Rule the tuning of the WEBER 45DCOE carburettors remains the same as the standard procedure set out in the manual with the proviso that the lean side of maximum idle speed setting be aimed at.

(1) Connect to the engine a tachometer with a range of 0–1,000 r.p.m.

(2) Connect to each vacuum bleed hole a vacuum dial gauge reading 0–30″ Hg.

(3) Set adjuster rod to measure 3.5″ between ball joint centres.

(4) Disconnect ball joint connector from No. 1 carburettor.

(5) Lightly close idle mixture adjusting screws and then open them ¾ turn off their seats. Take care NOT to force the screws into their seats.

(6) Slacken off the jam nuts on the air bleed screws and turn the screws onto their seats, taking care not to over-tighten them.

(7) WITH THE ENGINE AT NORMAL RUNNING TEMPERATURE, use the idle speed adjusting screws of No. 1 and No. 2 carburettor and the synchronizing screw of No. 3 carburettor to set the idling speed to 700 r.p.m. on the E37, and 750 r.p.m. on the E38.

(8) Synchronize the two throats on each carburettor by opening the air bleed screw of that throat showing the greater vacuum.

(9) Synchronize all three carburettors using No. 2 carburettor as a reference. Adjust the synchronizing screw on No. 3 carburettor and the idle speed adjusting screw on No. 1 carburettor until all three carburettors show the same vacuum reading.

(10) Turn the idle mixture adjustment screws on each throat until the maximum idling speed is found. At this condition turning the screw in either direction will result in erratic running and a decrease in r.p.m.

(11) Alter the idle speed adjustment screws on No. 1 and No. 2 carburettors and the synchronizing screw on No. 3 carburettor to maintain the prescribed idling speed and at the same time retain the same vacuum reading for all these carburettors.

(12) Repeat step 10 and, if necessary, repeat step 11 to ensure correct idling speed and good synchronization.

(13) Vacuum readings should agree within at least ½″ Hg. Closer readings will result in finer tuning.

(14) Replace No. 1 carburettor throttle control arm and adjust it to the correct length, taking care not to cause any rise in r.p.m. The rod must not be too short, otherwise No. 1 carburettor will not open at the same time as Nos. 2 and 3.

(15) Tighten the air bleed screw jam nuts.

(16) Check for synchronization by opening the throttle to give 1500 r.p.m. Vacuum readings should now be within ½″ Hg. If not, return the engine to idle and repeat idle synchronization or adjustment of throttle rod length as necessary.

(17) Remove the vacuum gauge lines and replace the plugs in the vacuum bleed holes.

> NOTE: During tuning at idle it may be necessary to clear the spark plugs by revving the engine up several times, especially if some of the carburettors have been running rich.

5. FITTING AND ADJUSTING CHOKE CABLE

(1) Fit clamping sleeves to choke cable posts on carburettors 1 and 2.

(2) Feed choke inner cable through the cable post of No. 3 carburettor and progressively pass it through the lever arms and the cable posts of No. 2 and No. 1 carburettors.

(3) Check that the choke control knob is approximately .125″ from the totally "off" position and clamp the cable to each lever arm, making sure that each lever is resting against its "off" stop.

(4) Pull the choke knob fully "out" and make sure the cable is free enough to allow the choke levers to return to their "off" stops when the knob is pushed in.

6. FAULT-FINDING CHECKS

It must be emphasized that this list is by no means comprehensive, but merely a guide to assist in fault-finding.

(1) *Hard Start in Cold Conditions:*

1.1 The choke must be fully out and operating correctly.

1.2 The accelerator pedal must not be kept wide open.

1.3 The distributor vacuum control must be operating correctly — maximum retard is necessary for cold starting.

1.4 The battery, electrical wiring and ignition system must be in perfect order to enable sufficient cranking speed, together with adequate spark.

(2) *Hard Start in Hot Conditions:*

2.1 The choke must not be used.

2.2 Ensure the accelerator is opened SLOWLY to avoid excess flooding by the accelerator pumps.

2.3 The throttle must be held partly open to remove excess vapours that have accumulated during hot soak.

2.4 The ignition system must provide adequate spark.

(3) *Poor Slow Running:*

3.1 With the engine running, check for air leakage past the manifold to carburettor gasket and the throttle shaft bearings. Check that the idle speed jet holder is properly tightened in its seat.

3.2 Check that none of the mixture adjusting screws are fully closed, which would cause all idling mixture to be supplied through the transition orifices.

3.3 Check that the throttle blade closing is not impeded and that all passages and calibrated jets in the idling system are not blocked by a build-up of carbon or "varnish" deposits.

3.4 Check that all throttles return to the closed position without drag. Remember to check the choke control for free operation at the same time.

3.5 Check that all ignition components are to specification.

(4) *Inadequate Acceleration or Poor High Speed Running — Excessive Fuel Consumption:*

4.1 Remember that these conditions are often caused by faulty components and adjustments other than carburettors!!

4.2 Check carburettors for perfect cleanliness and correct jetting.

4.3 Check that accelerator pumps are supplying fuel at every throttle opening.

4.4 Check that the throttles open fully when the accelerator is fully depressed.

(5) *Flooding and Fuel Losses:*

5.1 Check needle valve wear, fuel filter efficiency and float level adjustment.

5.2 Check that floats are not distorted and are free to move without binding on the fulcrum pins or against the chamber walls. Check for leaking floats. Do not attempt to repair these floats by soldering except

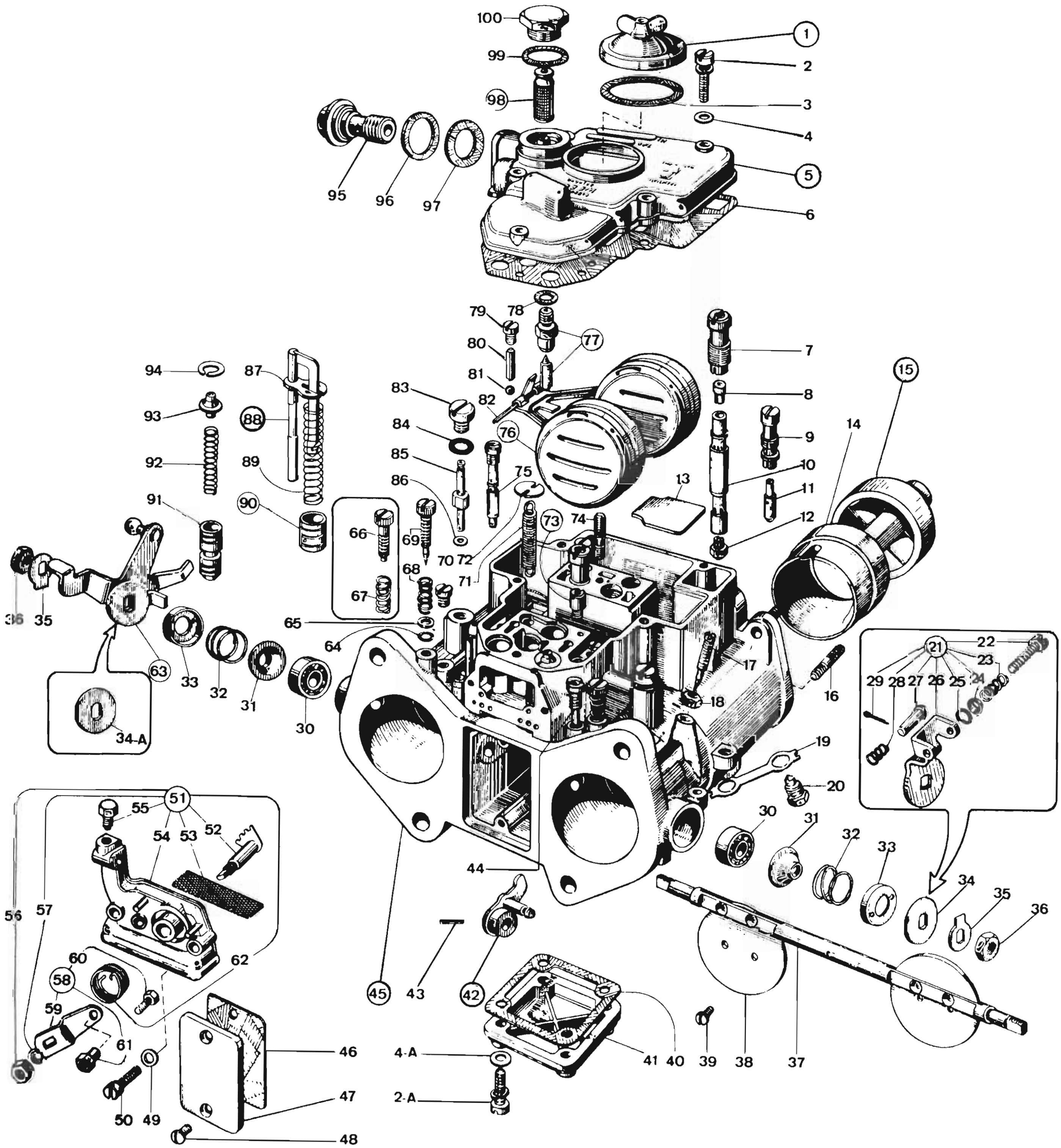


Fig. 7 – Exploded view of carburettor

in dire emergency. Their weight is critical for correct carburettor operation. Always fit a new float if float damage occurs.

5.3 Check for leakages around all plugs and jet holders.

5.4 Check that fuel delivery pressure is as specified.

7. SERVICING THE CARBURETTOR

Normally Weber DCOE Carburettors require no servicing other than periodic cleaning. The carburettors have been carefully adjusted to suit the engine they are fitted to and alterations to any jets are not recommended because serious side effects could result. To conserve fuel cleanliness, a fine gauze filter is fitted to the fuel inlet housing of the carburettor. This should be inspected and cleaned at every engine tune-up. When servicing carburettors, always keep parts in order so that they are replaced in the same relative positions.

The carburettors should at all times be perfectly clean, especially the inner passages. After cleaning, all metal parts should be blown dry with compressed air (with the exception of floats and needle valves).

NOTE: As the floats are made of thin sheet metal, and maintenance of their exact shape is essential for correct carburettor operation, they must NEVER be blown with compressed air.

Jets must always be cleaned with compressed air, and never by probing with wires or drills. This practice upsets both the size and surface finish of the jets, both of which are essential for correct fuel metering.

Removal of Carburettor(s):—

(1) Disconnect battery.

(2) Remove air cleaner(s) (keep parts in order to assist in assembly).

(3) Disconnect the carburettor connecting rod(s) (at carburettor throttle lever).

(4) Loosen choke cable clamping screws and withdraw the cable from the carburettor(s).

(5) Disconnect the fuel line(s) at the flexible hose connection(s).

(6) Remove the carburettor mounting nuts and lift the carburettor(s) from the engine.

CAUTION: Whenever handling Weber Carburettors, extreme care should be taken to avoid damage to the throttle discs.

Disassembling the Carburettor:—

(1) Remove the gauze filter cap *(100)* and remove the filter *(98)* and gasket *(99)*.

(2) Remove the air horns and keep in order to ensure that they can be replaced in the same positions.

(3) Remove the jet inspection cap *(1)* and gasket *(3)*.

(4) Remove cover fixing screws *(2)*.

(5) Remove cover *(5)* and small metal plate *(13)*.

(6) Remove the float pivot pin *(82)* and then the float *(76)*.

(7) Remove the needle and seat *(77)* and gasket. *(78)*.

(8) Remove cover from well bottom *(41)*.

(9) Remove the emulsioning tube holder *(7)*, air correction jet *(8)*, emulsioning tube *(10)* and main jet *(12)*.

(10) Remove the idling jet holder *(9)* and the idling jet *(11)*.

(11) Loosen jam nuts *(18)* and remove air bleed screws *(17)*.

(12) Remove the idling mixture adjusting screws *(69)*.

(13) Remove the accelerator pump rod *(88)*, spring *(89)*, plate *(87)*, and piston *(90)*.

(14) Remove accelerator pump jet *(85)* and intake ball valve *(73)*.

(15) Remove delivery valve ball *(81)* and rod *(80)*.

(16) Remove the two screws *(50)* retaining the cold start device *(51)* and remove the assembly.

Throttle Valves and Shafts:—

To Disassemble:

(1) Remove throttle valve fixing screws *(39)* and remove the throttle discs *(38)*.

(2) Remove shaft return spring and retaining plate *(71)* and *(72)*.

(3) Remove cover *(47)* and remove the locating pin *(43)* from the pump control lever *(42)*.

(4) Straighten the lock tabs *(35)* and remove the throttle lever(s) *(63)*.

(5) Withdraw shaft *(37)* complete with bearing *(30)*.

(6) Carefully tap off washer *(34A)*, caps *(33)*, springs *(32)* and seals *(31)*.

(7) Remove bearing from shaft.

(8) Use the throttle shaft to remove the other bearing.

To Install:

(1) Fit one bearing *(30)* to the throttle shaft *(37)* and the other to the carburettor body.

(2) Fit the shaft and bearing to the body including the pump control lever *(42)* and locating pin *(43)*.

(3) Lubricate bearings and fit seals *(31)*.

(4) Re-assemble levers, washers, caps and springs.

(5) Replace shaft retaining plate and spring.

(6) Refit throttle valves and countersink retaining screws.

Inspection and Re-assembly:

Thoroughly clean all ports and channels, etc., with clean gasoline and dry compressed air.

(1) Inspect the cold starting device selector spindle positions *(Fig. 5)*.

(2) Install the cold starting device *(51)* and check for freedom of operation.

(3) Install the delivery valve ball and rod and ensure that the ball is free in the bore.

(4) Install accelerator pump jet *(85)*.

(5) Check pump intake ball valve *(73)* for operation and install.

(6) Install accelerator pump, rod, spring, plate and piston.

(7) Inspect the idling mixture adjusting screw *(69)* tapers and install. (Screw tapers should be smooth and free from grooves.)

(8) Inspect air bleed screw *(17)* tapers and lightly screw fully in. (Screw tapers should be smooth and free from grooves.)

(9) Install the idling jet *(11)* and jet holder *(9)*.

(10) Install the main jet *(12)*, emulsioning tube *(10)*, air corrector jet *(8)* and emulsioning tube holder *(7)*.

(11) Inspect the needle valve for signs of grooving and replace if necessary. Install needle valve *(77)*.

(12) Install the float and float pivot pin *(76)* and *(82)*.

(13) Check float level (7.5 mm) *(refer page 28)*.

(14) Check float drop (14 mm) *(refer page 28)*.

(15) Install body well cover *(41)*.

(16) Install metal plate *(13)* and top cover *(5)*.

(17) Install jet inspection cap *(1)* and gasket *(3)*.

(18) Install air horns, taking care to ensure that they are fitted in exactly the same location as before.

(19) Clean gauze filter *(98)* and install.

(20) Screw idling mixture screws fully in and back off ¾ of turn.

Installing the Carburettor:—

Always use a new carburettor to manifold gasket.

(1) Fit carburettor(s) to manifold and tighten retaining nuts to 200 in. lbs.

(2) Re-connect fuel flexible lines.

(3) Re-connect choke cable and adjust as outlined on page 29.

(4) Re-connect carburettor connecting rods and check that the throttle linkage is:

1. Firmly fixed to manifold.
2. Parallel to carburettor mounting face.
3. Free from high spots in operation.

(5) Install air cleaners.

(6) Re-connect battery.

The carburettors will now have to be adjusted and synchronized as outlined on page 28.

Leakages:

After assembling the carburettors to the manifolds, all joints should be checked for leakage. This can be achieved by applying engine oil to all joints, whilst the engine is idling. Any leakage will be indicated by an alteration to engine idle and possible colouration of the exhaust gases due to oil being burnt in the combustion chamber.

8 CYLINDER 360 C.I.D.

SPECIFICATIONS

HOLLEY CARBURETTOR MODEL 2210

Type	Dual Throat Down Draught
"Holley" Part Numbers	R6178A; R6517A
Bore	1–9/16″
Venturi	1–7/16″
Main Metering Jet, Standard	No. 62
Main Metering Jet, 1 Step Lean	No. 61
Main Metering Jet, 2 Steps Lean	No. 60

Adjustments

Accelerator Pump Setting	9/16″ (¼″ Travel)
Float Setting	No. 7 drill (.200″)
Vacuum Kick Adjustment	No. 30 drill (.130″)
Fast Idle Cam Position Adjustment	No. 35 drill (.110″)
Bowl Vent Valve (at curb idle)	5/64″
Choke Unloader	11/64″
Idle Speed R.P.M. (curb idle)	650
Fast Idle Speed R.P.M.	1,800*

NOTE: The final settings of the idle mixture screws must be within ¼ of a turn of each other.

Choke

Type	Well
Control	Thermostatic Coil Spring
Setting	2 Notches Rich

* After approx. 500 miles (if necessary).

SPECIAL TOOLS

E14C30D	Carburettor Tool Kit
E14C30E	Remover Vacuum Power Piston
E14C30F	Installer Vacuum Power Piston
E14C30G	Power Valve Remover and Installer
E14C20F	Pin Gauge
E14C20G	Pin Gauge
E14C5	Repair Stand

TORQUE SPECIFICATIONS

Carburettor Retaining Screws	100 lbs. in.
Fuel Line Union Nuts	125 lbs. in.

HOLLEY 2210 CARBURETTOR

SERVICE INFORMATION—PROCEDURES

The Holley dual throat 2210 series carburettors are equipped with a common float chamber, fuel inlet, accelerator pump and power valve system, in addition each throat has its own main metering jet, throttle valve and idle mixture adjusting screw.

1. DISASSEMBLING CARBURETTOR

(1) Place carburettor on Repair Stand E14C5 or similar. (This tool is used to protect throttle valves from damage and to provide a suitable base for working.) *(Fig. 6).*

(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 centre 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 or air horn. Slide lever off shaft, being careful not to lose lever spring. (Note position of spring.) *(Fig. 5).*

(7) Remove eight air horn attaching screws, then lift air horn straight up and away from main body (long screw in centre).

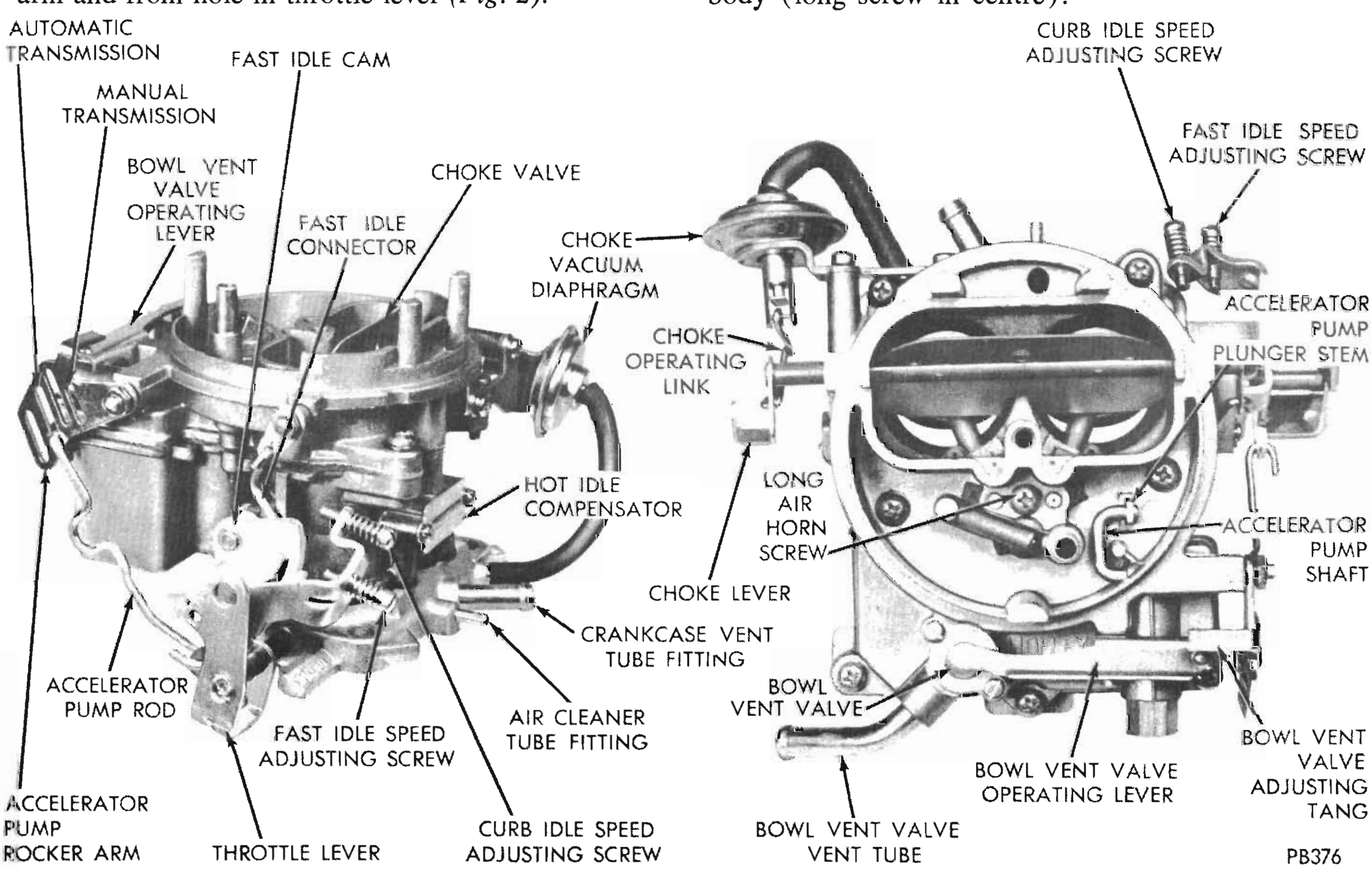


Fig. 1 – Carburettor assembly (Holley 2210 series)

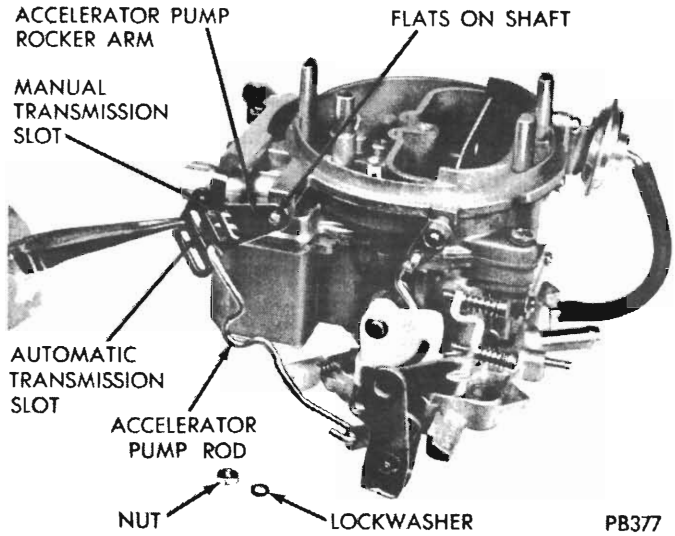


Fig. 2 – Removing or installing accelerator pump rocker arm

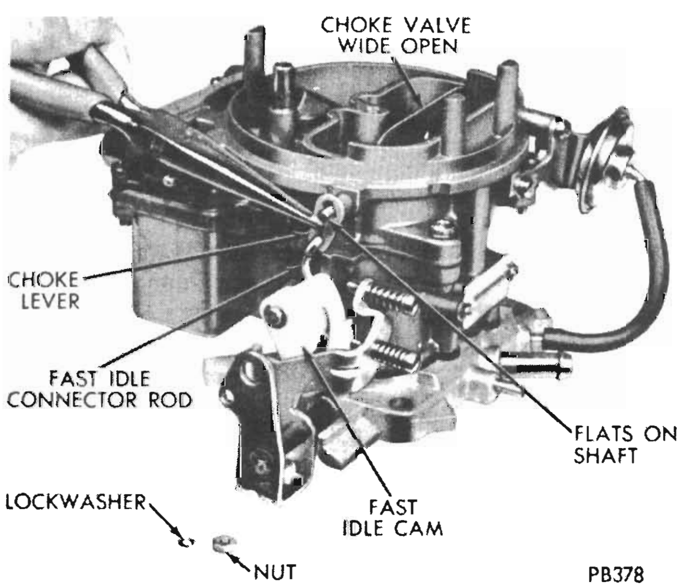


Fig. 3 – Removing or installing fast idle connector rod

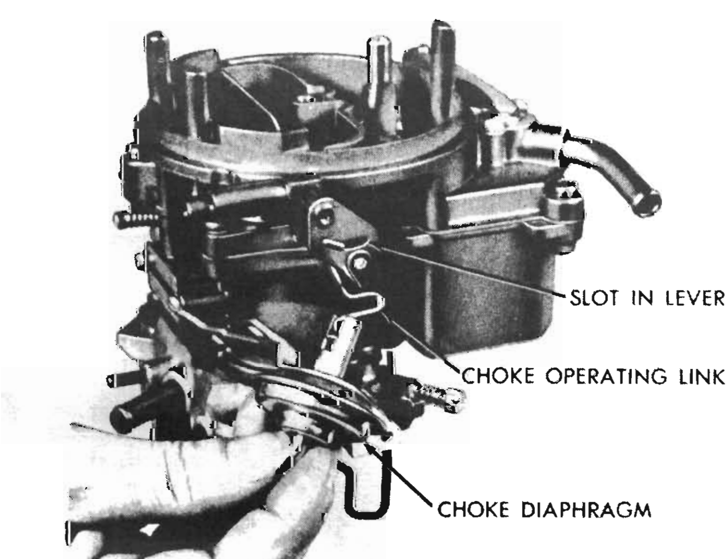


Fig. 4 – Removing or installing choke diaphragm

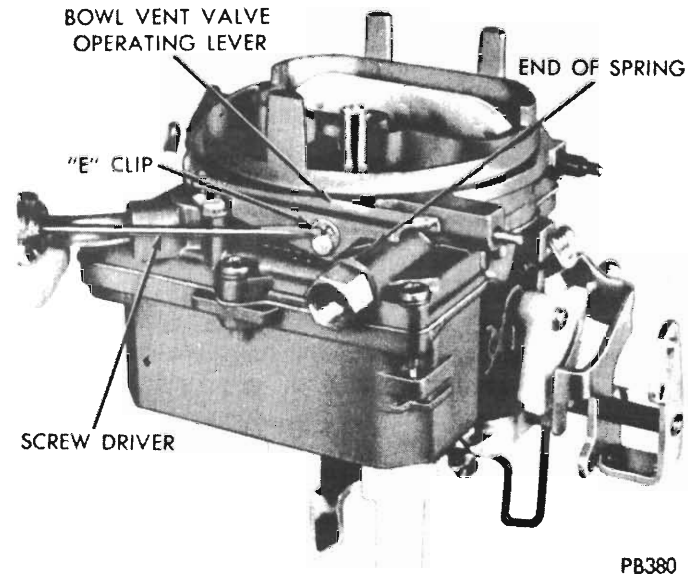


Fig. 5 – Removing bowl vent valve operating lever "E" clip

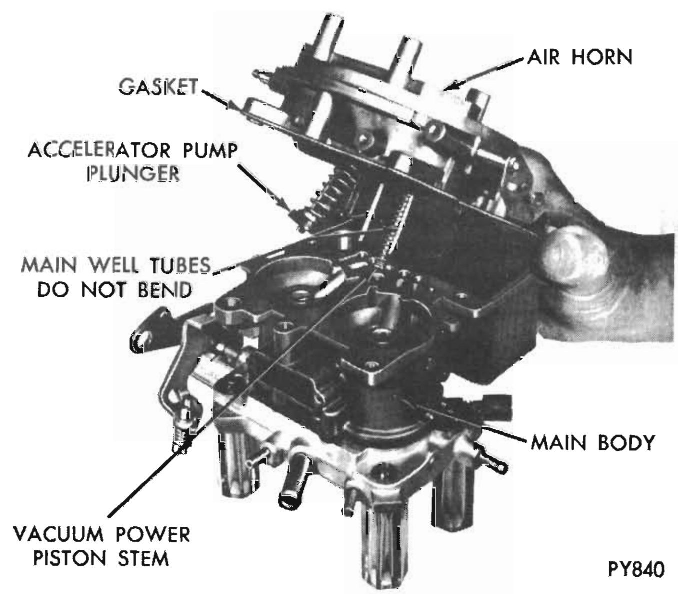


Fig. 6 – Removing or installing air horn

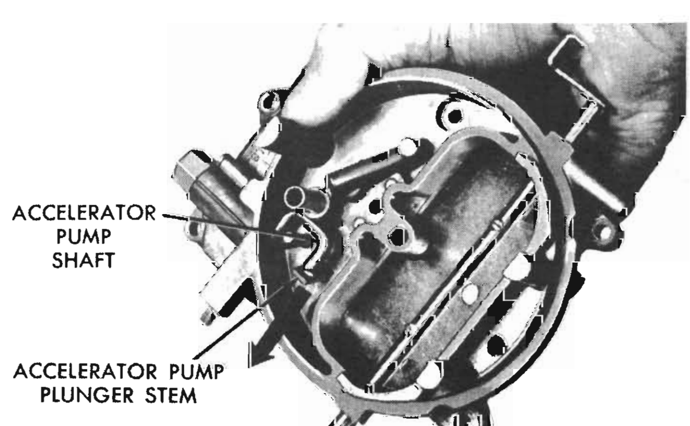


Fig. 7 – Removing or installing accelerator pump plunger

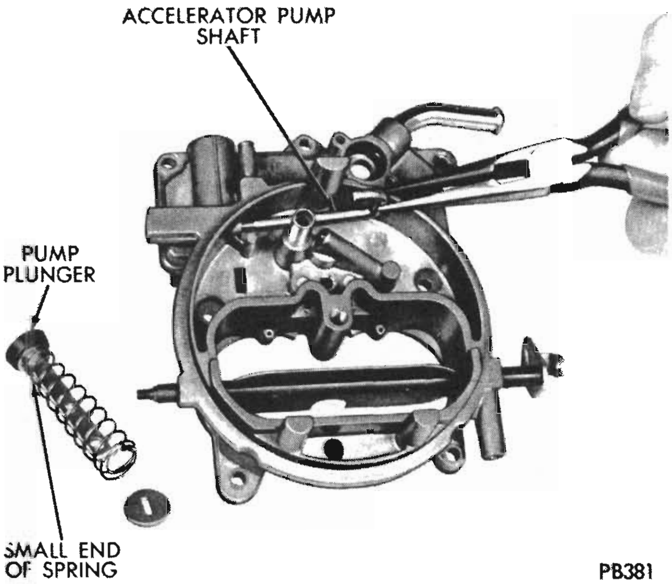


Fig. 8 – Removing or installing accelerator pump shaft

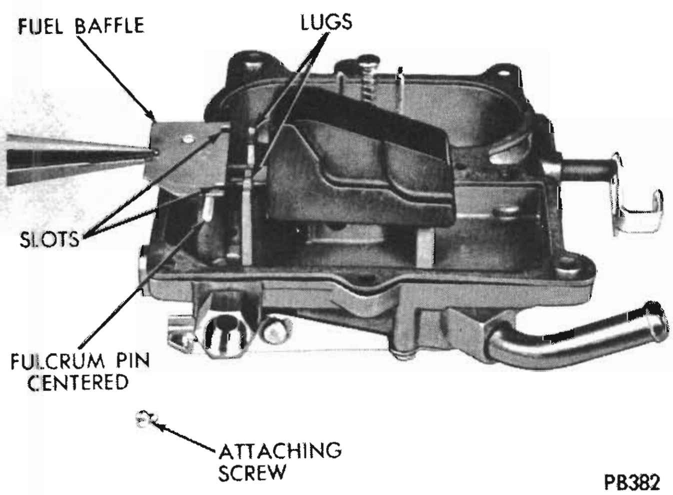


Fig. 9 – Removing or installing fuel baffle

NOTE: Use extreme care when handling air horn so as not to bend or damage main well tubes *(Fig. 6)*.

(8) Disengage accelerator pump plunger from pump shaft by pushing *up* on bottom of plunger, then tilting slightly toward centre, 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)*.

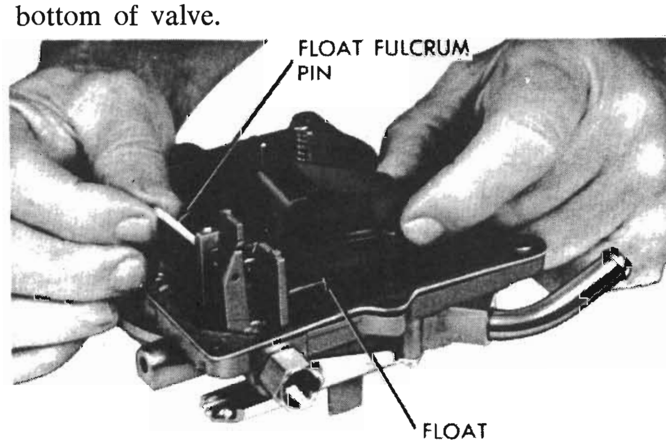
(12) Slide nylon float fulcrum pin out of air horn, then remove float. Invert air horn and drop out fuel inlet needle. Using a wide blade screw driver, remove fuel inlet needle valve seat and gasket *(Fig. 10)*.

(13) Remove air horn gasket and discard.

(14) Remove vacuum power piston from air horn, using Tool E14C30E *(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 press fit in air horn, and will be damaged if removed. They can be cleaned in a solvent and blown dry with compressed air. If carburettor parts are cleaned in a basket, be sure other carburettor parts are not striking these tubes.

(16) 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.



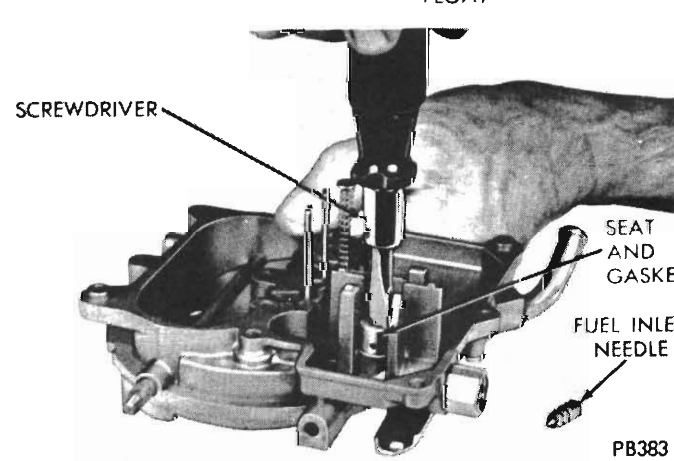


Fig. 10 – Removing or installing float and needle seat

(17) Remove screws that attach hot idle compensator valve cover to main body. Lift off cover, then remove valve and gasket *(Fig. 12)*.

(18) Remove main metering jets *(Fig. 13)*.

(19) Using Tool E14C30G, remove power valve assembly *(Fig. 14)*.

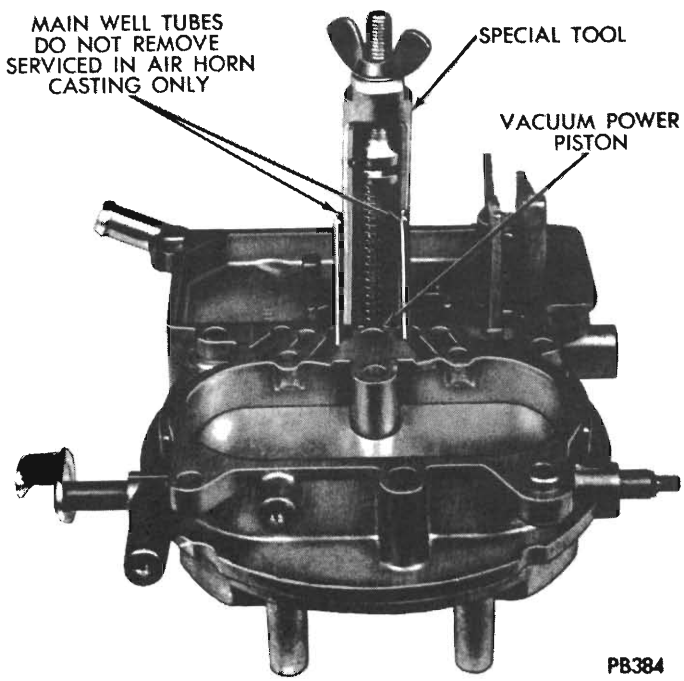


Fig. 11 – Removing vacuum power piston

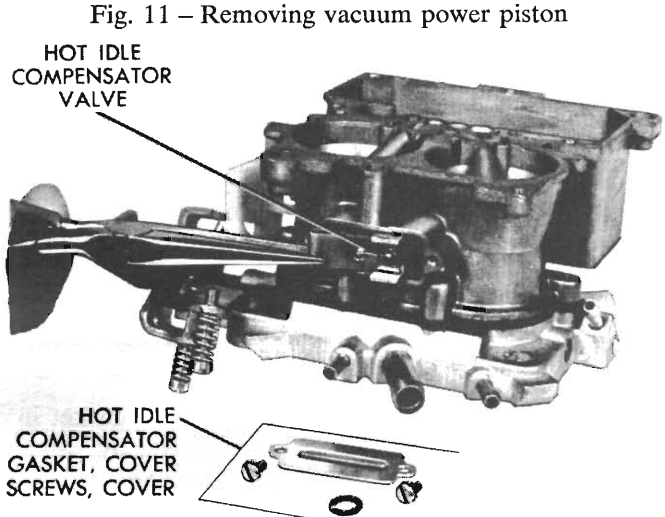


Fig. 12 – Removing or installing hot idle compensator valve

(20) Invert main body and drop out accelerator pump discharge check needle from discharge passage.

(21) Remove fast idle cam retaining "E" clip, then slide fast idle cam off stub shaft *(Fig. 15)*.

(22) Invert main body and remove throttle body to main body attaching screws. Separate bodies and discard gasket.

(23) Turn idle limiter caps to stop. (Top on throttle side and bottom of stop on choke side.) 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.

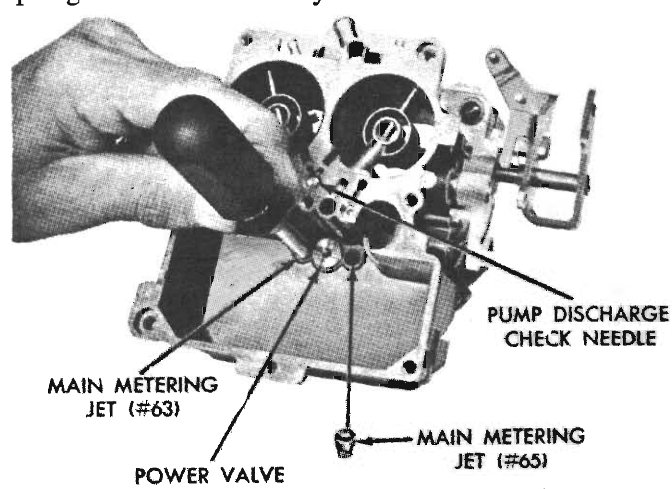


Fig. 13 – Removing or installing main metering jets

The carburrettor 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.

2. INSPECTION AND REASSEMBLY

DO NOT clean any rubber or plastic parts 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 screws and lockwashers that show signs of stripped threads or distortion.

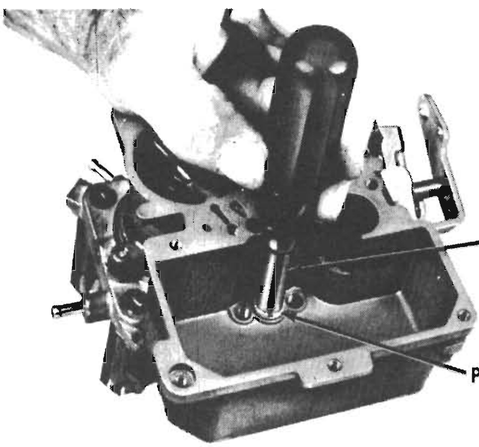


Fig. 14 – Removing or installing power valve (using Tool No. E14C30G)

Throttle Body

(1) 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 ensure having correct idle mixture control.) DO NOT USE A SCREWDRIVER. Turn screws lightly against their seat with fingers. Back off the number of turns (from the seat) counted at disassembly. Install new plastic caps with tab against stop. (Screws should be equal number of turns on both sides.)

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 to 25 inch pounds.

(2) Install accelerator pump discharge check needle in discharge passage *(Fig. 16)*. Check accelerator pump, fuel inlet and discharge systems as follows:

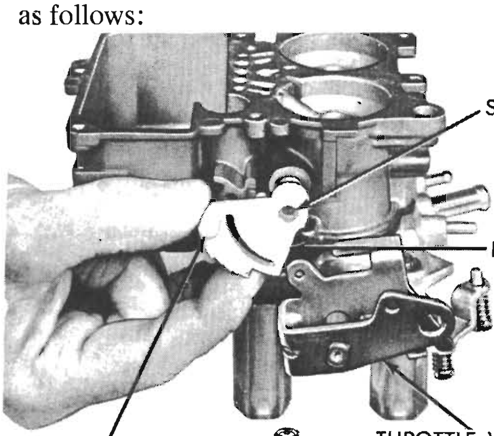


Fig. 15 – Removing or installing fast idle cam

(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. 17)*.

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.

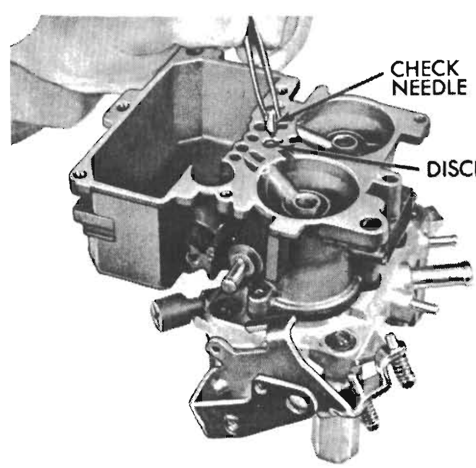


Fig. 16 – Installing accelerator pump discharge check needle

(6) Install power valve, using Tool E14C30G *(Fig. 14)*. Tighten securely.

(7) Install main metering jets *(Fig. 13)*. Tighten to 25 inch pounds.

(8) Install accelerator pump discharge check needle in pump discharge passage *(Fig. 16)*.

(9) 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. 12)*. Place cover over opening and install attaching screws. Tighten to 15 inch pounds.

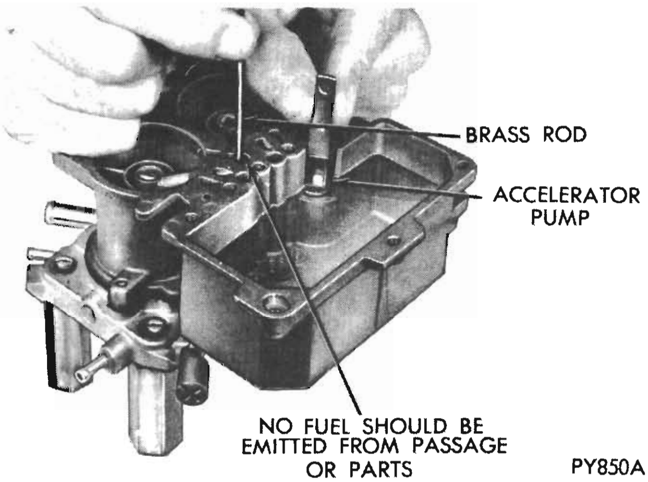


Fig. 17 – Testing accelerator pump discharge check needle

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. 18)*. Lock in position by prick punching rim of cylinder (at least three places). Do not overstake. 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 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 delrin fulcrum pin through float hinge to retain float. Centre fulcrum pin *(Fig. 10)*.

(7) Install fuel baffle on bosses with slots engaged lugs. Install attaching screw and tighten securely *(Fig. 9)*.

Measuring Float Setting

The carburettors 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 carburettor is being overhauled, proceed as folows:

(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. 19)*. 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, bend float lip toward or away from needle, using a narrow blade screwdriver *(Fig. 20)*, until correct clearance of 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 of air horn *(Fig. 21)*. 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 pump plunger into its cylinder.

CAUTION: Do not cut lip on plunger on sharp edge of cylinder.

Install attaching screws (long screw in centre) and tighten to 25 inch pounds *(Fig. 6)*.

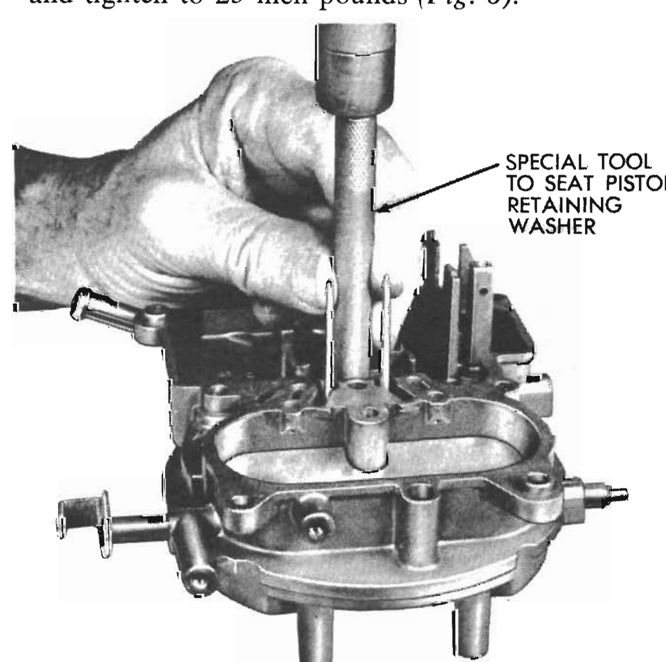


Fig. 18 – Installing vacuum power piston

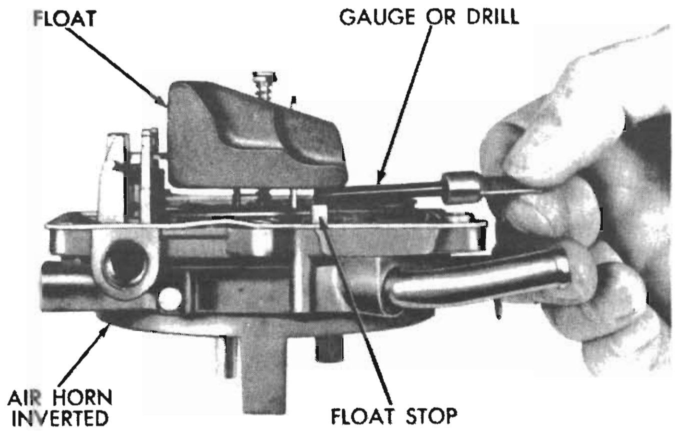


Fig. 19 – Checking float setting

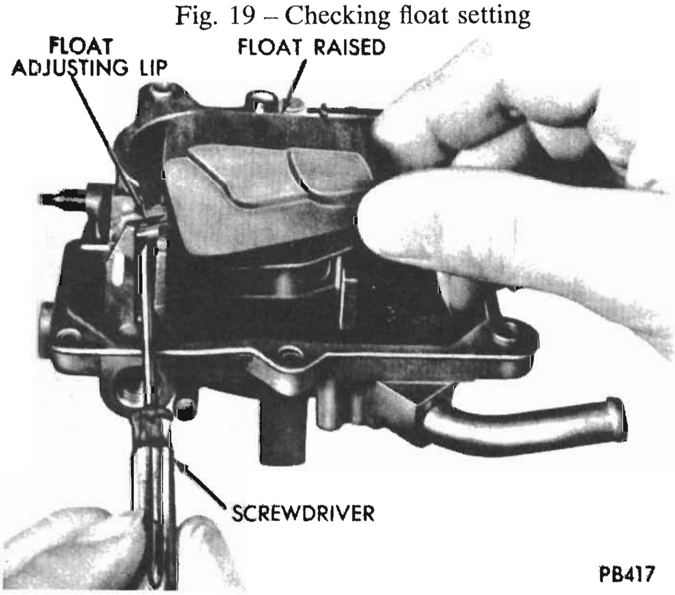


Fig. 20 – Bending float adjusting lip

(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 centre 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 seal on bottom of vent valve. Slide plastic valve and seal into cover, with valve recess, mating with shoulder on underside of cover.

(6) Install bowl vent valve spring in position in opening in bowl, then install valve and cover over spring. Install attaching screws and tighten securely *(Fig. 22)*.

(7) Install bowl vent valve lever on air horn, by first inserting spring into position in arm, with end of spring pointing toward fuel inlet fitting *(Fig. 23)*. 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.

(8) Install fast idle cam on air horn stub shaft, with steps toward fast idle adjusting screw. Install "E" clip to secure *(Fig. 15)*.

(9) 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, slide lever over choke shaft (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 dia-

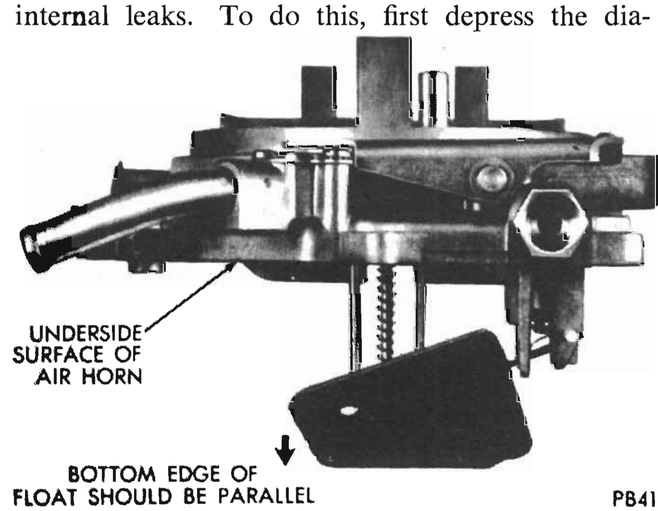


Fig. 21 – Checking float drop

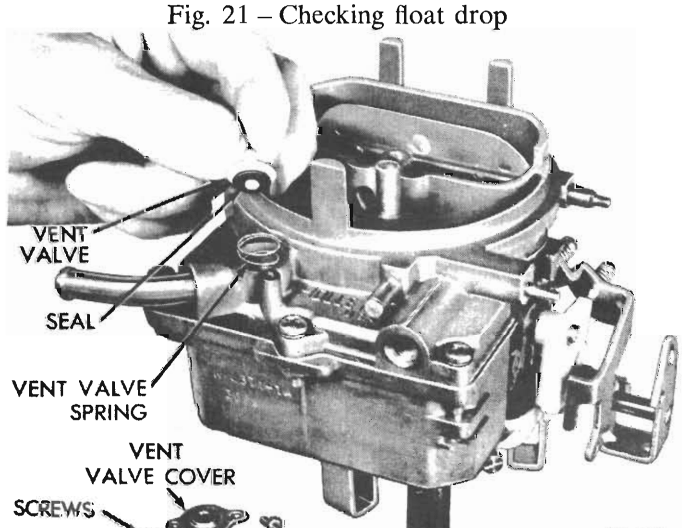


Fig. 22 – Installing vent valve, seal and cover

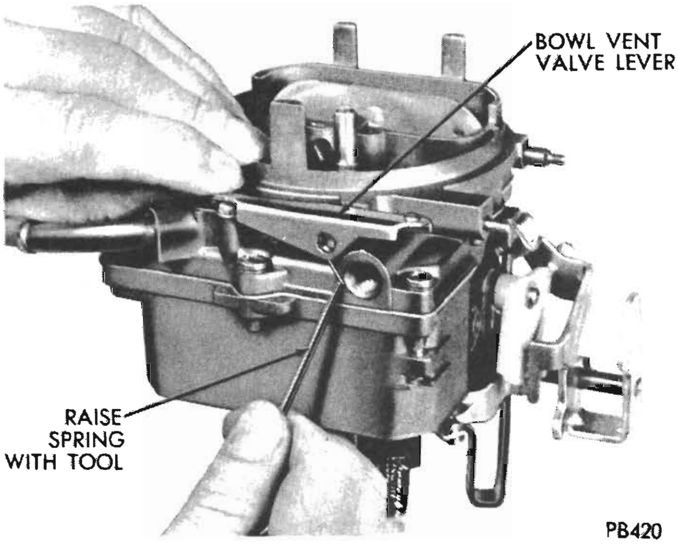


Fig. 23 – Installing bowl vent valve lever and spring

phragm 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) second, 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 carburettor fitting *(Fig. 1)* after vacuum kick adjustment has been made.

3. CARBURETTOR ADJUSTMENTS

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 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. 24)*. 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 until correct valve opening has been obtained *(Fig. 24)*.

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 with a 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 carburettor 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) between top of choke valve and wall of air horn *(Fig. 25)*. 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 com-

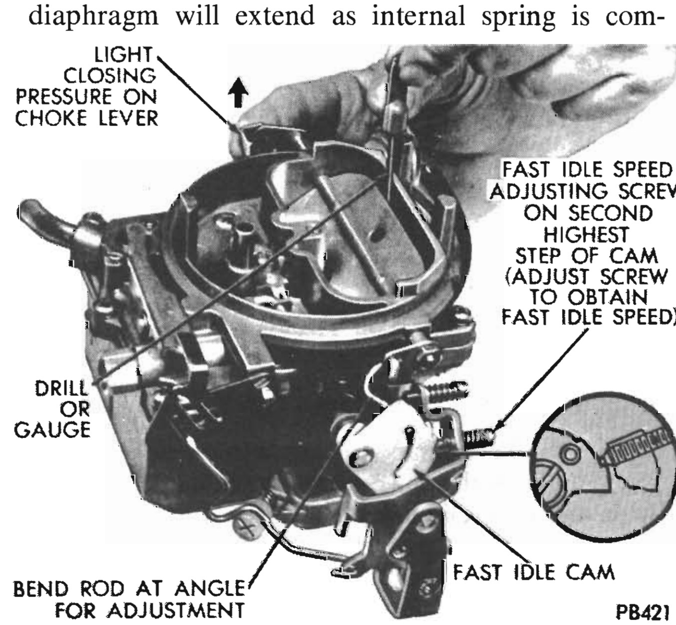


Fig. 24 – Fast idle cam position adjustment

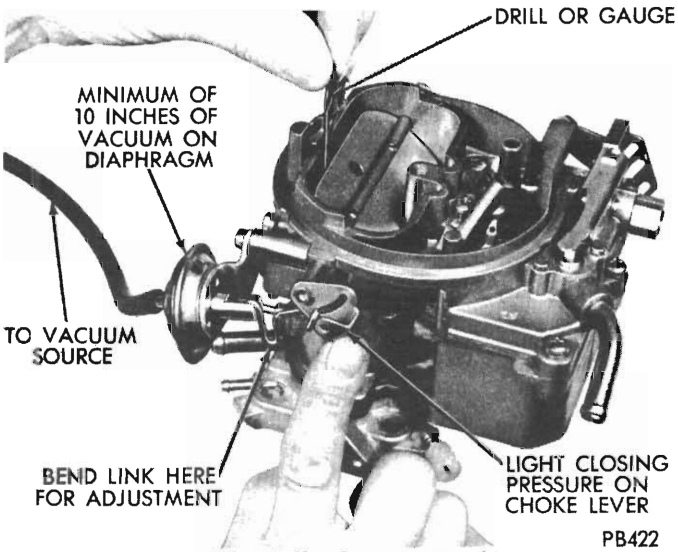


Fig. 25 – Adjusting vacuum kick

pressed. This spring must be fully compressed for proper measurement of vacuum kick adjustment.

(4) Adjustment is necessary if slight drag is not obtained when removing the drill. Shorten or lengthen diaphragm link to obtain correct choke valve opening. Length changes should be made by carefully opening or closing the U-bend provided in the link. Improper bending causes contact between the U-section and the diaphragm assembly.

CAUTION: DO NOT APPLY TWISTING OR BENDING FORCE TO DIAPHRAGM.

(5) Re-install vacuum hose on correct carburettor 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 cleaned 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. 26)*.

(2) With a finger slightly 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. 26)*.

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 correct slot of accelerator pump rocker arm 3rd slot (from attaching screw).

(2) Close throttle valves tightly. Measure the distance between top of air horn and end of plunger shaft *(Fig. 27)*. See specifications.

(3) To adjust pump travel, bend pump operating rod, using Tool E14C10, at loop of rod, until correct setting has been obtained.

Checking Bowl Vent Valve Clearance

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 .015 inch gauge between the bowl vent valve plunger stem and operating rod *(Fig. 28)*.

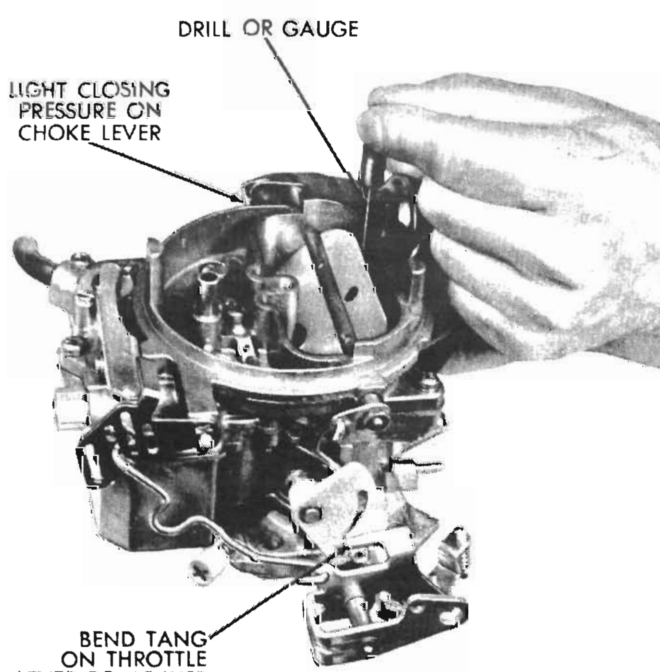


Fig. 26 – Choke unloader adjustment (wide open kick)

(2) If an adjustment is necessary, bend the tang on pump lever to change arc of contact with throttle lever, using Tool E14C10, until correct clearance has been obtained.

Idle Speed Adjustments—Prior to 1/1/72.
(For vehicles built after 1/1/72—refer to Emission Control Section).

(Curb Idle)

(Refer to page 14 – 20).

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 carburettor icing. Set this adjustment after the vehicle odometer indicates over 500 miles to ensure a normal engine friction level. Prepare 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 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. 29).*

(3) Start engine and determine stabilized speed. Turn fast idle speed screw *in* or *out* to secure specified speed. (See Specifications.)

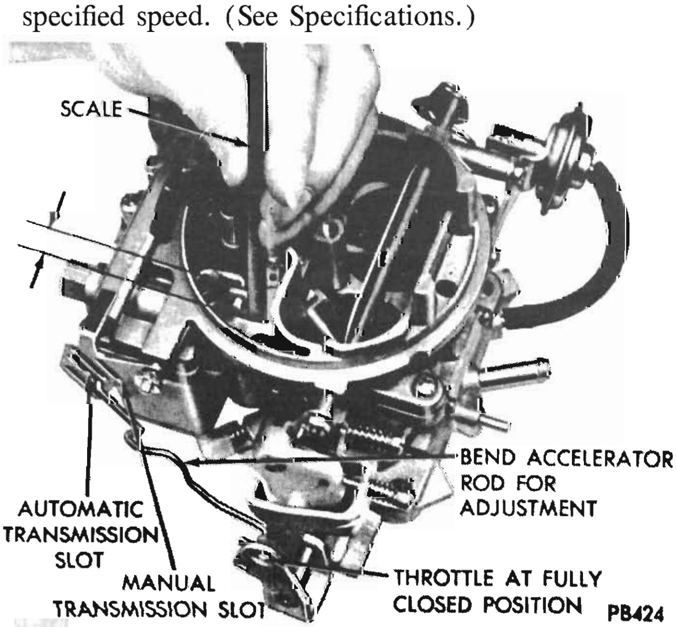


Fig. 27 – Accelerator pump adjustment

(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.

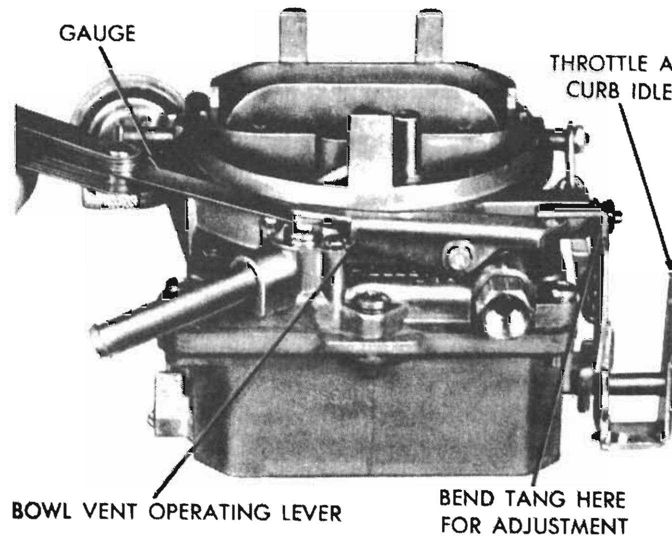


Fig. 28 – Adjusting bowl vent

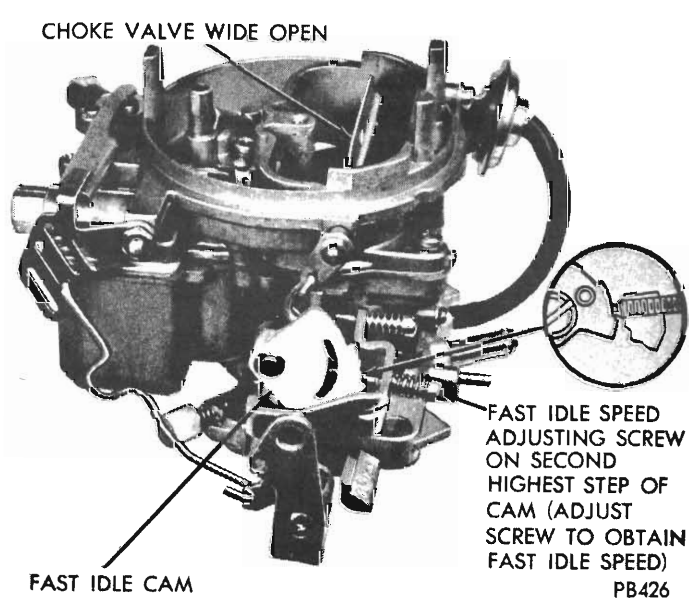


Fig. 29 – Fast idle speed adjustment (on vehicle)

PART 2 — FUEL PUMPS

SPECIFICATIONS

	6 CYLINDER	8 CYLINDER
Make/Type	Email/Carter	
Model—(Initial Equipment No.)	837005	837225
(Service Replacement No.)	11–837005	11–837225
Type	Diaphragm	
Number of Valves	2	
Driven by	Camshaft	
Pump Pressure	3½–5 P.S.I.	5–7 P.S.I.
Torque—F. Pump Mounting Screw	30 lbs. ft.	
Torque—Cover Attaching Screw	30–45 lbs. in.	
Torque—Valve Body Attaching Screw	50 lbs. in.	

SPECIAL TOOLS

E14C35	Gauge — Fuel Pump Pressure Testing

SERVICE DIAGNOSIS

CONDITIONS—POSSIBLE CAUSES

1. FUEL PUMP LEAKS (FUEL)

(1) Worn, ruptured or torn diaphragm.

(2) Loose diaphragm mounting plates.

(3) Loose inlet or outlet line fittings.

2. FUEL PUMP LEAKS (OIL)

(1) Cracked or deteriorated pull rod oil seal.

(2) Loose rocker arm pivot pin.

(3) Loose pump mounting bolts.

(4) Defective pump to block gasket.

3. INSUFFICIENT FUEL DELIVERY

(1) Vent in tank (this will also cause a collapsed fuel tank).

(2) Leaks in fuel line or fittings.

(3) Dirt restriction in fuel tank.

(4) Worn, ruptured or torn diaphragm.

(5) Frozen fuel lines.

(6) Improperly seating valves.

(7) Vapour lock.

(8) Weak or incorrect main spring.

(9) Restricted fuel filter.

(10) Worn eccentric or lever arm.

4. FUEL PUMP NOISE

(1) Loose mounting bolts.

(2) Scored or worn rocker arm.

(3) Weak or broken rocker arm spring.

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

Two different model fuel pumps are used. The same basic design applies to all models. The service procedures for testing are the same. Fuel pump (typical assembly) shown in *Fig. 2* is used on the 6 CYLINDER engines and fuel pump model No. 837225 (not shown) is used on the 8 CYLINDER engines.

The fuel pumps are driven by an eccentric cam cast on the camshaft in the 6 CYLINDER engines and by a pressed steel eccentric cam mounted on the gear end of the camshaft in the 8 CYLINDER engine.

As the camshaft rotates, the eccentric cam presses down on the 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 carburettor.

The fuel pumps are of the die-cast aluminium type and can be disassembled for service. If a pump malfunction occurs, tests should be performed before removing and servicing the pump.

2. TESTING THE FUEL PUMP (ON VEHICLE)

If the fuel pump fails to supply fuel properly to the carburettor, 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 the fuel line at carburettor as shown in *Fig. 1*.

(2) Connect a 6″ piece of hose between the "T" fitting and gauge E14C35. (The hose should not exceed 6″ in length.)

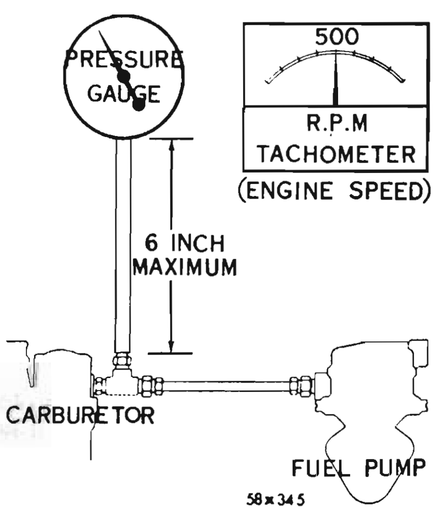


Fig. 1 – Pressure testing the fuel pump

(3) Vent the pump for a few seconds (this relieves the air trapped in the fuel chamber). If this is not done, the pump will not operate at full capacity and a low pressure reading will result.

(4) Connect a tachometer, then start the engine and run at 500 R.P.M. The reading should be from 3½ to 5 P.S.I. for a 6 CYLINDER engine or 5 to 7 P.S.I. for an 8 CYLINDER engine, and remain constant or return to zero, very slowly when the engine is stopped.

An instant drop to zero indicates a leaking outlet valve. If the pressure is too low, a weak diaphragm main spring or incorrect assembly of the diaphragm may be the cause. If the pressure is too high, the main spring is too strong.

Vacuum Test

The vacuum test should be made with the fuel line disconnected from the carburettor. (This will allow the pump to operate at full capacity, which it must do to prime a dry carburettor.)

Volume Test

The fuel pump should supply 2 pints of fuel in one minute or less at 500 R.P.M.

Inlet Valve Test

To test the inlet valve, connect a vacuum gauge on the inlet fitting whilst the line is disconnected.

(1) Start the engine or turn over with starting motor.

(2) There should be a noticeable vacuum present, not alternated by blow-back.

(3) If blow-back is present, the inlet valve is not seating properly. If the fuel pump does not perform to the above test requirements, it should be removed from the vehicle and correctly serviced.

NOTE: E37 and E38 optional engine fuel pumps have 8 CYLINDER diaphragm assemblies fitted. This is to give additional fuel flow for the multiple carburettors. They operate at 5 P.S.I. minimum.

SERVICING THE FUEL PUMP

3. DISASSEMBLING THE FUEL PUMP

NOTE: Before disassembling the fuel pump, mark the housings in such a manner that the inlet will be facing the inlet fuel line when re-assembled. This is important.

To disassemble the fuel pump for cleaning or overhaul, *refer to Fig. 2* then proceed as follows:

(1) Remove the pivot pin plug, using a suitable tool, then mark the related position of the 3 parts of the body.

(2) Disengage the rocker arm follower spring from the rocker arm and rocker arm housing.

(3) Turn the pump on its side (pivot pin hole down) and rap gently to remove the pivot pin.

(4) Disengage the rocker arm from the diaphragm pull rod, by sliding rocker arm out of housing.

(5) Remove the screws that attach the valve body to the rocker arm housing. Separate the valve body and rocker arm housings, and lift out the diaphragm and pull rod assembly.

(6) Remove the screws that attach the valve body to the valve housing cover. Separate cover and valve body and remove the outlet air dome diaphragm.

4. CLEANING THE FUEL PUMP PARTS

Clean all fuel pump parts (except the diaphragm) in a suitable solvent, then blow dry with compressed air. Check the condition of the valve seats and parts for gum deposits. If the gum deposits are found, remove with denatured alcohol. If the valves are badly worn or damaged, they should be renewed.

5. RE-ASSEMBLING THE FUEL PUMP

Examine the diaphragm for cracks, torn screw holes or ruptures. Check the rubber oil seal on the end of the pull rod for deterioration. Check the outlet air dome diaphragm for cracks or deterioration. Check the rocker arm for scoring or galling on the camshaft eccentric bearing surface.

To reassemble the fuel pump, *refer to Fig. 2* and proceed as follows:

(1) Place the air dome diaphragm in position on the valve body.

(2) Align the scribe marks on the cover and the valve body, then install attaching screws. Tighten as specified.

(3) Slide the diaphragm pull rod into the rocker arm housing. Place the valve body in position on the diaphragm with the scribe marks aligned. (Be sure that the holes in the diaphragm,

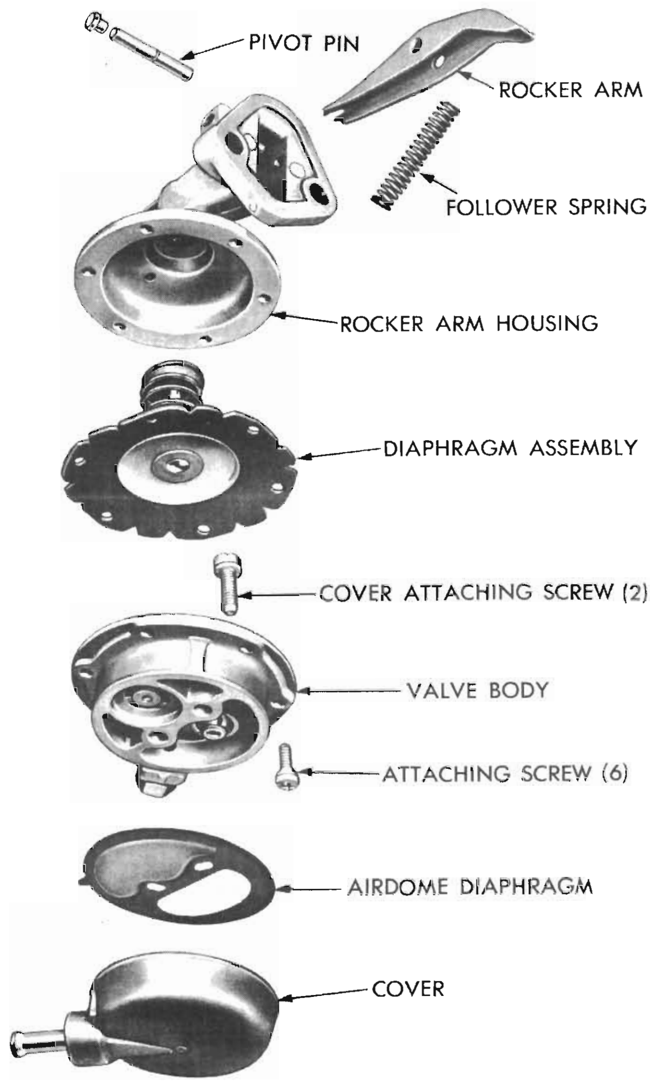


Fig. 2 – Fuel pump
(typical disassembled view)

rocker arm housing and valve bodies are aligned). Compress the unit together, then install the attaching screws, but DO NOT TIGHTEN. NEVER USE SHELLAC OR ANY OTHER ADHESIVE ON THE DIAPHRAGM.

(4) Slide the rocker arm into the housing and engage the diaphragm pull rod. Align the pivot pin holes in the arm with those in the housing, then install the pivot pin. Install new plug and drive in securely.

(5) Install the rocker arm follower spring over the tab on the rocker arm and over dimple in the housing.

(6) Place the pump in a vice (with protector jaws) then push on the rocker arm until full travel is reached. Hold in this position, whilst tightening the attaching screws as specified. (This will prevent tearing of the diaphragm when the pump is in operation with the pump arm in its full stroke).

(7) Test the fuel pump as described previously (*in para. 2*).

PART 3 – FUEL TANK

SPECIFICATIONS

Location:	All Models	Under Vehicle at Rear
	Utility	Under Tray Floor
Capacity:	All Models (except*)	19 gallons
	* Utility	19.5 gallons
	* Charger	17.5 gallons (35 galls. with A84 option)

SERVICE INFORMATION—PROCEDURES

WARNING: When working on fuel tanks, be sure the ignition is switched off.

The fuel tank is fitted with a gauge unit, including the suction pipe.

The filter on the end of the suction pipe is a replaceable unit and prevents the entry of water or foreign material. When installing a tank unit, be sure the filter is pushed down on the pipe until seated.

NOTE: If the vehicle is to be stored for any appreciable length of time, the fuel should be drained from the entire system in order to prevent gum formation. If the vehicle should have been undercoated, be sure that the tank vent tube is open. If this vent is plugged, a collapsed fuel tank will result.

SEDAN

The fuel tank is located at the rear of the body beneath the trunk compartment floor. Access to the filler cap is gained by pulling the rear licence plate downwards.

1. REMOVING FUEL TANK

Should it become necessary to remove the fuel tank, proceed as follows:

(1) Drain the fuel tank dry by disconnecting the fuel line at the pump and then connect a syphon tube and syphon the fuel into a suitable container. Disconnect the fuel line and the wire lead to the gauge unit.

(2) Disconnect the vent tube.

(3) Remove the nuts that hold the tank retaining straps to the bolts. Allow straps to drop or hang, then lower the tank and remove from under the car.

(4) Remove the tank gauge unit. Slide the gauge assembly out of the fuel tank. Discard the gasket.

(5) If necessary, check the operation of the fuel gauge, as described in *Group 8* of this manual.

2. INSTALLING FUEL TANK

Before installing the fuel gauge, check the condition of the filter on the end of the suction tube. If the filter is clogged, install a new filter. To install the fuel tank, *refer to Fig. 1* and proceed as follows:

(1) Insert a new gasket in the fuel gauge opening recess, then slide gauge into tank. Align the positioning tangs on the gauge with those in the tank. Install the lockring, then tighten securely.

(2) Slide the tank under the vehicle and up in position, then raise the retaining straps and thread onto the bolts. Install the attaching nuts, and tighten securely (not over 60 lbs. in.).

(3) Re-connect the vent tube.

(4) Re-connect the fuel supply line and the wire lead to the gauge.

(5) Refill the tank and check for leaks.

2. STATION WAGON AND UTILITY

The fuel tank is located under the rear floor. The rear floor has to be lifted to gain access to the filler tube. (Station wagon models.)

(1) Drain the fuel tank by disconnecting the fuel line at the pump and then connect a syphon tube and syphon the fuel into a suitable container.

(2) Disconnect the fuel line and the wire lead to the gauge unit.

(3) Disconnect the vent tube at the tank.

(4) Raise the spare wheel cover and remove the spare wheel. (Station wagon models.)

(5) Release the two hose clips on the filler tube joining hose.

(6) Slide the hose up the filler tube and remove the inner filler tube from the tank.

(7) Remove the two nuts holding the support straps in place and lower the tank to the floor.

Installation is a reversal of the above procedure.

NOTE: Always use a new grommet in the tank filler tube sleeve.

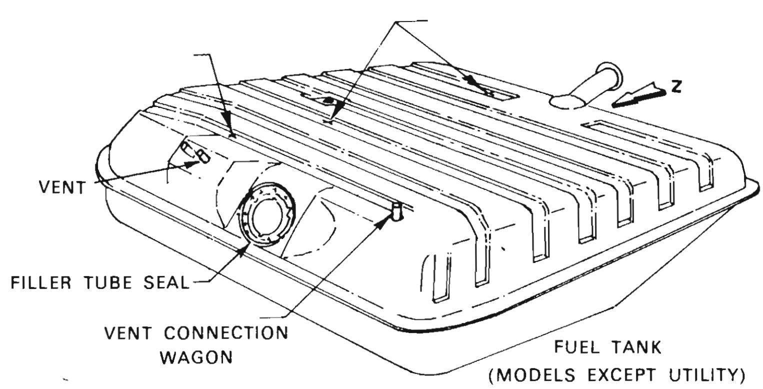


Fig. 1 – Fuel tank (all models except station wagon and utility)

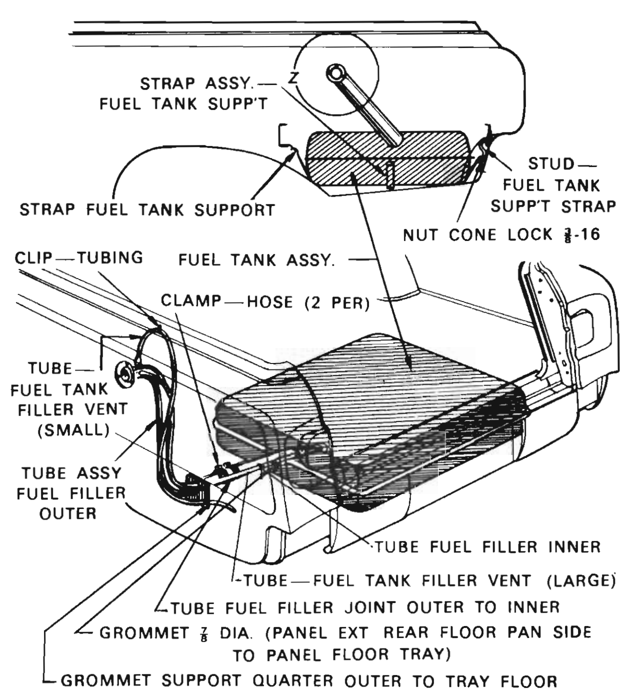


Fig. 2 – Fuel tank and filler (station wagon and utility)

PART 4—EMISSION CONTROLS

GENERAL INFORMATION

Over the past 15 years there has been an increasing awareness of the problems created by automobile exhaust emissions. The most undesirable pollutants in exhaust gases are carbon monoxide and hydrocarbons. In the United States there is government legislation limiting the levels of these emissions and manufacturers have spent vast sums of money in order that their vehicles may pass the stringent requirements. At present both Europe and Japan have less demanding emission requirements, but every year these are becoming more severe, in line with U.S. requirements. For 1972 the Australian government has introduced a rule requiring the carbon monoxide level for all passenger cars at idle to be less than 4.5% by volume. This is similar to the European rule for 1972.

To achieve this level of carbon monoxide, extreme care must be taken to ensure that the correct idle mixture setting is used to avoid over richness. An indication of the precision required in setting up an engine, as little as ¼ turn of the mixture adjusting screw can result in a 2% change in carbon monoxide level. During the running-in period as the engine friction drops, the idle speed would normally increase. However, it is desirable to maintain the lower idle speeds and so the throttle opening is decreased on a run-in engine to maintain the specified idle speeds. This results in the carbon monoxide emissions being greater for a run-in engine than for the new or fully reconditioned engine.

1. Curb Idle Mixture and Speed Adjustments

1–1 It is strongly recommended that a reliable exhaust gas analyzer and an accurate ignition tachometer are used when making these adjustments.

2. Procedure using tachometer and gas analyzer.

2–1 Warm up the engine to normal operating temperature. Ensure that choke is fully open.
2–2 Set the ignition timing to specification.
2–3 Check that the air cleaner is fitted correctly.
2–4 Place transmission in neutral.
2–5 Turn off all vehicle lights and air conditioner.
2–6 If there are two idle mixture screws it is important that they are both turned out the same amount from the seated position.
2–7 Connect tachometer.
2–8 Switch on the analyzer, allow it to warm up then calibrate according to manufacturers' instructions.
2–9 Insert the probe of the gas analyzer in the tail pipe as far as possible.

> NOTE: It is essential that the probe and connecting tubing of the analyzer are in good condition, as any leaks would lead to erroneous readings. If a garage exhaust system is used to conduct the exhaust gases away during this operation, it will be necessary to fit a plenum chamber (or other means) to reduce the vacuum of the system to a reading of ½ inch or less on a water gauge.

2–10 Set the idle speed to specification.
2–11 Adjust the mixture screws to obtain the air/fuel ratio of 13:1 (or 4¼% CO on the analyzers equipped with % CO—carbon monoxide scale) using following procedure:

> IMPORTANT: When setting the idle mixture do not turn the adjusting screws more than 1/16 turn at a time. The exhaust analyzer is so sensitive that the ratio must be changed by very small amounts if accurate readings are to be obtained.
>
> (a) Adjust the mixture screws 1/16 turn richer (anticlockwise) and wait 10 seconds before reading the analyzer.
>
> (b) If necessary repeat step (a) until analyzer indicates a definite increase in richness. This step is very important since some analyzers (thermal conductivity type) reverse readings and indicate a richer mixture as the carburettor is set too lean.
>
> (c) When it has been established that the analyzer is indicating a richer reading when the idle mixture screws are turned in the rich direction, proceed to adjust the carburettor to give 13:1 air/fuel ratio, or 4¼% CO (carbon monoxide).
>
> (d) If the idle speed changes as the mixture screws are turned, adjust the speed back to the specified r.p.m. then re-adjust the idle mixture to obtain above specified ratio.
>
> (e) Race engine at 2,000 r.p.m. for 5 seconds, then recheck idle speed and analyzer reading. Readjust if necessary.

NOTE: As mixture screw is turned clockwise (leaner) air/fuel ratio increases and % CO decreases. As mixture screw is turned anti-clockwise (richer) air/fuel ratio decreases and %CO increases.

3. Procedure using tachometer only.

3–1 Warm up the engine to normal operating temperature. Ensure that choke is fully open.
3–2 Set ignition timing to specification.
3–3 Check that the air cleaner is fitted correctly.
3–4 Place transmission in neutral.
3–5 Turn off all vehicle lights.
3–6 If there are two idle mixture screws it is important that they are both turned out the same amount from the seated position.
3–7 Connect tachometer.
3–8 Set the idle speed to specification.
3–9 Adjust the idle mixture screw to obtain the highest possible engine speed, then turn the screw clockwise to obtain the leanest setting without causing the engine speed to drop.
3–10 Re-adjust the idle speed screw to obtain specified engine r.p.m.
3–11 Turn the idle mixture screws as shown on following chart:
3–12 If necessary re-adjust the idle speed screw to maintain specified engine r.p.m.

4. Idle mixture limit cap installation.

An idle mixture limit cap is fitted correctly in production and must not be disturbed unless the carburettor has been dismantled and the idle mixture screw removed. In this case a new cap should be fitted.

4–1 Set idle mixture as specified.
4–2 Fit limit cap with tang positioned to allow only 90° extra enrichment as shown.

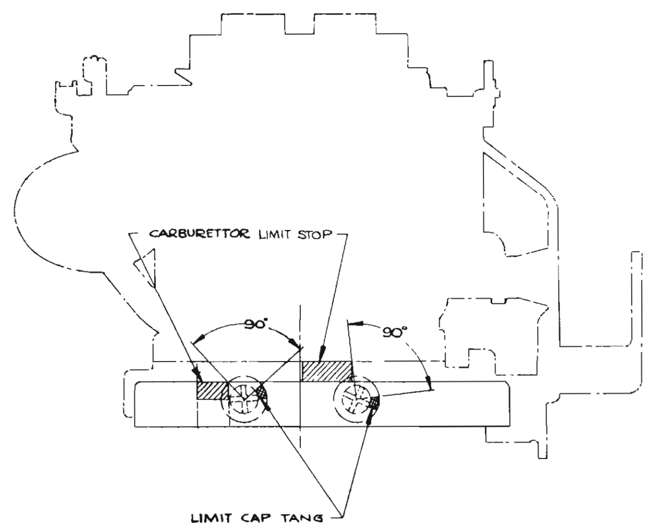


Fig. I — Idle mixture limit cap installation.

Carburettor	Model	Deviation from Lean Side of Maximum Idle Speed
Email-Carter	RBS (1v)	1/16 lean
Email-Carter	BBD $1\frac{1}{4}$ in. (2v)	None
Carter	AVS 4934S (4v)	None
Holley	2210 $1\frac{1}{2}$ in. (2v)	$\frac{1}{8}$ lean
Weber	45 DCOE (3 x 2v)	Standard tuning procedure should be adopted with proviso that the *lean* side of maximum idle speed be aimed at.

PART 5 — CARTER AVS SERIES CARBURETTOR

8 CYLINDER 340 C.I.D.

SPECIFICATIONS

CARBURETTOR

Type	Carter 4 Barrel Downdraught
Model	AVS-4934S
THROTTLE BORE	
Primary	1-7/16"
Secondary	1-11/16"
MAIN VENTURI	
Primary	1-3/16"
MAIN JET	
Primary	.089"
Secondary	.098"
LOW SPEED JET	
Primary	#68-.031"
STEP-UP ROD (2 stage) Dimensions	
Standard	.055"-.064"
ADJUSTMENTS	
Accelerator Pump (top of plunger to air horn)	7/16"
Fast Idle Cam Position (drill size)	#50
Choke Unloader	1/4"
Vacuum Kick (drill size)	#50
Bowl Vent Valve Setting	1/8"
Fast Idle Speed (r.p.m.)	2000*
Idle Speed (r.p.m.)	900
Secondary Throttle Lever Adj.	19/64"
Secondary Throttle Lockout Adj.	.020"
Float Setting	7/32"
Float Drop	1/2"
Air Valve Spring Tension — (from Vertical-Turns)	2
CHOKE	
Type	Well
Control	Thermostatic Coil Spring
Setting	On Index

*After Approx. 500 miles (if necessary)

SPECIAL TOOLS

E14C5	Repair Stand
E14C20H	Float Gauge
E14C10	Bending Tool
E14C10A	Bending Tool

TORQUE SPECIFICATIONS

Carburettor Retaining Nuts	100 lbs. in.
Choke (well) Thermostat Retaining Screws	40 lbs. in.

AVS SERIES CARBURETTOR

SERVICE INFORMATION—PROCEDURES

1. GENERAL INFORMATION

The Carter four barrel carburettor model AVS-4934S is used on the 340 cu. in. engine (Fig. 1).

The AVS (air valve secondary) carburettor 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 carburettor 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.

The throttle valves of the secondary half of the carburettor 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 carburettor increases and tends to overcome the air valve spring attached to the air valve, permitting the air valve to position itself according to engine requirements.

All the major castings of the carburettor are aluminium, with the throttle body cast integral with the main body. This allows an overall height reduction in the carburettor. The section containing the accelerator pump is termed the primary side of the carburettor. The rear section is the secondary. Five conventional systems are 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.

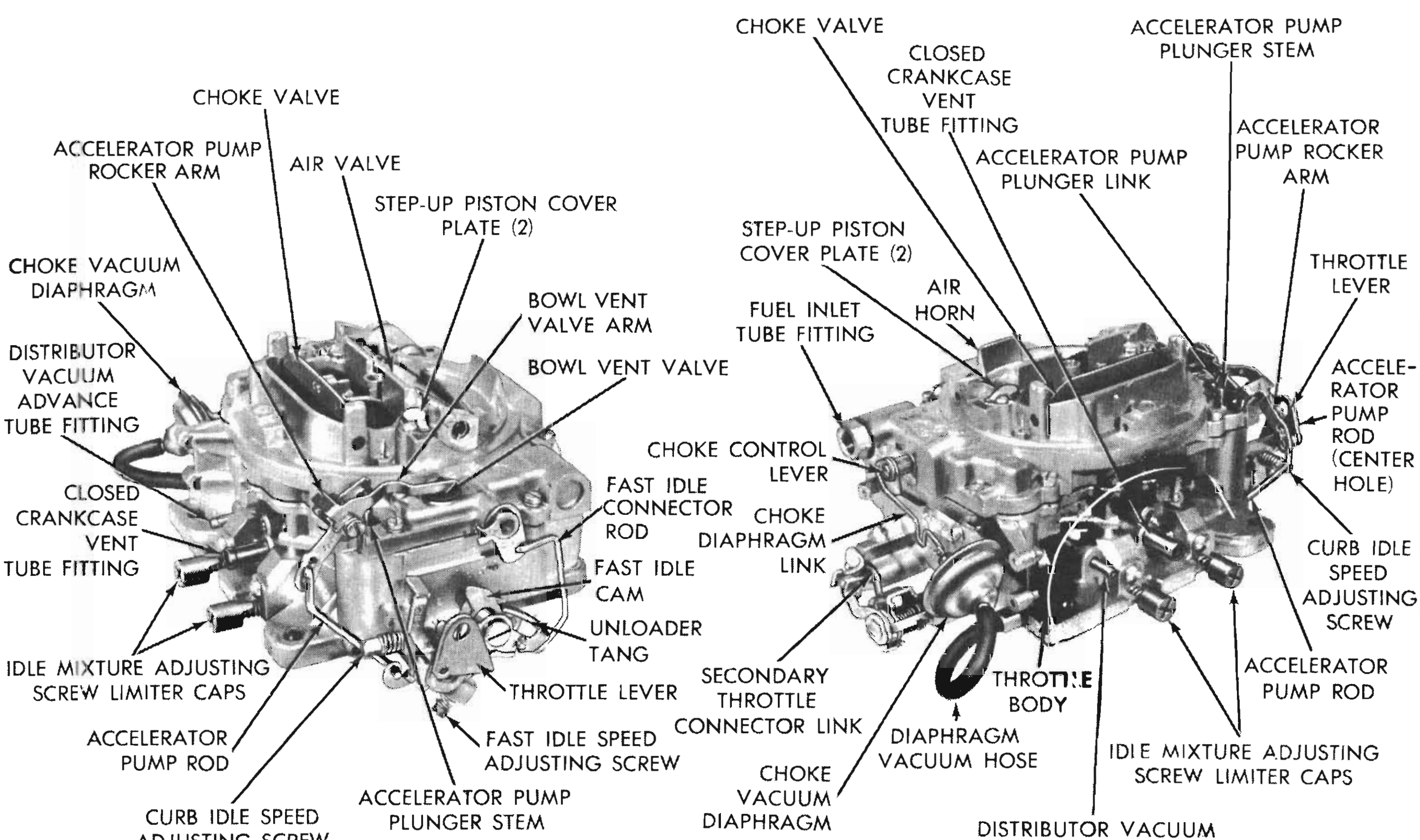


Fig. 1—Carburettor Assembly AVS

2. DISASSEMBLING CARBURETTOR (Fig. 1)

(1) Place carburettor assembly on repair stand Tool E14C5. 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. Remove second spring clip. 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 centre hole of accelerator pump arm. Disengage rod from arm and throttle lever, then remove from carburettor.

(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 carburettor 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.

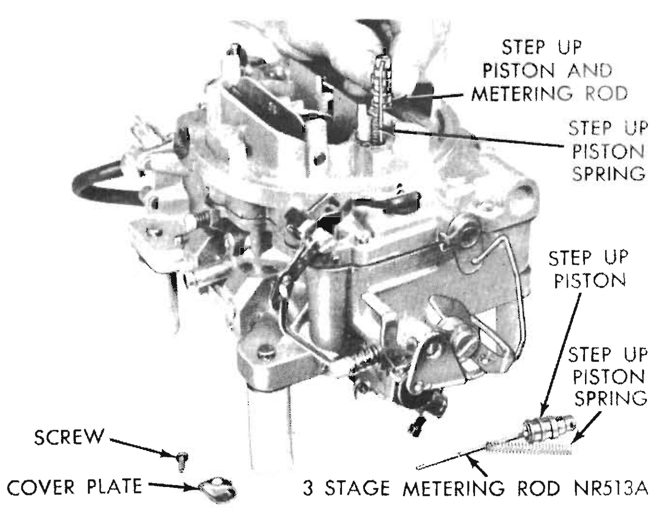


Fig. 2—Removing or Installing Step-Up Pistons and Rods

(8) 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.

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 screwdriver, 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. 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.

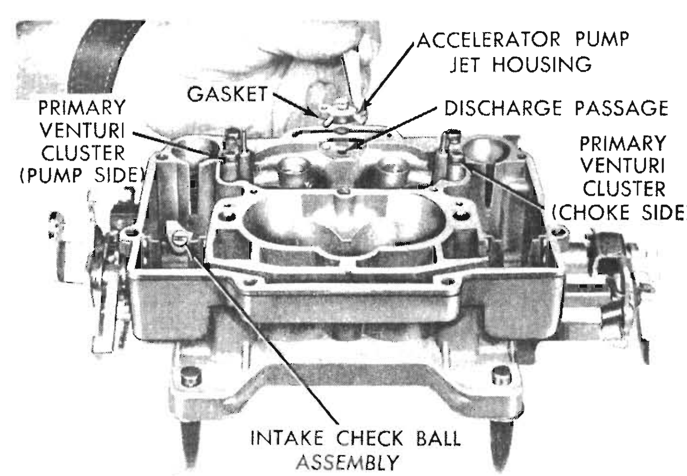


Fig. 3—Removing or Installing Accelerator Pump Jet Housing

(2) Remove main metering jets (primary side) (Fig. 4).

NOTE: 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.

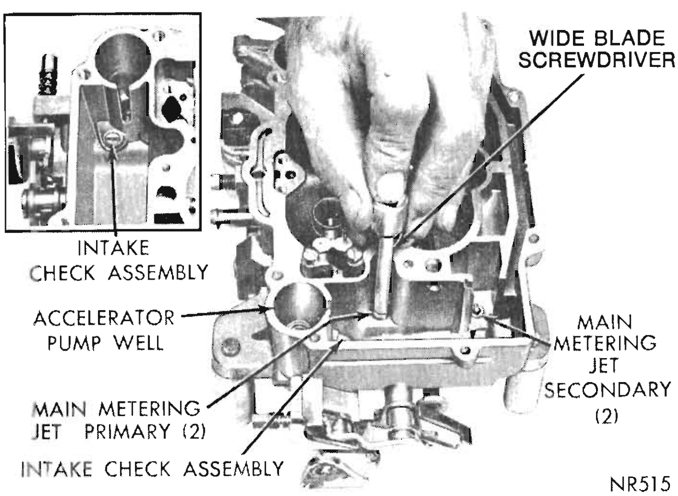


Fig. 4—Removing or Installing Main Metering Jets

(3) Remove main metering jets (secondary side) (Fig. 4).

(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.

NOTE: The venturi assemblies are not interchangeable, side for side and must be reinstalled in their original locations at reassembly.

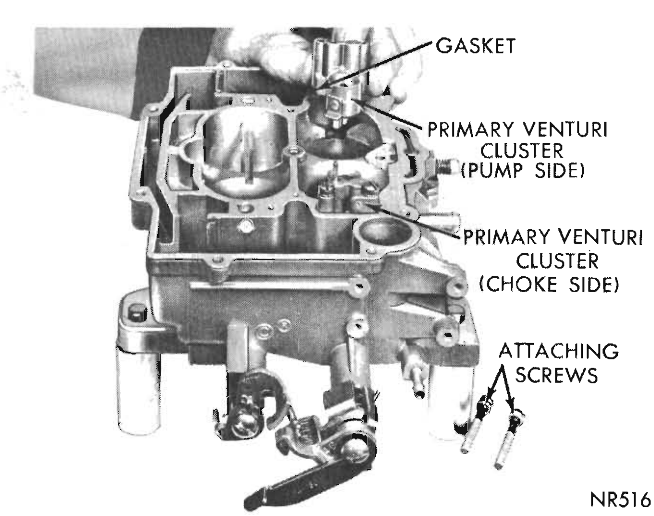


Fig. 5—Removing or Installing Primary Venturi Cluster

(5) 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. Remove screws and springs from throttle body.

The carburettor 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 carburettor, the location of the idle transfer ports and the idle discharge ports to the valve is carefully established for one particular assembly (Fig. 6). The valves are milled to give proper port relation.

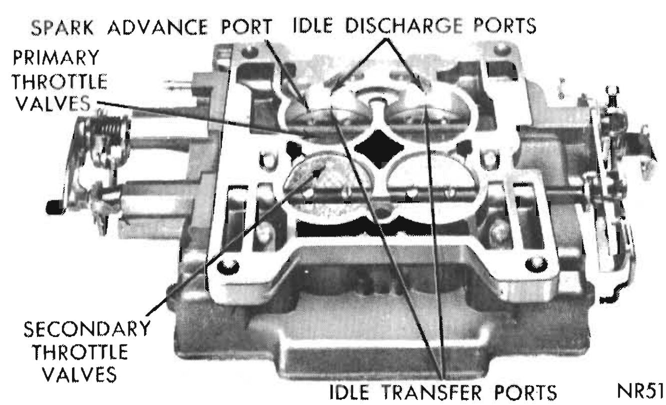


Fig. 6—Ports in Relation to Throttle Valves

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 carburettor 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 carburettor 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.

NOTE: 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.

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.

3. 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 ensure having correct idle mixture control.) **DO NOT USE A SCREWDRIVER.** Turn screws lightly against their seats with fingers. Back off two turns. Turn clockwise (leaner) and anti-clockwise (richer).

NOTE: Be sure all the metering holes and vent tubes are clean, in the primary venturi.

(4) 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 (Fig. 4). Tighten jets securely. Install intake check.

(6) Install accelerator pump intake check ball housing.

Accelerator Pump Test

(1) Pour clean gasoline into carburettor bowl (approximately $\frac{1}{2}$ inch deep). Remove accelerator pump plunger from jar of gasoline. Flex leather several times, then slide into pump cylinder.

(2) Install accelerator pump dicharge 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 old 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 carburettor 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 carburettor 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 enter arms. Tighten securely. Engage ends of spring with tang on vent arm and shoulder on air horn. Check for proper operation.

The carburettors 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.

NOTE: 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. 7).

(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.

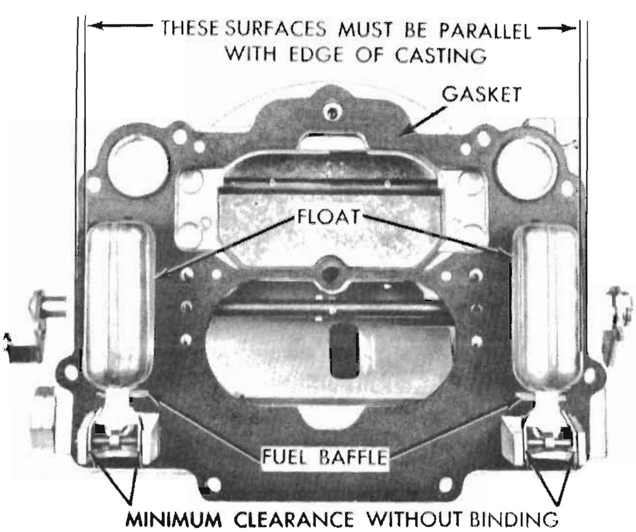


Fig. 7—Checking Float Alignment

Float Level Setting

(1) With air horn inverted, air horn gasket in place and float needle seated, slide float gauge (refer to specifications) between top of the float (at outer end) and air horn gasket (Fig. 8). Float should just touch gauge E14C20H.

(2) Check other float in same manner. If an adjustment is necessary, bend the float arm until correct clearance has been obtained. After bending arm, recheck the float alignment.

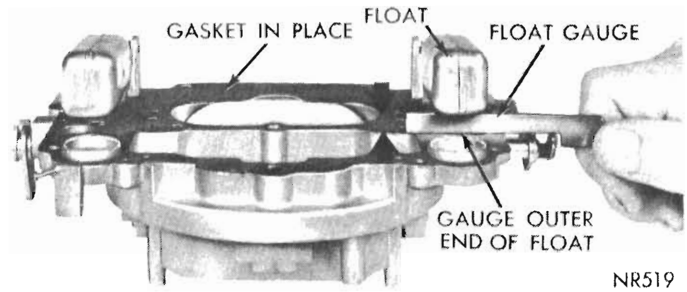


Fig. 8—Checking Float Height

Float Drop Setting

Float drop is the distance the floats move from the inverted air horn (float level setting position) to the air horn 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 $\frac{1}{2}$ inch (Fig. 9). 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 carburettor as follows:

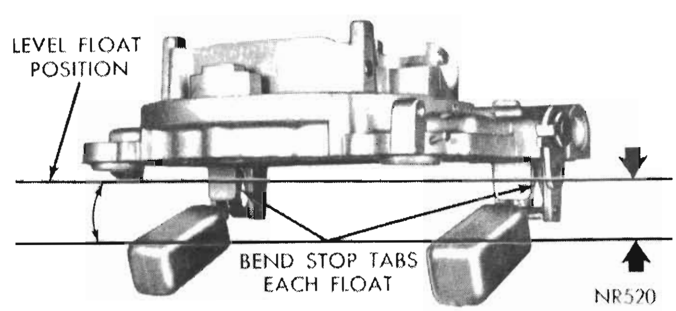


Fig. 9—Checking Float Drop

(3) Place accelerator pump plunger lower spring in pump cylinder, then lower air horn carefully down on main body.

CAUTION: Be sure the fuel baffles on the air horn, slide down in front (bowl side) of the float chamber baffles, or the air horn will not index correctly with the main body and can cause the floats to hang up. Be sure the leather on the plunger does not curl or wrinkle. Accelerator pump operation will be *affected if* this precaution is not observed.

(4) Install air horn attaching screws and tighten securely.

(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.

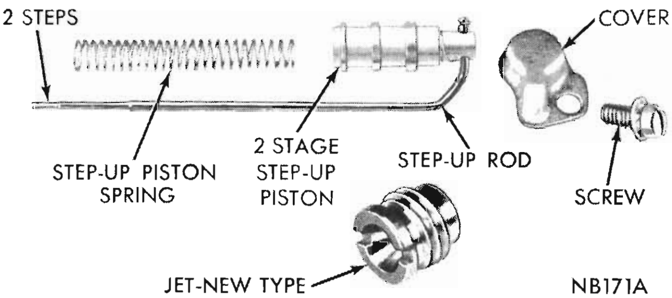


Fig. 10—Step-up Piston, Rod and Jet

(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 acelerator pump rocker arm (centre hole) and install hairpin clip to secure.

(8) Engage upper end of fast idle connector rod in slot of choke operating lever and secure with hairpin clip. 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 carburettor as follows:

(1) Assemble to carburettor and tighten attaching screws securely.

(2) Install choke operating link with washer on choke end in position between diaphragm plunger (stem) and choke lever slot. Install clip to secure. Secure choke lever end with spring clip.

(3) Inspect rubber hose for cracks, before placing it on correct carburettor fitting.

NOTE: Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburettor Adjustments.)

4. CARBURETTOR ADJUSTMENTS

The following adjustments should be made with the carburettor 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 Fast Idle Cam Position) between choke valve and wall of air horn (Fig. 11). An adjustment will be necessary if a slight drag is not obtained as the drill is being removed.

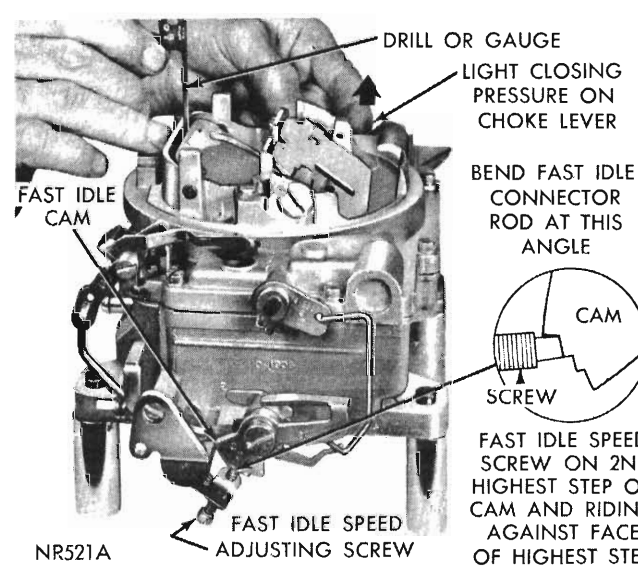


Fig. 11—Fast Idle Cam Position Adjustment

(3) To adjust, bend fast idle connector rod at angle until correct valve opening has been obtained (Fig. 11).

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 betwen 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 carburettor 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 Vacuum Kick) between choke valve and wall of air horn (Fig. 12). Apply sufficient closing pressure on **lever** to which choke rod attaches to provide a minimum choke valve opening without distortion of diaphragm link.

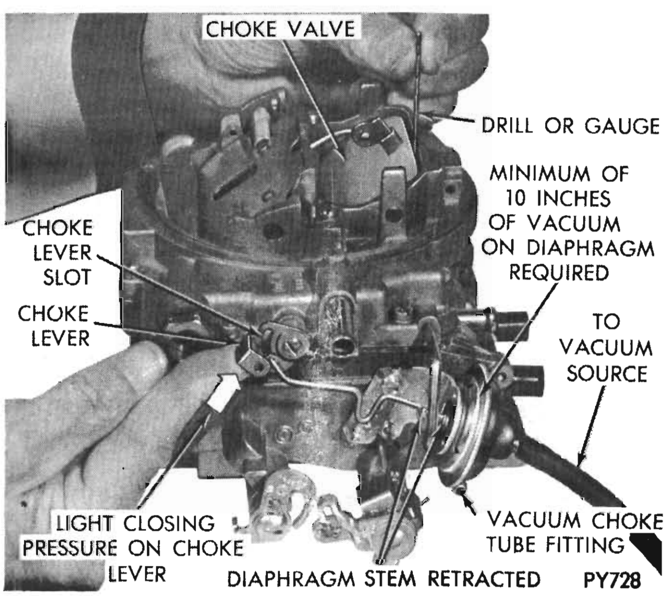


Fig. 12—Checking Choke Vacuum Kick Setting

Note that on most units a cylindrical 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 carburettor 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 Choke Unloader) between upper edge of choke valve and inner wall of air horn (Fig. 13).

(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 until correct opening has been obtained (Fig. 13).

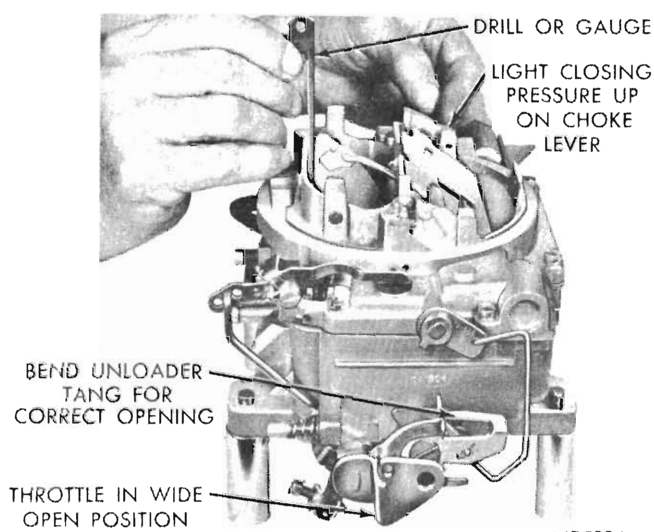


Fig. 13—Checking Choke Unloader (Wide Open Kick)

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. 14). This distance should be 7/16 inch.

If an adjustment is necessary, bend the throttle connector rod at the lower angle until correct travel has been obtained.

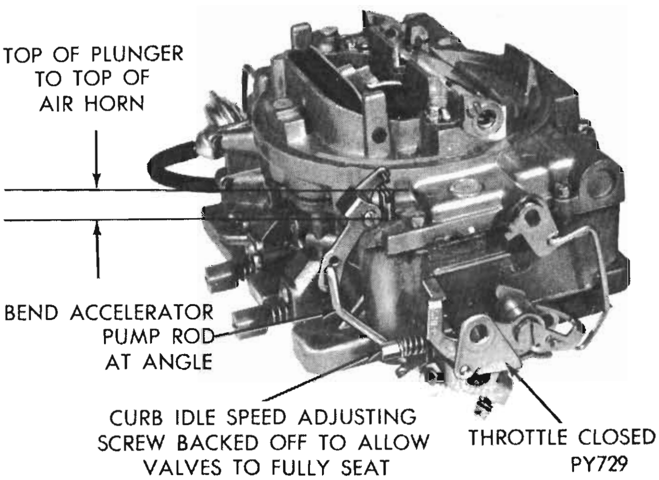


Fig. 14—Checking Accelerator Pump Adjustment

Secondary Throttle Lever Adjustment

To check the secondary throttle lever adjustment, block the choke valve in the wide open position and invert the carburettor. Slowly open the primary throttle valves until it is possible to measure 19/64 inch between the lower edge of the primary valve and the bore (opposite idle port) (Fig. 15). At this measurement, the secondary valves should just start to open. If an adjustment is necessary, bend the secondary throttle operating rod at the angle until correct adjustment has been obtained.

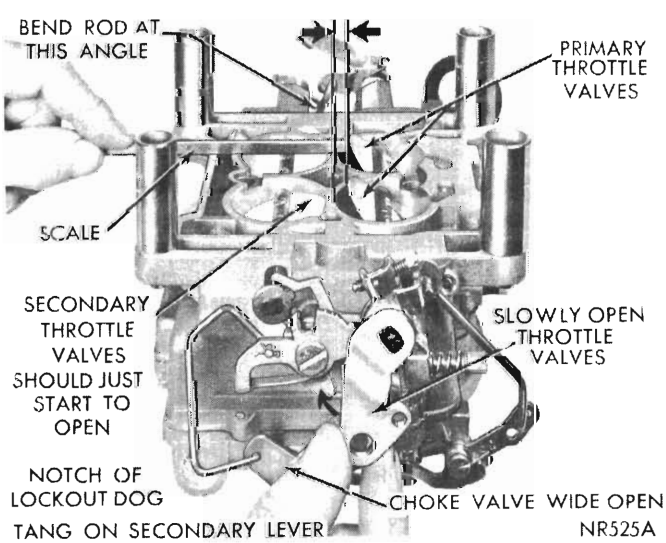


Fig. 15—Checking Secondary Throttle Adjustment

With primary and secondary throttle valves in tightly closed position, it should be possible to insert .020" wire gauge between positive closing shoes on the secondary throttle levers (Fig. 16).

If an adjustment is necessary, bend the shoe on the secondary throttle lever until correct clearance has been obtained.

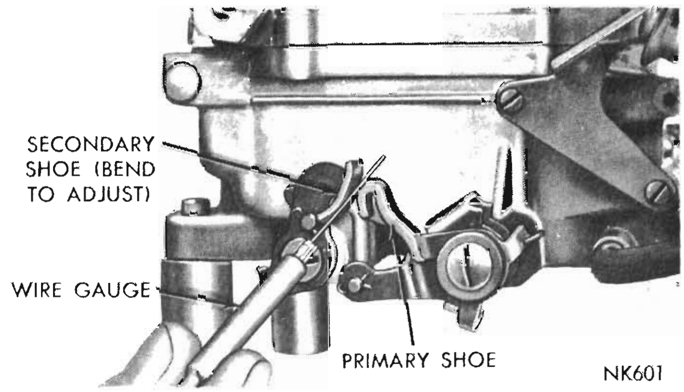


Fig. 16—Checking Clearance Between Closing Shoes

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. 15).

If an adjustment is necessary, bend the tang on the secondary throttle lever until engagement has been made.

After adjustments have been made, reinstall carburettor on engine, using a new gasket.

It is suggested that the carburettor 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 carburettor is primed.

Bowl Vent Adjustment

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. 17).

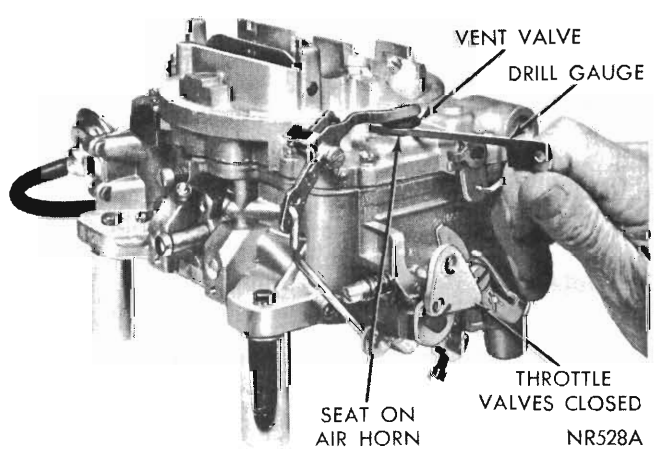


Fig. 17—Bowl Vent Valve Adjustment

(2) If an adjustment is necessary, bend adjusting tang (on pivot end of lever) until correct opening has been obtained.

Secondary Air Valve Adjustment

(1) Loosen lock screw (Fig. 18) 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. 18).

(3) Hold in this position with finger, then tighten lock screw securely. Check valve for freedom of movement.

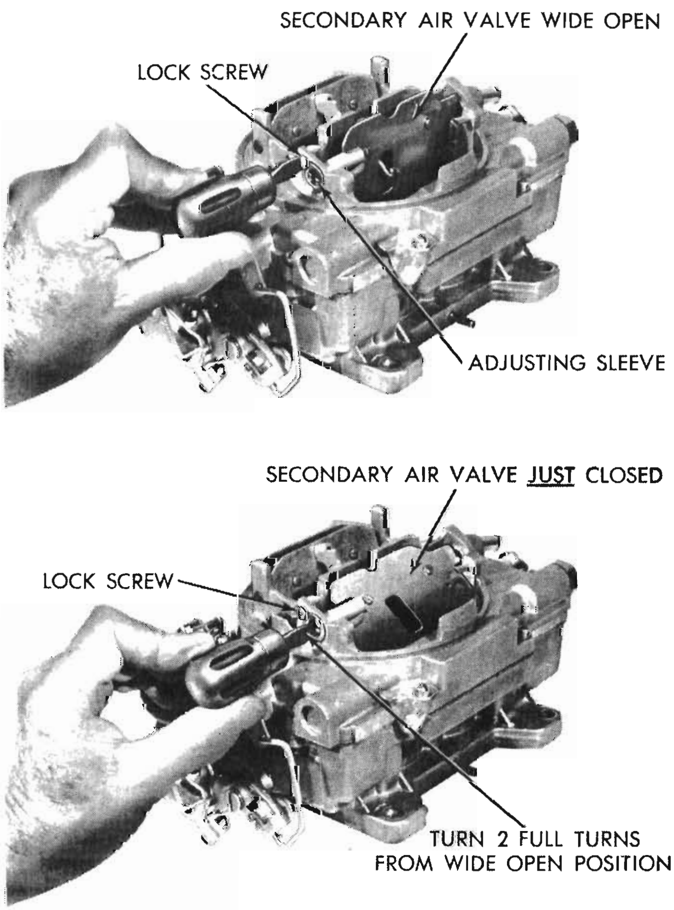


Fig. 18—Secondary Air Valve Adjustment

CURB IDLE MIXTURE AND SPEED ADJUSTMENTS

Refer to Part 4 — Emission Controls section, P. 49.

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 carburettor icing. Set this adjustment after vehicle odometer indicates over 500 miles to ensure 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. 19).

(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.

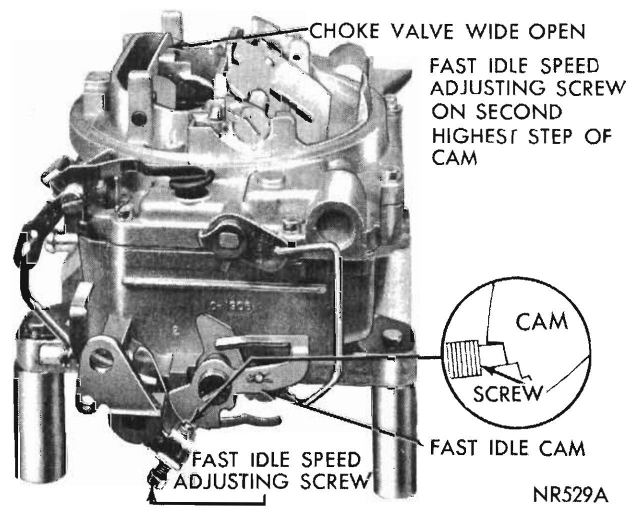


Fig. 19—Fast Idle Speed Adjustment (On Vehicle)

GROUP 16

PROPELLER SHAFT
AND UNIVERSAL JOINTS

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SPECIFICATIONS
PROPELLER SHAFT

Type .... Tubular

Differential Carrier and Propeller Shaft Angularity .... 1° – 3°

PROPELLER SHAFT CHART

Model Application	Length (BETWEEN "U" JOINT CENTRES)	Diameter	Colour Bands					
			Red	Yellow	Lt. Green	Lt. Blue	Grey	Lt. Brown
VALIANT:—								
Sedan and Wagon								
6 Cyl. Auto. Trans.	53.60″	3.25″	—	1	—	—	—	1
6 Cyl. Man. Trans. (3S)	53.60″	3.25″	1	—	—	—	—	1
8 Cyl. Auto. Trans.	53.60″	3.25″	2	—	—	—	—	1
6 Cyl. Man. Trans. (4S)	51.45″	3.25″	—	—	3	—	—	1
CHARGER:—								
6 Cyl. Man. Trans. (3S)	47.60″	3.25″	—	—	—	1	—	1
6 Cyl. Auto. Trans.	47.60″	3.25″	—	—	—	—	1	1
8 Cyl. Auto. Trans. (318)	47.60″	3.00″	—	—	—	—	—	3
6 Cyl. Man. Trans. (4S)	45.45″	3.25″	3	—	—	—	—	1
8 Cyl. Auto. Trans. (340)	43.65″	3.00″	—	2	—	—	—	1
DODGE, VALIANT, RANGER:—								
Ute. Manual	53.60″	3.25″	1	—	—	—	—	1
Ute. Auto.	53.60″	3.25″	—	1	—	—	—	1
CHRYSLER:—								
265 Auto.	57.60″	3.50″	—	—	—	—	2	1
360 Auto.	53.60″	3.50″	—	1	—	—	—	2

SPECIFICATIONS

UNIVERSAL JOINTS

Front	Cross and Roller (Sliding Spline)
Rear	Cross and Roller

TORQUE SPECIFICATIONS

Clamp Screws	170 lbs. in.
Rebound Bumper Plate Bolts	200 lbs. in.
Rear Spring "U" Bolt Nuts	45 lbs. ft.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. PROPELLER SHAFT VIBRATION

Propeller shaft vibration frequency is much higher than wheel, tyre or drum vibration. Vibration caused by an unbalanced propeller shaft or other chassis parts can usually be detected by driving at a speed slightly above the speed where the condition is most noticeable and shifting the transmission into neutral and letting the car slow down. If vibration is still evident look for the following conditions:

(1) Undercoating on the propeller shaft.

(2) Worn universal joint bearings or needle bearings missing.

(3) Worn universal joint housing.

(4) Propeller shaft bent or out of balance.

(5) Loose clamp bolts.

(6) Bent drive yoke.

(7) Spring centre bolt not in its seat.

(8) Broken or weak rear springs.

(9) Rear springs not matched.

(10) Incorrect drive line angularity.

2. UNIVERSAL JOINT NOISE

Check for worn universal joints by turning the propeller shaft by hand. Excessive backlash or looseness can be felt by hand pressure. Roughness at low to moderate speeds often indicates worn universal joints.

(1) Lack of lubrication.

(2) Worn universal joint.

(3) Propeller shaft clamp screws loose.

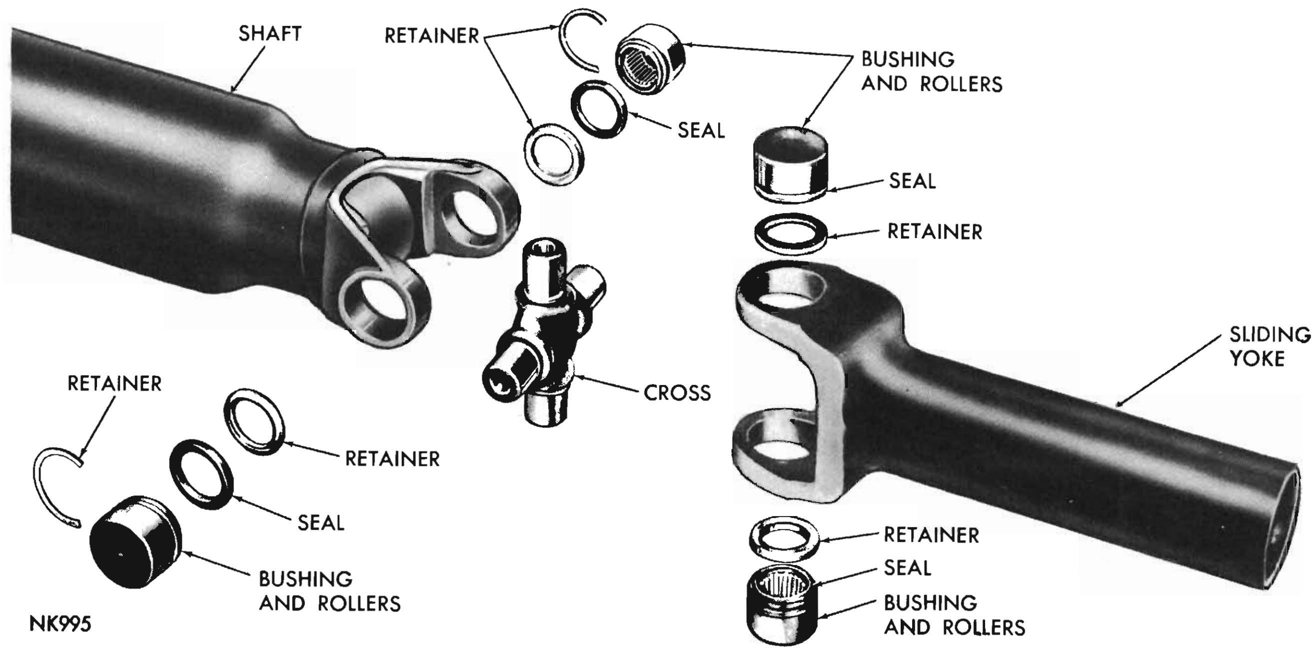


Fig. 1 – Cross and roller universal joint – front – (typical view)

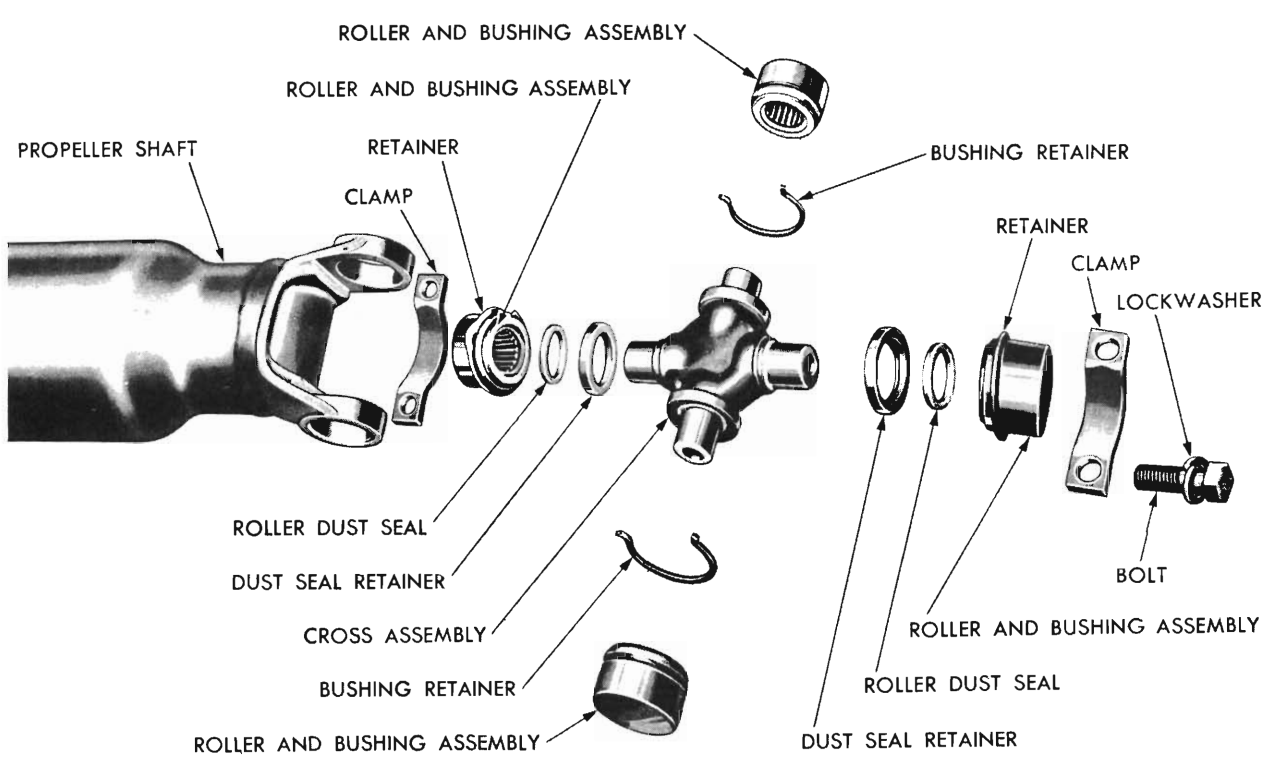


Fig. 2 – Cross and roller universal joint – rear

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The propeller shaft has a cross and roller type universal joint with a sliding spline *(Fig. 1)* at its forward end.

The rear universal joint is the cross and roller type.

The cross and roller, sliding spline type front universal joint moves back and forth on the transmission output shaft splines.

2. PROPELLER SHAFT ANGULARITY

The quiet, smooth operation of the propeller shaft and universal joints depends upon correct alignment together with the lubrication of the joints at regular intervals. (Every 36,000 miles.)

The propeller shaft rear joint angle may be obtained by using a spirit level protractor. The angle of the propeller shaft and the tilt of the axle carrier must be determined separately and then resolved to give the rear axle universal joint angle. With no extra weight in the vehicle over standard equipment, the rear joint angle should be checked as follows:

(1) Place the vehicle on a hoist, pit or wheel alignment rack so that the weight of the vehicle is on all four wheels.

(2) Remove the rebound plate and bumper from the top of the differential carrier housing.

(3) Place the protractor on the machined surface of the rebound plate bosses, level the bubble, and record the reading of angularity *(Fig. 3)*.

This is the angular tilt of the axle carrier. (Also note the direction of tilt.)

(4) Place the protractor on the underside of the propeller shaft, level the bubble, and record the angularity, as shown in *Fig. 4*. This value is the slope of the propeller shaft. Again note the direction.

(5) The rear universal joint angle may be resolved as follows:

a. If the axle carrier nose tilts upwards, and the propeller shaft slopes down (toward rear), subtract the angles found in steps 3 and 4.
Example: Axle tilts up 1° and propeller shaft slopes down 1° (1° – 1° = 0°).

b. If the axle carrier nose tilts downward and the propeller shaft slopes down (toward rear), add the angles found in steps 3 and 4.
Example: Axle tilts down 1° and propeller shaft slopes down 2° (1° + 2° = 3°).

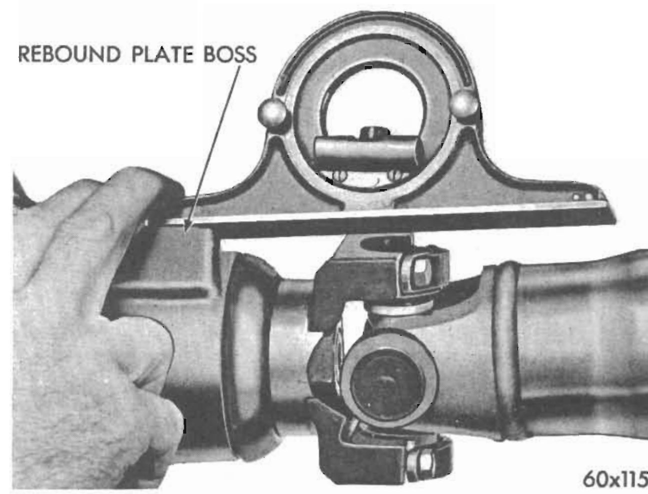


Fig. 3 – Checking rear axle angularity

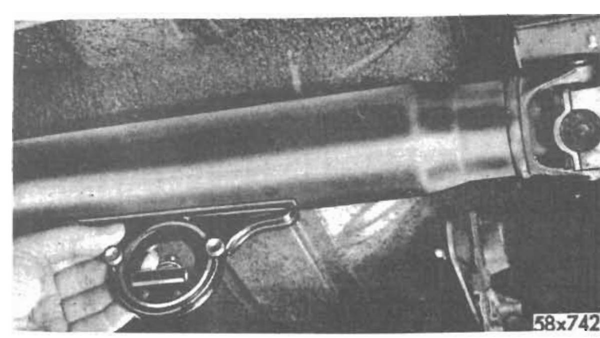


Fig. 4 – Checking propeller shaft angularity

(6) The axle carrier nose should tilt down slightly, and the angle between the carrier and propeller shaft at the rear universal joint should be between 1° and 3°.

(7) If the rear joint angle must be adjusted, tapered wedges should be added between the rear springs and the rear axle spring plates *(Fig. 5)*. Select wedges of correct degree taper, so as to obtain the specified universal joint angle. Tighten rear spring 'U' bolt nuts to 45 lbs./ft. torque.

(8) Recheck the rear joint angle, then install the rebound bumper and plate assembly on the carrier. Tighten retaining bolts to 200 lbs./in. torque.

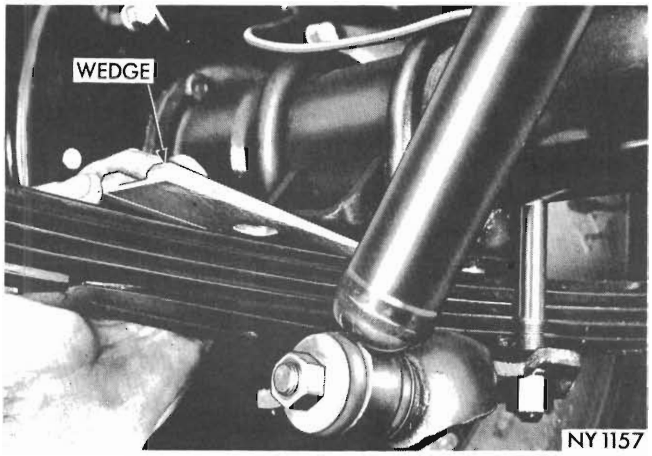


Fig. 5 – Installing tapered wedges (typical)

3. PROPELLER SHAFT

To Remove

(1) Remove both rear universal joint and bushing assembly clamps from pinion yoke. (Do not disturb the retaining strap used to hold bushing assemblies on the universal joint cross).

(2) Slide the propeller shaft and front yoke from the transmission output shaft. Be careful not to damage the output shaft or yoke splines. Examine the sliding yoke seal for evidence of leakage. If no leakage is evident, do not disturb the seal. If it is necessary to replace the seal refer to *Transmission Group 21*.

To Install

(1) Clean the old Lubricant from the front yoke splines. Engage the yoke splines on the end of the output shaft, being careful not to burr the splines.

(2) Install the rear universal joint cross roller bushings in the seats of the pinion yoke. Install the bushing clamps and attaching screws. Tighten the screws to 170 lbs./in.

4. CROSS AND ROLLER UNIVERSAL JOINT

To Disassemble

(1) Remove retainer and press one roller and bushing assembly out of the yoke by pressing the opposite bushing in *Fig. 2*.

(2) Press the remaining roller and bushing assembly out by pressing on the end of the cross assembly.

(3) Remove cross from yoke. The cross and seal retainers are serviced as an assembly. Do not remove seal retainers from the cross.

Cleaning and Inspection

(1) Clean the parts in a suitable solvent and dry with compressed air.

(2) Examine the bearing surfaces of the cross. The surfaces should be smooth, free from pits and ripples. If dust seal retainers are damaged, replace cross assembly.

(3) Examine roller bearings in bushings. Bearings that have operated on a worn cross should be replaced. Bearings should have a uniform appearance and should roll freely inside bushings.

To Assemble

(1) Force universal joint grease between the rollers in all four bushings. Fill the reservoirs in ends of cross.

(2) Place cross in propeller shaft yoke and insert roller bushing assemblies in yoke.

(3) Press roller and bushing assemblies into yoke whilst guiding the cross into both bushings.

(4) Press until both bushing retainers can be installed in grooves.

(5) Position the remaining two bushings on the cross and install retainer strap to hold bushings on cross during installation in vehicle.

Re-install propeller shaft as previously described in *para. 3*.

GROUP 17

SPRINGS AND SHOCK ABSORBERS

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SPECIFICATIONS

REAR SPRINGS	
Type	Semi elliptic
Number of Leaves	
Valiant Sedan/	4
Station Wagon	5
Length	
Valiant	55″
Width	2.5″
SPRING MOUNTING	
Front	Pivot — Rubber bushed
Centre	'U' — Bolt and plate
Rear	Shackle — rubber bushed

SHOCK ABSORBERS

Type	Oriflow Direct
Mounting	Rubber Bushing

COLOUR CHART

Models	Front Shockers	Rear Shockers
Sedans, St/Wagon	Dark Green	Dark Green
Pacer	Light Tan	Dark Green

SPECIAL TOOLS

Valiant Regal & Regal 770 models	E17C10 Remover and Installer — Rear Spring Front Bushing
Other models	E17C10A

TORQUE SPECIFICATIONS

Front Pivot Nuts	
Valiant Regal & Regal 770 models	125 lbs. ft.
All other models	85 lbs. ft.
Shackle Bolt Nut	30 lbs. ft.
Axle "U" Bolt Nut	45 lbs. ft.
Front Spring Hanger to Body Bolt	30 lbs. ft.
Rear Spring Hanger to Body Bolt	30 lbs. ft.
Front Shock Absorber Mounting Nuts	
Upper	25 lbs. ft.
Lower	50 lbs. ft.
Rear Shock Absorber Mounting Nuts	
Upper	50 lbs. ft.
Lower	50 lbs. ft.
Rear Shock Absorber Upper Stud to Body Nut	50 lbs. ft.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. SPRING BREAKAGE

(1) Excessive overload.

(2) Loose "U" bolts.

(3) Inoperative shock absorbers.

(4) Extreme abuse over rough roads.

(5) Rear axle bumper missing.

2. SPRING NOISE

(1) Loose "U" bolts.

(2) Loose alignment clips.

(3) Loose or worn shackle bushings.

(4) Rear spring front eye striking rear spring front bracket.

(5) Broken spring leaves.

(6) Worn or missing interliners.

3. SPRING SAG OR BOTTOM

(1) Severe operation or overloading.

(2) Inoperative shock absorbers.

(3) Broken leaves.

(4) Springs "settled".

SERVICE INFORMATION — PROCEDURES

The rear springs *(Fig. 1)* are of semi-elliptic type with rubber bushings in the eye of each end of the main leaf. These bushings tend to reduce noise and increase riding comfort by reducing torque and reaction shock.

The front ends of the springs are attached to mounting brackets bolted to the body. The rear ends of the springs are attached to the body by flat plate shackles, with rubber shackle bushings. The springs are attached to the rear axle housing spring seats by "U" bolts.

Double acting Oriflow shock absorbers are used with rubber mounting bushings at each end of the shock absorber. The Oriflow shock absorber permits the wheels to follow the contour of the road and the springs to flex smoothly.

The Oriflow shock absorber is a pre-filled and sealed unit. They should only be replaced when they have lost their resistance in one or both directions, or if they DRIP oil, evidence of oil moisture is not a cause to replace them.

The lower ends of the front shock absorber *(Fig. 2)* are attached to the lower control arm by means of holes in the side plates of the lower control arm. The top of the shock absorber extends through a bracket and fender shield and is disconnected through the engine compartment.

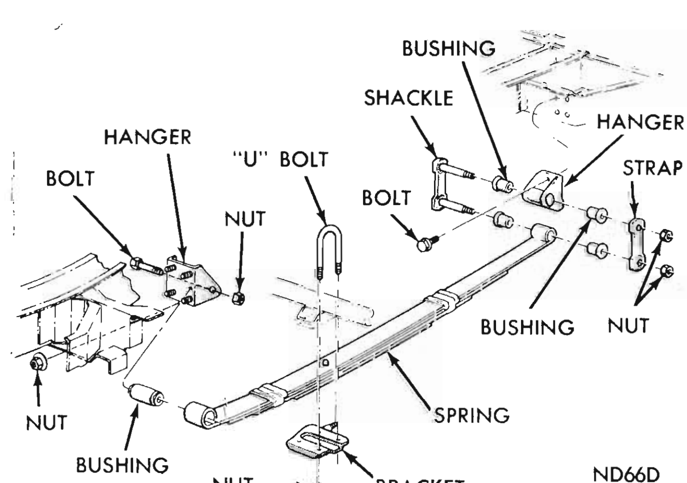


Fig. 1 - Rear springs, hangers and shackles.

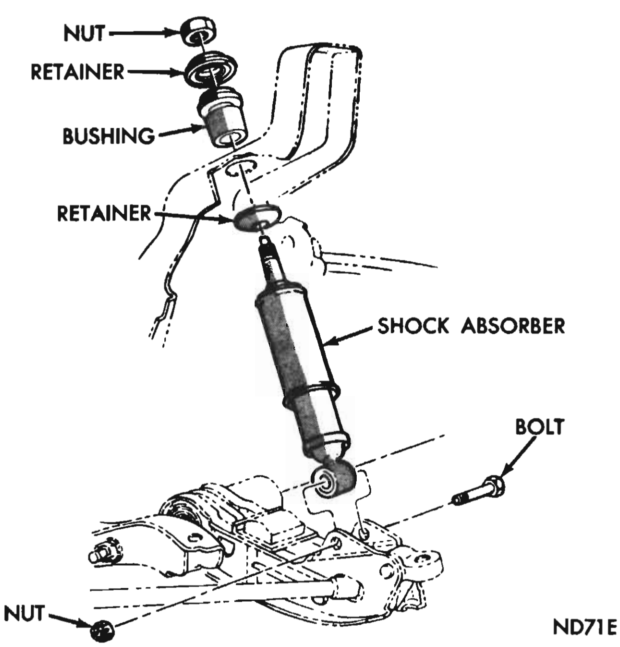


Fig. 2 – Front shock absorber. (Typical view).

> Note:— Bolt must be installed as shown. The head of the bolt must face toward the rear of the vehicle.

The rear shock absorbers *(Fig. 3)* are, at the lower end, mounted to a stud, welded to the rear spring plate. The upper end of the shock absorber is attached to a mounting stud, bolted to the body over the rear axle housing.

1. REAR SPRINGS

To Remove

(1) Raise the vehicle to a comfortable working level.

(2) Disconnect the rear shock absorber at the lower mounting stud.

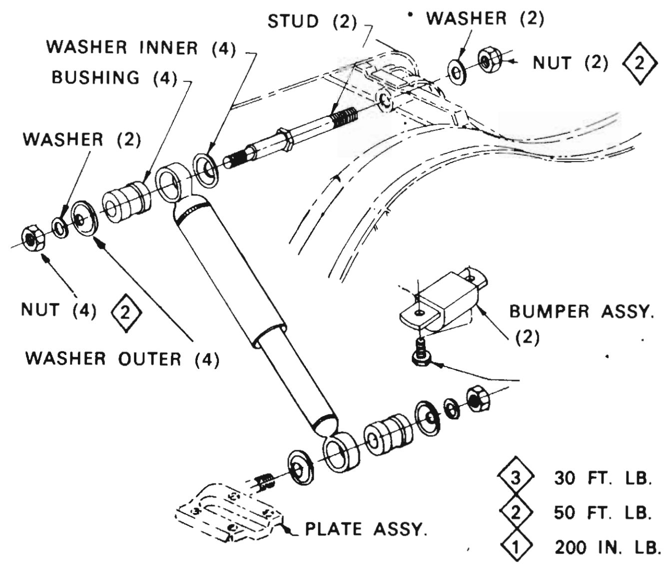


Fig 3 – Rear shock absorbers.

(3) Support vehicle at lifting points, permitting rear springs to hang free.

(4) Support the rear axle housing to this position.

(5) Remove the bolts from the rear spring front pivot hanger.

(6) Remove the "U" bolt nuts and spring plate.

(7) Remove the rear hanger bolts and remove spring from vehicle.

(8) Remove the spring front pivot bolt and remove hanger from spring.

(9) Remove the rear shackle and bushing from the spring and hanger.

To Install

Inspect the spring pivot bolt bushings, and if necessary replace bushing using tool E17C10A or E17C10 as outlined in para. 2.

(1) Attach front hanger to front end of spring and tighten pivot bolt nut to specified torque (See Page 17-3).

(2) Assemble rear shackles and bushings *(Fig. 1)* in rear of spring and rear spring hanger. (Do not lubricate rubber bushings). Tighten shackle bolt nuts to 30 lbs. ft.

(3) Attach the rear hanger to the body bracket and tighten bolts to 30 lbs. ft.

(4) Attach the front hanger to the body bracket and tighten bolts to 30 lbs. ft.

(5) Remove the rear axle housing support, and place centre hole of axle spring seat over the head of the spring centre bolt.

(6) Place the spring plate under spring and install the "U" bolts, and tighten nuts to 45 lbs. ft.

(7) Raise vehicle and connect rear shock absorbers. Remove stands and lower vehicle onto its wheels.

(8) Jounce the vehicle several times and compare spring heights. (It may be necessary to replace mating spring to ensure level position of vehicle.)

2. SPRING BUSHING REPLACEMENT

The spring front pivot and rear shackle bushings may be replaced with the spring still on the vehicle, by the following method:

(1) Raise vehicle so spring is relaxed with rear wheels just touching the floor. Do not permit weight of rear axle to be suspended on fully extended shock absorbers.

(2) To replace the front bushing, remove the front hanger from the body bracket. Remove the pivot bolt and hanger.

(3) Place the new bushing on tool E17C10 or E17C10A, as shown in *Fig. 4*. Arrange tool on spring eye then press out old bushing whilst pressing in new bushing, in one operation.

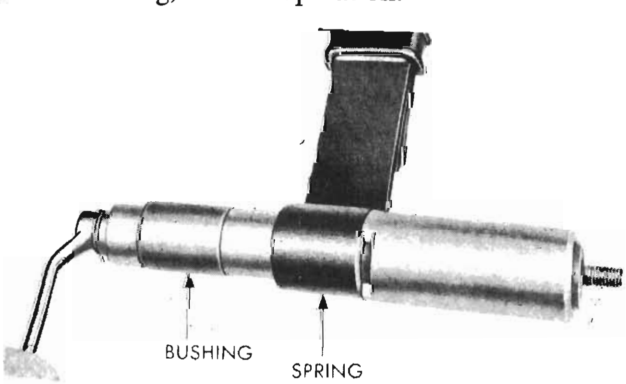


Fig. 4 – Removing and installing spring bushing (Tool E17C10A).

(4) Assemble hanger to spring and tighten the pivot bolt nut to specified torque (See Page 17-3).

(5) Attach the spring hanger to the body bracket, and tighten the mounting bolts to 30 lbs. ft.

(6) To replace the spring shackle bushing, remove the rear hanger from the body bracket. Remove the shackle, then slide the bushings out of the spring and hanger.

(7) Insert new bushings in the spring and hanger, then assemble the shackle and hanger on the spring. Tighten the shackle bolt nuts to 30 lbs. ft.

3. LEAF SPRING INTERLINER REPLACEMENT

(1) Release the weight from the rear spring by elevating the body at the closest lifting point of the body.

(2) Bend top of spring alignment clips upwards, using a tapered pry bar or screwdriver to facilitate removal of interliner.

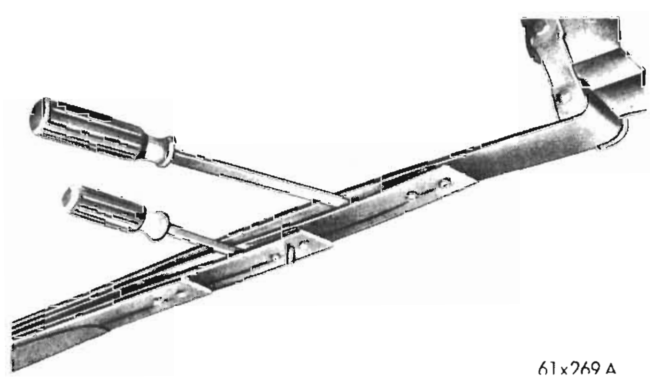


Fig. 5 – Separating spring leaves.

(3) Separate the spring leaves *(Fig. 5)* with a tapered pry bar or screwdriver, and using another screwdriver, pry out the interliner from the spring leaf.

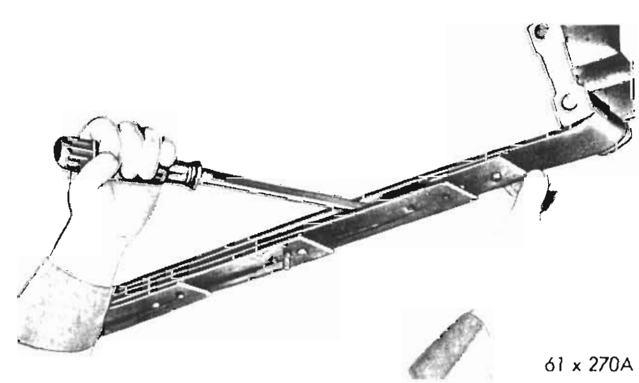


Fig. 6 – Positioning spring interliner.

(4) Keeping the spring leaves separated, clean the mating area of both spring leaves thoroughly. If rust or corrosion is evident, wrap sandpaper around a flat file or putty knife, and sand until area is smooth and clean.

(5) With spring leaves still separated, insert the new interliner *(Fig. 6)* with retaining buttons in alignment with locating holes.

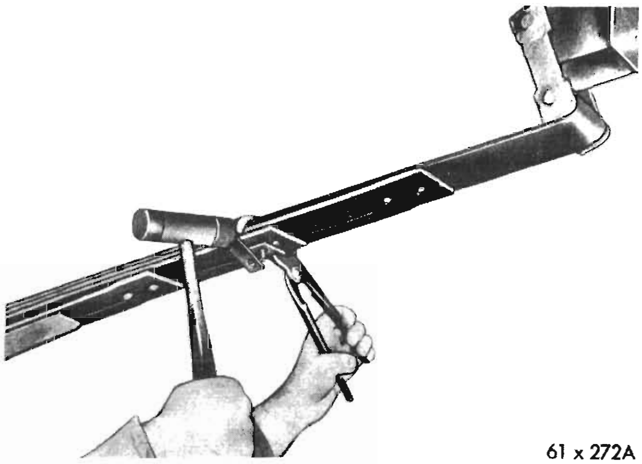


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Fig. 7 – Installing aligning clips.

(6) Press retaining buttons into the retainer holes and remove the pry bar from the spring leaves.

(7) Repeat the above procedure for the balance of the interliners. (Do not lubricate interliners).

(8) Reinstall the aligning clips to original position *(Fig. 7)*.

(9) Lower vehicle onto its wheels.

4. FRONT SHOCK ABSORBERS

To Remove

(1) Remove the nut and washer from the upper end of the piston rod. (Accessible from engine compartment).

(2) Raise the vehicle and remove the pivot nut and bolt from the lower shock absorber eye and mounting bracket.

(3) Compress the shock absorber and remove from the vehicle by pulling down out of upper shock absorber mounting bushing.

(4) If the upper bushing appears worn, damaged, or deteriorated, remove it by first pressing out the inner sleeve 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) Test the shock absorber as outlined in Para. 6.

To Install

(1) With the inner steel sleeve removed from the upper rubber bushing, immerse bushing in water, (do not use oil or soap) and with a twisting motion, start bushing into hole of mounting bracket, then tap into place with a hammer. Reinstall steel sleeve.

(2) Compress the shock absorber and install washer on upper rod of shock absorber and insert rod through upper bushing.

(3) Install the upper compression washer and retaining nut and torque to 25 lbs. ft.

(4) Align the lower mounting bracket and eye of shock absorber. Install bolt and nut and torque to 50 lbs.-ft.

NOTE: Disc Brake Models — The bolt must be installed as shown in *(Fig. 2)*.

5. REAR SHOCK ABSORBER REPLACEMENT

(1) Remove the nuts and washers attaching the shock absorber to its mounting studs.

(2) Remove the shock absorber from the studs.

(3) Remove the remaining cupped washers from the studs.

(4) Check the bushings for deterioration or fatigue, and replace if necessary. Test and bleed the shock absorber as outlined in Para. 6.

(5) Position the washers on the shock absorber mounting studs.

(6) Position the shock absorber on the mounting studs and install the remaining cupped washers and nuts. Tighten the upper and lower stud nuts to 50 lbs. ft.

6. TESTING THE SHOCK ABSORBERS

(1) With shock absorber removed from vehicle, extend it fully in an upright position.

(2) Inspect for evidence of fluid running from upper end of reservoir. (Actual leakage will be a stream of fluid running down the side and dripping off the lower end of the unit. A slight amount of seepage is not unusual and does not affect performance.)

(3) To test for low fluid level or trapped air in cylinder, hold shock absorber in vertical position and alternately extend and compress unit. There should be no lost motion in either direction.

(4) Should lost motion be evident, hold shock absorber in its normal vertical position and fully extend it.

(5) With shock absorber still in the vertical position compress it. Do not invert the shock absorber.

(6) Repeat steps 4 and 5 several times until no air can be heard exhausting through the valves.

(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 old ones due to friction of the new seal.

(8) After the shock absorber has been bled it MUST be kept in the vertical position before installation on the vehicle.

GROUP 19

STEERING

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

PART 1 — MANUAL STEERING

SPECIFICATIONS

Type	Re-circulating ball and nut
No. of balls	54
Ratio	**20:1, 16:1 on A84 and A87 Options**
Cross-shaft bearings	3 needle bearings
Worm-shaft bearings	2 caged ball bearings
Cross-shaft adjusting screw end play	.000" – 004"
Worm bearing pre-load	1½–4½ lbs./in. to keep wheel moving
Sector mesh adjustment pre-load torque (including worm bearing pre-load)	8¼–11¼ lbs./in. pull through high spot
Steering column bearing	Ball bearing
Wheel turns (steering arm removed)	5 (approximately) (16:1) 4 approx.
Wheel turns (steering arm and linkage attached)	**4½ (approximately) (16:1) 3½ approx.**
Steering shaft to wormshaft coupling	Rubber fabric disc

SPECIAL TOOLS

E2C5A	Puller – Steering Arm
E19C5A	Fixture – Steering Gear holding
E19C10	Puller – Steering wheel
E19C15A	Installer – Thrust Bearing cup (in steering gear housing and adjuster)
E19C20	Remover/Installer and arbor – Cross-shaft needle bearings
E19C20A	Remover/Installer – Cross-shaft oil seal (kit)
E19C25	Nut – Wormshaft torque checking
E19C25C	Installer – Wormshaft seal – also Remover–Thrust bearing cup
E19C25D	Protector – Wormshaft seal
E19C25F	Wrench – Wormshaft adjusting
	Pounds-Inch Torque Wrench

TORQUE SPECIFICATIONS

Sector shaft cover bolt	25 lbs. ft.
Steering arm nut	175 lbs. ft.
Gear assembly to frame bolt	80 lbs. ft.
Steering wheel nut	24 lbs. ft.
Sector shaft adjusting screw lock nut	35 lbs. ft.
Steering column jacket clamp screws	15 lbs. ft.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL

(1) Steering gear shaft adjusted too loosely or badly worn.

(2) Steering linkage loose or worn.

(3) Front wheel bearings incorrectly adjusted.

(4) Steering arm loose on steering gear shaft. Inspect for damage to shaft and steering arm.

(5) Steering gear housing attaching bolts loose.

(6) Steering arms loose at steering knuckles.

2. HARD STEERING

(1) Low or uneven tyre pressure.

(2) Insufficient lubricant in the steering gear housing or in steering linkage.

(3) Steering gear shaft adjusted too tightly.

(4) Front wheels out of line.

(5) Steering column mis-aligned.

(6) Interference between steering shaft and jacket tube caused by mis-alignment.

3. PULL TO ONE SIDE

(Tendency of the car to veer in one direction only)

(1) Incorrect tyre pressure.

(2) Wheel bearings incorrectly adjusted.

(3) Dragging brakes.

(4) Incorrect caster and camber.

(5) Incorrect toe-in.

(6) Grease, dirt, oil or brake fluid on brake linings.

(7) Front and rear wheels out of alignment.

(8) Broken or sagging rear springs.

(9) Bent suspension parts.

4. WHEEL TRAMP

(Excessive vertical motion of wheels)

(1) Incorrect tyre pressure.

(2) Incorrect balance of wheels, tyres and brake drums.

(3) Loose tie-rod ends or steering connections.

(4) Worn or inoperative shock absorbers.

5. ROAD WANDER

(1) Low tyre pressure.

(2) Incorrect ball nut rack and cross-shaft sector mesh.

(3) Faulty front wheel bearing.

(4) Worn tie-rod ends.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The manual steering gear *(See Fig. 1)* is designed provide easy steering with a minimum of friction the steering gear. A ball nut travels up or down on the wormshaft, riding on re-circulating balls acting as a screw thread.

The wormshaft and ball nut assembly is supported in the gear housing *by an adjustable*

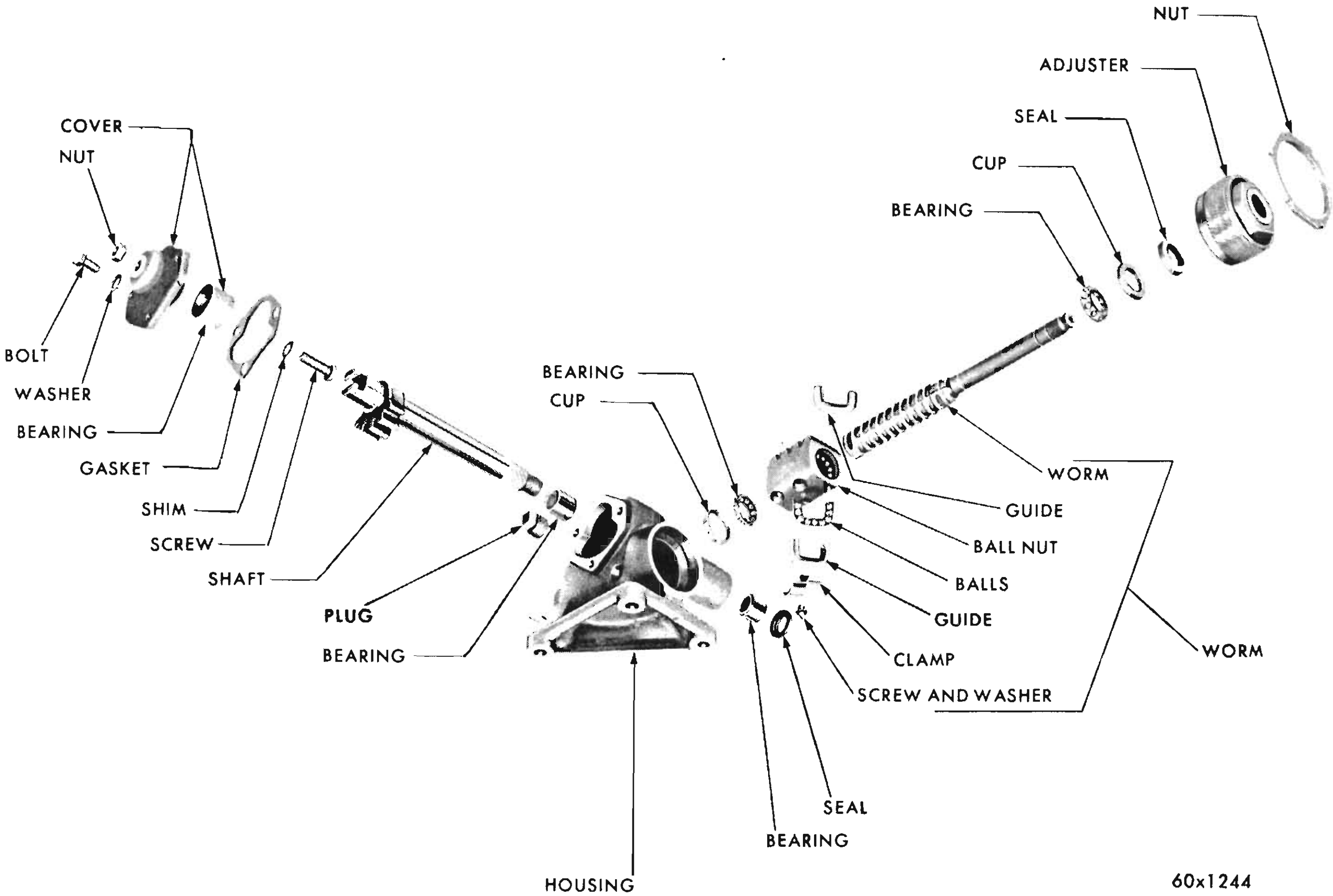


Fig. 1 – Steering gear assembly exploded view (typical)

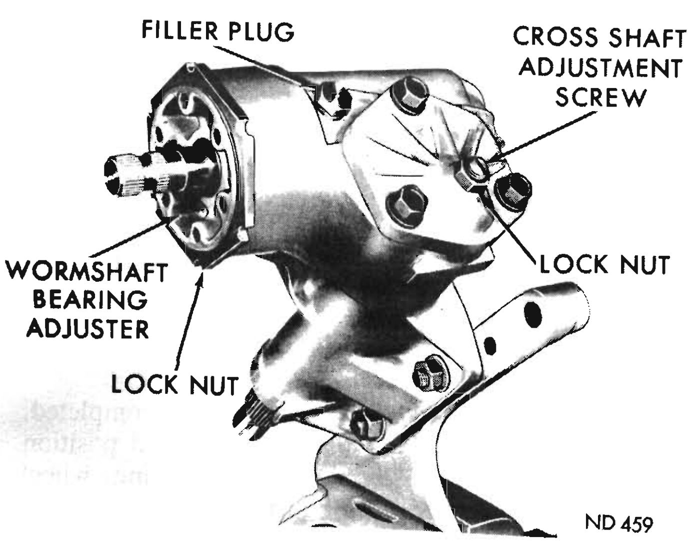


Fig. 2 – Steering gear adjustment locations (typical)

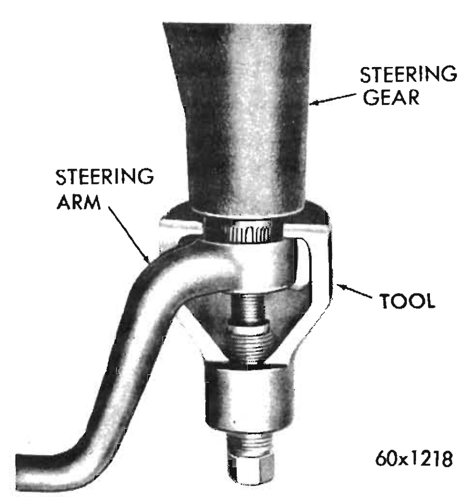


Fig. 3 — Removing steering gear arm (Tool E2C5A)

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 worm-shaft bearing adjuster. The cross-shaft is integral with the sector gear.

The sector gear meshes with the rack teeth on the re-circulating ball nut. Adjustment at this point is controlled by the cross-shaft adjusting screw which extends through the housing cover.

2. ADJUSTMENTS

Two adjustments are provided in the steering gear *(See Fig. 2)*: the worm-bearing pre-load adjustment, and the ball nut rack sector gear mesh adjustment.

Before correct adjustment can be made at the ball nut rack and the sector gear, it must be determined that the worm bearing pre-load is correctly 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.

3. WORM BEARING PRE-LOAD

To Test (in the Vehicle)

(1) Disconnect the steering gear arm from the sector shaft with Tool E2C5A *(See Fig. 3)*.

(2) Remove the horn ring.

(3) Loosen the cross-shaft adjusting screw lock nut and back out the adjusting screw approximately two turns. This will relieve any friction load which may be present at the closely meshed ball nut rack and sector gear teeth.

(4) Turn the steering wheel two complete turns from the straight ahead position and place a lbs. in. torque wrench on the steering shaft nut.

(5) Rotate the steering shaft at least one turn toward the straight ahead position, while checking the rotating torque with the torque wrench.

The torque required to keep the wheel moving should be between $1\frac{1}{2}$ and $4\frac{1}{2}$ lbs. in. If the reading is not within these limits, adjustment of the worm-bearing pre-load is necessary.

To Adjust

(1) Loosen the adjuster lock-nut.

(2) Use the adjuster wrench E19C25F, and turn the adjuster clockwise to increase pre-load or counter-clockwise to decrease pre-load.

(3) Whilst holding the adjuster from turning, tighten the lock-nut securely, then re-test worm-bearing pre-load.

4. BALL NUT RACK AND SECTOR MESH

To Adjust (in the Vehicle)

The cross-shaft adjusting screw, located in the housing cover raises or lowers the shaft to provide the correct mesh load between the tapered teeth of the sector gear and the tapered teeth of the ball nut.

> NOTE: This adjustment can be accurately made only after correct worm-bearing pre-load has been established.

(1) Turn the steering wheel gently from one stop all the way to the other, carefully counting the number of turns. Turn the steering wheel back exactly halfway to the centre position.

(2) Turn the cross-shaft adjusting screw clockwise to take out all lash between the ball nut rack and sector gear teeth, then tighten the adjusting screw lock nut to 35 lbs. ft. torque.

(3) Turn the steering wheel about one quarter turn away from the centre or high spot position. Then using lbs. in. torque wrench at the steering wheel nut, check the torque required to rotate the steering wheel through the high spot at the centre position. This reading should be between $8\frac{1}{4}$ and $11\frac{1}{4}$ lbs. in. This represents the total of the wormshaft bearing pre-load and the ball nut rack and sector gear mesh load. Re-adjust the cross-shaft adjustment screw if necessary to obtain the correct torque reading.

(4) After the adjustments have been completed, place the front wheels in a straight ahead position and with the steering gear and steering wheel centred, install the steering arm on the cross-shaft.

(5) Tighten the steering arm retaining nut to 175 lbs. ft. torque.

To Remove from Vehicle

6 and 8 Cylinder

(1) Remove the two nuts from the bolts clamping the flexible coupling to the steering gear shaft flange.

8 Cylinder Only

(2) Remove the right hand torsion bar *(See Group 2 Paragraph 6).*

(3) Disconnect both exhaust pipes from the manifold flanges and position to one side to provide clearance.

6 and 8 Cylinder

(4) Unscrew the cross-shaft arm retaining nut and remove the arm with tool No. E2C5A.

(5) Remove the three steering gear to frame attaching bolts.

6 Cylinder Only

(6) Withdraw the steering gear assembly with the flexible coupling from the steering shaft flange and remove the unit from the vehicle through the top of the engine compartment.

8 Cylinder Only

(7) Slide the steering gear assembly down and away from the gear shaft flange and lower the assembly downward from the engine compartment.

6 and 8 Cylinder

(8) If necessary remove the pin from the flexible coupling clamp and remove the clamp from the wormshaft splines.

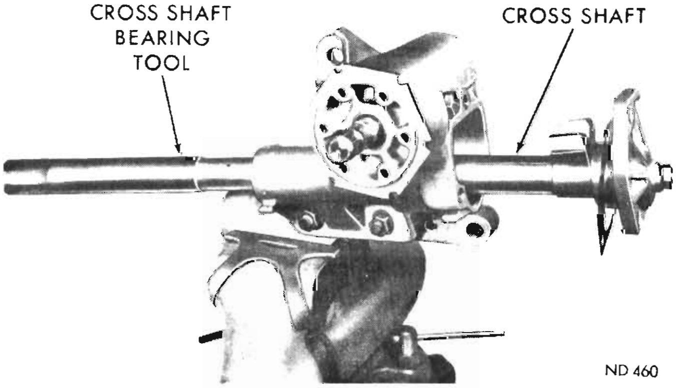


Fig. 4 – Removing or installing sector shaft and cover assembly (typical) (Tool E19C20)

5. RECONDITIONING THE STEERING BOX

To Disassemble

(1) Thoroughly clean the entire outside surface of the steering gear before disassembly to avoid contaminating the wormshaft and ball nut assembly with dirt or grit.

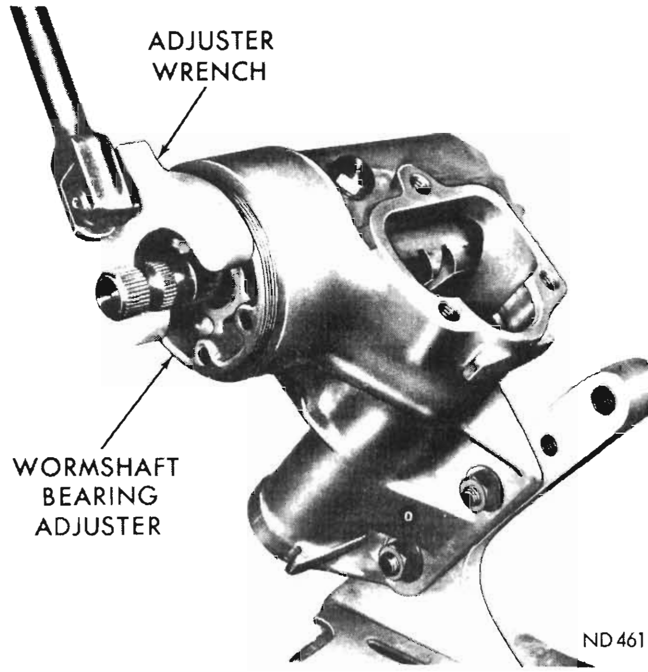


Fig. 5 – Removing wormshaft adjuster

(2) Loosen the cross-shaft adjusting screw lock nut and back out the screw about two turns to relieve the load caused by close mesh between the ball nut rack and sector gear teeth.

> NOTE: Remove the cross-shaft seal as outlined in *Para. 6 — Cross-shaft Oil Seal Replacement.*

(3) Position the steering wormshaft in straight-ahead position.

(4) Remove the bolts from the cross-shaft cover, then slowly remove the cross-shaft whilst sliding the arbor into housing *(See Fig. 4).*

(5) Remove the lock nut from the cross-shaft adjusting screw and remove the screw from the cover by turning the screw clock-wise.

(6) Slide the adjustment screw and shim out of the slot in the end of cross-shaft.

(7) Loosen the wormshaft bearing adjuster lock nut with a soft drift and remove the lock nut. Hold wormshaft from turning whilst unscrewing the adjuster, using tool wrench E19C25F *(See Fig. 5).*

(8) Slide the wormshaft adjuster off the shaft.

> NOTE: The adjuster must be handled carefully to avoid damage to the aluminium threads.

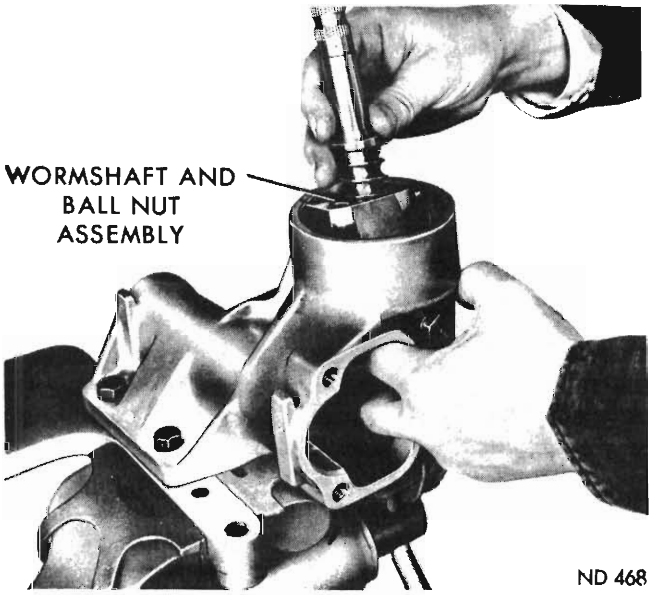


Fig. 6 – Removing wormshaft and ball nut assembly

CAUTION: Be careful that the ball nut does not run down to either end of wormshaft as the ball guide ends can be damaged if the ball nut is allowed to rotate until stopped at the end of the worm.

(9) Carefully remove the worm and ball nut assembly *(See Fig. 6)*.

NOTE: The ball nut and wormshaft are serviced as an assembly only and are not to be disassembled. DO NOT remove or disturb the ball return guides.

The 20:1 ratio steering boxes have a master serration on the steering gear wormshaft spline and the steering shaft coupling. If it should become necessary to replace a steering gear wormshaft and ball nut assembly, it will be necessary to file a master serration on the spline of the wormshaft, since the replacement part does not have a master serration machined in the spline. To file a master serration on a wormshaft spline, the steering gear must be completely assembled and the wormshaft centred in its travel. To centre the steering box, carefully turn the wormshaft from one stop position to the other. Count the total number of turns and back off exactly half way. 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.

(10) Remove the cross-shaft needle bearings by placing the steering gear housing in an arbor press; insert Tool E19C20 *(See Fig. 7)* and press both bearings through the housing.

NOTE: The cross-shaft cover assembly, including needle bearing, is serviced as an assembly.

(11) Remove the wormshaft oil seal from the wormshaft bearing adjuster by inserting a blunt punch behind the seal and tap alternately on each side of the seal until the seal is driven out of the adjuster.

(12) Remove the wormshaft upper bearing cup in the same manner. This must be done carefully to avoid cocking the bearing cup and distorting the adjuster counter bore.

(13) To remove the lower cup, drive the plug out of the front end of the housing with a long blunt drift. Drive out the bearing cup with Tool E19C25A.

(14) Drive wormshaft oil seal from adjusting nut with Tool E19C25A.

To Clean and Inspect

Wash all parts in cleaning solvent and blow dry with compressed air. Use a magnifying glass to inspect ball bearings and bearing cups, spherical surfaces, for signs of indentation, chipping, or breakdown of the surfaces. 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 the assembly must be replaced.

Inspect the sector shaft for wear and check fit of the shaft in the needle bearings. Check fit of the shaft pilot in its needle bearing in the cover. The sector shaft and wormshaft oil seals should be replaced when the unit is reconditioned.

Extreme care is necessary when handling the aluminium bearing adjuster to avoid damaging its threads. The wormshaft adjuster must never be screwed into the housing without lubrication or when threads are dirty or damaged. These precautions must be taken to avoid picking up the threads and ruining the bearing adjuster.

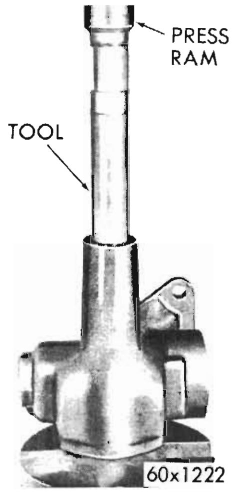


Fig. 7 – Removing cross-shaft needle bearings or installing outer needle bearings (typical) (Tool E19C20)

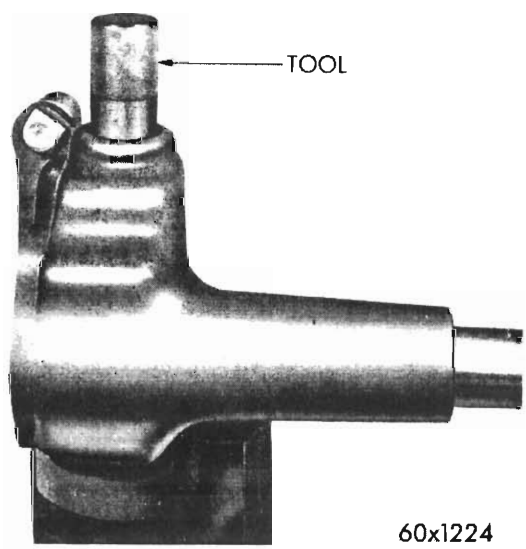


Fig. 8 – Removing wormshaft bearing cup from housing

To Assemble

(1) Install the cross-shaft outer needle bearing by placing the bearing on the end of Tool E19C20. Press bearing into housing to 5/16″ below the end of bore to provide space for the oil seal.

(2) Install the inner needle bearing by placing bearing on Tool E19C20 *(See Fig. 9)*. Press the bearing into the inside end of the housing bore flush with the inside end of the bore surface.

(3) Install the wormshaft bearing cups, position the cups in the housing and bearing adjuster nut. Then press them in place with Tool E19C15A *(See Fig. 10)*. Install a new plug in front end of housing.

(4) Install the wormshaft oil seal by positioning the seal in the wormshaft adjuster with lip of seal up. Drive the seal into place with a suitable sleeve so it is slightly below the end of the bore in the adjuster.

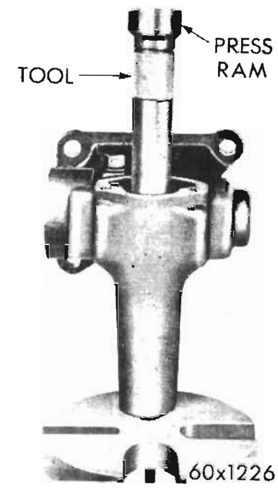


Fig. 9 – Pressing inner bearing into housing (Tool E19C20)

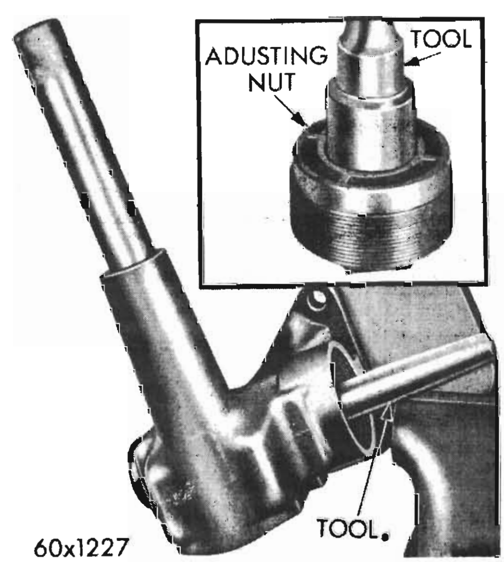


Fig. 10 – Installing wormshaft bearing cups (typical) (Tool E19C15A)

(5) Apply a coating of steering gear grease to all moving parts during assembly; also place grease on and around oil seal lips.

(6) Clamp the housing in a vice with the bearing adjuster opening upward.

(7) Place a thrust bearing in the lower cup in the housing.

(8) Hold the ball nut from turning *(See Fig. 6)* and insert the wormshaft and ball nut assembly into housing with end of worm resting in the thrust bearing.

(9) Place the upper thrust bearing on the wormshaft. Thoroughly lubricate the threads on the adjuster and the threads on housing.

(10) Place seal protector Tool E19C25D over splines of wormshaft. If this tool is not available, place a protective sleeve of plastic tape over the wormshaft splines so that the splines do not damage the seal, and slide the adjuster assembly over the shaft.

(11) Thread the adjuster into the steering housing and with the wrench E19C25F and nut E19C25, tighten the adjuster to 50 lbs.-ft. whilst rotating the wormshaft. This is done to seat the bearings effectively.

(12) Loosen the adjuster so no bearing preload exists. Then using lbs./in. torque wrench, adjust wormshaft bearing preload to $1\frac{1}{2}$–$4\frac{1}{2}$ lbs.-in.

(13) After adjusting the preload, tighten the bearing adjuster lock nut and then re-check to ensure the preload remains between $1\frac{1}{2}$ and $4\frac{1}{2}$ lbs.-in.

(14) Before installing cross-shaft, pack the wormshaft cavities in the housing above and below the ball nut with steering gear grease. Use steering gear grease whenever possible, but if not available, use GL5-SAE90 gear oil. When the gear is correctly packed with steering gear grease, the level of the grease will be at the top of the worm.

(15) Slide the cross-shaft adjusting screw and shim into slot in the end of the shaft.

(16) Check the end clearance *(See Fig. 11)*. The screw must be free to turn with no perceptible end play to .004″ loose. Three different thickness shims are available to obtain the specified clearance.

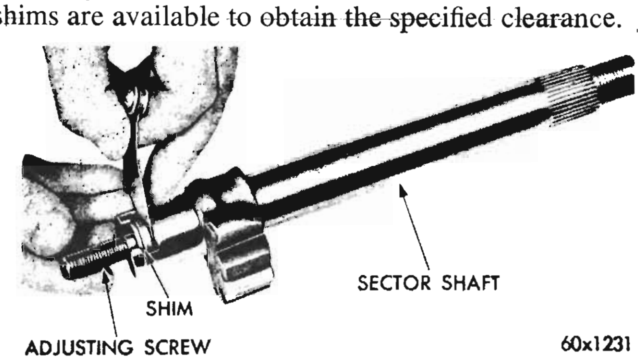


Fig. 11 – Checking cross-shaft adjusting screw end play

(17) Start the cross-shaft and adjuster screw into bearing in the housing cover. Then using a screwdriver through the hole in the cover, turn the screw counter-clockwise to pull the shaft into the cover.

(18) Install the adjusting screw lock nut, but do not tighten at this time.

(19) Rotate the wormshaft to centralise the ball nut.

(20) Place a new cover gasket on the housing cover.

(21) Carefully install the cross-shaft and cover assembly into steering gear housing *(See Fig. 4)*.

> NOTE: The cross-shaft and sector teeth should be coated with steering gear grease before installing the cross-shaft in the housing.

(22) Make certain some lash exists between the cross-shaft sector teeth and the ball nut rack, then install and tighten the cover bolts to 25 lbs.-ft. torque.

(23) Install a new sector shaft oil seal using Tool E19C20A.

6. CROSS-SHAFT OIL SEAL

The cross-shaft oil seal may be replaced by this procedure either on the bench or without removing the steering gear from the vehicle.

> NOTE: When replacing the oil seal in the vehicle, clean the exposed portion of the cross-shaft to help prolong oil seal life.

To Remove

Slide the threaded adapter of Tool E19C20A over the end of the cross-shaft and install the nut portion of the tool on the shaft *(See Fig. 12)*. Maintain pressure on the adapter with the tool nut whilst screwing the adapter into the seal until it grips the oil seal firmly. Place the two half rings and retainer over both portions of the tool. Turn tool nut counter-clockwise to withdraw the seal from the housing.

To Install

(1) Place the cross-shaft seal on the seal protector sleeve from Tool E19C20A, by carefully sliding the seal over the tapered end of the sleeve so that the lip of the seal faces the tapered end of the sleeve.

(2) Place the seal and protector sleeve assembly on to the splines on the cross-shaft with the lip of the seal facing the gear housing *(See Fig. 13).*

(3) Slide the seal down off the protector sleeve onto the cross-shaft and remove the sleeve.

NOTE: A piece of tape can be wrapped around the end of the sleeve opposite the tapered end, to provide a better grip when removing the sleeve.

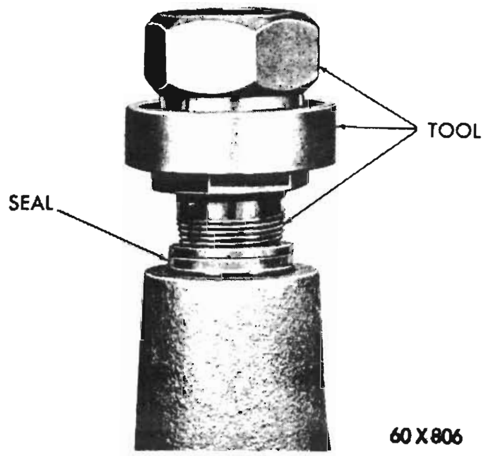


Fig. 12 – Removing sector shaft oil seal (Tool E19C20A)

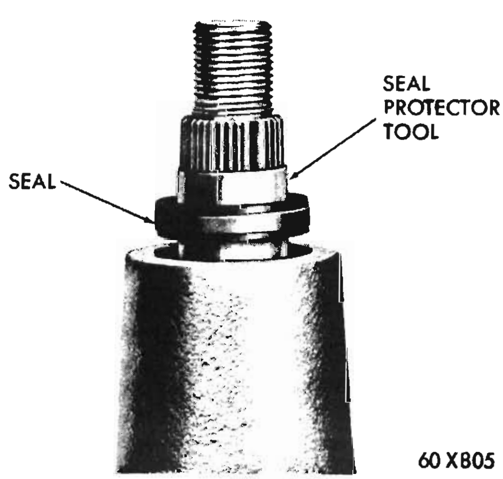


Fig. 13 – Sector shaft oil seal protector (Tool E19C20A)

(4) Place the installing adapter from Tool E19C20A against the seal.

(5) Place the nut from Tool E19C20A on the cross-shaft and turn it down against the adapter, pressing the seal into the housing until the step on the adapter contacts the end of the housing.

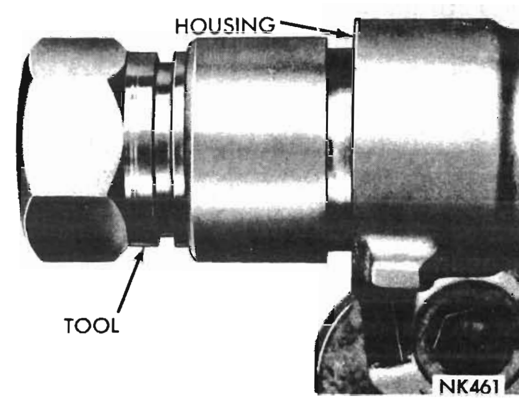


Fig. 14 – Installing sector shaft oil seal (Tool E19C20A)

7. BALL NUT RACK AND SECTOR MESH

To Adjust (out of the Vehicle)

The ball nut rack and sector mesh adjustment can be accurately made only after correct worm-bearing pre-load has been established.

(1) Turn the wormshaft to the midpoint of its travel. When the gear is exactly centred, the master spline on the wormshaft will be at the 12 o'clock position when viewed with the gear positioned as it would be when installed in the vehicle.

(2) Turn the cross-shaft adjusting screw clockwise to take out all lash between the ball nut rack and sector gear teeth, then tighten the adjusting screw lock nut *(See Fig. 15).*

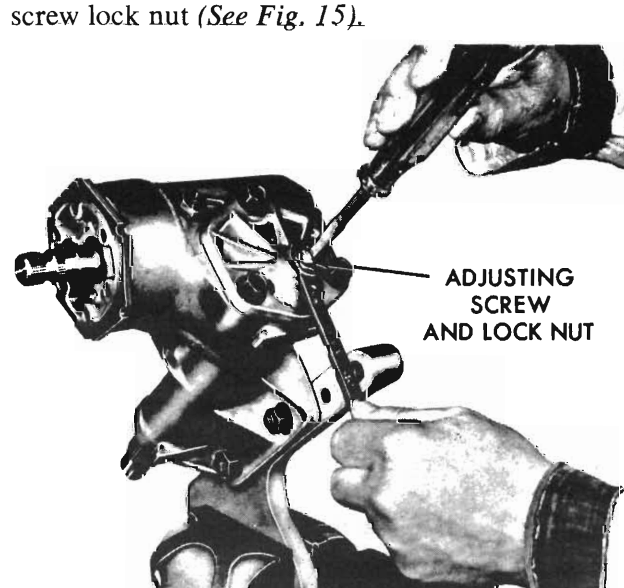


Fig. 15 – Cross-shaft adjustment (typical)

(3) Turn the wormshaft about one-quarter turn away from the centre or high spot position. Using Tool E19C25 and lbs.-in. torque wrench *(See Fig. 16)*, rotate the wormshaft through the centre or high spot position, observing the rotating torque required to turn the gear through the high spot. This reading should be between 8¼ and 11¼ lbs.-in. This represents the total of the worm bearing pre-load and the sector gear mesh load.

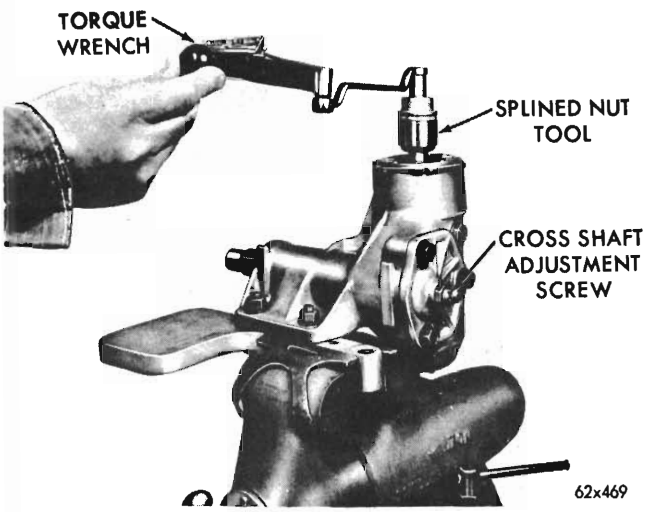


Fig. 16 – Testing ball nut rack and cross-shaft sector mesh (typical)

(4) Re-adjust the cross-shaft adjustment screw, if necessary, to obtain the correct torque reading. Ensure that the adjusting screw lock nut is tight whenever a pre-load torque reading is taken.

(5) With the steering gear positioned in a vice at its operating angle, fill the gear housing with approved steering gear grease so the level of grease covers the top of worm.

To Install

6 and 8 Cylinder

(1) Install a new roll pin to the coupling clamp if removed. It may be necessary to tap the coupling lightly to align the hole in the coupling with the radial groove on the wormshaft.

(2) Align the steering wheel for straight ahead position.

(3) Carefully manoeuvre the steering gear into position, connect the flexible coupling to the steering gear shaft, then install the steering gear to frame attaching bolts and tighten to 80 lbs.-ft. torque.

(4) Align the front wheels in a straight ahead position and install the steering arm on the cross-shaft. DO NOT tighten the retaining nut.

(5) Re-check the front wheels for straight ahead position, with steering wheel alignment and steering gear centred on high spot. If satisfactory, tighten the steering arm nut to 175 lbs.-ft. torque.

8 Cylinder Only

(6) Install the torsion bar and adjust the front suspension height *(See Group 2)*.

(7) Re-connect both exhaust pipes.

6 and 8 Cylinder

(8) After the steering gear has been completely installed, check the steering wheel to ensure it is centred in the straight ahead position. If it is found to be off centre with the wheels straight ahead, adjust the tierods to centre the wheel *(See Group 2)*.

PART 2 — POWER STEERING UNITS

SPECIFICATIONS

(A) POWER STEERING GEAR

Type	Constant control (co-axial)
Ratio	15.7:1
Turns (Lock to Lock)	3½
Fluid capacity of hydraulic system	2.7 Pints (approx.)
Wormshaft thrust bearing preload	16–24 inch/ozs.
Cross shaft adjustment	Tighten adjusting screw ⅜ to ½ turn past zero backlash (centre of highspot)

(B) POWER STEERING PUMP

Type/Capacity	Constant displacement/.94 cu. in. per rev.
Maximum pump pressure	800-950 P.S.I.
Maximum fluid flow	2¼ G.P.M.

Power Steering Fluid Part No. 2793254 to be used

SPECIAL TOOLS

E2C5A	Remover – Steering arm
E19C5A	Fixture – Steering gear holding
E19C20	Remover/Installer – Cross-shaft needle bearings
E19C20A	Remover/Installer – Cross-shaft oil seal (kit)
E19C20B	Wrench – Cross-shaft cover nut
E19C20E	Adapter – Cross-shaft oil seal installer (used with E19C20A)
E19C25A	Installer – Wormshaft oil seal
E19C25B	Protector – Wormshaft needle bearing arbor
E19C25G	Wrench – Power train retaining nut
E19C25H	Remover – Wormshaft seal from housing
E19C25J	Remover/Installer – Piston ring
E19C25K	Nut – Wormshaft torque checking
E19C30	Aligning tool – Valve lever hole
	Press fixtures
	Snap-ring pliers

TORQUE SPECIFICATIONS

Housing head nut	110–200 lbs. ft.
Pressure inlet fitting	30 lbs. ft.
Gear unit pressure inlet fitting	14 lbs. ft.
Pump pressure hose connection	24 lbs. ft.
Steering gear arm nut	175 lbs. ft.
Valve body attaching screws (initially)	95 lbs. ins.
(finally)	200 lbs. ins.
Valve body plug	25 lbs. ft.
Steering gear to side rail bolts	80 lbs. ft.
Steering column jacket clamp screws	30 lbs. ft.
Power steering pump bracket screws	30 lbs. ft.
Belt idler bracket nuts	30 lbs. ft.
Belt idler pulley bolt nut	50 lbs. ft.

PART 2A — POWER STEERING GEAR
SERVICE DIAGNOSIS
CONDITIONS — POSSIBLE CAUSES

1. HARD STEERING

(1) Tyres not properly inflated.

(2) Low oil level in pump reservoir (usually accompanied by pump noise).

(3) Loose pump belt.

(4) Incorrect caster and camber.

(5) Power steering output low.

(6) Steering linkage binding.

(7) Steering gear malfunctions.
- a. Gear shaft adjustment too tight.
- b. Faulty or damaged valve lever.
- c. External leakage.
- d. Excessive internal leakage.

2. POOR RECOVERY FROM TURNS

(1) Tyres not properly inflated.

(2) Steering linkage binding.

(3) Improper wheel alignment.

(4) Damaged steering tube bearing.

(5) Steering wheel column jacket and steering nut misaligned.

(6) Steering gear malfunctions.
- a. Improper gear shaft adjustment.
- b. Column support spanner nut loose.
- c. Damaged valve lever.
- d. Improper worm thrust bearing adjustment.
- e. Worn or damaged cylinder head worm seal ring or faulty worm piston ring.
- f. Burrs or nicks in the reaction ring grooves in the cylinder head or column support.
- g. Dirt or chips in the steering gear unit.
- h. Rough worm in the piston assembly.
- i. Valve binding.

3. VEHICLE LEADS TO EITHER SIDE

(1) Tyres not properly inflated.

(2) Improper wheel alignment.

(3) Valve body out of adjustment.

(4) Valve lever damaged.

(5) Column support spanner nut loose.

(6) Coupling not centered.

(7) Internal leakage in the steering gear valve body.

4. TEMPORARY INCREASES IN EFFORT WHEN TURNING STEERING WHEEL TO THE RIGHT OR LEFT

(1) Oil level low in pump reservoir.

(2) Loose pump belt.

(3) Oil on pump belt.

(4) Binding steering linkage.

(5) Engine idle too slow.

(6) Air in the system.

(7) Power steering pump output low.

(8) Gear malfunction.

5. NOISES

(1) Buzzing noise in neutral and stops when the steering wheel is turned.

(2) Chucking noise. Cause as follows:
- a. Improper gear shaft adjustment.
- b. Improper wormshaft thrust bearing adjustment.
- c. Coupling loose on the wormshaft.
- d. Worn worm and piston assembly.

(3) Metallic clatter or hissing noise.

(4) Knocking condition at the bracket stop when the engine is running.

(5) Loose pump belt.

(6) Pump components incorrectly assembled or damaged.

6. EXCESSIVE STEERING WHEEL FREE-PLAY

(1) Improper gear shaft adjustment.

(2) Column support spanner nut loose.

(3) Improper worm thrust bearing adjustment.

(4) Coupling loose on the wormshaft.

(5) Excess worm piston side play.

7. LACK OF ASSIST (one direction)

(1) Oil leaking past wormshaft oil seal ring.

(2) Broken or worn ring on worm piston.

(3) Piston end plug loose.

(4) Reaction seal missing.

(Both directions)

(1) Pump belt slipping.

(2) Pump output low.

(3) Broken or worn ring on worm piston.

(4) Piston end plug loose.

(5) Flow control valve incorrect or plug not sealed.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The power steering gear *(Figs. 1 and 2)* consists of a gear housing containing a gear shaft with sector gear, a power piston with gear teeth broached into the side of the piston which is in constant mesh with the gear shaft sector, and a wormshaft connecting the steering wheel to the power piston through a U-joint 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 slipper type pump through a pressure hose. Oil is returned to the pump reservoir from the steering gear through a return hose.

2. POWER STEERING UNIT

To Remove

6 and 8 Cylinder

(1) Remove the two nuts from the bolts clamping the flexible coupling to the steering gear shaft flange.

(2) Unscrew the cross-shaft arm retaining nut and remove the arm with Tool No. E2C5A.

(3) Disconnect pressure and return hoses at steering gear valve. Fasten ends of hoses above oil level in pump reservoir.

8 Cylinder Models Only

(4) Remove the driver's side torsion bar as described in *Group 2 Paragraph 6*. (Withdraw the torsion bar as far as possible to clear the steering unit).

(5) Disconnect both exhaust pipes from the manifold flanges and position to one side to provide clearance.

(6) Remove the driver's side engine brace strut.

6 and 8 Cylinder

(7) Remove the three steering gear to frame attaching bolts.

6 Cylinder Only

(8) Withdraw the steering gear assembly with the flexible coupling from the steering shaft flange and remove the unit from the vehicle through the top of the engine compartment.

8 Cylinder Only

(9) Withdraw the steering gear assembly with the flexible coupling from the steering shaft flange and remove the unit from the vehicle downward from the engine compartment.

6 and 8 Cylinder

(10) If necessary, remove the roll pin from the flexible coupling clamp, and remove the clamp from the wormshaft spline.

To Install

6 and 8 Cylinder

(1) Install a new roll pin to the coupling clamp if removed. It may be necessary to tap the coupling lightly to align the hole in the coupling with the radial groove on the wormshaft.

(2) Align the steering wheel for straight ahead position.

(3) Carefully manoeuvre the steering gear into position, connect the flexible coupling to the steering gear shaft, then install the steering gear to frame attaching bolts, and tighten to 80 lbs.-ft. torque.

8 Cylinder Models Only

(4) Re-install the engine exhaust pipes.

(5) Re-install the torsion bar as described in *Group 2, Paragraph 6.*

(6) Re-install the engine brace strut.

6 and 8 Cylinder

(7) Align the front wheels in a straight ahead position and install the steering arm on the cross-shaft. DO NOT tighten the retaining nut.

(8) Reconnect the pressure and return hoses to the steering valve.

(9) Re-check the front wheels for straight ahead position with the steering wheel alignment and steering gear centred on the high spot. If satisfactory, tighten the steering arm nut to 175 lbs.-ft. torque.

(10) Fill the power steering pump reservoir and start the engine.

(11) Expel all the air from the system by turning the steering wheel from stop to stop several times. Inspect the pump reservoir fluid level and replenish if necessary.

SERVICE OPERATIONS — IN VEHICLE

3. GEAR SHAFT ADJUSTMENTS

(1) Disconnect centre link from steering gear arm.

(2) Start engine and run at idle speed.

(3) Turn steering wheel gently from one stop all the way to the other, counting number of turns. Then turn wheel back exactly half way, to centre 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 $\frac{3}{8}$ to $\frac{1}{2}$ turn from this position and tighten lock nut to 28 lbs. ft. to maintain this setting (where the combination gasket/date tag is used) otherwise 50 lbs. ft.

4. STEERING VALVE BODY — SERVICING AND ADJUSTMENTS

To Remove

(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. 3).*

To Install

(1) Align lever hole in valve spool with lever opening in valve body.

(2) Install 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, re-align valve spool hole with lever opening in valve body and install valve body.

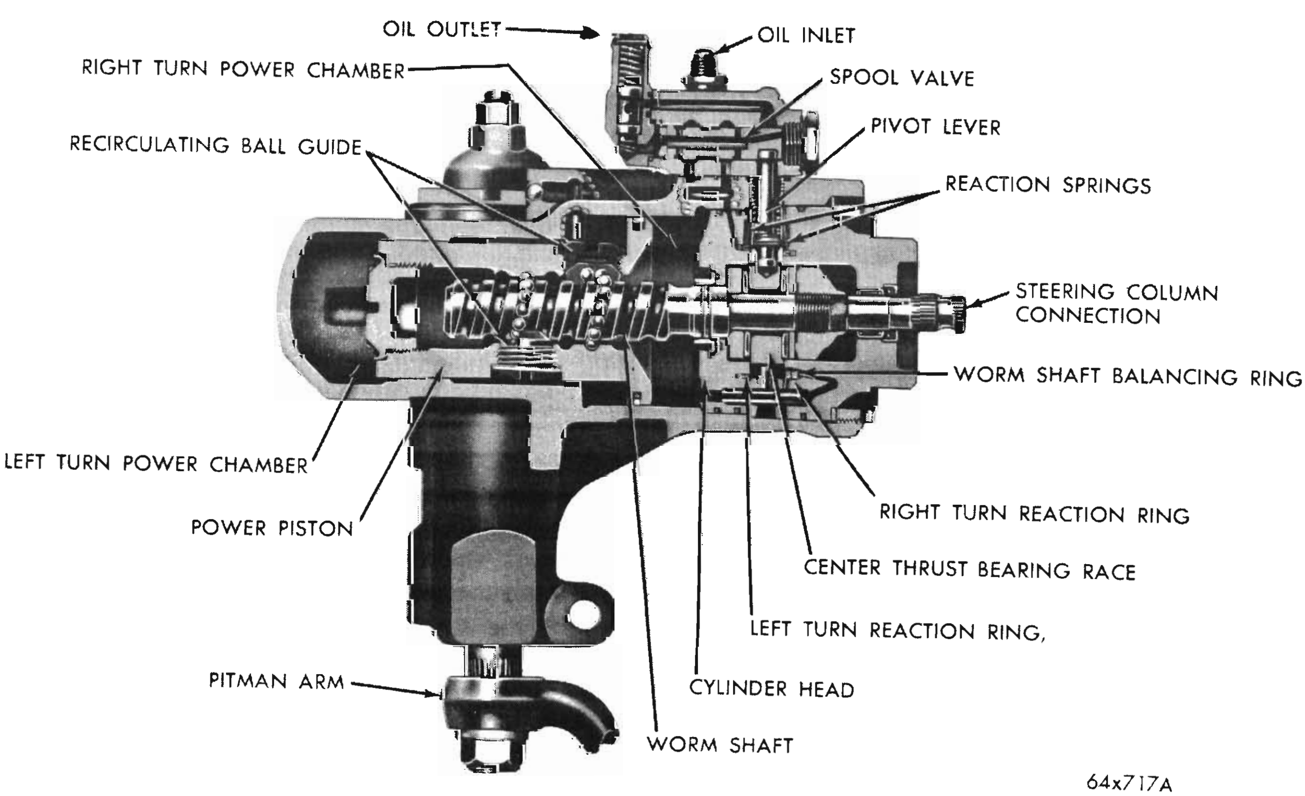


Fig. 1 – Power steering gear unit (typical — cut-away view)

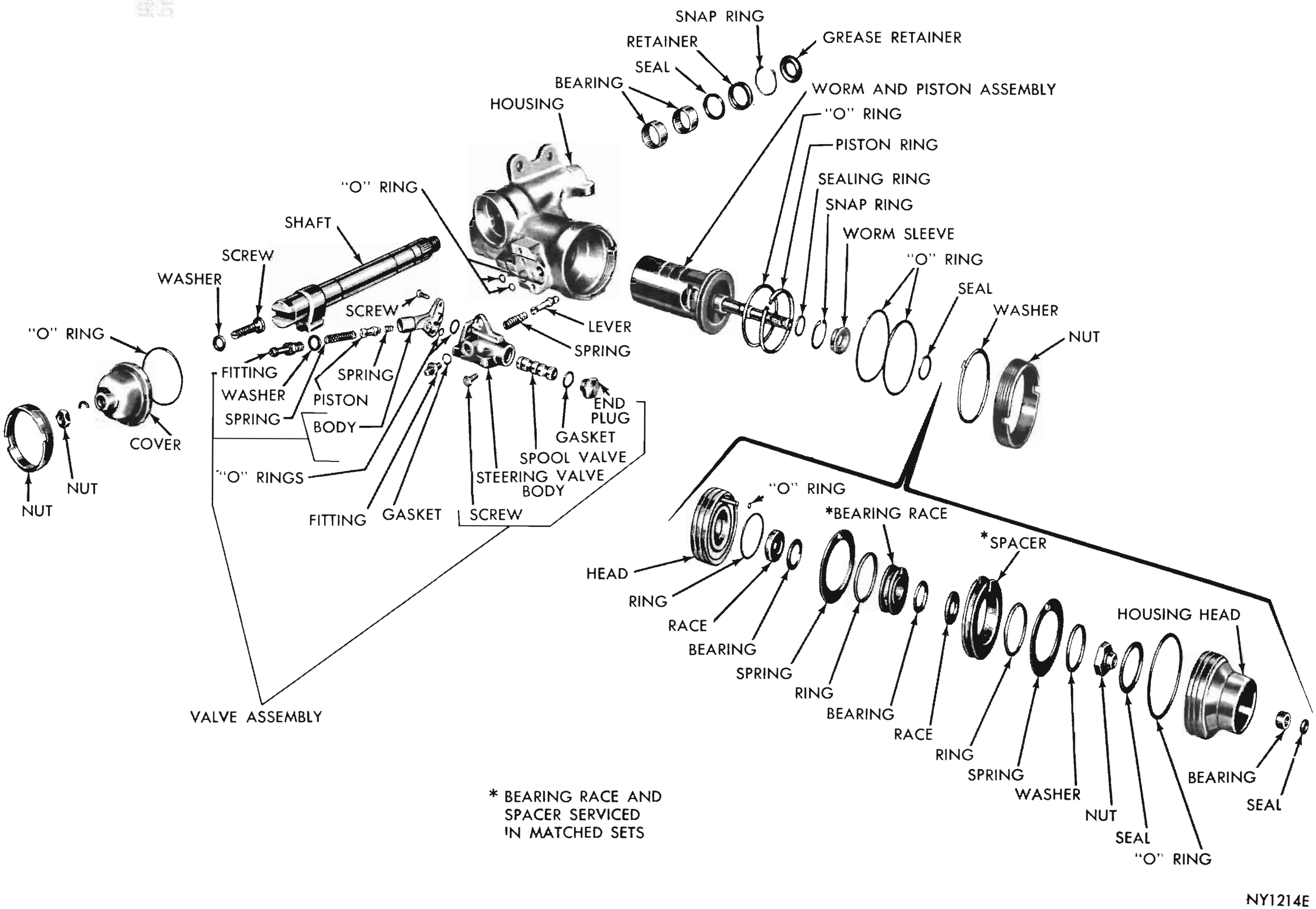


Fig. 2 – Steering gear (disassembled view)

(3) Install two screws and tighten to 7 lbs. ft. to prohibit leakage during valve centering operation. *(To Test and Adjust Paragraph)* – below, and reconnect the hoses.

To Disassemble

(1) Remove the two screws attaching the control valve body to the steering valve body, and separate the two bodies *(Figs. 3 and 4)*.

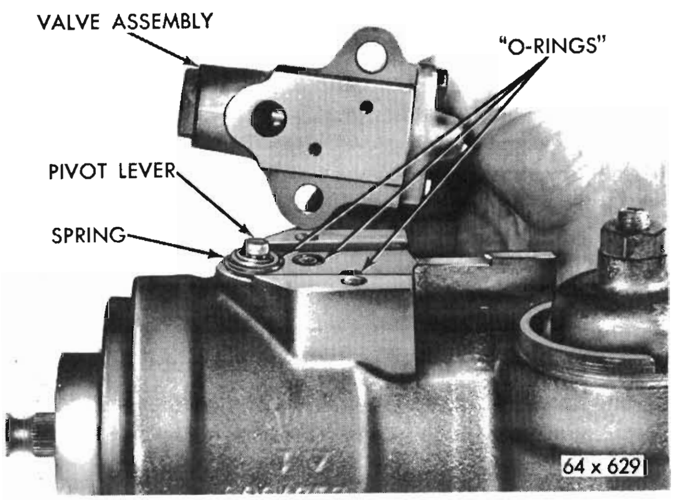


Fig. 3 – Removing valve body assembly

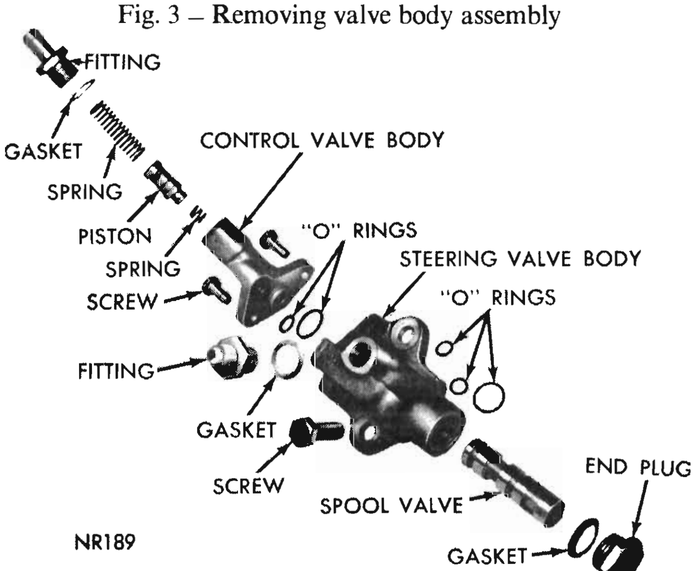


Fig. 4 – Valve body components

(2) Compress the control valve spring and remove the retainer pin, spring, valve piston and cushion spring.

(3) Carefully shake out the spool valve and inspect the valve for nicks, burrs and scores. Do not remove the valve body end plug unless inspection indicates a leak at the gasket.

NOTE: If the spool valve or valve body is damaged, replace the valve and body as an assembly.

Small burrs and nicks may be removed with crocus cloth if extreme care is used not to round off the sharp edge portion of the valve. The sharp edge portion is vitally important to the operation of this valve.

(4) Clean the valve bodies and valve pistons thoroughly in clean solvent. Blow out all passages and dry parts with compressed air. Lubricate pistons and bores with power steering fluid, Part No. 2793254.

(5) Install the steering spool valve into the valve body so that the valve lever hole is aligned with the lever opening in the valve body. Valve must be perfectly free in the valve body without sticking or binding *(Fig. 4)*.

(6) Install a new gasket on the end plug (if removed). Tighten the plug to 25 lbs./ft.

(7) Install the piston cushion spring in the control valve body, being sure it seats in the counterbore at the bottom of the housing. Lubricate the piston and insert the nose end of piston into the body bore. Test for smooth operation. Be sure the cushion spring is not cocked.

(8) Install the spring on top of the piston, compress the spring and install the retaining pin.

(9) Position the two new 'O' rings on the control valve body and attach the control valve body to the steering valve body. Tighten the two attaching screws to 95 lbs./in.

(10) If the pressure inlet fitting has been removed, tighten the fitting to 30 lbs. ft. (initially).

(11) Re-install valve assembly and test as follows.

To Test and Adjust

(1) Start engine. If unit is self-steering tap the valve up or down to correct. When tapping valve "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.

(2) 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.

(3) With steering wheel in straight ahead centre 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 both started or stopped.

(4) The valve is now centered. Tighten the two screws attaching valve body to housing to 200 lbs./ins.

5. OIL SEAL REPLACEMENT

Gear Shaft Oil Seal — To Remove

The gear shaft oil seals may be replaced in the vehicle or on the workbench without dismantling the steering gear.

(1) Remove the steering gear arm by normal procedure, using puller Tool E2C5A.

(2) Slide the threaded adaptor of Tool E19C20A over the end of the gear shaft and thread the tool nut on the gear shaft (with short reach flange towards adaptor).

Maintain pressure on the threaded adaptor with the tool nut whilst screwing the adaptor far enough to engage the metal portion of the grease retainer. Place the two half rings and tool retainer ring over both portions of the tool *(Fig. 5)*.

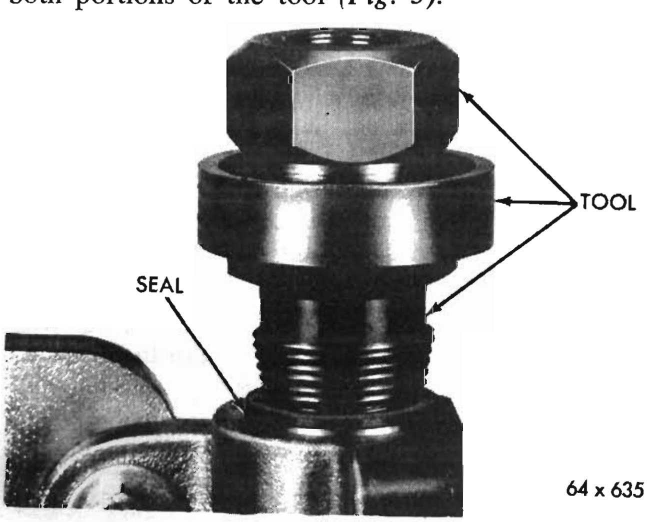


Fig. 5 – Removing gear shaft oil seal

Turn the tool nut counterclockwise to withdraw the grease retainer from the housing.

(3) Remove the oil seal snap ring with snap-ring pliers and remove the oil seal back-up washer.

(4) Remove the inner oil seal with Tool E19C20A and adaptor in a similar manner to removal of the grease retainer, as detailed above, except that the nut will be reversed, with the long reach flange towards adaptor.

To Install

(1) Install new gear shaft inner oil seal in the steering gear housing with adaptor E19C20E of Tool E19C20A as follows:—

a. Place the long step of adaptor against the new seal, and slide it over the shaft with seal lip towards housing *(Fig. 6)*.

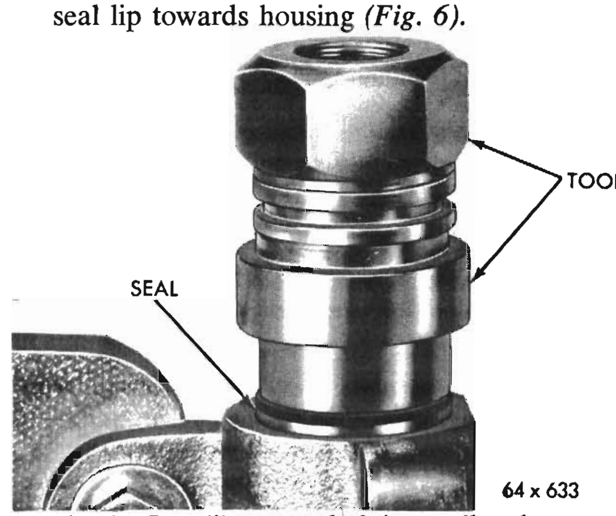


Fig. 6 – Installing gear shaft inner oil seal

b. Thread tool nut on the threaded end of the gear shaft.
c. Turn the tool nut on the gear shaft until the shoulder of the adaptor contacts the housing.
d. Remove tool and adaptor and install the oil seal back-up washer and retainer ring.

CAUTION: Make sure the snap ring is properly seated in the housing groove with sharp edge outer-most.

(2) Position the gear shaft outer seal with the lip of the seal toward the housing, place the short lip of adaptor against the seal, engage tool nut with the threaded end of the gear shaft *(Fig. 7)*. Turn the nut until the shoulder of the adaptor contacts the housing. Remove the tool nut and adaptor.

(3) Position steering gear and front wheels in straight ahead position and install steering gear arm and nut.

(4) Tighten nut to 180 lbs. ft.

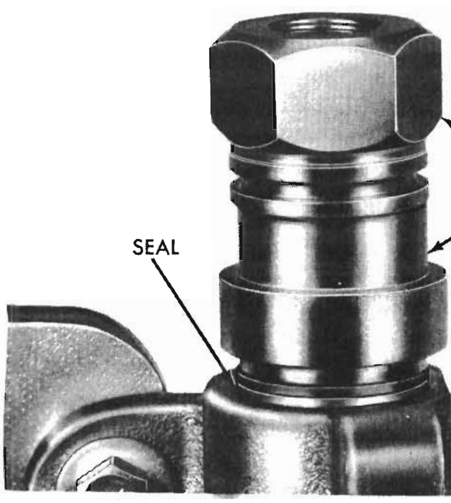


Fig. 7 – Installing gear shaft grease retainer

Wormshaft Oil Seal

The wormshaft oil seal replacement requires the removal of the steering gear assembly from the vehicle.

(1) Remove steering gear as described in *para 2*.

(2) Remove the oil seal using Tool E19C25H – *refer Fig. 8*.

(3) Install the new oil seal, lip of seal toward housing head, using Tool E19C25A – *refer Fig. 22*.

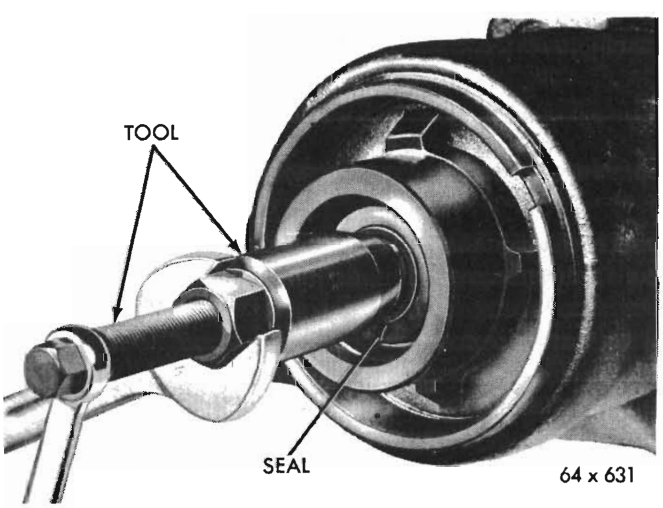


Fig. 8 – Removing the wormshaft oil seal

6. STEERING GEAR UNIT RECONDITIONING — OUT OF VEHICLE

To Disassemble

Clean gear assembly thoroughly in a suitable solvent and install unit in holding fixture Tool E19C5A. (Slot the holes in Tool to accept the bolts, where necessary).

(1) Drain the steering gear through the pressure and return connections by turning the steering wormshaft from one extreme of travel to the other.

(2) Remove the 2 valve body attaching screws, and remove the valve body and the 3 'O' rings *(Fig. 4)*.

(3) Remove the pivot lever and spring. Pry under the spherical head with a screwdriver *(Fig. 9)*.

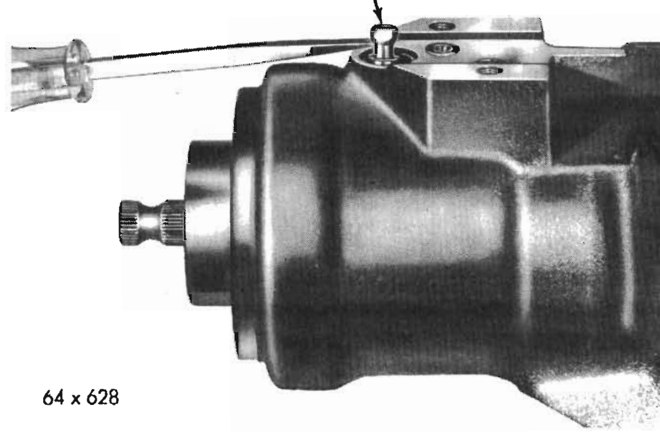


Fig. 9 – Removing pivot lever

CAUTION: Use care not to collapse slotted end of the valve lever as this will destroy the bearing tolerance of the spherical head.

(4) Remove the gear shaft grease retainer as follows:

Slide the threaded adaptor of Tool E19C20A over the end of the gear shaft and thread the tool nut on the gear shaft (with short reach flange) toward adaptor). Maintain pressure on the threaded adaptor with the tool nut whilst screwing the adaptor far enough to engage the metal portion of the grease retainer.

Place the two half rings and retainer ring over both portions of the tool *(Fig. 5)*. Turn the tool nut counter-clockwise to withdraw the grease retainer from the housing.

(5) Loosen the gear shaft adjusting screw lock-nut and remove the gear shaft cover nut with Tool E19C20B ***(Fig. 10)***.

(6) Rotate the wormshaft to position the gear shaft sector teeth at the centre of the piston travel then loosen the steering power train retaining nut with Tool E19C25G *(Fig. 11)*.

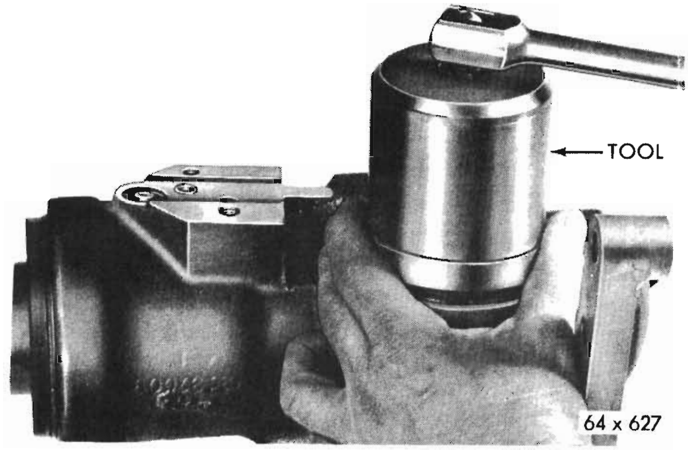


Fig. 10 – Removing gear shaft cover retaining nut

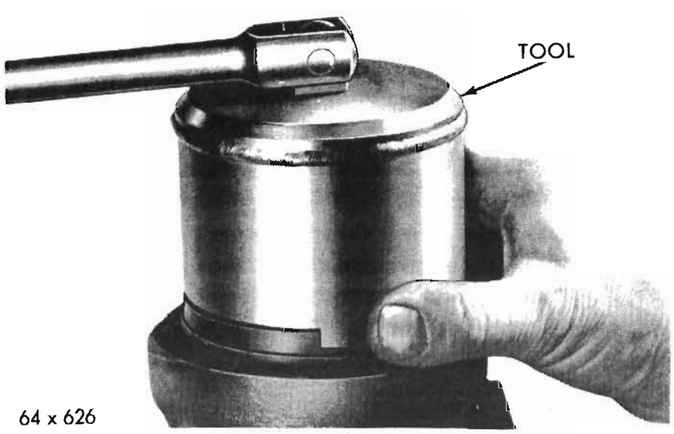


Fig. 11 – Removing the power train retaining nut

CAUTION: Oil will drain out when the gear shaft and cover are withdrawn from the gear housing.

(7) Position the holding Tool E19C5A so that the sector shaft is in a horizontal position, place Tool E19C20 on the threaded end of the gear shaft, and withdraw the gear shaft whilst sliding the tool into the housing until the tool is engaged with both the shaft and the bearings *(Fig. 12)*.

(8) Turn the wormshaft to the full left turn position to compress the power train parts, then remove the power train retaining nut using Tool E19C25C *(refer Fig. 11)*.

(9) Whilst holding the power train firmly compressed, pry on the piston teeth with a screwdriver using the gear shaft and tool as a fulcrum, and remove the complete power train *(Fig. 12)*. Remove the gear shaft, leaving Tool No. E19C20 engaged in both gear shaft bearings.

NOTE: It is important that the cylinder head centre race and spacer assembly and the housing head be maintained in close contact with each other. This will stop the teflon sealing ring on the wormshaft from becoming disengaged from its retainer in the cylinder head. It will also eliminate the possibility of the reaction rings becoming disengaged from their grooves in both the cylinder head and housing head. It will prohibit centre spacer from being separated from centre race and becoming "cocked" in housing which may make it impossible to remove power train without damaging the spacer, the housing or both.

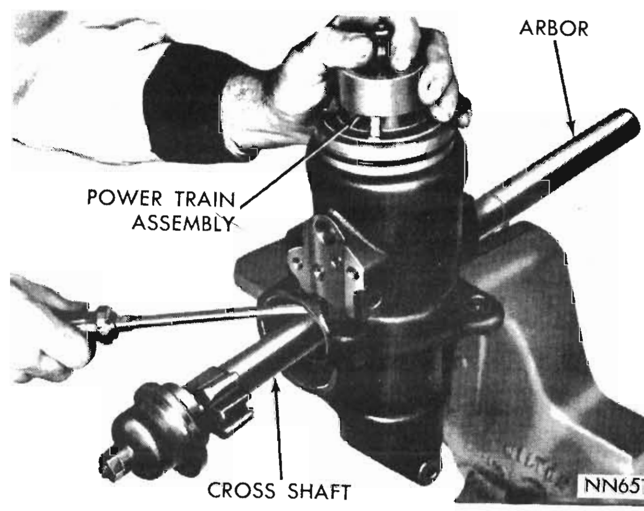


Fig. 12 – Removing power train (typical)

(10) Place the power train vertically in a vice equipped with soft jaws to avoid damaging the piston assembly *(refer Fig. 2)* for parts identification.

CAUTION: Do not turn the wormshaft more than one half turn during disassembly.

(11) Remove the housing, head nut and tang washer.

NOTE: The 33 worm bearing needle roller bearings will fall out if the housing head is removed from the wormshaft. Use Tool E19C25B to hold rollers in position when the housing head is removed *(refer Fig. 13)*.

(12) Raise the housing head until the worm shaft oil seal just clears the top of the wormshaft, and Position Tool E19C25B on top of the worm-shaft and into the oil seal.

With the tool in position pull up on the housing head whilst maintaining a steady downwards pressure on the tool until the tool is positioned in the bearing. Remove the housing head with the tool in position.

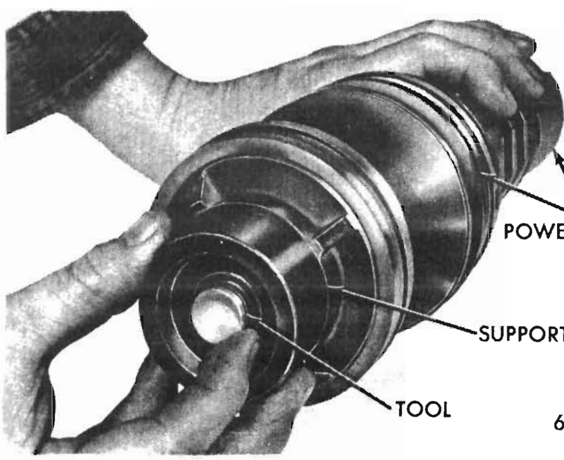


Fig. 13 – Retaining bearing rollers with Tool E19C25B (typical)

NOTE: To re-install rollers, retain the rollers in the cage with wheel bearing Petroleum Jelly.

CAUTION: If the wormshaft oil seal is to be replaced, perform the operation with the housing head assembled in the steering gear housing.

(13) Remove the large 'O' ring from the groove in the housing head.

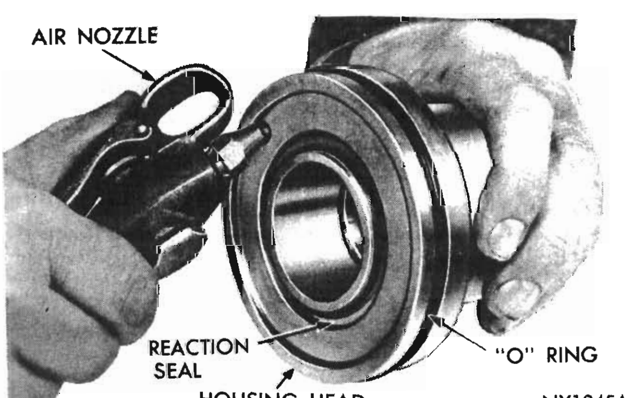


Fig. 14 – Removing reaction seal from worm shaft support

(14) Remove the reaction seal from the groove in the face of the housing head with air pressure directed into the ferrule chamber *(Fig. 14).*

(15) Inspect all grooves for burrs. Make sure the passage from the ferrule chamber to the upper reaction chamber is unobstructed.

(16) Remove the reaction spring, reaction ring, worm balancing ring and spacer.

(17) Hold the wormshaft from turning with Tool E19C25K then turn the nut with sufficient force to release the staked portions from the knurled section and remove the nut.

NOTE: Wire brush the knurled section to remove the chips, then blow out the nut and wormshaft to remove any metal particles.

(18) Remove the upper thrust bearing race (thin) and upper thrust bearing.

(19) Remove the centre bearing race.

(20) Remove the lower thrust bearing, and lower thrust bearing race (thick).

(21) Remove the lower reaction ring and reaction spring.

(22) Remove the cylinder head assembly.

(23) Remove the two 'O' rings in the two outer grooves in the cylinder head.

(24) Remove the reaction 'O' ring from the groove in the face of the cylinder head with air pressure directed into the hole located between the two 'O' ring grooves *(Fig. 15).*

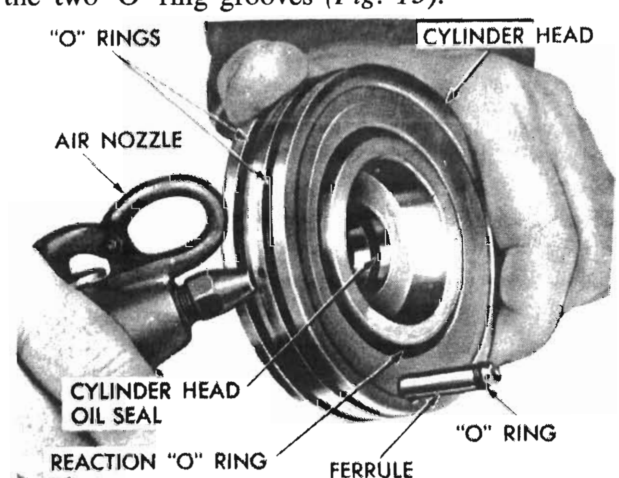


Fig. 15 – Removing reaction seal ring from cylinder head

(25) Remove the snap ring, sleeve and rectangular oil seal ring from the cylinder head counterbore *(Fig. 16).* Inspect the seal for possible damage and replace seal if necessary *(Fig. 16).*

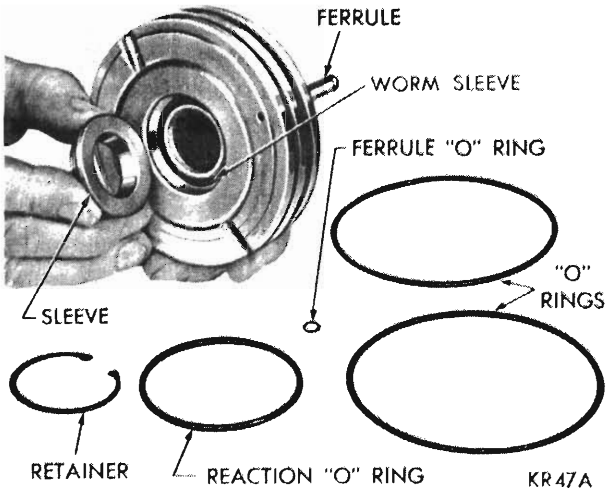


Fig. 16 – Removing cylinder head oil seal

(26) Test the operation of wormshaft. The torque required to rotate wormshaft throughout its travel in or out of piston must not exceed 2 lbs./in. with a 15 lb. side load. The worm should run in and out of piston under its own weight. Test for excessive side play with the piston held firmly in a vice with the rack teeth up, and the worm in its approximate centre of travel. The vertical side play measured at a point 2-5/16" from the piston flange should not exceed .008 inch when the end of the worm is lifted with a force of 1 lb. *(refer Fig. 17)*

NOTE: The worm and piston are serviced as a complete assembly and should not be disassembled.

If it should become necessary to replace a power steering gear wormshaft and piston assembly, it will be necessary to file a master serration on the spline of the wormshaft, since the replacement part does not have a master serration machined in the spline.

To file a master serration on a wormshaft spline, the power steering gear must be completely assembled, and the wormshaft 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.

(27) Remove the cast iron piston ring as follows:—

Mount tool E19C25J in a vice. Place the piston and ring assembly in tool E19C25J with the lower part of the ring resting on the land of the tool

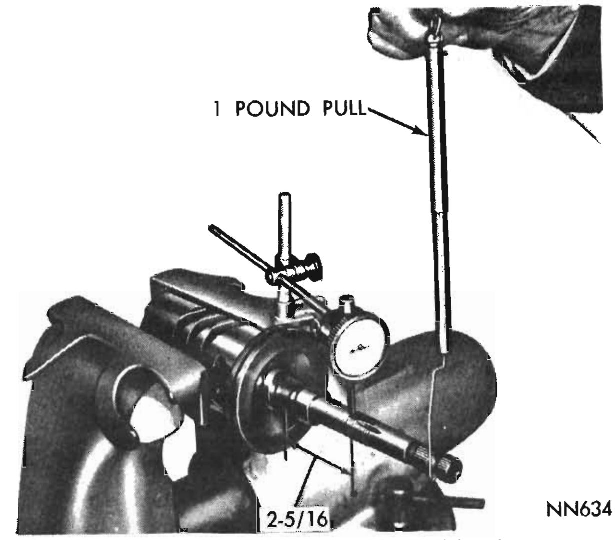


Fig. 17 – Checking worm shaft side play

(Fig. 18) and the joint of the ring approximately ⅝" above the top surface of the tool. Press downwards on the piston to seat the ring in the piston groove, then bring the tool lever into contact with the ring and apply a downward pressure, forcing the open end of the ring out enabling the ring ends to be unlocked. The ring may then be removed.

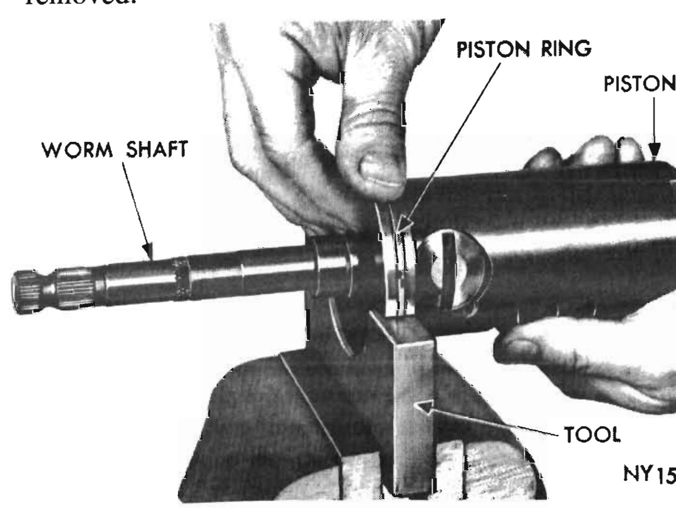


Fig. 18 – Removing and installing piston ring (Tool lever not shown)

Inspect the condition of rubber sealing ring located under the piston ring, and replace if necessary.

Install a new piston ring in the piston groove, place the assembly in tool E19C25J, compress the ring as set out for removal, and lock the ends of the ring.

(28) Place the piston assembly in a vertical position (wormshaft up) in a vice equipped with soft jaws. Turn wormshaft in an anti-clockwise direction to full extent.

(29) Inspect the 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. 16).*

(30) Install the worm sleeve seal, sleeve and snap ring (if removed). Make sure the snap ring is seated in the groove.

(31) Install the lower reaction seal ('O' ring) in the cylinder head groove.

(32) Slide the cylinder head assembly (ferrule up) on the wormshaft. Test the wormshaft seal ring making sure the gap is closed to avoid damaging the ring as the cylinder head moves against the piston flange. (Turn worm shaft clockwise half a turn.)

(33) Lubricate with Power Steering Fluid (Part No. 2793254) and install parts in following order:

a. Lower thrust bearing race (thick).
b. Lower thrust bearing.
c. Lower reaction spring (with small hole over the ferrule).
d. Lower reaction ring (flange up so that ring protrudes through reaction spring and contacts the reaction 'O' ring in the cylinder head).
e. Centre bearing race.
f. Upper thrust bearing.
g. Upper thrust bearing race (thin).
h. Start the wormshaft thrust bearing adjusting nut (do not tighten).

(34) Hold the wormshaft in position with nut tool E19C25K, then tighten the adjusting nut to 50 lbs./ft. to pre-stretch the wormshaft threads.

CAUTION: If the wormshaft is turned more than one-half turn the cylinder head sleeve will clear the oil seal ring on the wormshaft. Always position the wormshaft oil seal ring before bottoming the cylinder head against the piston top flange to avoid damaging the oil seal ring.

(35) Loosen the adjusting nut. Place several rounds of cord around the centre bearing race *(Fig. 19).* Make a loop in the end of the cord and hook the loop of a distributor breaker arm spring tension scale in the cord loop. Pulling the cord with the spring tension scale will cause the bearing to rotate.

Retighten the worm bearing adjusting nut, checking the adjustment by pulling on the cord with the scale. When the adjusting nut is tightened correctly the reading on the scale should be 16–24 ozs. (20 ozs. preferred) whilst race is turning.

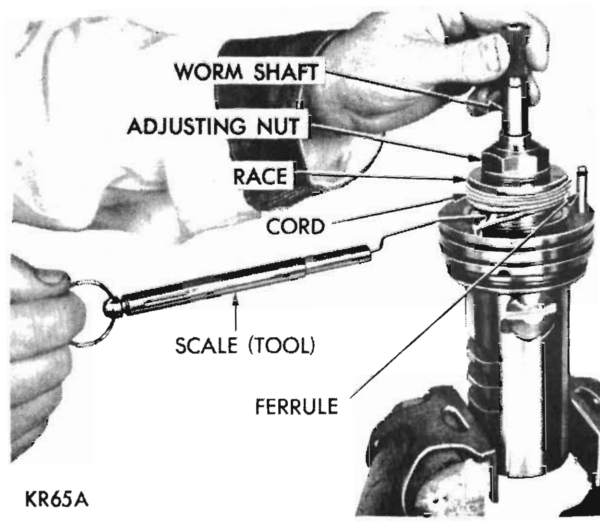


Fig. 19 – Checking centre bearing pre-load

(36) When correct adjustment has been obtained, stake the upper part of the wormshaft adjusting nut into the knurled area of the shaft.

CAUTION: Place a support under the adjusting nut during the staking operation to avoid brinnelling the piston, worm, or steel balls.

a. Hold a ¼" flat end punch in line with the centre line of the wormshaft, at a slight angle to, and in contact with, the nut flange *(Fig. 20).*
b. Strike the punch a sharp blow with a hammer. Test preload.

NOTE: If the adjusting nut moved during the staking operation, it can be corrected by turning the nut slightly on the wormshaft in the direction required to regain correct preload.

c. After obtaining correct preload, stake the nut at three more locations 90° apart around the upper part of the nut.
d. To test the total staking, torque the nut to 20 lbs. ft. in either direction. If the nut does not move, the staking operation is satisfactory.

IMPORTANT: Retest the preload adjustment, the torque of 16 to 24 ounces must remain after the adjusting nut is securely locked.

(37) Position the spacer assembly over the centre race, engaging the dowel pin of the spacer in the slot of the race, and the slot of the spacer entered over the cylinder head ferrule.

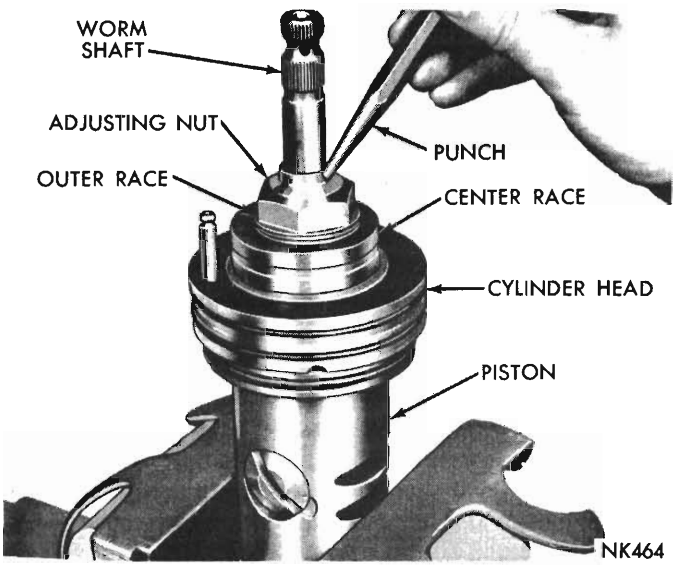


Fig. 20 – Staking wormshaft bearing adjusting nut

NOTE: This will align the valve pivot lever hole in the centre bearing race with the valve pivot lever hole in the centre bearing spacer assembly. The small 'O' ring for the ferrule groove should not be installed until after the upper reaction spring and spacer have been installed.

(38) Install the upper reaction ring on the centre race and spacer with the flange down against the spacer.

(39) Install the upper reaction spring over the reaction ring with the cylinder head ferrule through the hole in the reaction spring.

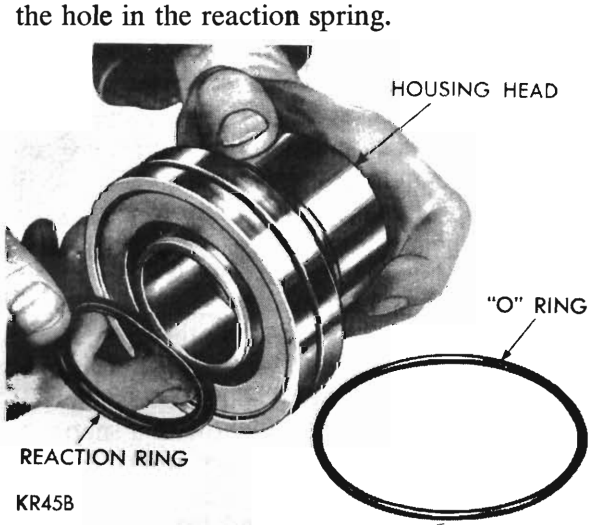


Fig. 21 – Installing reaction seal ring in wormshaft support

(40) Install the worm balancing ring (without flange) inside the upper reaction ring.

(41) Lubricate the ferrule 'O' ring with petrolatum and install it in the groove on the cylinder head ferrule.

(42) Lubricate and install the reaction seal ring in the groove in the face of the housing head with the flat side of the seal out *(Fig. 21)*. Install the 'O' ring in the groove on the housing head.

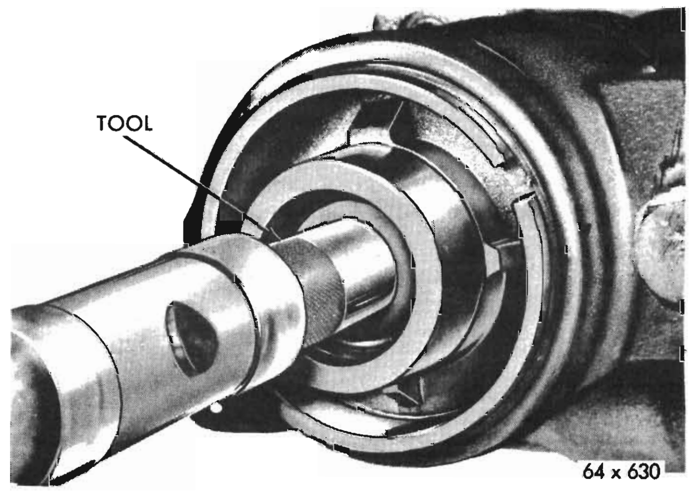


Fig. 22 – Installing wormshaft oil seal

(43) Slide the housing head with Tool E19C25A in position over the wormshaft, carefully engaging the cylinder head ferrule and 'O' ring and making sure the reaction rings enter the circular groove in the housing head support. Remove the Tool E19C25A as the support is fully positioned.

(44) If oil seal in housing head is to be replaced, remove seal with Tool E19C25H and install new seal with Tool E19C25A, with the lip in the seal toward the bearing. Drive in the seal until the tool bottoms on the support.

(45) Align the parts on the power train so that the valve pivot lever holes in the centre race and spacer assembly will index with the lever hole in the housing.

(46) To remove the gear shaft needle bearings, remove the oil seal snap ring with suitable snap ring pliers and remove the seal back-up washer.

(47) Install Tool E19C20 in both bearings. Place housing in a press and then press out the bearings and the oil seal.

NOTE: The housing bore is relieved between the bearings, but the tool will project through the upper bearing and lower bearing so that the two bearings and the oil seal will be pressed out together.

(48) To install the gear shaft lower needle bearing, place the bearing on the Tool E19C20 and press the bearing into the housing bore until the bearing is 15/16″ below the end of the bore to provide space for the oil seal, back-up washer, snap ring and grease retainer.

(49) To install the upper needle bearing, place the bearing on the end of Tool E19C20. Press the bearing into housing until bearing is flush with end of bore.

(50) Insert the gear shaft and adjusting screw into the cover if removed and using a Tool through the threaded hole in the cover, turn the screw counter-clockwise to pull the shaft completely into the cover. Lubricate the new square section seal ring (early type) and slide it over the adjusting screw into position on top of the cover. Install the adjusting screw locknut and tab washer (later type) but do not tighten at this time.

(51) Lubricate the cover 'O' ring and gear shaft cover groove with Petrolatum and place the 'O' ring in the cover groove.

(52) With the steering gear housing in the holding fixture, lubricate the bore of the housing with Power Steering Fluid (Part No. 2793254) and carefully install the power train assembly, whilst keeping the worm turned fully to the "left" to keep the reaction rings from coming out of the grooves, with the centre bearing spacer valve lever slot in the "up" position to line up with the control valve lever clearance hole in the steering gear housing and the bearing race.

CAUTION: Make sure the cylinder head is bottomed on the housing shoulder *(Fig. 1)*.

(53) Align the valve lever slot in the centre bearing spacer exactly with the steering valve hole in the gear housing, using Tool E19C30 *(Fig. 23)*.

NOTE: The aligning tool should not be removed until the spanner nut is securely tightened.

(54) Install the housing head tang washer to index with the groove in the housing. Install spanner nut and tighten to 125 to 200 lbs. ft.

(55) Set the power piston at the centre of travel and install the gear shaft and cover assembly

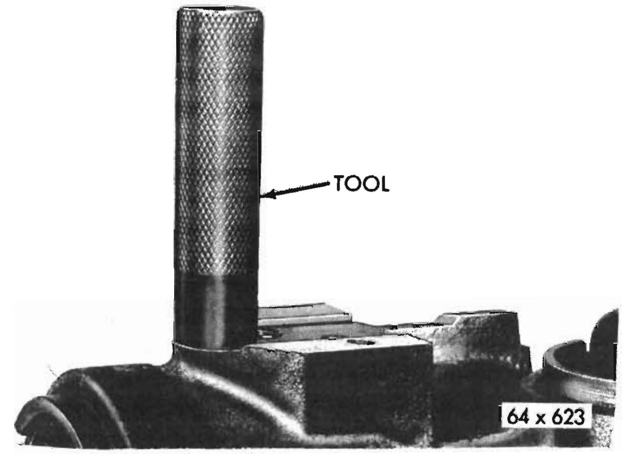


Fig. 23 – Aligning centre bearing spacer with steering valve

so that the sector teeth index with the piston rack teeth.

Make sure the 'O' ring is positioned in the face of the cover.

(56) Install the cover spanner nut and tighten to 110 to 200 lbs./ft.

(57) Install the valve pivot lever (double bearing end first) *(Fig. 24)* into the centre bearing spacer through the hole in the steering housing so that the slots in the valve lever are parallel to the wormshaft in order to engage the anti-rotation pin in the centre race.

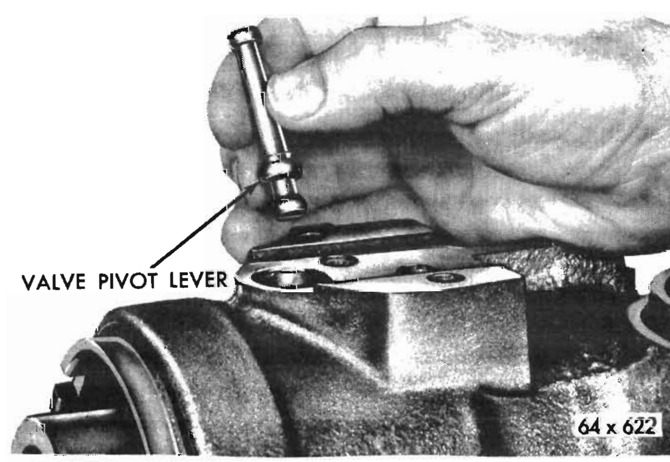


Fig. 24 – Installing valve pivot lever

NOTE: Turn the worm until the piston bottoms in both directions and observe the action of the lever. It must be in the centre of the hole and return with a snap action to its centre position when the worm torque is relieved. Install the valve pivot lever spring small end first.

(58) Install the valve body on the housing making sure that the valve pivot lever enters the hole in the valve spool *(Fig. 1)*. Ensure that the 'O' ring seals are in place.

Tighten the valve mounting screws to 7 lbs./ft.

(59) Install the new gear shaft seal followed by the seal back-up washer and snap ring, and a new grease retainer as follows:—

a. Place adaptor Tool No. E19C20E with the long step of adaptor against the new seal and slide it over the shaft with seal lip toward housing *(Fig. 6)*. Install tool nut on the gear shaft and tighten the tool nut until the shoulder of the tool adaptor contacts the gear housing.

b. Remove the tool nut and adaptor and install the seal back-up washer and oil seal snap ring with the sharp edge out.

c. Position the grease retainer in the housing bore; place adaptor Tool No. E19C20E with short step of lip against the seal *(Fig. 7)*. Install tool nut on the gear shaft and tighten the tool nut until the shoulder of the tool adaptor contacts the gear housing. Remove tool nut and adaptor.

7. TESTS AND ADJUSTMENTS — OUT OF VEHICLE

(1) Remove the oil reservoir cover and fill the reservoir with Power Steering Fluid (Part No. 2793254) to the level mark.

(2) Connect the test hoses (with correct adaptors, if required) to the hydraulic pump of the vehicle (with pressure gauge installed between the pump and the steering gear to register pressures).

(3) Start the engine and operate at idle to bring the steering gear to operating temperature.

(4) Roughly centre the valve until the unit is not self steering, then expel all air from system by turning the wormshaft several times to the left and then to the right. Tap on the back pressure valve body attaching screws to move the valve body up on the steering housing, and tap on the end plug to move the valve body down on the housing.

(5) Refill the reservoir before proceeding with the following tests and adjustments on the bench.

a. With the steering gear on centre, loosen the gear shaft adjusting screw until backlash is evident in the gear shaft. Tighten the gear shaft adjusting screw until backlash in gear shaft just disappears. If the power train has been removed, tighten 1¼ turns from this position and whilst holding adjusting screw in this position, tighten the locknut. *(Refer Fig. 25)*.

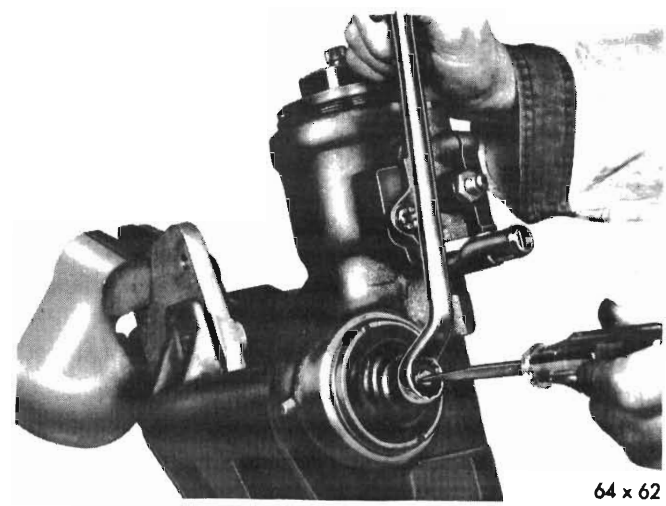


Fig. 25 – Adjusting steering gear mesh

NOTE: This is a temporary adjustment to bring the piston rack and sector teeth into full alignment.

b. Operate the unit through its full travel several times to align piston rack and sector teeth.

c. With gear on centre, re-adjust the sector shaft backlash. This will require loosening the adjusting screw until backlash is evident. Then retighten the adjusting screw until the backlash just disappears. Continue to tighten for ⅜ to ½ turn from this position and tighten the locknut to 50 lbs./ft. to maintain this setting.

d. Starting from a point at least one full turn of the wormshaft either side of centre, the torque at the sector shaft required to turn the unit through centre at 2 R.P.M. in each direction shall not exceed 20 lbs./ft. or vary more than 5 lbs./ft. from left to right. Perform this operation carefully to prevent a lock-up in the steering gear.

e. Adjust torque to be equal by moving the steering valve assembly.

> NOTE: If the torque is greater to the left move the control valve body down. If the torque is greater to the right move the valve body up. After positioning the valve to obtain equal torque, tighten valve body attaching screws to 200 lbs./in. to maintain this setting.

f. With the gear at or near the full turn in either direction, attempt to return the unit to centre by applying a torque wrench at the steering gear cross-shaft. Hold the worm-shaft until the cross-shaft torque builds up to 50 lbs./ft. Release the wormshaft and maintain a constant steady pull on the cross-shaft (turning cross-shaft slowly — approximately 2 R.P.M. rate). If the cross-shaft torque does not drop to 20 lbs./ft. maximum as the unit passes through centre, check for too much interior drag; binding valve lever, binding spool valve, or cross shaft adjustment that is too tight.

(6) With unit under power, but with no load, the torque required to rotate the wormshaft through an included angle of 180° (90° each side of centre) at approximately 6 R.P.M. rate shall be 6–10 lbs./in. Disconnect test equipment and mounting fixture ready for installation of unit in vehicle.

8. HOSE REPLACEMENT

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 pounds-feet and gear end fitting to 160 pounds-inches.

PART 2 (B) POWER STEERING PUMP

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. INTERMITTENT OR NO ASSISTANCE

(1) Loose belt.

(2) Low fluid level.

(3) Low pump efficiency.

(4) Pump seizure.

(5) Broken slipper spring(s) or damaged pump.

(6) Flow control bore plug ring not in place.

(7) Flow control valve sticking.

(8) Wrong pressure-relief valve assembly.

(9) Broken 'O' ring on flow control bore plug.

(10) Loose pressure relief valve.

2. NOISY PUMP

(1) Low fluid level.

(2) Belt noise.

(3) Foreign material block pump housing oil inlet hole.

3. PUMP VIBRATION

(1) Pump hose interference with sheet metal or brake lines.

(2) Faulty or loose belt.

(3) Pulley loose or out of round.

(4) Crankshaft pulley loose or damaged.

4. PUMP LEAKS

(1) Cap or filler neck leaks.

(2) Reservoir solder joints leak.

(3) Reservoir 'O' ring leaking.

(4) Shaft seal leaking or loose rear bracket bolts.

(5) Loose or faulty pressure hose ferrule.

(6) Rear bolt holes stripped or casting cracked.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The pump is a belt driven constant displacement slipper type pump. In operation the spring loaded slippers in the pump rotor are in contact with the eccentric inside diameter of the cam-insert. As the rotor turns, the slippers force the oil from the inlet side of the pump to the flow control valve. Orifices in the metering insert permit a flow of approximately two gallons per minute to the steering gear before the valve moves to the left to allow the excess to flow back to the inlet side of the pump. Maximum pressure in the system is limited by the pressure relief valve. The valve opens into the reservoir when the pressure exceeds the maximum pressure specified

2. PUMP REPLACEMENT

To Remove

(1) Loosen pump lower mounting and locking bolts and remove belt.

(2) Disconnect both hoses at pump.

(3) Remove mounting and locking bolts and remove pump and bracket.

To Install

(1) Position pump on engine and install retaining and locking bolt.

(2) Install drive belt and adjust. *See "Cooling System — Group 7, Part 2".* Tighten pump bracket bolts to 30 lbs./ft.

(3) Connect pressure and return hoses, routing the hoses in same position they were in before removal. Tighten pump hose to 24 lbs./ft.

(4) Fill pump reservoir with Power Steering Fluid, Part Number 2793754.

(5) Start engine and turn steering wheel all way from left to right to bleed system. Stop engine, check oil level and correct if necessary.

3. FLUID LEVEL

To Check Fluid Level

(1) Start engine, turn steering wheel back and forth 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 up to "full" mark on the dip stick. Do not overfill.

4. PUMP PRESSURE TESTS

To Test

(1) Inspect fluid level in reservoir. Fill to correct level if necessary.

(2) Measure belt tension and correct if necessary. *See "Cooling System", Group 7, Part 2.*

(3) Disconnect pressure hose at pump and in its place install adaptor fitting and test hoses. Connect pressure hose from steering gear to valve side of gauge. (If adaptor and test hoses are not available, connect a second power steering pressure hose.) *(Fig. 1).*

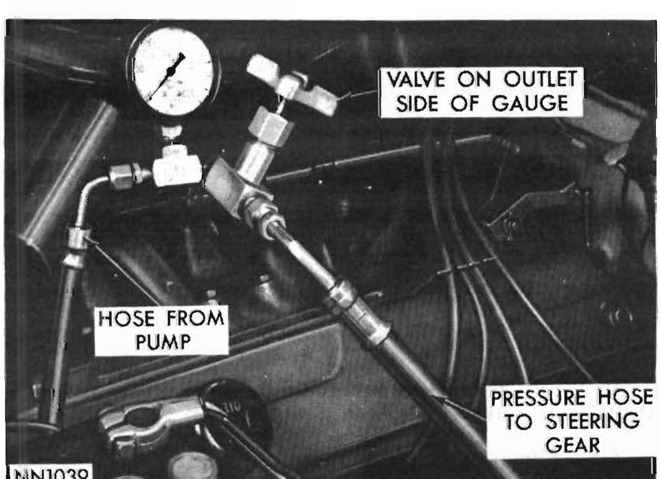


Fig. 1 – Pressure test arrangement

Valve must be installed on outlet side of gauge.

(4) Insert thermometer in fluid reservoir, start engine and warm up fluid to a temperature between 150 and 170 deg. 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 over-heating will result.

(5) With engine idling at 600 R.P.M. 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 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 pump in *"Specifications"* the pump is faulty and should be replaced.

Should pressure reading in note (5) read low but not in note (6) the steering gear is faulty.

When removing test equipment, be sure to re-install hoses in original position to avoid interference with engine or sheet metal.

5. Drive Shaft Oil Seal

To Replace

(1) Remove pump from engine. Drain reservoir and clean exterior before servicing.

(2) Remove brackets, reservoir screws, reservoir gaskets and 'O' ring.

(3) Using spacer washers between front bracket and pump, reinstall front bracket for use as holding fixture. Clamp bracket in a vice.

(4) Remove the pump pulley using a suitable universal type of puller and 2 long ¼" whitworth threaded bolts screwed into the hub. *Refer Fig. 2.*

(5) Hold the cross-head nut and turn the puller bolt into the pulley to remove the pulley.

(6) Thread Tool E19C25H or similar into the metal portion of the seal to secure a grip.

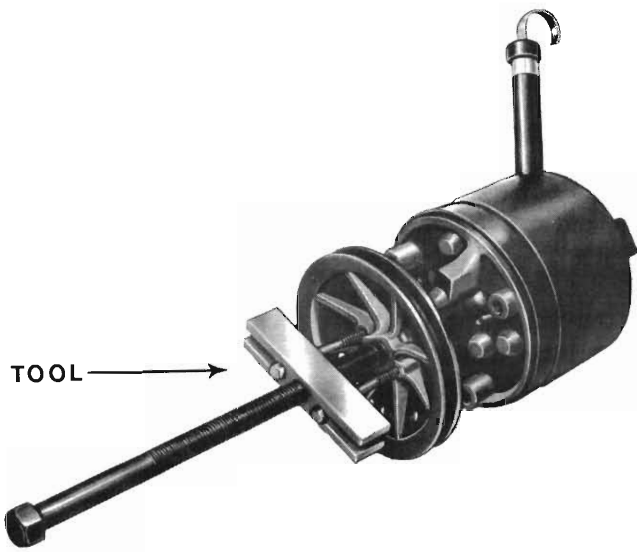


Fig. 2 – Removing the Pump Pulley

(7) Turn the puller screw into the shaft to withdraw the seal, while holding the puller body.

(8) After inspecting the body and shaft for burrs or scratches (removing any, where necessary) then install a new seal ensuring that the lip is toward the pump, using a suitable driver to install the seal flush with body.

(9) Reinstall the pump pulley, using a puller screw threaded into the pump shaft.

NOTE: DO NOT DRIVE, PRESS OR HAMMER on the pump shaft, as the pump internal assemblies are located by the relief pressure springs, damage may be caused to these parts.

(10) Reinstall pump as described in *Paragraph 2.*

6. RESERVOIR 'O' RING SEAL

To Replace

(1) Remove the oil pump as described in *Paragraph 2* and drain reservoir.

(2) Clean off the pump exterior being careful to prevent any foreign matter entering the pump.

(3) Remove the reservoir retaining nut and seal washer from the output union.

(4) Mark the position of the reservoir relative to the housing then remove the reservoir from the body, *refer to Fig. 3.*

(5) The seal ring may now be lifted from the groove.

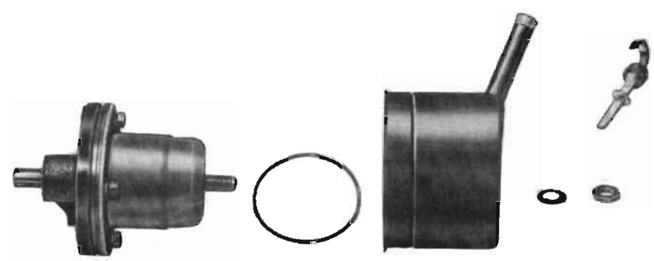


Fig. 3 – Pump reservoir removed

To Install

(1) Check all parts removed for damage or burrs — if serviceable, clean parts and install a new seal ring.

(2) Place the reservoir on the body, in the relative position and push into place. Then secure using a new retaining nut seal washer.

(3) Tighten the nut sufficiently to secure a good seal.

(4) Re-install, as described in *Paragraph 2.*

NOTE 1: Correct indexing of the pump reservoir on the body may be obtained by positioning the filler tube at 12 o'clock.
2. In some cases bleeding of the pump may take as long as 20 minutes to expel all air from the system.

GROUP 21

TRANSMISSIONS

PART 2A — TORQUEFLITE TRANSMISSION — MODEL A-904-LA & A-727-A (Eight Cylinder Models)

SERVICING OPERATIONS WITH TRANSMISSION IN VEHICLE

RECONDITIONING TRANSMISSION OUT OF VEHICLE

PART 3 — CONVERTER AND TRANSMISSION

Rev. May '72

PART 4 — TRANSMISSION STANDARD 4 SPEED SYNCHROMESH

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

PART 1 — TRANSMISSION STANDARD 3-SPEED SYNCHROMESH

SPECIFICATIONS

	Std.	Pacer	Heavy Duty E37 & E38 Option
Ratios:			
First	2.95:1	2.71:1	2.50:1
Second	1.69:1	1.55:1	1.43:1
Third	1.00:1	1.00:1	1.00:1
Reverse	3.67:1	3.37:1	3.10:1

Synchromesh:	All Forward Speeds
Tolerances:	
First speed gear end float	.006″–.019″
Second speed gear end float	.006″–.019″
Mainshaft bearing end float	.000″–.004″
Maindrive bearing end float	.000″–.004″
Snap Rings:	
Mainshaft bearing snap ring thickness (Selective to maintain bearing end float)	.086″–.088″ .089″–.091″ .092″–.094″ .095″–.097″
Maindrive bearing snap ring thickness (Selective to maintain bearing end float)	.086″–.098″ .089″–.091″ .092″–.094″ .095″–.097″
No. of rollers in reverse idler gear bore	22 rollers (Heavy Duty)
No. of rollers in cluster gear bore	3 sets of 22 rollers
No. of rollers in maindrive pocket bore (std.)	14 rollers
(Pacer and Heavy Duty)	15 rollers

SPECIAL TOOLS

E19C10	Puller–steering wheel
E21C50D	Extension housing seal remover
E21C50C	Extension housing oil seal installer
E21C50E	Bushing installer
E21C15A	Detent ball installer
E19C25A	Camshaft oil seal installer
E19C25B	Camshaft oil seal protector
E21C10D	Bearing retainer oil seal installer

TORQUE SPECIFICATIONS

Extension to case bolts	45–55 lbs./ft.
Transmission cover retaining bolts	8–12 lbs./ft.
Bearing retaining bolts	20–25 lbs./ft.
Operating lever retaining bolts	20–25 lbs./ft.
Drain plug	20–25 lbs./ft.
Filler plug	20–25 lbs./ft.
Case to clutch housing bolts	50 lbs./ft.
Steering column upper bearing retainer nuts	50 lbs./in.
Steering column lower support cup retainer screws	30 lbs./in.
Steering column lower bushing to jacket screws	30 lbs./in.
Steering column jacket to instrument panel clamp screws	15 lbs./ft.
Floor plate to toe board screws	95 lbs./in.
Steering wheel retaining nut	24 lbs./ft.
Speedometer drive pinion retainer screw	150 lbs./in.
Reversing light switch	150 lbs./in. (max.)
Transmission support to crossmember nuts	80 lbs./ft.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. HARD SHIFTING

(1) Incorrect clutch adjustment.

(2) Shift linkage out of adjustment.

(3) Synchronizer clutch sleeve damaged.

(4) Synchronizer spring improperly installed.

(5) Broken or worn synchronizer blocker rings.

(6) Incorrect lubricant.

(7) Misaligned transmission.

2. TRANSMISSION NOISES

(1) Misaligned or loose transmission

(2) Worn or damaged gears.

(3) Worn or damaged bearings.

(4) Incorrect lubricant or low lubricant level.

3. TRANSMISSION JUMPS OUT OF GEAR

(1) Synchronizers worn.

(2) Clutch housing misalignment — misaligned transmission.

(3) Shift linkage out of adjustment.

(4) Incorrect or damaged interlock detent spring.

(5) Bent mainshaft.

(6) Worn or damaged bearings on input or output shaft.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The transmission is a three speed fully synchronized type using three strut synchronizers which give rapid silent gear changes. All forward gears are helical to give smooth operation.

The reverse gear is of the spur type as this is fundamental for the provision of full forward gear synchronization.

The second, third and first gear synchronizers are keyed to the out-put or mainshaft and permit clutching to the maindrive second speed gear or first speed gear which are in constant mesh with the cluster gear. The second and first speed gears when not engaged by the synchronizer sleeve splines are free to rotate on the mainshaft. It is important to maintain running clearances specified or seizure may result owing to expansion of the components.

The inner hubs of the synchronizer assemblies are splined to the mainshaft, and fitted with three shifting plates which fit into slots in the inner hubs. The plates are located by two circular synchronizer springs between the inner hubs and the synchronizer sleeves which are splined to the inner hubs. The shift plates fit into three recesses in bronze blocker rings which fit over the taper cones of the gears. The blocker rings have clutch teeth similar to those on the gears.

When a forward speed gear is to be engaged the synchro sleeve carrying with it the shift plates moves over the inner hubs bringing the shift plates into contact with the back face of the recesses in the blocker rings. There is sufficient lateral clearances for the shift plates in the blocker ring recesses to allow the blocker ring clutch teeth to move out of line with the splines on the inner hub due to the frictional drag of the blocker ring tapers on the gear cones. This prevents the synchronizer sleeve from moving over the blocker ring teeth until such time as the gear and the blocker ring are rotating at the same speed. When this occurs the shift pads centralize in the blocker ring recesses, the synchro sleeve clutch teeth move over the clutch teeth of the blocker ring and engage the clutch teeth of the gear.

To engage reverse gear, the reverse gear and sleeve is moved into mesh with the reverse idler gear, the drive being transferred to the out-put shaft (mainshaft) through the first and reverse inner hub.

The cluster gear runs on three rows of roller bearings, the main drive gear and mainshaft on ball bearings, the reverse idler on a bronze bush and the first and second speed gears directly on the mainshaft. The mainshaft is also supported by a set of rollers in the maindrive gear and a bushing in the gear case extension housing. The speedometer gear is located on the mainshaft. The gearshift forks, camshaft assemblies and interlock mechanism are located in the gear case.

The interlock mechanism consisting of an interlock sleeve in which are housed the interlock pin, interlock spring and two interlock balls prevent the engagement of two gears simultaneously and holds the gears in the position selected. The interlock balls are forced into the gearshift cam detents by spring pressure providing a load which must be overcome by a force applied to the gearshift lever before a gearshift can be made. The interlock sleeve and the gearshift cam shape are so designed that it is impossible for any cam to be moved into a gear selected position unless the other cam is in neutral position. A striker integral with the first and reverse speed gearshift cam operates the reversing light switch when reverse gear is selected.

A heavy duty transmission is fitted to vehicles with optional E37 and E38 engines. This transmission differs from the standard unit in the following respects:—

1. Heavy duty front gearbox bearing.
2. Heavy duty rear gearbox bearing.
3. Different reverse idler gear (22 needle rollers instead of bronze bush).
4. There are 15 maindrive needle rollers.

When ordering parts for this transmission it is essential to quote all of the numbers stamped on the vehicle certification plate attached to the plenum chamber.

2. STEERING COLUMN WITH GEARSHIFT

The concentric gearshift utilizes a shift tube inside the steering column jacket to transmit shift lever motions to the lower shift linkage *(see Fig. 2)*. The shift mechanism is supported by resin bearings and requires very little maintenance.

To Remove

(1) Disconnect the battery cable at the battery negative terminal.

(2) Disconnect the shift linkage rods from the shift tube levers at the bottom of the steering column assembly.

(3) Remove the steering shaft coupling to wormshaft coupling roll pin.

> NOTE: Pin must be completely removed since it engages a groove in the wormshaft.

(4) Disconnect the directional signal, and horn-wires.

(5) Remove the centre pad assembly retaining screws and lift off pad.

(6) Disconnect the horn wire from switch and remove the three switch retaining screws, if necessary *(Refer. Fig. 1)*.

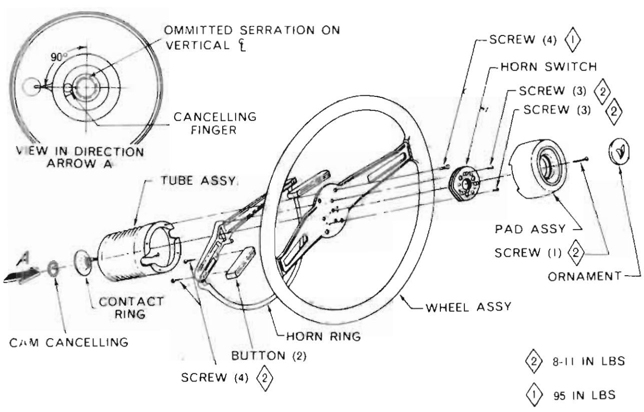


Fig. 1 – Steering Wheel Assembly Components (Typical Dissassembled View)

(7) Remove the four steering wheel retaining screws and lift off the steering wheel.

(8) Remove the steering column collapsible tube assembly retaining nut and washer from the steering shaft.

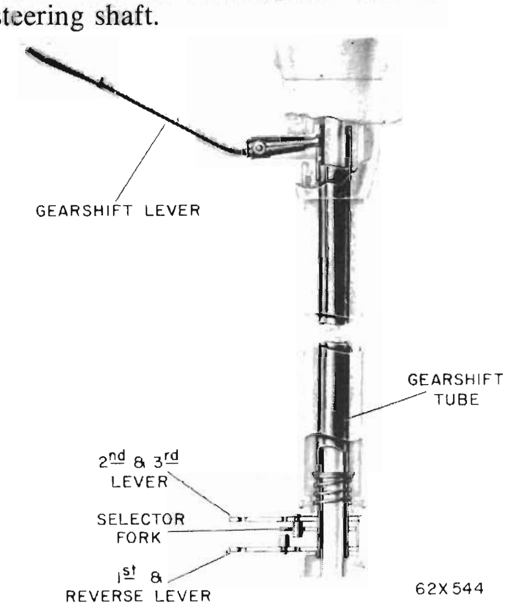


Fig. 2 – Steering column with concentric gearshift (typical)

(9) Remove the steering column collapsible tube assembly, using Puller Tool E19C10.

(10) Remove floor plate to toe board attaching screws.

(11) Disconnect the steering column at the instrument panel bracket by removing the retaining screws and clamp. (Also unplug ignition switch wires).

(12) Lift the steering column assembly up and off the end of the wormshaft, and remove the assembly out through the passenger compartment being careful not to soil or damage the head lining.

To Disassemble

(1) Remove the turn signal lever retaining screw and remove the lever.

> NOTE: Disassembe, repair and assemble the steering column assembly on a clean, padded bench to protect the finish on the column jacket and related parts.

(2) Remove the three recessed head switch retaining screws *(See Fig. 3)* and pull the turn signal switch and switch plate up and out, feeding the wires and connectors through the steering column jacket.

(3) Disengage the column jacket lower seal from the lip on the jacket, and slide the seal down toward the coupling.

(4) Using snap ring pliers, remove the bearing upper snap ring from the upper groove in the steering shaft.

(5) Slide the steering shaft and coupling assembly down and out of the steering column jacket assembly.

(6) Remove the column jacket lower seal from the steering shaft.

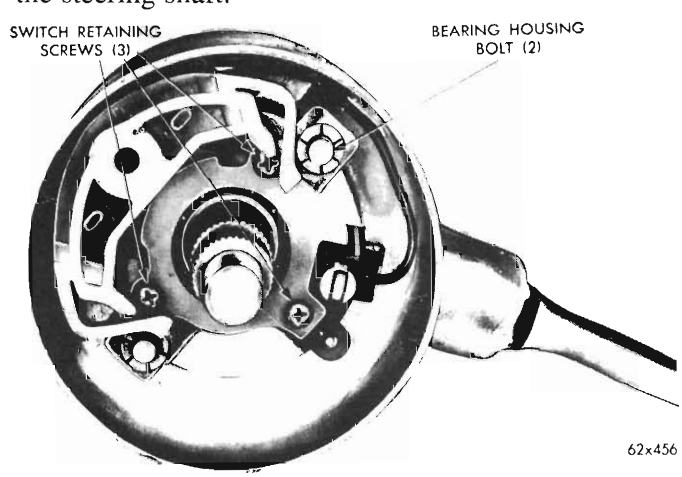


Fig. 3 – View of steering column – upper end (typical)

> NOTE: The steering shaft and coupling assembly is serviced as an assembly and is not to be disassembled.

(7) Whilst supporting the gear-shift housing in the area around the shift level pivot pin, drive out the pivot pin, using a 3/16" punch, and remove the shift lever *(see Fig. 4).*

NOTE: A ⅜" drive, ¾" hex socket may be used to support the gearshift housing.

(8) Remove the three lower support cup to jacket attaching screws *(see Figs. 5 and 6)* and remove the cup.

(9) Remove the nylon thrust washer, the low and reverse lever and the spacer.

(10) Remove the two lower shift tube bushing retaining screws at the slotted holes in the jacket.

(11) Slide the shift tube with the 2nd and direct lever, nylon bushing, spring and spring retainer out of the jacket *(see Figs. 6 and 7).*

NOTE: The shift tube assembly with 2nd and direct lever, spring retainer and nylon bushing are serviced as an assembly, and are not to be disassemled.
A spring clip attached to the 2nd and direct lever loads the lever and prevents pin chatter.

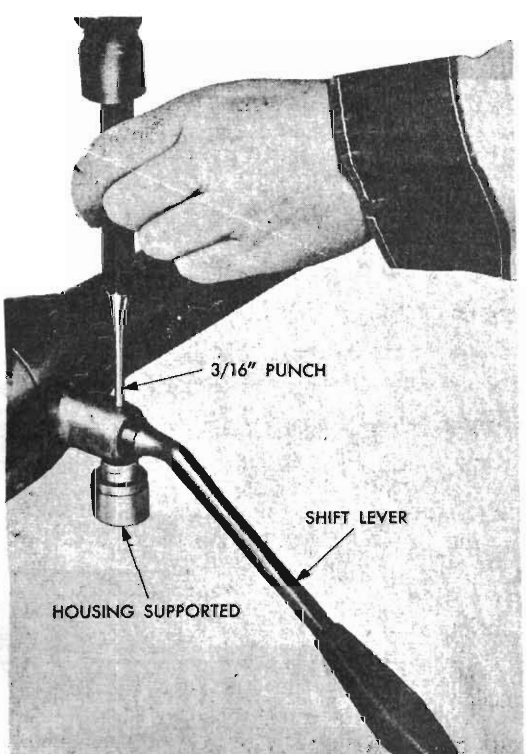


Fig. 4 – Removing shift lever pivot pin

(12) Remove the floor plate with isolator from the column jacket.

(13) Remove the hexagon nuts from the two bearing housing retaining bolts and lift the steering column upper bearing housing off the jacket assembly *(see Fig. 8),* and remove the bearing.

(14) Lift the gearshift housing and spring washer off the steering column jacket.

To Inspect

After cleaning, inspect all parts for wear or damage. Note the condition of the pins in the two lower shift levers, the shift lever socket at the top end of the shift tube, and the inner end of the shift lever.

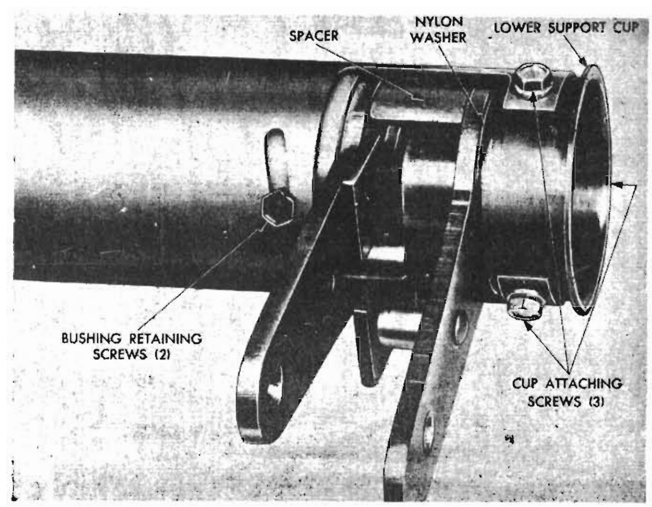


Fig. 5 – Lower end of steering column tube assembly (typical)

Inspect the steering shaft upper bearing for smooth operation, and lubricate with Chrysler Door Ease Lubricant or similar lubricant.

If the bearing has any signs of roughness or wear, it should be replaced. Replacement bearings are pre-lubricated.

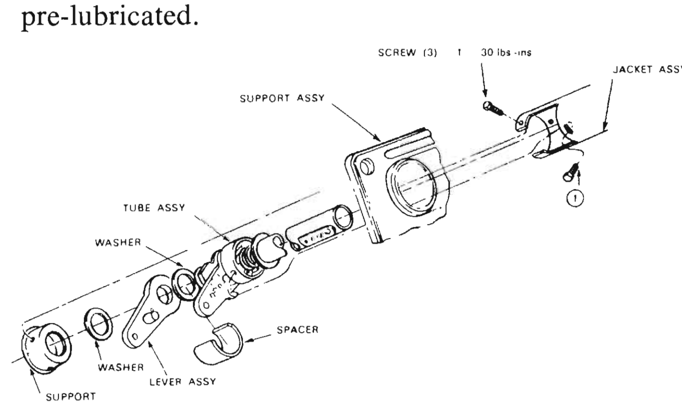


Fig. 6 – Gearshift tube lever and jacket support (typical)

To Assemble

(1) Position the spring washer on the ledge provided in the top end of the steering column jacket *(see Fig 8)*, and place the shift lever housing in position at the top end of the column jacket.

(2) Place the two bearing housing retaining bolts in position in the housing, and just start the nuts on them.

(3) Stand the column assembly upright, and lower the bearing housing into position, engaging the bolt heads in the slots in the column jacket.

(4) Tighten the two retainer bolt nuts alternately and evenly in steps to prevent unseating the bolt heads from the slots. Tighten to 50 lbs./in. torque.

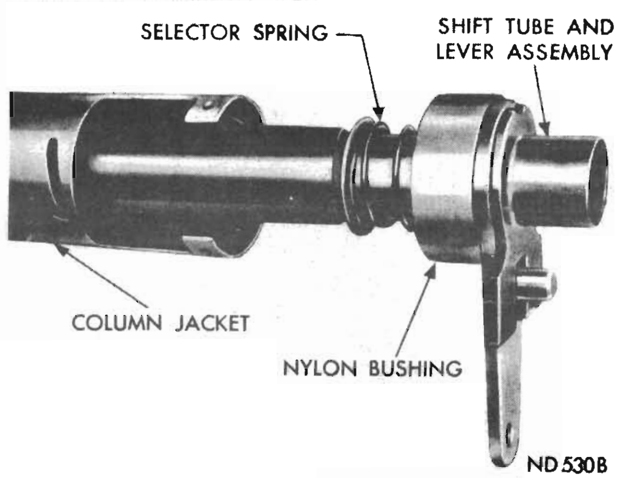


Fig. 7 – Removing shift tube assembly (typical)

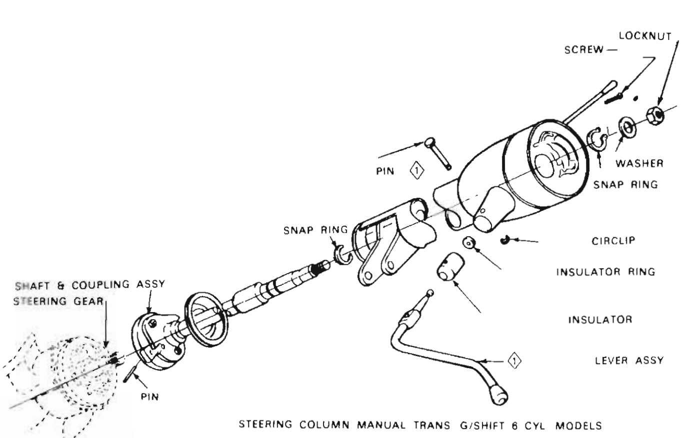


Fig. 8 – Jacket tube

(5) Position the isolator in the inside diameter of the floor plate, and install the floor plate on the steering column with insulated side down.

NOTE: Before installing the floor plate and isolator on the column jacket, lubricate the inside diameter of the isolator with a soap solution or a rubber lubricant. This will make it easier to slide the column up or down for proper positioning in the vehicle when centring the steering shaft coupling.

(6) The floor plate assembly must be installed before installing the shift tube and levers, since this cannot be done after the shift tube and levers are in place in the steering column.

NOTE: Metal to metal working surfaces should be lubricated to facilitate installation.

(7) Turn the nylon bushings on the shift tube *(see Fig. 6)* so that the two holes in the bushings are aligned with the centreline of the 2nd and 3rd speed shift lever, then slide the shift tube and lever assembly through the jacket tube and into the bearing housing.

(8) Install the spacer around the selection lever so it rests against the 2nd and 3rd speed shift lever *(see Fig. 6)*.

(9) Install the low and reverse lever. Then install the nylon washer *(see Fig. 5)* centring it over the end of the shift tube.

(10) Install the lower support cup in the jacket *(see Fig. 5)* whilst holding pressure against the cup to overcome the selector spring load, start the three support cup retaining screws, and tighten to 30 lbs./in.

(11) Loosely enter the lower bushing retaining screws through the slots in the jacket, and into the nylon bushing *(see Figs. 6 and 7)*.

(12) Rotate the nylon bushing to where all play at the shift levers and spacers is eliminated, but no binding occurs. With the bushing in this position, tighten the two bushings to jacket screws to 30 lbs./in. torque.

NOTE: The shift tube must be free to slide up and down in its bushings. No binding is permissible.

(13) The gearshift lever insulator *(see Fig. 2)* should be examined, and if any wear or damage is evident, it should be pulled off the lever and replaced.

NOTE: A worn gearshift lever insulator will result in a thumping or rattling sound in the steering column.

(14) Place a screwdriver blade between the 2nd and 3rd speed shift lever and the selector lever, so it will hold the selector lever at neutral position halfway between the two shift levers *(see Fig. 9)*.

(15) Position the gearshift lever in the shift lever housing so it engages the hole in the shift tube plate with the pin hole aligned.

(16) Support the jacket tube housing in the area around the pin hole *(see Fig. 4)* and drive the pivot pin in flush with the housing.

NOTE: Before sliding the column jacket lower seal onto the steering shaft the seal should be lubricated. Fill the cavity in the inside diameter of the seal, between the two moulded seal bushings with short fibre wheel bearing grease.

(17) Slide the seal onto the steering shaft and down against the coupling, with the lip at the outside diameter facing upward, so the seal can be positioned on the lower end of the column jacket during assembly.

(18) Install the horseshoe-shaped lower snap ring in the lower groove on the steering shaft and slide the steering shaft into the column assembly.

(19) Install the upper bearing in the bearing housing, ensuring that it is correctly positioned against the lower snap ring. Position the wavy upper snap ring against the top of the bearing.

(20) Exert sufficient pressure against the upper snap ring to flatten it against the bearing so it can enter the groove in the steering tube. Ensure that the snap ring is firmly seated in the groove.

(21) Place the bearing insulator over the bearing column upper bearing and position the bearing and insulator in the counterbore provided in the bearing housing.

(22) Position the directional switch assembly in the bearing housing, whilst feeding the twin signal and horn wires down through the steering column and out through the opening provided in the column jacket.

(23) Place the switch plate over the switch, and install the three switch retaining screws *(see Fig. 3)*.

(24) Position the turn signal lever in the assembly, sighting down through the hole in the switch to align the screw hole, and install the lever attaching screw.

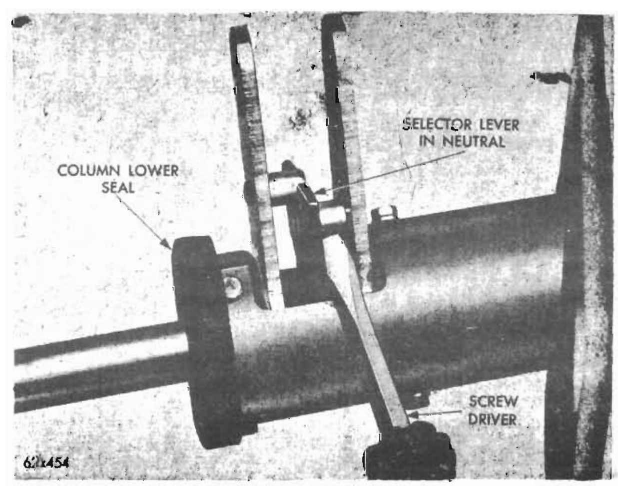


Fig. 9 – Holding selector lever in neutral position

To Install

(1) Insert the column and jacket tube assembly through the floor pan opening, being careful not to soil or damage the headlining.

(2) Position the clamp on the coupling and with the master splines on the wormshaft and coupling aligned, engage the column coupling with the steering gear wormshaft.

(3) Loosely fasten the steering column jacket to the instrument panel bracket with the clamp and the two attaching screws.

(4) With the steering shaft coupling clamp in position on the coupling assembly, install a new roll pin so that it engages the groove in the wormshaft.

(5) With the coupling centred, tighten the column jacket to instrument panel clamp bolts to 15 lbs./ft. torque.

(6) Push the floor plate down to contact the toe board, and start the floor plate to toe board attaching bolts, leaving them just loose enough so the floor plate can be shifted to align the lower end of the column jacket.

(7) Visually check to be sure the lower end of the column jacket and shifter tube assembly is concentric with the steering shaft. If they are not concentric, shift the floor plate to a position where it holds the column jacket and shift tube assembly concentric with the steering shaft and tighten the floor plate to toe board attaching screws to 25 lbs./in. torque.

NOTE: If the column jacket and shift tube assembly are not concentric it is possible for the steering shaft to rub on the inside surface of the shifter tube at the lower end.

(8) Recheck the lower end of the column jacket and shift tube assembly to ensure that they have remained concentric with the steering shaft after tightening the attaching screws.

(9) Slide the steering column lower seal up to the bottom of the column jacket, and force the outer lip of the seal into position around the flanged lower end of the column jacket and shift tube assembly.

(10) With the master splines in the steering tube assembly and steering shaft aligned, place the steering tube assembly on the steering shaft, *Fig. 1.*

(11) Install the steering tube assembly retaining washer and nut. Tighten the retaining nut to 24 lbs./ft. torque.

(12) Install the horn switch and horn ring previously removed from the steering wheel, tighten screws to 8-11 lbs./in. torque (where removed).

(13) Attach the steering wheel assembly to the collapsible steering tube using four special screws and torque to 95 lbs./in.

(14) Re-connect the horn wire to switch.

(15) Install the centre pad, tightening the screw to 8-11 lbs./in. torque.

(16) Install the ornament to the wheel centre pad.

3. FLOOR GEAR SHIFT ASSEMBLY

To Remove

(1) Remove the screws retaining the gear lever boot to the floor.

(2) Remove the studs attaching the gearshift bracket assembly to the extension housing and after lowering the rear of the gearbox, remove the lever and attaching brackets as an assembly.

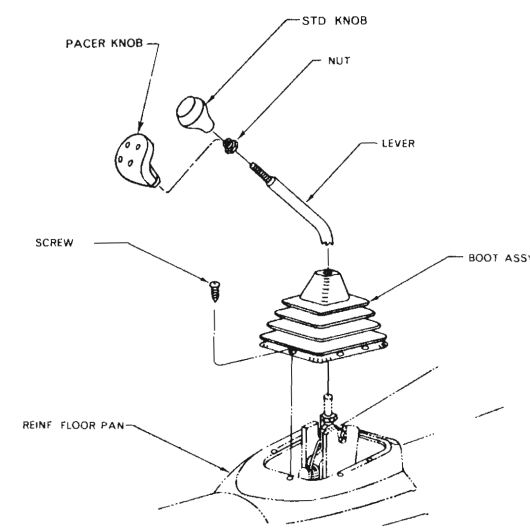


Fig. 10 – Gear lever and boot (dis-assembled view)

(3) Disconnect the selector lever rods from the levers by removing the spring clips and washers. *Refer Fig. 11.*

(4) Remove the four bushing bracket retaining nuts and remove the lever bracket assembly.

To Install

(1) Install the two bushing brackets and the lever assembly to the mounting bracket and tighten nuts to 100 lbs./in.

(2) Re-connect the two gear selector rods and secure with washers and spring clips, *refer Fig. 11.*

(3) Re-install the gear lever and boot to the lever bracket assembly stud. (Check that the gear lever fork assembly is spring loaded toward the 2nd and 3rd gear selector position and has no greater clearance than .030" between the opposite blade and the fork pin). *Refer Fig. 11 insert.*

(4) Position the hand selector lever correctly, tighten the stud locknut to 20-25 lbs. ft. torque.

(5) Reposition the boot and secure with six screws to the floor pan.

(6) Readjust the selector linkage *(refer para. 4).*

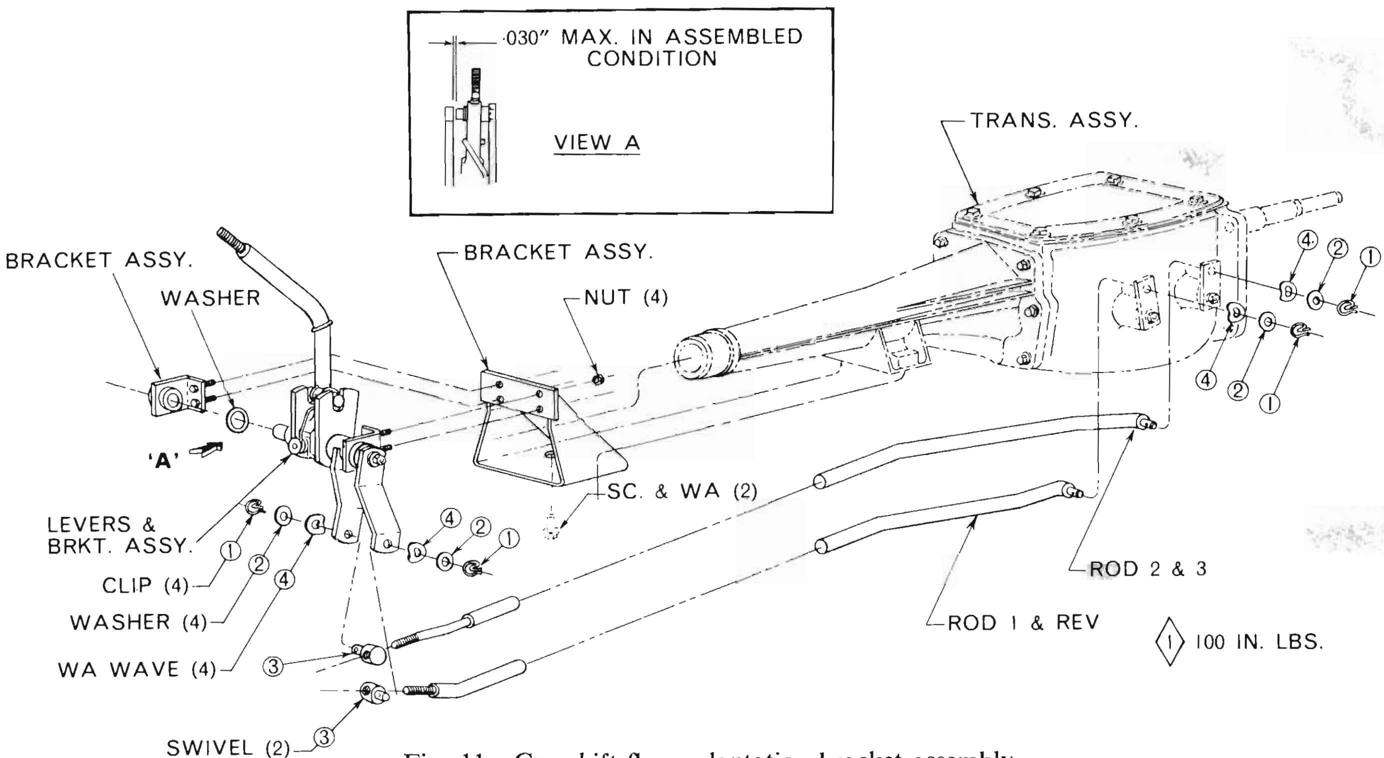


Fig. 11 – Gearshift floor adaptation bracket assembly

To Disassemble

Refer Fig. 12

(1) Remove the 2nd/3rd gear selector lever assembly retaining nut and washer from the shaft.

(2) Disassemble the components and inspect condition — replace worn or damaged parts.

To Reassemble

(1) Lubricate all the component bearing surfaces with a multi-purpose molybdenum grease.

(2) Reassemble the components in the order shown in *Fig. 12*.

(3) Install the lever retaining nut and washer and tighten to 20-25 lbs. ft. torque.

(4) Check the fork bracket stud is spring loaded towards the 2nd and 3rd selection position and .030" clearance (max.) exists between the fork selection lug and the opposite selector blade. *Refer Fig. 11 insert.*

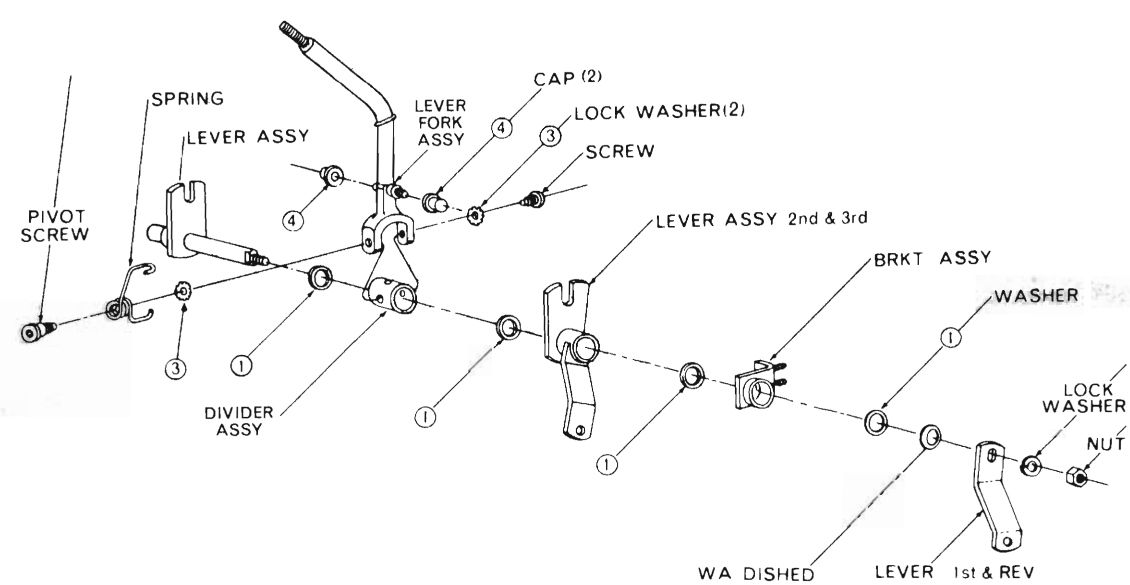


Fig. 12 – Selector lever bracket lever asembly (dis-assembled view)

4. GEARSHIFT LINKAGE ADJUSTMENT

(1) Disconnect both the gearshift control rods at the transmission levers. Position both transmission levers in neutral. (The neutral detent balls must be engaged to make this adjustment correctly). To test, start the engine (with clutch disengaged) then release the clutch slowly.

(2) Inspect the column shift axial freedom of the shift levers in the column assembly. If the outer end of the levers move axially over 1/16", loosen the two upper bushing screws and rotate the nylon bushing (downward), until all free play of the levers has been removed. Re-tighten the bushing screws securely *(refer Fig. 9)*.

(3) Install a wedge or suitable tool between the crossover blade and the second and third lever, so that the crossover blade is engaged with both lever crossover pins, as shown in *Fig. 9*.

(4) Adjust the swivel on the end of the second and third control rod until the stub shaft of the swivel enters the hole in the transmission lever. Install the washers and clips to secure. Tighten the swivel lock nut to 70 lbs. in. *(refer Fig. 10)*. During the above setting, the second and third control rod should be adjusted to also position the selector lever (on the column) 10° above horizontal level. (Transmission in neutral).

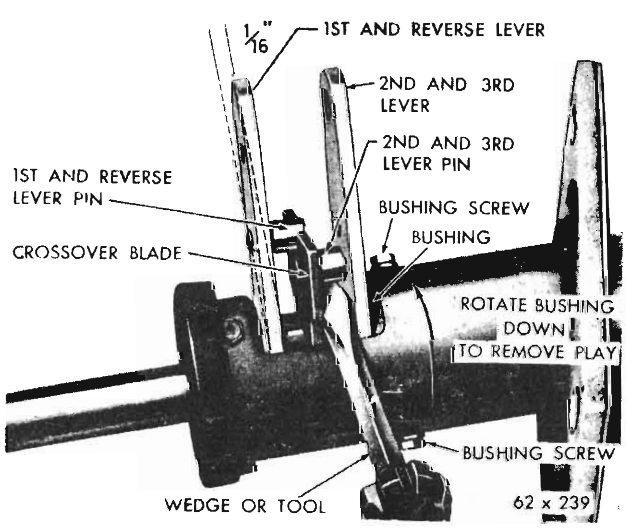


Fig. 9 – Gearshift lever adjustment (typical)

(5) Adjust the swivel on the end of the first and reverse control rod until the swivel stub shaft enters the hole in the transmission lever. Install washers and clip to secure. Determine the mid backlash position in the linkage, then tighten the swivel lock nut to 70 lbs. in.

(6) Remove the positioning wedge of tool from the crossover blade lever, then move the selector lever through all positions to test the adjustments to ensure crossover smoothness.

5. BACK-UP LAMP SWITCH

The reversing light switch is installed in the rear face of the transmission side cover which houses the shift mechanism. When installing the switch, tighten to 150 lbs. in. (maximum).

6. SPEEDOMETER DRIVE PINION

(1) The speedometer drive pinion assembly is retained in the extension housing with a clamp and screw *(refer Fig. 11)*.

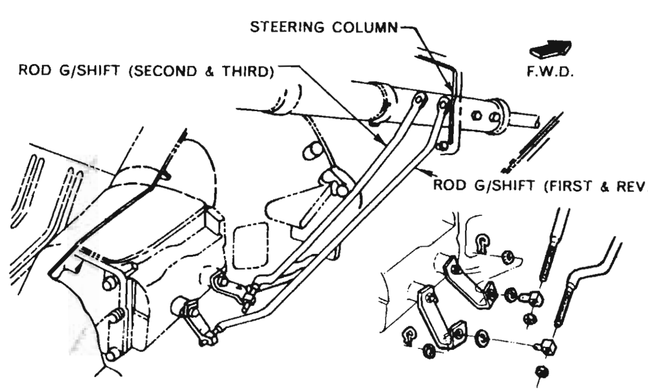


Fig. 10 – Control Rod Adjustment (typical)

> NOTE: Whenever transmission lubricant is found in the cable, the seal should be inspected, and replaced if unsatisfactory. *Refer para. 24 of Group 1 for Speedometer cable lubrication.*

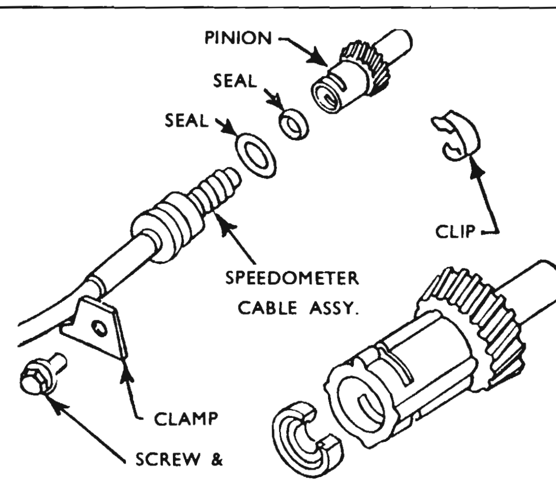


Fig. 11 – Speedometer drive pinion asembly – disassembled view

(2) Install the seal with the lips of the seal away from the pinion.

(3) Install the pinion on the cable and secure with clip in pinion while holding firmly together.

(4) Lightly lubricate the seal with multi-purpose grease and carefully install the cable assembly in housing.

(5) Install retainer clamp and screw, tighten to 150 lbs. in.

The transmission camshaft "O" rings can be replaced with the transmission in position by:

(a) Selecting top gear.
(b) Removing the shaft locating pins (76).
(c) Removing the lever arms (69 and 71).
(d) Withdrawing the shafts to expose the "O" rings.

When re-assembling with new "O" rings, they should be lubricated and carefully fitted over the camshafts.

7. EXTENSION HOUSING YOKE SEAL REPLACEMENT

(1) Disconnect propellor shaft at rear universal joint. Carefully pull shaft yoke out of the transmission extension housing.

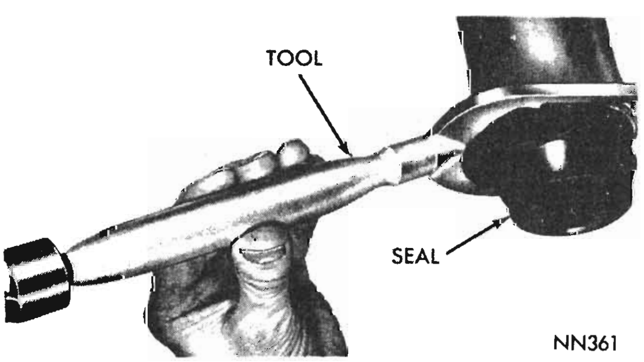


Fig. 12 – Removing extension housing yoke seal

> 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. 12)* with Tool E21C50D.

(3) To install a new seal, position seal in opening of extension housing and drive it into the housing with Tool E21C50C *(Fig. 13)*.

(4) Carefully guide front universal joint yoke into extension housing and on the mainshaft spline. Connect propeller shaft to rear axle pinion shaft yoke.

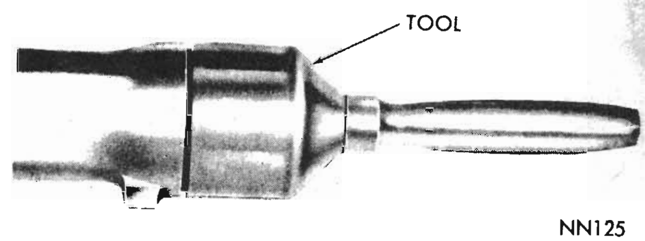


Fig. 13 – Installing extension housing yoke seal

8. EXTENSION HOUSING AND BUSHING

To Remove

(1) Disconnect propellor shaft at rear universal joint. Carefully pull shaft assembly out of the extension assembly.

(2) Remove speedometer pinion assembly *(Fig. 11)*. Drain approximately one pint of lubricant from the transmission.

(3) Remove bolts securing extension housing to the crossmember. Raise transmission slightly with service jack and a piece of flat wood, then remove centre crossmember and support assembly.

(4) Remove extension housing to transmission bolts and carefully remove the extension housing.

(5) Drive oil seal out of extension housing with tool. Be sure not to mar oil seal surface in the housing.

(6) Press or drive out bushing with Tool E21C50E *(Fig. 14)*.

(7) Slide a new bushing on installing end of Tool E21C50E. Align oil hole in bushing with oil slot in the housing, then press or drive bushing into place.

(8) Install a new oil seal into housing with Tool E21C50C *(refer Fig. 13)*.

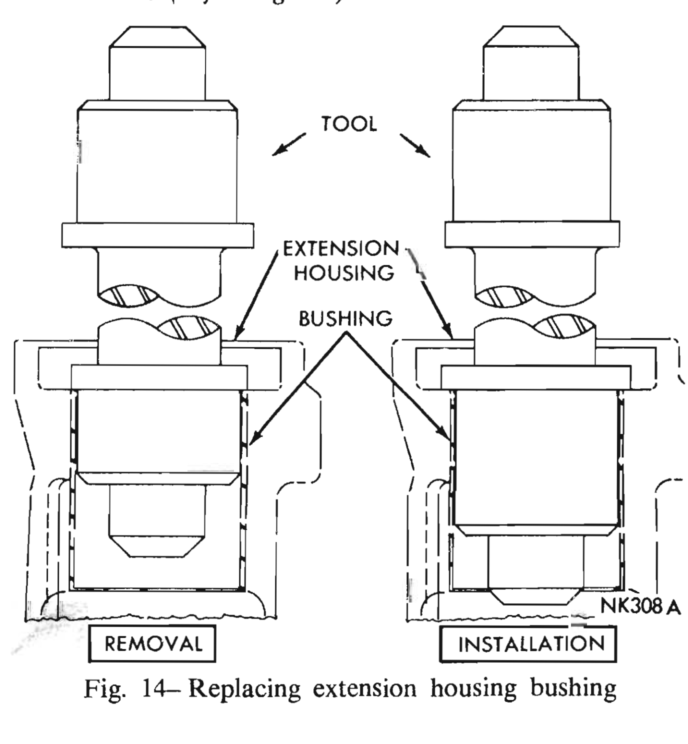


Fig. 14– Replacing extension housing bushing

9. TRANSMISSION REMOVAL

(1) Disconnect the battery earth lead.

(2) Drain the lubricant from the transmission.

(3) Disconnect the propellor shaft, speedometer cable and gearshift control rods.

> CAUTION: Remove the speedometer cable, (pinion comes out with cable) by hand so that the housing is not crushed.

(4) Remove the back-up switch leads.

(5) Place a jack and a flat piece of wood under the flat portion of the oil pan.

(6) Using care raise engine slightly and remove the rear support attaching bolts. Remove thè cross-member.

FLOOR SHIFT MODELS

(a) Remove the Gear lever rubber boot from the floor pan by removing 6 screws, and raise the boot.

(b) Remove the gear lever knob and boot, remove the studs attaching the gearshift bracket assembly to the extension housing and after lowering the rear of the gearbox, remove the lever and attaching brackets as an assembly.

(7) Support the transmission using a suitable jack, then remove the bolts that attach the transmission to the clutch housing.

(8) Slide the transmission rearward until the pinion shaft clears the clutch disc before lowering the transmission. (This precaution will avoid damaging the clutch disc.)

(9) Lower the transmission, remove from under vehicle and thoroughly clean exterior of transmission.

> FLOOR SHIFT MODELS: Ensure care is taken to protect the floor shift adaption bracket assembly.

10. TRANSMISSION INSTALLATION

(1) Remove the transmission from the repair stand. Install rear crossmember and support, then position under vehicle (except floor change models).

(2)Raise the transmission using a suitable jack, until the main drive pinion is centred in the clutch housing bore.

(3) Roll the transmission slowly forward until the pinion shaft enters the clutch disc. Turn the pinion shaft until the splines are aligned, then push transmission forward until seated against clutch housing.

Do not allow the transmission to "hang" after the pinion has entered the clutch disc.

(4) Install the transmission attaching bolts and tighten to 50 lbs. ft. Remove the jack.

> FLOOR CHANGE MODELS: Lower the rear of the gearbox, re-install the floor shift lever and bracket assembly (where removed). Install the rear crossmember and support.

(5) Using a pointed drift, align the crossmember bolt holes, then install attaching bolts. Tighten to 80 lbs. ft.

(6) Lower the engine and remove the jack and support block.

(7) Install the speedometer drive pinion and cable assembly.

(8) Reconnect the gearshift rods, propeller shaft and back-up light switch leads.

(9) Fill transmission with the recommended gear lubricant *(see Lubrication and Maintenance* refer to *Para. 3).* Connect battery earth terminal.

(10) Road test the vehicle, making sure the transmission shifts smoothly and operates quietly.

(11) If the shift linkage requires adjustment, refer to paras. 2 and 3.

> NOTE: Due to a difference in ratios between some gearboxes, the internal operating parts of the gearboxes are not interchangeable. When ordering replacement parts or exchange transmissions always quote all of the numbers stamped on the vehicle certification plate attached to the plenum chamber.

11. TO DISASSEMBLE TRANSMISSION

(1) Remove the front bearing retainer (2) and extension housing (57). *(Refer Fig. 15).*

(2) Use a soft drift to knock the countershaft (40) partly through from the front to allow the lock plate (51) to be removed. Remove the lock plate.

(3) Push the counter-shaft out through rear of case with a dummy countershaft.

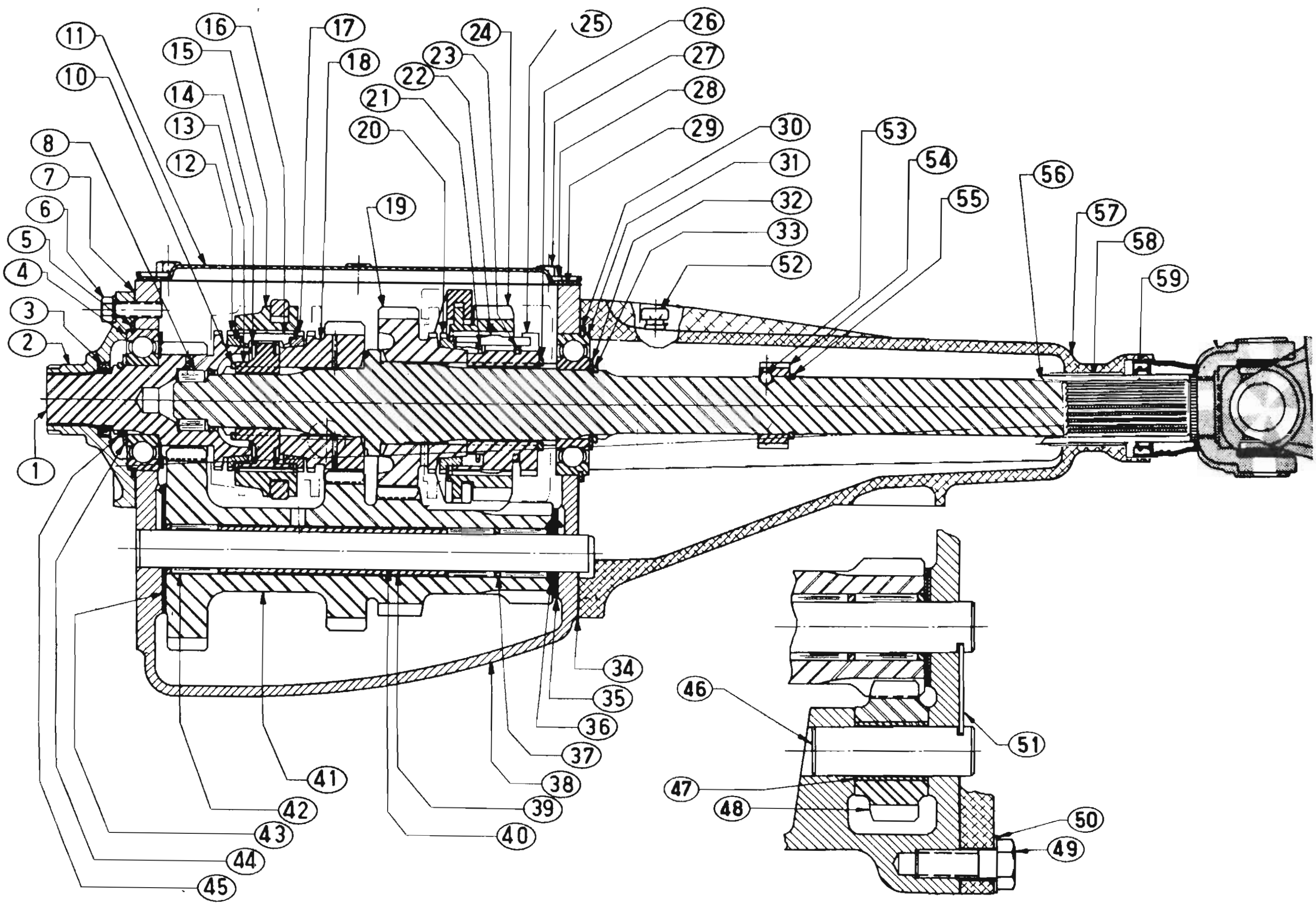


Fig. 15 – Transmission assembly (cross-sectional views)

> NOTE: A suitable dummy countershaft can be made from a piece of .75 in. diameter bright steel cut to a length of 8.00–8.01 ins.

(4) Remove the top cover (11) and discard the gasket. Mount the gearbox in a stand or vice.

(5) Pull out the maindrive (1) from the front of the case (38). Remove third speed blocker ring (12).

(6) Remove the rear (mainshaft) bearing outer snap ring (30).

(7) Move the second and third speed gearshift cam (78) into third gear position.

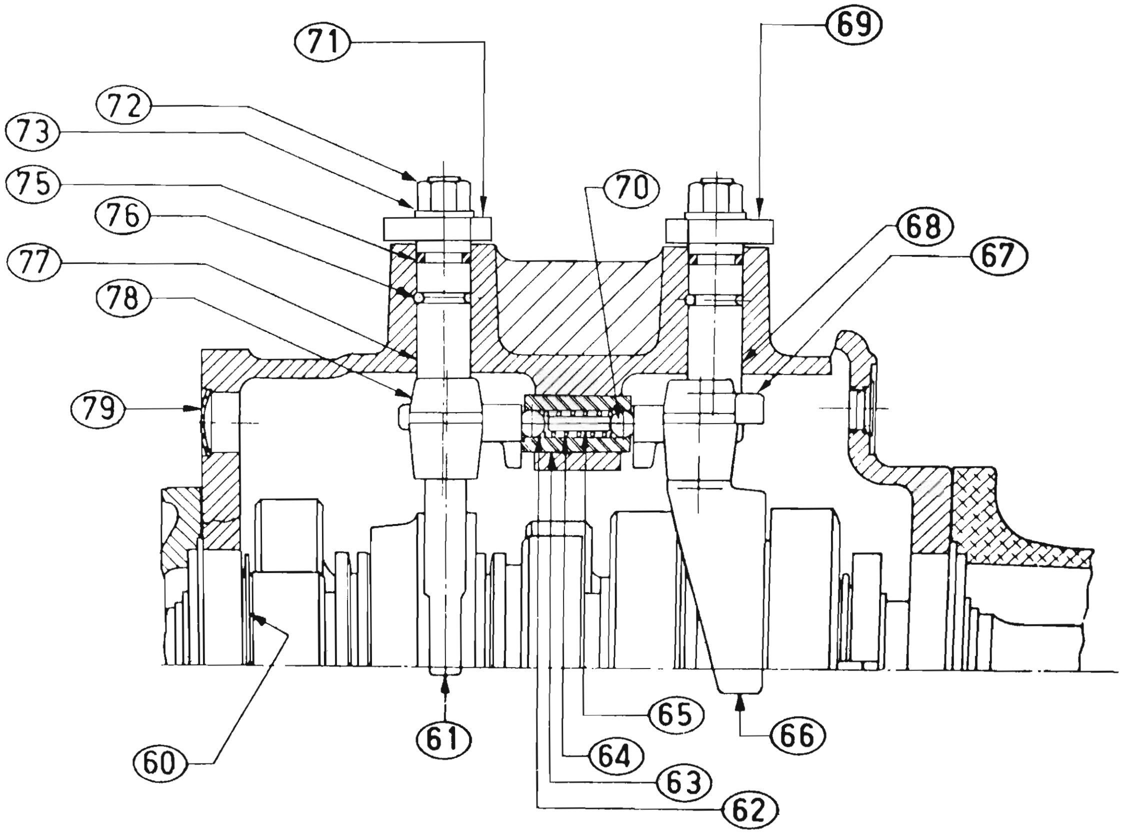
(8) Remove the gearshift levers (69, 71). Knock out the taper pin (76) from each gearshift camshaft (68, 77).

(9) Pull the gearshift cam and shaft assemblies back against the case.

(10) Push the mainshaft assembly forward so that the mainshaft bearing moves through into the gear case. Move the mainshaft assembly away from the gearshift forks (66, 61).

(11) Move the first and reverse sleeve and gear (24) forward into first speed position but do not move first and reverse gearshift fork out of neutral position.

(12) Remove the first and reverse gearshift fork.



Legend - Figs. 15 and 16

1. Maindrive
2. Maindrive bearing retainer
3. Bearing retainer oil seal
4. Maindrive bearing
5. Maindrive bearing outside diameter snap ring. Same as Item 30
6. Bearing retainer bolt (3 off)
7. Bearing retainer gasket
8. Maindrive needle roller bearing (14 off) NOTE Pacer Transmissions (15 off)
10. Snap ring. Same as thinnest thickness of items 33 and 45
11. Top cover
12. Third speed synchronizer blocker ring. Same as item 17. Not interchangeable with item 20.
13. Second and third speed synchronizer inner hub.
14. Synchronizer spring (2 off)
15. Second and third speed synchronizer sleeve.
16. Second and third speed shift plate (3 off)
17. Second speed synchronizer blocker ring. Same as item 12. Not interchangeable with item 20
18. Second speed gear
19. First speed gear
20. First speed synchronizer blocker ring. Not interchangeable with items 12 and 17
21. Synchronizer spring. Not interchangeable with item 23
22. First speed synchronizer shift plate (3 off)
23. Synchronizer spring. Not interchangeable with item 21
24. Reverse speed gear and first speed synchronizer sleeve
25. First and reverse inner hub
26. Snap ring
27. Cover bolt (6 off)
28. Cover bolt lock washer (6 off)
29. Cover gasket
30. Mainshaft bearing outside diameter snap ring. Same as item 5
31. Mainshaft bearing
32. Spacer. Same as item 44
33. Snap ring. Selective assembly - 4 thicknesses. Each thickness interchangeable with item 45
34. Extension housing gasket
35. Thrust washer - rear outer
36. Thrust washer - rear inner
37. Needle roller thrust washer (3 off)
38. Gear case
39. Counter shaft bearing spacer
40. Countershaft
41. Cluster gear
42. Cluster gear needle rollers (3 sets of 22 each)
43. Thrust washer - front
44. Spacer. Same as items 32
45. Snap ring. Selective assembly - 4 thicknesses. Each thickness interchangeable with item 33
46. Reverse idler shaft
47. Reverse idler bronze bush
48. Reverse idler
49. Extension housing bolt (6 off)
50. Lock washer (6 off)
51. Locking plate
52. Breather
53. Speedometer gear retaining ball
54. Speedometer gear
55. Snap ring
56. Mainshaft
57. Extension housing
58. Extension housing bushing
59. Extension housing oil seal
60. Oil slinger
61. Second and third speed gearshift fork
62. Interlock ball
63. Interlock sleeve
64. Interlock spring
65. Interlock pin
66. First and reverse speed gearshift fork
67. First and reverse speed gearshift cam
68. First and reverse speed gearshift camshaft
69. First and reverse speed gearshift lever
70. Interlock ball
71. Second and third speed gearshift lever
72. Nut (2 off)
73. Shakeproof washer (2 off)
74. Plain washer (2 off)
75. Gearshift camshaft 'O' ring (2 off)
76. Taper pin (2 off)
77. Second and third speed gearshift cam shaft
78. Second and third speed gearshift cam
79. Welch plug

(13) Remove the second and third speed gearshift fork.

(14) Move the second and third speed synchronizer outer sleeve (15) rearwards into second speed position.

(15) Remove the mainshaft assembly through the top of the gear case.

(16) Knock out the reverse idler shaft (46).

(17) Remove the reverse idler (48) and cluster gear (41).

(18) Remove gearshift cams, interlock sleeve, springs and balls from the gear case *(refer Fig. 17)*.

Should it be necessary to disassemble the sub-assemblies the following procedures should be adopted.

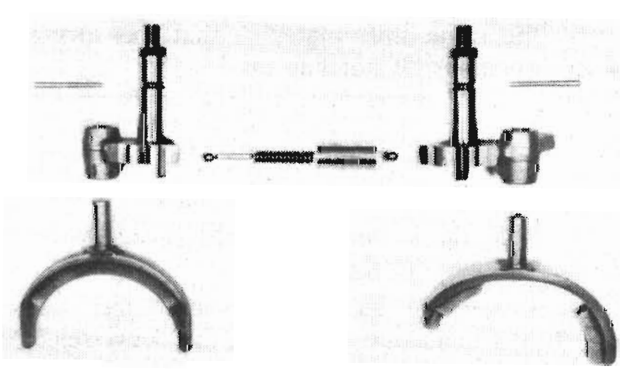


Fig. 17 – Gearshift forks, cams and interlock assembly

Mainshaft

Before commencing to dismantle the mainshaft assembly, the first speed and second speed gear end float should be checked with the aid of feeler gauges inserted between the respective gear and the shoulder of the mainshaft. *(Refer Figs. 22 and 23)*. The end float in each case should be within the specification of .006″ to .019″.

Should the end float of one or both gears fall outside the above limits the following dimensions must be checked after disassembly in order to determine which component must be replaced to bring the end float within specifications.

Gear–second speed (18)	1.712″	1.709″
Hub inner–synchronizer 2nd and 3rd gear (13)	.889″	.885″
Gear–first speed (24)	1.753″	1.750″
Hub inner–synchronizer 1st gear (25)	1.429″	1.433″

(1) Remove circlip (55) from speedometer drive gear and remove gear (54) and drive ball. Remove circlip (33) and washer (32) from mainshaft.

(2) Remove bearing (31) from mainshaft.

(3) Remove circlip (26) from mainshaft and remove synchronizer hub (25), reverse speed gear (24) as an assembly.

(4) Remove first speed blocker ring (20) and slide first speed gear (19) from mainshaft.

(5) Remove circlip (10) from front end of mainshaft.

(6) Remove second and third synchronizer assembly (13, 15).

(7) Remove second speed blocker ring (17) and slide second speed gear (18) from mainshaft.

(8) Slide 2nd and 3rd synchronizer sleeve (15) from synchronizer hub (13) and remove springs and shift plates.

(9) Slide first speed synchronizer sleeve (24) from synchronizer hub (25) and remove springs and shift plates.

Countershaft

(1) Remove dummy countershaft and needle roller thrust washers from cluster gear. *(Refer Fig. 18)*.

(2) Remove needle rollers and spacer from bore of cluster.

Drive Pinion

(1) Remove circlip (45) and spacer (44) from drive pinion shaft.

(2) Remove main drive bearing (4) and oil slinger (60)

(3) Remove needle rollers (8) from bore of pinion.

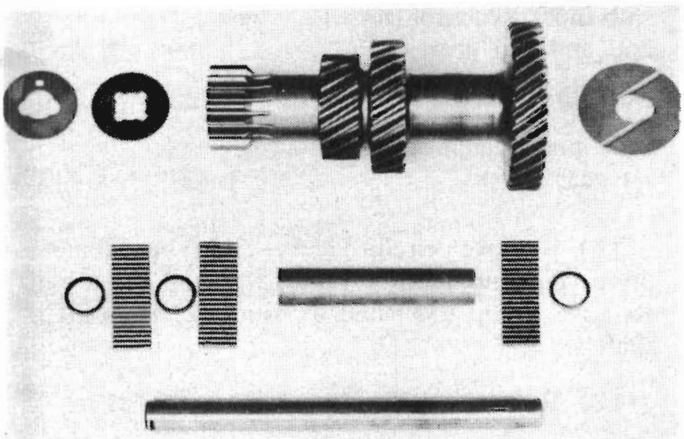


Fig. 18 - Cluster gear sub-assembly

12. CLEANING AND INSPECTION

Clean all the parts (including the case) in a suitable solvent and blow dry with compressed air.

> CAUTION: Do not spin bearings with compressed air.

The bearings should be immersed in clean solvent and rotated by hand until clean. A bearing that is spun by air pressure is likely to score due to the absence of lubrication. Lubricate the cleaned bearings with light oil, then turn by hand to test for roughness, looseness or wear. Test the fit of the bearings on their respective shafts and in the bores. Inspect the cluster gear and drive pinion, shaft needle bearings and bearing surfaces for scoring or wear. Inspect the mainshaft splines for galling or scoring. Inspect bearing mounting surfaces and snap ring grooves. Slight nicks or burrs can be stoned off. Inspect all gears for excessive wear or damage. Inspect synchronizer springs for distortion and loss of tension.

Inspect the general condition of the transmission case and extension housing and all the threaded holes and plugs for stripped and pulled threads. Inspect all mating and gasket surfaces for roughness and scratches. Inspect the castings for small cracks and sand holes. Inspect the interlock sleeve and pin for free movement in their bores. Examine the detent balls for brinelling. If the cam detents show signs of excessive wear to the extent of not locking in gear install a new cam and shaft. Inspect the shift forks for wear on the shanks and pads. Inspect the synchronizer blocker rings for wear and damage.

13. TO ASSEMBLE TRANSMISSION

> NOTE: When assembling the transmission the following lubricants are required:
> Oil: SAE 30 engine oil.
> Grease: Lithium base multi-purpose automotive grease.

SUB ASSEMBLIES

Mainshaft

Assemble the first speed synchronizer assembly as follows: *(Refer Fig. 19).*

(1) Lubricate the synchronizer sleeve and reverse gear (24) and fit to the inner hub (25) with the teeth of the gear and the synchronizer spring groove of the inner hub at the same end.

(2) Install synchronizer spring (21) into recessed end of hub and the white painted (or long tanged) synchronizer spring (23) in grooved end of hub.

> NOTE: Springs are not identical. The spring tangs should locate on opposite sides of the same shift plate, so that the spring openings do not line up.

(3) Slide three shift plates (22) into the hub ensuring that plates pass over springs.

Assemble the second and third speed synchronizer as follows: *(Refer Fig. 20).*

(4) Install the lubricated synchronizer sleeve (15) to the inner hub (13) with the sleeve selector groove and hub inner spline protrusion at opposite ends.

(5) Slide the sleeve across the hub until three second and third speed shift plates (16) can be fitted into the slots in the inner hub.

(6) Install two second and third speed synchronizer springs (14) under the shift plates behind the pads with the long tang of each spring in the same shift plate.

> NOTE: The spring tangs should locate on opposite sides of the same shift plate, so that the spring openings do not line up.

(7) Lubricate the first speed gear bore (19) and fit with the blocker ring (20) to the mainshaft (56). The first speed blocker ring slots are .631 to .641 inches wide compared with the second speed blocker ring slots of .356 to .360 inches wide.

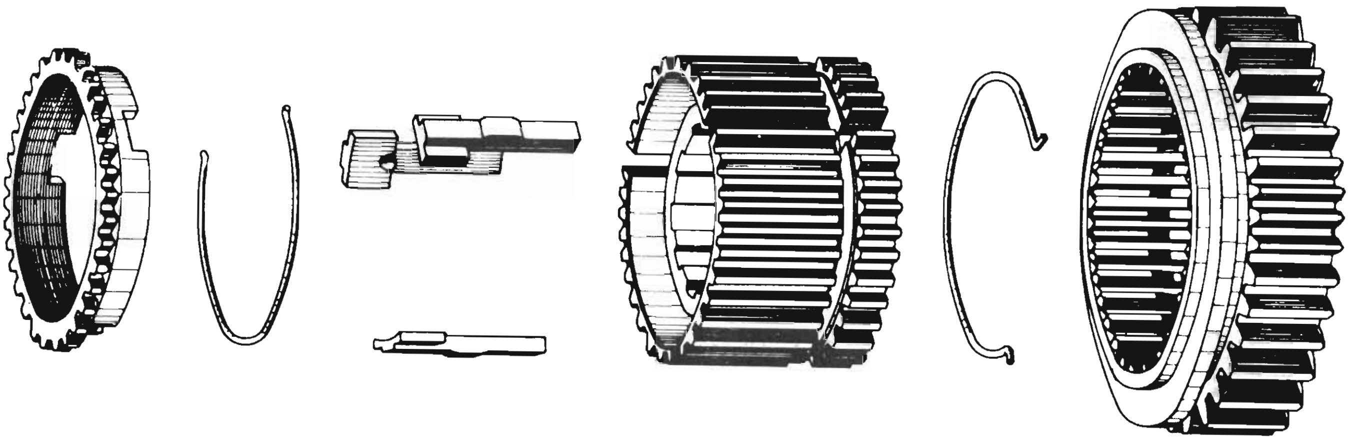


Fig. 19 – First speed synchronizer and reverse gear assembly

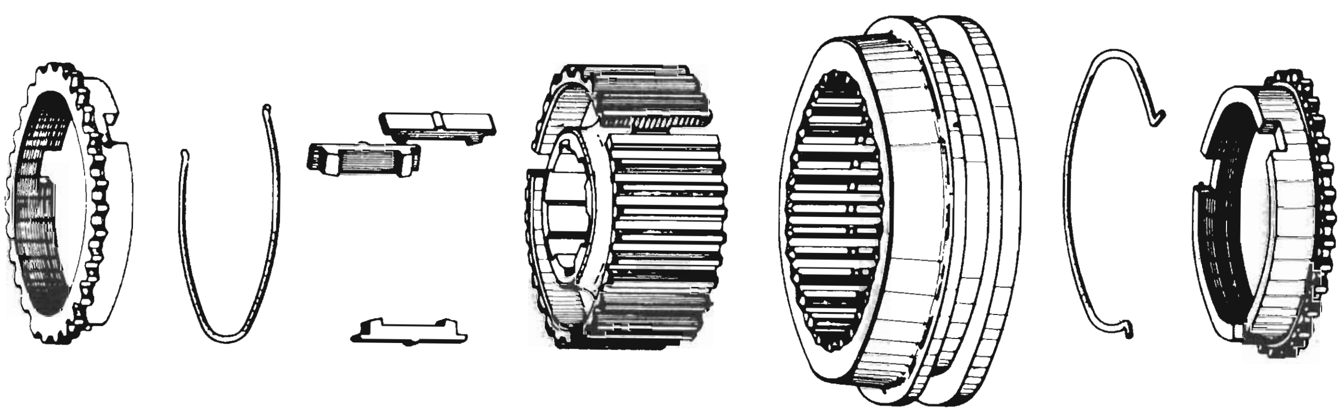


Fig. 20 – Second and third speed synchronizer

(8) Install the first speed synchronizer sleeve and reverse gear assembly and snap ring (26) to the mainshaft with the reverse gear sleeve gear teeth toward rear of case.

(9) Recheck end float as outlined in disassembly of mainshaft. (*Refer Fig. 22*).

(10) Install the mainshaft bearing (31) (HD transmissions use special bearing), spacer (32), and snap ring (33) selecting the snap ring to keep end float to a minimum within limits .000 to .004 inches. DO NOT install snap ring (30) to the outside diameter of the mainshaft bearing.

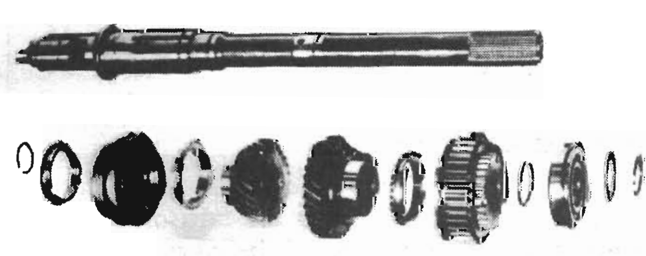


Fig. 21 – Exploded View—Main Shaft Assembly.

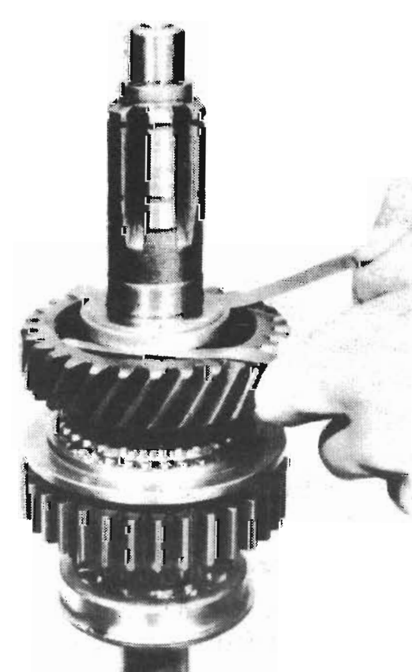


Fig. 22 – Checking Main Shaft End Float.

NOTE: The initial equipment mainshaft bearing is not interchangeable with the maindrive bearing. Replacement bearings are interchangeable.

(11) Lubricate the second speed gear bore (18). Install it with blocker ring (17) to the mainshaft so that the back face of the gear is against the front face of the mainshaft shoulder. *(Refer Fig. 21).* The second speed blocker ring is distinguished from the first speed blocker ring by its narrower slots. The second speed blocker ring slots are .356 to .360 inches wide, the first speed blocker rings .631 to .641 inches wide.

(12) Lubricate the second and third speed synchronizer assembly. Install to mainshaft with the inner hub spline protrusion to the front of the gear case. Install the snap ring (10) and check the end float as outlined in disassembly of mainshaft. *(Refer Fig. 23).*

(13) Move the second and third speed synchronizer sleeve to engage second gear and the first and reverse synchronizer sleeve to engage first gear. The mainshaft is now completely assembled ready for assembly into gear case.

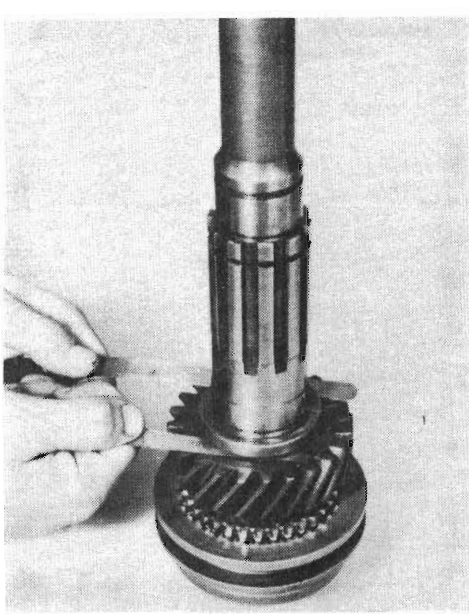


Fig. 23 – Checking end float; second speed gear

Gearshift selector cams

(1) Use grease to hold one ball (70) in the rear of the interlock sleeve (63). Install the sleeve into the case (38).

(2) Lubricate the shaft (68) of the first and reverse gearshift cam (67) and shaft assembly and replace "O" ring. Install the cam and shaft assembly to the case in neutral position (so that the interlock sleeve ball is in the extended detent notch of the cam). *(Refer Fig. 16).*

(3) Lubricate the shaft (77) of second and third speed gearshift cam (78) and shaft assembly and replace "O" ring. Install the cam and shaft assembly to the case, pushing the cam against the side of the case so that the interlock sleeve hole is not blocked.

(4) Install the interlock pin (65), spring (64) and second ball (62) using Tool E21C15A. Move the cam and shaft assembly into third gear position, so that the extended detent notch of the cam retains the ball and spring. *(Refer Fig. 17).*

Countershaft

(1) Assemble the cluster gear (41), dummy countershaft and bearings as follows: *(Refer Fig. 18).*

Insert the dummy countershaft and spacer (39) into the cluster gear. Install a set of 22 lubricated needle rollers (42) at the front (largest gear step) of the cluster.

(2) Install two sets of 22 lubricated needle rollers at the other end of the cluster, separating the rollers with a cluster gear needle roller thrust washer (37).

(3) Install cluster gear needle roller thrust washer at each end of the dummy countershaft, together with two thrust washers (25, 36) at the rear (smallest step end) of the cluster gear and one thrust washer (43) at the front end of the gear. These may be retained with grease.

Drive pinion

(1) Fit oil slinger (60), maindrive bearing (4) (H.D. transmissions use special bearing), spacer (44) and third speed synchronizer blocker ring to the maindrive. *(Refer Fig. 24).* Select a snap ring (45) to keep end float to a minimum within limits .000 to .004 inches and assemble it to the bearing. Install fourteen needle roller bearings (8) (standard transmissions) to the maindrive (1).

NOTE: Pacer and H.D. transmissions use 15 needle roller bearings (8).

To install sub-assemblies

(1) Place the cluster assembly in the bottom of the gear case, ensuring that the tabs of the thrust washers enter the grooves of the case.

(2) Lubricate and install the reverse idler (48) and bush (needle rollers on H.D. transmissions) (47) assembly and shaft (46) with the bevelled ends of the gear teeth forward. The shaft must be inserted so that the locking groove is flush with the outside face of the gear case, and towards the cluster gear shaft hole.

(3) Install the extension housing oil seal (59), in the extension housing (57) with tool E21C50C.

(4) Position the mainshaft assembly into the transmission case through the top opening, but do not press the mainshaft bearing into the case.

(5) Push the gearshift camshafts to the side of the case, ensuring that the third and neutral positions are still held by the two cams. Tilt the mainshaft assembly away from the camshaft.

(6) Roll the second and third gearshift fork (61) into position in the camshaft assembly (with the fork pad branded "T" upwards). Move the mainshaft assembly so the second and third speed fork lines up with the second and third speed synchronizer outer sleeve. Lift the mainshaft assembly to engage the fork in the synchronizer sleeve. Push the camshaft assembly into its operating position and install taper pin (76) (use sealer on the pin).

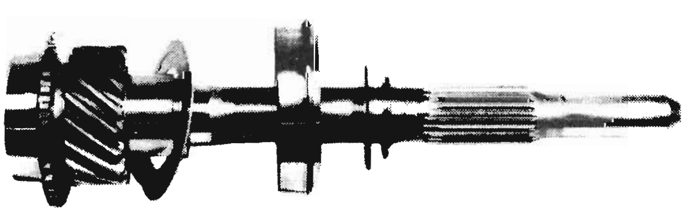


Fig. 24 – Maindrive sub-assembly

(7) Roll the first and reverse gearshift fork (66) into position. Adjust the first speed synchronizer sleeve until the groove in the first and reverse fork lines up with the sleeve. Position the mainshaft assembly to engage the fork in the first and reverse synchronizer sleeve. Push the camshaft assembly into its operating position and install the taper pin (use sealer on the pin).

(8) Pull the mainshaft assembly rearwards, fitting the bearing into case until the bearing retaining snap ring (30) can be installed.

(9) Position the third speed synchronizer blocker ring to the maindrive. Assemble the maindrive into case from the front, fitting the maindrive bearing outside diameter snap ring (5).

(10) Press the bearing retainer oil seal (3) into the bearing retainer (2) with Tool E21C10D (if removed). Coat the oil seal outside diameter with gasket cement.

(11) Use a light coating of grease to position the bearing retainer gasket (7) and install the bearing retainer with three bolts and lock washers (6) tightening the bolts to 20-25 lbs. ft. torque.

(12) Bring the cluster gear into mesh by carefully turning the gear case upside down and allowing the cluster gear to drop into place. It may be necessary to rotate the maindrive to ensure proper meshing.

(13) Using the countershaft (40), drive out the dummy shaft from the rear of the case until the locking plate slot in the countershaft is flush with the ouside rear face of the case. The slots in the countershaft and the reverse idler shaft must be parallel and adjacent.

(14) Install the locking plate (51) to the countershaft and reverse idler shaft, tapping to bring the plate against the case.

(15) Install the speedometer gear retaining ball (53) to the mainshaft and slide on the speedometer gear (54). Install the snap ring (55).

(16) If necessary, a new bushing should be fitted to the extension housing using tool E21C50E.

(17) Install a suitable protector over the mainshaft splines to prevent damage to the extension housing oil seal and bushing when installing the extension housing.

(18) Install the extension housing gasket (34) using a light coating of grease. Install the extension housing with six bolts (49) and lock washers (50) tighten to 45-55 lbs. ft. torque.

(19) Install both gearshift levers (69, 71) with plain washers (74) shakeproof washers (73) and nuts (72) tightening to 20-25 lbs. ft. torque.

(20) Position the gearbox top cover gasket (29) and top cover (11) tightening six bolts (27) and lock washers (28) to 8-12 lbs. ft. torque.

(21) Install the drain and filler plugs, tightening to 20-25 lbs. ft. torque.

(22) Install the breather (52) in the extension housing.

PART 2 — TORQUEFLITE TRANSMISSION
6 CYLINDER — MODELS

SPECIFICATIONS

Type	Automatic 3 speed with Torque Converter
Torque Converter Diameter	$10\frac{3}{4}''$
Cooling Method	Water—heat exchanger
Lubrication	Pump—rotor type
BAND ADJUSTMENT ("Back-off" Turns)	
Front (Kickdown)	4 from 10 lbs. ins.
Rear (Low/Reverse)	$\frac{3}{4}$ from 10 lbs. ft. (with tool No. BW547-502)
	$\frac{3}{4}$ from 5 lbs. ft. (with tool No. E1294-1)
CLUTCHES	
	'C' & 'D'
Number of front clutch plates	4 "Flat"
Number of front clutch discs	5 "Flat"
Number of rear clutch plates	5 "Coned"
Number of rear clutch discs	5 "Flat"
GEAR RATIOS	
1 — low	2.39:1
2 — second	1.45:1
D — drive—direct	1.00:1
R — reverse	2.09:1
OIL PUMP	
Type	Gear—rotary
Gear train end play	.010″–.030″
End Play Control Washers	.061″–.063″
(Selective)	.078″–.080″
Fluid Capacity	14.25 imp. pts.
Fluid type — Chrysler specification	41/MS5033

Refill and Top Up:		Top-up Only:	
Shell S7368A	B10378	Ampol DXR4413	B10673
Caltex TL6673	B10101	Golden Fleece Dexron	B10314
Castrol 14704	B10599	Amoco Dexron	B10672 & B10600
Esso AP	B10664	B.P. A.T.F. Dexron	B10800
		Mobil A.T.F. 220	B10104

SERVICE BUSHING FINISHING SIZES	(Bored or Reamed *after* installation)
Input Shaft Bushing	.730″ – .731″
Output Shaft Bushing	1.250″ – 1.251″
Pump Adaptor Support Bushing	1.250″ – 1.251″
Pump Housing Bushing	1.4995″ – 1.5005″
Reverse Sungear Bushing and Planetary Gear Cover Bushing (Aluminium)	.843″ – .844″
Transmission Case (REAR) Bushing	1.750″ – 1.751″

SPECIAL TOOLS

E1282	Front Band Spacer Gauge .250″
E1386	Clutch Spring Compressor
E1387	Inserting Sleeve—Rear Clutch Piston
E1388	Inserting Sleeve—Front Clutch Piston
E1294–1	Rear Servo Adaptor Socket (5/16″ square—3/8″ drive)

SPECIAL TOOLS—(Continued)

E1299	Socket Head Adaptor M.H.H. 3/16″ (Hex.) A.F. (Remove and reinstall pressure take-off plug)
E1300	Torque Wrench—Screwdriver Adaptor
E1284	Front Servo Adaptor (short)
E21C65A	Hydraulic Pressure Test Gauge and Hose (use with 1/8″—27N.P.T. Fitting No. 26 Union)
E21C5C	Transmission Stand
E21C35F	Installer—Oil pump seal
E21C35G	Remover—Oil pump seal
2793527	Torque Converter Flushing Tool
E21C50D	Remover—extension housing yoke seal
E21C50C	Installer—extension housing yoke seal
E21C50E	Remover and Installer—extension housing sliding spline bushing
	Pounds/Inch torque wrench
	Pounds/feet torque wrench
	Circlip Pliers (2)
	Allen keys (3) 3/16″, 1/4″ and 7/32″

TORQUE SPECIFICATIONS

	lbs. ft.	lbs. ins.
Cooler line fitting nut		75
Converter drain plug	10	
Converter to Drive plate bolt	32–45	
Converter drive plate to crankshaft bolt	55	
Converter cover plate to transmission case screw		40
Extension housing to transmission case bolt	25–35	
Converter housing to engine bolt (lower)	50	
(upper)	40	
Transmission case to converter housing bolt	12–18	
Filler tube connector sleeve nut	14–18	
Breather tube connector to case	20–30	
Governor body plate screws		20–30
Governor body to sleeve screws		48–84
Intermediate (centre) support to transmission case screw	15–25	
Kickdown (front) band adjusting screw lock nut	15–20	
Kickdown (Transmission Throttle) cable adaptor to case	8–9	
Kickdown (front) servo to transmission case bolt	10–15	
Low-reverse (rear) band adjusting screw lock nut	25–30	
Low-reverse (rear) servo to transmission bolt	15–25	
Manual valve shaft lever nut	6–7	
Oil pan drain plug	10–14	
Oil pan to transmission case screw	10–13	
Oil tube connector to case nut		50
Output shaft support	4–8	
Pressure test plug	4–5	
Pump adaptor to pump body bolt	17-22	
Pump adaptor to pump body screw	2–3	
Pump adaptor to transmission case bolt	12–18	
Neutral Starter/Rev. Light switch screws		20–30
Throttle valve cam bracket		20–30
Transmission Throttle cable adaptor	10–12	
Valve body screws		20–30
Valve body to case		48–96
Selector rod adjustment locknut		70

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. NO DRIVE

No Forward Drive

(1) Fluid level.
(2) Manual linkage adjustment.
(3) Transmission throttle valve cable adjustment.
(4) Valve body malfunction.
*(5) Front clutch and/or seal rings leaking.
*(6) Output shaft plug leaking.
*(7) Over-running clutch slipping ('D' or '2' selected).
*(8) Planetary gear set damaged.
*(9) Torque converter faulty.
*(10) Oil pump or drive tangs damaged.

No Reverse Drive

(1) Fluid level.
(2) Manual linkage adjustment.
(3) Rear band adjustment and/or throttle cable adjustment.
(4) Rear servo and/or tube leakage.
(5) Rear clutch tube leakage.
(6) Valve body malfunction.
*(7) Rear clutch and/or seal rings leakage.
*(8) Rear band faulty.

2. ENGAGEMENT

'D' — 'l' — '2' — 'R'

Rough

(1) Engine idle speed.
(2) Transmission throttle cable adjustment.
(3) Valve body malfunction.
(4) Front/rear clutch faulty.

Delayed

(1) Fluid level.
(2) Transmission throttle cable adjustment.
(3) Manual linkage adjustment.
(4) Oil strainer blocked.
(5) Rear servo/tubes leaking.
(6) Rear clutch tube leaking.
(7) Valve body malfunction.
(8) Pump tubes leaking.
*(9) Front clutch/seal rings leaking.
*(10) Output shaft plug leaking.
*(11) Rear clutch/seal rings leaking.

No Neutral (Drives in Neutral)

(1) Manual linkage adjustment.
(2) Valve body screws loose.

3. NO UPSHIFT

No. 1 — 2

(1) Manual linkage adjustment.
(2) Governor valve malfunction.
(3) Front band adjustment.
(4) Front servo/tubes leaking.
(5) Valve body malfunction.
*(6) Front band faulty.

No. 2 — 3

(1) Manual linkage adjustment.
(2) Governor valve malfunction.
(3) Rear clutch/tubes leaking.
(4) Front servo/tubes leaking.
(5) Valve body malfunction.
*(6) Rear clutch/seal rings leaking.

4. SHIFT QUALITY

Harsh 1 — 2

(1) Transmission throttle cable adjustment.
(2) Front band adjustment.
(3) Valve body malfunction.
(4) Governor valve malfunction.

Harsh 2 — 3

(1) Transmission throttle cable adjustment.
(2) Front servo malfunction.
(3) Valve body malfunction.

Harsh 3 — 2

(1) Transmission throttle cable adjustment.
(2) Valve body malfunction.

Harsh 2 — 1

(1) Engine idle speed.
(2) Transmission throttle cable adjustment.
*(3) Over-running clutch malfunction.

5. INCORRECT SHIFT SPEED

(1) Throttle operation (full throttle at carburettor).
(2) Transmission throttle cable adjustment.
(3) Valve body malfunction.
(4) Governor valve malfunction.
(5) Front servo assembly/tubes leaking.
(6) Rear clutch assembly/tubes leaking.

6. NO KICKDOWN

(1) Throttle operation (full throttle at carburettor).
(2) Transmission throttle cable adjustment.
(3) Valve body malfunction.
(4) Kickdown band adjustment.

7. SLIPPAGE

Slip — "Breakaway"

(1) Fluid level.
(2) Manual control linkage adjustment.
(3) Transmission throttle cable adjustment.
(4) Valve body malfunction.
*(5) Front clutch assembly and/or seal rings leaking.
*(6) Output shaft plug leaking.
*(7) Over-running clutch malfunction.
*(8) Torque converter malfunction.

Slip 1 — 2

(1) Fluid level.
(2) Transmission throttle cable adjustment.
(3) Manual control linkage adjustment.
(4) Front band adjustment.
(5) Front servo assembly and/or tubes leaking.
(6) Valve body malfunction.
*(7) Front band malfunction.

Slip 2 — 3

(1) Fluid level.
(2) Manual control linkage adjustment.
(3) Transmission throttle cable adjustment.
(4) Rear clutch assembly and/or tubes leaking.
(5) Valve body malfunction.
*(6) Rear clutch assembly and/or seal rings leaking.

Slip "I" Selected

(1) Fluid level.
(2) Manual control linkage adjustment.
(3) Transmission throttle cable adjustment.
(4) Rear band adjustment.
(5) Rear servo and/or tubes leaking.
(6) Valve body malfunction.
*(7) Front clutch assembly and/or seal rings leaking.
*(8) Output shaft plug leaking.
*(9) Rear band malfunction.

Slip "R" Selected

(1) Fluid level.
(2) Manual control linkage adjustment.
(3) Transmission throttle cable adjustment.
(4) Rear band adjustment.
(5) Rear servo assembly and/or tubes leaking.
(6) Valve body malfunction.
*(7) Rear clutch assembly and/or seal rings leaking.
*(8) Rear band malfunction.

8. INCORRECT OPERATION

Upshift "I" Selected

(1) Manual control linkage adjustment.
(2) Valve body malfunction.

Delayed Downshift

"2" Selected

(1) Manual control linkage adjustment.
(2) Governor valve malfunction.
(3) Front servo assembly and/or tubes leaking.
(4) Valve body malfunction.

"I" Selected

(1) Manual control linkage adjustment.
(2) Governor valve malfunction.
(3) Rear servo and/or tube leaking.
(4) Valve body malfunction.

Miscellaneous

"Park" Not Holding Vehicle

(1) Manual control linkage adjustment.
(2) Park pawl operating mechanism malfunction.

Incorrect Starter/Reverse Lamp Operation

(1) Manual control linkage adjustment.
(2) Mounting screws loose.
(3) Faulty connections or switch.

9. OVERHEATING

(1) Fluid level.
(2) Torque converter faulty.
(3) Heat exchanger or tubes/pipes blocked.
(4) Faulty cooling system.

* REQUIRES TRANSMISSION REMOVAL

SERVICE INFORMATION — PROCEDURES

The greater majority of Torqueflite service jobs can be traced back to shift quality or shift pattern irregularities. By comparison purely mechanical failures are few and far between. If a major mechanical failure does occur, chances are it was caused by an abnormal shift condition. If minor shift problems are corrected early enough, most mechanical failures can be avoided. For this reason this procedure is designed to assist in the diagnosis and correction of shift problems.

The obvious things must be checked first—fluid and service adjustments. Identify the exact nature of the complaint by road-testing the transmission. Once the trouble has been narrowed down to one of the clutches or bands, faults that could cause that one band or clutch to malfunction can be investigated.

There are four important service adjustments in the transmission:—

(1) Transmission Gearshift Control Linkage
(2) Transmission Throttle Cable
(3) Kickdown (Front) Band
(4) Low and Reverse (Rear) Band.

To ensure continued trouble-free operation, these four items should be adjusted in the manner set out in this section at the recommended intervals shown in the vehicle Certified Car Care Booklet and the fluid level and cleanliness maintained.

The conclusion that the valve body has probably caused the trouble must not be hastily drawn just because of its complex operation and construction.

Experience has shown that most troubles start with neglected service adjustments or fluid. The great majority of transmission problems develop because one of the bands or clutches is not doing *what* it is supposed to *when* it is supposed to do it. If it is known what the bands and clutches are supposed to do in low, second, direct and reverse, the band or clutch which is not operating correctly can be found by diagnosis when road-testing the vehicle.

Fluid Level

The fluid level should be checked first on every transmission complaint. Many malfunctions, such as erratic shifting, can be traced to an incorrect fluid level. If the fluid level is low, the clutches and bands will not operate properly, while a high fluid level can result in foaming of the transmission fluid which will allow air to enter the hydraulic system and upset the operation of the control valves, band servos and clutch pistons.

To Check Fluid Level

To carry out an accurate check on fluid level, the transmission fluid should be warmed up to normal operating temperature. Apply the parking brake and start the engine. Select each gear position to ensure all control circuits are filled with fluid, then select the Neutral position. The fluid level should never be above the "HIGH" mark or below the "LOW" mark. *Refer Figure 9.* If any doubt exists as to the temperature of the fluid, the fluid level should be rechecked after road-testing the vehicle. The difference between the "HIGH" and the "LOW" mark is ONE IMP. PINT.

When checking the fluid level, note the condition of the fluid as some good clues to the probable cause or extent of the trouble can often be obtained from the condition of the fluid.

Fluid with Burnt Odour

Black or dark-coloured fluid, having a strong, burnt smell, is caused by an overheated clutch or band.

By the time this condition becomes apparent, loose friction material from the deteriorating band or clutch has probably worked its way into the fluid passages in the transmission, causing valves to stick. Sticking valves may cause other friction elements to fail.

Milky-Appearing Fluid

If the fluid appears milky, it may be contaminated with water. This condition is not common, but it is possible.

Since the engine coolant attacks O-rings, seals, clutches and bands, a complete overhaul is necessary. If this condition is found, ensure that the reason for coolant leakage into the transmission fluid is rectified. Check for a leak in the transmission oil cooler in the lower tank of the radiator by disconnecting the fluid lines and applying air pressure to the tank—*no more than 50 p.s.i.* If a leak exists, air will bubble up through the coolant in the radiator.

Test Neutral Starting Switch Operation

Check that starter will operate only with the selector in "P" and "N" and that the reverse light operates only in "R". No adjustment is provided; where faulty, replace the switch assembly. Refer Paragraph 4.

Test Gearshift Control Linkage Adjustment

After checking the fluid level, take a moment to test the gearshift control linkage adjustment. With the engine running and the foot brake lightly applied, select "D" position and then the "N" position. Rev the engine. If there is a definite tendency for the car to move forward, with the transmission in neutral and the brakes released, check the gearshift control linkage adjustment.

Repeat the test by selecting "R" and then the "N" position. If the car definitely attempts to back up, the gearshift control linkage adjustment should be checked. Refer Paragraph 2 for gearshift control linkage adjustment.

Road Test

A road test takes time, but tackling a transmission problem without identifying the exact nature of the trouble does not save time on most transmission problems. Sometimes the nature of the complaint is obvious, however, more often than not it is hard to tell from the owner's account of his trouble just what he is complaining about.

Identify the Complaint

Find out exactly what the owner is complaining about by having the owner drive the vehicle so he can demonstrate the transmission fault.

Start with a Normal Transmission Performance

Before attempting to diagnose a condition on road test, the normal performance and shift qualities of that transmission must be fully understood and recognised.

If they are not, time should be taken to acquaint yourself with them by driving other vehicles that are correctly tuned and adjusted.

Road Test Procedure

Very little can be learnt about normal or abnormal automatic transmission operation by taking a short "joy ride", with the transmission in "D" range. All positions must be tried, accelerate and decelerate, compare shift quality under light, medium and heavy throttle and test kickdown and part throttle downshift performance.

It is most important to learn and visualise which band or clutch is being applied for each gear.

During the road test, concentrate your thoughts on what the clutches and bands are doing, rather than the control valves and hydraulic circuits.

Reference to the following "BAND AND CLUTCH APPLICATION CHART" will assist you when forming a mental picture of the internal functions of the transmission.

Breakaway Low

When either the "D" or the number "2" positions are selected, the transmission shifts into "Breakaway Low" for good acceleration from a standing start. In this gear the front clutch is applied and the over-running clutch locks to obtain the first gear ratio. It must be remembered that the over-running clutch will transmit power on forward drive only.

BAND AND CLUTCH APPLICATION CHART

LOW (Breakaway)	LOW (Lock-up) No. 1 Position	SECOND (Kick-down) No. 2 Position	DIRECT	REVERSE
FRONT CLUTCH	FRONT CLUTCH	FRONT CLUTCH	FRONT CLUTCH	REAR CLUTCH
OVER-RUNNING CLUTCH	LOW AND REVERSE (REAR) BAND	KICK-DOWN (FRONT) BAND	REAR CLUTCH	LOW AND REVERSE (REAR) BAND

It automatically releases on deceleration and no power is transmitted from the rear wheels to the engine. There is no engine breaking and the vehicle simply coasts *(refer Fig. 1).*

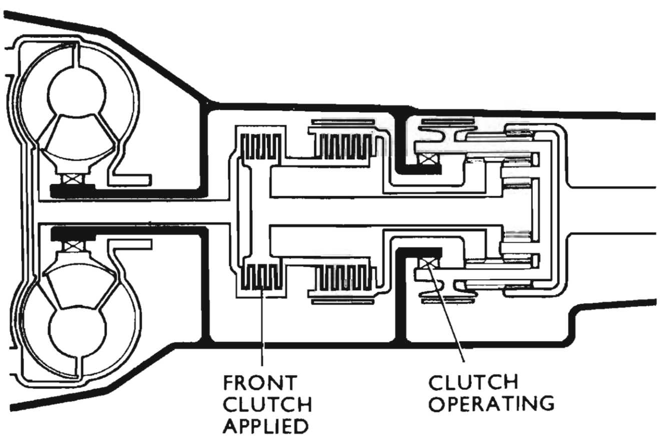


Fig. 1 – Elements applied in breakaway low

Number "l"—Low

When the number "1" position is selected, the front clutch is applied just as it was in breakaway.

In addition, the low and reverse (rear) band is applied *(refer Fig. 2).*

The low and reverse band is a "two-way" coupling, giving a low gear ratio for both accelration and deceleration. That is, it provides maximum engine braking whereas the over-running clutch provides *no* engine braking.

If the low-reverse band should fail to apply, the over-running clutch would transmit the drive on acceleration giving a condition as in breakaway low in the number "1" position. As with breakaway low, there would not be any engine braking on deceleration. In addition, there would not be any power transmitted through the transmission with the reverse "R" position selected. This will be explained fully in "Reverse Gear paragraph, foot of Page 21-31.

Since the low and reverse band provides a low gear ratio for both acceleration and deceleration, the reason for employing the over-running clutch to obtain low gear ratio in breakaway low may cause some confusion. As band-to-band shifts are difficult to synchronize and are apt to be very harsh, the over-running clutch is utilized in breakaway low to ensure a smooth shift from first to second. Also a closed throttle downshift to a low gear which provided maximum engine braking would be abrupt and undesirable. This can be demonstrated by releasing the pressure from the throttle and selecting the number "1" position at 15 m.p.h.

A noticeable jolt will be felt as the transmission downshifts into low gear. Part of the jolt is engine braking and part of it is from the low and reverse band application.

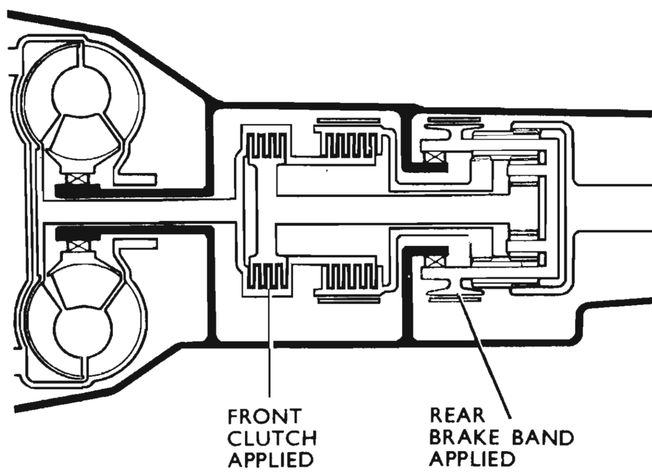


Fig. 2 – Elements applied in No. 1 position—low

To eliminate the harsh shifts between low and second, the over-running clutch acts as follows:

For smooth one-two upshifts, the over-running clutch simply over-runs as soon as the kickdown band is applied. The problem of timing or synchronising the upshift is eliminated. For smooth, closed throttle downshifts, the over-running clutch simply "coasts". The shift is very smooth and the over-running clutch stands by to pick up the load automatically when the driver chooses to accelerate/ drive.

Test for Front Clutch Slippage

Here is an example of how a working knowledge of bands and clutches can be applied to road test diagnosis.

If slippage exists in the low gear with the number "1" position selected, as well as in breakaway low, the trouble must be in the front clutch. The front clutch is the common drive element to both the breakaway low and number "l" low *(refer Fig. 3).*

Second Gear

In second, the front clutch and the kickdown band are applied. If the transmission slips in second, but does not slip in breakaway low, or direct the trouble must be in the kickdown band application

SLIPPAGE

LOW (Breakaway)	LOW No. "1" position
FRONT CLUTCH	FRONT CLUTCH
OVER-RUNNING CLUTCH	LOW AND REVERSE BAND

COMMON ELEMENT

Fig. 3 – Diagnosis of front clutch slippage

(refer Fig. 4). At this point it will not be known whether the trouble is in the band itself or in the band apply circuit.

However, the friction element at fault is known and investigations can start at this point . . . starting with kickdown band adjustment.

Reference to *Fig. 4* will show that the slippage is not in the front clutch. Eliminating the friction elements that are not giving trouble speeds up the job of diagnosis and service.

> NOTE: If the transmission shifts from low to direct, missing second completely, the kickdown band is not applying.

DOES NOT SLIP

SLIPS

LOW (Breakaway)	SECOND	DIRECT
FRONT CLUTCH	FRONT CLUTCH	FRONT CLUTCH
OVER-RUNNING CLUTCH	KICKDOWN BAND	REAR CLUTCH

TROUBLE

Fig. 4 – Diagnosis of kickdown band slippage

Direct Drive

In direct drive the front clutch and rear clutch are both applied. The front clutch is applied in direct, second and low . . . *in all forward gears.* Therefore, if slippage occurs in direct drive but not in second or low, the front clutch can be considered satisfactory.

By the process of elimination the trouble must be with the rear clutch *(refer Fig. 5).*

NO SLIPPAGE SLIPPAGE

LOW (Breakaway)	LOW No. 1 Position	SECOND	DIRECT
FRONT CLUTCH	FRONT CLUTCH	FRONT CLUTCH	FRONT CLUTCH
OVER-RUNNING CLUTCH	LOW AND REVERSE BAND	KICK-DOWN BAND	REAR CLUTCH

TROUBLE

Fig. 5 – Diagnosis of rear clutch slippage

NO SLIPPAGE SLIPPAGE

DIRECT	REVERSE
REAR CLUTCH	REAR CLUTCH
FRONT CLUTCH	LOW AND REVERSE (REAR) BAND

TROUBLE

Fig. 6 – Diagnosis of reverse band slippage

Reverse Gear

In reverse gear, the rear clutch and the low and reverse (rear) band are applied. The rear clutch is the friction member that is common to direct drive and reverse *(refer Fig. 6).* If there is slippage in reverse but no slippage in direct drive, the trouble is most likely in the low and reverse band application.

NOTE: If the low and reverse band should fail to apply, no engine braking could be obtained with the transmission in the "LOW No. 1" position. (Refer Paragraph headed NUMBER 1 LOW.)

Diagnosis by Elimination

The clutch and band application chart shown earlier is a simple but extremely useful aid to diagnosis. The examples and explanations shown in the foregoing paragraphs illustrate how fault diagnosis is simplified when it is known which bands and clutches are applied for each gear. It is not practical in a section of this size to try and cover every conceivable type of malfunction or shift quality problem. It must be realised that occasionaally a condition will be encountered where a road test will not isolate the trouble to one band or clutch.

If more than one friction element is faulty or if friction material is preventing the valves in the valve body from operating correctly, the symptoms may be confusing. However, in these cases the road test will help to confirm the suspected fault when the burnt friction material was discovered in the transmission fluid; the transmission must be completely overhauled.

On the other hand, removal of the transmission unnecessarily can be avoided if the exact trouble that the owner is complaining about is identified during the road test.

Engine Performance is very important

The condition of the engine must not be overlooked, particularly on complaints relating to shift quality or performance. Idle speed and engine performance should be up to specifications as the shift pattern and shift quality of the transmission is tailored to normal engine performance.

The transmission *cannot* compensate for an engine which has become sluggish, it will automatically continue to carry out each shift as crisply as it should for a correctly tuned engine delivering full torque. The usual result being delayed or harsh shifts.

If the engine output is low, the driver has to open the throttle more to accelerate. Transmission throttle pressure will be too high in relation to actual engine torque, resulting in delayed, harsh shifts which resemble the trouble encountered when transmission throttle cable adjustment is advanced too much. Under no circumstances should transmission throttle cable be adjusted to compensate for poor engine performance; correctly "tune" the engine.

More than one shift quality complaint has been corrected by correcting engine performance and *not* touching the transmission.

Transmission Throttle Cable and Shift Quality

After the carburettor has been serviced, the transmission throttle cable adjustment must be checked as sufficient clearance may exist at the carburettor lower body attaching holes to allow the carburettor to be installed in a different position than it was originally. This may be just enough to upset the transmission throttle cable adjustment.

Late Harsh Shifts

Should the transmission upshift late — at higher speeds than normal—it is quite possible that transmission throttle advance is leading carburettor throttle advance. (When transmission throttle pressure is too high, relative to engine torque, shifts are late and harsh.)

Early Mushy Shifts

Should the transmission upshift too soon — at lower speeds than normal — it is quite likely that the transmission throttle cable is incorrectly adjusted. Transmission throttle cable is lagging behind carburettor throttle advance, scheduling shifts sooner than normal (when transmission throttle pressure is not high enough to provide a crisp, firm shift).

Shift Speeds

The shift pattern summary chart of this section summarises shift speeds for the transmission.

Reference to this chart should be made when conducting a road test. However, it is *permissible* for shift speeds to occur just *outside* the ranges, *as long as* the shift quality is good.

Speedometer error, abnormal vehicle loading and abnormal operating conditions also affect the shift points. However, if shift speeds are appreciably outside the specified range, transmission throttle cable adjustment may be incorrect.

STALL TEST

WARNING: During test let no one stand in front of vehicle.

The stall test consist 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 r.p.m. 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 r.p.m., transmission clutch slippage is indicated. Follow the transmission oil pressure and air pressure checks outlined in the Service in 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 r.p.m. below specification and the vehicle operates properly *at highway* speeds but has poor through-gear acceleration, the stator over-running 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.

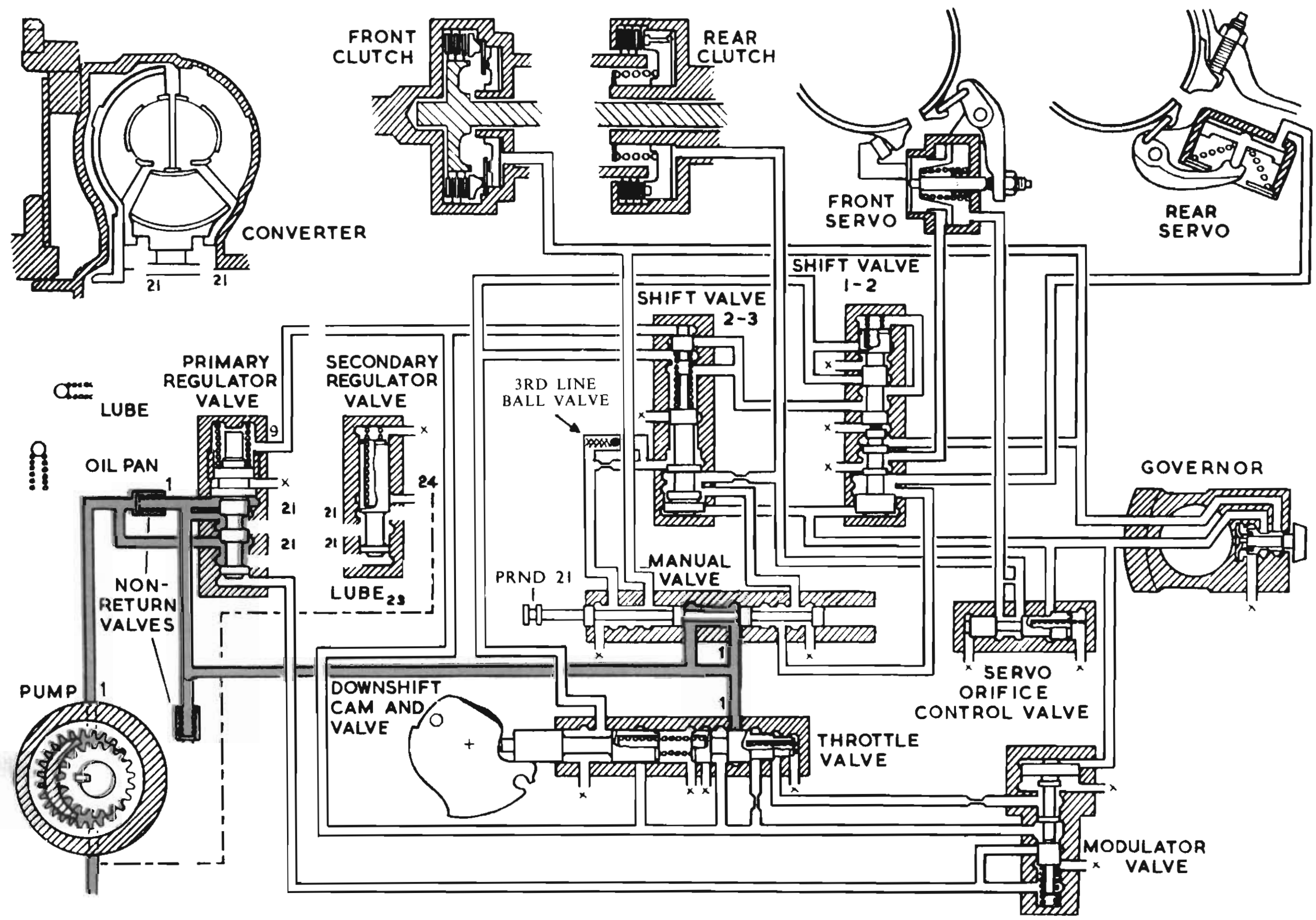
Both of these stator defects require replacement of the torque converter.

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.

MODEL	R.P.M.
215, 245 "D"	1700–1800
265 2BBL "C"	1900–2050

Fig. 7 –



R544A

LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

EXHAUST

R

Fig. 8 – Hydraulic circuit diagram (neutral selected)

HYDRAULIC CIRCUIT

IN

N — NEUTRAL

(See Figure 8 on opposite page)

With the engine running, the pump produces hydraulic fluid pressure for whole system.

The primary regulator valve regulates line pressure (1) which is directed to the manual valve and throttle valve. It also permits fluid to reach the secondary regulator valve.

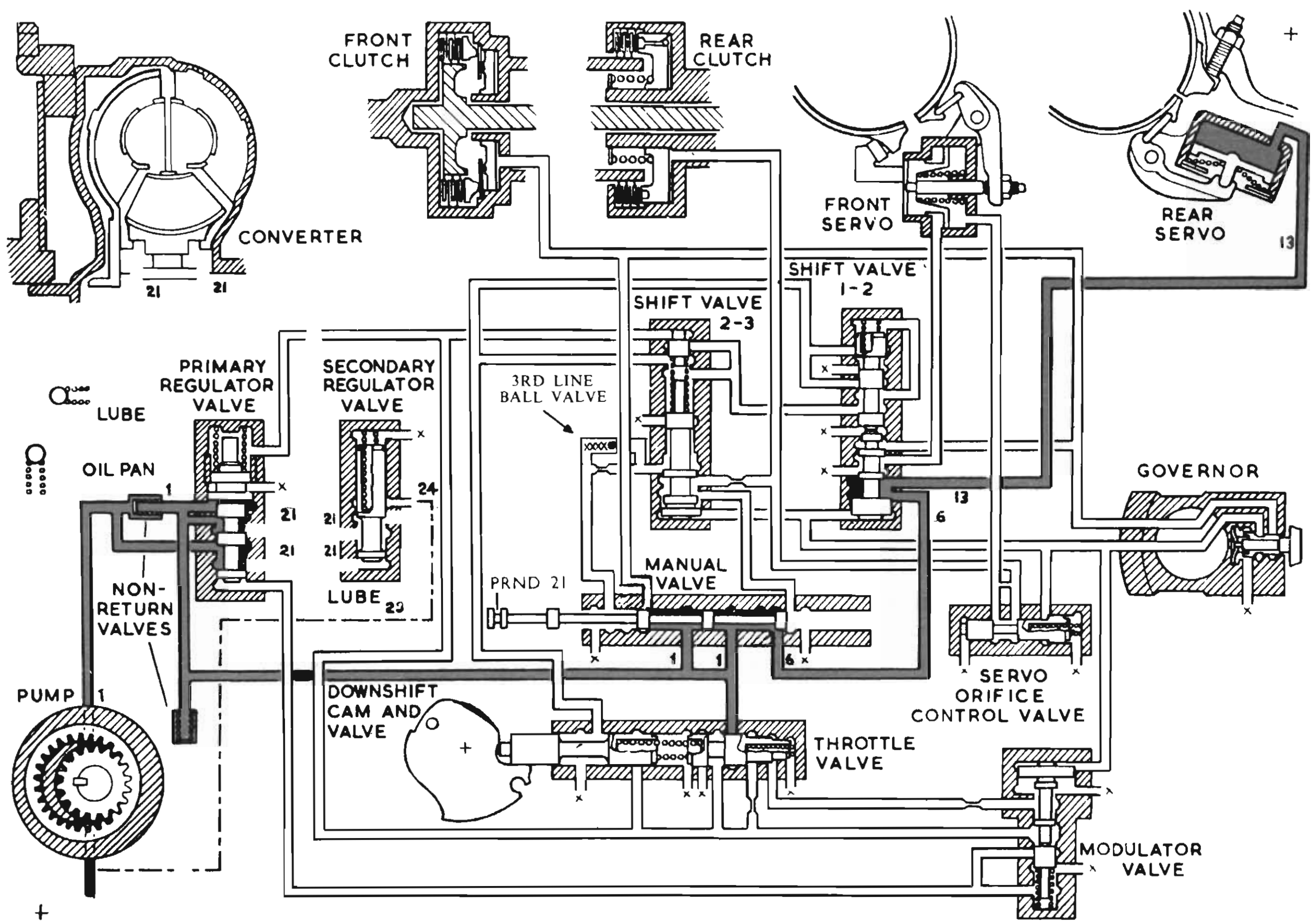
The secondary regulator valve regulates pressure to the converter and lubrication of the front end of the gear train (21). Identical pressure (23) is directed to the rear end of the gear train. The valve returns excess flow (24) to the oil pan through the pump inlet, thus partially returning the pump output.

POWER FLOW

Neutral

The front and rear clutches are off and no power is transmitted from the converter to the gear set.

The front and rear bands are also released.



LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

EXHAUST

R

Fig. 8a – Hydraulic circuit diagram (park selected)

HYDRAULIC ACTION

IN

P — PARK

(See Figure 8A on opposite page)

An internal linkage from the manual valve detent lever engages the parking pawl with teeth formed on the outside of the driven shaft ring gear.

With the engine running, the operation of the hydraulic system is identical to N except that the manual valve directs line pressure (6) to the rear servo (13).

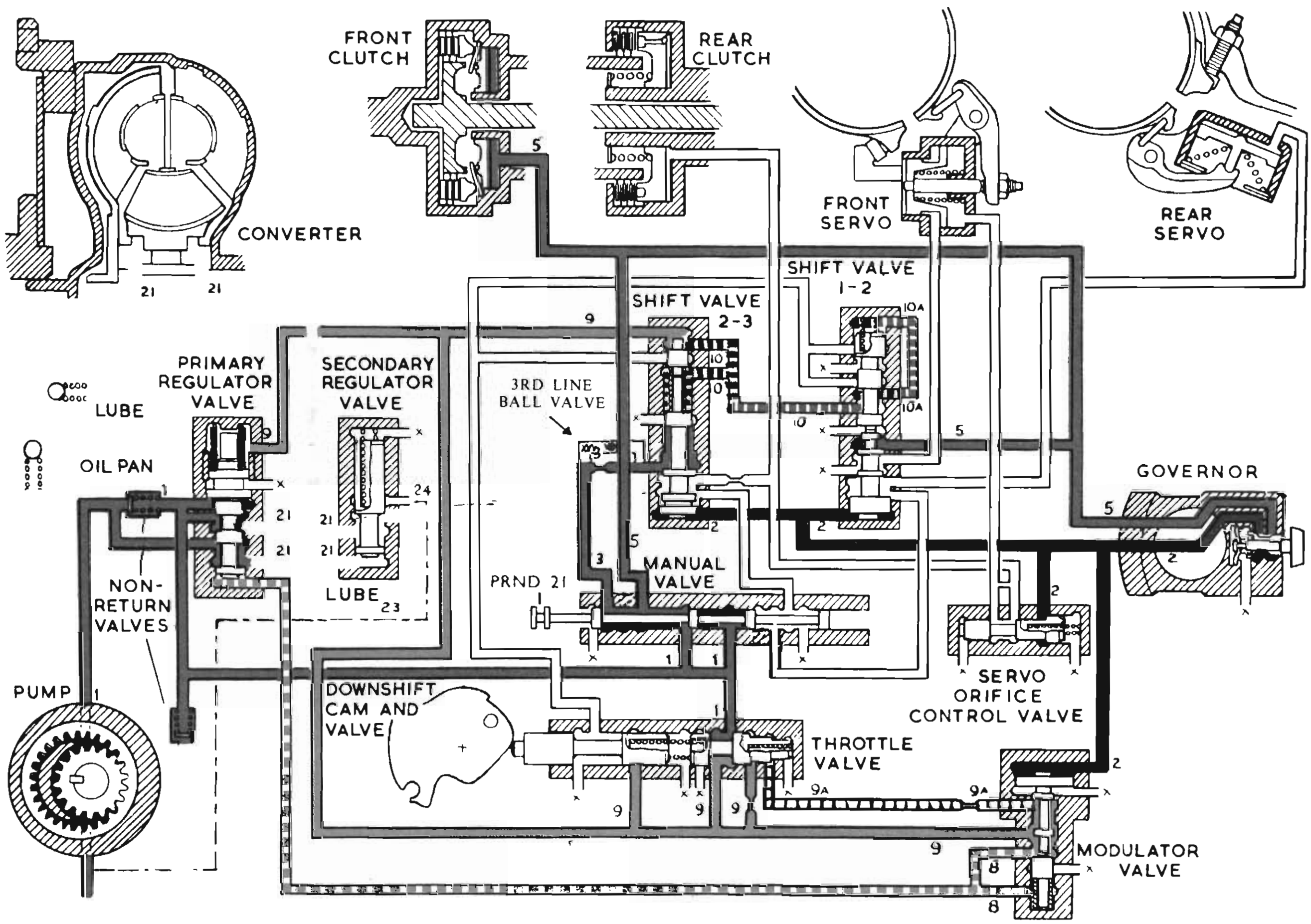
This arrangement is based upon the design of the hydraulic system without the rear servo or band performing any function in this selector position.

POWER FLOW

Park

The front and rear clutches are off and no power is transmitted from the converter to the gear set.

The front band is released. For constructional reasons the rear band is applied as long as the engine is running.



R547

LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

GOVERNOR PRESSURE

THROTTLE PRESSURE

MODULATED THROTTLE PRESSURE

THROTTLE PRESSURE CONTROLLED BY MODULATOR VALVE

SHIFT VALVE PLUNGER PRESSURE

EXHAUST

Fig. 8b – Hydraulic circuit diagram (1st gear selected)

HYDRAULIC ACTION

IN

DRIVE "1" — LOW

(See Figure 8B on opposite page)

Pressure control of the pump will be as in R but with the throttle valve in the full throttle position as illustrated, throttle pressure (9) regulated by the modulator valve plunger (8) acts upon the primary regulator valve opposing throttle pressure (9), thus modulating line re-regulating pressure in the interest of gear shift quality.

The manual valve directs line pressure (5) to the front clutch, governor feed and 1–2 shift valve for the subsequent 1–2 shift. Line pressure (3) reaches the 2–3 shift valve for the subsequent 2–3 shift.
The front clutch applied in conjunction with the one-way clutch, permits the car to move off from rest, in first gear.

DRIVE '1' (Low)—POWER FLOW

—Front clutch applied

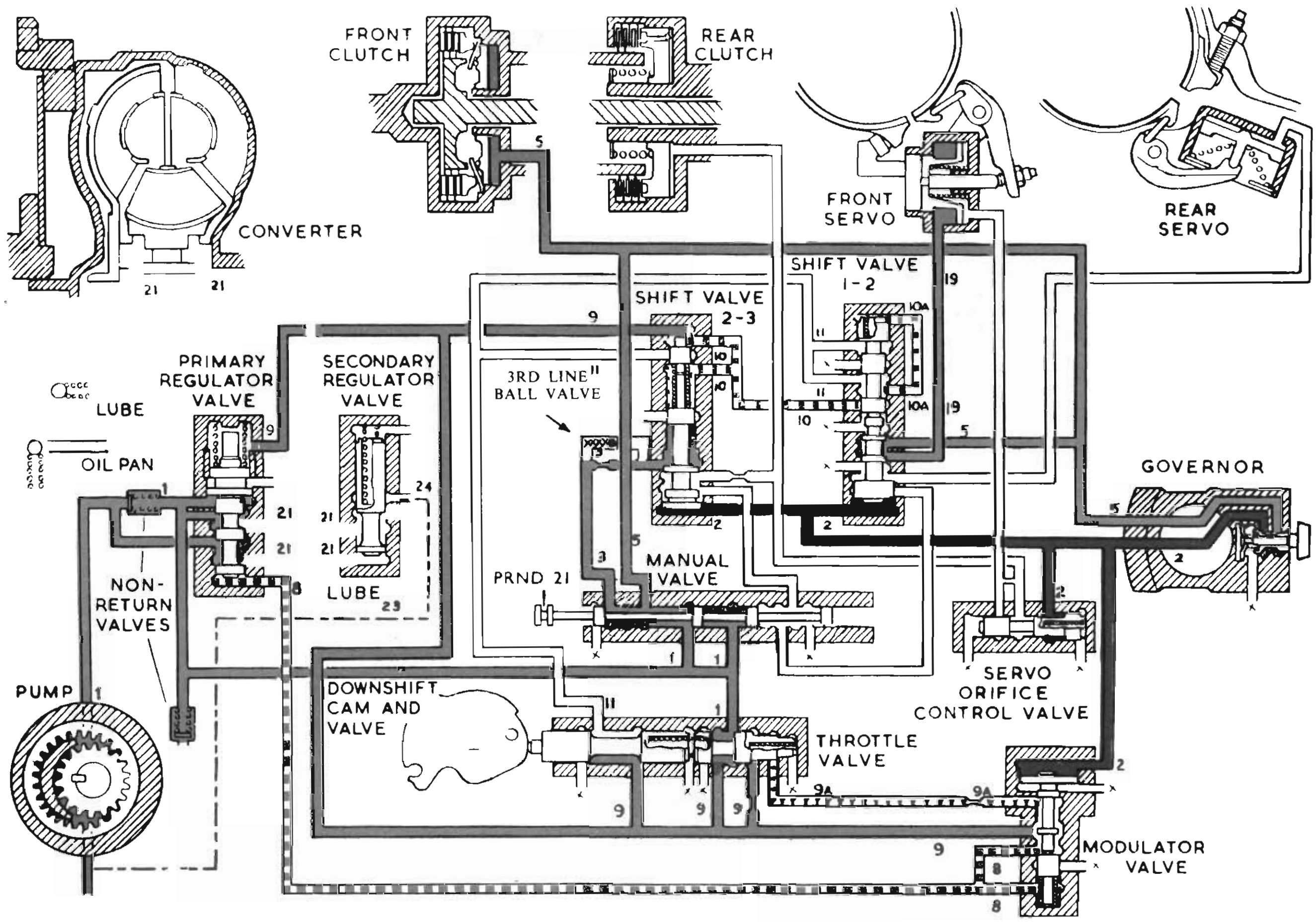
—One-way clutch in use.

—Power through front clutch drives small sun gear to short pinions, long pinions and ring gear.

—Planet carrier prevented from rotating anti-clockwise by one-way clutch.

—Ring Gear fixed to output shaft.

—Free wheeling because of one-way clutch.



R548A

LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

GOVERNOR PRESSURE

THROTTLE PRESSURE

FORCED THROTTLE PRESSURE

MODULATED THROTTLE PRESSURE

THROTTLE PRESSURE CONTROLLED BY MODULATOR VALVE

SHIFT VALVE PLUNGER PRESSURE

EXHAUST

Fig. 8c – Hydraulic circuit diagram (2nd gear engaged—drive selected)

HYDRAULIC ACTION

IN

DRIVE 2 OR SELECTED 2 — INTERMEDIATE

(See Figure 8C on opposite page)

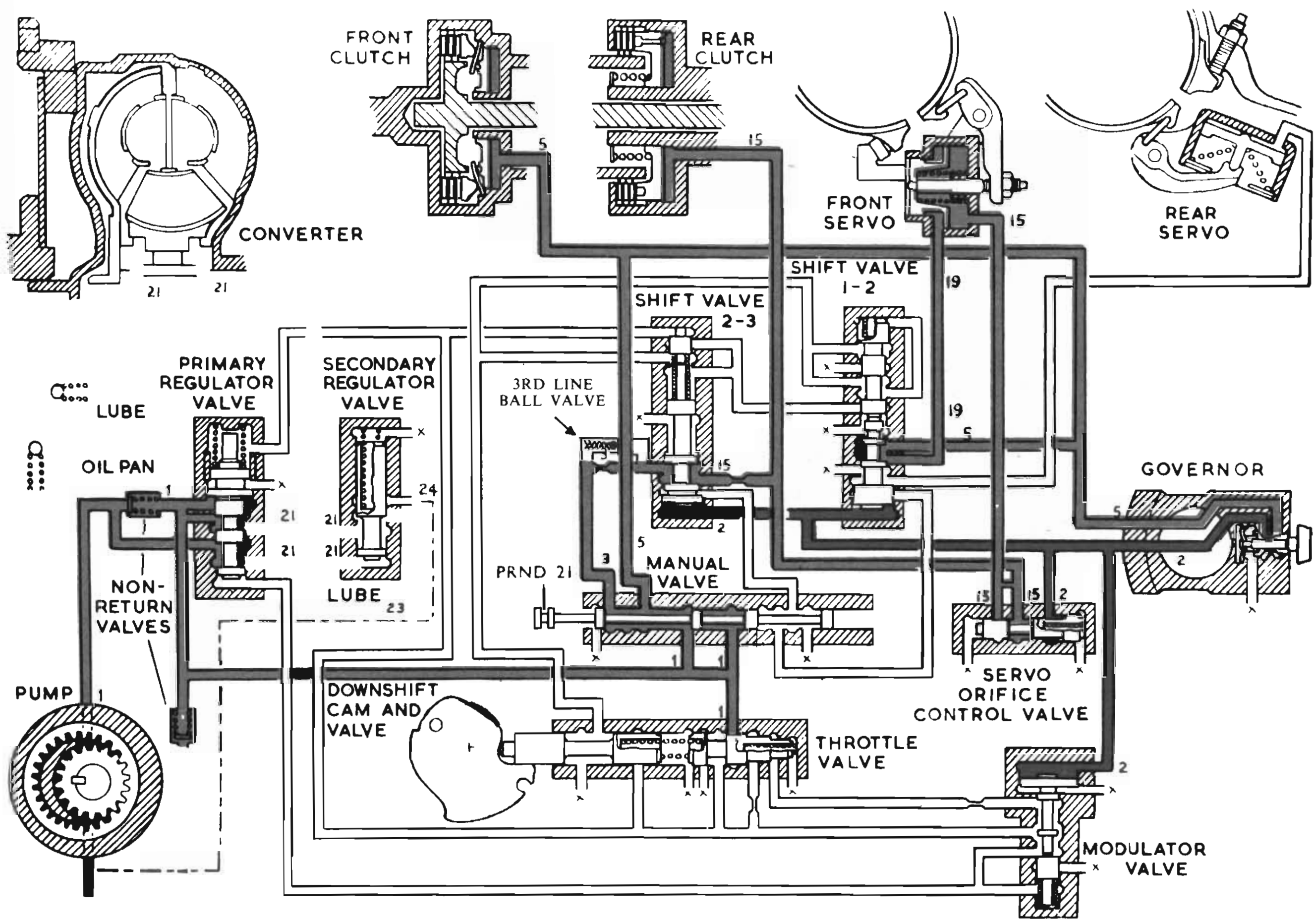
Pressure control by the primary regulator valve of the pump output provides torque converter and front lubrication requirements (21) as well as rear lubrication (23). Modulated throttle pressure (8) acts upon the primary regulator valve as in Drive 1. Shift control is provided by the 1–2 shift valve moving against spring pressure under influence of governor pressure (2). This permits line pressure (5) to reach the apply side of the front servo (19). The front band thus applied, in conjunction with the front clutch, provides 2nd gear. With the downshift valve in the forced throttle position as illustrated, forced throttle pressure (11) acts upon the 1–2 and 2–3 shift valves in addition to throttle pressure (10), thus further delaying upshifts or providing a 2–1 downshift at speeds when there is little governor pressure (2).

DRIVE 2 (Intermediate) SELECTED 2—
POWER FLOW

—Front clutch applied

—Front band applied

—Power flow as in Drive '1' except front band has locked the large sun gear. This has caused the planet carrier to revolve clock-wise over-riding the one-way clutch and increasing output shaft speed.



R549A

LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

GOVERNOR PRESSURE

EXHAUST

Fig. 8d – Hydraulic circuit diagram (direct drive—"D" selected)

HYDRAULIC ACTION

IN

3 — DIRECT DRIVE

(See Figure 8D on opposite page)

Pressure control is as in Drive 2 except that in the throttle valve position shown (minimum throttle) no throttle pressure or modulated throttle pressure acts upon the two ends of the primary regulator valve.

Shift control is provided by the 2–3 shift valve moving against spring pressure under influence of governor pressure (2). This permits line pressure (3) to reach the rear clutch direct (15) together with front servo release pressure directed through the servo orifice control valve. When governor pressure (2) is apparent, the servo orifice control valve closes, forcing front servo release pressure through a .052″ orifice which thus affects the relationship between rear clutch apply and front servo release in accordance with road speed.

Because the release side of the front servo has a larger area than the apply side, the front servo will disengage the band. The rear clutch now engaged in conjunction with the front clutch provides 3rd gear.

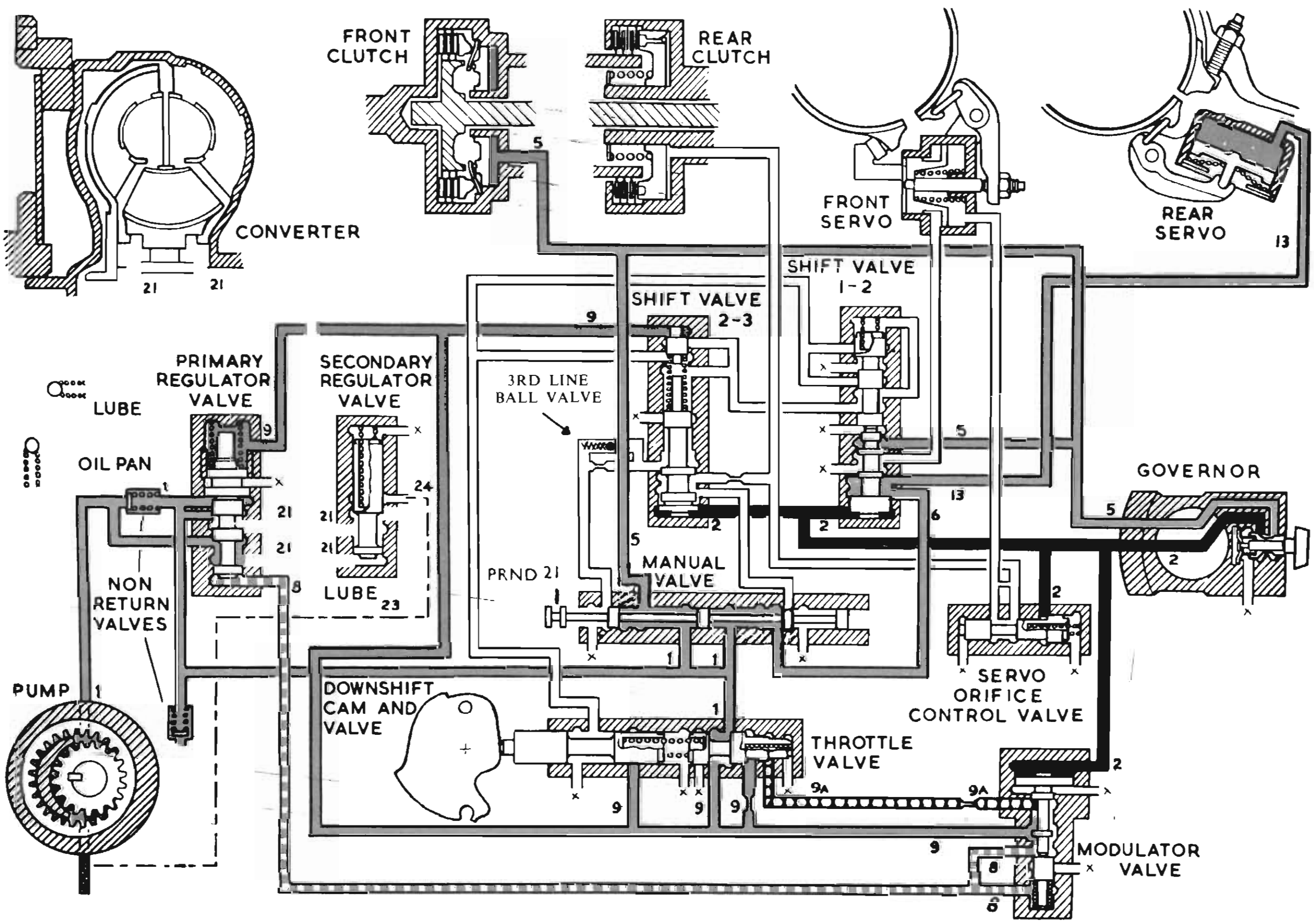
The absence of throttle pressure as mentioned above will cause the 2–3 shift valve to move early under influence of governor pressure, thus providing a low-speed 2–3 shift.

DRIVE DIRECT—POWER FLOW

—Front clutch applied

—Rear clutch applied

—Both sun gears are driven together locking up the gear train giving straight through drive.



R550

LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

GOVERNOR PRESSURE

THROTTLE PRESSURE

MODULATED THROTTLE PRESSURE

THROTTLE PRESSURE CONTROLLED BY MODULATOR VALVE

EXHAUST

6550

8e – Hydraulic circuit diagram (1st gear engaged—"1" selected)

HYDRAULIC ACTION

IN

1 — (SELECTED)

(See Figure 8E on opposite page)

Pressure control of the pump will be as in Drive 1 as the same position of throttle valve (full throttle) is illustrated.

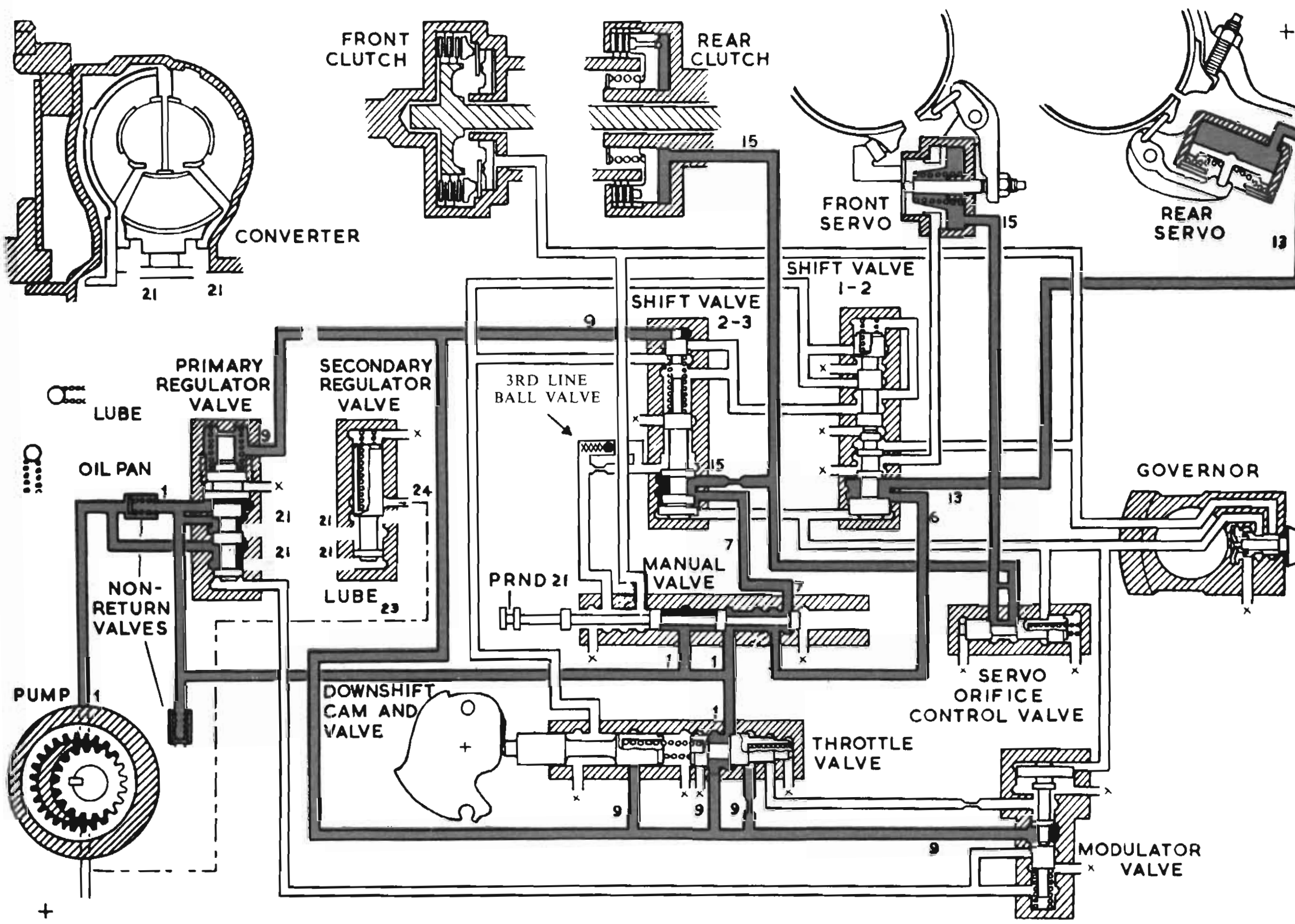
In first gear, in Selected "1", the manual valve directs line pressure (5) to the front clutch, governor feed and 1–2 shift valve. In the position illustrated, the 1–2 shift valve is subjected to insufficient governor pressure (2) to overcome spring pressure. The result is that the valve prevents line pressure (5) from reaching the apply side of the front servo but line pressure (6) is open to the rear servo (13). For second gear in the Selected "1" position (not shown in Figure 8E), the manual valve opens to exhaust the rear clutch and front servo release circuit from the 2–3 shift valve. This causes a downshift from 3rd gear whenever "1" or "2" is selected at speed. In this condition governor pressure (2) will move the 1–2 shift valve; the result is that line pressure (6) will then be blocked from the rear servo (13) but open (5) to the apply side of the front servo (19) as in Drive 2.

SELECTED "1" (LOCK-UP)—POWER FLOW

—Front clutch applied

—Rear band applied

—Power flow as in Drive "1" with the exception that engine braking is obtained because rear band holds planet carrier from rotating.



R546

LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

THROTTLE PRESSURE

EXHAUST

R

8f – Hydraulic circuit diagram ("R" reverse selected)

HYDRAULIC ACTION

IN

R — REVERSE

(See Figure 8F on opposite page)

Pressure control of the pump is as in P or N but in accordance with accelerator pedal depression, throttle pressure (9) is directed to the spring end of the primary regulating valve thus increasing line pressure (1) in accordance with torque capacity requirements.

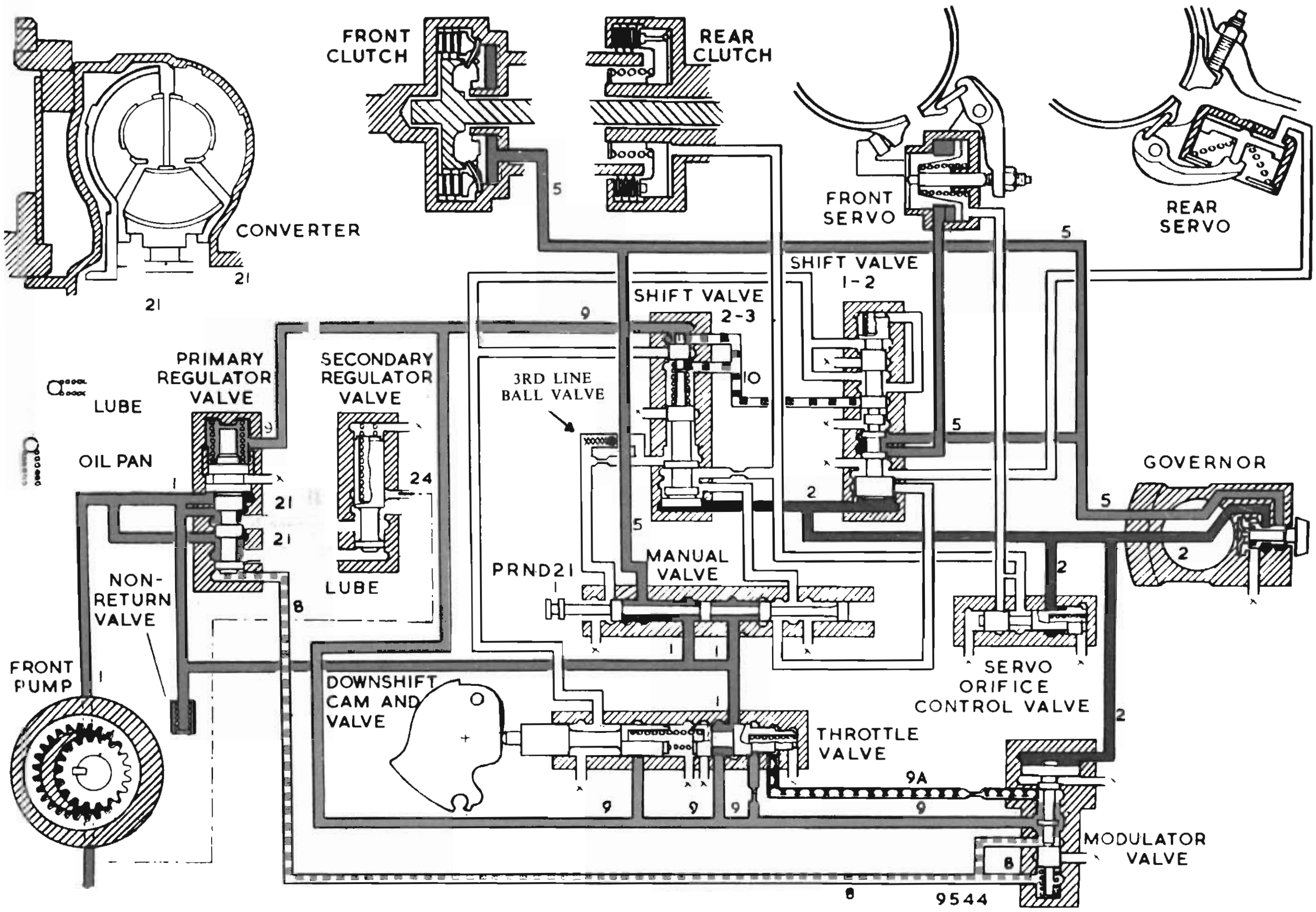
The manual valve directs line pressure (6) through the 1–2 shift valve to the rear servo (13) and line pressure (7) through the 2–3 shift valve to the rear clutch and front servo release (15). Due to absence of governor pressure the shift valves and servo orifice control valve perform no function in this selector position. The fluid passages 13 and 15 of other manual valve positions are utilised in R to simplify the hydraulic circuit.

REVERSE—POWER FLOW

—Rear clutch applied

—Rear band applied

—Power through a rear clutch drive large sun gear. Planet carrier is held by rear band, giving a step-down ratio in reverse.



LINE OR DIRECTED LINE PRESSURE

CONVERTER PRESSURE

GOVERNOR PRESSURE

THROTTLE PRESSURE

MODULATED THROTTLE PRESSURE

THROTTLE PRESSURE CONTROLLED BY MODULATOR VALVE

SHIFT VALVE PLUNGER PRESSURE

EXHAUST

The numbers refer to the hydraulic circuits on page 21 - 34

9544 A.

Fig. 8g – Hydraulic circuit diagram (2nd gear engaged—2 selected)
Intermediate power flow is shown on page 21 - 42

CIRCUIT IDENTIFICATION AND CIRCUITS

Circuit No.	Pressure	From	To	Remarks
1	Line Pressure	Pump	Primary Regulator Manual Control Throttle Valve	
2	Governor Pressure	Governor	Modulator 1–2 Shift 2–3 Shift Servo Orifice Control Valve	Varies with Road Speed
3	Directed Line Pressure	Manual Control Valve	2–3 Shift Valve	in D '3'
5	Directed Line Pressure	Manual Control Valve	Front Clutch Governor feed 1–2 Shift Valve	in '1' '2' and D
6	Directed Line Pressure	Manual Control Valve	1–2 Shift Valve	in '1' '2' D R and P
7	Directed Line Pressure	Manual Control Valve	2–3 Shift Valve	in R and P
8	Modulated Throttle Pressure	Modulator Valve	Primary Regulator Valve (piston end)	
9	Throttle Pressure	Throttle Valve	Modulator Valve Primary Regulator Valve (spring end) 2–3 Shift Valve Shift Valve Plunger	
9A	Throttle Pressure Controlled by Modulator Valve	Modulator Valve	Throttle Valve	Doubles Throttle Pressure before cut back and increases line pressure under part throttle acceleration
10	Shift Valve Plunger Pressure	Shift Valve Plunger	2–3 Shift 1–2 Valves	
10A	Shift Valve Plunger Pressure	Shift Valve Plunger	1–2 Shift Valve	in 1st Gear only
11	Forced Throttle Pressure	Downshift Valve	1–2 Shift 2–3 Valves	
13	Line Pressure	1–2 Shift Valve	Rear Servo Apply	
15	Line Pressure	2–3 Shift Valve	Rear Clutch and Front Servo release	
19	Line Pressure	1–2 Shift Valve	Front Servo Apply	
21	Converter Pressure	Primary Regulator Valve	Secondary Regulator Valve	
23	Lubrication Pressure	Secondary Regulator Valve		
24	Exhaust (Vent)	Secondary Regulator	Pump Suction	

The Hydraulic System

In brief, hydraulic fluid is pumped under pressure to the control system. The control system regulates the fluid pressure and directs the fluid to the hydraulic operating units—the clutch pistons and band servos.

It is not essential to have a complete working knowledge of every valve in the control system, the road test and pressure test will provide all the clues needed to diagnose shift troubles.

The pressure supply system consists of an oil pump driven by the engine through the torque converter to supply all the pressure for hydraulic and lubrication requirements.

> NOTE: It is not possible to start the engine through the transmission by pushing or towing.

Whenever the vehicle it to be towed the following precautions must be adhered to:

Transmission Inoperative

Tow the vehicle with a rear end pick-up or disconnect the propellor shaft.

Transmission Operating Properly

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 pick-up or disconnect the propellor shaft, from the rear axle, then strapping the propeller shaft to body.

Hydraulic System "Lock-up"

All hydraulic circuits in the Torqueflite are vented whenever they are not being used to apply a clutch or band. Consequently it is not possible for fluid under pressure to be trapped in an unused circuit where it could prevent the release of the operating unit.

If a clutch or band hangs up, the trouble is mechanical.

Service Adjustments and Tests

The road test will help pinpoint the trouble to one specified clutch or band. If the problem is traced to either the kickdown band or the low and reverse band, a band adjustment may be all that is needed to correct the complaint. However, if an adjustment appears to correct the complaint, ensure that a sample of the transmission fluid is checked for loose particles of band facing material before returning the vehicle to its owner.

Any evidence of deteriorating friction material necessitates a complete overhaul.

On complaints of poor shift quality, the gear shift control linkage adjustment and the transmission throttle cable adjustment must be checked. These two adjustments will correct many shift complaints and they are insurance against transmission troubles of a more serious nature.

Procedures for carrying out the following service adjustments and tests necessary for diagnosing Torqueflite faults are outlined in the Service Information Procedures—Paragraphs 2 and 3.

1. Low and reverse band adjustment.
2. Kickdown band adjustment.
3. Transmission throttle cable adjustment.
4. Line pressure check.

Important Service Precautions

A Torqueflite transmission is a complex assembly . . . particularly the valve body. However, it is not necessary to know how every control valve and hydraulic circuit works to do an expert job of servicing the transmission. Accurate diagnosis will indicate what to concentrate on if disassembly and repair is necessary. It will also help to avoid unnecessary disassembly.

The Valve Body

The valve body is undoubtedly the one part of the transmission that technicians fear most, and because the valve body is complex and awe-inspiring many serviceable valve bodies are replaced unnecessarily.

Of course, a new valve body will cure many shift problems but a thorough cleaning of the original valve body could also cure the shift problem.

> NOTE: The most common cause of valve body trouble is dirt, not worn or damaged parts.

Valve Body Service Tips

There are three important points to remember when servicing the valve body.

1. Handle all parts gently.
2. Clean all parts thoroughly, and keep them clean.
3. Assemble all parts correctly.

If the above cardinal rules of valve body service are observed and the service tips below are read, no trouble should be experienced.

Handle Parts Gently

Never clamp the valve body or any part of a body in a vice. Do not use force when removing or installing parts. The "fits" between valves and bores are close but they will go together easily if they are free from nicks and burrs and absolutely clean. Be careful not to drop any of the parts, particularly the valves.

Clean Parts Thoroughly

Since dirt is the number one *enemy* of the valve body assembly, it stands to reason that a thorough cleaning is the number one cure. Many technicians prefer to clean the parts in a series of solvent-filled containers, beginning at one with solvent that has been used considerably. In this container, the largest deposits are removed. From there, the parts are immersed in containers having successively cleaner solvent. Fnishing with a clean solvent, rinse. Dry the parts with clean, dry compressed air. Do not wipe parts with a cloth—lint will remain on the parts.

Test Valves

To ensure the valves will operate when the valve body assembly is rebuilt, test the valves, one at a time. Slip a valve into its bore in the valve body. Do not lubricate the valve or install any springs for this test. Tip the body back and forth so that the valve moves back and forth in its bore. If the valve does not move freely, remove it and inspect for burrs on the valve lands. Slight burrs can be polished down using crocus cloth, but *be careful not to round off the corners* of the lands. These sharp edges are essential for proper valve operation.

Assemble Parts Correctly

During assembly of the valve body, do not trust your memory; follow the Service instructions and illustrations contained on Pages 21–66 to 21–70.

Inspection During Disassembly

Every part of the suspected system should be carefully examined as it is removed. Pay particular attention to the condition of the O-rings and other seals. Also examine the seal and bushing area of the impeller hub. This area should be extremely smooth to the touch. Any wear or roughness will cause seals to fail. Finally, be sure to clean and carefully inspect the pump. Since it is the only source of hydraulic pressure, it is essential that it be in good condition.

Cleanliness

The importance of doing everything possible to ensure that the transmission be kept absolutely clean cannot be overstressed. If any part of the transmission has failed, the torque converter must be flushed to ensure that fine metal particles or small fragments of friction material are not left to circulate through the reconditioned transmission. Do not be afraid to use plenty of solvent—keep flushing until the solvent comes out clean.

Do not neglect to clean the oil cooler and its connecting lines thoroughly.

SHIFT PATTERN SUMMARY

Condition	Engine Application Transmission Model Axle Ratio	215 and 245 Single bbl. 'D' 3.23	 2.92	265 2bbl. 265 Two bbl. 'C' 3.23	 2.92
Closed Trottle 1–2 upshift		6–11	7–12	8–14	9–15
Closed Throttle 2–3 upshift		11–15	12–17	12–19	13–21
Forced (wide open Throttle 1–2 upshift)		28–37	31–41	33–43	37–47
Forced (wide open Throttle 2–3 upshift)		53–62	59–69	58–67	63–74
Kickdown limit 3–2 downshift		45–54	50–60	50–59	55–65
Kickdown limit (incl. 2–1) 3–1 downshift		16–25	18–28	21–30	23–33
Closed Throttle 3–1 downshift		5–9	6–10	7–12	8–13
Closed Throttle 2–1 downshift		9–17	10–19	12–20	13–22
Part Throttle 3–2 downshift (1/3 Throttle i.e. .6″ Cable Movement)		10–20	11–22	15–25	17–27
Part Throttle 3–2 downshift ($\frac{3}{4}$ Throttle i.e. 1.3″ Cable Movement)		20–30	22–33	25–35	27–39

SERVICE INFORMATION — PROCEDURES

1. LUBRICATION

Fluid Level

The fluid level should be checked at every engine oil change period. When checking, the engine and transmission should be at normal operating temperature and the vehicle standing on a level floor. The lever indicator is located to the left of the engine *(refer Fig. 9).*

(1) With the parking brake applied and the engine idling, select each gear position momentarily, ending with "N" Neutral position, allow to idle for two minutes.

(2) The fluid level should check at the "full" mark, or slightly below, but never above the "full" mark when the engine is at its normal temperature. Add or remove fluid as necessary to bring to this prescribed level. *(Refer Fig. 10).*

NOTE: ATF Type fluid to specification 41/MS5033 only to be used.

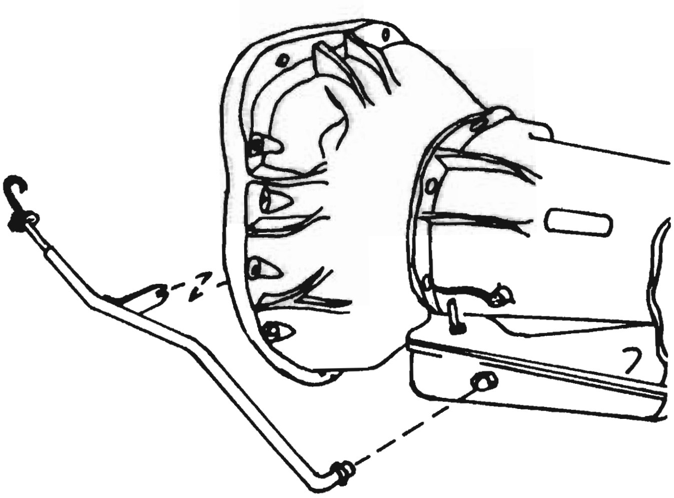


Fig. 9 – Transmission fluid level indicator (dip stick)

CAUTION: To prevent dirt or water from entering transmission after checking or replenishing fluid, make certain that the dip stick cup is reseated correctly on to the filler tube.

If it is necessary to check fluid when the transmission is cold, the fluid should be not higher than 3/8" below the "full" mark.

Fig. 10 – Transmission dip stick markings (typical)

2. GEAR SHIFT LINKAGE ADJUSTMENT

(1) With gear shift selector lever to "D" Drive position, disconnect the adjustable rod from the external lever on the transmission.

(2) Select "D" Drive position using the transmission lever. (Third detent from rear "Park" position.)

(3) Adjust rear (adjustable) rod to be readily installed into lever without interference or binding.

(4) Tighten lock nuts on rod evenly to 70 lbs. in torque.

(5) Reinstall the adjustable rod.

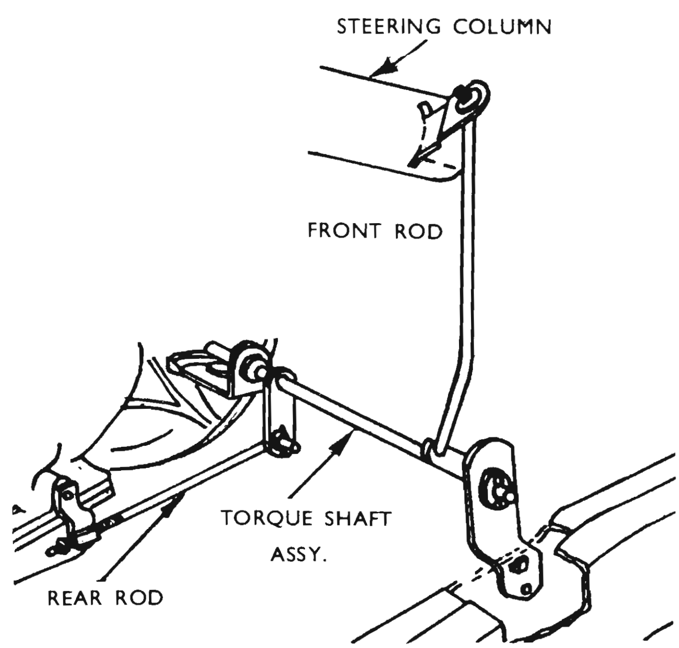


Fig. 11 – Gear selector linkage adjustment location

3. DRAIN, REFILL AND PERIODIC ADJUSTMENTS

The transmission adjustments and fluid change should be made regularly as shown in the lubrication and maintenance schedule.

NOTE: If the regular operation of a vehicle is classified as severe, the transmission should be serviced every 12,000 miles. Typical examples of the type of service which comes within this category are:
1. Police or taxi-cab operation.
2. Frequent towing of trailers.
3. Continuous operation at higher than normal loading.

(1) Drain oil from transmission as follows: Remove the transmission drain plug permitting the fluid to drain.

(2) Remove transmission oil pan—clean oil pan. (Remove the filler tube from pan.)

(3) Adjust reverse (rear) band. Refer paragraph 5.

(4) Adjust kickdown (front) band. Refer paragraph 5.

(5) Adjust gear shift control linkage. Refer paragraph 2.

(6) Install oil pan using a new gasket and tighten screws evenly to 10-13 lbs. ft. torque. Install filler tube, tighten to 17 lbs. ft. torque.

(7) Add 8 pints of Automatic Transmission fluid through the filler tube (the recommended fluids are listed in the specifications, Page 21–24.)

(8) Start engine and add approximately one quart of fluid whilst engine is idling.

(9) Allow engine to idle for at least two minutes, then with the parking brake applied select each drive range momentarily, ending with the Neutral position selected.

(10) Add sufficient fluid to bring the fluid level to the "add one pint" mark.

(11) Adjust engine idle to specifications.

(12) Inspect for fluid leaks, then reinstall torque converter housing cover.

(13) Adjust the transmission and carburettor throttle cables. Refer to paragraph 6.

(14) Test vehicle performance.

CAUTION: To prevent dirt or water from entering transmission, make certain that the dip stick cap is reseated correctly on to filler tube.

Fluid Leaks

Leaks which may be repaired with the transmission in the vehicle are: transmission output shaft oil seal, extension housing gasket, speedometer pinion seal and cable seal, oil filler tube seal, oil pan gasket, selector shaft seals, neutral starting switch seal, oil cooler line fittings and pressure take-off plug.

CAUTION: If the oil filler tube or dip stick is removed every precaution must be taken to prevent dirt from entering the transmission hole. If this event occurs, remove oil pan and clean thoroughly.

If oil is found inside torque converter housing, determine whether it is transmission fluid or engine oil.

Leaks at these locations should be corrected, regardless of how slight. Correct by tightening loose screws, nuts or plugs. Where this does not remedy the situation, replace faulty gaskets, seals, plugs, or other parts as required.

Leaks requiring removal of transmission are: porous transmission case, sand hole in oil pump housing, oil pump housing retaining screws or seal-

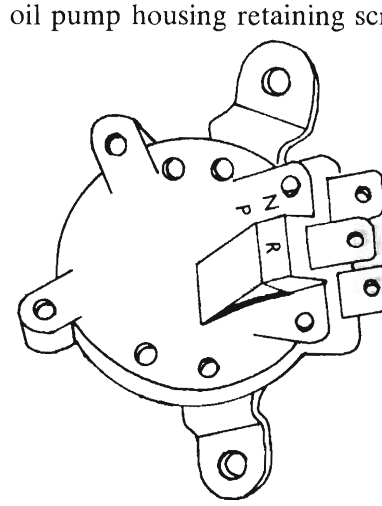


Fig. 12 – Neutral starting and reverse light switch assembly

ing washers damaged, oil pump housing gasket, torque converter assembly and converter impeller hub, oil seal (located in oil pump housing).

Leaks at these locations may be corrected by tightening loose bolts or replacing damaged or faulty parts. Any sharp edges on the converter impeller hub which could contact the seal during reinstallation should be removed by stoning with a fine stone.

4. NEUTRAL STARTING AND REVERSE LIGHT SWITCH

> NOTE: The combination switch contains two pairs of contacts.

The neutral starting switch should operate in both the park and neutral selector lever positions, while the reverse lights operate only in reverse selected position.

To Test Wiring

(1) Disconnect the multi-connector from the switch. (Not shown in *Fig. 12.*)

(2) Join the "yellow" and the "white" lead "blades" together using a suitable bridge connector, to provide reverse light operation (ignition switched on).

(3) "Earth" the "black" lead terminal blade. This should provide starter operation (when switch is operated).

> CAUTION: Prevent vehicle from driving off when starting in any drive range, by *fully applying brakes* and *"chocking"* wheels securely.

To Test Switch (Installed)

> NOTE: This switch is *not* adjustable.

(1) Select "R"—Reverse.

(2) Connect a series test lamp connection to the "yellow" and "white" lead blades. The lamp should light—replace switch if faulty.

(3) Select "P" or "N".

(4) Connect a series test lamp connection to "black" lead blade and the earth test lead to the transmission case. The lamp should light—replace switch if faulty.

> NOTE: The lamp should light *only* in park or neutral position.

(5) Reconnect the multi-connector to the switch.

Switch or Shaft Seal Replacement

The switch is secured by 2 screws to the transmission case and operated by a linkage driven shaft. The shaft seal is accessible after removing the switch and the "E" clip from the shaft.

5. BAND ADJUSTMENTS

Kickdown Band (Front Band)

(1) Drain transmission fluid and remove the oil pan (remove the filler tube from the pan).

(2) Loosen adjusting screw lock nut and back off the nut 5 turns (check screw for free rotation in lever).

(3) Lift the servo lever away from the servo piston and insert Tool E1282 Front band spacer gauge (.250") between the adjusting screw and the servo piston pin.

(4) Tighten adjusting screw to 10 lbs. in torque.

(5) Tighten lock nut to 15–20 lbs. ft. torque while maintaining screw position.

(6) Withdraw the gauge tool.

> NOTE: Special Tool E1282 (.250") represents 4 back-off turns, exactly, if tool is not available.

(7) Reinstall oil pan using a new gasket, tighten pan to 10 lbs. ft. torque. Reinstall the filler tube, tighten to 17 lbs. ft. torque.

(8) Refill transmission with approved Fluids from containers branded with the approval number. Page 21–24.

Low/Reverse Band (Rear Band)

The rear band adjustment screw is located centrally in the right side of the transmission case.

(1) Loosen the adjusting screw lock nut and back off nut several turns (check screw for free rotation in case).

(2) Tighten the adjustment screw to 10 lbs. ft. using tool No. BW-547-502 or to 5 lbs. ft. using Tool No. E1294-1 and the torque wrench.

(3) Back off the adjust screw ¾ turn and tighten the lock nut to 25-30 lbs. ft. torque.

6. THROTTLE CABLE AND TRANSMISSION CABLE ADJUSTMENTS

Throttle Cable

(1) Apply a thin film of multi-purpose grease on accelerator shaft where it turns in bracket, anti-rattle spring where it contacts shaft, ball end and pocket at rear end of throttle cable and the bell crank pin of the accelerator pedal mechanism (illustrated, *Fig. 13a*).

(2) Disconnect choke at carburettor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburettor to curb idle.

(3) Loosen the throttle cable clamp nut then adjust position of cable housing (housing ferrule) in the clamp so that all slack is removed from cable with carburettor at curb idle. To remove slack from cable, remove ferrule in the clamp in direction away from carburettor lever.

(4) Back off ferrule ¼″. This provides ¼″ cable slack at idle.

(5) Tighten cable clamp nut to 45 lbs. in.

(6) Connect choke rod or remove blocking fixture.

Transmission Throttle Cable

This cable is prelubricated and does not require additional lubrication.

Correct adjustment of the transmission throttle cable is *most* important.

Check that the wide open throttle position is obtained with the throttle pedal clear of the floor.

To Adjust

(1) Apply parking brakes fully, and position wheel chocks.

(2) Start engine and adjust idle speed to specifications at normal operating temperature.

(3) Stop engine (for safety reasons). Adjust outer cable to provide that the cable crimped sleeve (on original cable only) just contacts the abutment

(4) Connect tachometer to read engine R.P.M.

(5) Install a hydraulic gauge, Tool No. E21C65A to read line pressure. The gauge tapping point is located at the rear of the transmission housing to the left of the transmission centreline just above the transmission oil pan mounting flange. (*Refer Fig. 19* for location).

(6) Start the engine and select 'D' drive range (brakes fully applied).

(7) Note the engine R.P.M. and the line pressure with the transmission at operating temperature. The line pressure should be 60–76 P.S.I.

(8) *Use the accelerator pedal* to increase the engine speed 500 R.P.M. and note the increase in transmission pressure. The increase in pressure must be a *minimum* of 10 P.S.I. It may be necessary to lightly shake the transmission throttle cable outer casing during the operation to overcome cable drag.

(9) To increase the pressure rise, turn the cable adjusting nuts to widen the gap between the end of the outer cable casing and the crimp sleeve on the inner cable. To decrease the pressure rise, close the gap between the end of the outer cable casing and the crimp sleeve. REMOVE THE CABLE CRIMP SLEEVE IF CORRECT ADJUSTMENT CANNOT BE ACHIEVED. After setting, fit a new crimp sleeve, Part No. 3649292.

> NOTE: Duration of test must be limited to a few seconds to prevent transmission overheating. Select 'N' Neutral and return engine to idle speed whilst making necessary cable adjustments.

If and when a replacement of the cable is necessary, the following procedure should be adhered to:

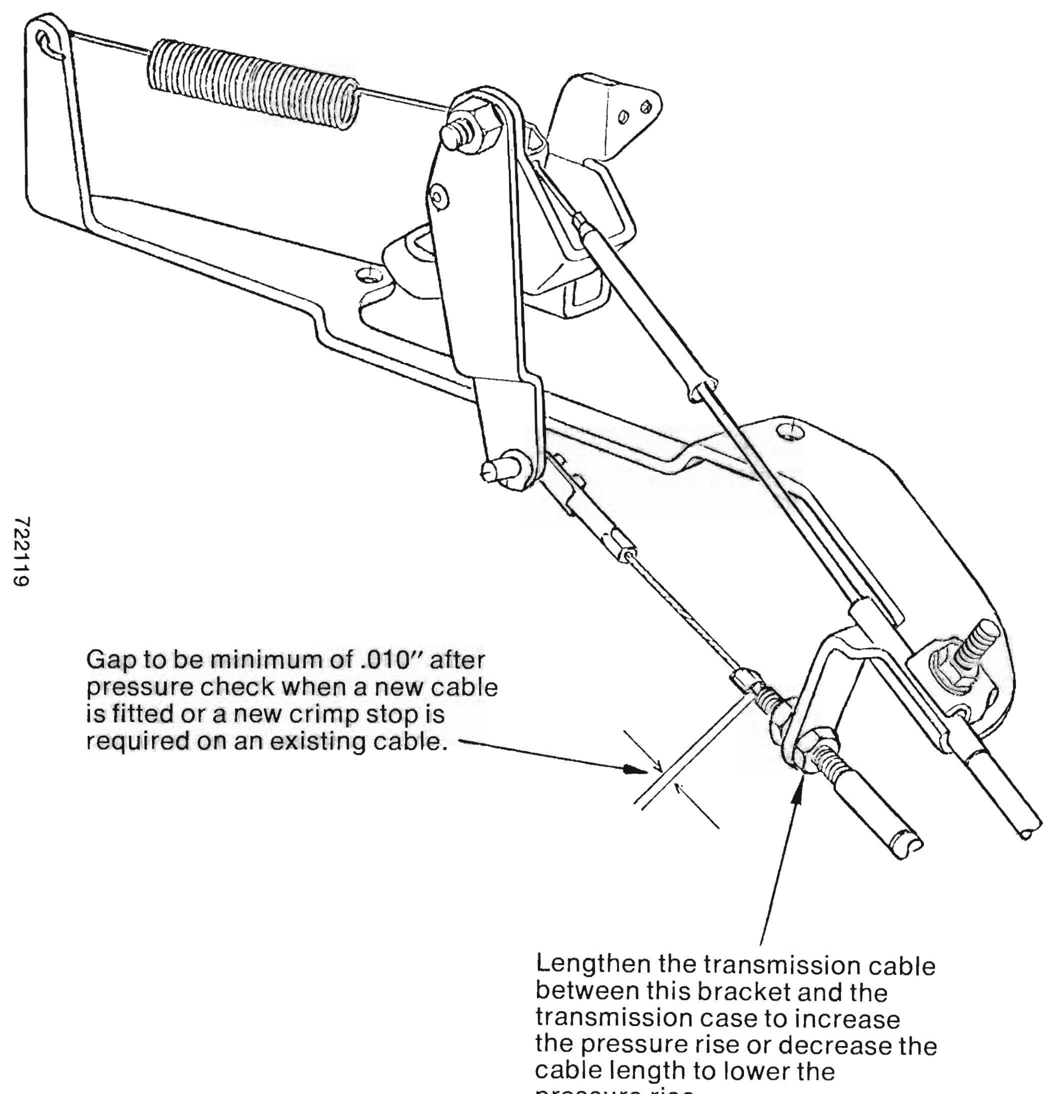


Fig. 13. Transmission Cable Adjustment (Typical Illustration).

REPLACEMENT OF TRANSMISSION THROTTLE CABLE

This operation requires the removal of the oil pan and disconnecting of the cable from the throttle cam linkage. Unscrew the cable adaptor from the transmission case. Fit a new cable, the cable retaining torque is 10–12 lbs. ft. with a new seal ring installed.

Adjustment of the cable should be conducted as previously described except that the new crimp sleeve—Part No. 3649292, is to be crimped with a .010″ gap between the crimp sleeve and the end of outer casing, after the completion of the pressure setting.

7. HYDRAULIC CONTROL PRESSURE TEST

Line Pressure

There is one hydraulic pressure which can be checked. This is line pressure which is set in relationship to the transmission throttle valve cable. *(Refer to Para. 6 — Throttle Cable and Transmission Throttle Cable Adjustments.)*

NOTE: At forced wide open throttle the line pressure should read "D" 190-240 P.S.I. "C" 210-260 P.S.I. in forward drive selections or in Reverse. The reading at "cut back" (reduced line pressure controlled by the modulator valve) should be "D" 80-105 P.S.I., "C" 135-165 P.S.I. "Cut back" will occur at various speeds depending on throttle opening, road speed and axle ratio used.

8. AIR PRESSURE TESTS

A NO DRIVE condition might exist even with 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. 14)*.

The front and rear clutches, kickdown servo, and low reverse servo may be tested by applying air pressure to their respective passages after the oil pan and 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.

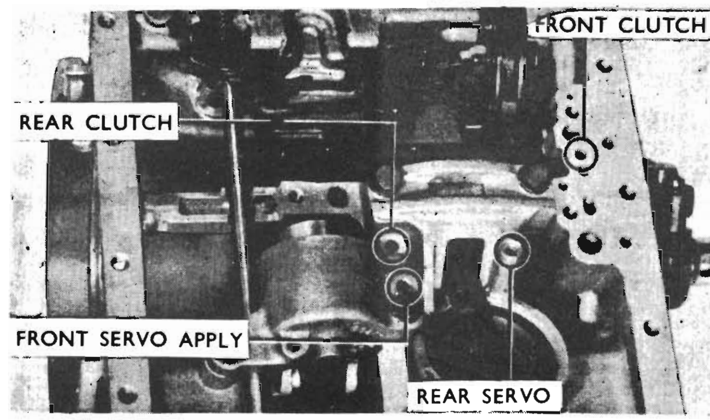


Fig. 14 – Air pressure test apply locations (typical view)

Front Clutch and Governor

Apply air pressure to front clutch "apply" passage and listen for a dull "thud" which indicates that front clutch is operating. Hold air pressure on for a few seconds and inspect system for excessive oil leakage.

If the extension housing is removed, rotate the output shaft to position the governor weight to the bottom. When air is applied, the valve should move "inward".

Rear Clutch

Apply air pressure to rear clutch "apply" passage *(refer Fig. 14)* and listen for a dull "thud" which indicates that rear clutch is operating. Also inspect for excessive oil leakage.

NOTE: If a dull "thud" cannot be heard in the clutches, place finger tips on clutch housing and again apply air pressure. Movement of piston can be felt as the clutch is applied.

Verify by turning the output shaft that the clutch is functioning. Listen for a "thump" indicating that the clutch is released when the air pressure is released.

Kickdown (Front) Servo

Direct air pressure into front servo "apply" passage *(refer Fig. 14)*. Servo operation is indicated by a tightening of front band. Spring tension on servo piston should release the servo and band.

Low and Reverse (Rear) Servo

Direct air pressure into rear servo tube "apply" passage, *refer Fig. 14*. Observe the movement of the servo lever.

SERVICE OPERATIONS WITH TRANSMISSION IN VEHICLE

9. SPEEDOMETER DRIVE PINION

(1) The speedometer drive pinion assembly is retained in the extension housing with a clamp and screw *(refer Fig. 15)*.

NOTE: Whenever transmission lubricant is found in the cable, the seal should be inspected, and replaced if unsatisfactory. Refer paragraph 25, Group 1, for Speedometer Cable Lubrication.

(2) Install the seal with the lips of the seal away from the pinion.

(3) Install the pinion on the cable and secure with clip in pinion while holding firmly together.

(4) Lightly lubricate the seal with multi-purpose grease and carefully install the cable assembly in housing.

(5) Install retainer clamp and screw, tighten to 150 lbs. in.

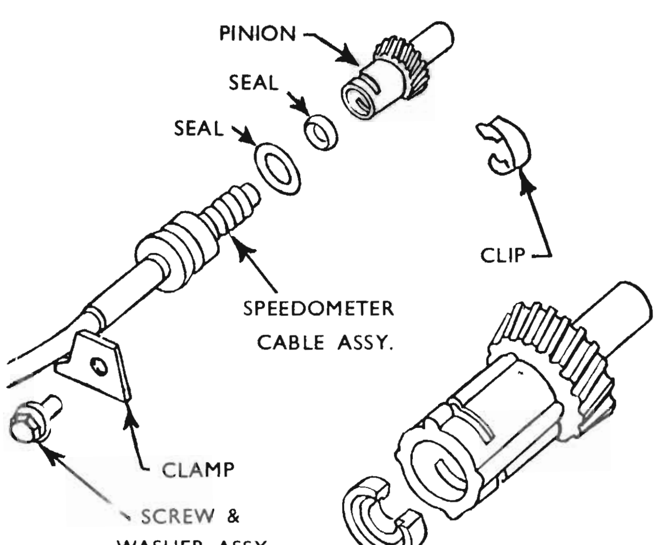


Fig. 15 – Speedometer drive pinion assembly—disassembled view

NOTE. The speedometer drive pinion used in transmissions driving the 3.23:1 axle ratios has 19 teeth. The 2.9:1 ratio requires the 17 tooth pinion.

10. EXTENSION HOUSING YOKE SEAL REPLACEMENT

(1) Disconnect propeller shaft at rear universal joint. Carefully pull shaft yoke out of the transmission extension housing, being aware that the transmission fluid will flow from the seal when the spline is exposed. (Plug opening or raise rear of vehicle.)

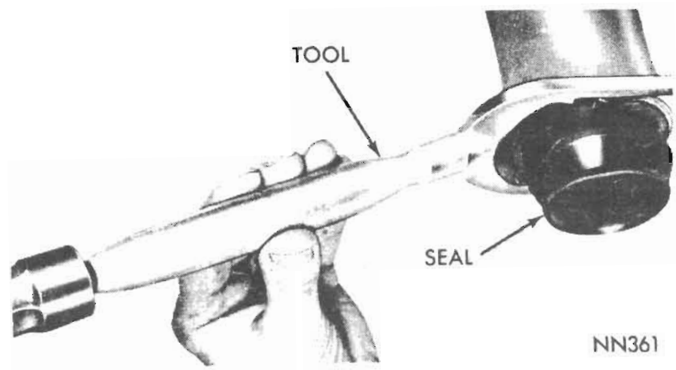


Fig. 16 – Removing extension housing yoke seal

CAUTION: Be careful not to scratch or nick ground surface on sliding spline yoke during removal or installation of the shaft assembly.

(2) Remove the extension housing yoke seal *(Fig. 16)* with Tool E21C50D.

(3) To install a new seal, position seal in opening of extension housing and drive it into the housing with Tool E21C50C *(Fig. 17)*.

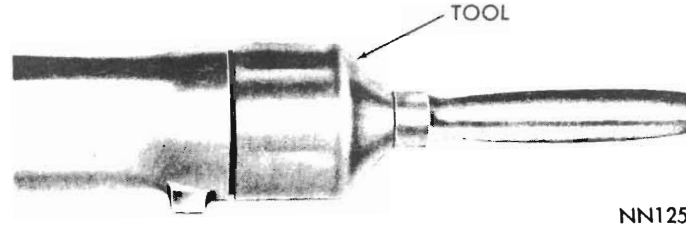


Fig. 17 – Installing extension housing yoke seal

11. EXTENSION HOUSING AND BUSHING

To Remove

(1) Drain approximately 2 quarts of fluid from the transmission by removing drain plug from pan.

(2) Disconnect propeller shaft at rear universal joint. Carefully pull shaft assembly out of the extension housing.

(3) Remove speedometer pinion assembly *(Fig. 15).*

(4) Remove bolts securing extension housing to the crossmember insulator. Raise transmission slightly with service jack then remove centre crossmember and support assembly.

(5) Remove extension housing to transmission bolts.

Bushing Replacement

(1) Pry or drive oil seal out of extension housing with a long blunt drift. Be sure not to mar oil seal surface in the housing.

(2) Press or drive out bushing with Tool E21C50E *(Fig. 18).*

(3) Slide a new bushing on installing end of Tool E21C50E. Align oil hole in bushing with oil slot in the housing, then press or drive bushing into place.

(4) Install a new oil seal into housing with Tool E21C50C *(Fig. 17).*

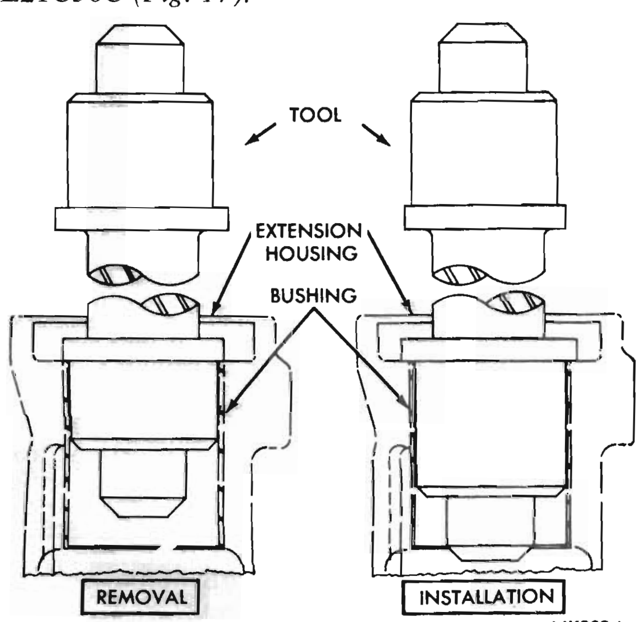


Fig. 18 – Replacing extension housing bushing

12. SPEEDOMETER DRIVE GEAR

(1) Remove the circlip retaining the speedometer drive gear on the shaft (after the extension housing is removed, paragraph 11).

(2) Withdraw the gear from output shaft and retrieve the 3/16" drive ball from the shaft recess.

13. GOVERNOR VALVE ASSEMBLY

To Remove

(1) Remove extension housing and speedometer drive gear (as previously described in paragraphs 11 and 12).

(2) Using circlip pliers carefully pry snap ring from shaft rear of governor *(Fig. 19).* Slide valve assembly from shaft taking care not to lose the ¼" drive ball.

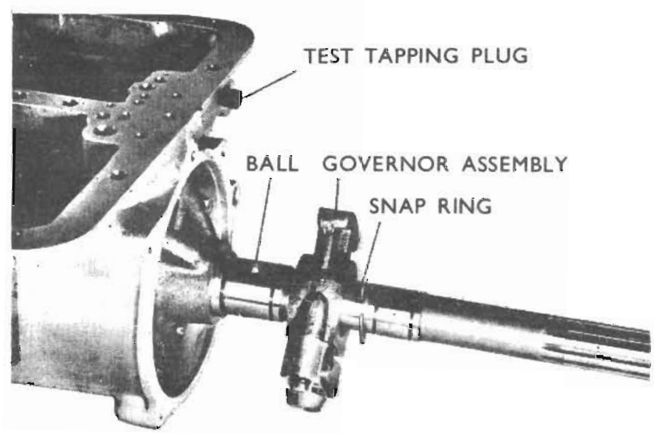
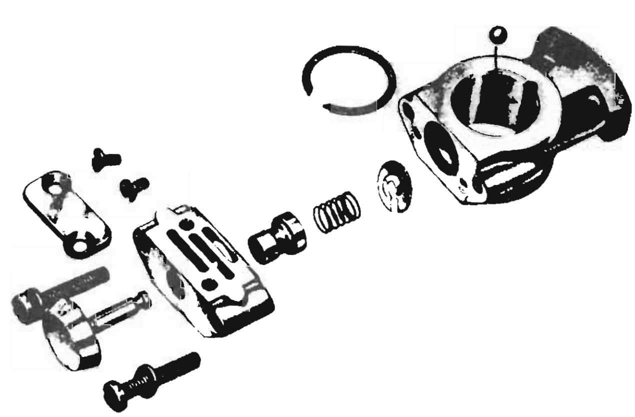


Fig. 19 – Governor valve assembly on output shaft

To Disassemble

(1) Remove two screws retaining valve body to base.

(2) Remove governor valve retainer clip and remove the weight, valve and spring from valve body.



(3) Remove the 2 valve body port cover retaining screws and remove cover (this plate faces rearward).

To Clean and Inspect

The primary cause of governor operating failure is due to a sticking governor valve or weight. Rough surfaces may be removed with "crocus-cloth". Thoroughly clean all parts in clean solvent and inspect for free movement before assembly.

Reassembly and installation is the reversal of the removal procedure. (See Page 21–62.)

14. VALVE BODY ASSEMBLY

To Remove

(1) Remove transmission oil pan drain plug, and allow fluid to drain.

(2) Remove transmission oil pan retaining screws and filler tube, then remove pan.

(3) Remove the 4 exposed oil tubes carefully from their bores *(Fig. 21).*

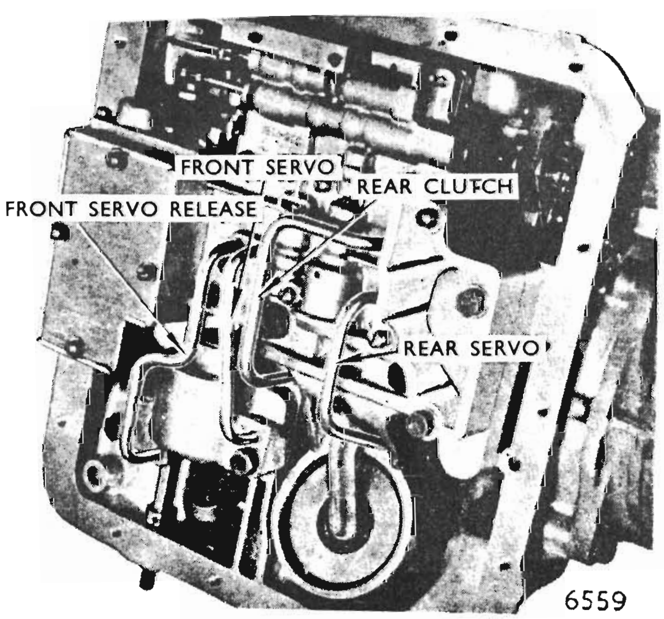


Fig. 21 – Oil tubes positioned in valve body

(4) Remove the 3 valve body retaining bolts (7/16" hex. heads).

(5) Carefully detach the transmission throttle valve cable from the valve cam.

(6) Disengage the valve body assembly from the 3 supply tubes at front of the transmission. *Refer Fig. 23.*

(7) Remove the pump intake tube O-ring (from the tube or recess *(Fig. 23)* in converter support).

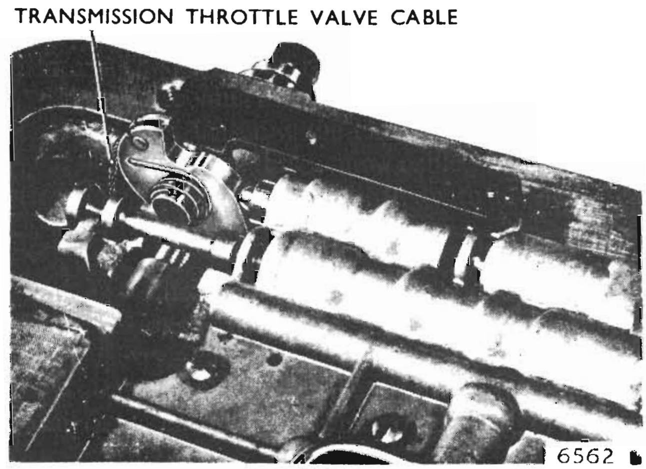


Fig. 22 – Transmission throttle valve cam and bracket assembly

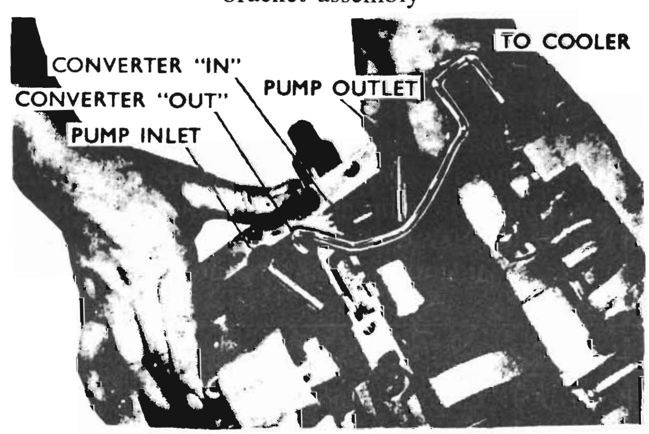


Fig. 23 – Valve body to pump assembly tubes

15. OUTPUT SHAFT SUPPORT AND SEAL RINGS

To Remove (Housing, Speedometer Gear and Governor Assembly removed)

(1) Remove the 6 screws and lock washers retaining the output shaft support to the transmission case. *Refer Fig. 24.*

(2) Carefully withdraw the output shaft support from shaft.

(3) Carefully remove the 3 oil seal rings from the output shaft where necessary.

> NOTE: These rings are easily broken and must be handled carefully.

Reassemble by reversing the foregoing procedures and torquing the retaining screws to 4–8 lbs./ft. torque or refer to Paragraph on *Page 21 – 62*.

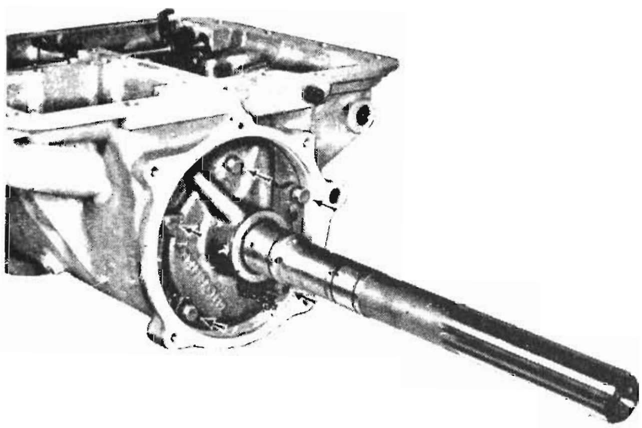


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Fig. 24 – Output shaft support

16. MANUAL SELECTOR VALVE SHAFT, LEVERS AND PARKING PAWL MECHANISM

To Remove (Valve Body Removed)

Parking Sprag Toggle Lift Lever

(1) Remove the parking sprag lift lever operating rod retaining spring clip using suitable needle-nose pliers — and detach the rod from lever by positioning it inwards from lever.

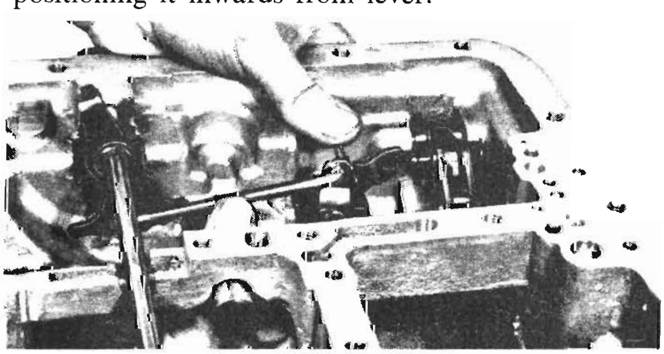


Fig. 25 – Parking pawl (sprag) linkage

(2) Using a screwdriver, release the lift spring from the lift lever.

(3) Remove the lift assembly retaining spring clip from the shaft, and remove the washer, parking lever, toggle lift lever and toggle lever spring. (These parts can now be separated).

Where removal is difficult, remove the rear band servo and retrieve the strut; release the rear band adjustment and slide the band forward, to provide additional clearance.

Reassemble by reversing the foregoing procedures, adjusting the band and torquing retaining nut to specified torque, as described in *Para. 5*.

Parking Pawl Disassembly

(1) Drive the slotted spring pin, retaining the parking brake toggle pin, inwards using $\frac{1}{8}$" diameter drift.

(2) Remove the toggle anchor pin (this is the upper pin), using a small suitably hooked tool; apply force to the shoulder of the pin from the inside of the case.

(3) Remove the parking pawl pivot pin rearward.

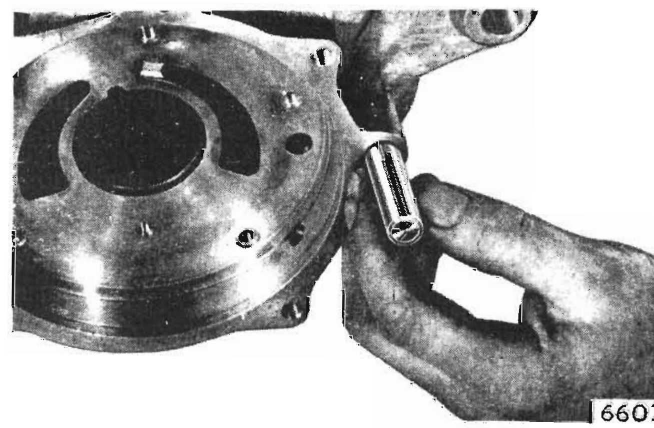


Fig. 26 – Removing parking pawl pivot pin

(4) Remove the O-ring and toggle assembly.
(5) Remove the retaining spring using pliers.
(6) Remove release spring using pliers and lift
(7) Separate toggle lever from link.
off the pins. (Flanged pin, ball ended toggle link pin, parking pawl and link. (The pivot shaft is part of the casing assembly).

Manual Control Shaft

To Remove

(1) Remove the manual control shaft "collar roll pin" locating detent lever, using a $\frac{1}{8}$" pin drift.

(2) Slide the manual shaft detent lever in the direction of the spring bias, taking care that the detent ball does not eject violently, retrieve the $\frac{3}{8}$" ball and spring.

(3) Remove the remaining shaft lever pin.

(4) Remove the bias spring and manual valve detent lever assembly.

(5) Withdraw the manual valve lever shaft (where necessary).

> NOTE: To obtain sufficient body clearance it may be necessary to lower the transmission support taking care not to damage the radiator hoses or similar flexible couplings.

(6) Remove the two shaft seal rings from each recess (where applicable).

To Install

(1) Install the manual valve lever shaft.

(2) Install the thrust collar, detent lever and bias spring.

(3) Install the solid pin in the detent lever end of shaft (using pliers) then engage the detent lever on to pin.

(4) Install the detent spring and $\frac{3}{8}''$ ball in position and while holding the ball depressed using a suitable tube, slide the detent lever over the ball.

(5) Secure the manual valve shaft towards the case, compressing the bias spring.

(6) Position and secure the thrust collar, install a new roll pin, using suitable pliers.

(7) Install the new manual control shaft seals on to shaft ends and into each case recess.

(8) Install the manual shaft lever in the "upward" position on the shaft, and tighten the retaining nut to 6–7 lbs./ft. torque.

17. SERVO ASSEMBLIES

To Remove (Valve body and tubes removed)

(1) Carefully remove the retaining bolts, while suitably supporting the assembly.

(2) Retrieve the operating strut. Note that the kickdown servo rear bolt is the longer.

Installation instructions are contained in *Para. 38*; then re-adpust the bands as described in *Para. 5*.

18. TRANSMISSION AND TORQUE CONVERTER

To Remove

> 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, the weight of the transmission should not be allowed to rest on the plate during removal.

(1) Connect a remote control starter switch, to starter solenoid and position switch so engine can be rotated from under the vehicle.

(2) Disconnect high tension wire from the distributor cap.

(3) Remove cover plate from in front of converter to provide access to the converter drain plug and mounting bolts.

(4) Rotate engine with remote control switch to bring the 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 the balance of 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 screwdriver 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 bolts have been loosened.

(7) Disconnect negative (ground) cable from the battery.

(8) Remove the starting motor assembly.

(9) Disconnect wire connections from the neutral starting switch.

(10) Disconnect gearshift rod from the transmission lever. Remove the gearshift torque shaft from transmission housing and left side rail.

Console Shift Models:

Remove two bolts securing gearshift torque shaft lower bracket to the extension housing. Swing bracket out of way for transmission removal. Disconnect gearshift rod from the transmission lever.

(11) Disconnect transmission throttle cable from the upper throttle lever and bracket.

(12) Disconnect oil cooler lines at transmission and remove oil filler tube. Disconnect the speedometer cable and the transmission vent tube from union.

(13) 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 jack and raise the engine slightly.

(16) Remove crossmember attaching bolts and remove the crossmember.

(17) Place a transmission service jack under transmission to support the assembly.

(18) Attach a small "C" clamp to edge of bell housing to hold converter in place during removal of the transmission.

(19) Remove the bell housing retaining bolts. Carefully work transmission rearward off engine block dowels and disengage coverter hub from end of the crank-shaft.

(20) Lower transmission jack and remove transmission and converter assembly.

(21) To remove converter assembly, remove "C" clamp from edge of bell housing, then carefully slide assembly out of the transmission.

RECONDITIONING TRANSMISSION OUT OF VEHICLE

When ordering parts for Torqueflite transmissions always quote Transmission Part No. from transmission case identification plate.

19. ALUMINIUM THREAD REPAIR

Damaged or worn threads in the aluminium 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 in the tapped hole. This brings the hole back to its original thread size. The table, below, lists the threaded hole sizes which are used in the aluminium 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 dealers.

NOTE: 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 a pound-inch torque wrench and added to the specified bolt torque, so that all bolts securing a particular part will be tightened to the same torque.

20. PUMP OIL SEAL

To Replace

The pump seal can be replaced without removing pump and reaction shaft support assembly from the transmission case.

(1) Screw remover Tool E21C35G into Seal *(Fig. 27)*, then tighten screw portion of tool to withdraw the seal.

(2) To install a new seal, place a seal in opening of pump housing (lip side facing inward). Using Tool E21C35F, drive seal into housing until tool bottoms *(Fig. 28)*.

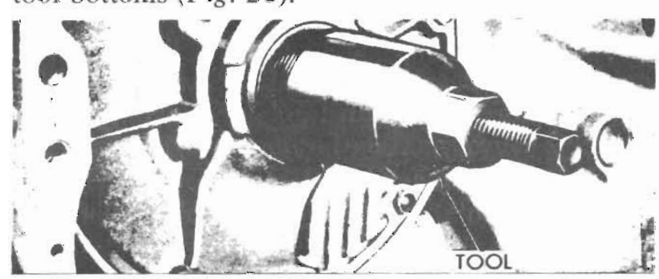


Fig. 27 – Removing pump oil seal (typical view)

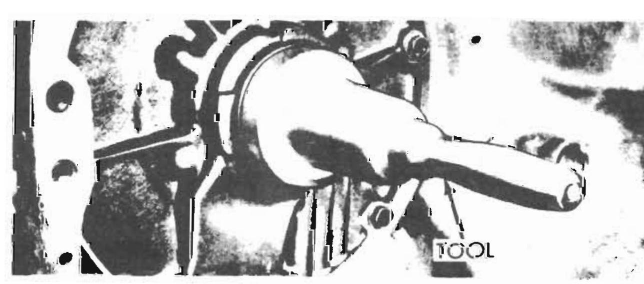


Fig. 28 – Installing pump oil seal (typical view)

THREADED HOLE SIZES

Heli-Coil Insert			Drill Size	Tap Part No.	Inserting Tool Part No.	Extracting Tool Part No.
Thread Size	Part No.	Insert Length				
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

REMOVAL OF SUB-ASSEMBLIES (Transmission Removed)

21. VALVE BODY ASSEMBLY

With the transmission mounted in the repair stand Tool E21C5C.

(1) Remove transmission oil pan retaining screws and remove pan.

(2) Remove the 4 oil tubes carefully from their bores *(refer Fig. 21).*

(3) Remove the 3 valve body retaining bolts (7/16″ hex. heads).

(4) Carefully detach the transmission throttle valve cable from the valve cam *(Fig. 22).*

(5) Disengage the valve body assembly from the 3 supply tubes at front of the transmission — *refer Fig. 29.*

(6) Remove the pump intake tube O-ring (from the tube or recess in converter support).

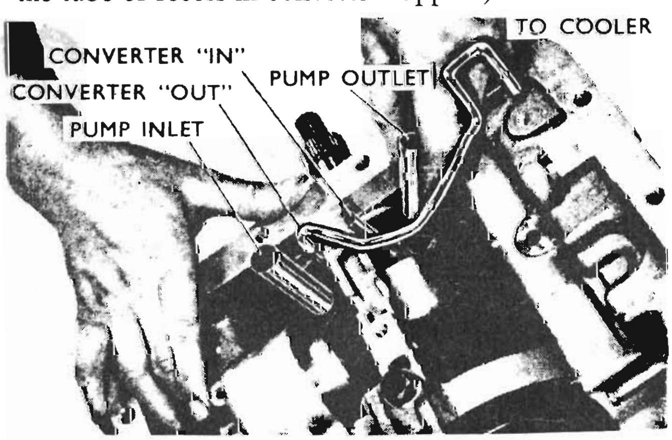


Fig. 29 – Location of oil tubes, front of transmission

22. EXTENSION HOUSING

(1) Remove screws securing extension housing to transmission case and carefully remove the extension housing and gasket.

23. SERVO ASSEMBLIES (Oil Pan Removed)

Kickdown (Front) Servo Assembly

(1) Remove the 2 tubes from the front servo and valve body.

(2) Remove the 2 retaining bolts securing the servo to transmission casing.

(3) Remove the servo assembly and retrieve the strut *(refer Fig. 53).*

Low/Reverse Servo Assembly (Oil Pan Removed)

(1) Remove the supply tube from the servo and valve body.

(2) Remove the 2 retaining bolts securing the servo assembly to the transmission casing.

(3) Remove the servo assembly and retrieve the strut.

24. PUMP ASSEMBLY

NOTE: Before the pump assembly is removed the 4 valve body to pump adaptor oil tubes must be removed (refer paragraph 21 Valve Body Assembly). Also *read and record* the existing gear shaft end float, as an aid to adjustment when reassembling the transmission.

(1) Remove the 6 "fluted" head screws retaining the pump assembly to case using a $\frac{3}{8}$″ AF socket.

(2) Remove the pump assembly by pulling on the converter support while holding the input shaft inwards.

(3) Retrieve the input shaft (selective) thrust washer (tabs towards casing) and place with pump assembly.

25. FRONT CLUTCH ASSEMBLY (Refer Fig. 30)

(1) Remove the front clutch assembly by pulling on the input shaft.

(2) Retrieve the clutch front cylinder thrust washer (bronze) and backing washer (steel).

25A. REAR CLUTCH (Refer Fig. 30)

(1) Remove the rear clutch together with the forward sun gear assembly by pulling on the shaft.

Kickdown (Front) Band and Servo

(1) Using fingers, squeeze the band ends together and remove the band through the pump opening.

(2) Lift out the strut.

(3) Remove the 2nd kickdown (front) servo where previously not removed, retaining bolts and spring washers. (Note that the long bolt is rearmost.)

(4) Remove the kickdown servo assembly.

(5) Do not disturb the band adjustment at this time, or if so required, *observe* the amount of *adjustment* taken up for later reference.

Intermediate Support and Planet Gear Assembly

(1) Remove the 2 remaining intermediate support screws and lock washers, located in the transmission case exterior, identify the screws for (original location) replacement.

(2) Remove the low/reverse (rear) servo assembly retaining screws (front screw only), where not previously removed.

(3) Withdraw intermediate support from planet gear carrier assembly with the thrust washers.

(4) Remove the over-running clutch assembly.

(5) Using screwdriver remove the snap ring retaining the over-running clutch race in planet gear carrier assembly.

> NOTE: Needle thrust bearing plate inside planet gears assembly (1-9/16" diameter) has lip located towards rear.

26. LOW/REVERSE (REAR) BAND AND SERVO ASSEMBLY

(1) Using fingers, compress the band ends and tilt band to withdraw it through the front end of the transmission case.

(2) Retrieve the servo strut.

(3) Remove the remaining servo retaining bolt.

(4) Remove the low/reverse servo assembly.

(5) Observe the band adjustment for later reference if "backing off" is required.

Speedometer Drive Gear

(1) Remove the retaining snap ring using snap ring pliers.

(2) Remove the drive gear and retrieve the 3/16" drive ball.

27. GOVERNOR ASSEMBLY

(1) Remove the retaining snap ring using snap ring pliers.

(2) Remove the governor assembly from the shaft (cover plate faces rearward).

(3) Retrieve the ¼" drive ball bearing.

28. OUTPUT SHAFT SUPPORT

(1) Remove the 6 screws and lock washers retaining the output shaft support to the transmission case *(refer Fig. 24)*.

(2) Carefully withdraw the output shaft support assembly.

(3) Carefully remove the 3 oil sealing rings from the output shaft (where necessary).

> NOTE: These rings are easily broken and must be handled carefully.

(4) Carefully remove the output shaft forward out of the transmission case taking care not to damage the white metal bushing.

> NOTE: Thrust washer with 3 tabs is located between the output shaft and rear transmission case.

29. MANUAL SELECTOR VALVE SHAFT, LEVERS AND PARKING PAWL (SPRAG) MECHANISM

Parking Sprag Toggle Lift Lever

(1) Remove the parking sprag lift lever operating rod retaining spring clip using suitable needle nose pliers and detach the rod from lever.

(2) Using a screwdriver, release the liftspring from the lift lever.

(3) Remove the lift lever assembly retaining spring clip from the shaft and remove the washer, parking lever, toggle lift lever and toggle lever spring (these parts can now be separated).

Parking Pawl (Sprag) Disassembly

(1) Remove the sprag pivot pin (the upper pin, retained by extension housing) by tilting the case and pushing pin from bore using a suitably hooked tool.

(2) Drive the slotted spring pin, retaining the parking brake toggle pin, inwards, using a ⅛" diameter drift.

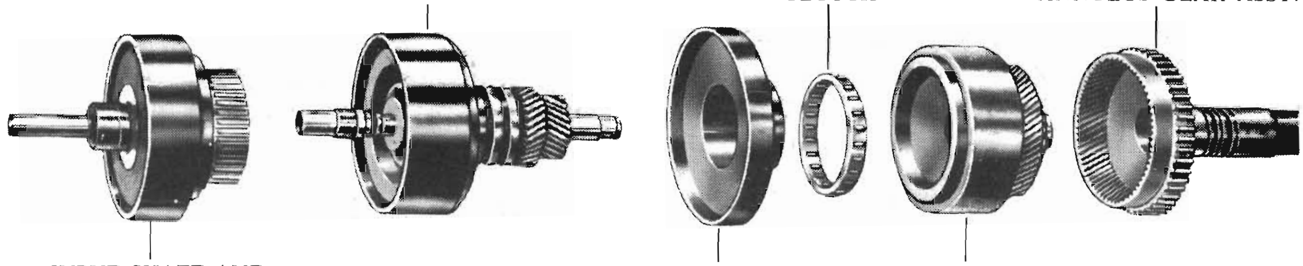


Fig. 30 – Gear train components (in order of arrangement)

(3) Withdraw the parking pawl toggle pin rearward using a suitable tool.

(4) Remove the O-ring from the shaft.

(5) Remove the retaining spring clip (¼" centres) using needle nose pliers.

(6) Remove the release spring, spring retainer (flanged), parking brake washer, toggle link pin, parking pawl and toggle pin (ball ended).

(7) Separate toggle lever from link.

30. MANUAL CONTROL VALVE SHAFT ASSEMBLY

(1) Remove the manual control shaft collar roll pin, using a ⅛" pin drift.

(2) Slide the manual shaft in the direction of the spring bias, *taking care* that the detent ball does not eject violently, retrieve the ball and spring.

(3) Remove the spring and manual valve detent lever assembly.

(4) Withdraw the manual lever shaft and both shaft seal rings from each case recess.

Neutral Starting Switch, Linkage and Seal

(1) Remove the 2 screws retaining the switch and pin.

(2) Remove the "E" ring retaining the shaft and seal.

(3) Disconnect the linkage from the detent lever.

RECONDITIONING OF SUB-ASSEMBLIES
(Removed from Transmission)

In all valve bodies *(Fig. 32)* a new feature has been introduced which allows much faster manual 3–2 shifts. This consists of a ball check valve in the lower body *(Fig. 33A)* which "short-circuits" an orifice in the separator plate when this shift is made. The valve must seal at all other times, however, in order to prevent "flare".

The correct method to accomplish this is to place the spring and ball in the lower body and then to place the separator plate on top such that the ball is central in the hole. The oil tube collector plate and the governor line plate are then placed in position and their holding screws tightened to finger tightness.

The sealing of the ball check valve can then be checked by squirting A.T.F. into the hole shown in the separator plate *(Fig. 33)*. The oil should then squirt back out of the orifice marked. No oil should leak around the ball. If there is leakage, the separator plate should be repositioned until this is eliminated.

When this is achieved, the upper valve body can be placed in position and all screws tightened to the correct torque.

31. VALVE BODY ASSEMBLY

To Disassemble Throttle Valve Cam (Refer Fig. 31)

(1) Remove the 2 screws and lock washers retaining the throttle valve cam assembly to "lower" kickdown valve body, taking care that the kickdown valve does not eject when the cam is released.

(2) Remove the kickdown valve and spring.

(3) Discard strainer if punctured.

OPERATING CABLE

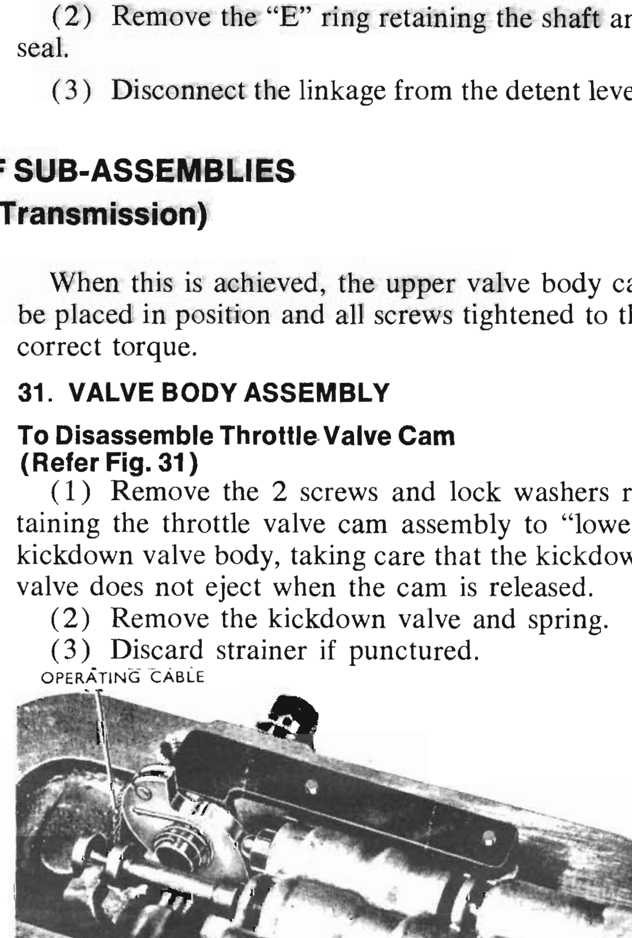


Fig. 31 – Correct cam installation

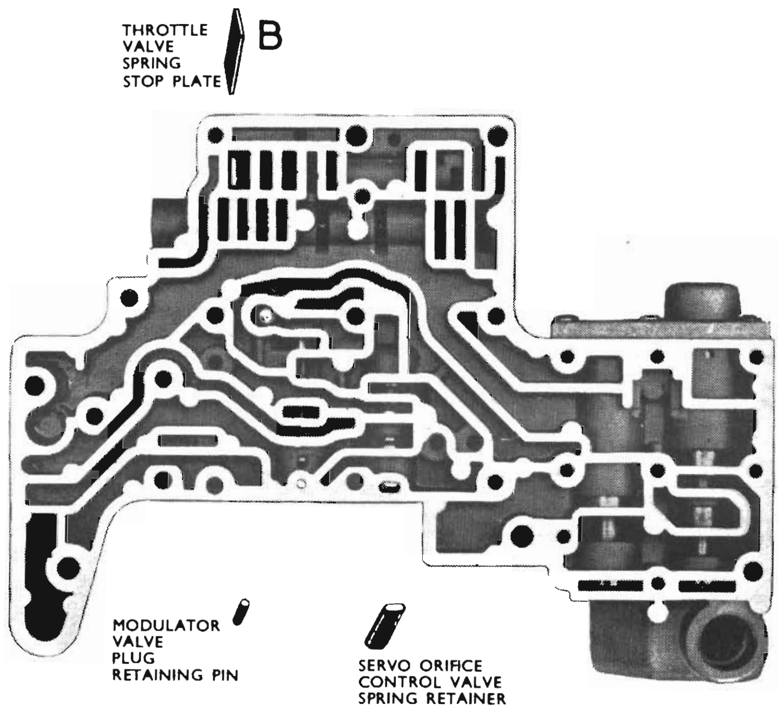


Fig. 32 – Lower valve body assembly

Upper and Lower Bodies

(1) Remove 4 screws ($\frac{5}{8}$″ long) and lock washers from the "top" of the valve body.

(2) Remove 5 screws (1″ long) and 1 screw (1$\frac{3}{8}$″ long) and lock washers from the "lower" side of valve body to allow the halves to separate.

(3) Remove 6 screws (11/16″ long) and 2 screws ($\frac{7}{8}$″ long) and lock washers from the lower half of valve body to allow the oil tube collector to be removed.

NOTE: The tube location is nearest the manual valve.

(4) Remove 4 screws (1″ long and 2″ long) and lock washers to remove the governor line plate allowing the separating plate to be detached. Note position of 3rd line ball valve and spring *(see Fig. 32)*.

Lower Body (Refer Fig. 35)

(5) Withdraw the manual control valve from lower body, note that the double collars protrude to engage the detent lever.

(6) Remove the kickdown and throttle valve spring and stop (if not previously removed) with kickdown valve. Note that the throttle valve large land is toward the kickdown valve.

(7) Remove the modulator valve assembly retaining dowel pin, retainer, modulator valve and plug (large land outermost) and spring.

(8) Remove the servo orifice control valve retainer (stop), spring and servo orifice control valve (large land outermost).

(9) Remove 3 screws (9/16″ long) and lock washers retaining primary and secondary regulator valve and plate, remove the plate, both springs, primary regulator sleeve, and both regulator valves. Note that the primary regulator valve has the larger components and both valve lands are innermost when installed.

Upper Body (Shift Valves)—Fig. 35

(10) Remove the 3 screws retaining each shift valve assembly and plate, which are spring loaded. Remove the larger valves. (Screws 7/16″ long.)

(11) Next largest plunger and spring (2-3 shift valve), then the smaller spring and plunger (spring between plate and plunger) as in Fig. 35.

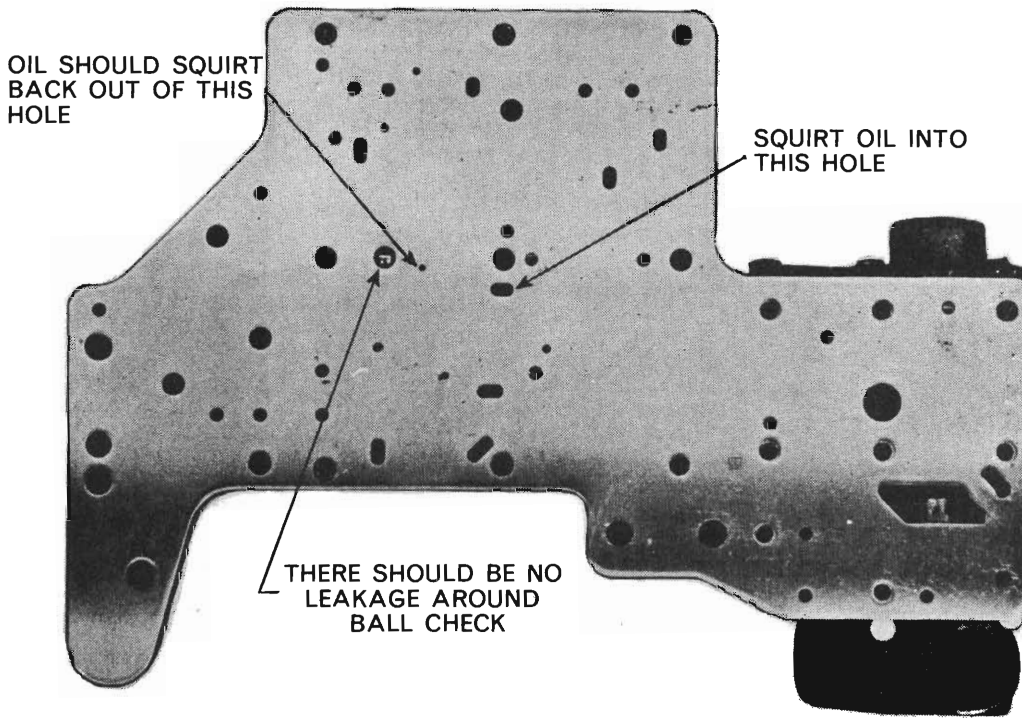


Fig. 33 – Testing 3rd line ball valve seat

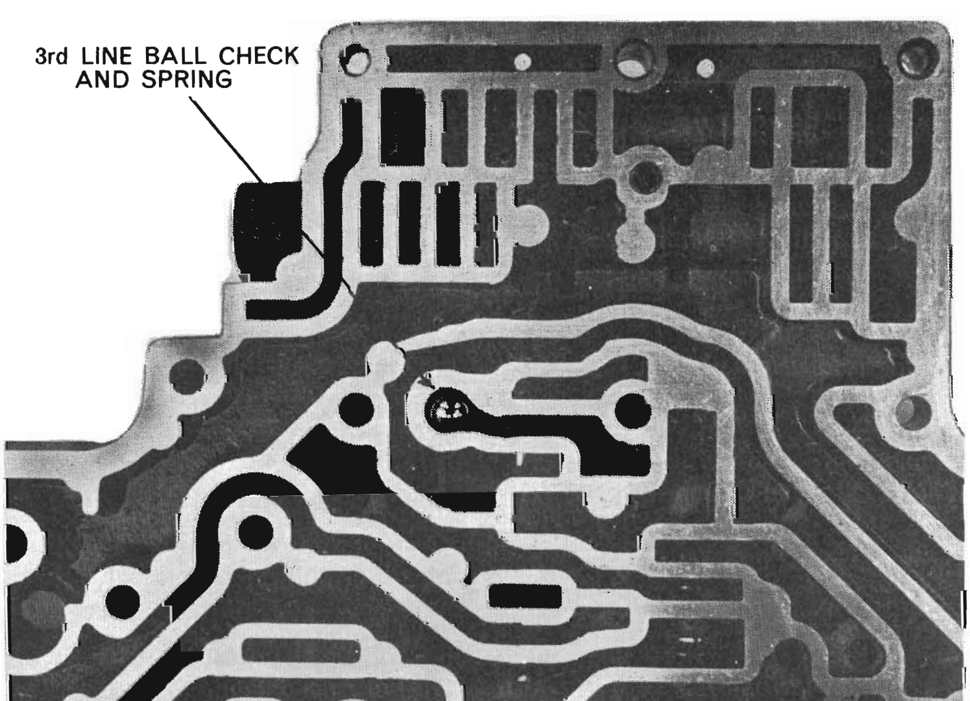


Fig. 33a – Correct location of 3rd line valve ball

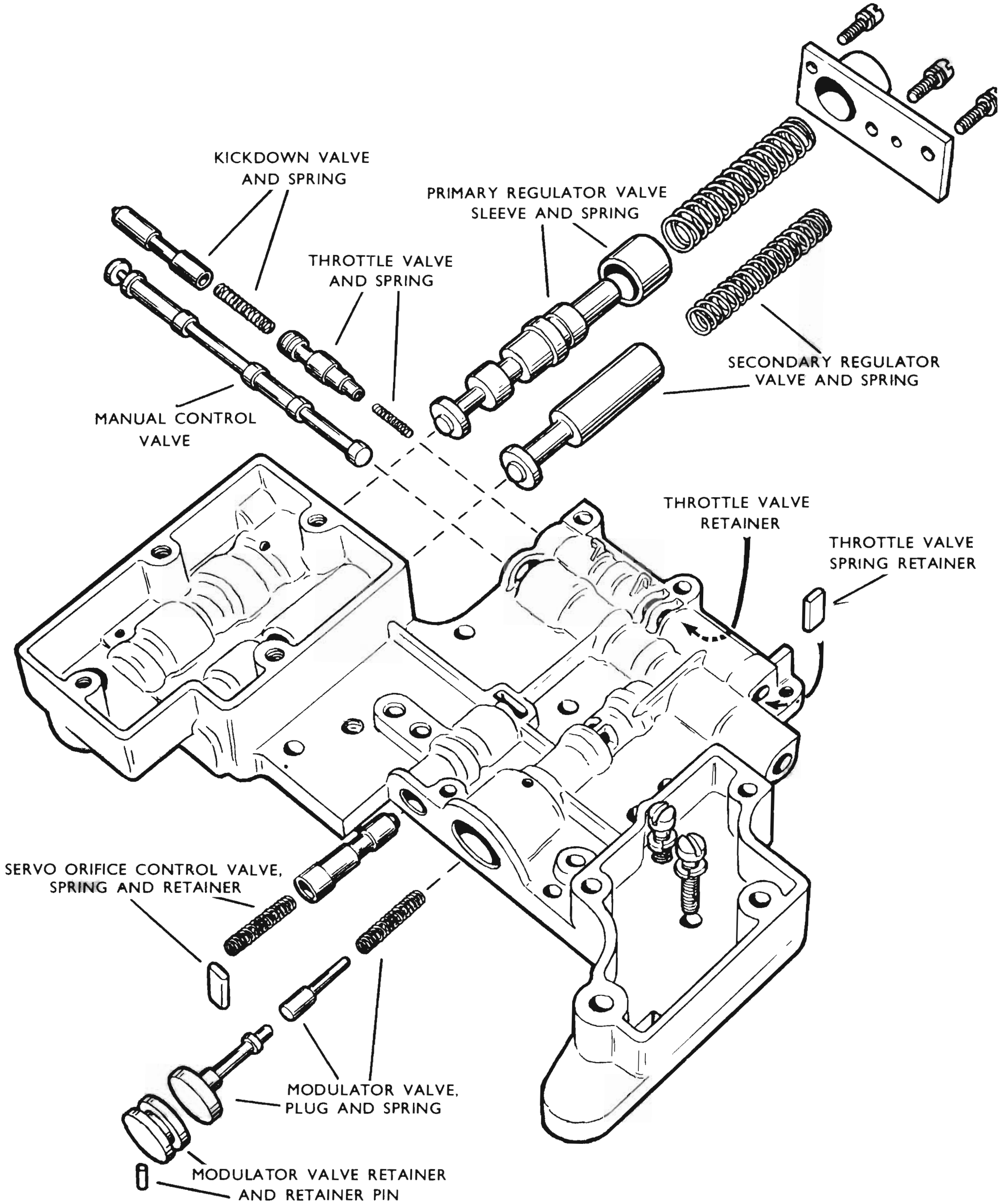


Fig. 34—Lower valve body components (disassembled, inverted view)

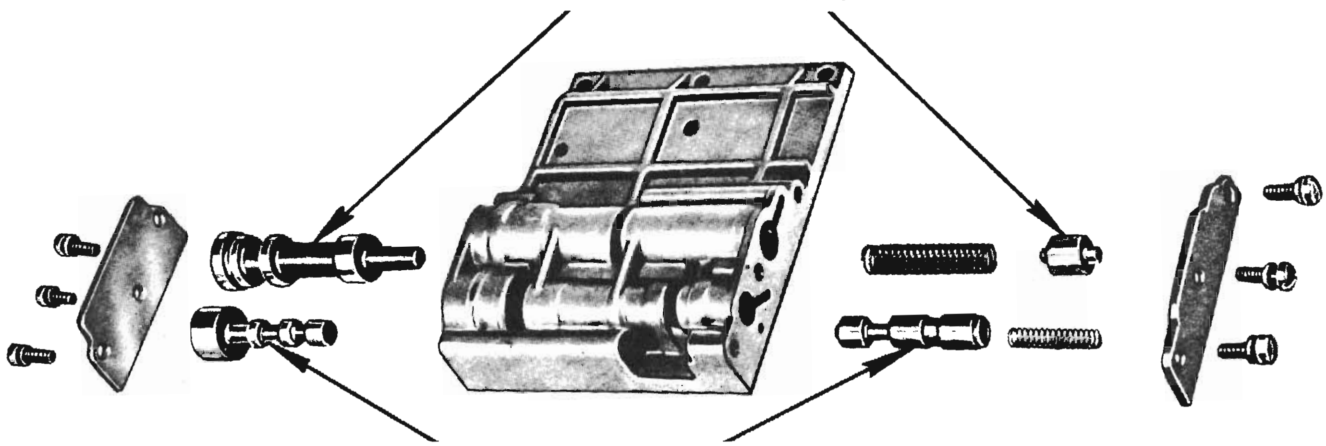


Fig. 35 – Upper valve body (disassembled view)

Reassembly and installation procedures are the reversal of the foregoing instructions, ensuring that all components are completely cleaned and lubricated upon assembly and all screws correctly tightened to the specified torque of 20–30 lbs. ins. for body screws and 4–8 lbs. ft. for the body retaining screws.

Refer to spring application identification chart to ensure that the correct spring is used.

32. VALVE BODY SPRING IDENTIFICATION CHART

Spring Applications (Models)	Lengths	Coils	Wire Diam.	Load
Primary Regulator Valve	2.94″	14	.056″	9.5/10.5 lbs. @ 1.090″
Secondary Regulator Valve	2.593″	21½	.065″	9.75/11.25 lbs. @ 1.937″
Kickdown Valve	1.18″	19½	.032″	3.55/4.04 lbs. @ .750″
*Throttle Return	.807″	28	.018″	.55/.65 lbs. @ .593″
	.807″	25	.018″	.55/.65 lbs. @ .593″
*Servo Orifice Control Valve	1.086″	24	.025″	1.27/1.39 lbs. @ .754″
	1.213″	25	.024″	1.27/1.39 lbs. @ .754″
Modulator Valve	.988″	16½	.034″	3.38/3.74 lbs. @ .734″
	1.005″	17	.024″	
*Pressure Retaining Valve	.617″	3	.0204″	.2/.3 lbs. @ .437″
	.617″	5	.024″	.2/.3 lbs. @ .437″
2–3 Shift Valve	1.59″	19½	.036″	1.33/1.47 lbs. @ 1.178″
1–2 Shift Valve	1.094″	13½	.024″	1.8/2.1 lbs. @ .500″
“Line 3 Check Valve Spring”	.650″	16	.007″	.127/.141 ozs. @ .28″

*Production Variation

33. PUMP ASSEMBLY

To Disassemble

(1) Remove 5 bolts and spring washers and 1 screw and lock washer.

(2) Separate pump body and gears from converter support assembly (using wood block if necessary).

(3) Remove the pump body and converter support gasket and O-ring *(refer Fig. 36).*

(4) Remove pump drive gear assembly from housing, *making sure that* the outside faces of *gears are marked* to retain the original position.

(5) Remove O-ring from the body. (Oil suction (large) tube.)

(6) Remove the oil seal from body (may be done at disassembly). Using Tool E21C35G where required.

(7) Inspect the reaction shaft bushing for wear or damage. Reassemble by reversing the foregoing procedures after cleaning and inspection. Install new oil seal using Tool E21C35F.

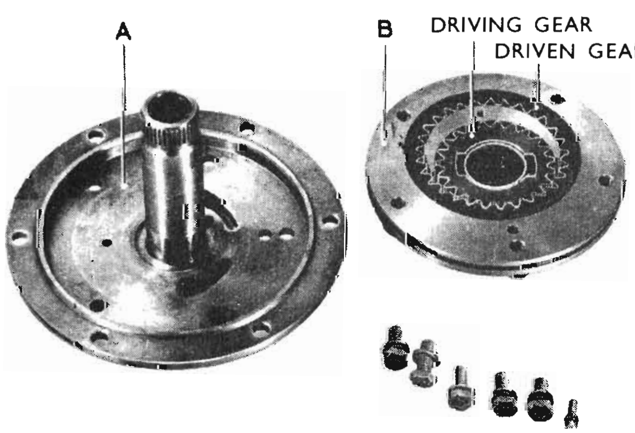


Fig. 36 – Reaction shaft and pump adaptor components

Torque the small screw to 30 lbs. ins. and the 5 set screws to 12–18 lbs. ft.

34. FRONT CLUTCH

To Disassemble

> NOTE: Front clutch cylinder thrust washer (bronze) and cylinder backing washer (steel).

(1) Remove snap ring (using screwdriver) from front clutch retainer.

(2) Remove the input shaft assembly and disassemble the clutch components — *refer Fig. 37* (discs are interchangeable with rear clutch). Refer to specifications for correct number of plates and discs.

> NOTE: Clutch hub thrust washer and front clutch (outer) plates are flat.

(3) Remove clutch hub and fibre thrust face "forward".

(4) Remove inner snap ring (with screwdriver).

(5) Remove diaphragm spring (dishing inwards) and pivot ring from piston (where replacement is necessary).

(6) Blow out piston with air pressure (at drilling in bore).

(7) Remove snap ring from inner groove.

(8) Remove piston outer rubber seal (ring) from groove.

(9) Remove seal O-ring from inside drum.

Reassemble by reversing the foregoing procedures after cleaning and inspecting. Use Tool E1388 to aid reassembly of clutch piston.

35. REAR CLUTCH

To Remove Sun Gear Intermediate Shaft (Refer Fig. 30)

(1) Withdraw sun gear assembly from rear clutch, retrieving needle thrust bearings each side of sun gear. (Note the 1½" O.D. bearing (30 x .078" rollers) is positioned between sun gears.)

(2) Remove 2 oil rings from forward end of intermediate shaft if necessary to replace.

(3) Remove (teflon) oil ring from rear of shaft (if necessary to replace). Reassemble by reversing the foregoing procedures after cleaning and inspection.

Disassembling Rear Clutch (Refer Fig. 38)

(1) Remove snap ring retaining plate from drum with screwdriver.

(2) Remove pressure plate and 5 plate assemblies.

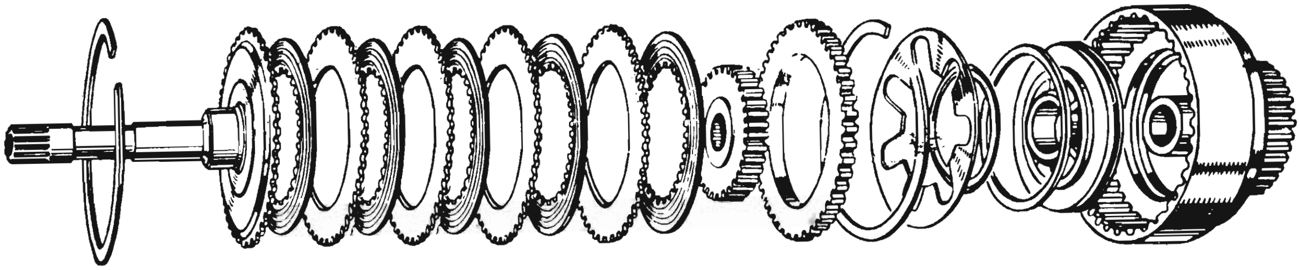


Fig. 37 – Front clutch assembly (disassembled view)
(inner piston seal ring not shown)

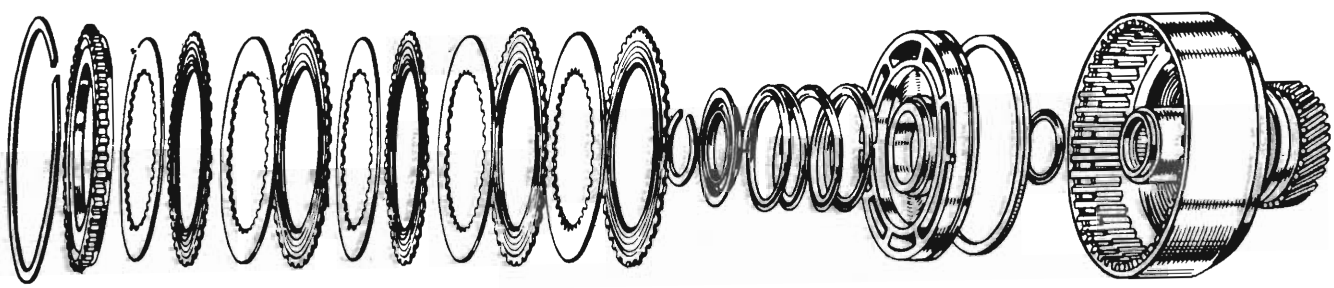


Fig. 38 – Rear clutch assembly (disassembled view)

NOTE: The 5 "outer" plates are coned (identified by the omission of serrations (teeth) 180° apart) and must be all in the same direction when assembled.

(3) Remove piston, using Tool E1386, to compress the spring *(refer Fig. 38).*

(4) Remove spring seat ıetaining snap ring (accessible with ring positioned over flat on boss).

(5) Remove spring seat, spring, piston assembly, by cautiously blowing out with air pressure.

(6) Remove rubber seal ring from piston, also O-rings. Remove the 3 seal rings from clutch drum grooves (where necessary).

(7) Examine sun gear intermediate shaft and seal rings. The needle bearing assembly is serviced separately. Reassemble by reversing the foregoing procedures after cleaning and inspecting. Use special Tool E1387 to install the piston assembly into the cylinder.

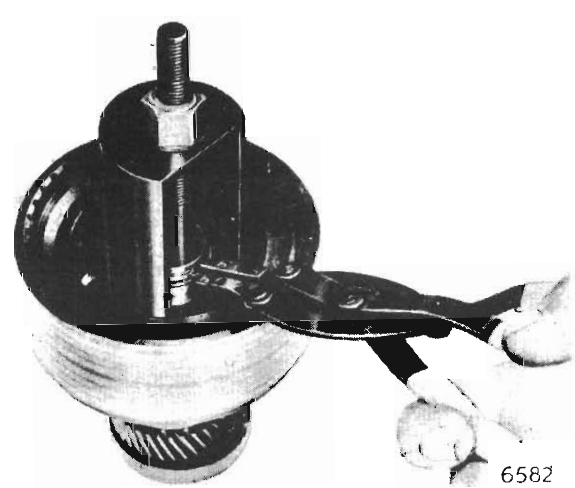


Fig. 39 – Removing spring retaining snap ring showing Tool E1386 installed

36. SERVO ASSEMBLIES

Kickdown (Front) Servo Disassembly (Refer Fig. 40)

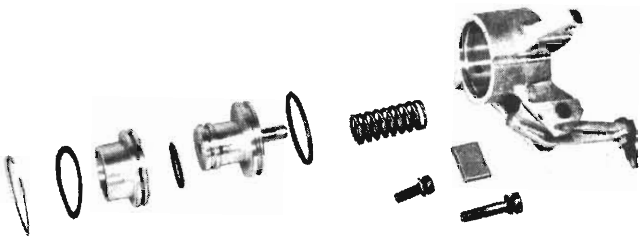


Fig. 40 – Kickdown (front) servo assembly (disassembled view)

(1) Hold sleeve and piston down; remove snap ring retaining piston assembly, using a small screwdriver.

(2) Withdraw piston and sleeve assemblies from bore, retrieve spring.

(3) Withdraw piston from sleeve and remove 3 seal O-rings.

NOTE: The sleeve seal ring replacement is square sectioned.

Reassemble by reversing the foregoing procedures after cleaning and inspecting.

Low/Reverse (Rear) Servo Disassembly (Refer Fig. 41)

(1) Remove the lever return "hairpin" spring by unclipping with fingers.

(2) Suitably support the assembly, then carefully drive out the pivot pin from the housing.

(3) Separate the lever, pin and housing.

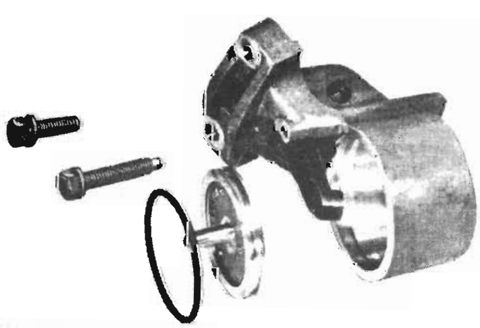


Fig. 41 – Low-reverse rear servo components (disassembled view, "hairpin" spring not shown)

(4) Remove the piston assembly from the servo bore.

(5) Remove the seal, O-ring from the piston groove.

Reassemble by reversing the foregoing procedures after cleaning and inspecting.

NOTE: That the pivot pin protrudes rearward from the servo housing to locate the hairpin spring.

37. CLEANING AND INSPECTION

(1) Thoroughly clean all components in a suitable industrial solvent excepting rubber seals, particularly should these be required for reuse.

(2) Inspect the transmission case for damaged or stripped threaded holes; repairs as described in Page 21–47.

(3) Inspect the output shaft bush, in rear of case, for excess wear or any damage, and that it is secure in case. This bushing is serviced separately.

(4) Inspect the parking brake torsion lever pin (bore) and the anchor pin for damage or looseness in case. The pivot (anchor) pin is part of the case assembly.

(5) Inspect the parking pawl toggle lever assembly, springs and clips, etc., manual shaft levers, detent and neutral starting switch linkage.

(6) Inspect the output shaft support seal ring surfaces for excess wear or damage.

(7) Inspect the band surfaces for excess wear, cracks or signs of overheating, damaged ends, etc., also inspect the adjusting screws (reference to band adjustment settings will indicate balance of service life).

(8) Inspect the clutch disc assemblies for excess wear, for flaking of facings, damaged serration edges and warpage or buckled plates.

NOTE: The dished outer plates of rear clutch are identified by omission of outer serration "teeth".

(9) Inspect oil tubes and mating recesses for tube in casing and valve body and tubes for damage.

(10) Inspect pump assembly housing, bushings gears, drive lug surfaces, and gears for excess wear or scoring, etc. Replace as required.

(11) Inspect torque converter reaction shaft support bushing and converter pump drive lugs and sealing surfaces, splined shafts, etc., and rear clutch retainer check valve condition.

(12) Inspect drums for signs of overheating, scoring or surface imperfections.

(13) Inspect the gear assemblies and shafts for chipped or scored teeth or damaged thrust bearing faces. Check for excessive wear of pinion thrust washers and sun gear shaft seal ring.

(14) Inspect the over-running clutch components for scoring, discolouration (indicating excessive heating) and sprag surfaces for scoring or "flats"—check correct operation of clutch (spring bias), holes free and open.

(15) Inspect the outer shaft cast iron sealing rings for wear and damage on seal faces, rings should be rectangular in section. Check that the ring has sufficient depth clearance in the ring groove of shaft. The rings must not spin in the casing bore.

(16) Inspect the piston rubber O-rings and square section seals for hardening, cracking or cuts. Check that the ring is an interference fit in its bore when assembled on piston.

(17) Inspect valve body and governor for damage or burring of components, scratches or scoring of valves or sealing surfaces. Check for excessive wear of contact points of the throttle cam and throttle valve components. Slight damage may be removed using crocus cloth very carefully. Make sure that the valve lands are *sharp* and *not rounded off*. Check return springs against the spring application chart on Page 21–70, Para. 32.

(18) Inspect shafts and bearing surfaces for damage or scoring, excess wear or worn ring grooves; loose or damaged shaft plugs.

(19) Inspect the casing and servo castings for damage, cracks or scoring, drillings, and passages clear, gasket surfaces clean and flat.

(20) Inspect the fluid strainer and oil pan for damage, and magnet strength.

(21) Inspect the line pressure test tapped hole for damage.

38. INSTALLATION OF SUB-ASSEMBLIES MANUAL VALVE LEVER SHAFT, LEVERS AND PARKING PAWL MECHANISM

Manual Valve Lever Control Shaft Assembly

(1) Mount the transmission case in the repair stand E21C5C.

(2) Install the detent spring into bore.

(3) Position the manual shaft in casing, positioning the spring and detent lever and collar on shaft as shown in *Fig. 42*.

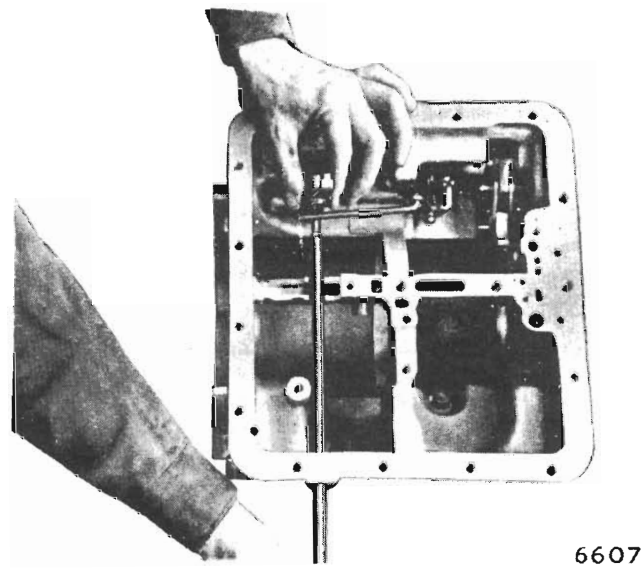


Fig. 42 – Installing the manual control shaft components

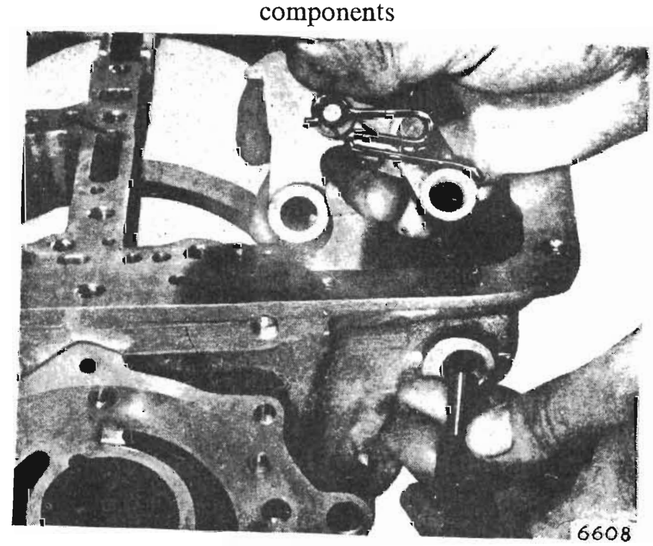


Fig. 43 – Installing parking pawl toggle levers and pin

(4) Install the plain pin locating the detent lever, by forcing with pliers.

(5) Install the ball on detent spring, compressing spring and ball, using a suitable tube, while sliding the detent lever over the ball and holding it in this position.

(6) Secure the collar to shaft, using a new roll pin forced into shaft with pliers, while compressing bias spring.

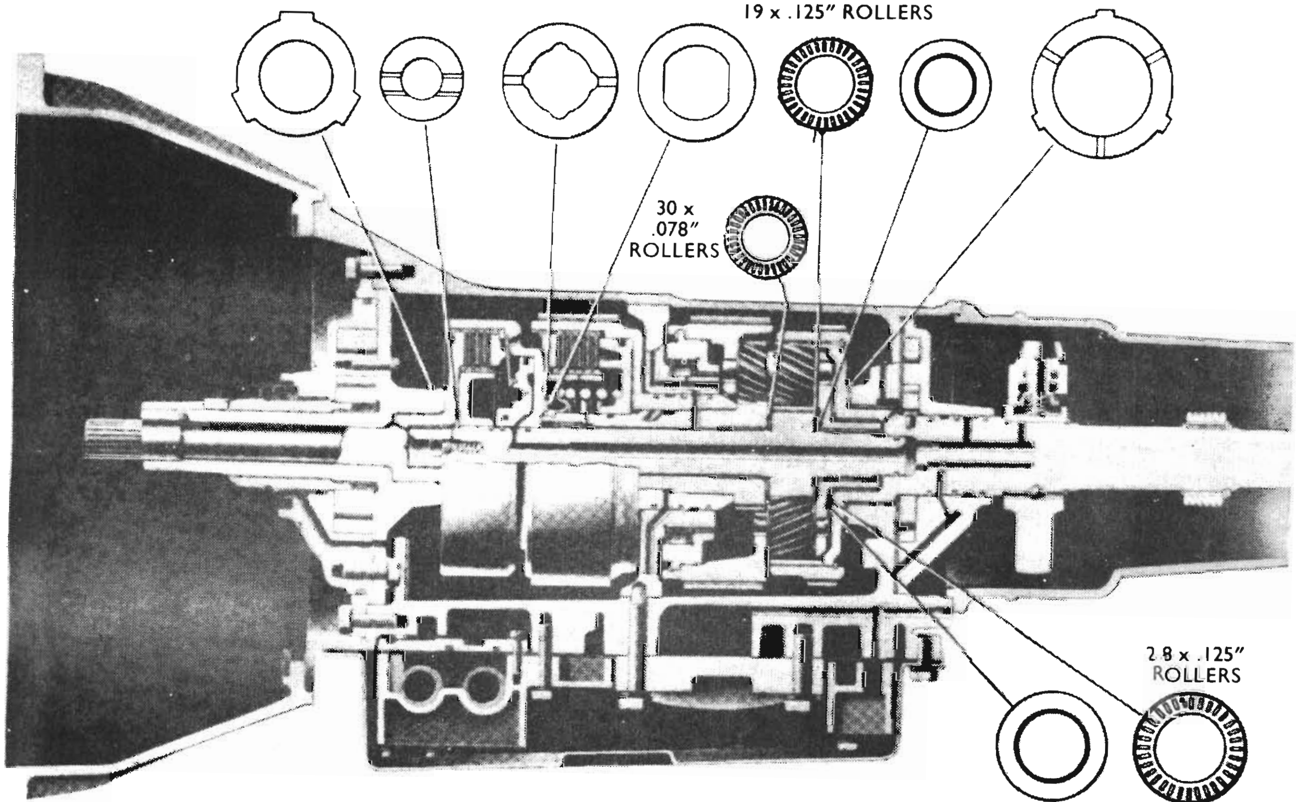


Fig. 44 – Locations of thrust washers (typical view)

(7) Install 2 new shaft seals into recesses in casing.

(8) Install lever to shaft (bushing up) and secure with washer and nut, torque nut to 6–7 lbs. ft. *(Refer Fig. 10).*

(9) Install the neutral starting switch shaft and seal, then secure, using a new "E" clip in shaft groove.

(10) Connect the starting switch lever link to detent lever and install the retaining clip.

Parking Pawl and Toggle Mechanism

(1) Reassemble the parking pawl, link and toggle lever *(as shown in Fig. 43),* with ball headed pin in the toggle lever and secured with the special lift spring.

(2) Install the pawl assembly, using the toggle pivot shaft with a new seal ring in groove.

(3) Install a new roll pin to secure the shaft in the case.

(4) Install the pawl anchor (pivot) shaft. (This shaft is retained by extension housing.)

(5) Install the lift lever and spring assembly on pivot shaft, install washer and retaining spring clip.

(6) Using a screwdriver blade, lift the free end of the spring over the lift lever to spring load the lever.

(7) Install the connecting link and switch linkage and secure with spring clips.

(8) Check the correct operation of the parking pawl mechanism.

Output Shaft

NOTE: That the annulus gear is retained on the output shaft using selective snap rings to provide minimum clearance, available in .055", .057" and .059" thickness.

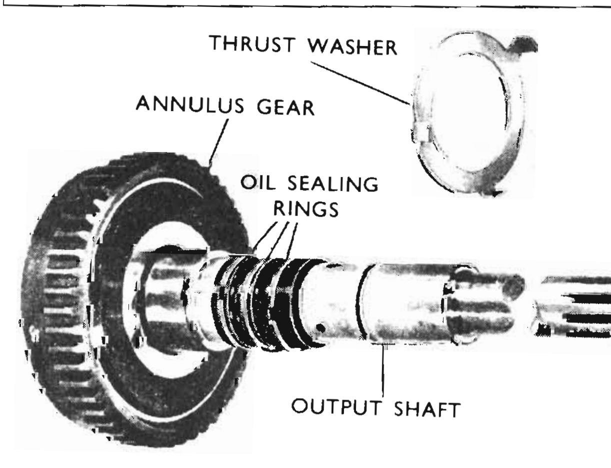


Fig. 45 – Output shaft assembly and thrust washer

(1) Position the output shaft seal ring gaps uppermost in grooves, where installed.

(2) Attach the output shaft tabbed thrust washer using petroleum jelly (Petrolatum-vaseline) with the tab in the projections, on the rear face of transmission case (tab outward) — *refer Fig. 45.*

(3) Carefully install the output shaft rearward through the rear bearing of transmission, taking care not to damage the bearing surface with the seal rings, where installed.

Low/Reverse (Rear) Band

(1) Install the rear band with the ends together to facilitate installation (with the abutment end to casing abutment) then position against the annulus gear.

Intermediate Support and Gear Assembly (Refer Fig. 46)

(1) Insert the over-running clutch sprag assembly into the carrier assembly race (flange outwards) whilst holding the sprag assembly spring-loaded (anti-clockwise).

(2) Install the intermediate support into the over-running clutch, whilst turning the support anti-clockwise to engage sprags. Check operation of clutch and carrier assembly, then install the 2.052" diameter thrust bearing and washer (lip towards output shaft) over the gear carrier journal.

(Mark the position of the oil tube port on the forward face of intermediate support.)

(3) Carefully install the gear carrier assembly into the output shaft annulus gear, turning output shaft to engage gears.

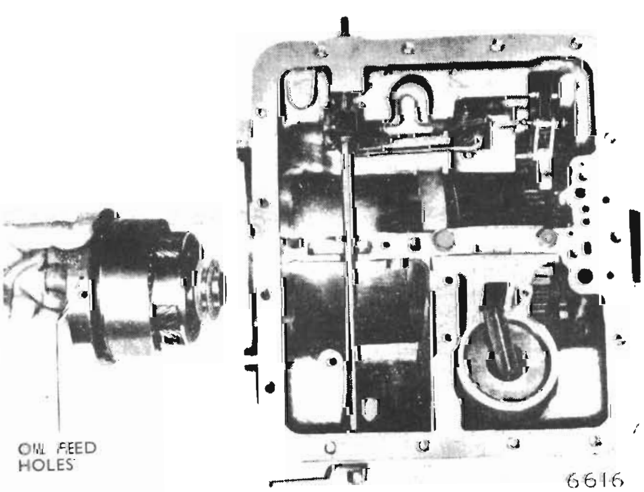


Fig. 46 – Installing intermediate support and planet gear assembly with needle thrust bearing and plate washer

(4) Position the intermediate support to centrally align the oil feed tube with marked drilling (adjacent to the centre bolt hole); insert the feed tube to hold this position, whilst installing the 2 centre support screws and special lock washers (rolled side to screwhead). *Refer Fig. 47.*

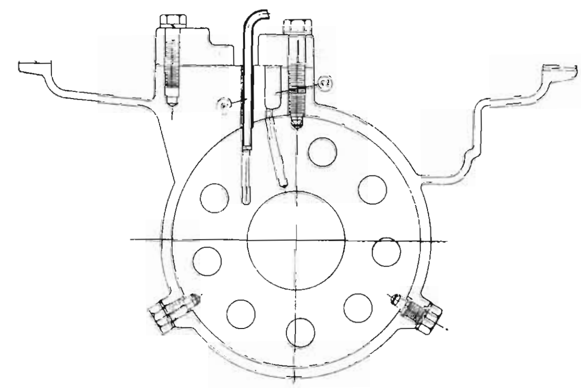


Fig. 47 – Intermediate support location diagram

(5) Tighten the intermediate support set screws carefully, making sure that they do not bind or foul the drillings in the support. Torque screws to 15-25 lbs. ft. then remove the oil tube.

Kickdown (Front) Band

(1) Install the front band by squeezing the two ends together and positioning correctly to abutment.

Rear Clutch Assembly

(1) Inspect the 2 small interlocking oil rings in the intermediate shaft and install a new teflon seal in rear groove.

(2) Install needle thrust bearing (19 x .078" rollers) and thrust plate to the rear face of the rear sun gear, with the thrust plate lip towards the output shaft. *Refer Fig. 48.*

(3) Position the needle roller thrust bearing ($1\frac{5}{8}$" diameter) against the forward face of the sun gear and install the sun gear intermediate shaft into the rear clutch assembly.

(4) Carefully install the rear clutch assembly into the gear carrier assembly. *(Fig. 48).*

Front Clutch

(1) Position the front clutch thrust washers (steel backing and bronze) on to the front clutch assembly with the steel washer located on the "driving flats" of the front clutch centre then the bronze thrust washer.

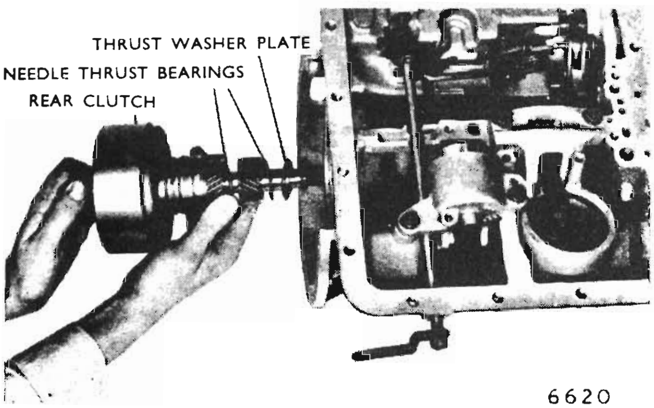


Fig. 48 – Installing rear clutch retainer assembly (typical view)

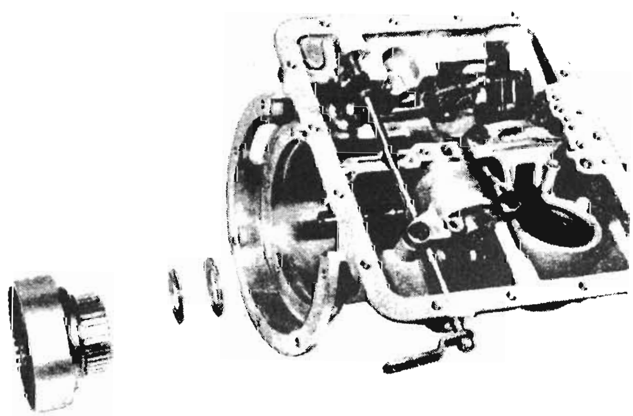


Fig 49 – Installing front clutch retainer assembly

Pump Assembly

(1) Position the selective tabbed thrust washer using vaseline to the pump assembly, locating tabs in recesses provided.

(2) Position a new gasket onto the pump housing mounting face, then carefully install assembly to transmission casing. *Refer Fig. 50.*

(3) Install the 6 retaining $\frac{3}{8}''$ AF head screws and washers and tighten evenly to 12-18 lbs. ft. torque.

Transmission Gear End Float

(1) Install the dial indicator to read the input shaft end float as shown in *Fig. 51*. The shaft end float should be within .010″-.030″.

(2) Adjust if necessary by installing a new selective washer of correct thickness where required.

Selective thickness washers are .061″-.063″ or .078″-.080″.

Output Shaft Seal Rings and Support

(1) Carefully install new output shaft seal rings (where previously removed) positioning the gaps upward.

(2) Carefully install the output shaft support and plate (where equipped) making sure that the oil holes are open.

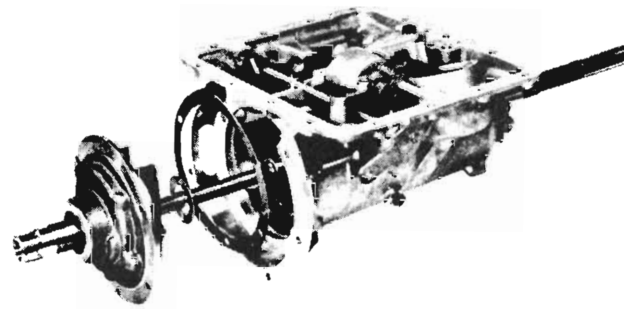


Fig. 50 – Installing pump assembly

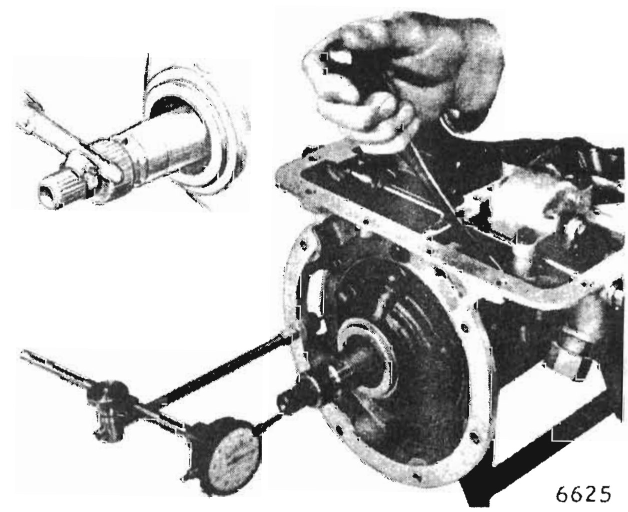


Fig. 51 – Measuring input shaft end float (Inset shows alternative method using a hose clip and feeler gauges)

Governor Valve Assembly

(1) Install the $\frac{1}{4}''$ drive ball into shaft recess and then install the governor valve body to shaft, with plate side rearward.

(2) Install the retaining circlip in output shaft.

(3) Install the speedometer drive 3/16″ ball into shaft recess.

(4) Install the speedometer drive gear and retaining circlip.

Extension Housing

(1) Position a new extension housing gasket correctly on the extension housing and install the

housing on the transmission case, tightening the 7/16" head retaining screws to 25-35 lbs. ft. torque.

Kickdown (Front) Servo

(1) Attach the strut to the front servo lever using petroleum jelly (vaseline) positioning the strut to obtain correct assembly of these components. *Refer to Fig. 53.*

(2) Install the retaining bolts, note the rear bolt is the longer and tighten evenly to 10-15 lbs. ft. torque.

Low/Reverse (Rear) Servo

(1) Attach the strut to the band engaging slot using petroleum jelly, positioning the strut to obtain correct assembly of these components.

(2) Install the retaining screws and tighten evenly to 15-25 lbs. ft. torque.

Valve Body

(1) Install the tube connecting the cooler line in casing from the pump adapter drilling (converter "OUT"). *(Fig. 54.)*

(2) Install the pick-up tube O-ring on intake tube swaged end which is inserted into the pump adapter.

(3) Install the tubes as shown in *Fig. 54.*

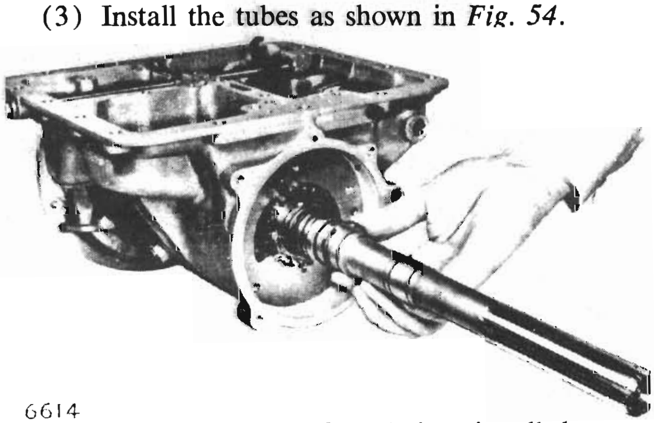


Fig. 52 – Output shaft seal rings installed

(4) Install the transmission throttle cable, using a new seal ring and tighten to 10-12 lbs. ft.

(5) Position the valve body assembly on to the respective tube recesses carefully, then install the retaining bolts and tighten *evenly* to 4-8 lbs. ft. torque.

(6) Connect the transmission throttle cable to the throttle valve cam.

(7) Adjust the bands as described in paragraph 5 of page 21–54.

Oil Pan

(1) Install the oil pan permanent magnet to the inside of pan in the area of the strainer.

(2) Install a new pan gasket and tighten the retaining screws evenly to 10 lbs. ft. torque.

Transmission in Vehicle

(1) Install the filler tube to oil pan and tighten to 14 lbs. ft.

(2) Install the breather tube to breather union and connect the oil cooler lines, tightening union nuts to 75 lbs. in.

(3) Reinstall the gear shift torque shaft selector bracket on transmission location.

NOTE: When the transmission is installed ensure that the correct transmission fluid is added to pan and the throttle cable is correctly adjusted as described. Refer to Para. 1, 3 and 6.

(4) Road test the vehicle.

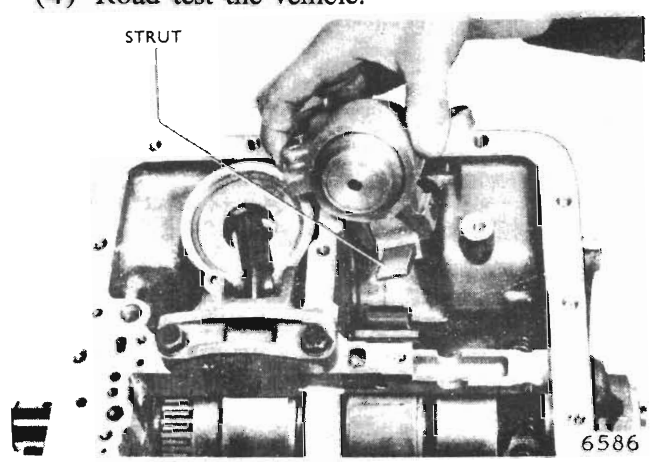


Fig. 53 – Installing the front servo assembly (typical view)

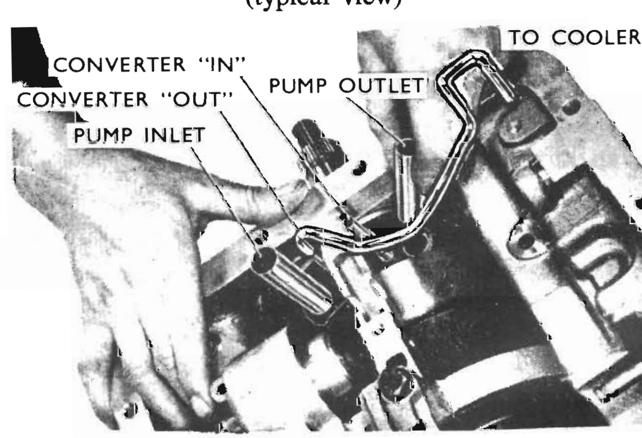


Fig. 54 – Location of tubes

PART 2A — TORQUEFLITE TRANSMISSION

8 CYLINDER

318 — MODEL A904LA

360 and 340 — MODEL A727A

CAUTION: A904LA and A727A transmissions are similar in many respects, however when ordering parts it is essential to quote the transmission serial number as well as all of the numbers on the vehicle certification plate attached to the plenum chamber.

SPECIFICATIONS

Type	Automatic three speed with Torque Converter
Torque Converter Diameter	10¾″,
Cooling Method	Water—Heat exchanger
Lubrication	Pump—Rotor type
Clutches	
Number of front clutch plates	4
Number of front clutch discs	4
Number of rear clutch plates	3
Number of rear clutch discs	4
Gear Ratios:	
1–Low	2.45:1
2–second	1.45:1
D–drive	1.00:1
R–reverse	2.20:1
Oil Pump:	
Type	Gear—rotary
End clearance (rotor)	.0015″ - .003″
Drive Train End Play	.030″ - .089″
Planetary Gear Assembly End Play	.006″ - .033″
Clutch Plate Clearance:	
Front Clutch	.056″ - .104″
Rear Clutch	.032″ - .055″

Snap Rings:

Front and Rear Clutches	.060" - .062"
Rear Snap Ring (selective)	.068" - .070"
	.076" - .078"
Output shaft (forward end)	.040" - .044"
	.048" - .052"
	.059" - .065"

Thrust Washers:

Output shaft to input shaft (selective)	.052" - .054" (natural)
	.068" - .070" (red)
	.083" - .085" (black)
(Sun) Gear planetary driving shell	.060" - .062"
Driving shell (steel)	.034" - .036"
Kickdown annulus support	.121" - .125"
Front clutch to rear clutch	.043" - .045"
Front clutch to reaction shaft support	.043" - .045"

Band adjustments (back off turns):

— Front (kickdown)	A904LA	2 from 72 lbs. in.	A727 2½ turns
— Rear (low/reverse)	A904LA	4 from 72 lbs. in.	A727 2 turns

FLUID TYPE: Chrysler Specification 41/MS5033

Refill and Top-Up:

Shell S7368A	B10378
Caltex TL 6673	B10101
Castrol Grade 14704	B10599
Esso AP Dexron	B10664

Top-Up Only:

Ampol DXR 4413	B10673
Golden Fleece Dexron	B10314
Amoco Dexron	B10672, and B10600
BP ATF Dexron	B10800
Mobil ATF 220	B10104

SPECIAL TOOLS

lbs. in	—	Torque wrench
lbs. ft.	—	Torque wrench
E21C30	—	Compressor — front clutch piston spring
E1295	—	Adaptor — transmission band adjuster (use with lbs. in torque wrench)
	—	Remote starter switch
	—	Jack — transmission
E21C35B	—	Studs — pilot
E21C35C	—	Studs — pilot
E21C65	—	Gauge — low pressure
E21C65A	—	Gauge — high pressure
	—	Snap ring pliers
E21C35L	—	Seal remover front pump
E21C35K	—	Seal replacer front pump
E21C60A	—	Extension housing bush remover
E21C50B	—	Extension housing seal replacer
E21C30C	—	Front clutch compressor
E21C35P	—	Aligning tool — front pump
	—	Straight edge
E0092	—	Compressor — engine valve spring
E19C10	—	Puller — steering wheel
	—	Engine support fixture
E21C5B	—	Stand — valve body
E21C5C	—	Stand — transmission
E21C35D	—	Remover — front oil pump and reaction shaft support
E21C35E	—	Aligning tool — front oil pump
E21C35F	—	Installer — oil pump seal
E21C35G	—	Remover — oil pump seal
E21C35H	—	Assembly tool — oil pump to reaction shaft support
E21C55	—	Gauge — throttle pressure
E21C15A	—	Installer — detent ball
E21C5D	—	Transmission repair stand adaptor
E21C50D	—	Remover — extension housing yoke seal
E21C50C	—	Installer — extension housing yoke seal
E21C50E	—	Remover and Installer — extension housing sliding spline bushing
E21C45B	—	Installer — speedometer drive adaptor inner oil seal
E21C65	—	Torque converter flushing tool
E21C25A	—	Torque converter spinning shaft
E21C60	—	Transmission bushing kit

TORQUE SPECIFICATIONS

	lbs./ft.	lbs./in.
Cooler line fitting		110
Cooler line union nut		85
Converter drain plug	10	
Converter drive plate to crankshaft bolt	55	
Converter drive plate to torque converter bolt	23	
Converter cover plate to housing bolt		40
Extension housing to transmission case bolt	24	
Extension housing to insulator mounting bolt	40	
Extension housing insulator to cross-member nut		200
Extension housing-crossmember to frame bolt	90	
Governor body to support bolt		100
Kickdown band adjusting screw lock nut	25	
Kickdown lever shaft plug		150
Neutral starter switch	25	
Oil filler tube bracket bolt		150
Oil pan bolt		150
Oil pump housing to transmission case bolt		175
Output shaft support bolt		150
Over-running clutch cam set screw		100
Pressure test take-off plug		75
Reaction shaft support to oil pump bolt		125
Reverse band adjusting screw lock nut	20	
Speedometer drive clamp screw		100
Transmission to engine bolt (upper)	40	
(lower)	50	
Valve body screw (Cheese head)		35
(Phillips head)		28
Valve body to transmission case bolt		100
Throttle valve shaft lever clamp bolt		95
Adjustment Swivel Clamp screw		100
Steering Column Retaining Screws	15	

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

The Service Diagnosis Chart lists the most common operating difficulties encountered in the automatic transmission and gives the possible causes of the trouble. Before proceeding with any diagnosis checks, make certain the transmission fluid is up to the correct level and the engine is properly tuned. Also check the gearshift control linkage and throttle linkage for correct adjustment and possible wear. Never remove a transmission from a vehicle until all the possible "in vehicle" causes have been checked for the operating difficulty. In some cases the oil pan should be removed to check for dirt, metal chips, band material, broken band ends, and burned or scored band contacting surfaces. Also check the fluid for a burnt odour, indicating burned clutch plates.

Corrective procedures for the "Items to check" are covered in detail in one of the following sections of this transmission group: Maintenance, Adjustments and Tests, Servicing Operations – (Transmission in Vehicle), Reconditioning Transmission – (Unit out of vehicle).

1. HARSH ENGAGEMENT IN D, 1, 2, AND R

(1) Engine idle speed too high.
(2) Hydraulic pressures too high or low.
(3) Low-reverse band out of adjustment.
(4) Valve body malfunction or leakage.
(5) Accumulator sticking, broken rings or springs.
(6) Low-reverse servo, band or linkage malfunction.
(7) Worn, or faulty front and/or rear clutch.

2. DELAYED ENGAGEMENT IN D, 1, 2, AND R

(a) (1) Low fluid level.
(2) Incorrect gearshift control linkage adjustment.
(3) Oil filter clogged.
(4) Hydraulic pressures incorrect.
(5) Valve body malfunction or leakage.
(6) Accumulator sticking, broken rings or spring.
(7) Clutches or servos sticking or not operating.
(8) Faulty oil pump.
(9) Worn or faulty front and/or rear clutch.
(10) Worn or broken input shaft and/or reaction shaft, support seal rings.
(11) Aerated fluid.

(b) DELAYED ENGAGEMENT — PARK TO REVERSE.
(1) Loose valve body screws.

3. RUNAWAY OR HARSH UP-SHIFT AND 3-2 KICKDOWN

(1) Low fluid level.
(2) Incorrect throttle linkage adjustment.
(3) Hydraulic pressures incorrect.
(4) Kick-down band adjustment.
(5) Valve body malfunction or leakage.
(6) Governor malfunction.
(7) Accumulator sticking, broken rings or spring.
(8) Clutches or servos sticking or not operating.
(9) Kickdown servo, band or linkage malfunction.
(10) Worn or faulty front clutch.
(11) Worn or broken input shaft and/or reaction shaft support seal rings.

4. NO UPSHIFT

(1) Low fluid level.
(2) Incorrect throttle linkage adjustment.
(3) Kickdown band adjustment.
(4) Hydraulic pressures incorrect.
(5) Governor sticking.
(6) Valve body malfunction or leakage.
(7) Accumulator sticking, broken rings or spring
(8) Clutches or servos sticking or not operating.
(9) Faulty oil pump.
(10) Kickdown servo band or linkage malfunction.
(11) Worn or faulty front clutch.
(12) Worn or broken input shaft and/or reaction shaft support seal rings.

5. NO KICKDOWN OR NORMAL DOWNSHIFT

(1) Incorrect throttle linkage adjustment.
(2) Incorrect gearshift control linkage adjustment.
(3) Kickdown band adjustment.
(4) Hydraulic pressures incorrect.
(5) Governor sticking.
(6) Valve body malfunction or leakage.
(7) Accumulator sticking, broken rings or spring.
(8) Clutches or servos sticking or not operating.
(9) Kickdown servo, band or linkage malfunction.
(10) Overrunning clutch not holding.

6. SHIFTS ERRATIC

(1) Low fluid level.
(2) Aerated fluid.
(3) Incorrect throttle linkage adjustment.
(4) Incorrect gearshift control linkage adjustment.
(5) Hydraulic pressures incorrect.
(6) Governor sticking or leaking.
(7) Oil filter clogged.
(8) Valve body malfunction or leakage.
(9) Clutches or servos sticking or not operating.
(10) Faulty oil pump.
(11) Worn or broken input shaft and/or reaction shaft support seal rings.

7. SLIPS IN FORWARD DRIVE POSITIONS

(1) Low fluid level.
(2) Aerated fluid.
(3) Incorrect throttle linkage adjustment.
(4) Incorrect gearshift control linkage adjustment.
(5) Hydraulic pressures too low.
(6) Valve body malfunction or leakage.
(7) Accumulator sticking, broken rings or spring.
(8) Clutches or servos sticking or not operating.
(9) Worn or faulty front and/or rear clutch.
(10) Overrunning clutch not holding.
(11) Worn or broken input shaft and/or reaction shaft support seal rings.

8. SLIPS IN REVERSE ONLY

(1) Low fluid level.
(2) Aerated fluid.
(3) Incorrect gearshift control linkage adjustment.
(4) Hydraulic pressures incorrect.
(5) Low-reverse band adjustment.
(6) Valve body malfunction or leakage.
(7) Front clutch or rear servo, sticking or not operating.
(8) Low-reverse servo, band or linkage malfunction.
(9) Faulty oil pump.

9. SLIPS IN ALL POSITIONS

(1) Low fluid level.
(2) Hydraulic pressures too low.
(3) Valve body malfunction or leakage.
(4) Faulty oil pump.
(5) Clutches or servos sticking or not operating.
(6) Worn or broken input shaft and/or reaction shaft support seal rings.

10. NO DRIVE IN ANY POSITION

(1) Low fluid level.
(2) Hydraulic pressures too low.
(3) Oil filter clogged.
(4) Valve body malfunctioning or leakage.
(5) Faulty oil pump.
(6) Clutches or servos sticking or not operating.
(7) Torque converter failure.

11. NO DRIVE IN FORWARD DRIVE POSITIONS

(1) Hydraulic pressures too low.
(2) Valve body malfunctioning or leakage.
(3) Accumulator sticking, broken rings or spring.
(4) Clutches or servos, sticking or not operating.
(5) Worn or faulty rear clutch.
(6) Over-running clutch not holding.
(7) Worn or broken input shaft and/or reaction shaft support seal rings.

12. NO DRIVE IN REVERSE

(1) Incorrect gearshift control linkage adjustment.
(2) Hydraulic pressures too low.
(3) Low reverse band adjustment.
(4) Valve body malfunctioning or leakage.
(5) Front clutch or rear servo, sticking or not operating.
(6) Low-reverse servo, band or linkage malfunction.
(7) Worn or faulty front clutch.

13. DRIVES IN NEUTRAL

(1) Incorrect gearshift control linkage adjustment.

(2) Valve body malfunction or leakage.

(3) Rear clutch malfunction.

14. DRAGS OR LOCKS

(1) Kickdown band out of adjustment.

(2) Low-reverse band out of adjustment.

(3) Kickdown and/or low-reverse servo, band, linkage malfunction.

(4) Front and/or rear clutch faulty.

(5) Planetary gear sets broken or seized.

(6) Overrunning clutch worn, broken or seized.

15. GRATING, SCRAPING, GROWLING NOISE

(1) Kickdown band out of adjustment.

(2) Low-reverse band out of adjustment.

(3) Out-put shaft bearing and/or bushing damaged.

(4) Governor support binding or broken seal rings.

(5) Oil pump scored or binding.

(6) Front and/or rear clutch faulty.

(7) Planetary gear sets broken or seized.

(8) Overrunning clutch worn, broken or seized.

16. BUZZING NOISES

(1) Low fluid level.

(2) Pump sucking air.

(3) Valve body malfunction.

(4) Overrunning clutch inner race damaged.

17. HARD TO FILL, OIL FLOWS OUT FILLER TUBE

(1) High fluid level.

(2) Breather clogged.

(3) Oil filter clogged.

(4) Aerated fluid.

18. TRANSMISSION OVERHEATS

(1) Low fluid level.

(2) Kickdown band adjustment too tight.

(3) Low-reverse band adjustment too tight.

(4) Faulty cooling system.

(5) Cracked or restricted oil cooler line or fitting.

(6) Faulty oil pump.

(7) Insufficient clutch plate clearance in front and/or rear clutches.

19. STARTER WILL NOT ENERGIZE IN NEUTRAL OR PARK

(1) Incorrect gearshift control linkage adjustment.

(2) Faulty or incorrectly adjusted neutral starting switch.

(3) Broken lead to neutral switch.

CLUTCH ENGAGEMENT AND BAND APPLICATION CHART

Lever Position Drive-Ratio	Front Clutch	Rear Clutch	Front (kickdown) Band	Rear (Low-Rev) Band	Over-running 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

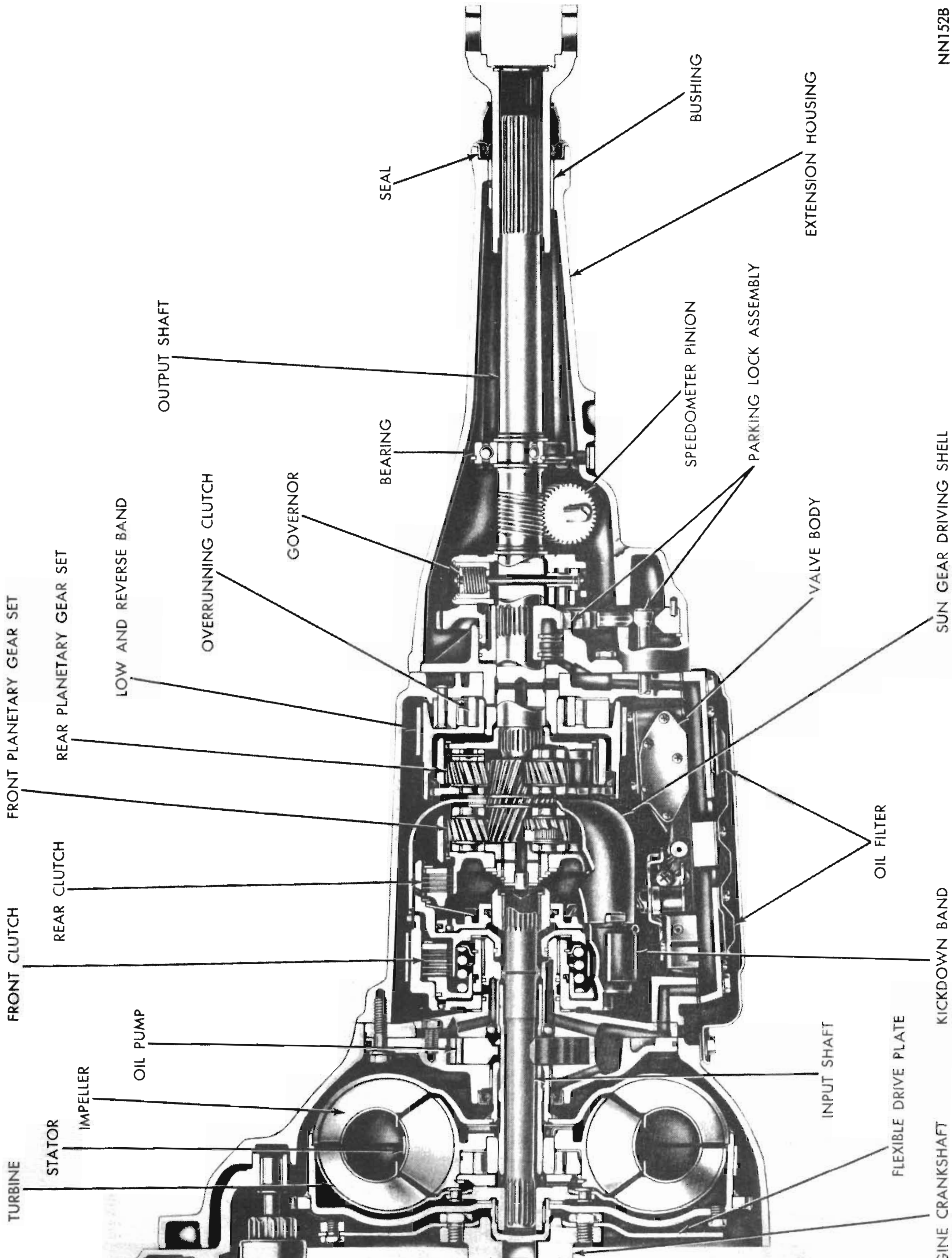


Fig. 1—TorqueFlite Transmission and Torque Converter (A-904)

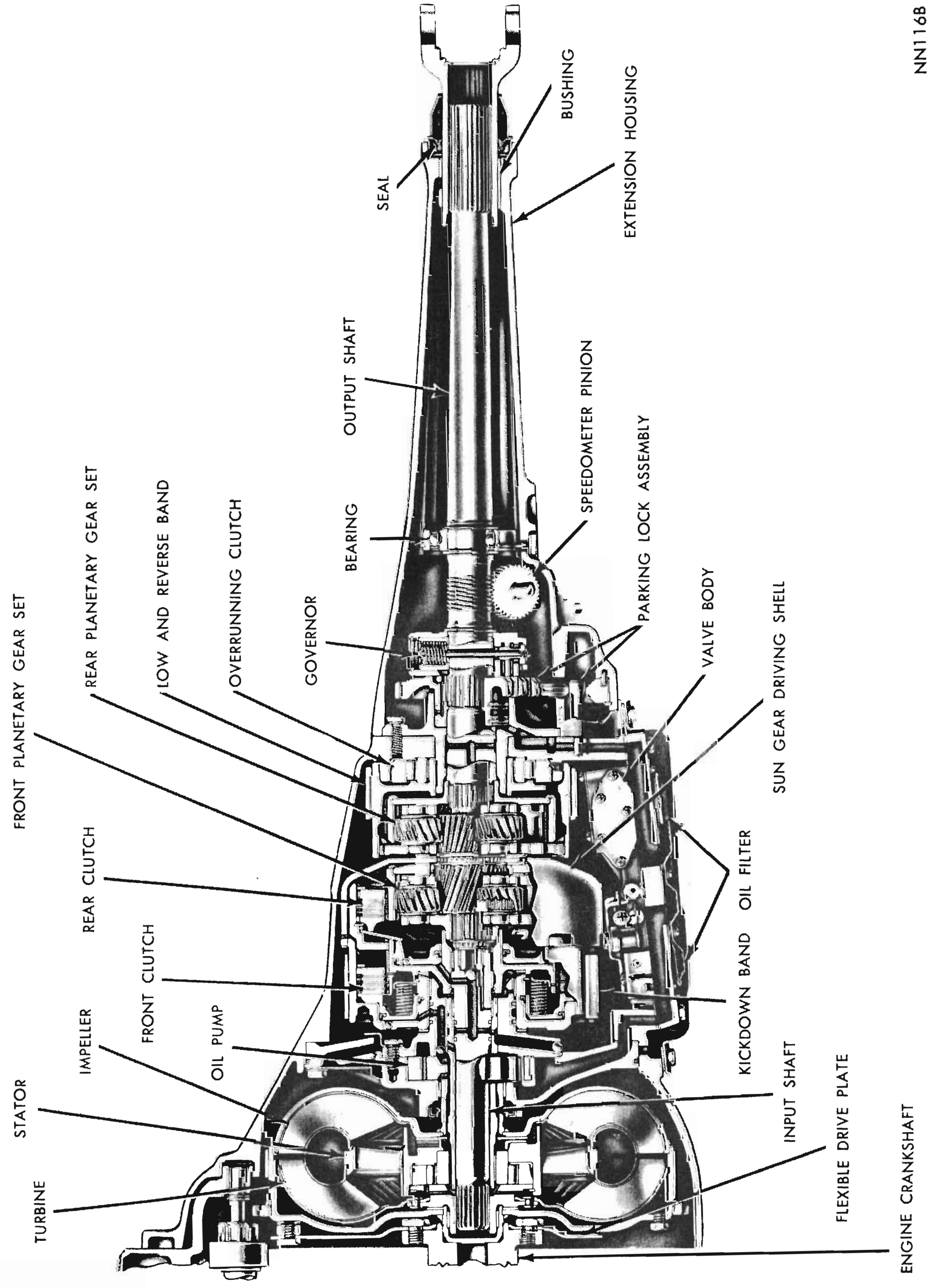
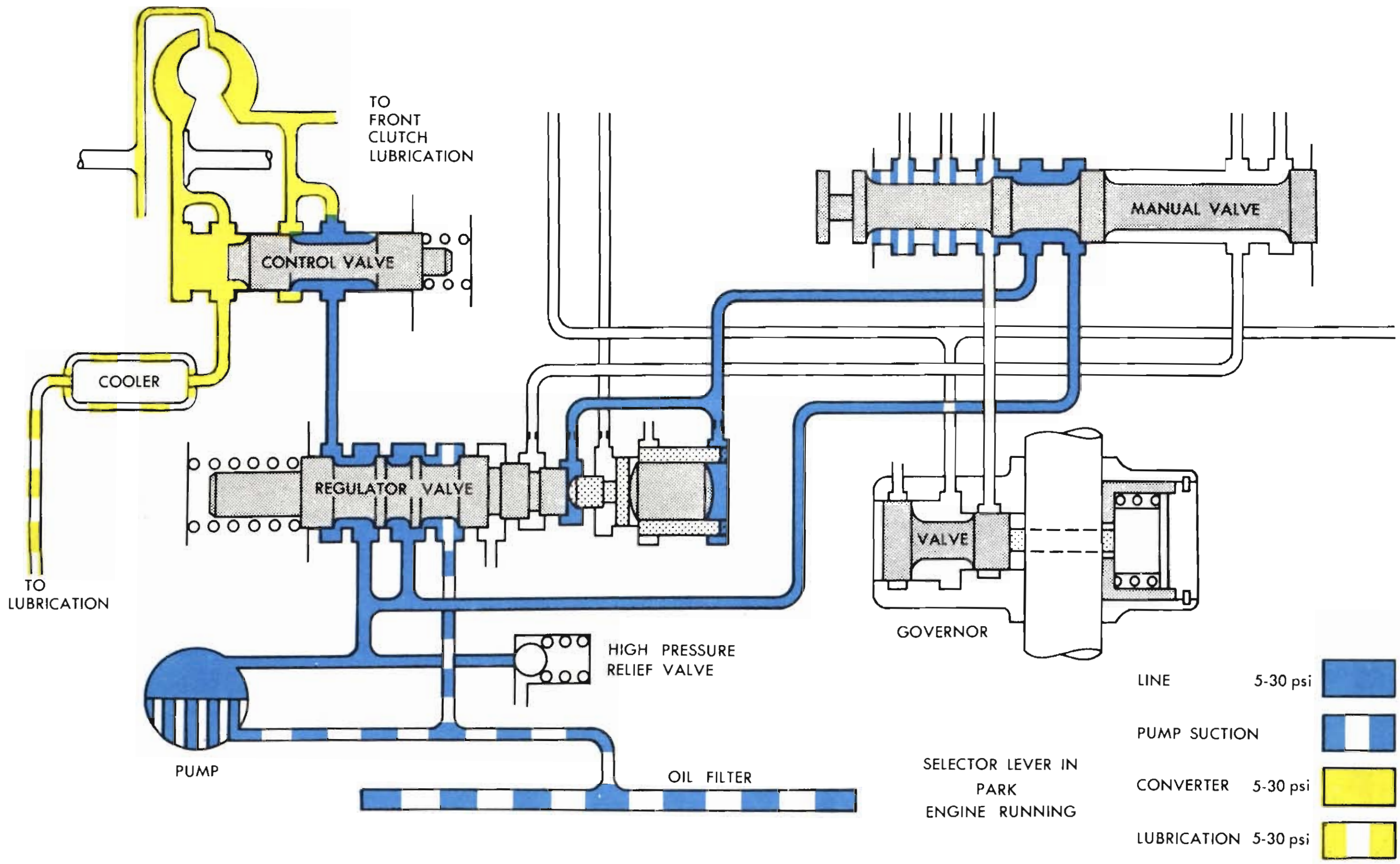
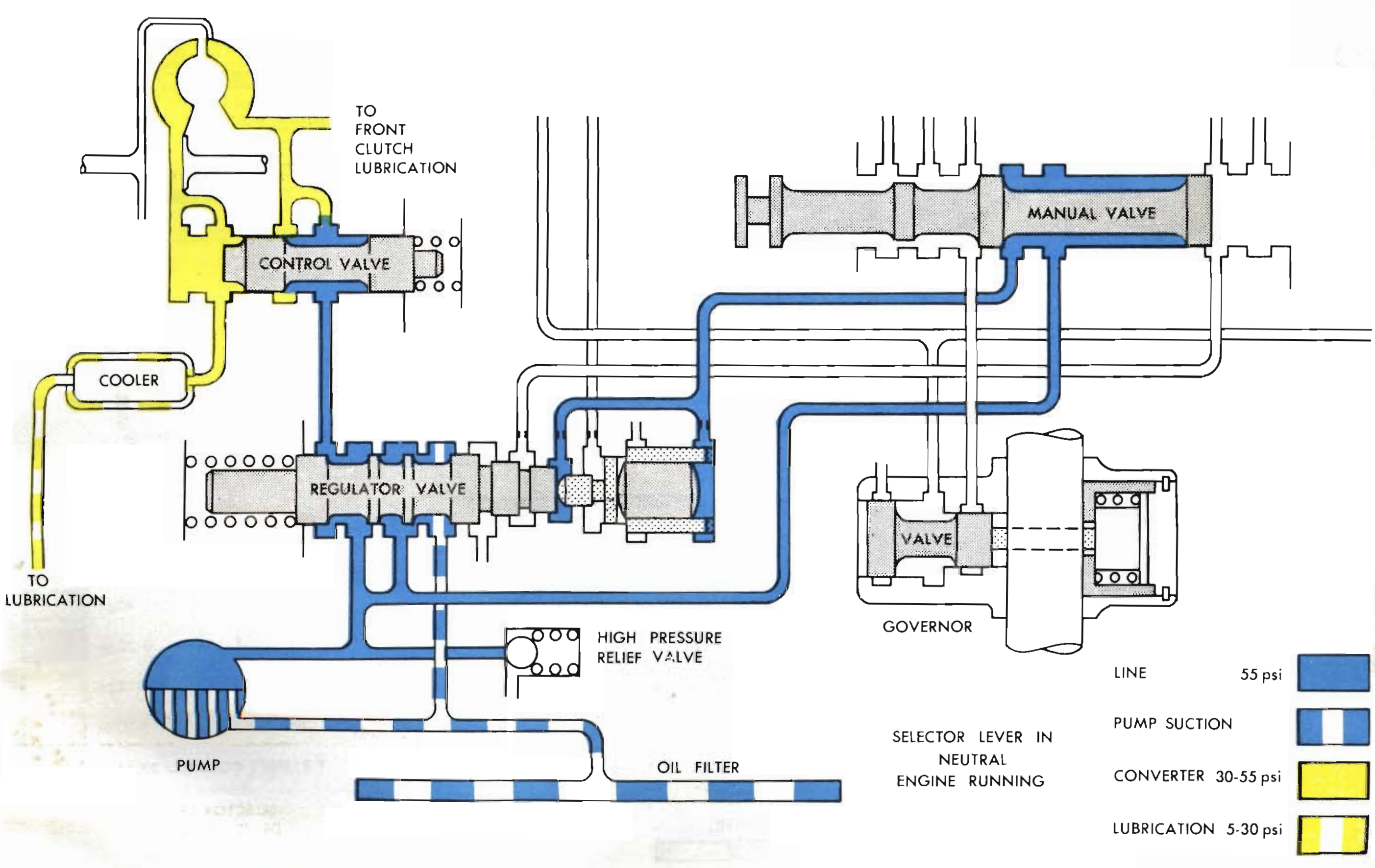
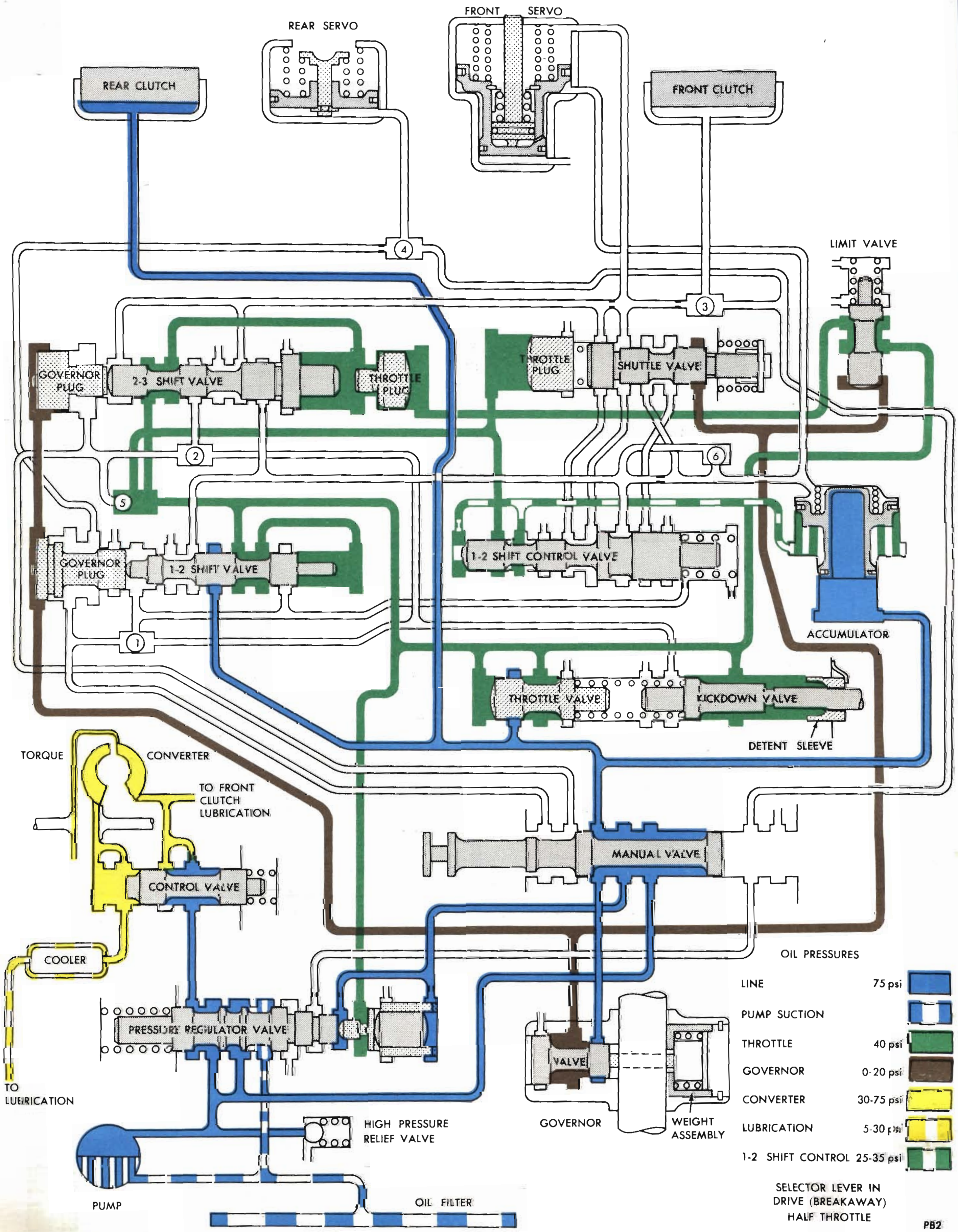


Fig. 1A—TorqueFlite Transmission and Torque Converter (A-727)

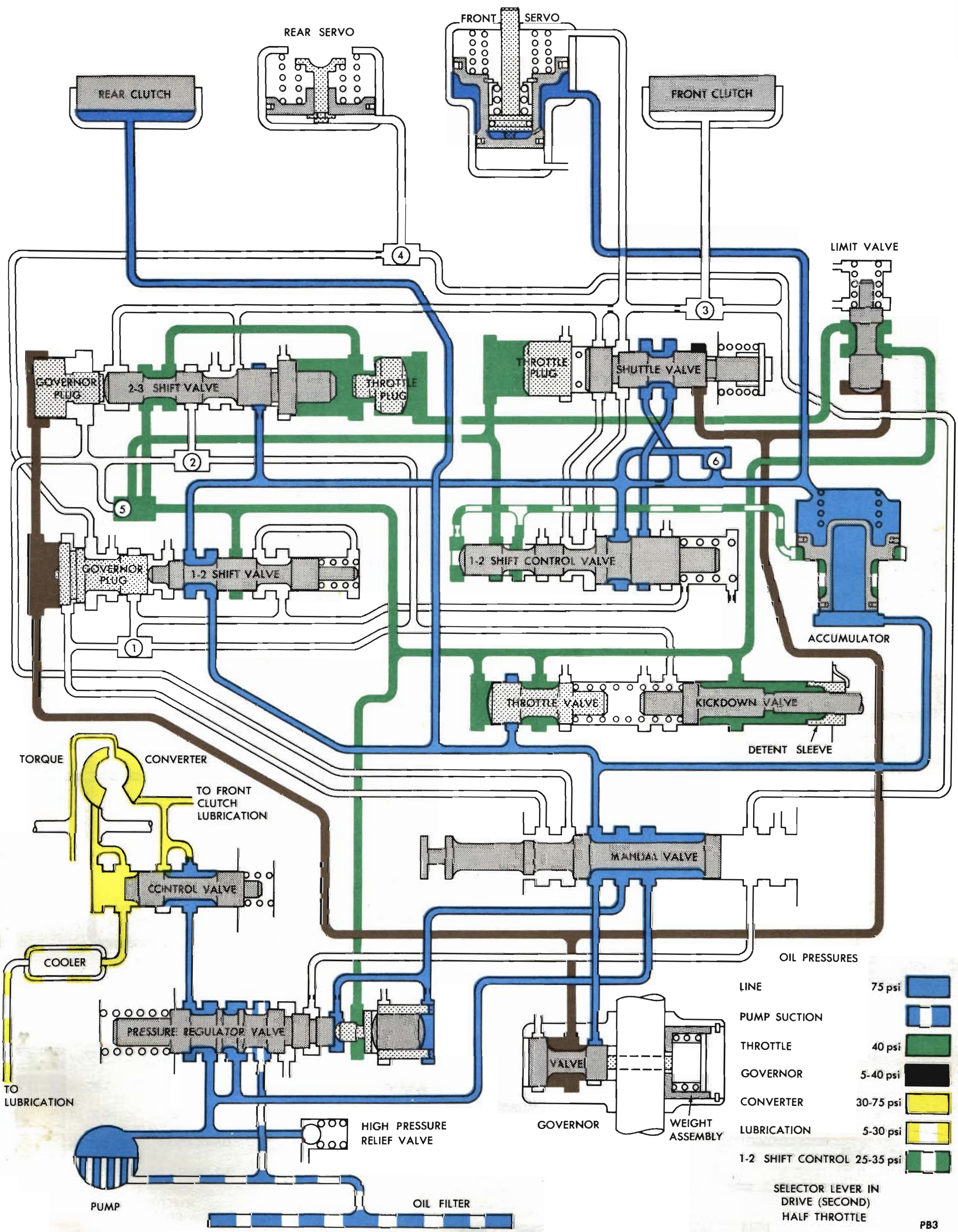




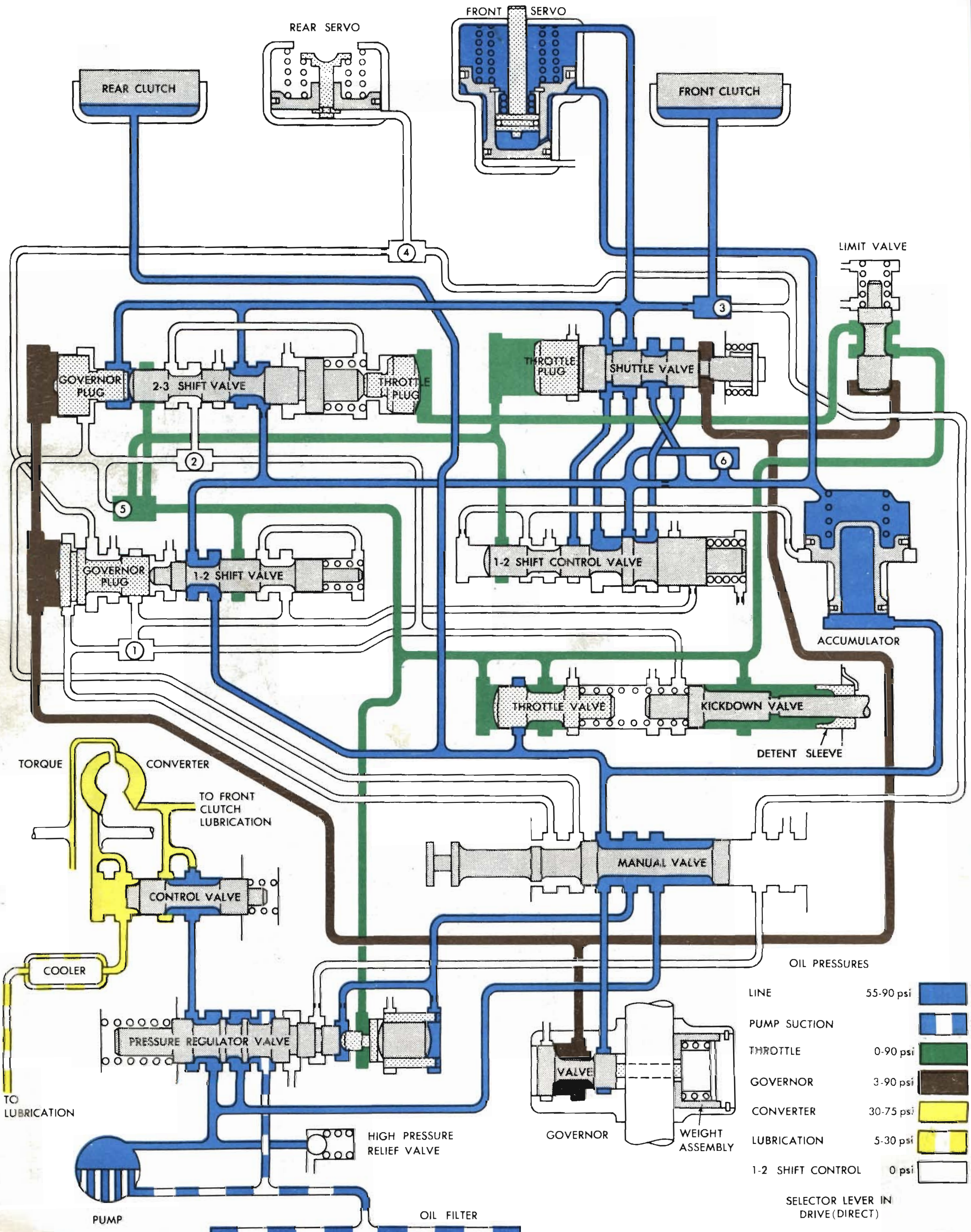
Park and Neutral (8 cylinder)



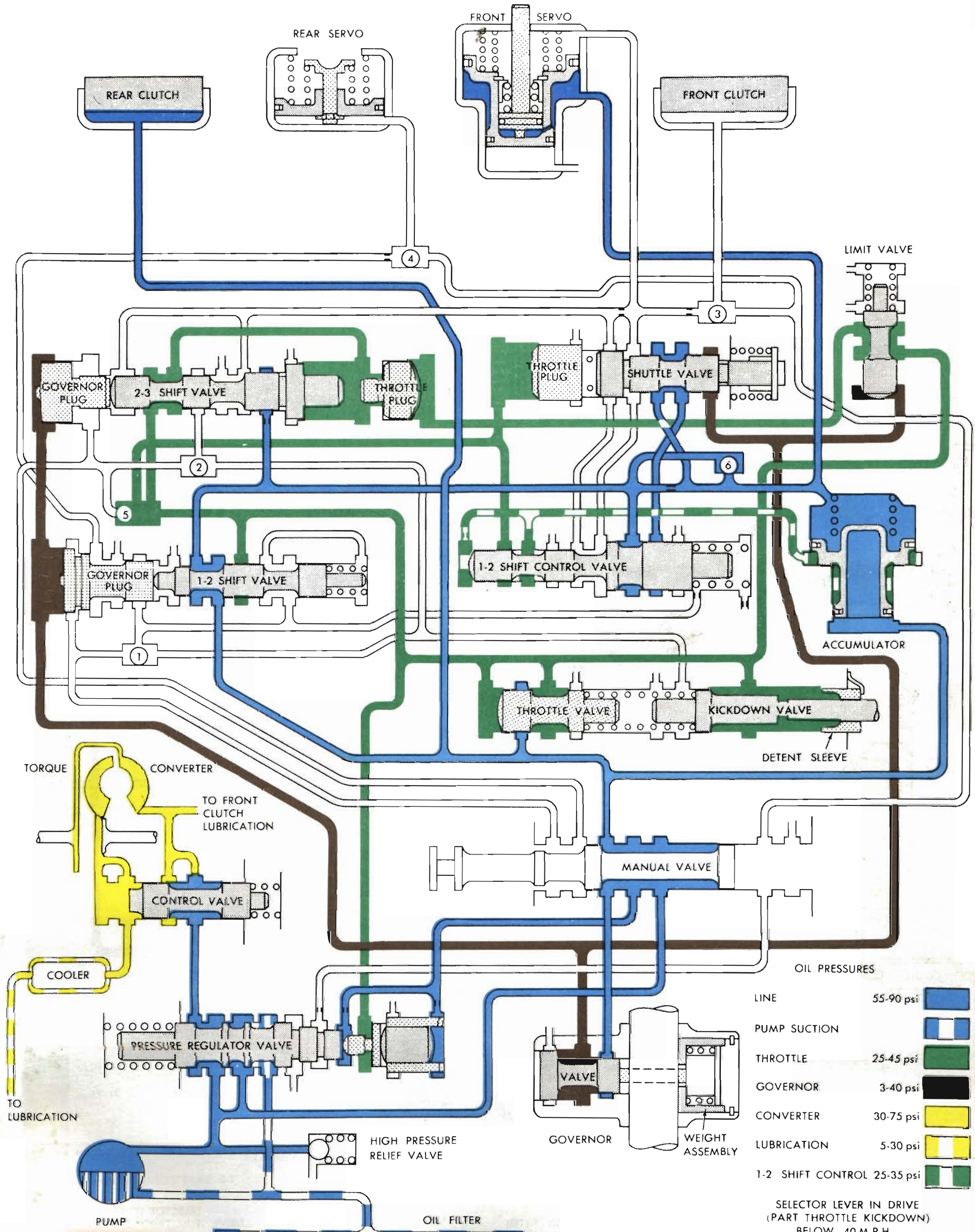
Drive Low (breakaway) (8 cylinder)



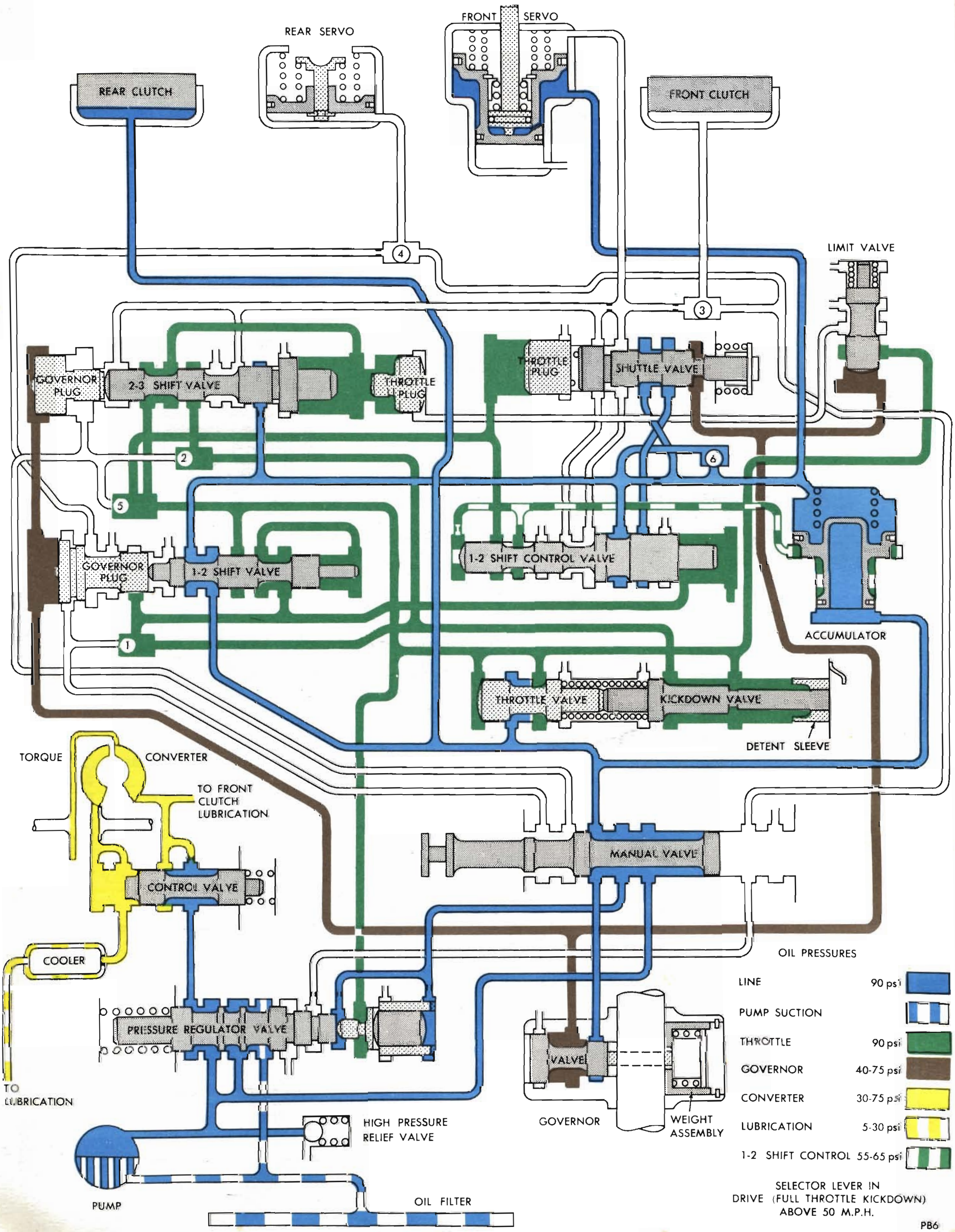
Drive-Second (8 cylinder



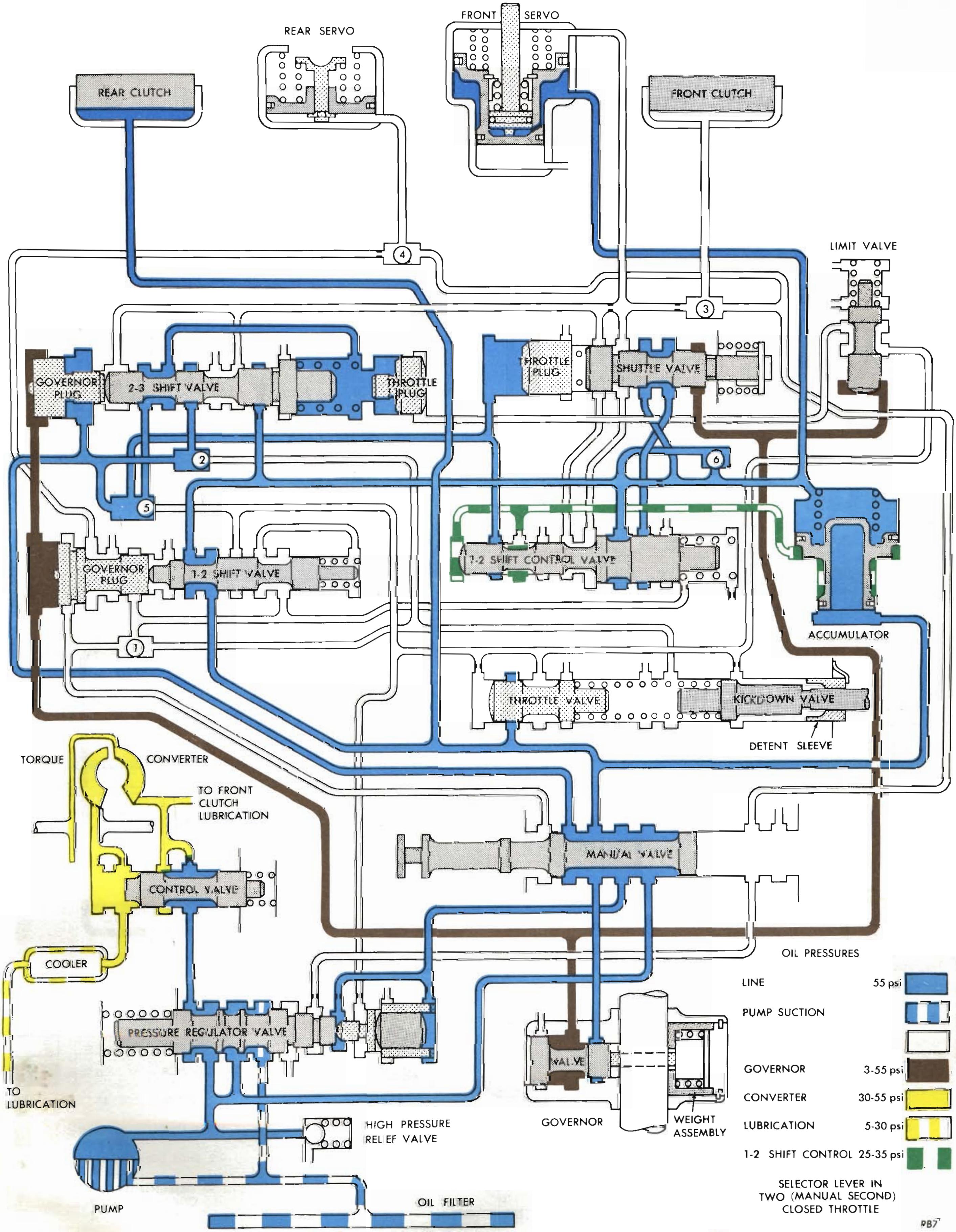
Drive-Direct (8 cylinder)



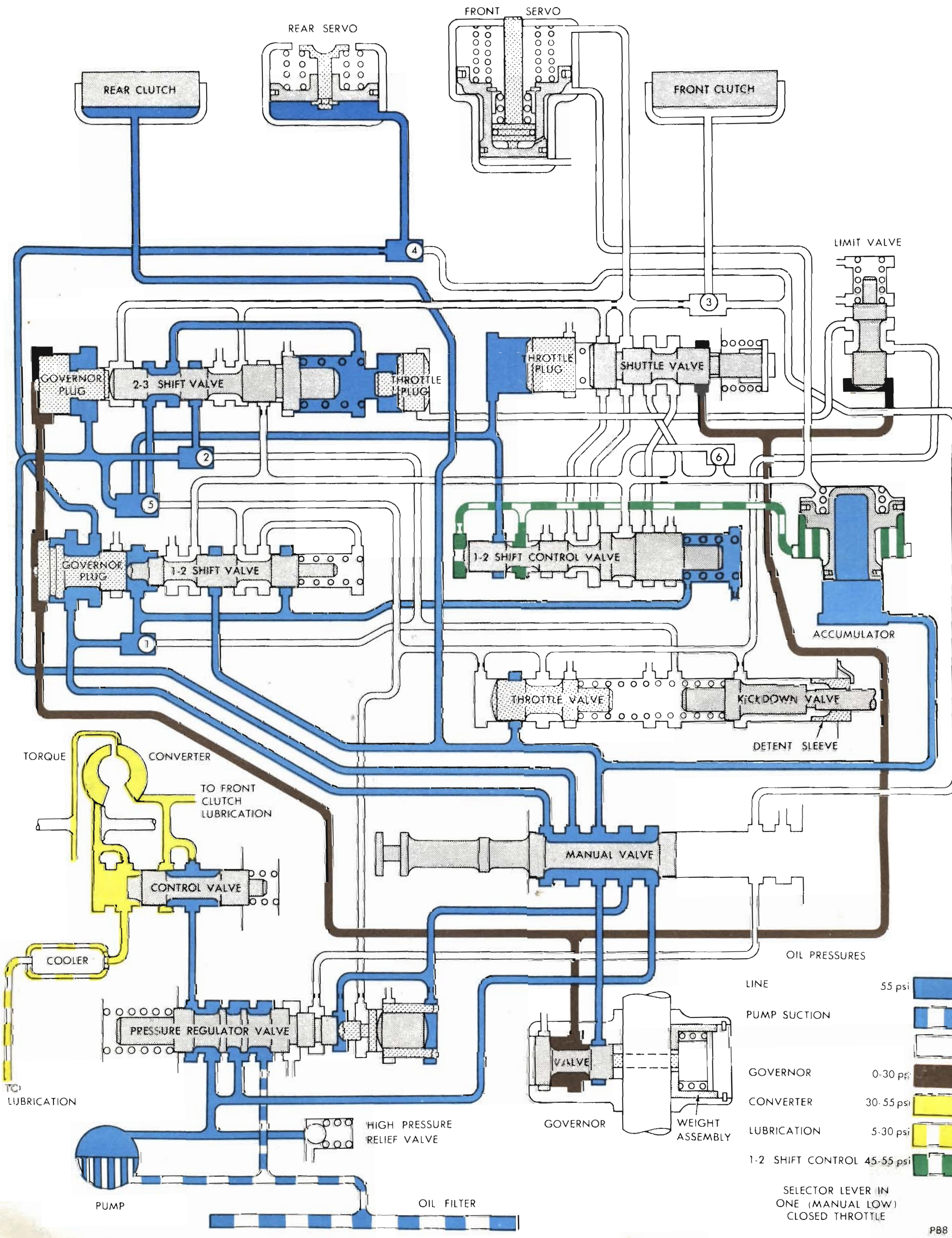
Drive-Part Throttle Kickdown (8 cylinder)



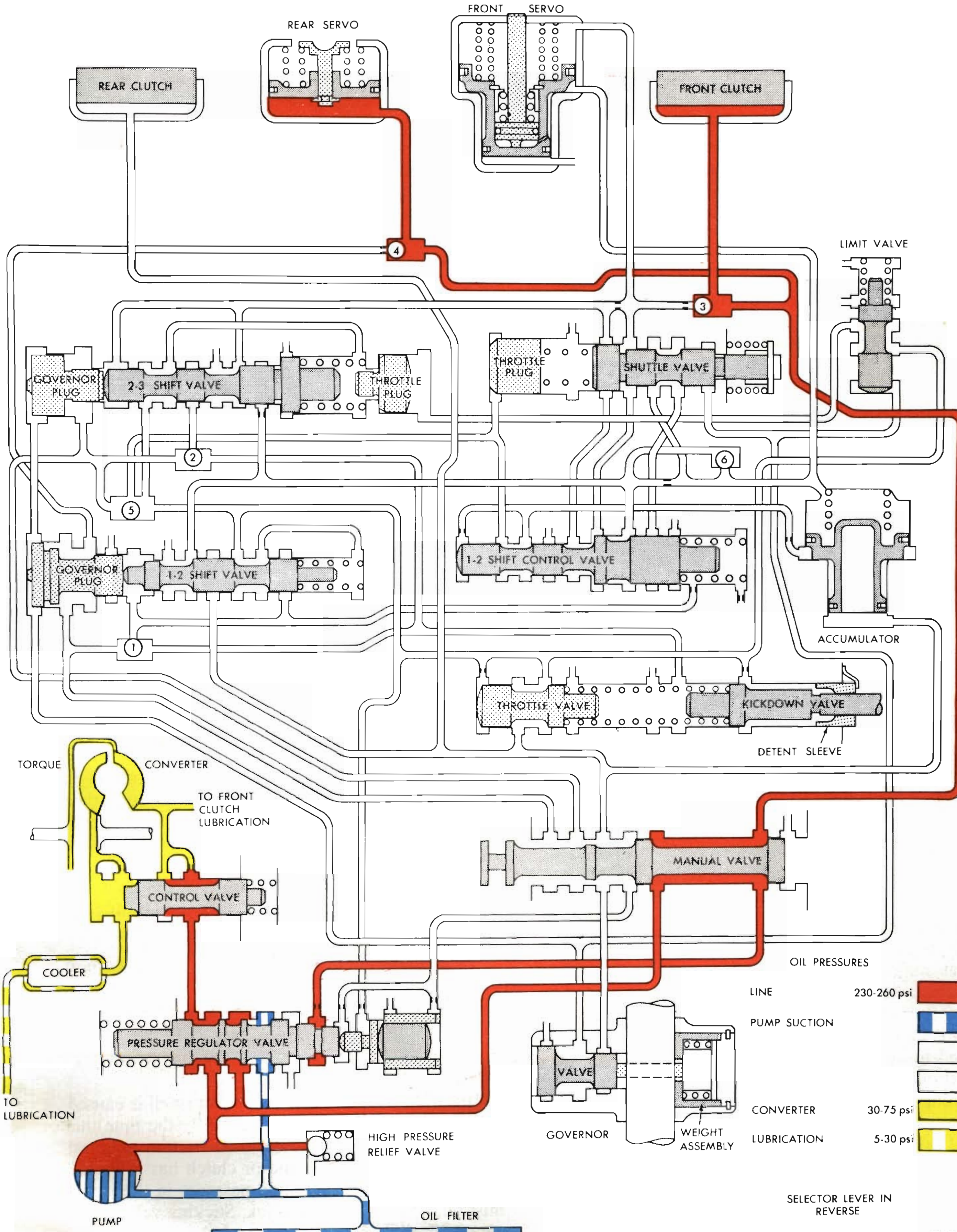
Drive-Full Throttle Kickdown (8 cylinder)



Selector Lever-Two (8 cylinder)



Selector Lever-One (8 cylinder)



Reverse (8 cylinder)

SERVICE DIAGNOSIS PROCEDURE

The greater majority of Torqueflite service jobs can be traced back to shift quality or shift pattern irregularities. By comparison purely mechanical failures are few and far between. If a major mechanical failure does occur, chances are it was caused by an abnormal shift condition. If minor shift problems are corrected early enough, most mechanical failures can be avoided. For this reason this procedure is designed to assist in the diagnosis and correction of shift problems.

The obvious things must be checked first — fluid and service adjustments. Identify the exact nature of the complaint by road testing the transmission Once the trouble has been narrowed down to one of the clutches or bands, faults that could cause that one band or clutch to malfunction can be investigated.

There are four important service adjustments in the transmission:

(1) Transmission Gearshift Control Linkage.

(2) Transmission Throttle Linkage.

(3) Kickdown Band.

(4) Low and Reverse Band.

To ensure continued trouble free operation these four items should be adjusted in the manner set out in this section at the recommended intervals shown in the vehicle Certified Car Care Booklet and the fluid level and cleanliness maintained.

The conclusion that the valve body has probably caused the trouble must not be hastily drawn just because of its complex operation and construction.

Experience has shown that most troubles start with neglected service adjustments or fluid. The great majority of transmission problems develop because one of the bands or clutches is not doing *what* it is supposed to *when* it is supposed to do it. If it is known what the bands and clutches are supposed to do in low, second, direct and reverse, the band or clutch which is not operating correctly can be found by diagnosis when road testing the car.

Fluid Level

The fluid level should be checked first on every transmission complaint. Many malfunctions, such as erratic shifting, can be traced to an incorrect fluid level. If the fluid is low, the clutches and bands will not operate properly, while a high fluid level can result in foaming of the transmission fluid which will allow air to enter the hydraulic system and upset the operation of the control valves, band servos and clutch pistons.

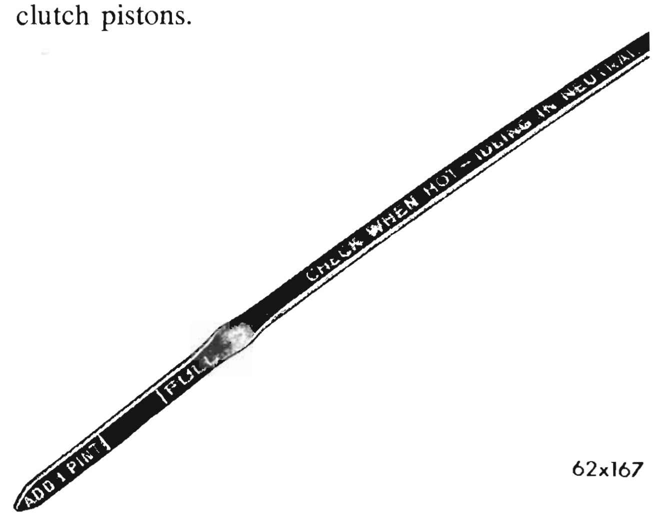


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Fig. 2 – Dip stick markings

To Check Fluid Level

To carry out an accurate check on fluid level, the transmission fluid should be warmed up to normal operating temperature. Apply the parking brake and start the engine. Select each gear position to ensure all control circuits are filled with fluid, then select the neutral position. The fluid level should never be above the "FULL" mark or below the "ADD ONE PINT" mark. *(Refer Fig. 2)*. If any doubt exists as to the temperature of the fluid, the fluid level should be rechecked after road testing the vehicle.

When checking the fluid level, note the condition of the fluid as some good clues to the probable cause or extent of the trouble can often be obtained from the condition of the fluid.

Fluid with Burnt Odour

Black fluid having a strong burnt smell is caused by an over-heated clutch or band. By the time this condition becomes apparent loose friction material from the deteriorating band or clutch has probably worked its way into the fluid passages in the transmission, causing valves to stick. Sticking valves may cause other friction elements to fail.

Milky-Appearing Fluid

If the fluid appears milky, it may be contaminated with water. This condition is not common, but it is possible. Since engine coolant attacks O — rings, seals, clutches and bands, a complete overhaul is necessary. If this condition is found, ensure that the reason for coolant leakage into the transmission fluid is rectified. Check for a leak in the transmission oil cooler in the lower tank of the radiator by disconnecting the fluid lines and applying air pressure to the tank — no more than 50 p.s.i. If a leak exists, air will bubble up through the coolant in the radiator.

Test Gearshift Control Linkage Adjustment

After checking the fluid level, take a moment to test the gearshift control linkage adjustment. With the engine running and the foot brake lightly applied, select "D" position and then the "N" position. Rev the engine. If there is a definite tendency for the car to move forward with the transmission in neutral and the brakes released check the gearshift control linkage adjustment.

Repeat the test by selecting "R" and then the "N" position. If the car definitely attempts to back up, the gearshift control linkage adjustment should be checked. Refer to paragraph 4 for control linkage adjustment.

Road Test

A road test takes time, but tackling a transmission problem without identifying the exact nature of the trouble does not save time on most transmission problems. Sometimes the nature of the complaint is obvious, however more often than not it is hard to tell from the owner's account of his trouble just what he is complaining about.

Identify the Complaint

Find out exactly what the owner is complaining about by having the owner drive the car so he can demonstrate the transmission fault.

Start With a Normal Transmission Performance

Before attempting to diagnose a condition on road test, the normal performance and shift qualities of that transmission must be fully understood and recognised.

If they are not, time should be taken to acquaint yourself with them by driving other vehicles that are tuned-up and correctly adjusted.

Road Test Procedure

Very little can be learnt about normal or abnormal automatic transmission operation by taking a short "joy-ride" with the transmission in "D" range. All positions must be tried, accelerate and decelerate, compare shift quality under light, medium and heavy throttle and test kickdown performance.

It is most important to learn and visualise which band or clutch is being applied for each gear.

During the road test, concentrate your thoughts on what the clutches and bands are doing, rather than the control valves and hydraulic circuits.

Reference to the following "BAND AND CLUTCH APPLICATION CHART" will assist you when forming a mental picture of the internal functions of the transmission.

Breakaway Low

When either the "D" or the number "2" position is selected, the transmission shifts into "Breakaway Low" for good acceleration from a standing start. In this gear the rear clutch is applied and the overrunning clutch locks to obtain the first gear ratio. It must be remembered that the overrunning clutch will transmit power on acceleration only. It automatically releases on deceleration and no power is transmitted from the rear wheels to the engine. There is no engine braking and the car simply coasts.

Number I—"Low"

When the number "1" position is selected the rear clutch is applied just as it was in breakaway.

In addition, the low and reverse band is applied *(refer Fig. 4).*

The low and reverse band is a "two-way" coupling, giving a low gear ratio for both acceleration and deceleration. That is, it provides maximum engine braking whereas the overrunning clutch provides no engine braking.

If the low-reverse band should fail to apply, the overrunning clutch would transmit the drive on acceleration giving a condition as in breakaway low in the number "1" position. As with breakaway low, there would not be any engine braking on deceleration. In addition, there would not be any power transmitted through the transmission with the reverse "R" position selected. This will be explained fully in a later paragraph.

Since the low and reverse band provides a low gear ratio for both acceleration and deceleration, the reason for employing the over-running clutch to obtain low gear ratio in breakaway low may cause some confusion. As band-to-band shifts are difficult to synchronize and are apt to be very harsh, the

BAND AND CLUTCH APPLICATION CHART				
LOW (Breakaway)	LOW No. 1 Position	SECOND	DIRECT	REVERSE
REAR CLUTCH	REAR CLUTCH	REAR CLUTCH	REAR CLUTCH	FRONT CLUTCH
OVERRUNNING CLUTCH	LOW AND REVERSE BAND	KICKDOWN BAND	FRONT CLUTCH	LOW AND REVERSE BAND

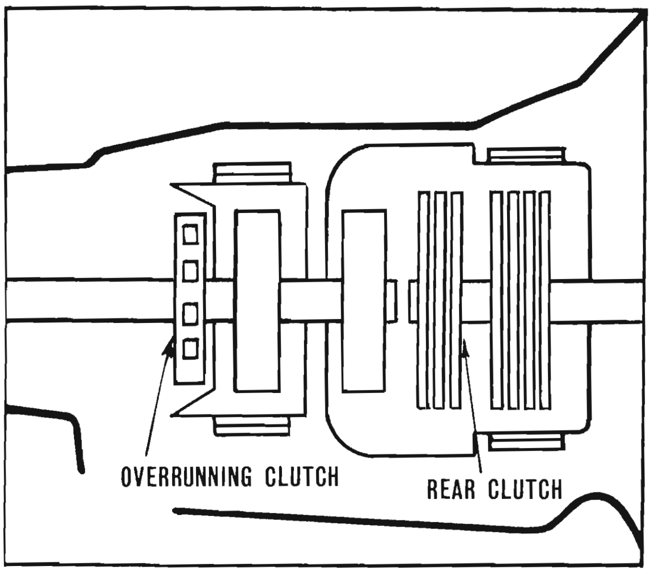


Fig. 3 – Elements applied in breakaway low

overrunning clutch is utilized in breakaway low to ensure a smooth shift from first to second. Also a closed throttle downshift to a low gear which provided maximum engine braking would be abrupt and undesirable. This can be demonstrated by driving at a speed of approximately 25 m.p.h. releasing pressure from the throttle and selecting the number "1" position.

A noticeable jolt will be felt as the transmission downshifts into Low Gear. Part of the jolt is engine braking and part of it is from the low and reverse band application.

To eliminate the harsh shifts between low and second, the over-running clutch acts as follows:

For smooth one-two upshifts, the overrunning clutch simply overruns as soon as the kick-down band is applied. The problem of timing or synchronizing the upshift is eliminated. For smooth, closed throttle downshifts, the overrunning clutch simply "coasts". The shift is very smooth and the overrunning clutch "stands by" to pick up the load automatically when the driver chooses to accelerate.

Test for Rear Clutch Slippage

Here is an example of how a working knowledge of bands and clutches can be applied to road test diagnosis.

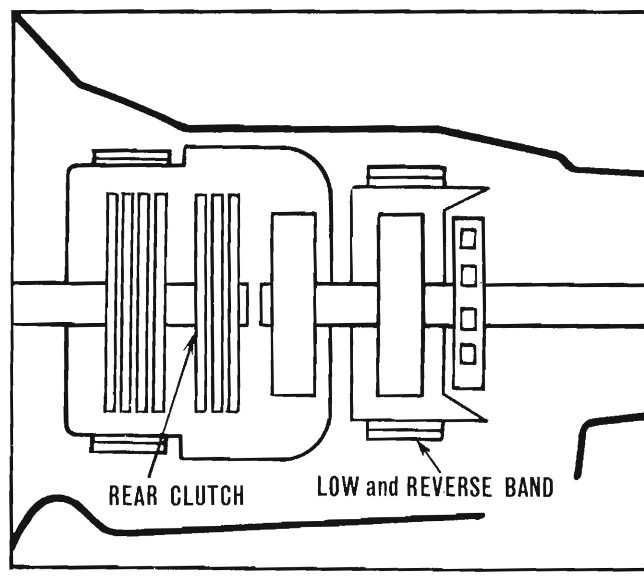


Fig. 4 – Elements applied in No. 1 position low

If slippage exists in the low gear with the number "1" position selected, as well as in breakaway low, the trouble must be in the rear clutch. The rear clutch is the common drive element to both breakaway low and number "1" *(Refer Fig. 5)*.

SLIPPAGE

LOW (Breakaway)	LOW No. 1 Position
REAR CLUTCH	REAR CLUTCH
OVERRUNNING CLUTCH	LOW AND REVERSE BAND

COMMON ELEMENT

Fig. 5 – Diagnosis of rear clutch slippage

Second Gear

In second, the rear clutch and the kickdown band are applied. If the transmission slips in second, but does not slip in breakaway low, or direct the trouble must be in the kickdown band application *(Refer Fig. 6)*. At this point it will not be known whether the trouble is in the band itself or in the band apply circuit.

However the friction element at fault is known and investigations can start at this point . . . starting with kick-down band adjustment.

Reference to *Fig. 6* will show that the slippage is *not* in the rear clutch eliminating the friction elements that are not giving trouble speeds up the job of diagnosis and service.

> NOTE: If the transmission shifts from low to direct, missing second completely, the kick-down band is not applying.

Direct Drive

In direct drive the front clutch and rear clutch are both applied. The rear clutch is applied in direct, second and low . . . in all forward gears. Therefore is slippage occurs in direct drive but not in second or low, the rear clutch can be considered satisfactory.

DOES NOT SLIP

SLIPS

LOW (Breakaway)	SECOND	DIRECT
REAR CLUTCH	REAR CLUTCH	REAR CLUTCH
OVERRUNNING CLUTCH	KICKDOWN BAND	FRONT CLUTCH

TROUBLE

Fig. 6 – Diagnosis of kickdown band slippage

NO SLIPPAGE SLIPPAGE

LOW (Breakaway)	LOW No. 1 Position	SECOND	DIRECT
REAR CLUTCH	REAR CLUTCH	REAR CLUTCH	REAR CLUTCH
OVER-RUNNING CLUTCH	LOW AND REVERSE BAND	KICK-DOWN BAND	FRONT CLUTCH

TROUBLE

Fig. 7 – Diagnosis of front clutch slippage

By the process of elimination the trouble must be with the front clutch *(Refer Fig. 7)*.

NO SLIPPAGE SLIPPAGE

DIRECT	REVERSE
FRONT CLUTCH	FRONT CLUTCH
REAR CLUTCH	LOW AND REVERSE BAND

TROUBLE

Fig. 8 – Diagnosis of reverse band slippage

Reverse Gear

In reverse gear, the front clutch and the low and reverse band are applied. The front clutch is the friction member that is common to direct drive and reverse *(refer Fig. 8)*. If there is slippage in reverse but no slippage in direct drive, the trouble is most likely in the low and reverse band application.

> NOTE: If the low and reverse band should fail to apply, no engine braking could be obtained with the transmission in the "LOW No. 1" position *(refer para. headed NUMBER 1 LOW)*.

Diagnosis by Elimination

The clutch and band application chart shown earlier is a simple but extremely useful aid to diagnosis. The examples and explanations shown in the foregoing paragraphs illustrate how fault diagnosis is simplified when it is known which bands and clutches are applied for each gear. It is not practical in a section of this size to try and cover every conceivable type of malfunction or shift quality problem. It must be realised that occasionally a condition will be encountered where a road test will not isolate the trouble to one band or clutch.

If more than one friction element is faulty or if friction material is preventing the valves in the valve body from operating correctly, the symptoms may be confusing. However, in these cases the road test will help to confirm the suspected fault when the burnt friction material was discovered in the transmission fluid; the transmission must be completely overhauled.

On the other hand, removal of the transmission unnecessarily can be avoided if the exact trouble that the owner is complaining about is identified during the road test.

Engine Performance is very important

The condition of the engine must not be overlooked, particularly on complaints relating to shift quality. Idle speed and engine performance should be up to specifications as the shift pattern and shift quality of the transmission is tailored to normal engine performance.

The transmission cannot compensate for an engine which has become sluggish, it will automatically continue to carry out each shift as crisply as it should for a tuned engine delivering full torque. The usual result being delayed or harsh shifts.

If the engine output is low, the driver has to open the throttle more to accelerate. Transmission throttle pressure will be too high in relation to actual engine torque, resulting in delayed, harsh shifts which resemble the trouble encountered when transmission throttle linkage adjustment is advanced too much. Under no circumstances should transmission throttle linkage be adjusted to compensate for poor engine performance, tune up the engine.

More than one shift quality complaint has been corrected by correcting engine performance and not touching the transmission.

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 r.p.m. in neutral for 20 seconds to cool the transmission fluid between runs. If engine speed exceeds specifications, *release* the accelerator *immediately* since transmission clutch slippage is indicated.

STALL SPEED ABOVE SPECIFICATION

2,000 to 2,300 R.P.M. A904LA
2,150 to 2,450 R.P.M. A727A

If stall speed exceeds the maximum specified by more than 200 R.P.M., transmission clutch slippage is indicated. Follow the transmission oil pressure and air pressure checks outlined in the "Service in Vehicle" section to determine the cause of slippage.

STALL SPEED BELOW SPECIFICATION

2,000 to 2,300 R.P.M. A904LA
2,150 to 2,450 R.P.M. A727A

Low stall speeds *with a properly tuned engine* indicates torque converter stator clutch problems. A road test will be necessary to identify the exact problem.

If stall speeds are 250-350 R.P.M. below specification, and the vehicle operates properly at highway speeds, *but* has *poor* through-gear *acceleration,* the stator over-running 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 or N on a hoist and listen under the transmission bell housing.

Throttle Linkage and Shift Quality

After the carburettor has been serviced, the transmission throttle linkage adjustment must be checked as sufficient clearance may exist at the carburettor lower body attaching holes to allow the carburettor to be installed in a different position than it was originally. This may be just enough to upset the transmission throttle linkage adjustment.

Late Harsh Shifts

Should the transmission upshift late — at higher speeds than normal — it is quite possible that transmission throttle advance is leading carburettor throttle advance. When transmission throttle pressure is too high, relative to engine torque, shifts are late and harsh.

Early Mushy Shifts

Should the transmission upshift too soon — at lower speeds than normal — it is quite likely that the transmission throttle linkage is incorrectly adjusted. Transmission throttle linkage is lagging behind carburettor throttle advance, scheduling shifts sooner than normal when throttle pressure is not high enough to provide a crisp, firm shift.

Shift Speeds

The shift pattern summary chart of this section summarises shift speeds for the transmission.

Reference to this chart should be made when conducting a road test. However, it is permissible for some shift speeds to occur just outside the ranges, as long as the shift quality is good. The quality of the shifts is very important. All shifts should be smooth, responsive, and with no noticeable engine runaway.

Speedometer error, abnormal vehicle loading and abnormal operating conditions also affect the shift points. However, if shift speeds are appreciably outside the specified range, transmission throttle linkage adjustment or governor pressure may be incorrect.

Diagnosis by Pressure Tests

If a transmission fault cannot be eliminated by external service adjustments, the next step is to test the hydraulic pressures which control the transmission. Pressure tests can be made quickly without disassembling the transmission, and they give a good indication of what to look for and where to look, before the transmission is disassembled.

The Hydraulic System

In brief, hydraulic fluid is pumped under pressure to the control system. The control system regulates the fluid pressure and directs the fluid to the hydraulic operating units — the clutch pistons and band servos.

It is not essential to have a complete working knowledge of every valve in the control system, the road test and pressure test will provide all the clues needed to diagnose shift troubles.

The pressure supply system consists of a front oil pump driven by the engine through the torque converter to supply all the pressure for hydraulic and lubrication requirements.

> NOTE: It is not possible to start the engine through the transmission by pushing or towing.

Whenever the vehicle is to be towed the following precautions must be adhered to:

Transmission Inoperative

Tow the vehicle with a rear end pick-up or with the propeller shaft disconnected.

Transmission Operating Properly

The vehicle may be towed safely in N (neutral) with rear wheels on the grounds at a speed not to exceed 30 M.P.H. If the vehicle is to be towed for extended distances, it should be done with a rear end pick-up or with the propeller shaft disconnected. 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 pick-up or with the propeller shaft disconnected.

Hydraulic System "Lock-up"

All hydraulic circuits in the Torqueflite are vented whenever they are not being used to apply a clutch or band. Consequently it is not possible for fluid under pressure to be trapped in an unused circuit where it could prevent the release of the operating unit.

If a clutch or band hangs up, the trouble is mechanical.

Service Adjustments and Tests

The road test will help pinpoint the trouble to one specified clutch or band. If the problem is traced to either kickdown band or the low and reverse band, a band adjustment may be all that is needed to correct the complaint. However, if an adjustment appears to correct the complaint, ensure that a sample of the transmission fluid is checked for loose particles of band facing material before returning the vehicle to its owner.

Any evidence of deteriorating friction material necessitates a complete overhaul.

On complaints of poor shift quality, the gearshift control linkage adjustment and the transmission throttle linkage adjustment must be checked. These two adjustments will correct many shift complaints and they are insurance against transmission troubles of a more serious nature.

Procedures for carrying out the following service adjustments and tests necessary for diagnosing Torqueflite faults are outlined in the Service Information Procedures of this section.

1. Low and reverse band adjustment.
2. Kickdown band adjustment.
3. Transmission throttle linkage adjustment.
4. Pressure checks.

Important Service Precautions

A Torqueflite transmission is a complex assembly . . . particularly the valve body. However, it is not necessary to know how every control valve and hydraulic circuit works to do an expert job of servicing the transmission. Accurate diagnosis will indicate what to concentrate on if disassembly and repair is necessary. It will also help to avoid unnecessary disassembly.

The Valve Body

The valve body is undoubtedly the one part of the transmission that technicians fear most, and because the valve body is complex and awe-inspiring many serviceable valve bodies are replaced unnecessarily. Of course, a new valve body will cure many shift problems but a thorough cleaning of the original valve body could also cure the shift problem.

> NOTE: The most common cause of valve body troubles is dirt, not worn or damaged parts.

Valve Body Service Tips

There are three important points to remember when servicing the valve body.

1. Handle all parts gently.
2. Clean all parts thoroughly, and keep them clean.
3. Assemble all parts correctly.

If the above cardinal rules of valve body service are observed and the service tips below are read, no trouble should be experienced.

Handle Parts Gently

Always use the valve body repair stand, E21C5B. Never clamp the valve body or transfer plate in a vice. Don't use force when removing or installing parts. The fits between valves and bores are close but they will go together easily if they are free from nicks and burrs and absolutely clean. Be careful not to drop any of the parts, particularly the valves.

Don't disturb the line pressure adjusting screw. This adjustment is provided so that line pressure for each valve body assembly could be accurately calibrated in production. There is no reason to readjust it unless it has been tampered with during previous servicing.

Clean Parts Thoroughly

Since dirt is the number one *enemy* of the valve body assembly, it stands to reason that a thorough cleaning is the number one cure. Many technicians prefer to clean the parts in a series of solvent-filled containers, beginning at one with solvent that has been used considerably. In this container, the largest deposits are removed. From there, the parts are immersed in containers having successively cleaner solvent. Finishing with a clean solvent rinse. Dry the parts with clean, dry, compressed air. Don't wipe parts with a cloth — lint will remain on the parts.

Test Valves

To ensure the valves will operate when the valve body assembly is rebuilt, test the valves, one at a time. Slip a valve into its bore in the valve body. Don't lubricate the valve or install any springs for this test. Tip the body back and forth so that the valve moves back and forth in its bore. If the valve doesn't move freely, remove it and inspect for burrs on the valve lands. Slight burrs can be polished down using crocus cloth, but be careful not to round off the corners of the lands. These sharp edges are essential for proper valve operation.

Assemble Parts Correctly

During assembly of the valve body, don't trust your memory, follow the Service Manual instructions and illustrations.

Inspection During Disassembly

Every part of the suspected system should be carefully examined as it is removed. If the pressure tests indicate low hydraulic pressure, pay particular attention to the condition of the O-rings and other seals. Also examine the seal and bushing area of the impeller hub. This area should be extremely smooth to the touch. Any wear or roughness will cause seals to fail. Finally, be sure to clean and carefully inspect the front pump. Since it is the only source of hydraulic pressure, it is essential that it be in good condition.

Cleanliness

The importance of doing everything possible to ensure that the transmission be kept absolutely clean cannot be overstressed. If any part of the transmission has failed, the torque converter must be flushed to ensure that fine metal particles or small fragments of friction material are not left to circulate through the reconditioned transmission. Don't be afraid to use plenty of solvent — keep flushing until the solvent comes out clean.

Don't neglect the oil cooler in the lower tank of the radiator. Flush the cooler and its connecting lines thoroughly, and install a new (correct) Dacron filter assembly.

Seal Leakage

Minor seal leakage may be remedied by the addition of Chrysler Transmission Sealer, Pt. No. 2298923, as directed.

SHIFT PATTERN SUMMARY CHART

TRANSMISSION MODEL		A904 LA	A 727 A	
AXLE RATIO		2.92 : 1	2.77 : 1	2.92 : 1
CONDITION:		Approximate Road Speed in M.P.H.		
Closed Throttle	1–2 Upshift	6–12	8–13	8–12
Closed Throttle	2–3 Upshift	11–16	15–20	14–20
Wide Open Throttle	1–2 Upshift	27–45	31–44	35–47
Wide Open Throttle	2–3 Upshift	65–76	68–79	68–77
3–2 Kickdown Limit		56–68	58–72	61–72
3–1 Kickdown Limit		25–29	23–36	27–40
Closed Throttle Downshift		5–11	8–11	7–10

SERVICE INFORMATION — PROCEDURES

1. STEERING COLUMN AND GEARSHIFT

To Remove

(1) Disconnect negative (ground) cable from battery.

(2) Disconnect shift linkage rod from lever at lower end of steering column.

(3) Drive roll pin out of lower end of steering shaft to worm shaft coupling.

(4) Disconnect turn signal, gearshift indicator light, horn and ignition switch wires.

(5) Remove the two centre pad assembly retaining screws and lift off pad to expose the horn switch. *(Refer Fig. 9).*

(6) Disconnect the horn wire from switch and remove the two switch retaining screws, if necessary, to remove the switch and horn ring.

(7) Remove the four steering wheel retaining screws, using an Allen wrench, and lift off the steering wheel and horn ring assembly.

(8) Remove the steering column collapsible tube assembly retaining nut and washer from the steering shaft.

(9) Remove the steering column collapsible tube from the column, using Puller Tool E19C10.

(10) Remove floor plate to floor pan attaching screws.

(11) Remove steering column to instrument panel retaining clamp and screws.

To Disassemble

(1) Remove snap ring from upper end of steering shaft *(Fig. 10).*

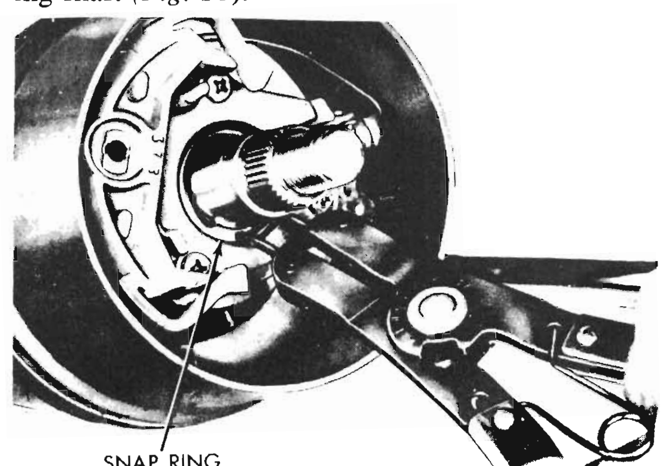


Fig. 10 – Removing or installing steering shaft snap ring

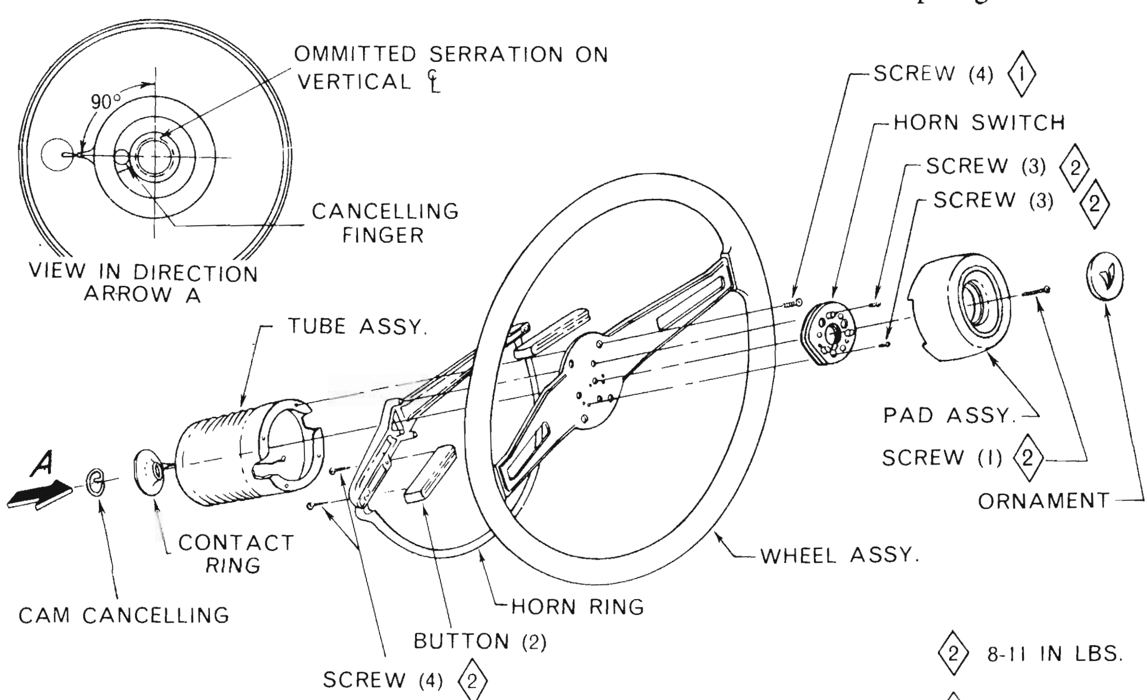


Fig. 9 – Impact absorbing steering wheel assembly

(2) Disengage column jacket lower seal from lip on jacket and slide it down toward coupling. Tap steering shaft downward through upper column bearing and remove shaft from the column.

(3) Remove two screws securing gearshift tube lever support in lower end of column *(Fig. 11)*. Remove the support.

(4) Support gearshift housing on a small socket, drive out roll pin and remove gear shift lever *(Fig. 12)*.

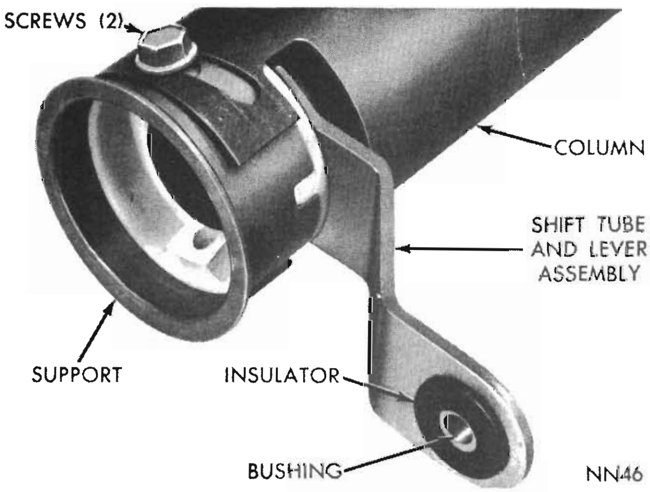


Fig. 11 - Steering column - lower end

(5) Remove turn signal switch retainer from bearing housing and lift switch upward out of the way *(Fig. 13)*. Remove four screws from inside bearing housing to separate it from shift lever gate. Slide gate out of column jacket. If necessary, tap column bearing out of the bearing housing.

(6) Rotate gearshift housing to align opening with the lock screw *(Fig. 14)*. Remove lock screw with an Allen wrench, then carefully pull gearshift tube out of column jacket. If necessary, remove shift lever crossover spring load parts *(Fig. 15)*.

(7) Remove floor plate assembly from the column jacket.

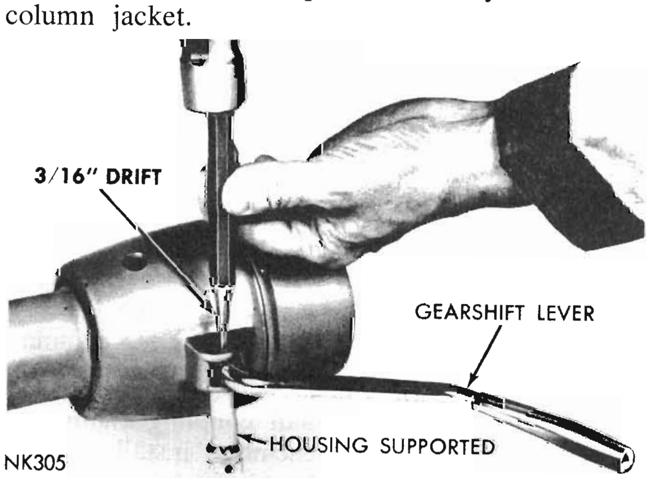


Fig. 12 - Removing or installing gearshift lever

To Inspect

After cleaning, inspect all parts for wear or damage. Note condition of bushing assembly in lower shift lever, shift lever gate and inner end of shift lever. Replace parts as required.

Inspect steering shaft bearings for smooth operation and lubricate with a suitable lubricant. If bearing has any signs of roughness or wear, it should be replaced. Replacement bearings are pre-lubricated.

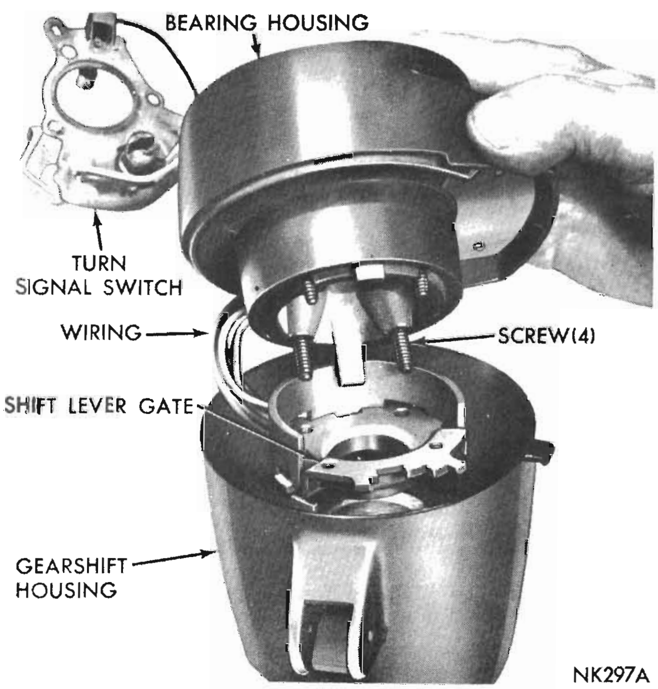


Fig. 13 - Disassembling or assembling upper end of column

To Assemble

(1) Lubricate floor plate O-ring with a soap solution or rubber lubricant and slide assembly on the steering column.

(2) Install shift lever crossover spring load parts in gearshift housing *(Fig. 15)*. Be sure all parts move freely in the bore, then install retaining screw.

The floor plate assembly must be installed before installing shift tube and lever, since this cannot be done after shift tube and lever are in place in the steering column.

(3) Install column upper bearing in bearing housing; make sure bearing is fully seated in the housing.

(4) With column jacket held upright, place gearshift and bearing housings on the jacket. Thread turn signal switch, horn and indicator lamp wires

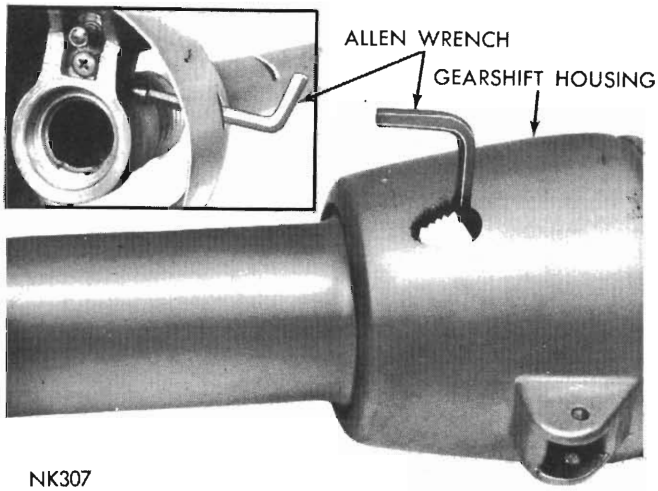


Fig. 14 - Removing or installing gearshift tube lock screw

through the two housings, down into column jacket and out through proper opening on side of the jacket.

(5) Raise bearing housing and slide shift lever gate into upper end of the column jacket *(Fig. 13)*. Place the four retaining screws in the bearing housing (note screw lengths) *(Fig. 13)*. Lower bearing housing and progressively thread screws into shift lever gate, then tighten screws securely.

(6) Slide spacer and felt washer on the gearshift tube. Insert gearshift tube into the column. Align upper end of tube with gearshift housing and push tube firmily into the housing.

(7) Install gearshift tube lever support in lower end of column and start the two retaining screws *(Fig. 11)*. Rotate support just enough to eliminate shift tube end play, then tighten screws to 30 lbs./in.

(8) Rotate gearshift housing to align it so lock screw can be installed with an Allen wrench *(Fig. 14)*. Tighten the screw to 100 lbs./in.

(9) With gearshift housing in NEUTRAL position, insert gearshift lever. Support gearshift

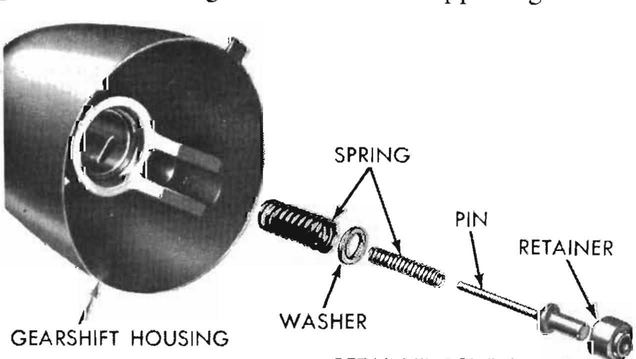


Fig. 15 - Gearshift housing - disassembled

housing *(Fig. 12)* while driving shift lever roll pin into place.

(10) Position turn signal switch in bearing housing, install switch retainer plate, dial lamp and secure with three screws *(Fig. 16)*. Guide dial pointer over dial, then snap base of pointer on lug provided on gearshift housing.

(11) Place gearshift lever in NEUTRAL position.

(12) Slide column jacket lower seal off the steering shaft. Fill the cavity in seal between the two nylon bushings with short fibre wheel bearing lubricant. Re-install seal on shaft and slide assembly in the column. Tap the shaft through upper bearing and install retaining snap ring *(Fig. 10)*. Engage seal over lip on lower end of column jacket.

To Install

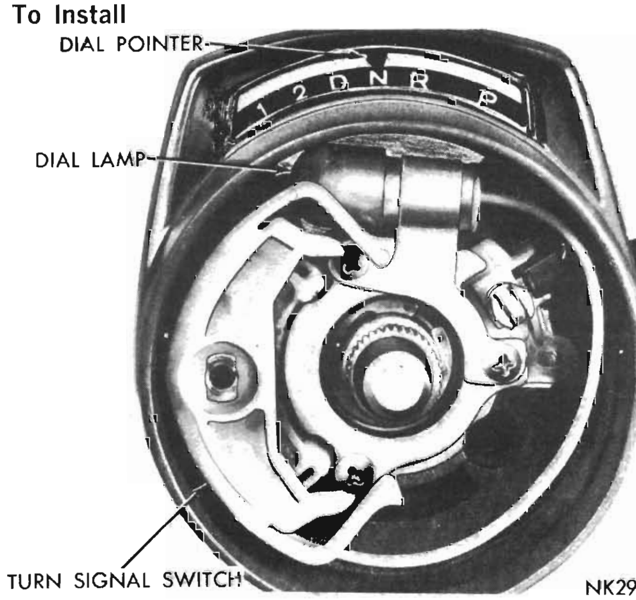


Fig. 16 - Turn signal switch and gearshift indicator

(1) Guide the lower end of the column through the floor opening.

(2) Position the clamp on the coupling and with the master splines on the worm shaft and coupling aligned, engage the column coupling with the steering gear wormshaft.

(3) Loosely fasten the steering column jacket to the instrument panel bracket with the clamp and the two attaching screws. Be sure the tab on the clamp is entered in the locating slot in the column jacket.

(4) With the steering shaft coupling clamp in position on the coupling assembly, install a new roll pin so that it engages the groove in the worm-shaft. Install gearshift control rod.

(5) With the coupling centred, tighten the column jacket to instrument panel clamp bolts to 25 lbs./ft. torque. Align and attach the floor plate to the floor pan. Install the turn signal lever.

(6) With the master splines in the collapsible steering tube assembly and steering shaft aligned, place the collapsible steering tube on the shaft. Install the retaining nut and washer, Tighten to 24 lbs./ft. torque.

(7) Install the horn ring and switch to wheel, where removed, tightening screws to 8–11 lbs./in. torque. *(Refer Fig. 9.)*

(8) Attach the steering wheel to the collapsible steering tube using four special screws and torque to 95 lbs./in.

(9) Reconnect the horn wire to switch.

(10) Install the centre pad, tightening the screw to 8–11 lbs./in. torque.

(11) Install the ornament to the wheel centre pad.

(12) Connect the turn signal, gearshift indicator light and horn wires. Connect the battery ground cable, test the operation of the lights and horns.

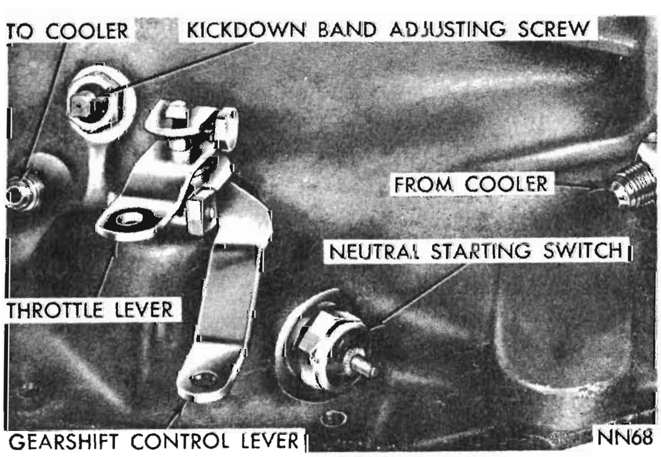


Fig. 17 – External controls and adjustments (typical view)

Linkage Adjustment

(1) Place gearshift selector lever in PARK position and loosen the gearshift linkage control rod swivel clamp screw a few turns *(refer Fig. 20).*

(2) Move transmission control lever *(Fig. 17)* all the way to rear (in park detent).

(3) With control lever on transmission in park position detent and selector lever in PARK position, tighten swivel clamp screw to 100 lbs./in.

2. CONSOLE GEARSHIFT

To Remove

(1) Disconnect negative (ground) cable from battery.

(2) Remove gearshift handle set screw with an Allen wrench *(Fig. 18).* Unscrew the knob (button), spring and handle assembly from the cable end.

(3) Remove two screws from front corners of console *(Fig. 19).* Raise console lid and remove two screws from bottom of tray. Raise console enough to disconnect dial lamp and other electrical connections, then lift off console assembly.

(4) Disconnect upper rod from gearshift unit *(Fig. 20).* Remove four gearshift to floor bracket bolts and remove unit.

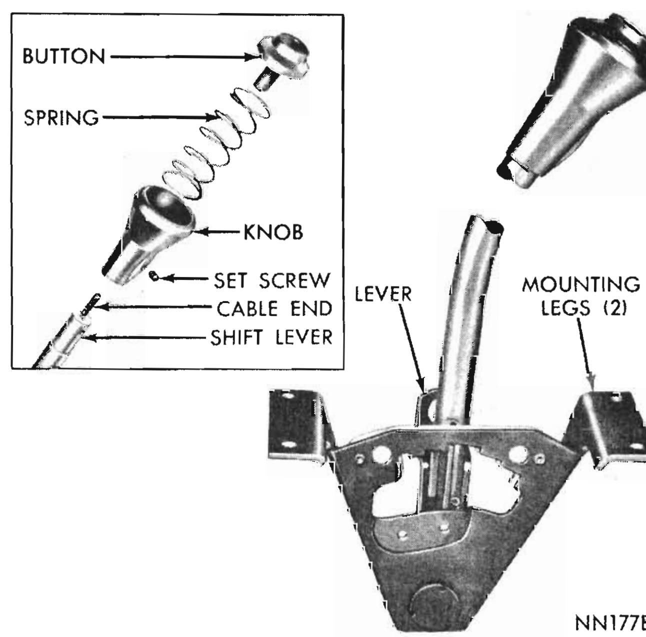


Fig. 18 – Console gearshift unit

To Install

(1) Install gearshift unit in its bracket, install and tighten four retaining bolts securely *(Fig. 20).* Attach upper rod to the unit.

(2) Lower console down over shift lever, insert dial lamp in its housing, and connect all electrical connections.

(3) Position console over floor brackets and install retaining screws and bolts. Install upper finish plate.

(4) Apply a small quantity of zinc base lubricant to button stem. With lever in NEUTRAL thread knob, spring and handle assembly on the cable end until serrated surface on the knob is

approximately 1/32" above top of handle. Secure handle with set screw.

(5) Connect battery ground cable.

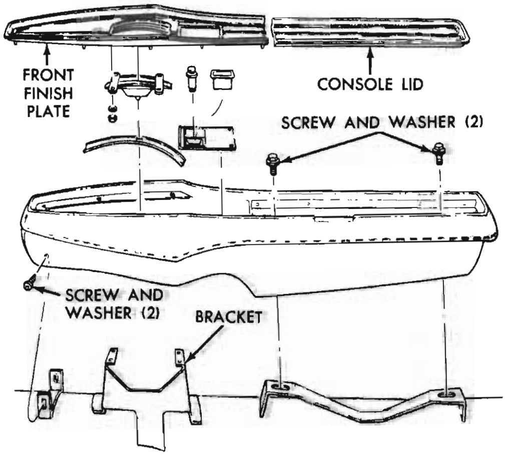


Fig. 19 - Removing or installing console

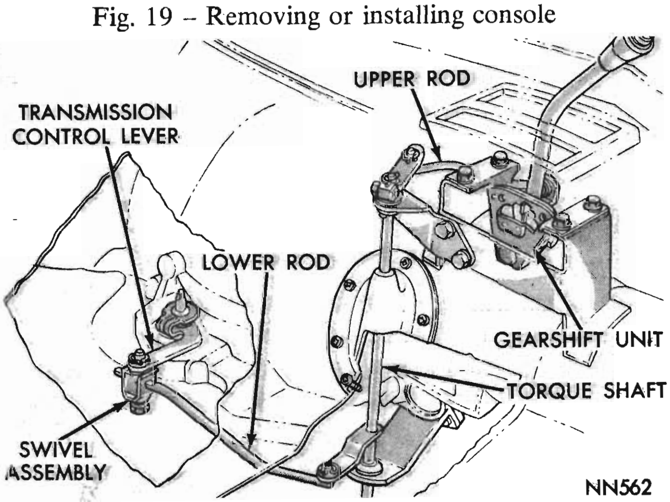


Fig. 20 - Console gearshift linkage

Linkage Adjustment

(1) With gearshift selector lever in PARK position, loosen lower rod swivel clamp screw a few turns *(Fig. 20)*.

(2) Move transmission control lever *(Fig. 17)* all the way to rear (in park detent).

(3) With control lever on transmission in park position detent, and selector lever in PARK position, tighten swivel clamp screw to 100 lbs./in.

NOTE: The following procedure should be observed for adjusting the gearshift linkage, where gear selection "over-travel" is experienced.

a. Set the steering column in the Park position. Apply a 3 lb. pull on the lever against the gate stop.

b. Set the transmission selector in the Park position.

c. With the adjusting swivel in the free position, extend operating rod by ⅛" and lock swivel.

d. This setting should result in equal amount of over-travel in the Neutral and Drive Top Gate. Checks should then be carried out to make sure that the over-travel does not permit the engagement of either Reverse or Second, unless the lever is raised as from normal shifting.

3. LUBRICATION

Fluid Level

The fluid level should be checked at every engine oil change period. When checking, the engine and transmission should be at normal operating temperature.

(1) With the parking brake applied and the engine idling, select each gear position momentarily, ending with N (neutral) position.

(2) The fluid level should check at the FULL mark, or slightly below, but never above the FULL mark when the engine is at its normal warmed condition. Add or remove fluid as necessary to bring to this prescribed level *(see Fig. 21)*.

Fig. 21 - Dip stick markings

CAUTION: To prevent dirt or water from entering transmission after checking or replenishing fluid, make certain that the dip stick cap is reseated correctly on to the filler tube.

If it is necessary to check fluid when the transmission is cold, the fluid should be at, or slightly below the Add One Pint mark. If below, add one pint of fluid then recheck the level.

Drain, Refill and Periodic Adjustments

The transmission adjustments and fluid change should be made regularly as shown in the lubrication and maintenance schedule. The filter should be renewed at 32,000 mile intervals.

NOTE: If the regular operation of a vehicle is classified as severe, the transmission should be serviced every 12,000 miles. Typical examples of the type of service which come within this category are:

1. Police or taxi-cab operation.
2. Frequent towing of trailers.
3. Continuous operation at higher than normal loading.

(1) Drain oil from transmission as follows:

Loosen the transmission oil pan bolts and tap pan with a soft mallet to break it loose, permitting the fluid to drain.

(2) Remove flywheel access plate and remove the torque converter drain plug and allow to drain *(see Fig. 22)*.

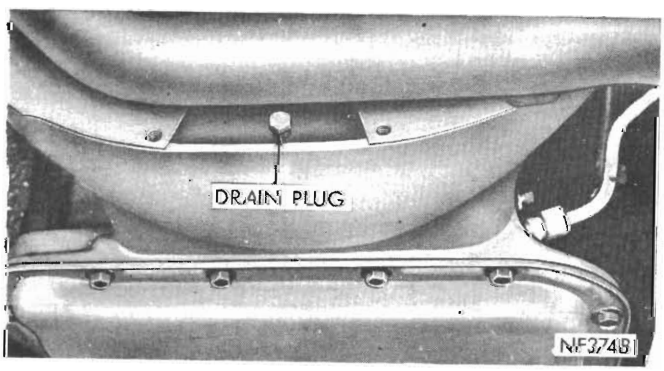


Fig. 22 – Converter drain plug

(3) Replace the torque converter drain plug, torque to 10 lbs./ft., re-install access plate.

(4) Remove transmission oil pan. Remove Dacron filter and discard. Clean oil pan.

(5) Adjust reverse band.

(6) Adjust kickdown band.

(7) Adjust gearshift control linkage.

(8) Re-install a new Dacron filter. Tighten screws to 35 lbs./in. Refit oil pan using a new gasket.

(9) Add 10 pints of Automatic Transmission fluid through the filler tube *(see Group 1, para. 17* for the recommended fluid.)

(10) Start engine.

(11) Allow engine to idle for at least two minutes, then with the parking brake applied, select each drive range momentarily ending with the N (neutral) position selected.

(12) Add sufficient fluid to bring the fluid level to the Add One Pint mark.

(13) Adjust engine idle to specifications.

(14) Adjust the transmission and carburettor throttle linkage.

(15) Test vehicle performance.

CAUTION: To prevent dirt or water from entering transmission, make certain that the dip stick cap is reseated correctly onto filler tube.

Fluid Leaks

Leaks which may be repaired with the transmission in the vehicle are:

Transmission output shaft oil seal, extension housing gasket, speedometer pinion seal and cable seal, oil filler tube seal, oil pan gasket, throttle shaft seal, neutral starting switch seal, oil cooler line fittings and pressure take-off plugs.

CAUTION: If the oil filler tube is removed every precaution must be taken to prevent dirt from falling into the transmission hole. If necessary remove oil pan and clean.

If oil is found inside torque converter housing, determine whether it is transmission fluid or engine oil.

Leaks at these locations should be corrected, regardless of how slight. Correct by tightening loose screws, nuts or plugs. Where this does not remedy the situation, replace faulty gaskets, seals, plugs or other parts as required.

Leaks requiring removal of transmission are: porous transmission case, sand hole in oil pump housing, oil pump housing retaining screws or sealing washers damaged, oil pump housing seal (located on outside diameter of pump housing), torque converter assembly and converter impeller hub, oil seal (located in oil pump housing).

Leaks at these locations may be corrected by tightening loose bolts or replacing damaged or faulty parts. Any sharp edges on the converter impeller hub which could contact the seal during re-installation should be removed by stoning with a fine stone.

Minor seal leakage may be remedied by the addition of Chrysler Transmission Sealer, Pt. No. 2298923, as directed.

4. GEARSHIFT CONTROL LINKAGE ADJUSTMENT

Steering Column Gearshift

(1) Place gearshift selector lever in PARK position and loosen the gearshift linkage control rod swivel clamp screw a few turns.

(2) Move transmission control lever *(Fig. 17)* all the way to rear (in park detent).

(3) With control lever on transmission in Park position detent and selector lever in PARK position, tighten swivel clamp screw securely.

Console Gearshift

(1) With gearshift selector lever in PARK position, loosen bolt in lower rod adjusting lever *(Fig. 20)*.

(2) Move transmission control lever *(Fig. 17)* all the way to rear (in park detent).

(3) With control lever on transmission in Park position detent, and selector lever in PARK position, tighten adjusting lever bolt securely.

5. NEUTRAL STARTING AND REVERSE LAMP SWITCH

The neutral starting switch *(Fig. 23) should* operate in both the PARK and NEUTRAL selector lever positions.

The Neutral Starting Switch is the centre terminal of the 3 terminal switch. It provides ground for the starter solenoid circuit *through* the selector lever *cam* in only Park and Neutral positions.

(1) To test switch, remove wiring connector from switch and test for continuity between *centre 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 incorrectly.

Replacement and Test

(1) Unscrew switch from transmission case allowing fluid to drain into a container. Move selector lever to PARK then to NEUTRAL position, and inspect to see that the switch operating lever fingers are centred in switch opening in the case.

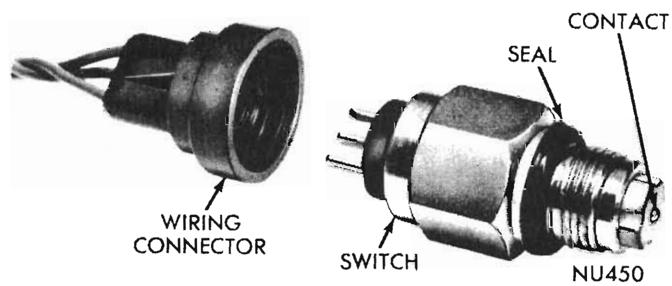


Fig. 23 – Neutral starting and reverse light switch

(2) Screw switch into transmission case and tighten to 25 lbs./ft. Re-test switch with the test lamp.

It may be necessary to align the valve body neutral and/or park fingers with the switch plunger. *Refer to page 21 – 120, para. 16.*

Re-connect the switch plug lead. Caution: Do not twist plug — as this can cause the pins to distort and a poor connection is the result.

(3) Add fluid to transmission to bring up to proper level.

> NOTE: Test starter for operation in all selector lever positions. If it should operate in any position other than PARK and NEUTRAL, re-adjust the gearshift control linkage.

6. BAND ADJUSTMENTS

Kickdown Band

The kickdown band adjusting screw is located on the left side of the transmission case *(Fig. 17)*.

(1) Loosen lock nut and back off approximately five turns. Test adjusting screw for free turning in the transmission case.

(2) Using lbs. in. torque wrench with adaptor E1295, tighten band adjusting screw to 36 lb. in. This represents a true torque of 72 lbs. in.

(3) Back off the adjusting screw two turns. Hold adjusting screw in this position and tighten lock nut to 29 lbs. ft. (A727 trans. 2½ turns).

Low and Reverse Band

(1) Raise vehicle, drain transmission fluid, and remove the oil pan.

(2) Loosen adjusting screw lock nut and back off nut approximately five turns *(Fig. 24)*. Test adjusting screw for free turning in the lever.

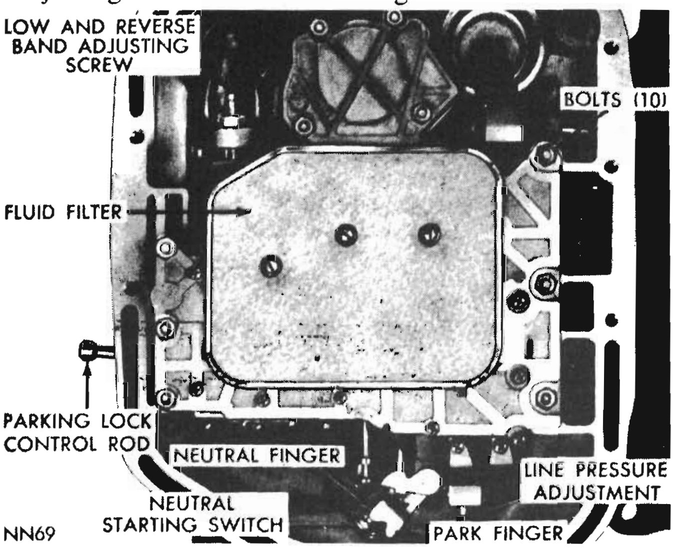


Fig. 24 – Bottom view of transmission (pan removed)

(3) Using lbs./in. torque wrench and ¼″ socket tighten band adjusting screw to 72 lbs./in.

(4) Back off adjusting screw 4 turns. Hold adjusting screw in this position and tighten lock nut to 35 lbs. ft. (A727 trans. 2 turns).

(5) Re-install oil pan using a new gasket. Tighten oil pan bolts to 150 lbs./in.

(6) Fill transmission with Automatic Transmission fluid. *(See Group 1, Para. 17, for the recommended fluid.)*

7. THROTTLE CABLE AND LINKAGE ADJUSTMENT Refer Fig. 25

(1) Apply a thin film of multi-purpose grease on accelerator shaft (2) where it turns in the bracket anti-rattle spring (1) where it contacts shaft, pivot points of both upper (9) and lower (15) linkage bell cranks, ball end of cable and pocket (3) at rear end of cable.

(2) Disconnect choke (4) at carburettor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburettor to curb idle.

(3) Hold or wire transmission lever (14) firmly forward against its stop while performing adjustments in the next four steps. It is important that the lever remains firmly against the stop during these steps to ensure a correct adjustment.

(4) With a 3/16″ diameter rod (7) placed in the holes provided in upper bellcrank and lever, adjust length of intermediate transmission rod (13) by means of the threaded adjustment at upper end. The ball socket (8) must line up with the ball end with a slight downward effort on rod.

(5) Assemble ball socket (8) to ball end and remove 3/16″ rod (7) from upper bellcrank and lever.

(6) Disconnect return spring (11), spring clip and washer, then adjust length of carburettor rod (5) by pushing rearward on rod with a slight effort and turning the threaded adjustment (12). The rear end of slot should contact carburettor lever pin without exerting any forward force on pin when slotted adjuster link (12) is in its normal operating position against lever pin nut.

(7) Assemble slotted adjustment (12) to carburettor lever pin and install washer and retainer clip. Assemble transmission linkage return spring (11) in place.

(8) Remove wire securing transmission lever, then check transmission linkage freedom of operation, move slotted adjuster link (12) to the full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(9) Loosen cable clamp nut (6), adjust the position of the cable housing ferrule (10) in the clamp so that all slack is removed from the cable with the carburettor at curb idle. To remove slack from the cable, move the ferrule (10) in the clamp in direction away from the carburettor lever.

(10) Back off ferrule (10) ¼″. This provides ¼″ free play between the front edge of the accelerator shaft lever and the dash bracket. Tighten cable clamp nut (6) to 45 lbs./in.

(11) Route cable so that it does not interfere with the transmission rod throughout its full travel.

(12) Connect choke rod (4) or remove blocking fixture.

8. 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°–200°F).

(1) Install an engine tachometer, raise vehicle on a hoist and position tachometer so it can be read under the vehicle.

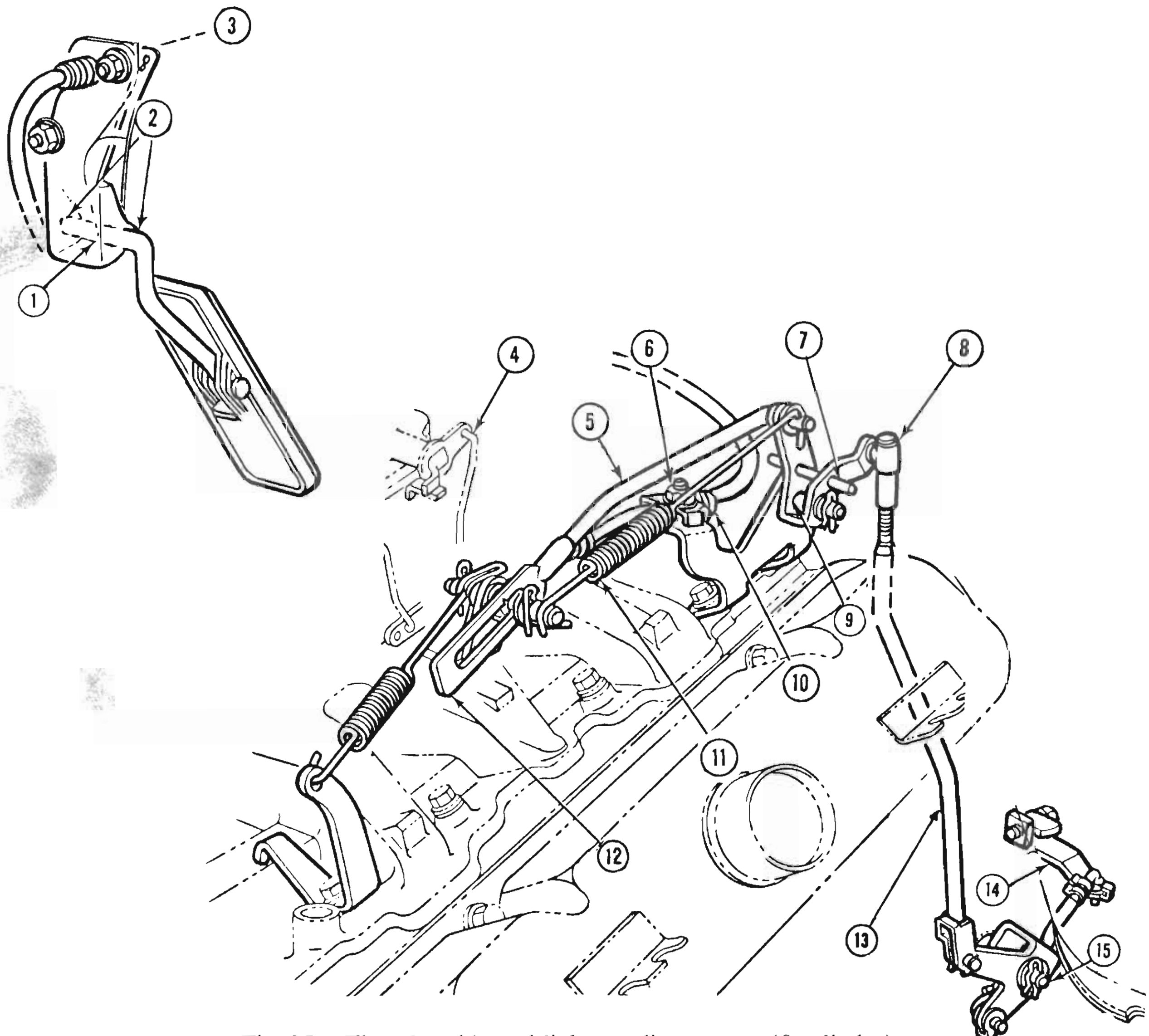


Fig. 25 – Throttle cable and linkage adjustment – (8 cylinder)

(2) Connect two 100 P.S.I. pressure gauges, Tool CA-3292 to pressure take-off points at side of accumulator and at front servo release *(Fig. 26)*.

(3) With control in D (drive) position, speed up engine slightly until transmission shifts into direct. (Front servo release will be pressurised in direct.) Reduce engine speed slowly to 1,000 R.P.M. Line pressure at this speed must be 54–60 P.S.I. and front servo release must not be more than 3 P.S.I. below the line pressure.

(4) Disconnect throttle linkage from transmission throttle lever and move throttle lever gradually to the full throttle position. Line pressure must rise to a maximum of 90–96 P.S.I. just before or at kickdown into low gear. Front servo release pressure must follow line pressure up to kickdown point and should not be more than 3 P.S.I. below line pressure.

If pressure is not 54–60 P.S.I. at 1,000 R.P.M., adjust the pressure as outlined in the following paragraphs.

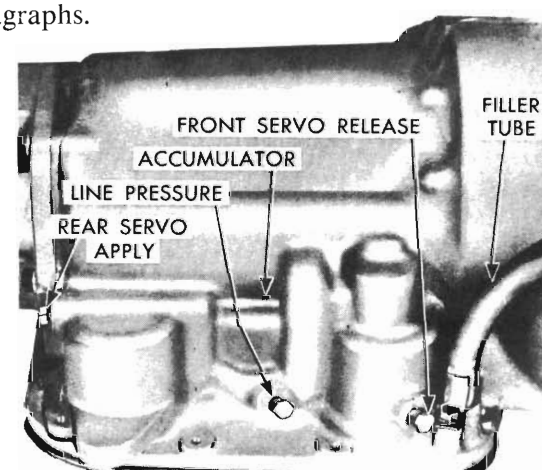


Fig. 26 – Pressure test locations (right side of case)

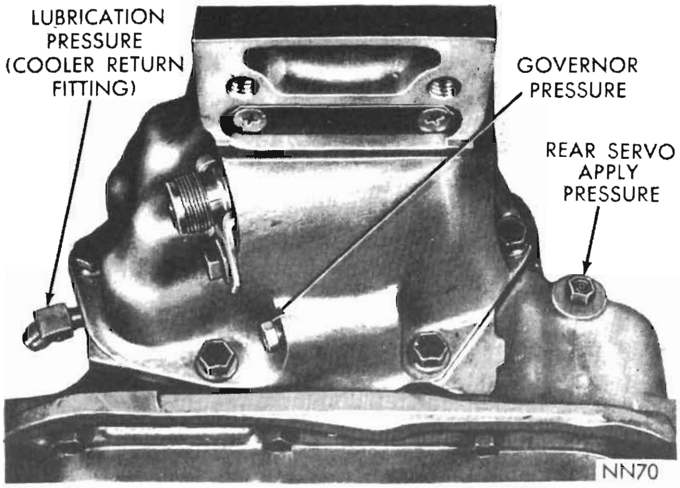


Fig. 27 – Pressure test locations (rear end of case)

8. 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 to 200 degrees F.).

(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 p.s.i. pressure gauges, Tool E21C65 to pressure take-off-points at side of accumulator and at front servo release *(Fig. 26).*

(3) With control in D (drive) position, speed up engine slightly until transmission shifts into direct. (Front servo release will be pressurised in direct.) Reduce engine speed slowly to 1,000 r.p.m. Line pressure at this time (1,000 r.p.m.) must be 54-60 p.s.i., and front servo release pressure must not be more than 3 p.s.i. below the line pressure.

(4) Disconnect throttle linkage from transmission throttle lever and move throttle lever gradually to the full throttle position. Line pressure must rise to a maximum of 90-96 p.s.i. just before or at kickdown into low gear. Front servo release pressure must follow line pressure up to kickdown point and should not be more than 3 p.s.i. below line pressure.

If pressure is not 54-60 p.s.i. at 1,000 r.p.m., see "Hydraulic Control Pressure Adjustments."

If front servo release pressures are less than pressures specified and line pressures are within limits, there is excessive leakage in the front clutch and/or front servo circuits. *Always inspect external transmission throttle lever for looseness on the valve body shaft when making the pressure tests.*

Lubrication Pressures

The lubrication pressure test should be made at same time that line pressure and front servo release pressure 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 *(Fig. 27).* Connect a 0-100 p.s.i. pressure gauge, Tool E21C65 to the "tee" fitting.

(2) At 1,000 engine r.p.m., with throttle closed and transmission in direct, lubrication pressure should be 5-15 p.s.i. Lubrication pressure will be approximately doubled as the throttle is opened to maximum line pressure.

Rear Servo Apply Pressure

(1) Connect a 0-300 p.s.i. pressure gauge, Tool E21C65A to apply pressure take-off point at rear servo *(Fig. 27).*

(2) With transmission control in R (reverse) position and engine speed set at 1,600 r.p.m., reverse servo apply pressure should be 230 to 300 p.s.i.

Governor Pressure

(1) Connect a 0-100 p.s.i. pressure gauge, Tool E21C65 to governor pressure take-off point, located at lower left side of extension near the mounting flange *(Fig. 27).*

(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. *The governor pressure should respond smoothly to changes in m.p.h. and should return to 0 to 1½ p.s.i. when vehicle is stopped. High pressure at stand still (above 2 p.s.i.) will prevent the transmission from downshifting.*

GOVERNOR PRESSURE CHART

Vehicle Speed to Axle Ratios 2.92:1	Pressure Limits
16-19 M.P.H.	15 P.S.I.
36-45 M.P.H.	50 P.S.I.
65-72 M.P.H.	75 P.S.I.

THROTTLE PRESSURE

No provisions are made to test the throttle pressure. Incorrect throttle pressure should only be suspected if part throttle up-shift speeds are either delayed or occur too early in relation to vehicle speeds. Engine runaway on either up shifts or down shifts can also be an indicator of incorrect (low) throttle pressure setting.

CAUTION: In no case should throttle pressure be adjusted until the transmission throttle linkage adjustment has been verified to be correct.

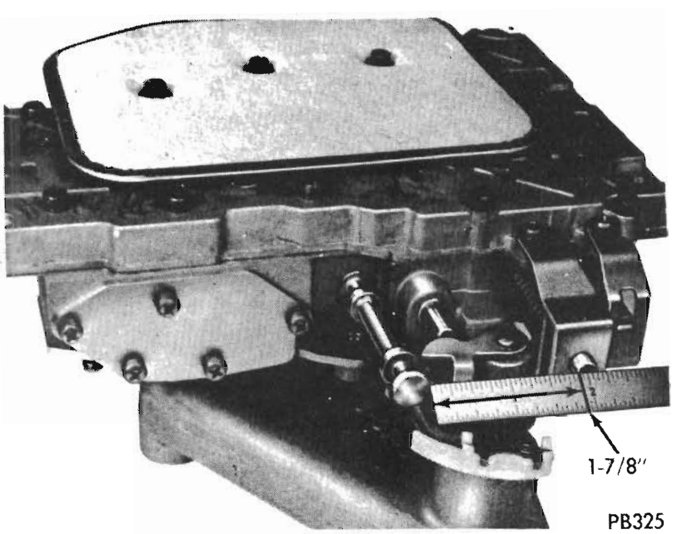


Fig. 28 – Measuring spring retainer locations

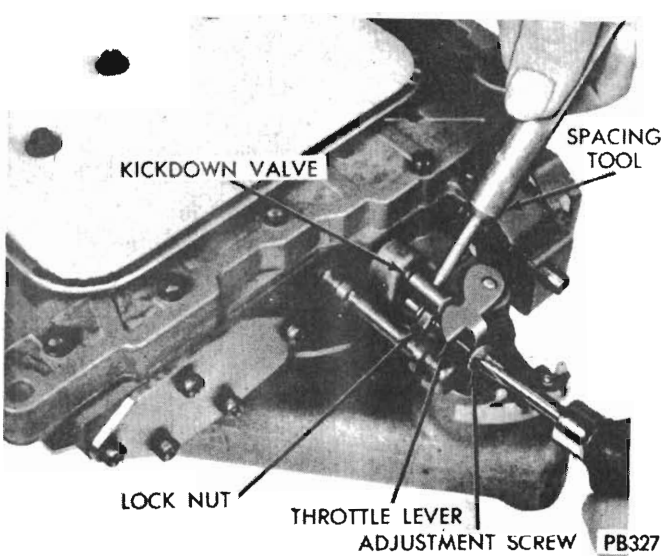


Fig. 29 – Throttle pressure adjustment

9. 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 manual valve (valve in 1-low position) and line pressure adjusting screw (Fig. 28).*

This measurement must be 1⅞ 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 unless a modified Allen Key is used.

The approximate adjustment is 1-5/16 inches, measured from valve body to inner edge of adjusting nut *(Fig. 30)*. 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 p.s.i. Turning adjusting screw counter-clockwise increases pressure, and clockwise decreases pressure.

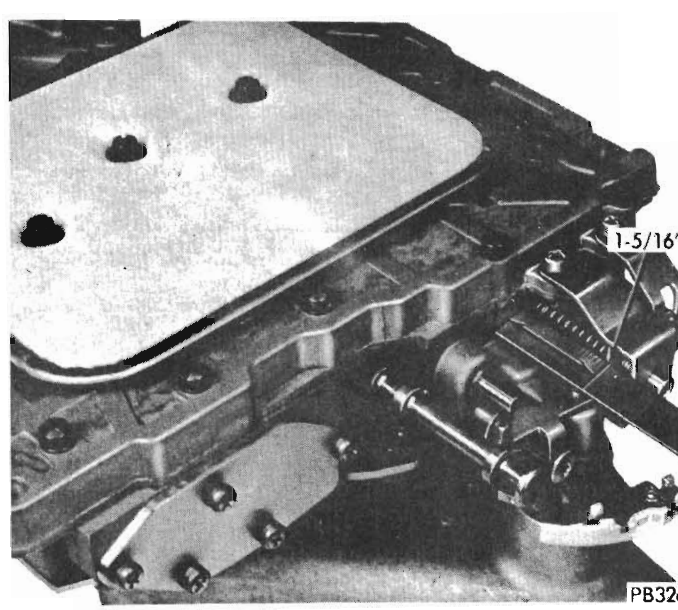


Fig. 30 – Line pressure adjustment

Throttle Pressure

Throttle pressures cannot be tested accurately; 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. 29)*.

(3) Insert gauge pin of Tool E21C55 between the throttle lever cam and kickdown valve.

(4) By pushing in on 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 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.

10. AIR PRESSURE TESTS

A "NO DRIVE" condition might exist even with 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. 31).*

The front and rear clutches, kickdown servo, and low-reverse servo may be tested by applying air

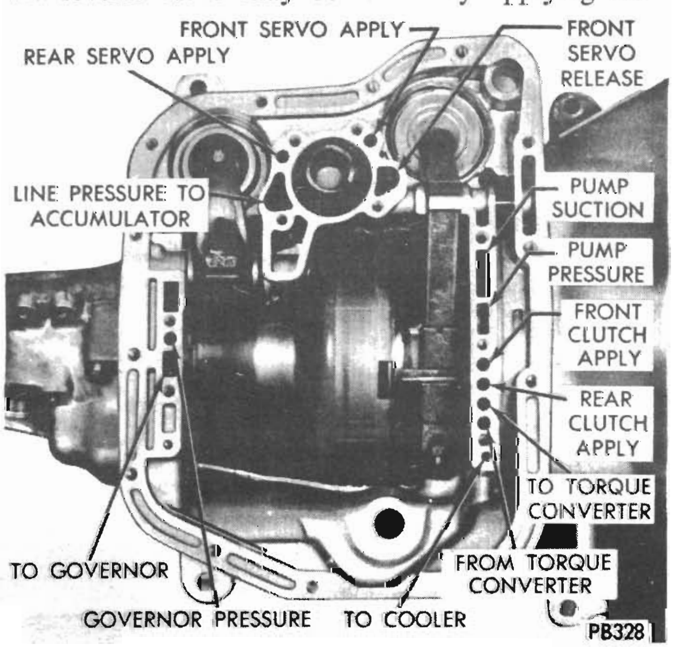


Fig. 31 – Air pressure tests

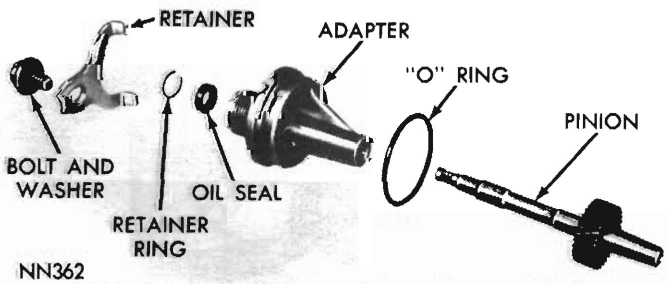


Fig. 32 – Speedometer drive—disassembled

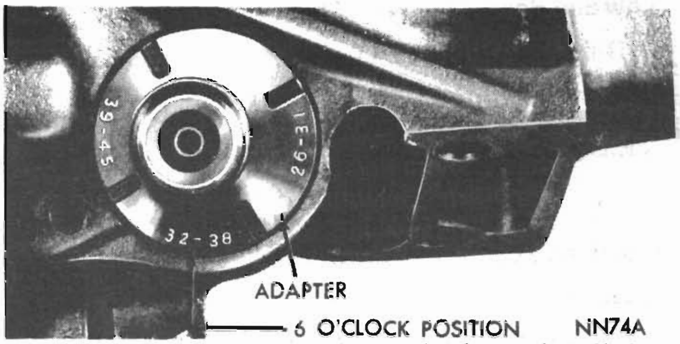


Fig. 33 – Speedometer pinion and adapter installed (Retainer removed for view)

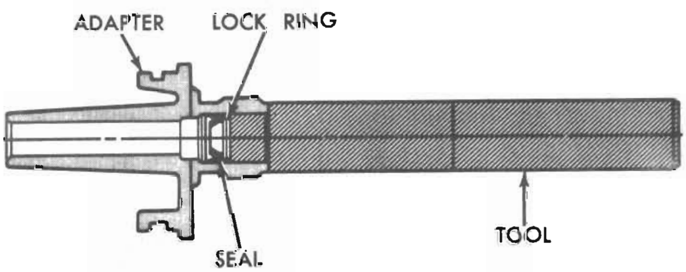


Fig. 34 – Installing speedometer pinion seal

pressure to their respective passages after the 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 p.s.i.

Front Clutch

Apply air pressure to front clutch "apply" passage and listen for a dull "thud" which indicates that front 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 inspect for excessive oil leaks. *If a dull "thud" cannot be heard in the clutches, place finger tips on clutch housing and again apply air pressure. Movement of piston can be felt as the clutch is applied.*

Kickdown Servo (Front)

Direct air pressure into front servo "apply" passage. Operation of servo is indicated by a tightening of front band. Spring tension on servo piston should release the band.

Low and Reverse Servo (Rear)

Direct air pressure into rear servo "apply" passage. Operation of servo is indicated by a tightening of 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 malfunctions exist in the valve body.

Governor

Governor operating failures can generally be diagnosed by a road test or hydraulic pressure test. Refer to "Hydraulic Control Pressure Tests."

11. SPEEDOMETER PINION

Removal and Installation

Rear axle gear ratio and tyre size determines pinion gear size requirements.

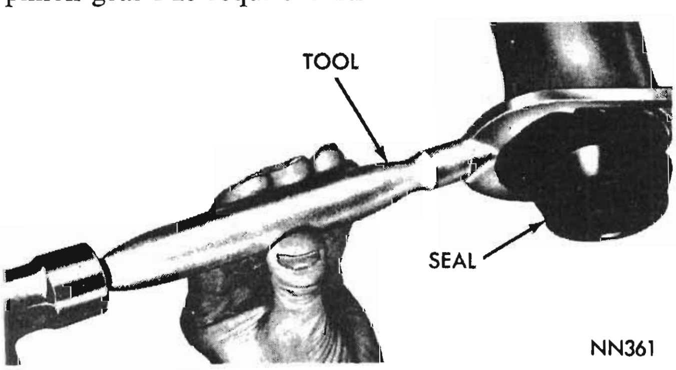


Fig. 35 – Removing extension housing yoke seal

(1) Remove bolt and retainer securing speedometer pinion adapter in the extension housing *(Fig. 33).*

(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. 32).* Start seal and retainer ring in the adapter, then push them into adapter with Tool E21C45B until tool bottoms *(Fig. 34).*

> 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. 32).*

(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. 33).*

(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 lbs. in.

12. EXTENSION HOUSING YOKE SEAL

Replacement

(1) Mark parts for reassembly then disconnect propeller shaft at rear universal joint. Carefully pull shaft yoke out of the 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. 35)* with Tool E21C50D.

(3) To install a new seal, position seal in opening of extension housing and drive it into the housing with Tool E21C50C or E21C50B *(Fig. 36).*

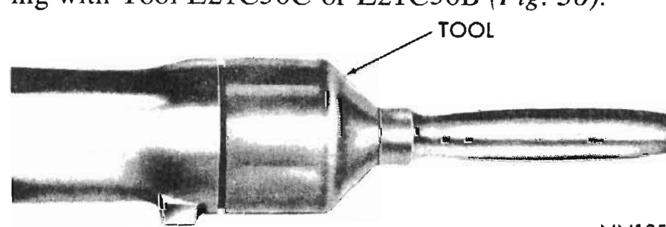


Fig. 36 – Installing extension housing yoke seal

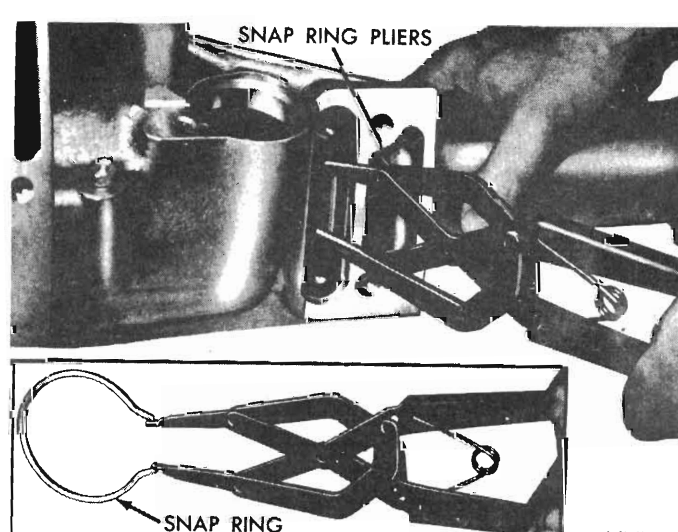


Fig. 37 – Removing or installing extension housing

(4) Carefully guide front universal joint yoke into extension housing and on the mainshaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion shaft yoke.

13. 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 assembly *(Fig. 33)*. Drain approximately two quarts of fluid from the transmission.

(3) Remove bolts securing extension housing to the crossmember. Raise transmission slightly with service jack, then remove centre crossmember and support assembly.

(4) Remove extension housing to transmission bolts.

Console Shift: Remove two bolts securing gearshift torque shaft lower bracket to extension housing. Swing bracket out of way for extension housing removal.

IMPORTANT: In removing or installing extension housing (step 5), the gearshift lever must be in "1" (low) position. This positions parking lock control rod rearward so it can be disengaged or engaged with the parking lock sprag.

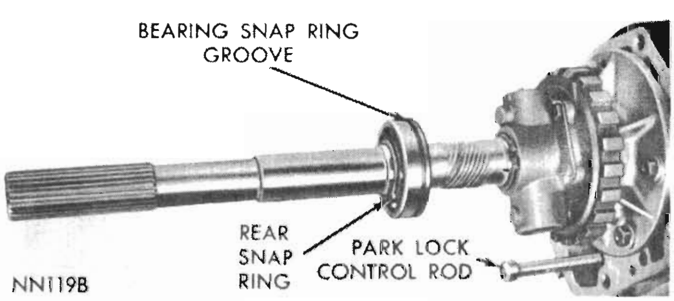


Fig. 38 – Output shaft bearing

(5) Remove two screws, plate and gasket from bottom of extension housing mounting pad. Spread large snap ring from output shaft bearing *(Fig. 37)*.

With snap ring spread as far as possible, carefully tap extension housing off the output shaft bearing. Carefully pull extension housing rearward to remove parking lock control rod knob past the parking sprag, then remove the housing.

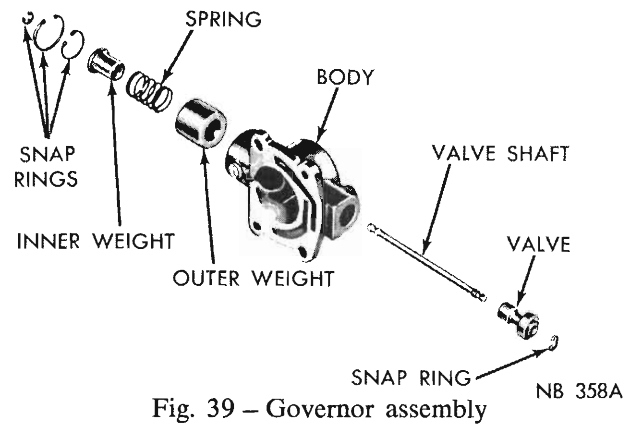


Fig. 39 – Governor assembly

Bearing Replacement

(1) Using heavy duty snap ring pliers, remove output shaft bearing rear snap ring and remove bearing from the shaft *(Fig. 38)*.

(2) Install a new bearing on shaft with outer race ring groove toward front *(Fig. 38)*, then install rear snap ring.

Installation

(1) Place a new extension housing gasket on the transmission case. Position output shaft bearing retaining snap ring in extension housing. Slide extension housing on output shaft guiding the parking lock control rod knob past the parking sprag. While spreading large snap ring in housing *(Fig. 37)*, carefully tap housing into place, then release the snap ring. Make sure snap ring is fully seated in bearing outer race ring groove.

(2) Install and tighten extension housing bolts to 24 lbs. ft.

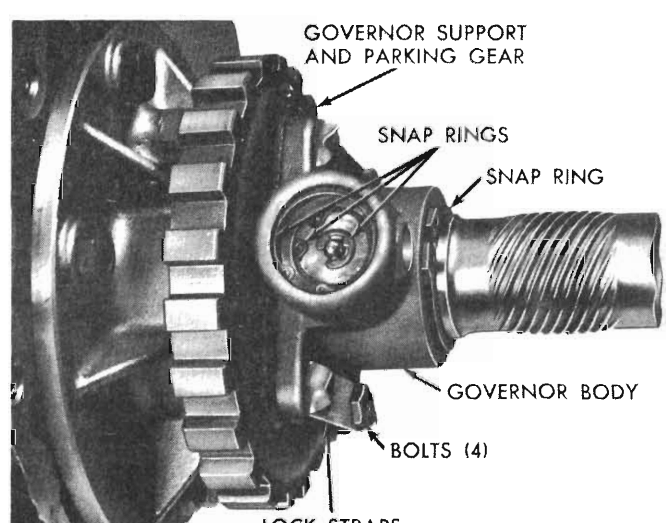


Fig. 40 – Governor shaft and weight snap ring

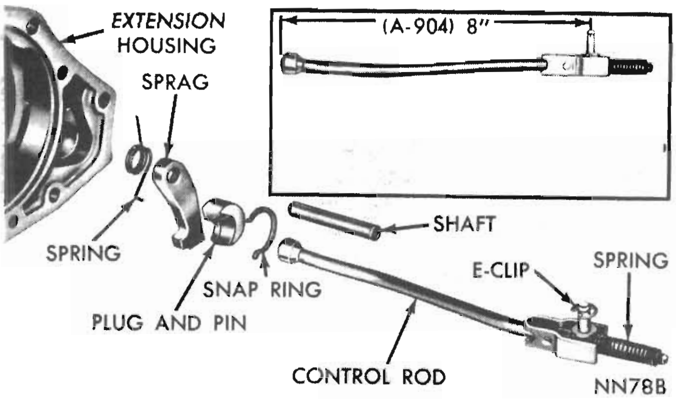


Fig. 41 – Parking lock components

(3) Install gasket, plate and two screws on bottom of the extension housing mounting pad.

(4) Install centre crossmember and rear mount assembly, tighten retaining bolts. Lower transmission, install extension housing to support bolts and tighten to 40 lbs. ft.

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 rear axle pinion shaft yoke.

(7) Add fluid to transmission to bring up to proper level.

14. GOVERNOR

Removal

(1) Remove extension housing and output shaft bearing.

(2) Carefully pry snap ring from weight end of governor valve shaft *(Fig. 40)*. Slide valve and shaft assembly out of 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 the outer weight. *Fig. 39* shows a disassembled view of the governor assembly.

(5) Remove snap ring from behind governor body, then slide governor and support assembly off the output shaft. If necessary, remove the four bolts and separate governor body 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 bolts finger tight. Make sure oil passage of governor body aligns with passage in the support.

(2) Position support and governor assembly on the output shaft. Align assembly so 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. 40)*. Tighten the body to support bolts to 100 lbs. in. Bend ends of lock straps over bolt heads.

(3) 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.

(4) Place governor valve on the valve shaft, insert assembly into the 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.

15. PARKING LOCK COMPONENTS

Removal

(1) Remove extension housing.

(2) To replace the governor support and parking gear, refer to "Governor and Support" page 21–132.

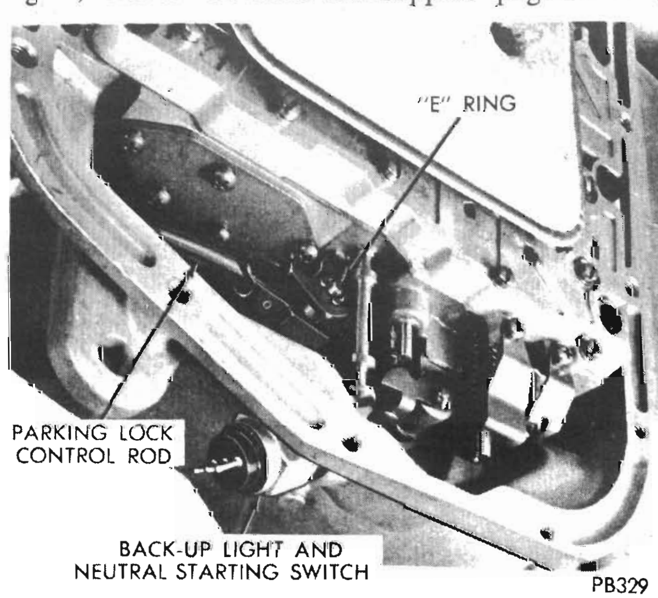


Fig. 42 – Parking lock control rod retaining E-clip

(3) Slide shaft out of extension housing to remove the parking sprag and spring *(Fig. 41)*. Remove snap ring and slide the 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 the housing and insert the shaft *(Fig. 41)*. Make sure square lug on sprag is toward 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.

16. VALVE BODY ASSEMBLY AND ACCUMULATOR PISTON

Removal

(1) Raise vehicle on a hoist.

(2) Loosen oil pan bolts, tap the pan to break it loose allowing fluid to drain, then remove oil pan.

(3) Disconnect throttle and gearshift linkage from levers on the transmission. Loosen clamp bolts and remove the levers *(Fig. 17)*.

(4) Remove E-clip *(Fig. 42)*, 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 down 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 the 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. 43)*.

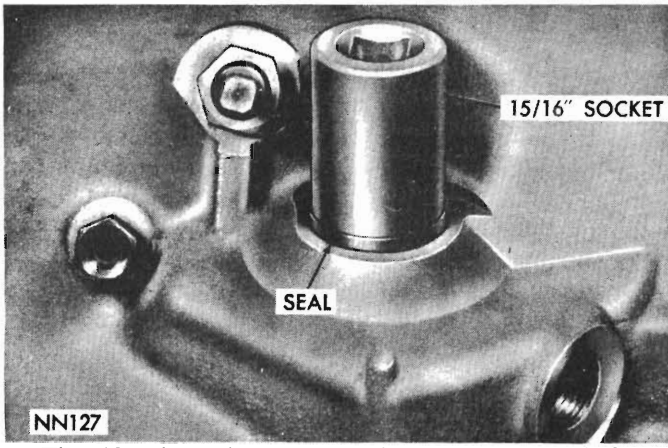


Fig. 43 – Installing valve body manual lever shaft oil seal

NOTE: 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 opening in rear of case with knob positioned against the plug and sprag. Move front end of rod toward centre of transmission while exerting rearward pressure on the rod to force it past the sprag. (Rotate propeller shaft if necessary.)

(2) Install accumulator piston in the transmission case.

(3) Position accumulator spring on the valve body.

(4) Place valve body manual level in LOW position. Lift valve body into its approximate position, connect parking lock rod to manual lever and secure with E-clip. Position valve body in the case, install retaining bolts finger tight.

(5) With neutral starting switch installed, place manual lever in the neutral position. Shift valve body if necessary to centre neutral finger over the neutral switch plunger. Snug bolts down evenly, then tighten to 100 lbs. in.

(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

17. TRANSMISSION AND CONVERTER REMOVAL

NOTE: 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 to starter solenoid and position switch so engine can be rotated from under the vehicle.

(2) Disconnect primary wire from the ignition coil.

(3) Remove cover plate from in front of converter to provide access to the converter drain plug and mounting bolts.

(4) Rotate engine with remote control switch to bring the 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 the balance of 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.

NOTE: 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 bolts have been loosened.

(7) Disconnect negative (ground) cable from the battery.

(8) Remove the starting motor assembly.

(9) Disconnect wire from the neutral starting switch.

(10) Disconnect gearshift rod from the transmission lever. Remove the 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 way for transmission removal. Disconnect gearshift rod from the transmission lever.

(11) Disconnect throttle rod from throttle lever on the transmission.

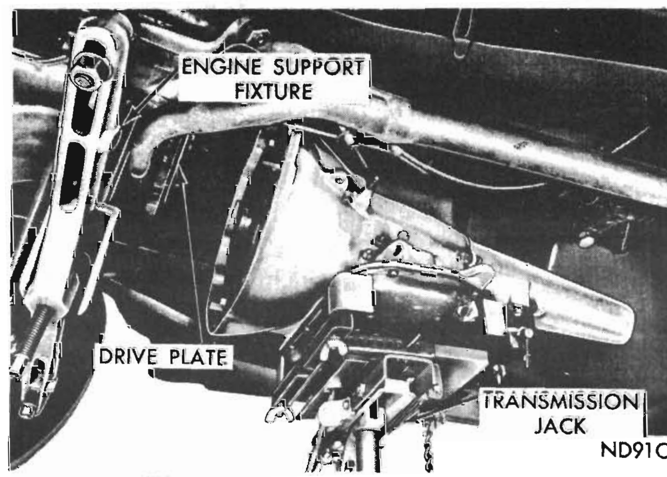


Fig. 44 – Engine support fixture

(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, and raise the engine slightly *(Fig. 44)*.

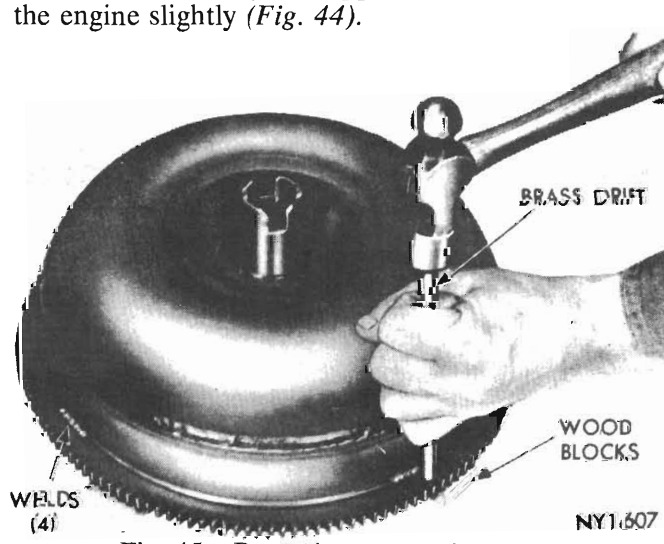


Fig. 45 – Removing starter ring gear

(16) Some models have exhaust systems which will have to be partially removed for clearance.

(17) Remove crossmember attaching bolts and remove the crossmember.

(18) Place a transmission service jack under transmission to support the assembly.

(19) Attach a small "C" clamp to edge of bell housing to hold converter in place during removal of the transmission.

(20) Remove the bell housing retaining bolts. Carefully work transmission rearward off engine block dowels and disengage converter hub from end of the crankshaft.

(21) Lower transmission jack and remove transmission and converter assembly.

(22) To remove converter assembly, remove "C" clamp from edge of bell housing, then carefully slide assembly out of the transmission.

18. 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. 45)*. Be careful not to cut or grind into 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. 45)*. Tap around ring gear until it comes off the converter.

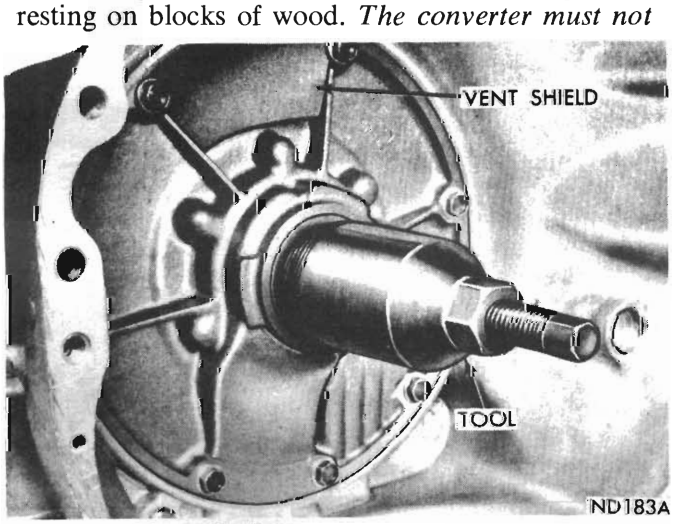


Fig. 46 – Removing pump oil seal

(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 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 gear on the 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 the cover evenly with a plastic or rawhide mallet until 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 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 the proper electrode is available.

c. Use a $\frac{1}{8}$ inch diameter welding rod, and a welding current of 80 to 125 amps.

d. Direct the arc at intersection of the 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.

19. 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.

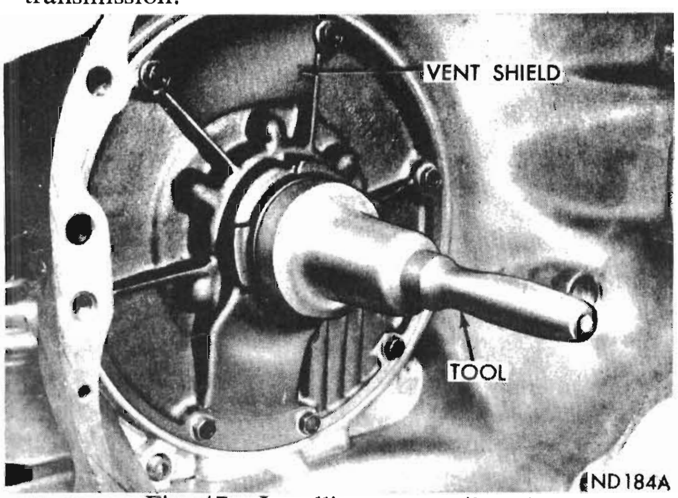


Fig. 47 – Installing pump oil seal

HAND FLUSHING

(1) Place converter in horizontal position and pour two quarts of new clean solvent 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 operation 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 E21C25 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 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 lbs. in.

(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.

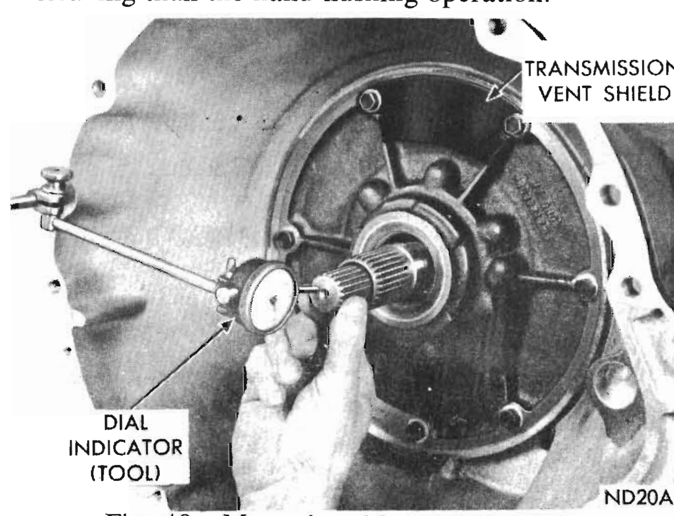


Fig. 48 – Measuring drive train end play

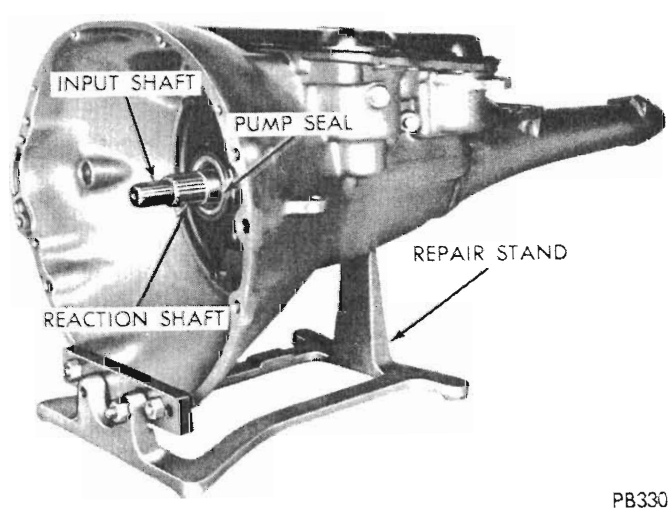


Fig. 49 – Transmission installed in repair stand

20. PUMP OIL SEAL

Replacement

The pump oil seal can be replaced without removing pump and reaction shaft support assembly from the transmission case. *The vent shield shown in (Figs. 46 and 47) is not used or required on the A-904 pumps.*

(1) *A-904*: Screw seal remover Tool E21C35G into seal *(Fig. 46)*, then tighten screw portion of tool to withdraw the seal.

A-727: Using Tool E21C35L, remove seal in the same manner.

(2) *A-904*: To install a new seal, place seal in opening of the pump housing (lip side facing inward). Using Tool E21C35F, drive seal into housing until tool bottoms *(Fig. 47)*.

A-727: Using Tool E21C35K, install new seal in the same manner.

21. DISASSEMBLY—SUB-ASSEMBLY REMOVAL

Prior to removing any 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 is required, (except when major parts are replaced). *The thrust washer is located between reaction shaft support and front clutch retainer on A-727 transmissions. The thrust washer is located between input and output shafts on A-904 transmissions.*

(1) Attach a dial indicator to transmission bell housing with its plunger seated against end of input shaft *(Fig. 48)*.

Move input shaft in and out to obtain end play reading. End play specifications are .030 to .089 inch for A-904 transmissions, and .037 to .084 inch for A-727 transmissions.

(2) Record indicator reading for reference when reassembling the transmission.

Oil Pan

(1) Place transmission assembly in repair stand, Tool E21C5C *(Fig. 49)*.

(2) Unscrew oil pan bolts and remove oil 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.

(3) Remove the ten hex-head valve body to transmission bolts. Remove E-clip securing parking lock rod to the valve body manual lever *(Fig. 42)*.

(4) While lifting valve body upward 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.

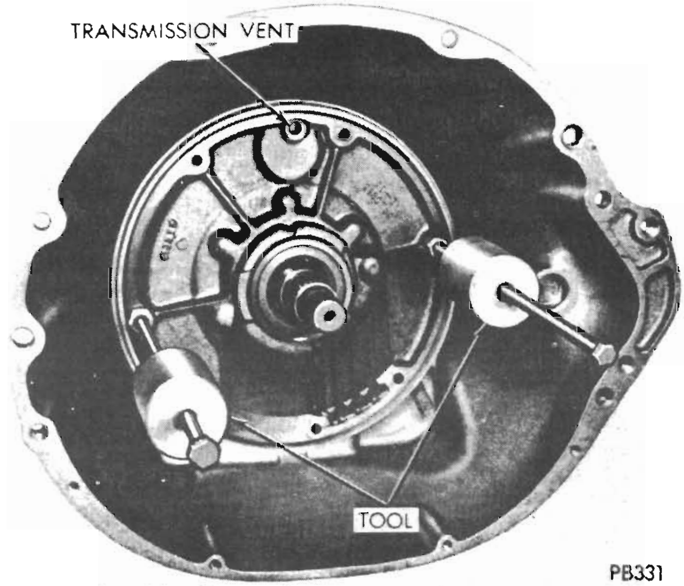


Fig. 50 – Removing pump and reaction shaft support assembly

Extension Housing

Before removing extension housing, pull parking 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 *(Fig. 37)*.

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, remove output shaft bearing rear snap ring. Remove bearing from shaft, then remove front snap ring (A-727). The A-904 has no front snap ring.

Governor and Support

(1) Carefully pry snap ring from weight end of governor valve shaft *(Fig. 40)*. 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 front clutch retainer*. This prevents clutch retainer from coming out with pump which might cause unnecessary damage to the clutches.

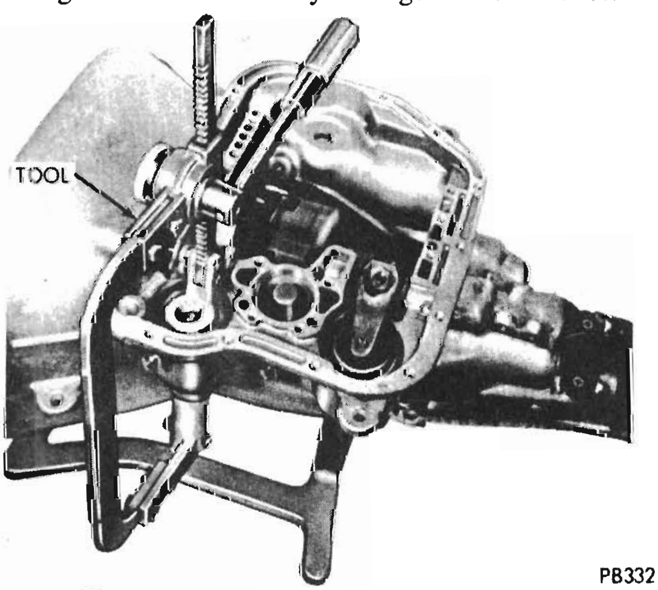


Fig 51 – Compressing kickdown servo spring

(2) Remove oil pump housing retaining bolts.

(3) Attach Tool E21C35D to pump housing flange, *(Fig. 50)*, in threaded holes in the flange.

(4) Bump outward evenly with the two "knocker weights" to withdraw pump and reaction shaft support assembly from the case.

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 the 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 link, then remove band from the case.

(A-904-LA Double Wrap Band): Loosen band adjusting screw then remove band and low-reverse drum.

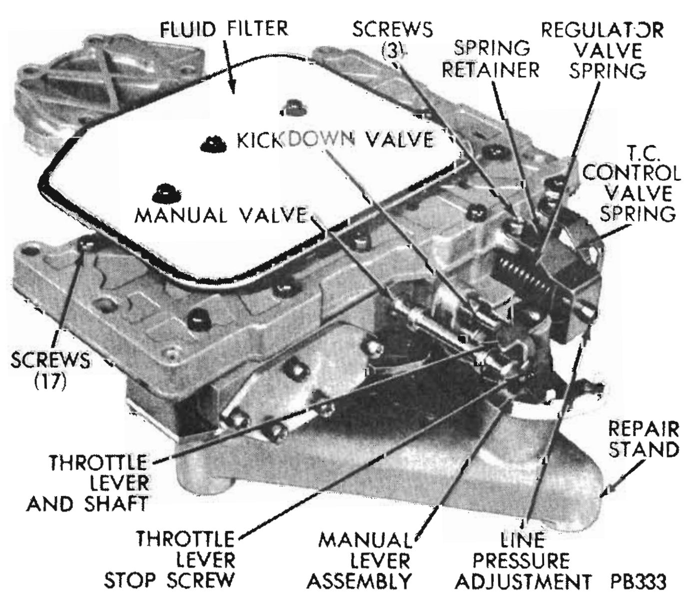


Fig. 52 – Valve body and control assembly

Over-running Clutch

(1) Note position of over-running clutch rollers and springs before disassembly to assist in reassembly.

(2) Carefully slide out clutch hub and remove rollers and springs. *If the over-running clutch cam*

and/or roller spring retainer are found damaged or worn, refer to Para. 37 for replacement procedures.

Kickdown Servo (Front)

(1) Compress kickdown servo spring by using engine valve spring compressor, Tool E0092, then remove snap ring *(Fig. 51)*.

(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. *(See Fig. 94 or 95)*.

(4) If so equipped, disassemble "Controlled Load" Servo piston assembly by removing small snap ring from servo piston then remove washer, spring and piston rod from servo piston.

Low and Reverse Servo (Rear)

(1) Compress low and reverse servo piston spring by using engine valve spring compressor, Tool E0092, then remove the snap ring.

(2) Remove spring retainer, spring, and servo piston and plug assembly from the case.

22. RECONDITIONING SUB-ASSEMBLIES

The following procedures cover disassembly, inspection, repair, and assembly of each sub-assembly as removed from the transmission.

Heli-Coil inserts are recommended for repairing damaged, stripped or worn threads in aluminium parts.

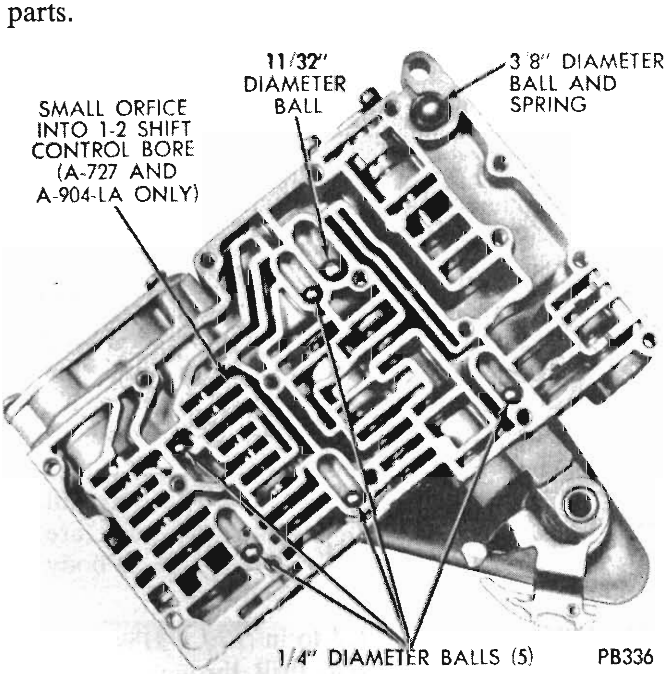


Fig. 53 – Steel ball locations

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 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 E21C60.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care to avoid rounding off the sharp edges. The sharp edge is vitally important to this type of 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 transmission, and vehicle has accumulated considerable mileage, install new seal rings on parts requiring their usage. *Coat each part with "DEXRON" type Automatic Transmission Fluid during assembly.*

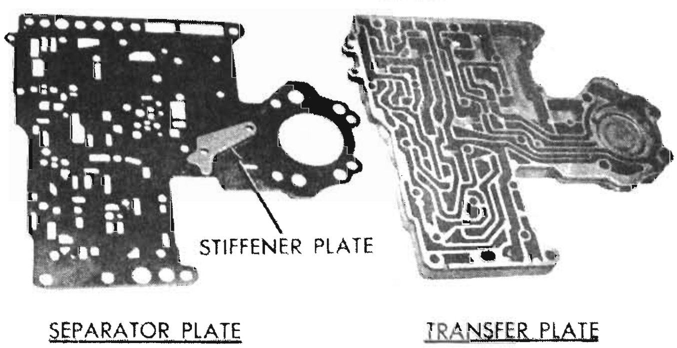


Fig. 54 – Transfer and separator plate (A-727 and A-904-LA)

23. VALVE BODY DISASSEMBLY

> CAUTION: Never clamp any portion of valve body or transfer plate in a vice. Any slight distortion of the aluminium body or transfer plate will result in sticking valves, excessive leakage or both. When removing or installing valves or plugs, slide them in or out carefully. Do not use force.

Filter, Transfer Plate and Ball Valves

(1) Place valve body assembly on repair stand, Tool E21C5B, *(Fig. 52)*. Remove three screws from fluid filter and lift off the filter.

(2) Remove (17) transfer plate retaining screws and 2 of the spring retainer mounting screws.

(3) Lift off transfer plate and separator plate assembly. Remove (4) screws from stiffener and separator plate and separate parts for cleaning *(Fig. 54).*

(4) Remove the 7 balls and spring from valve body shown in *(Fig. 53).*

> CAUTION: Tag all springs as they are removed for reassembly identification.

Shuttle Valve and Governor Plugs

(1) Turn valve body over *(Fig. 55)* and remove shuttle valve cover plate.

(2) Remove governor plug end plate *(Fig. 56)* and slide out the shuttle valve throttle plug and spring, the 1-2 shift valve governor plug and the 2-3 shift valve governor plug.

(3) Remove shuttle valve "E" clip and slide shuttle valve out of its bore. Also remove the secondary spring and guides which were retained by "E" clip.

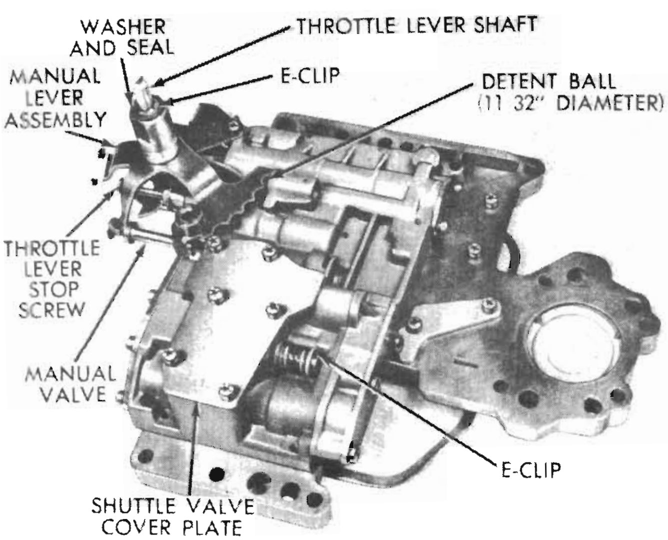


Fig. 55 – Valve body controls (A-727 and A-904-LA)

Pressure Regulators and Manual Control

(1) *Hold spring retainer firmly against spring force while removing last retaining screw from valve body (Fig. 57).*

(2) Remove spring retainer, line pressure adjusting screw assembly *(do not disturb setting)* and the line pressure and torque converter regulator springs.

(3) Slide torque converter and line pressure valves out of their bores.

(4) Remove E-clip and washer from throttle lever shaft *(Fig. 57).* Remove any burrs from shaft, then while holding manual lever detent ball and spring in their bore with Tool E21C15A or similar tool *(Fig. 59),* slide manual lever off the throttle shaft. Remove the detent ball and spring.

(5) Slide manual valve out of its bore.

(6) Remove throttle lever stop screw assembly from valve body and slide out the kickdown detent, kickdown valve, throttle valve spring and the throttle valve.

Shift Valves and Regulator Valve Pressure Sensing Plugs

(1) Remove the line pressure regulator valve end plate *(Fig. 58)* and slide out the regulator valve sleeve, line pressure plug, and throttle pressure plug.

(2) Remove end plate and downshift housing assembly if so equipped.

(3) Remove throttle plug from housing.

(4) Slide retainer from housing and remove limit valve and spring.

(5) Remove the three springs and shift valves from the 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 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 straight edge, inspect all mating surfaces for warpage or distortion. Slight distortion may be corrected, using a surface plate. Make sure all metering holes in steel plate and valve body are open. Using a pen light, inspect bores in valve body for scores, scratches, pits and irregularities.

Make sure orifice referred to in *(Fig. 53)* is open by inserting a 1/32 in. dia. drill through it into the 1-2 shift control valve bore.

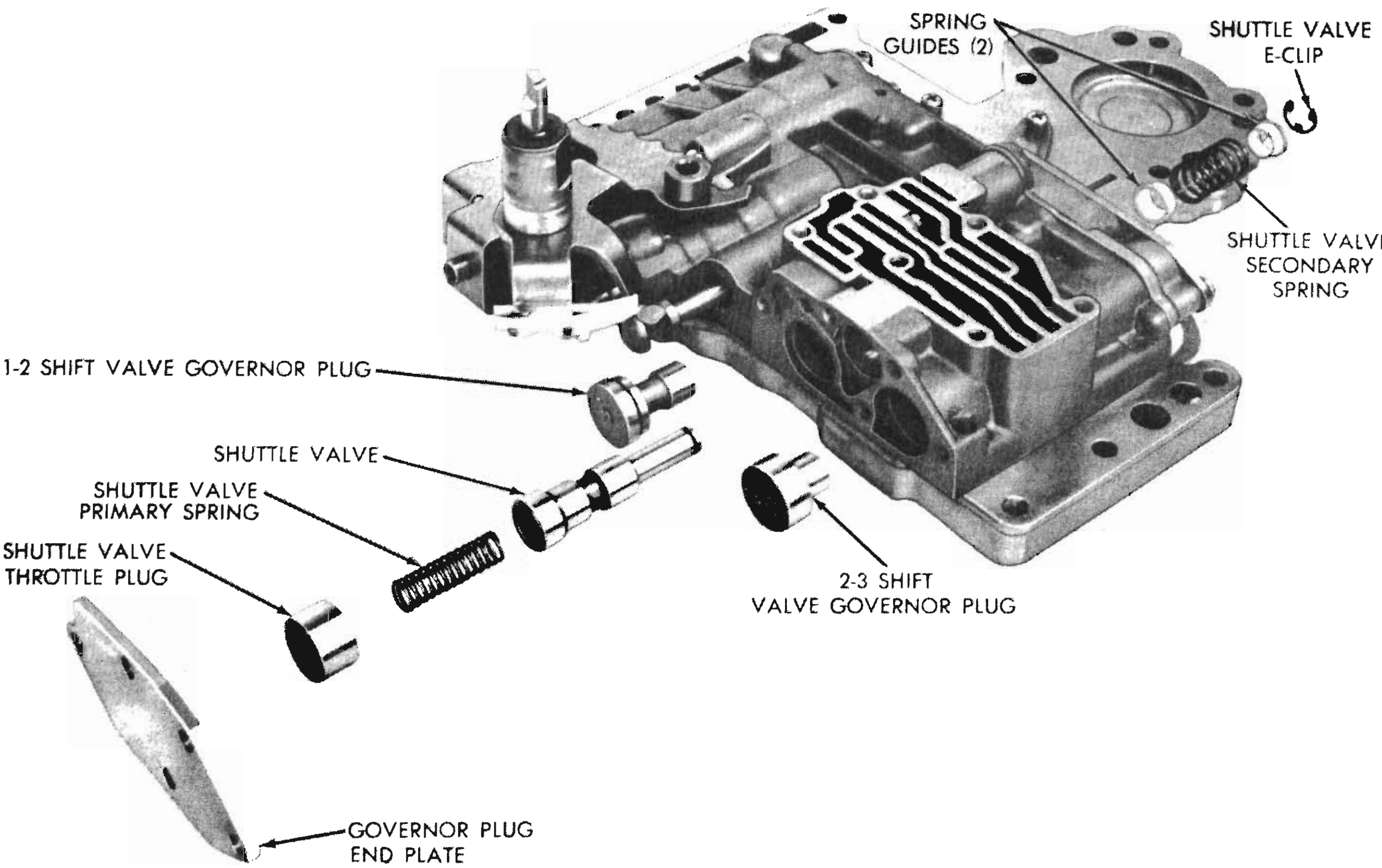


Fig. 56 – Shuttle valve and governor plugs (A-727 and A-904-LA)

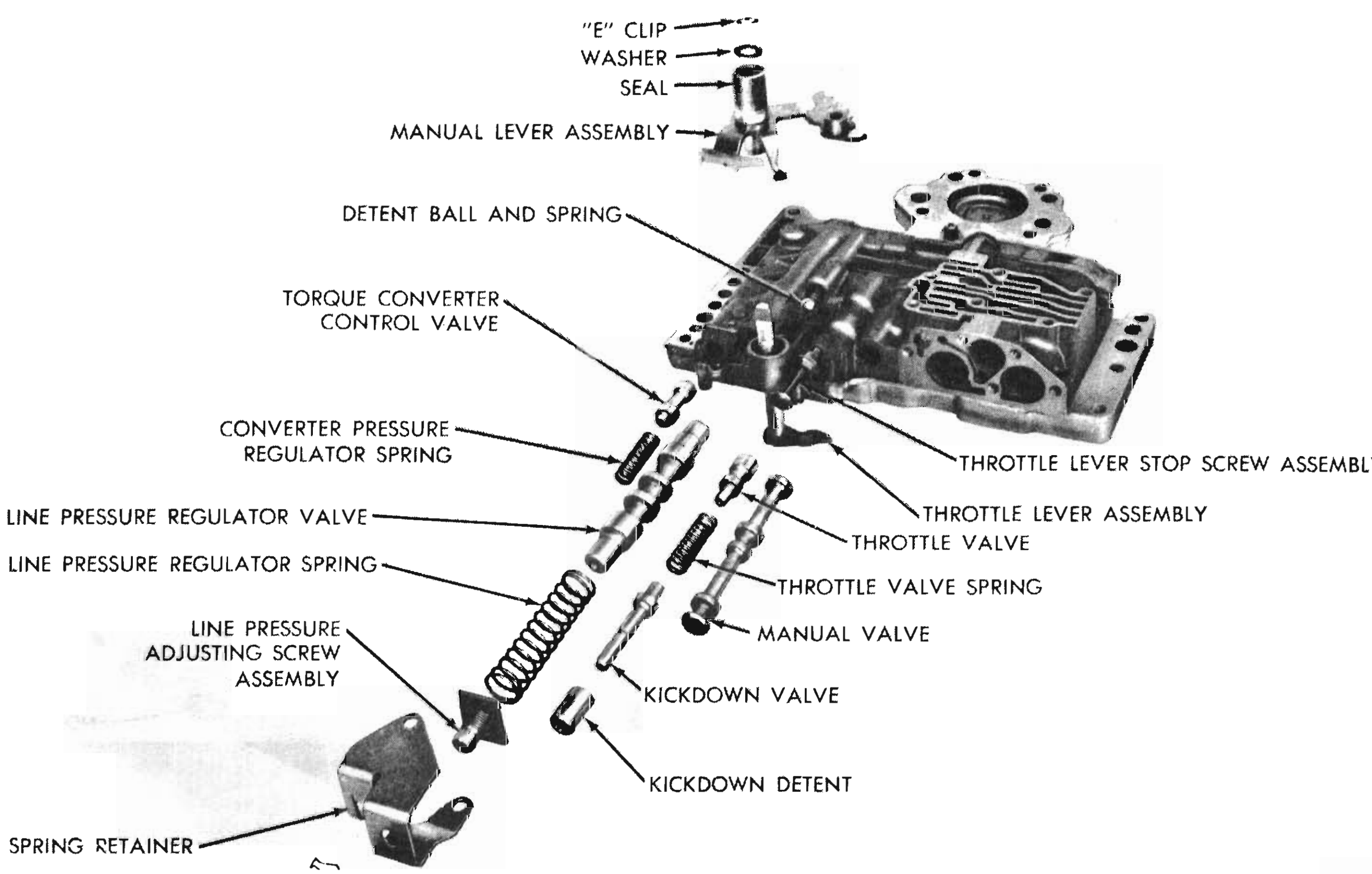


Fig. 57 – Pressure regulators and manual control (A-727 and A-904-LA)

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 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 valves and plugs should fall freely in the bores.

NOTE: 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 valve body unless it is damaged in handling.

24. VALVE BODY REASSEMBLY

Shift Valves and Regulator Valve Pressure Sensing Plugs (Fig. 58)

(1) Slide shift valves and springs into proper valve body bores.

(2) If so equipped, sub-assemble the downshift housing as follows:

(a) Insert limit valve and spring into housing.

(b) Slide spring retainer into groove in housing.

(c) Insert throttle plug in housing bore. Position assembly against the shift valve springs.

(3) Install end plate and tighten screws to 28 lbs. in.

(4) Install throttle pressure plug, line pressure plug, and sleeve then fasten end plate to valve body. Torque to 28 lbs. in.

Pressure Regulators and Manual Control (Fig. 57)

(1) Install throttle valve, throttle valve spring, kickdown valve, kickdown detent and throttle lever stop screw with lock nut (do not adjust yet).

(2) Slide manual valve into its bore.

(3) Install throttle lever and shaft on valve body *(Fig. 57)*. Insert detent spring and ball in its bore in valve body. Depress ball and spring with Tool E21C15A *(Fig. 59)* or similar tool and slide manual lever over throttle shaft so that it engages manual

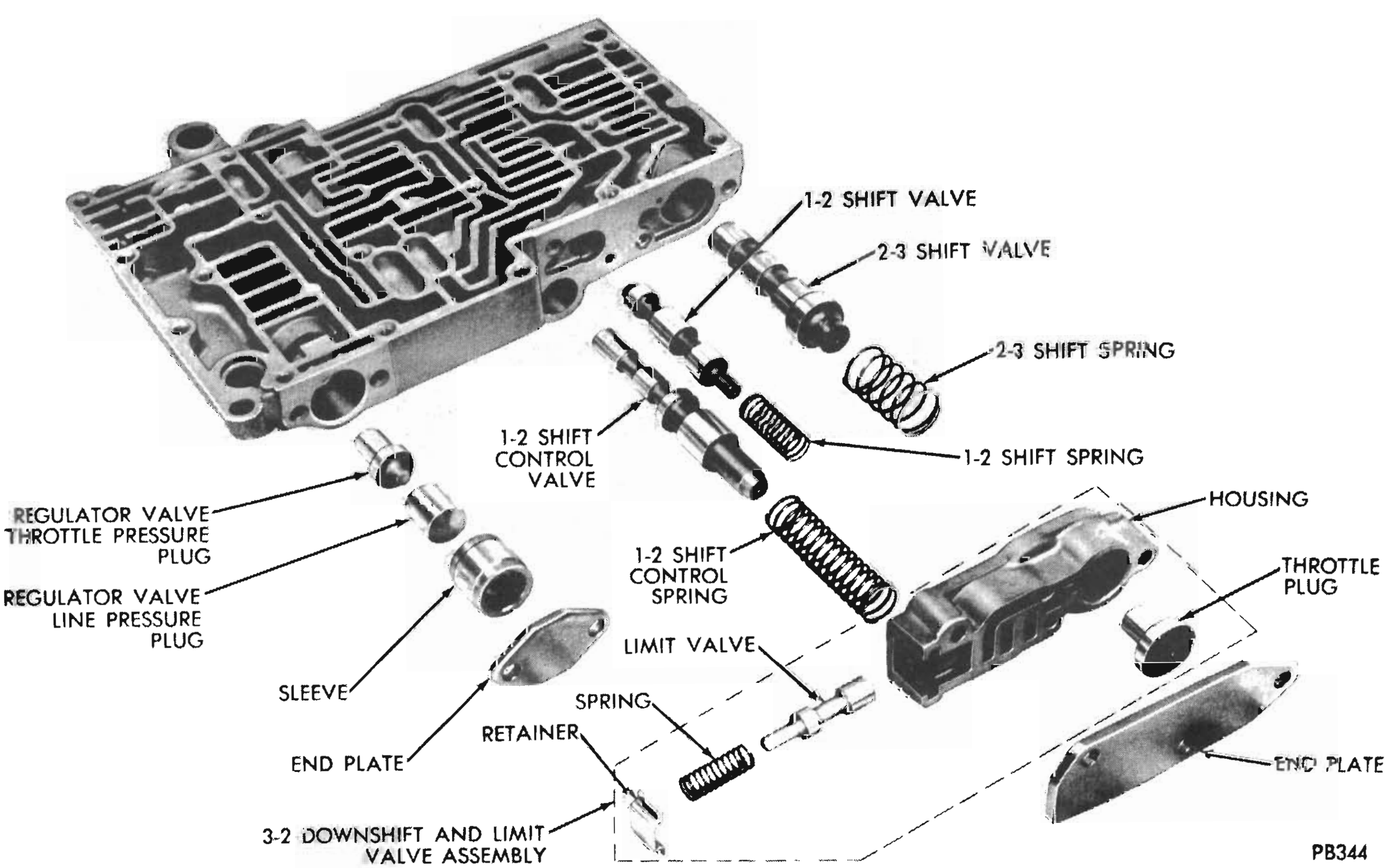


Fig. 58 – Shift valves and pressure regulator valve plugs (A-727 and A-904-LA)

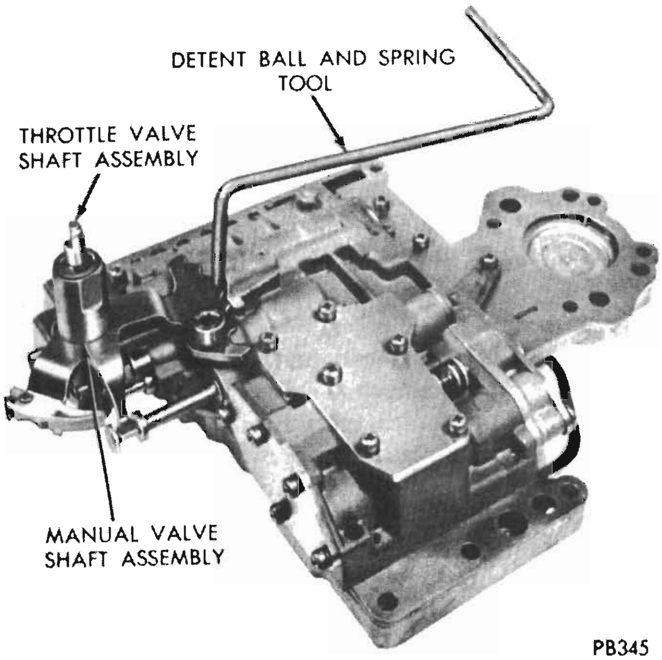


Fig. 59 – Installing detent ball, spring and control levers

valve and detent ball. Install seal, retaining washer and E-clip on throttle shaft.

(4) Insert torque converter control valve and spring into valve body.

(5) Insert line pressure regulator valve and spring into valve body.

(6) Install line pressure adjusting screw assembly and spring retainer on the springs and fasten with one screw for now.

Shuttle Valve and Governor Plugs (Fig. 56)

(1) Place 1-2 and 2-3 shift valve governor plugs in their respective bores.

(2) Install shuttle valve and hold it in bore with index finger while installing on the other end of it the secondary spring with guides and retaining "E" clip.

(3) Install primary shuttle valve spring and throttle plug.

(4) Install governor plug end plate and tighten the five retaining screws to 28 lbs. in.

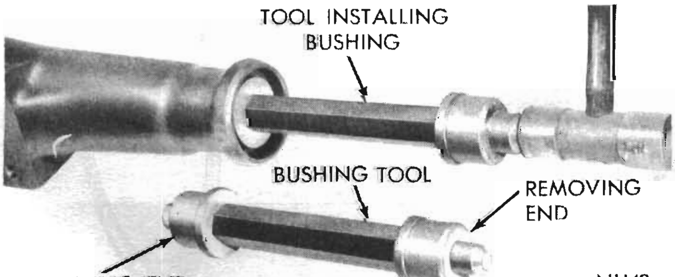


Fig. 60 – Replacing extension housing bushing

(5) Install shuttle valve cover plate and tighten the six retaining screws to 28 lbs. in.

Ball Valves, Transfer Plate and Filter

(1) Install the spring and seven balls in the valve body as shown in *(Fig. 53)*.

(2) Place separator plate on the transfer plate *(Fig. 54). Install stiffener plate and retaining screws exactly as shown.* Make sure all bolt holes are aligned, then tighten two transfer plate screws and two stiffener plate screws to 28 lbs. in.

(3) Place transfer plate assembly on valve body. Be careful to align the spring loaded ball as the 17 shorter screws are installed (3 longer screws are for oil filter).

(4) Starting at the centre and working outward, tighten screws to 35 lbs. in.

(5) Install oil filter and tighten to 35 lbs. in.

(6) Check spring engagement with tang and adjusting nut and install remaining spring retainer screws. Check alignment *(Fig. 28)*, and tighten to 28 lbs. in.

(7) After valve body has been serviced and completely assembled, adjust throttle and line pressures *(Fig. 29 and 30)*. However, if pressures were satisfactory prior to disassembly, use original settings.

25. ACCUMULATOR PISTON AND SPRING

Inspection

Inspect seal rings for wear and make sure they turn freely in piston grooves. It is not necessary to remove rings unless conditions warrant. Inspect piston for nicks, burrs, scores and wear. Inspect piston bore in the case for scores or other damage. Inspect piston spring for distortion. Replace parts as required.

26. EXTENSION HOUSING BUSHING AND OIL SEAL

Replacement

(1) Remove the extension housing yoke seal *(Fig. 34)* with Tool E21C50D.

(2) *A-904*: Press or drive out bushing with Tool E21C50E *(Fig. 60)*.

A-727: Remove bushing in the same manner with Tool E21C60A.

(3) *A-904*: Slide a new bushing on installing end of Tool E21C50E. Align oil hole in bushing

with oil slot in the housing, then press or drive bushing into place *(Fig. 60).*

A-727: Using Tool, install a new bushing in same manner.

(4) *A904*: Drive a new oil seal into housing with Tool E21C50C *(Fig. 36).*

A727: Using Tool E21C50B, install a new oil seal in same manner.

27. PARKING LOCK SPRAG

Disassembly

(1) Slide shaft out of extension housing to remove parking sprag and spring *(Fig. 41).* 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 sprag for broken edges, also lugs on parking gear for damage. Inspect knob on end of control rod for nicks, burrs and free turning.

To replace 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. 41).*

(2) Position sprag and spring in 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.

28. GOVERNOR AND SUPPORT

Disassembly

(1) Remove large snap ring from weight end of governor body, lift out weight assembly.

(2) Remove snap ring from inside governor weight, remove inner weight and spring from outer weight.

(3) If lugs on support gear are damaged, remove four bolts and separate support from governor body.

Cleaning and Inspection

Figure 39 shows a disassembled view of the governor assembly.

Inspect all parts for burrs and wear. Inspect inner weight for free movement in outer weight, and outer weight for free movement in governor body. Inspect valve for free movement in 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 governor weight spring for distortion. Inspect lugs on support gear for broken edges or other damage. Thoroughly clean all governor parts in clean solvent and test for free movement before assembly.

Assembly

(1) If support was separated from governor body, assemble and tighten 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.

29. OIL PUMP AND REACTION SHAFT SUPPORT (A-904)

Disassembly

Figure 61 shows the oil pump and reaction shaft support disassembled.

(1) Remove bolts from rear side of reaction shaft support and lift support off the pump.

(2) Remove rubber seal ring from pump body flange.

(3) Drive out oil seal with a blunt punch.

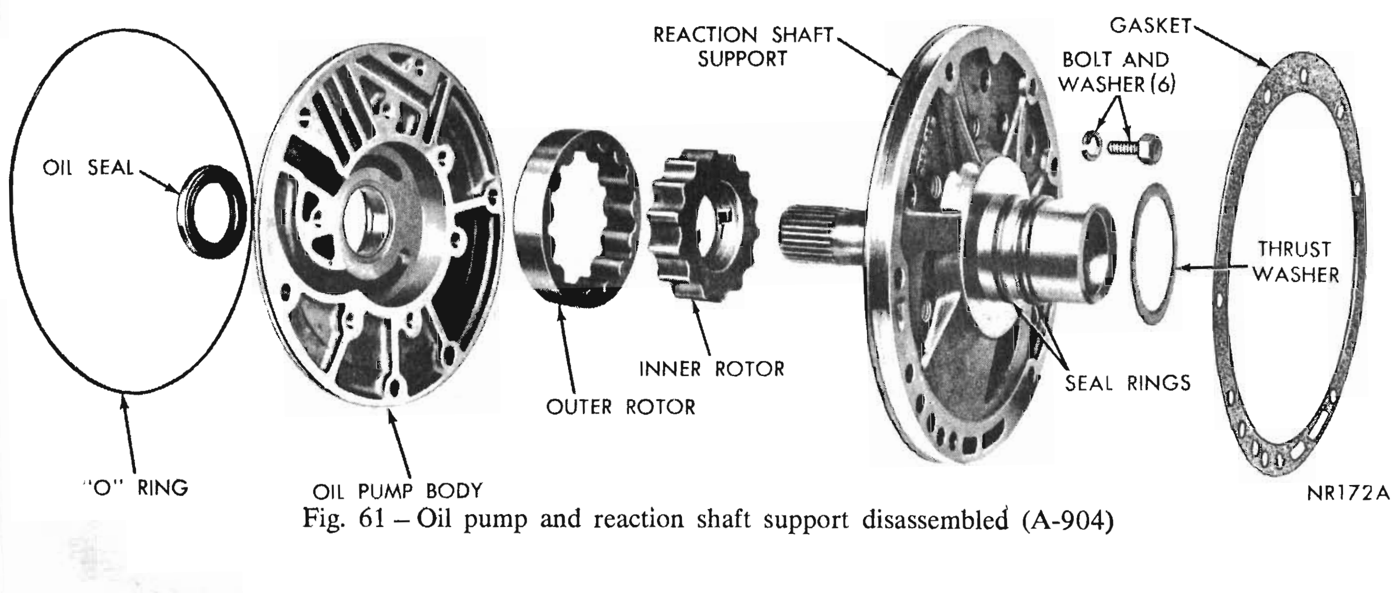


Fig. 61 – Oil pump and reaction shaft support disassembled (A-904)

Inspection

Inspect interlocking seal rings *(Fig. 61)* on reaction shaft support for wear or broken locks, make sure they turn freely in the grooves. Inspect front clutch piston retainer to reaction shaft support thrust washer for wear. Washer thickness should be .043 to .045 inch, replace if necessary. Inspect machined surfaces on pump body and reaction shaft support for nicks and burrs. Inspect pump body and reaction shaft support bushings for wear or scores. Inspect pump rotors for scoring or pitting. With rotors cleaned and installed in pump body, place a straight edge across face of rotors and pump body. Use a feeler gauge to measure clearance between straight edge and face of rotors. Clearance limits are from .0015 to .003 inch. Also, 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.

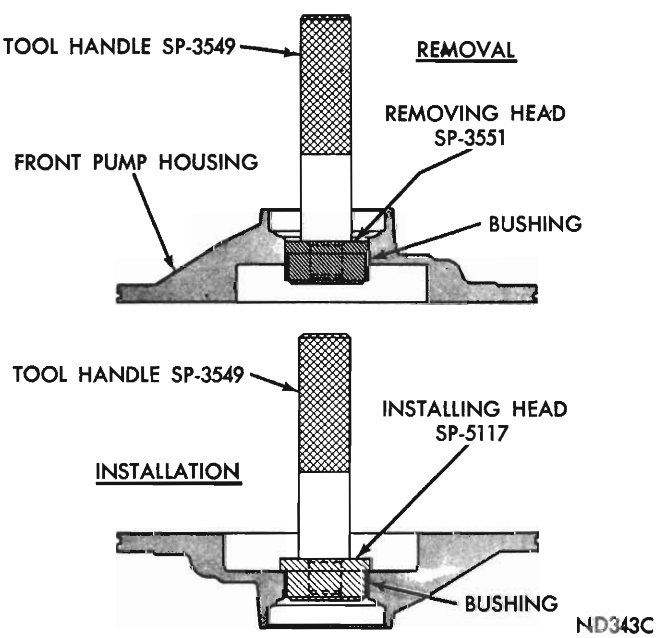


Fig. 62 – Replacing pump bushing (A-904)

Pump Bushing Replacement (A-904)

(1) Place pump housing (seal face down) on a smooth firm surface.

(2) Place removing head, Tool SP-3551 in bushing and install handle, Tool SP-3549 in the removing head *(Fig. 62)*.

(3) Drive bushing straight down and out of pump housing bore. Be careful not to cock tool in the bore.

(4) Position new bushing on installing head, Tool SP-5117.

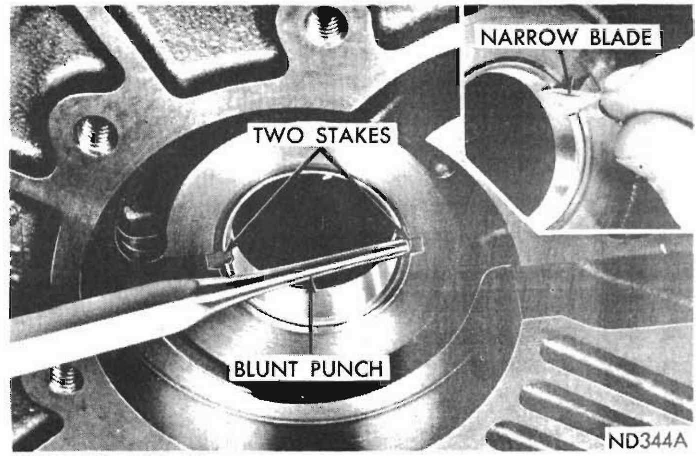


Fig. 63 – Staking pump bushing (A-904)

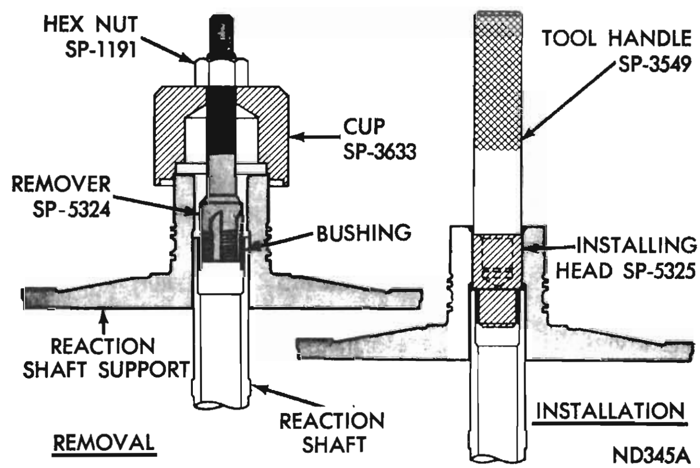


Fig. 64 – Replacing reaction shaft bushing (A-904)

(5) With pump housing on a smooth clean surface, start bushing and installing head in the bushing bore. Install handle, Tool SP-3549 in the installing head *(Fig. 62)*.

(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. 63)*. 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 staked area *(Fig. 63)*. Do not use a file or similar tool that will remove more metal than is necessary.

Reaction Shaft Bushing Replacement (A-904)

In case of a reaction shaft bushing failure, always inspect the support for wear from the input shaft seal ring lands. If worn or grooved, replace support assembly.

(1) Assemble remover Tool SP-5324, cup Tool SP-3633, and hex nut Tool SP-1191 *(Fig. 64)*.

CAUTION: Do not clamp any part of reaction shaft or support in a vice.

(2) With cup held firmly against reaction shaft, thread remover into bushing as far as possible by hand.

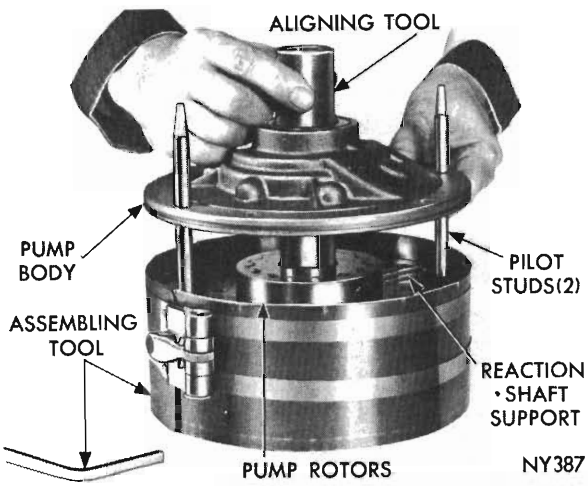


Fig. 65 – Assembling pump and reaction shaft support (A-904)

(3) Using a wrench, screw remover into bushing 3 to 4 additional turns to firmly engage threads in the bushing.

(4) Turn hex nut down against cup to pull bushing from reaction shaft. Thoroughly clean reaction shaft to remove chips made by remover threads.

(5) Lightly grip bushing in a vice or with pliers and back tool out of the bushing. Be careful not to damage threads on bushing remover.

(6) Slide a new bushing on installing head Tool SP-5325, and start them in the bore of reaction shaft *(Fig. 64)*.

(7) Support reaction shaft upright on a clean smooth surface and install handle Tool SP-3549 in installing head. Drive bushing into the shaft until tool bottoms.

(8) Thoroughly clean reaction shaft support assembly before installation.

Assembly

(1) Place reaction shaft support in assembling Tool E21C35H, with hub of support and tool resting on a smooth *flat* surface bench *(Fig. 65)*. Screw two pilot studs, Tool E21C35B into threaded holes of reaction shaft support flange.

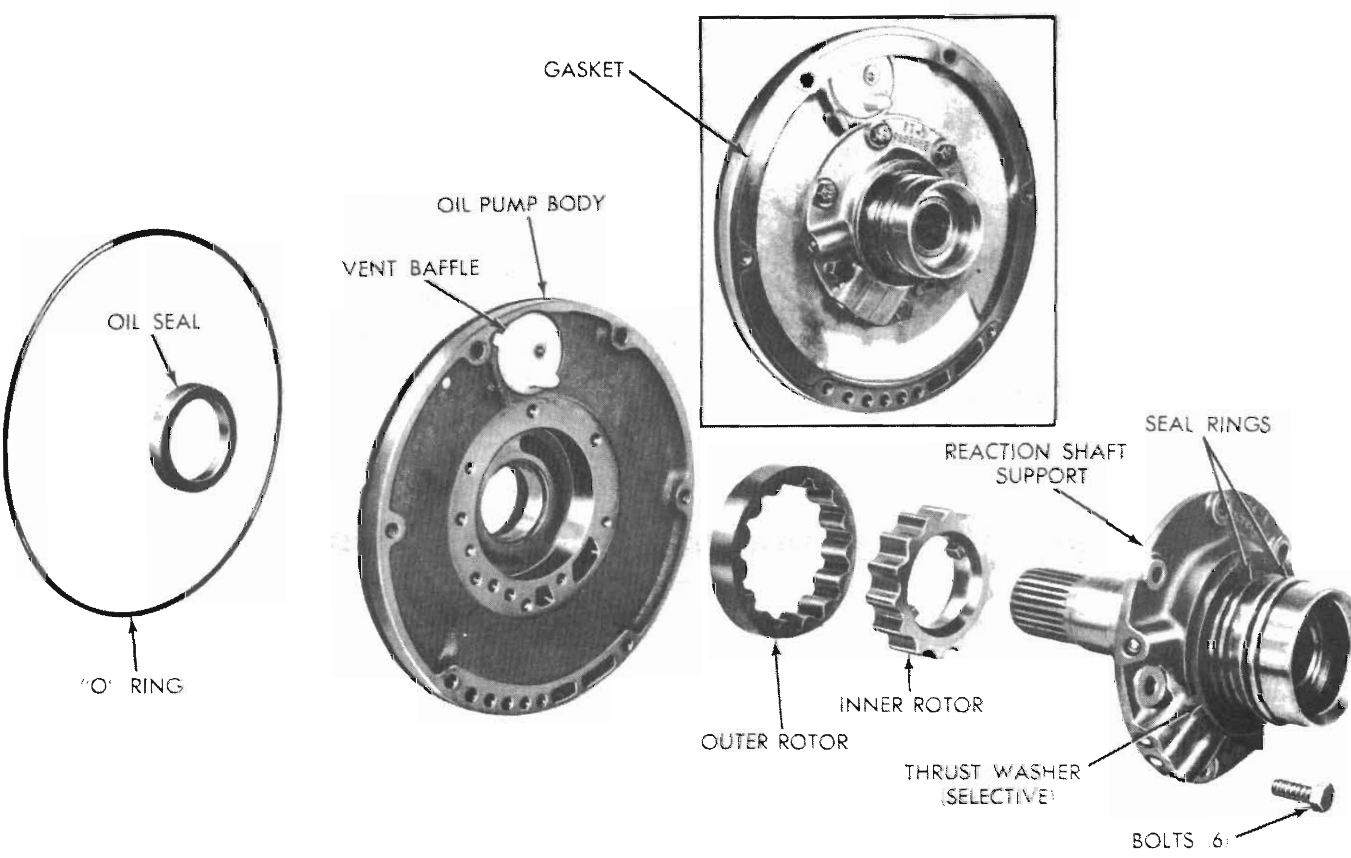


Fig. 66 – Oil pump and reaction shaft support (A-727)

(2) Assemble and place rotors in center of the support *(Fig. 65).*

(3) Lower pump body over the pilot studs, insert Tool E21C35E through pump body and engage pump inner rotor. Rotate the rotors with tool to enter rotors in pump body, then with pump body firm against reaction shaft support, tighten clamping tool securely.

(4) Invert pump and reaction shaft support assembly with clamping tool intact. Install support to pump body bolts and tighten to 160 lbs. in. Remove clamping tool, pilot studs and rotor alignment tool.

(5) Place a new oil seal in opening of pump housing (lip of seal facing inward). Using Tool E21C35F, drive seal into housing until tool bottoms.

30. OIL PUMP AND REACTION SHAFT SUPPORT (A-727)

Disassembly

Figure 66 shows the oil pump and reaction shaft support disassembled.

(1) Remove bolts from rear side of reaction shaft support, and lift support off the pump.

(2) Remove rubber seal ring from pump body flange.

(3) Drive out oil seal with a blunt punch.

Inspection

Inspect interlocking seal rings *(Fig. 66)* on reaction shaft support for wear or broken locks, make sure they turn freely in the grooves. Inspect machined surfaces on pump body and reaction shaft support for nicks and burrs. Inspect pump body and reaction shaft support bushings for wear or scores. Inspect pump rotors for scoring or pitting. With rotors cleaned and installed in pump body, place a straight edge across face of rotors and pump body. Use a feeler gauge to measure clearance between straight edge and face of rotors. Clearance limits are from .0015 to .003 inch. Also, measure rotor tip clearance between inner and outer 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 (A-727)

(1) Place pump housing on a clean smooth surface with rotor cavity down.

(2) Place removing head Tool SP-3550 in the bushing, and install handle Tool SP-3549 in the removing head *(Fig. 67).*

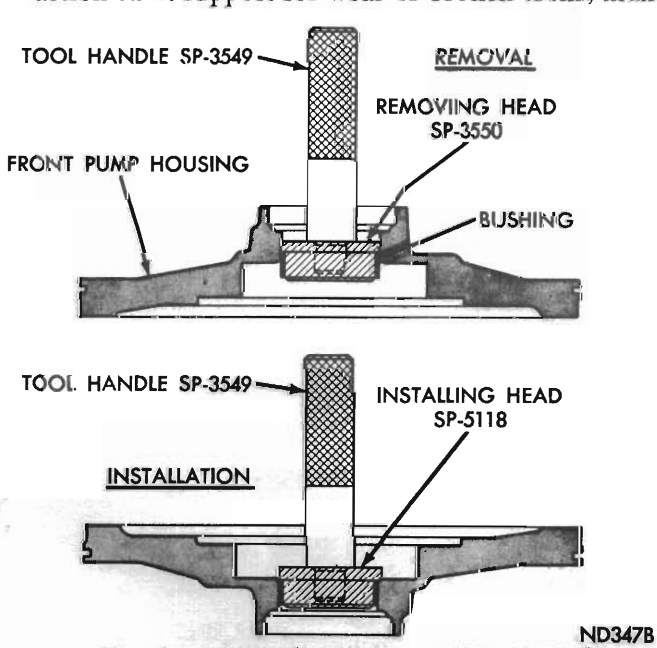


Fig. 67 – Replacing pump bushing (A-727)

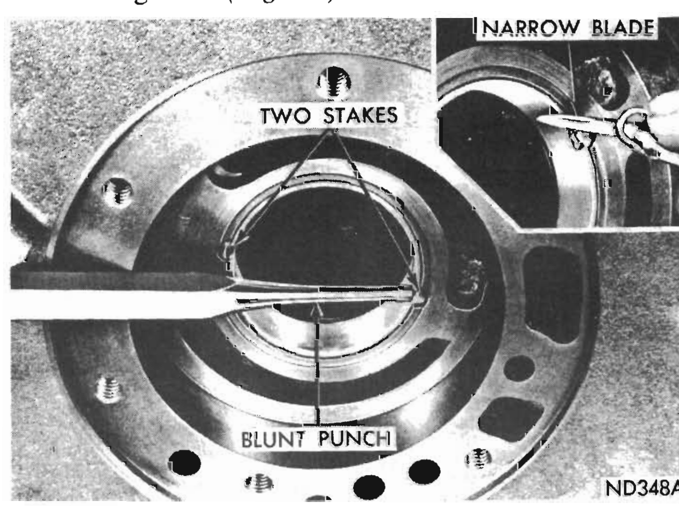


Fig. 68 – Staking pump bushing (A-727)

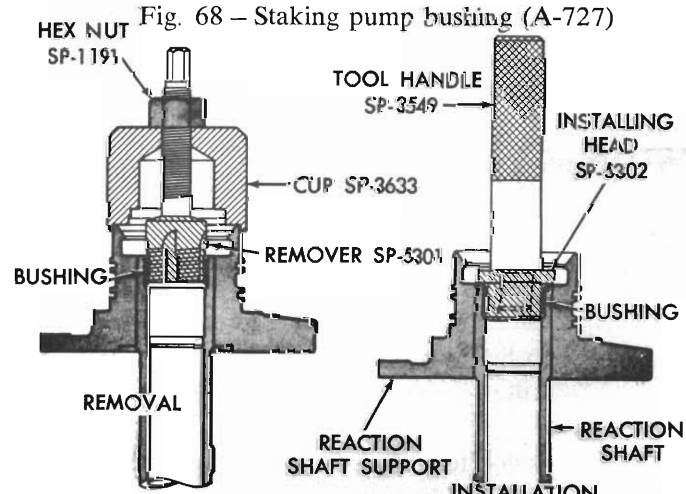


Fig. 69 – Replacing reaction shaft bushing (A-727)

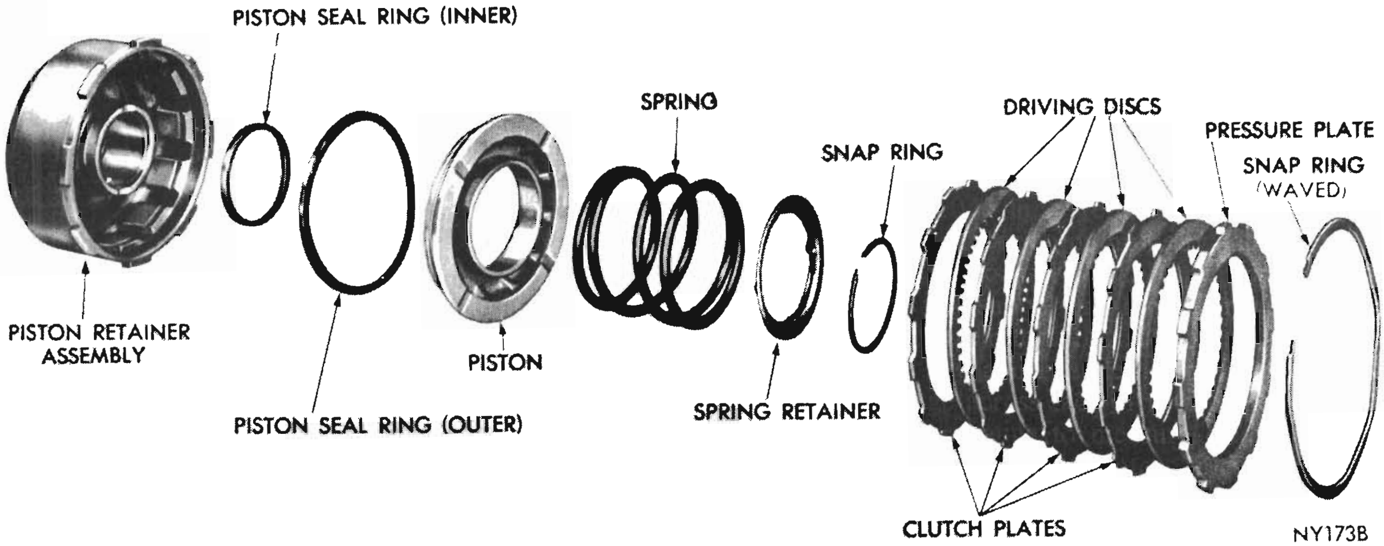


Fig. 70 – Front clutch disassembled (A-904)

(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 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 installing head *(Fig. 67).*

(6) Drive bushing into housing until tool bottoms in the pump cavity. Be careful not to cock tool during installation.

(7) Stake the bushing in place by using a blunt punch or similar tool *(Fig. 68).* 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 staked area *(Fig. 68).* 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 (A-727)

(1) Assemble remover Tool SP-5301, cup Tool SP-3633, and hex nut Tool SP-1191 *(Fig. 69).*

> CAUTION: Do not clamp any part of reaction shaft or support in a vice.

(2) With cup held firmly against reaction shaft, thread remover into bushing as far as possible by hand.

(3) Use a wrench to screw remover into bushing 3 to 4 additional turns to firmly engage threads in the bushing.

(4) Turn hex nut down against the cup to pull bushing from reaction shaft. Thoroughly clean reaction shaft to remove chips made by remover threads.

(5) Lightly grip bushing in a vice or with pliers and back tool out of the bushing. Be careful not to damage threads on bushing remover.

(6) Slide a new bushing (chamfered end first) on installing head Tool SP-5302, and start them in the bore of reaction shaft *(Fig. 69).*

(7) Support reaction shaft upright on a clean smooth surface and install handle Tool SP-3549 in installing head. Drive bushing into shaft until tool bottoms.

(8) Thoroughly clean reaction shaft support assembly before installation.

Assembly

(1) Assemble pump rotors and "O" ring in the pump housing *(Fig. 66).*

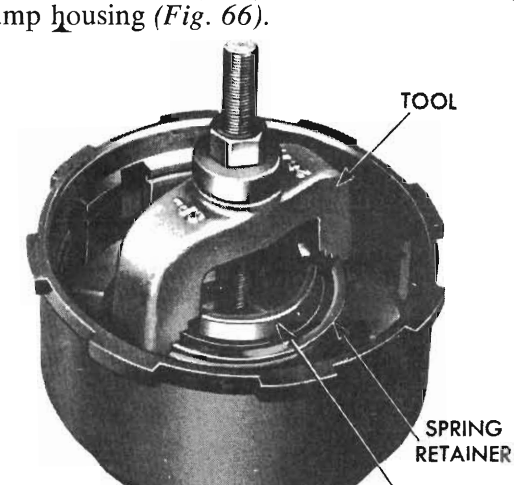


Fig. 71 – Removing or installing front clutch spring retainer snap ring (A-904)

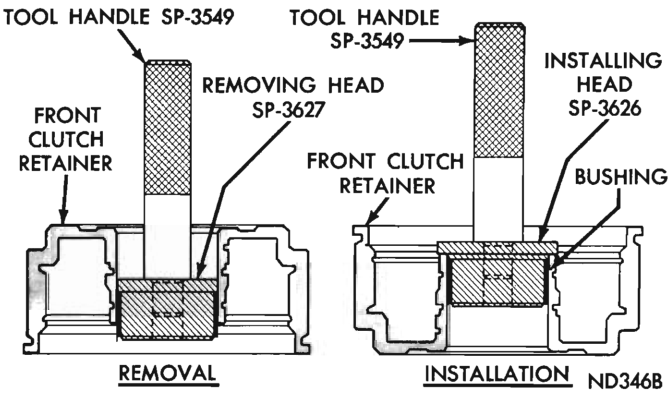


Fig. 72 – Replacing front clutch retainer bushing (A-904)

(2) Install reaction shaft support. Install retaining bolts and tighten to 160 inch-pounds.

(3) Place a new oil seal in opening of pump housing (lip of seal facing inward) using Tool E21C35K drive seal into housing until tool bottoms.

31. FRONT CLUTCH (A-904)

Disassembly

Figure 70 shows a disassembled view of the front clutch assembly.

(1) Remove large waved 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 E21C30C over piston spring retainer *(Fig. 71)*. Compress spring and remove snap ring, then slowly release tool until spring retainer is free of the hub. Remove tool, retainer and spring.

(3) Invert clutch retainer assembly and bump it on a wood block to remove the piston. Remove seal rings from the piston and clutch retainer hub.

Inspection

Inspect facing material on all driving discs. Replace discs that are charred, glazed or heavily pitted. Discs should 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. Inspect band contacting surface on clutch retainer for scores, *the contact surface should be protected from damage during disassembly and handling.* Note ball check in clutch retainer, make sure ball moves freely. Inspect piston seal ring surfaces in clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of neoprene rings. Inspect clutch retainer inner bore surface for wear from reaction shaft support seal rings. Inspect clutch retainer bushing for wear or scores.

Inspect inside bore of piston for score marks, if light, remove with crocus cloth. Inspect seal ring grooves for nicks and burrs. Inspect neoprene seal rings for deterioration, wear, and hardness. Inspect piston spring, retainer and snap ring for distortion.

Front Clutch Retainer Bushing Replacement (A-904)

(1) Lay clutch retainer (open end down) on a clean smooth surface and place removing head Tool SP-3627 in the bushing *(Fig. 72)*. Install handle Tool SP-3549 in removing head.

(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-3626, and start them in clutch retainer bore *(Fig. 72)*.

(4) Install handle Tool SP-3549 in installing head. Drive bushing into clutch retainer until tool bottoms.

(5) Thoroughly clean clutch retainer before assembly and installation.

Assembly

(1) Lubricate and install inner seal ring on hub of clutch retainer. Make sure lip of seal faces down and is properly seated in the groove *(Fig. 70)*.

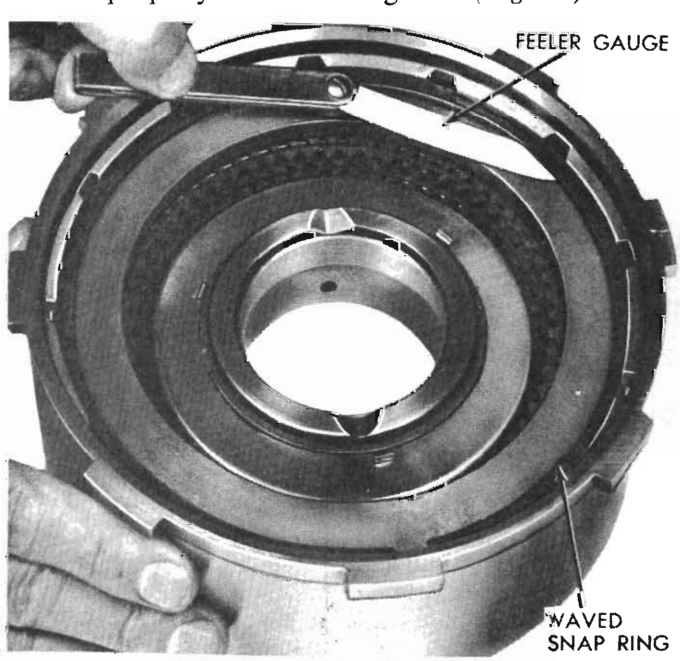


Fig. 73 – Measuring front clutch plate clearance

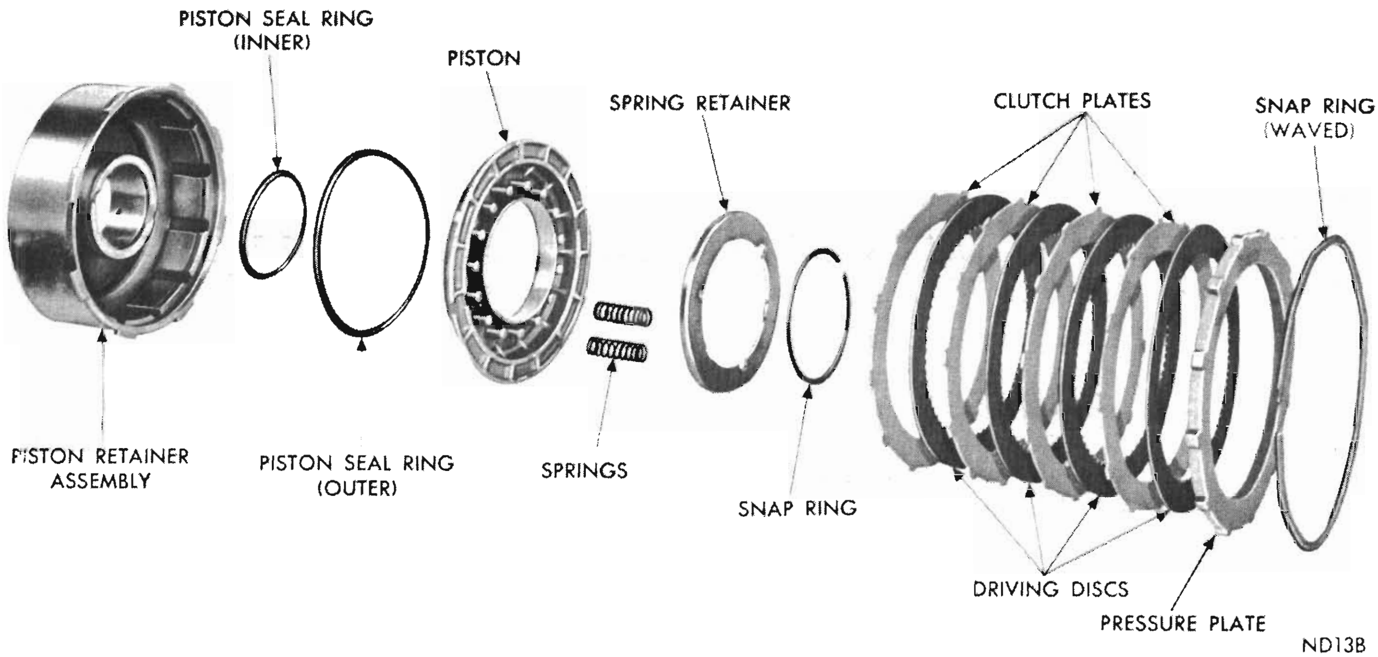


Fig. 74 – Front clutch disassembled (A-727)

(2) Lubricate and install outer seal ring on clutch piston, with lip of seal toward bottom of clutch retainer. Place piston assembly in retainer and, with a twisting motion, seat piston in bottom of retainer.

(3) Place spring on piston hub and position spring retainer and snap ring on the spring. Compress spring with Tool E21C30C *(Fig. 71)*, and seat snap ring in hub groove. Remove compressor tool.

(4) Lubricate all clutch plates, install one steel plate followed by a lined plate until all plates are installed. Install pressure plate and waved 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. 73)*.

Maximum clearance should be .048 to .109 inch.

32. FRONT CLUTCH (A-727)

Disassembly

Figure 74 shows a disassembled view of the front clutch assembly.

(1) Remove large waved snap ring that secures pressure plate in clutch piston retainer. Lift pressure plate and clutch plates out of the retainer.

(2) Install compressor, Tool E21C30C over piston spring retainer, *(Fig. 75)*. Compress spring and remove snap ring, then slowly release tool until spring retainer is free of hub. Remove tool, retainer and springs.

(3) Invert clutch retainer assembly and bump it 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.

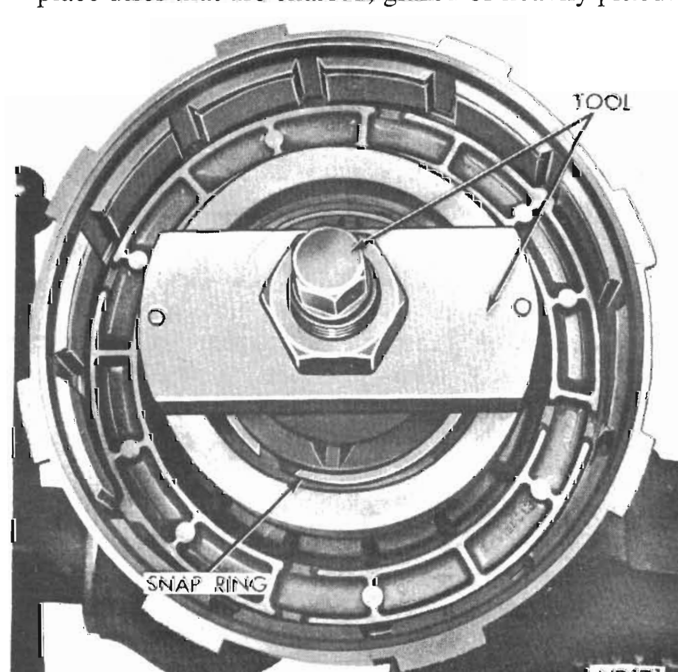


Fig. 75 – Removing or installing front clutch spring retainer snap ring (A-727)

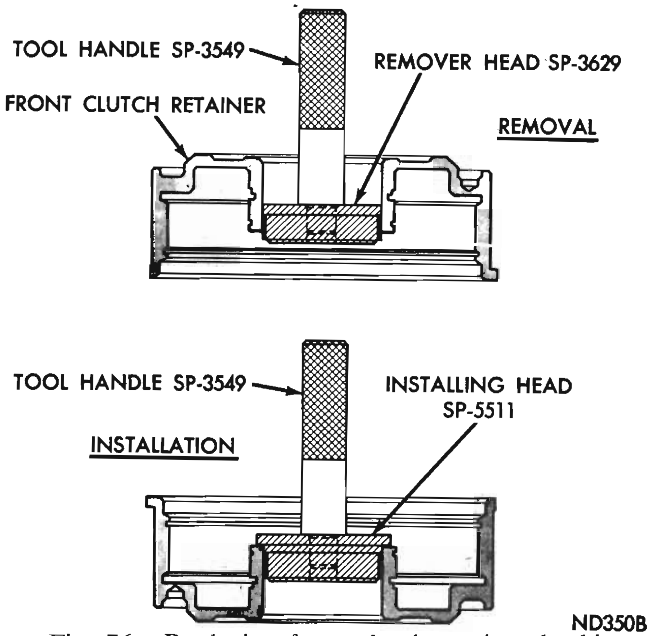


Fig. 76 – Replacing front clutch retainer bushing (A-727)

Discs 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 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.

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. Inspect piston springs, retainer and snap ring for distortion.

Front Clutch Retainer Bushing Replacement (A-727)

(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. 76)*.

(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-5511, and start them in clutch retainer bore.

(4) Install handle Tool SP-3549 in the installer *(Fig. 76)*. 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 clutch retainer. Make sure lip of seal faces down and is properly seated in the groove.

(2) Install outer seal on the clutch piston, with lip of seal toward bottom of clutch retainer. Apply a coating of wax type lubricant or Door Ease to outer edge of seals for easier installation of piston assembly. Place piston assembly in retainer and carefully seat piston in bottom of retainer.

(3) Refer to *Fig. 77* and install springs on piston exactly as shown.

Position spring retainer and snap ring over the springs. Compress springs with Tool E21C30C *(Fig. 75)* and seat snap ring in hub groove. Remove compressor tool.

(4) Lubricate all clutch plates, install one steel plate followed by a lined plate (disc) until the number given in the specification chart page 21–79 is installed. Install pressure plate and snap ring. Make sure snap ring is properly seated.

(5) With front clutch completely assembled, push downward on pressure plate and insert a feeler gauge between pressure plate and snap ring *(Fig. 73)*. The maximum clearance should be within limits given in the chart (page 21–79).

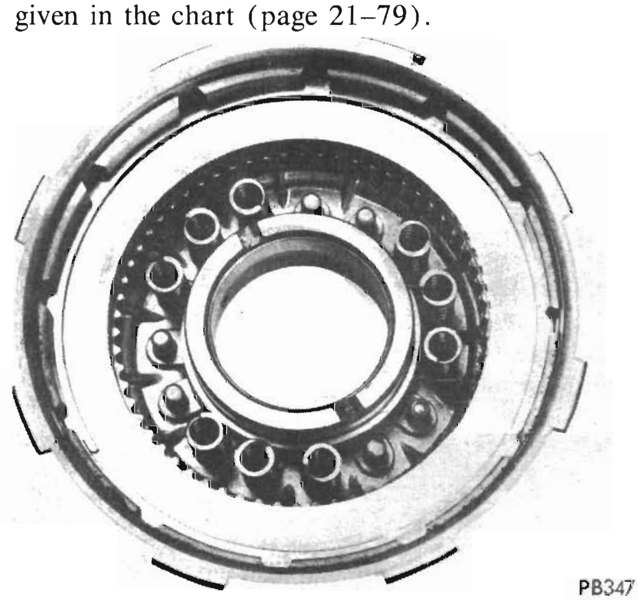


Fig. 77 – Front clutch spring location (9 springs)

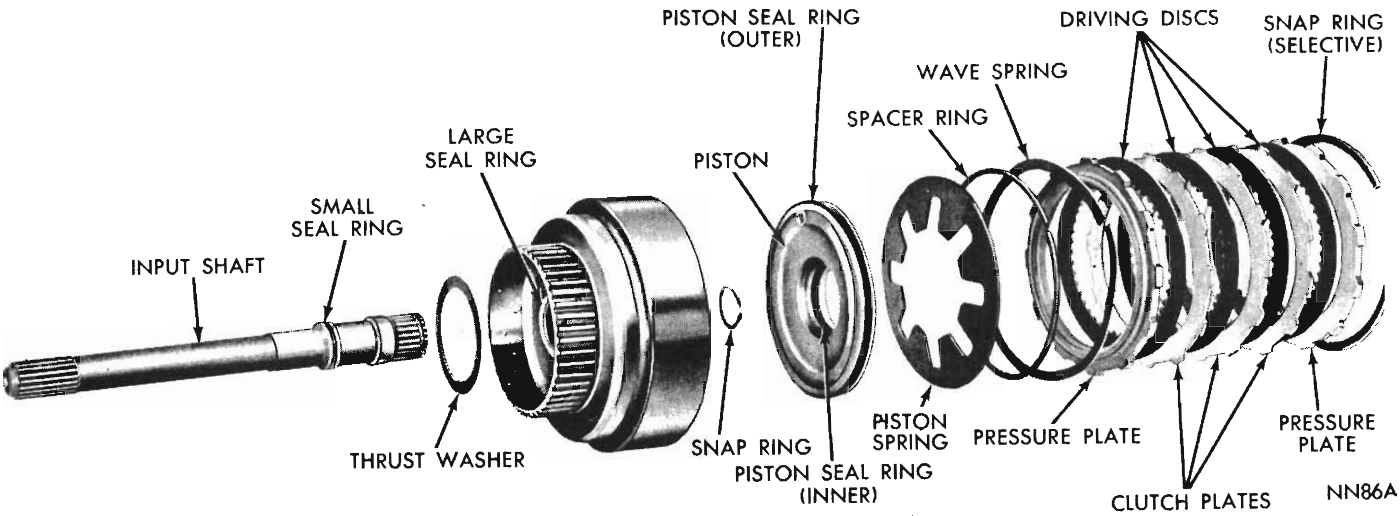


Fig. 78 – Rear clutch — disassembled

33. REAR CLUTCH (A-904)

Disassembly

Fig. 78 shows a disassembled view of the rear clutch assembly.

(1) Remove large selective snap ring that secures pressure plate in clutch piston 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 clutch retainer, then remove wave spring, spacer ring and clutch piston spring.

(3) Invert clutch piston retainer assembly and bump it on a wood block to remove piston. Remove seals from piston.

(4) If necessary, remove snap ring and press input shaft from piston retainer.

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 facing material can be scraped off easily. Inspect driving disc splines for wear or other damage. Inspect steel plate and pressure plate surface for burning, scoring or damaged driving lugs. Replace if necessary. Inspect plates and discs for flatness, they must not be warped or cone-shaped.

Inspect steel plate lug grooves in clutch retainer for smooth surfaces, plates must travel freely in the grooves. Note ball check in clutch retainer, make sure ball moves freely. Inspect seal ring surfaces in clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of the neo-

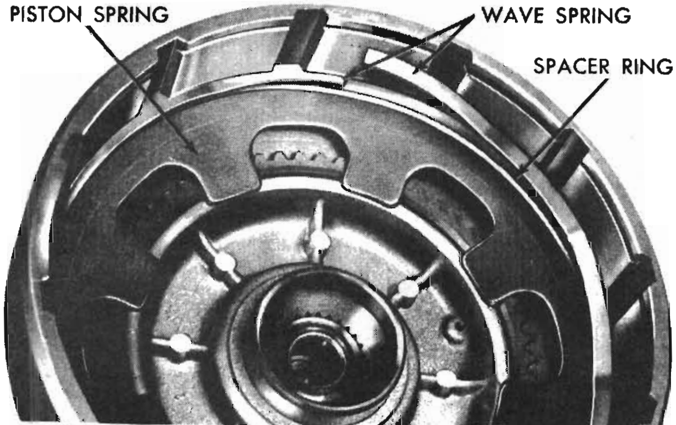


Fig. 79 – Installing rear clutch spring, spacer ring and wave spring

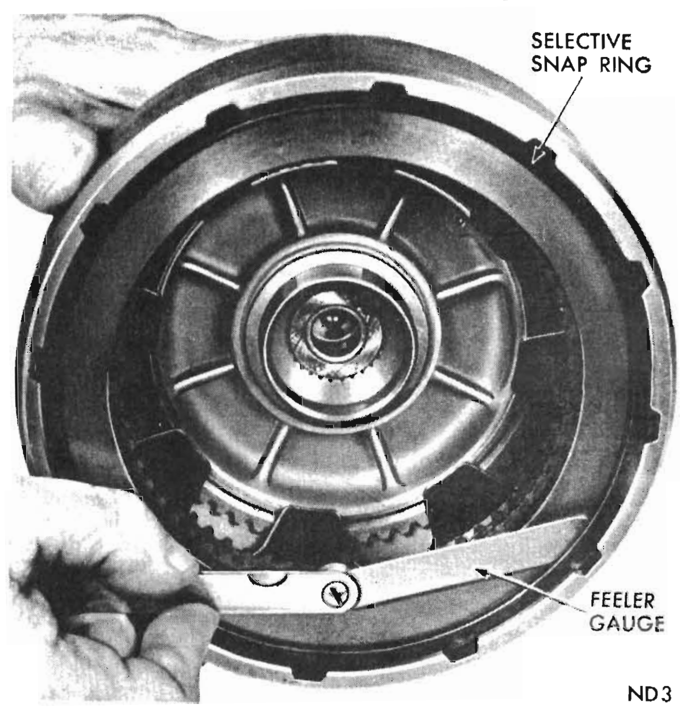


Fig. 80 – Measuring rear clutch plate clearance

prene rings. Inspect neoprene seal rings for deterioration, wear and hardness. Inspect piston spring, wave spring, and spacer for distortion or breakage.

Inspect interlocking seal rings *(Fig. 78)* on input shaft and piston retainer for wear or broken locks, make sure they turn freely in the grooves. Do not remove rings unless conditions warrant. Inspect rear clutch to front clutch thrust washer for wear. Washer thickness should be .043 to .045 inch, replace if necessary.

Assembly

(1) If removed, press input shaft into piston retainer and install snap ring.

(2) Lubricate and install inner and outer seal rings on clutch piston. Make sure lip of seals face toward head of clutch retainer, and are properly seated in piston grooves *(Fig. 78)*.

(3) Place piston assembly in retainer and, with a twisting motion, seat piston in bottom of retainer.

(4) Place clutch piston spring and spacer ring on top of piston in clutch retainer, make sure spring and spacer ring are positioned in the retainer recess. Start one end of wave spring in retainer groove *(Fig. 84)*, then progressively push or tap spring into place making sure it is fully seated in the groove.

(5) Install inner pressure plate in clutch retainer with raised portion of plate resting on the spring.

(6) 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.

(7) Measure rear clutch plate clearance by having an assistant press down firmly on outer pressure plate, then insert a feeler gauge between the plate and snap ring *(Fig. 80)*.

The clearance should be between .032 to .056 inch. If not, install a snap ring of proper thickness to obtain specified clearance. Low limit clearance is desirable.

NOTE: Rear clutch plate clearance is very important in obtaining proper clutch operation. Clearance can be adjusted by the use of various thickness outer snap rings. Snap rings are available in .060, .076 and .098 inch thickness.

34. REAR CLUTCH (A-727)

Disassembly

Fig. 81 shows a disassembled view of the rear clutch assembly.

(1) Remove large selective snap ring that secures pressure plate in 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 clutch retainer, then remove wave spring, spacer ring and clutch piston spring.

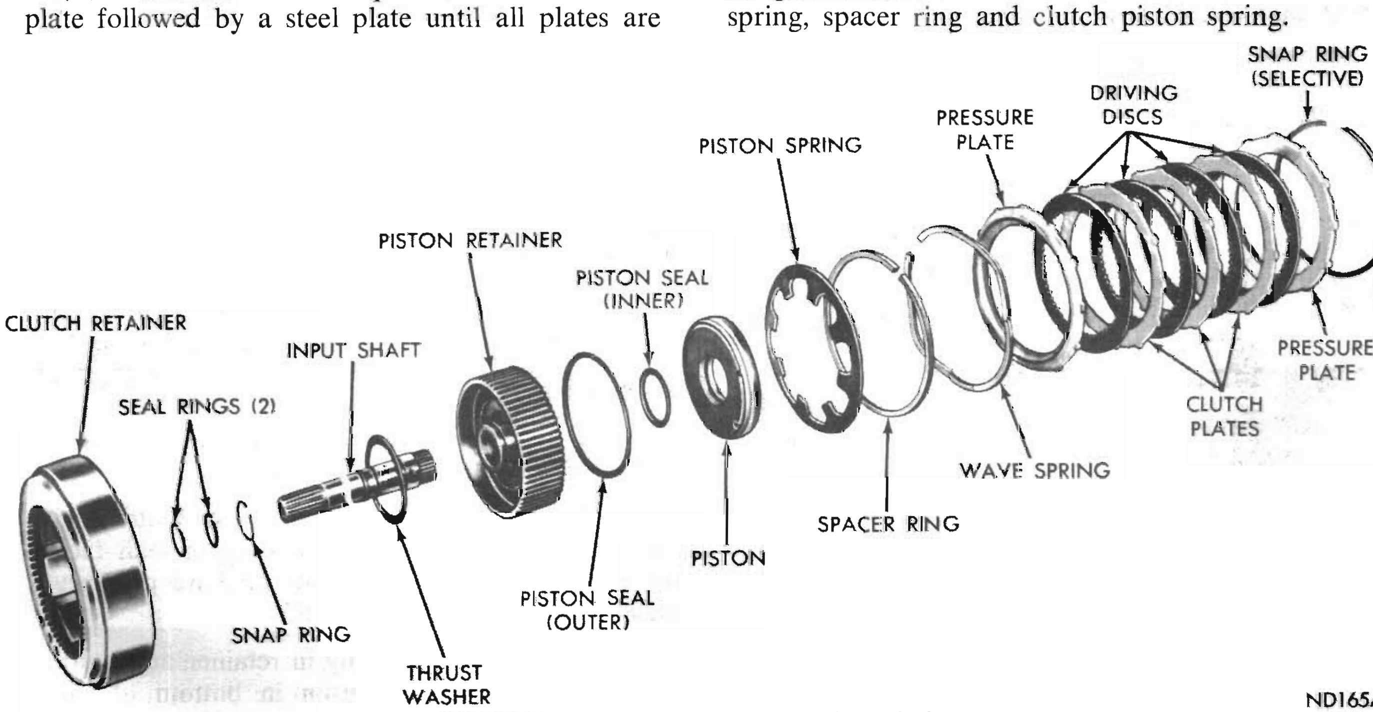


Fig. 81 – Rear clutch disassembled (A-727)

(3) Invert clutch piston retainer assembly and bump it on a wood block to remove piston. Remove seals from the piston.

(4) If necessary, remove snap ring and press input shaft from clutch piston retainer.

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 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. 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. 81)* 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 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 (A-727 only)

(1) Clamp input shaft in a vice with soft jaws, being careful not to clamp on seal ring lands or bearing journals.

(2) Assemble remover Tool SP-3630, cup Tool SP-3633, and hex. nut Tool SP-1191 *(Fig. 82).*

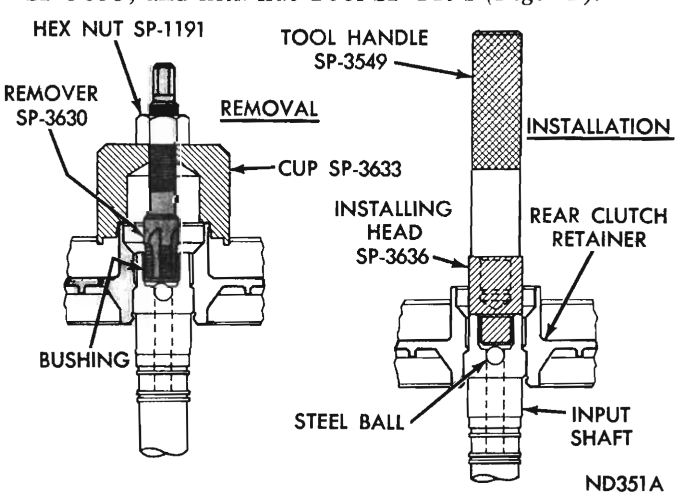


Fig. 82 – Replacing input shaft bushing (A-727)

(3) With cup held firmly against clutch piston retainer, thread remover into bushing as far as possible by hand.

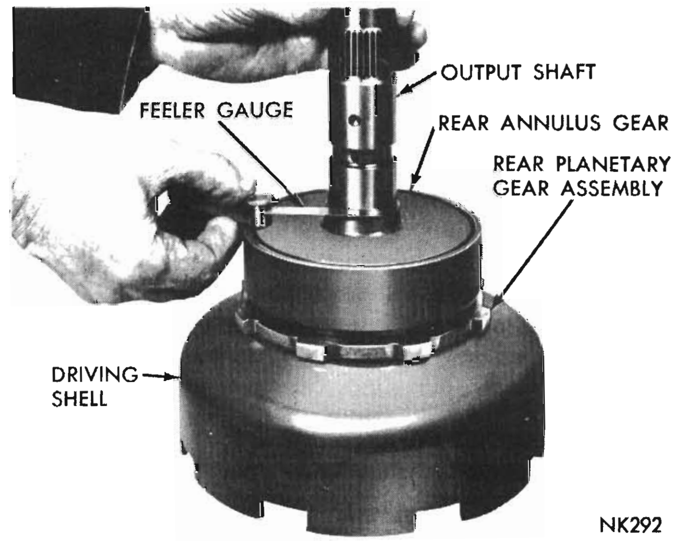


Fig. 83 – Measuring end play of planetary gear

(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 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 the bore of input shaft.

(8) Stand input shaft upright on a clean smooth surface and install handle Tool SP-3549 in the installing head *(Fig. 82).* 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 clutch piston. Make sure lip of seals face toward head of clutch retainer, and are properly seated in piston grooves *(Fig. 81)*

(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 the retainer recess. Start one end of wave spring in retainer groove *(Fig. 79)*, 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 outer pressure plate, then insert a feeler gauge between the plate and snap ring *(Fig. 80)*. 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.

NOTE: 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, .074, .088 and .106 inch thickness.

35. PLANETARY GEAR TRAIN (A-904)

End Play

Measure end play of planetary gear assemblies, sun gear and driving shell before removing these parts from output shaft. With 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 output shaft *(Fig. 83)*. *The clearance should be .006 to .033 inch.* If clearance exceeds specifications, replace thrust washers and/or necessary parts.

Disassembly

(1) Remove selective thrust washer from forward end of output shaft *(Fig. 84)*.

(2) Remove selective snap ring from forward end of output shaft, then slide front planetary assembly off the shaft.

(3) Remove snap ring and thrust washer from forward hub of front planetary gear assembly, slide front annulus gear and support off planetary gear set *(Fig. 84)*. Remove thrust washer from rear side of planetary gear set. If necessary, remove snap ring from front of annulus gear to separate support from annulus gear.

(4) Slide sun gear, driving shell and rear planetary assembly off the output shaft.

(5) Lift sun gear and driving shell off rear planetary assembly. Remove snap ring and steel washer from sun gear (rear side of driving shell).

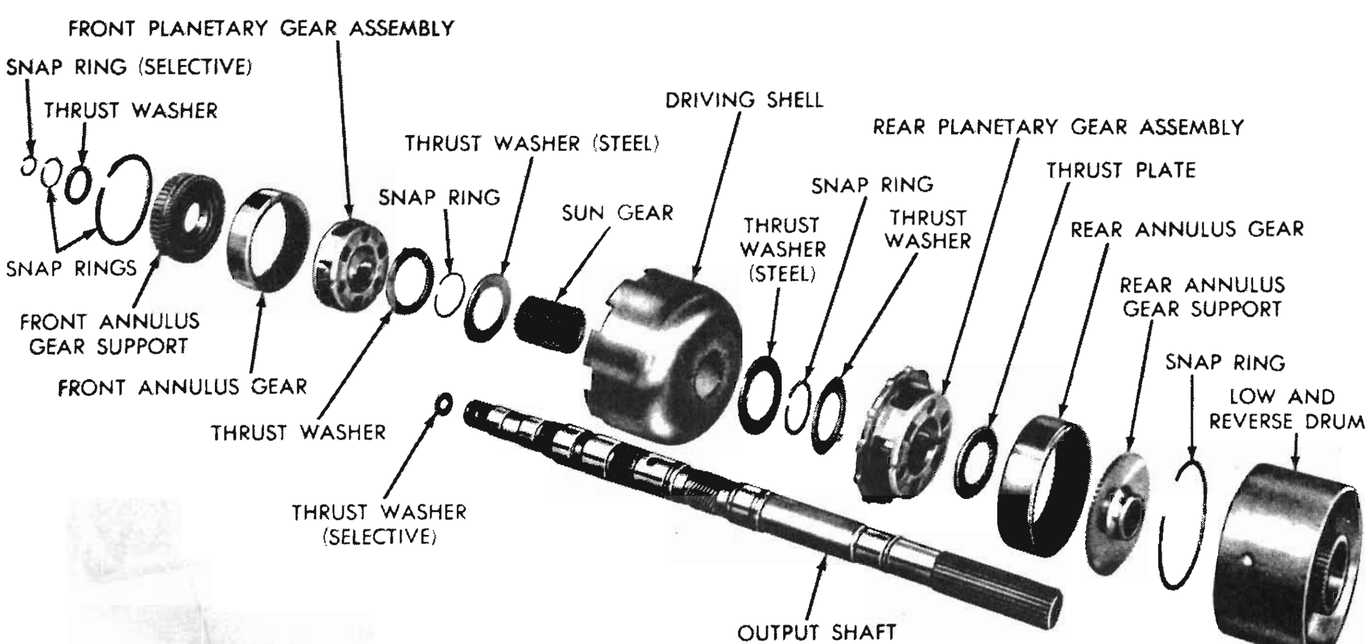


Fig. 84 – Planetary gear train and output shaft disassembled (A-904)

Slide sun gear out of driving shell, and remove snap ring and steel washer from opposite end of sun gear if necessary.

(6) Remove thrust washer from forward side of rear planetary assembly and remove planetary gear set and thrust plate from rear annulus gear. If necessary, remove snap ring from rear of annulus gear to separate support from 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 edged stone. Make sure all oil passages in 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 *Fig. 84* for parts reference.

(1) Place rear annulus gear support in annulus gear and install snap ring. 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

(2) Position rear planetary gear assembly in rear annulus gear and place thrust washer on front side of planetary gear assembly.

(3) Insert output shaft in rear opening of rear annulus gear. Carefully work shaft through annulus gear support and planetary gear assembly. Make sure shaft splines are fully engaged in splines of annulus gear support.

(4) Install steel washer and snap ring on one end of sun gear. Insert sun gear through front side of driving shell, install rear steel washer and snap ring.

(5) Carefully slide driving shell and sun gear assembly on the output shaft, engaging sun gear teeth with rear planetary pinion teeth.

(6) Place front annulus gear support in the annulus gear and install snap ring.

(7) Position front planetary gear assembly in front annulus gear, place thrust washer over planetary gear assembly hub and install snap ring. Position thrust washer on rear side of planetary gear assembly.

(8) Carefully work front planetary and annulus gear assembly on output shaft, meshing planetary pinions with sun gear teeth.

(9) With all components properly positioned, install selective snap ring on front end of output shaft. Re-measure end play of the assembly.

NOTE: The clearance can be adjusted by the use of various thickness snap rings. Snap rings are available in .040, .048 and .059 inch thickness.

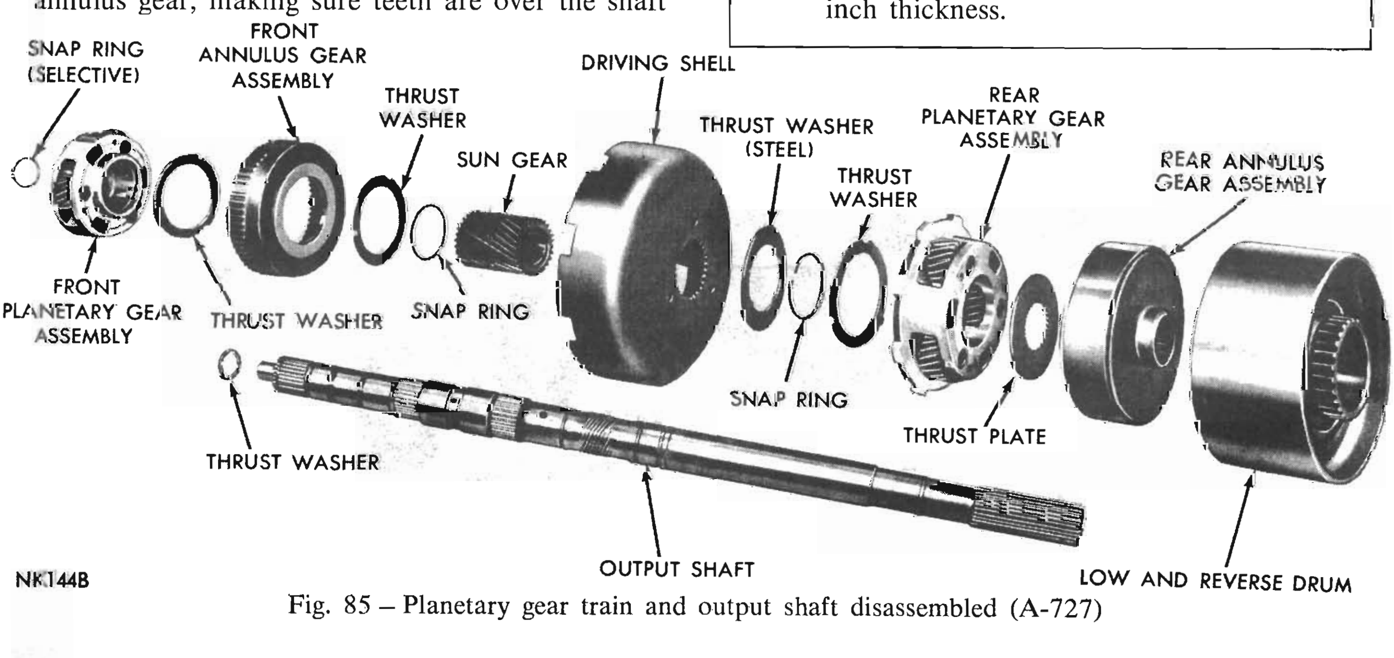


Fig. 85 – Planetary gear train and output shaft disassembled (A-727)

36. PLANETARY GEAR TRAIN (A-727)

End Play

Measure end play of planetary gear assemblies, sun gear and driving shell before removing these parts from output shaft. With assembly in an upright position, push rear annulus gear support downward on output shaft. Insert a feeler gauge between rear annulus gear support hub and shoulder on output shaft *(Fig. 83). The clearance should be .010 to .037 inch.* If clearance exceeds specifications, replace thrust washers and/or necessary parts.

Disassembly

(1) Remove thrust washers from forward end of output shaft *(Fig. 85).*

(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 planetary gear set *(Fig. 85).* Remove thrust washer from rear side of planetary gear set.

(4) Slide sun gear, driving shell and rear planetary assembly off output shaft.

(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 sun gear if necessary. Note that front end of sun gear is longer than rear.

(6) Remove thrust washer from forward side of rear planetary gear assembly, remove planetary gear set and thrust plate from 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

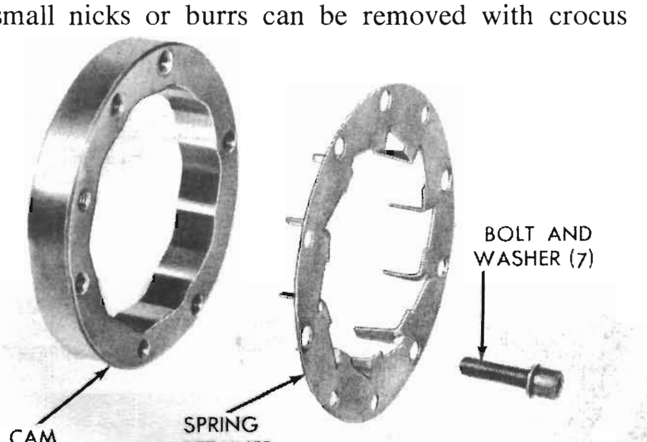


Fig. 86 – Overrunning clutch service replacement cam (A-904)

cloth or a fine stone. Inspect speedometer drive gear for any nicks or burrs, and remove with a sharp edged stone. Make sure all oil passages in 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.

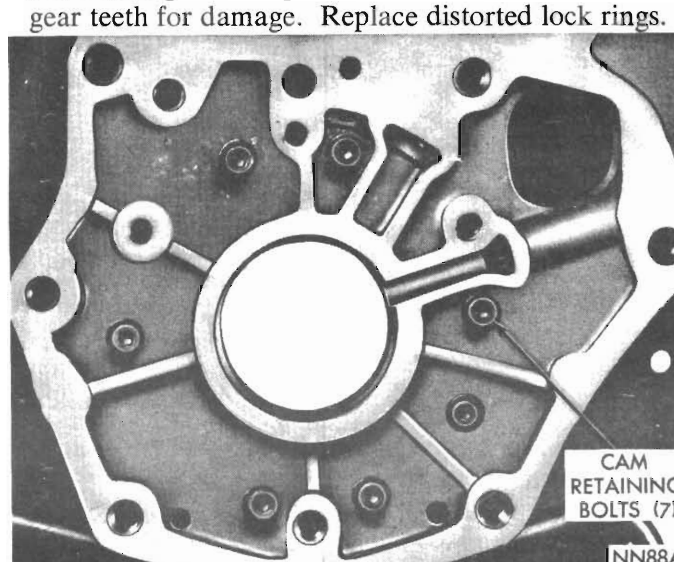


Fig. 87 – Cam retaining bolts installed (A-904)

Assembly

Refer to *Fig. 85* for parts identification.

(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 the rear annulus gear. Place thrust washer on front side of 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 output shaft, engaging sun gear teeth with rear planetary pinion teeth. Place thrust washer inside the front driving shell.

(5) Place thrust washer on rear hub of front planetary gear set, then slide assembly into front annulus gear.

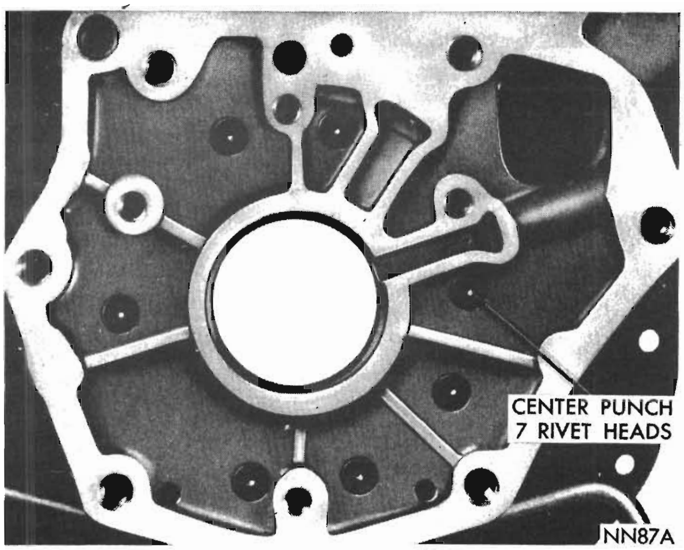


Fig. 88 – Centre punch rivet heads (A-904)

(6) Carefully work front planetary and annulus gear assembly on output shaft, meshing planetary pinions with the sun gear teeth.

(7) With all components properly positioned, install selective snap ring on front end of output shaft. Re-measure end play of the assembly.

> NOTE: The clearance can be adjusted by the use of various thickness snap rings. Snap rings are available in .048, .055 and .062 inch thickness.

37. OVER-RUNNING 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.

A-727: Inspect cam set screw for tightness. If loose, tighten and restake the case around screw.

Over-running Clutch Cam Replacement (A-904)

If over-running clutch cam or spring retainer are found damaged, they can be replaced with a service replacement cam, spring retainer, and retaining bolts *(Fig. 86)*.

The service parts are retained in the case with bolts instead of rivets. To install, proceed as follows:

(1) Remove four bolts securing output shaft support to rear of the transmission case. Drive support rearward out of the case with a wood block and hammer.

(2) Centre punch the rivets *exactly* in centre of each rivet head *(Fig. 88)*.

(3) Drill through each rivet head with a $\frac{3}{8}$ inch drill. *Be careful not to drill into the transmission case*. Chip off rivet heads with a small chisel, then drive rivets and cam from the case with a blunt punch of proper size.

(4) Carefully enlarge rivet holes in the case with a 17/64 inch drill. Remove all chips and foreign matter from the case, make sure cam area is free of chips and burrs.

(5) To install, position cam and roller spring retainer in the case. Align cam bolt holes with holes in the case, then thread all seven retaining bolt and washer assemblies into cam a few turns. The cone washers must be installed so inner diameter is coned toward the bolt head *(Fig. 87)*.

(6) Tap cam firmly into the case if necessary. Draw retaining bolts down evenly, then tighten to 100 lbs. in.

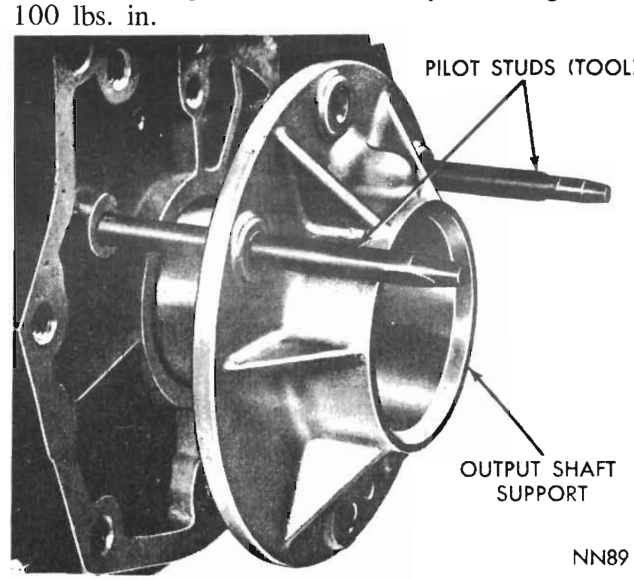


Fig. 89 – Installing output shaft support (A-904)

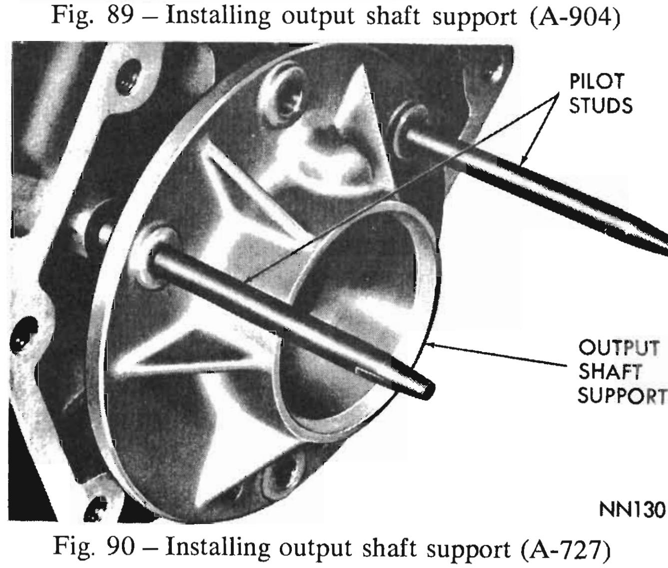


Fig. 90 – Installing output shaft support (A-727)

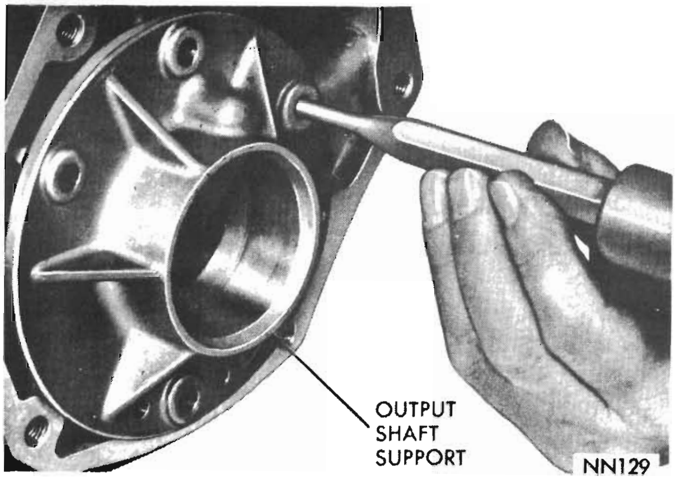


Fig. 91 – Removing overrunning clutch cam (A-727)

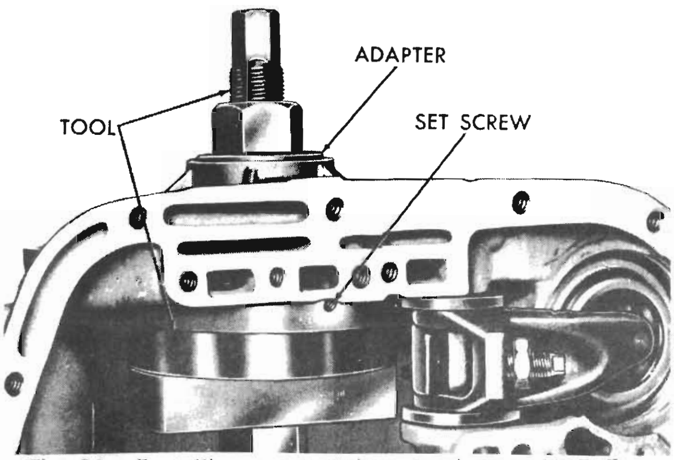


Fig. 92 – Installing overrunning clutch cam (A-727)

(7) Screw two pilot studs, Tool E21C35C, into the case *(Fig. 89).* 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.

Over-running Clutch Cam Replacement (A-727)

If over-running clutch cam and/or roller spring retainer are found damaged, replace cam and spring retainer in the following manner:

(1) Remove set screw from the case below clutch cam.

(2) Remove four bolts securing output shaft support to rear of transmission case. Insert a punch through bolt holes and drive cam from the case *(Fig. 91).* Alternate punch from one bolt hole to another so cam will be driven evenly from the case.

(3) Clean all burrs and chips from cam area in the case.

(4) Place spring retainer on the cam, making sure retainer lugs snap firmly into notches on the cam.

IMPORTANT: The output shaft support must be in the case to install the over-running clutch cam.

If the support requires replacement, drive it rearward out of the case with a wood block and hammer. To install, screw two E21C35C pilot studs into the case *(Fig. 90).* 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.

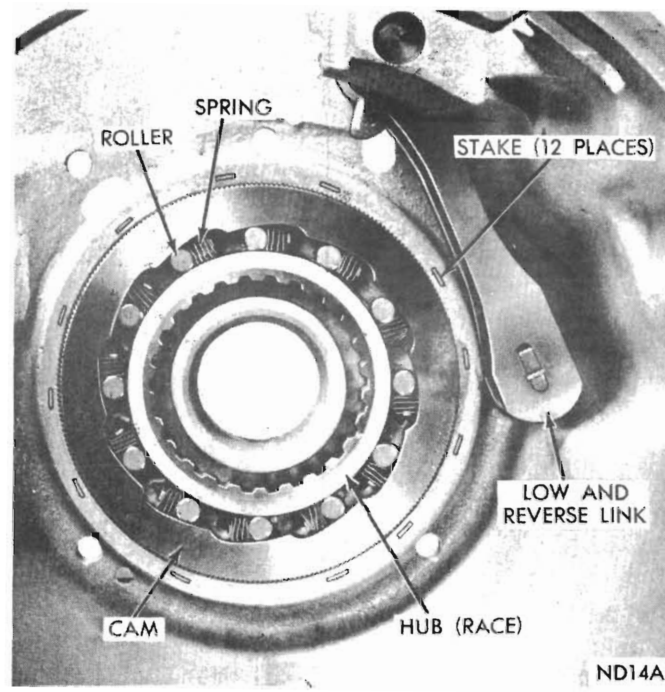


Fig. 93 – Overrunning clutch, low and reverse band link

(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 E21C30C and Adaptor SP-5124 as shown in *Fig. 92,* tighten nut on tool to seat cam into the case. Make sure cam is firmly bottomed, then install cam retaining set screw. Stake the case around set screw to prevent it coming loose.

(7) Remove cam installing tool. Install and tighten support retaining screws to 140 lbs. inch. Stake the case around cam in twelve places with a blunt chisel *(Fig. 93).*

38. KICKDOWN SERVO AND BAND

Inspection

See *Fig. 94 or 95* for parts reference.

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. Inspect piston bore in the case for scores or other damage. Inspect fit of guide on piston rod. Inspect piston spring for distortion.

If equipped with controlled load servo piston, inspect bore in piston and O-ring on piston rod.

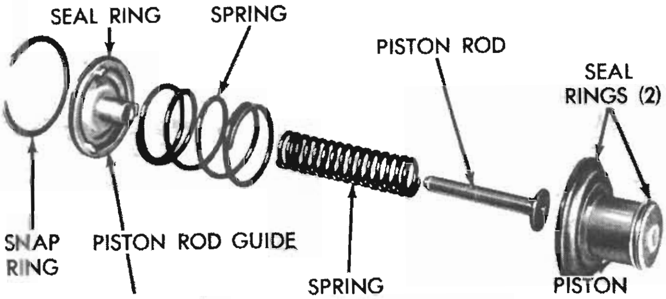


Fig. 94 – Kickdown servo

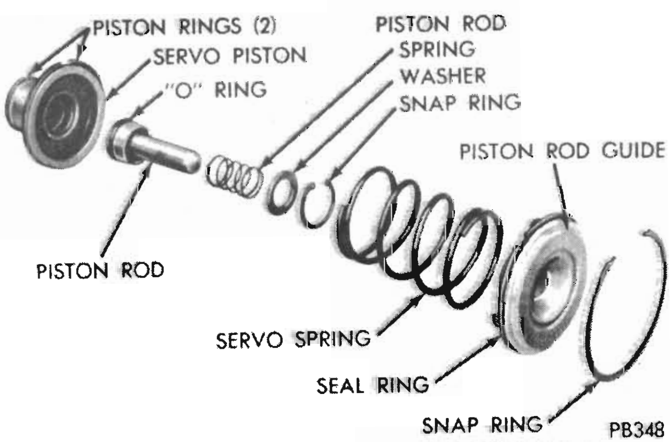


Fig. 95 – Kickdown servo (controlled load)

Inspect band lining for wear and bond of lining to the band. Inspect 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 the bands, replace the band. Inspect band for distortion or cracked ends.

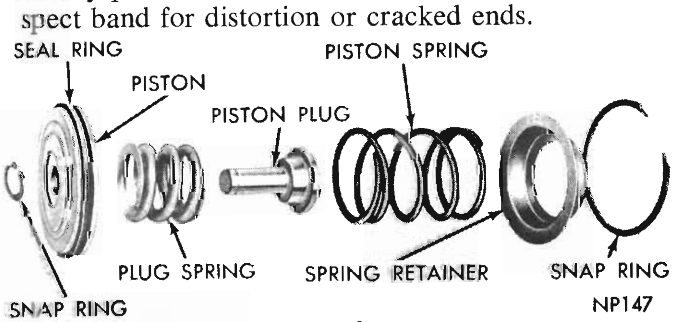


Fig. 96 – Low and reverse servo

39. LOW-REVERSE SERVO AND BAND

Disassembly

(1) Remove snap ring from piston and remove the piston plug and spring *(Fig. 96).*

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. Inspect springs for distortion.

Inspect band lining for wear and bond of lining to the band. If lining is worn so grooves are not visible at ends of any portion of the band, replace the band. Inspect band for distortion or cracked ends.

Assembly

(1) Lubricate and insert piston plug and spring in the piston, and secure with snap ring.

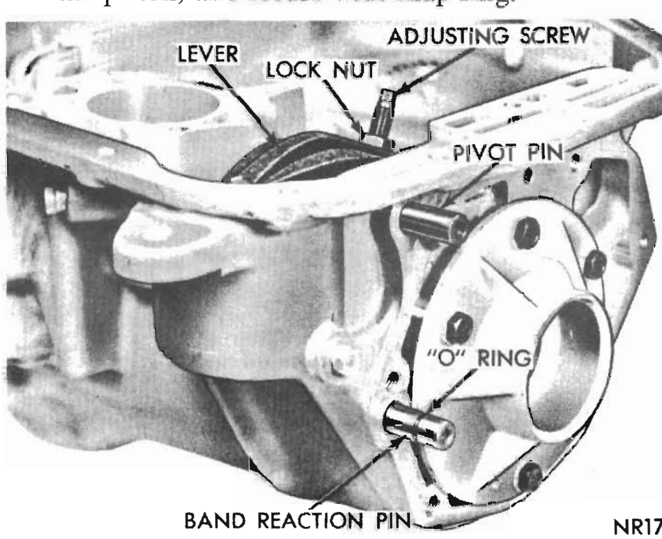


Fig. 97 – Double wrap band linkage — installed (A-904-LA transmission only)

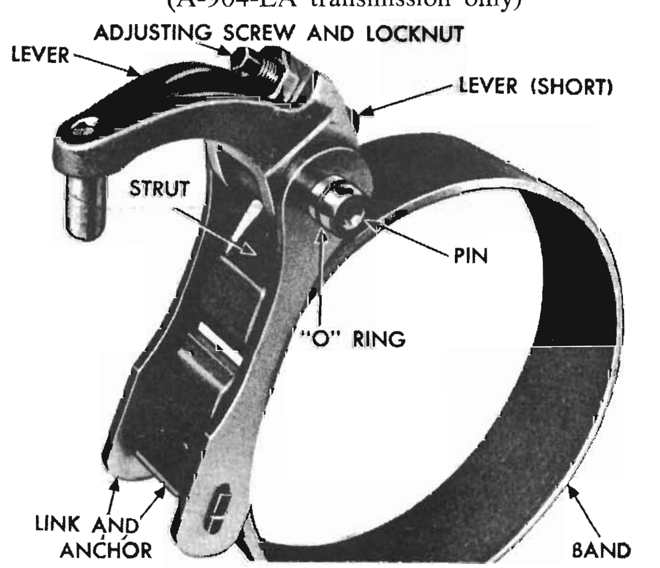


Fig. 98 – Low-reverse band and linkage

40. 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 the cause and correct the trouble before proceeding with assembly procedures. Always use new gaskets during assembly operations.

> IMPORTANT: Use only "Dexron" type Automatic Transmission Fluid to lubricate transmission parts during assembly.

Over-running Clutch

(1) With transmission case in an upright position, insert clutch hub inside the cam. Install over-running clutch rollers and springs exactly as shown in *Fig. 93*.

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. 96)*.

(2) Compress low and reverse servo piston spring by using engine valve spring compressor Tool E0092, then install snap ring.

(3) Position rear band in the case, install short strut, then connect long link and anchor to the band *(Fig. 98)*. Screw in band adjuster just enough to hold strut in place.

Install low-reverse drum.

A-727: Be sure long link and anchor assembly is installed, as shown in *Fig. 93*, to provide running clearance for the low and reverse drum.

Low-Reverse Band (A-904-LA) (318 cu. in. engine only)

This transmission has a double-wrap band supported at two points by a band reaction pin in the case and acted upon at one point by the servo lever adjusting screw *(Fig. 97 and 99)*.

(1) Push band reaction pin (with new O-ring) into case flush with gasket surface *(Fig. 97)*.

(2) Place band into case resting two lugs against band reaction pin *(Fig. 99)*.

(3) Install low-reverse drum into over-running clutch and band.

(4) Install operating lever with pivot pin flush in case and adjusting screw touching centre lug on band *(Fig. 99)*.

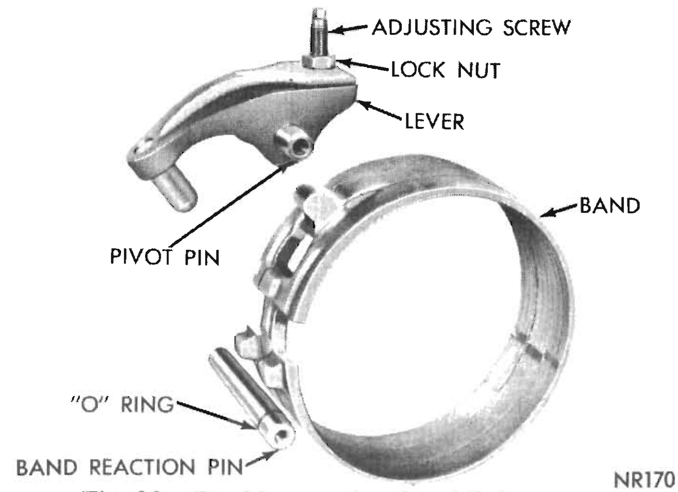


Fig. 99 – Double wrap band and linkage — disassembled (A-904-LA transmission only)

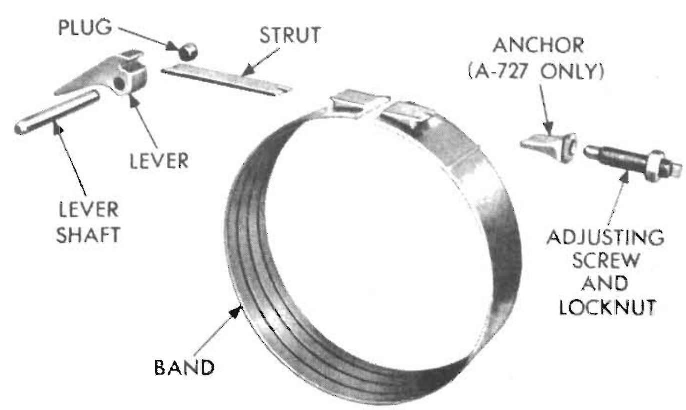


Fig. 100 – Kickdown band and linkage

Kickdown Servo (Figs. 99 or 100)

(1) If equipped with controlled load servo piston, sub-assemble it as follows *(Fig.95)*:

(a) Grease O-ring and install on piston rod.

(b) Install piston rod into servo piston.

(c) Install spring, flat washer and snap ring to complete the sub-assembly.

(2) Carefully push servo piston into the case bore. Install piston rod, springs and guide.

(3) Compress kickdown servo springs by using engine valve spring compressor Tool E0092, then install snap ring.

Planetary Gear Assemblies, Sun Gear, and Driving Shell

(1) While supporting assembly in the case, insert output shaft through rear support. Carefully work assembly rearward, engaging rear planetary carrier lugs into 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, oil pump and reaction shaft support are more easily installed with transmission in an upright position.

One method to support transmission is outlined in Steps 1 and 2.

(1) Cut a $3\frac{1}{2}$ 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 edge of the $3\frac{1}{2}$ inch hole so output shaft support will fit and lay flat in the hole.

(2) Carefully insert output shaft into hole to support the transmission upright, with its weight resting on flange of the output shaft support.

(3) *A-904*: Apply a coat of grease to selective thrust washer *(Fig. 84)* and install washer on front end of the output shaft. If drive train end play was not within specifications (.030 to .089 inch), when tested before disassembly, replace thrust washer with one of proper thickness.

The following selective washers are available for A-904 transmissions.

Thickness	Colour
.052-.054 inch	Natural
.068-.070 inch	Red
.083-.085 inch	Black

A-727: Apply a coat of grease on the input to output shaft thrust washer *(Fig. 85)*, and install 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 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 front annulus gear. Make sure front clutch drive lugs are fully engaged in slots in the driving shell.

Front Band

Figure 100 shows a disassembled view of the kickdown band assembly.

(1) Slide band over front clutch assembly.

(2) Install band strut, screw in adjuster just enough to hold strut and anchor in place.

Oil Pump and Reaction Shaft Support

If difficulty was encountered in removing 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 pump for a few minutes prior to installing pump and reaction shaft support assembly.

A-904: Install thrust washer on reaction shaft support hub *(Fig. 61)*.

A-727: If drive train end play was not within specifications (.037-.084 inch) when measured before disassembly, replace thrust washer on reaction shaft support hub with one of proper thickness *(Fig. 66)*.

The following selective thrust washers are available for A-727 transmissions.

Thickness	Colour
.061-.063 inch	Green
.084-.086 inch	Red
.102-.104 inch	Yellow

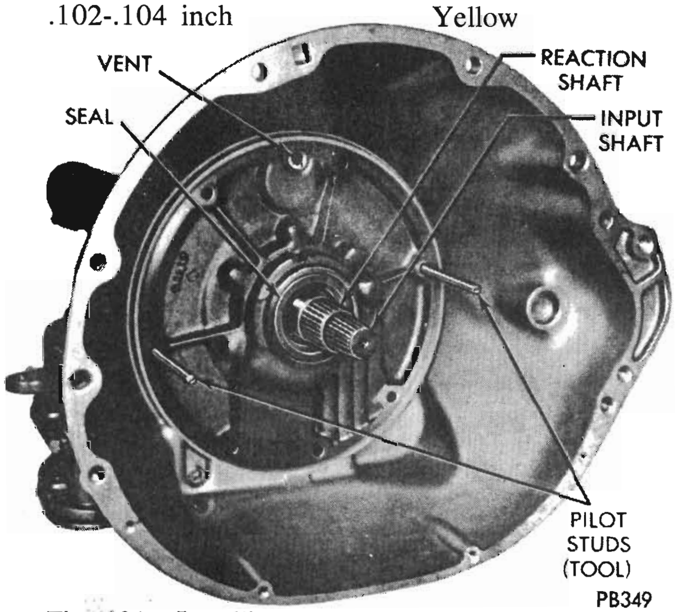


Fig. 101 – Installing pump and reaction shaft support assembly

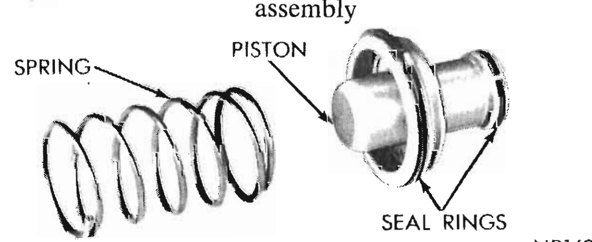


Fig. 102—Accumulator piston and spring

(1) Screw two pilot studs, Tool E21C35C in pump opening in the case *(Fig. 101)*. 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 deflector over vent opening and install four pump body bolts. (The A-904 does not use a deflector over vent opening.) Remove pilot studs, install remaining bolts and snug down evenly.

Rotate input and output shafts to see if any binding exists, then tighten bolts to 175 lbs. in. Check shafts again for free rotation.

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 output shaft, then slide assembly into place. Install snap ring behind the governor body *(Fig. 40)*. Tighten body to support bolts to 100 lbs. in. Bend ends of lock straps against bolt heads.

(2) Place governor valve on valve shaft, insert assembly into body and through governor weights. Install valve shaft retaining snap ring.

Output Shaft Bearing and Extension Housing

(1) Install a snap ring in the front groove (A-727 only) on output shaft. Install bearing on shaft with its outer race ring groove toward front *(Fig. 38)*. 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. 37)*, 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 lbs. ft.

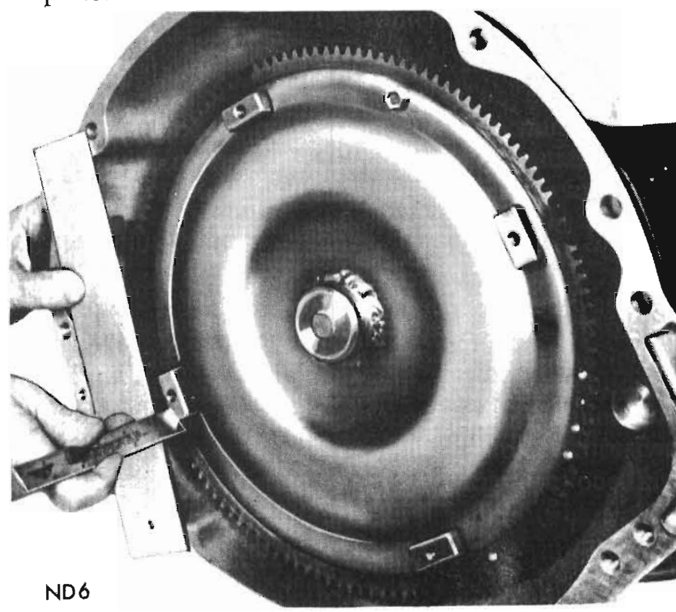
(4) Install gasket, plate and two screws on bottom of extension housing mounting pad.

(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.



ND6

Fig. 103 – Measuring converter for full engagement in transmission

(2) Install accumulator piston in transmission case and place piston spring on the accumulator piston *(Fig. 102)*. Make sure Back-Up Light and Neutral Start Switch has been removed.

(3) Insert parking lock rod through opening in rear of case with the knob positioned against the reaction plug and sprag. Move front end of rod toward centre 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 manual lever and secure with 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 centre neutral finger over the neutral switch plunger. Snug bolts down evenly, then tighten to 100 lbs. in.

(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 kickdown and low-reverse bands.

(9) Install oil pan, using a new gasket. Tighten pan bolts to 150 lbs. in.

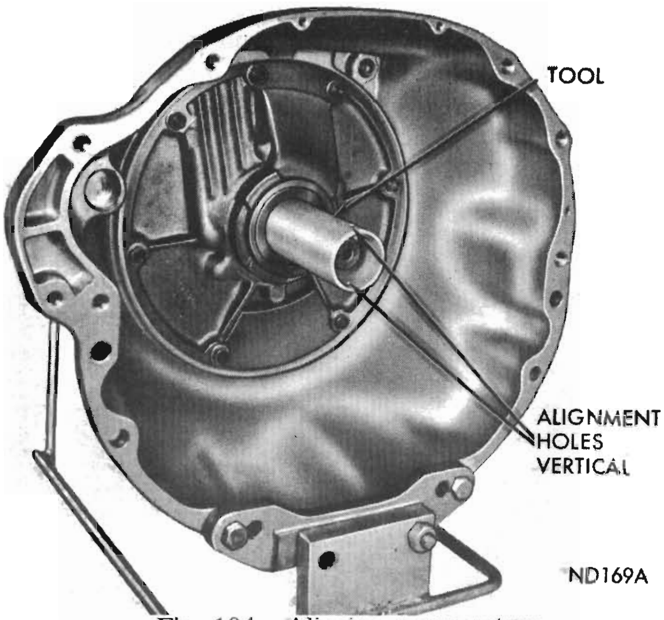


Fig. 104 – Aligning pump rotors

41. TRANSMISSION, CONVERTER AND DRIVE PLATE INSTALLATION

NOTE: 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 transmission should be allowed to rest on the plate during installation.

(1) Rotate pump rotors with Tool E21C35E (A-904) or Tool E21C35P (A-727) until the two small holes in handle are vertical *(Fig. 104)*.

(2) Carefully slide converter assembly over input shaft and reaction shaft. Make sure converter impeller shaft slots are also vertical and fully engage pump inner rotor lugs.

Test for full engagement by placing a straight edge on face of the case *(Fig. 103)*. The surface of converter front cover lug should be at least ½ inch to rear of straight edge when converter is pushed all the 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 lbs. ft.

(5) Coat converter hub hole in crankshaft with wheel bearing grease. 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 engine.

NOTE: When Drive Plate replacement has been necessary, make sure both transmission dowel pins are in engine block and they are protruding far enough to hold transmission in alignment.

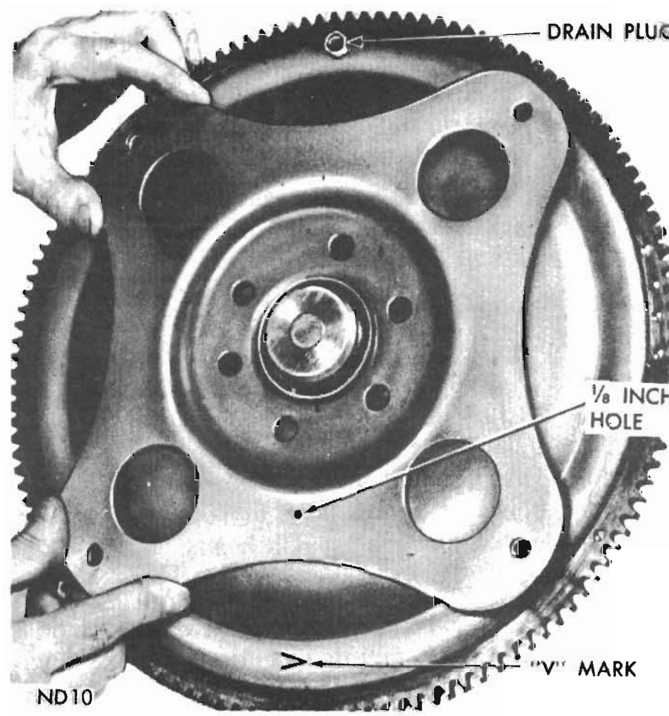


Fig. 105 – Converter and drive plate marking

(6) Rotate converter so mark on converter (made during removal) will align with mark on drive plate. The offset holes in plate are located next to ⅛ inch hole in the inner circle of plate. A stamped V mark identifies the offset hole in converter front cover *(Fig. 105)*. Carefully work transmission assembly forward over engine block dowels with converter hub entering the crankshaft opening.

(7) After transmission is in position, install bell housing bolts and tighten to 28 lbs. ft.

(8) Install and tighten the two lower drive plate to converter bolts to 270 lbs. in.

(9) Install starting motor 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 lbs. in.

(11) Install crossmember and tighten attaching bolts.

(12) Lower transmission so extension housing is aligned and rests on rear mount. Install bolts and tighten.

(13) Install gearshift torque shaft and connect gearshift rod to the transmission lever.

Console Shift: Align gearshift torque shaft lower bracket on 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 rear axle pinion shaft yoke.

(15) Connect oil cooler lines to the transmission and install oil filler tube. Connect the speedometer cable.

(16) Connect throttle rod to the transmission throttle lever.

(17) Connect wire to the back-up light and neutral starting switch.

(18) Install cover plate in front of the converter assembly.

(19) Install the transmission case to cylinder block brace. *The converter cover plate must be between case and brace. The oil line bracket is attached in front of the brace. Tighten bolts holding brace to the case before attaching brace to the cylinder block.*

(20) Refill transmission with "Dexron" Type Automatic Transmission Fluid as specified.

(21) Adjust throttle and gearshift linkage.

42. 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 removal 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 lbs. in.

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.

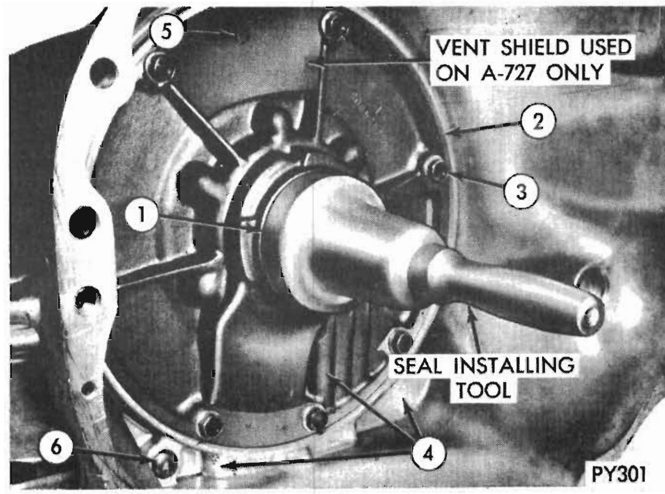


Fig. 106 – Transmission converter area

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) Fabricate and fasten test probe *(Fig. 106a)* securely to convenient dust shield bolt hole. Make certain converter is cleared by test probe. Tool must be clean and dry.

(4) Run engine as approximately 2,500 r.p.m. 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. 106)*.

(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 106)* are:

(a) Converter Hub Seal.

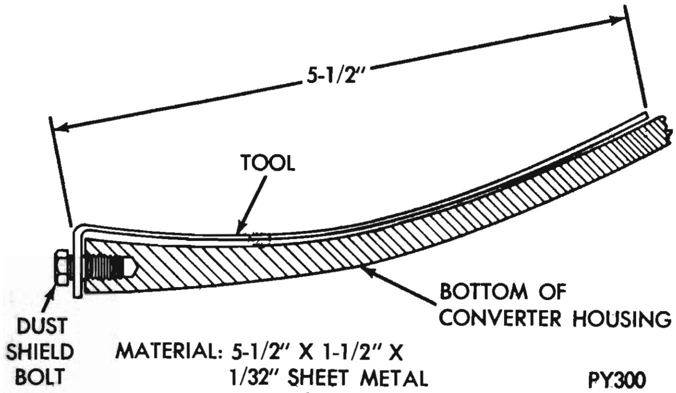


Fig. 106a – Leak locating test probe tool

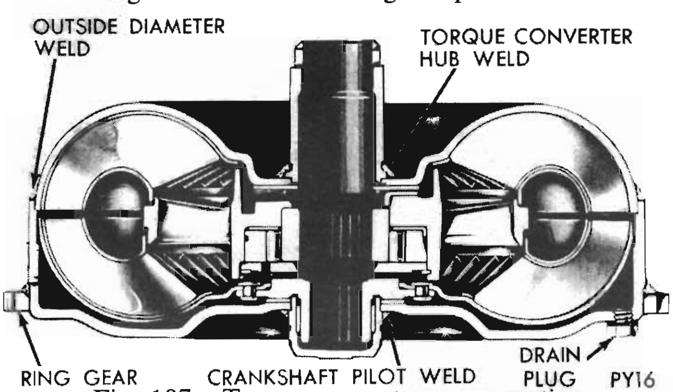


Fig. 107 – Torque converter cross section

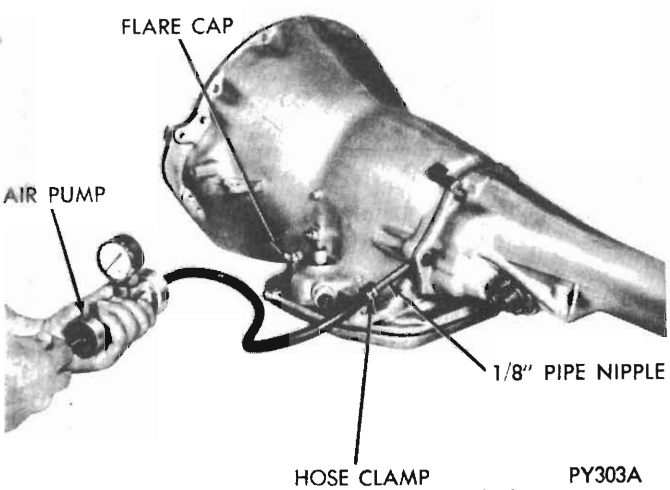


Fig. 108 – Pressurising transmission

(i) Seal lip cut, check converter hub finish.
(ii) Bushing moved and/or worn.
(iii) Oil return hole in front pump housing plugged or omitted.
(iv) Seal worn out (high mileage cars).
(b) Fluid leakage at the outside diameter from pump housing O-ring seal.
(c) Fluid leakage at the front pump to case bolts.
(d) Fluid leakage due to case or front pump housing porosity.
(e) Oil leakage out the vent.
(f) Kickdown lever shaft access plug.

Converter Leakage (Fig. 107)

Possible sources of converter leakage are:
(i) Torque converter weld leaks at the outside diameter (peripheral) weld.
(ii) Front pump hub weld.
(iii) Crankshaft pilot weld.
(iv) 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

Fabricate equipment needed for test as shown in *(Figs. 110 through 114).*

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 front cooler line fitting), and pipe nipple (in case at rear cooler line fitting) *(Fig. 108 and 109).*

(2) Remove necessary front pump housing bolts, and vent shield (in A-727 transmission). Install vent plug (rubber stopper), and vent plug re-

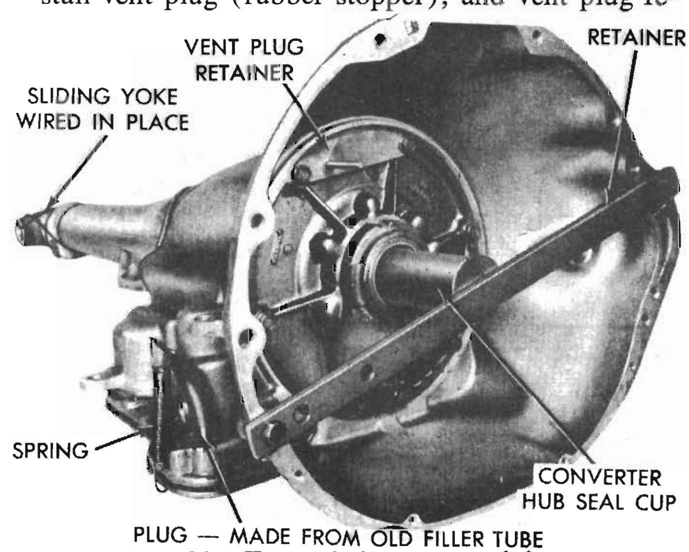


Fig. 109 – Transmission prepared for test

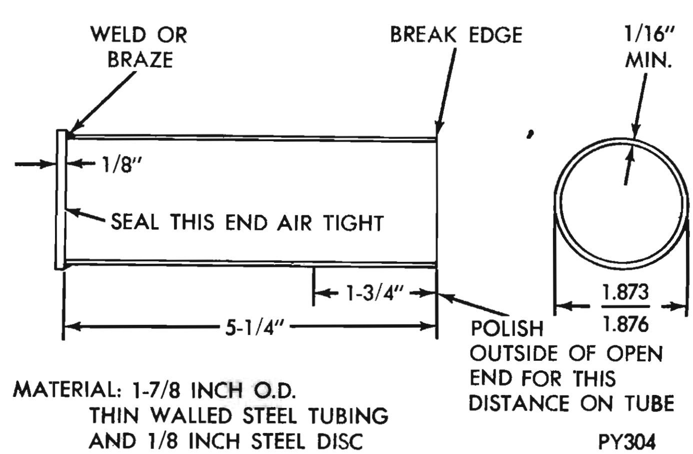


Fig. 110 – A-727—Converter hub seal cup

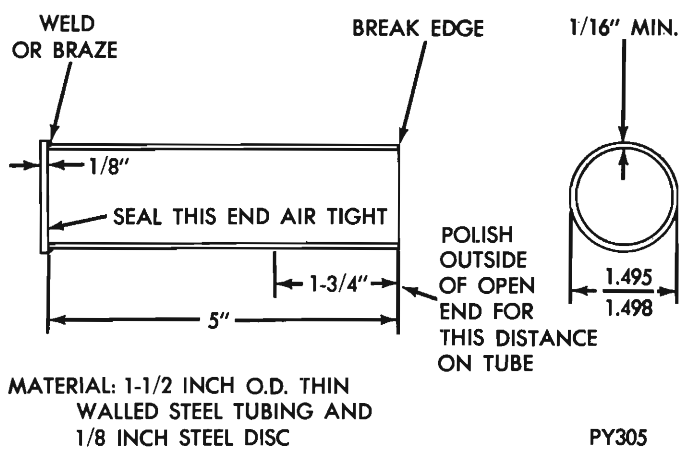


Fig. 111 – Converter hub seal cup

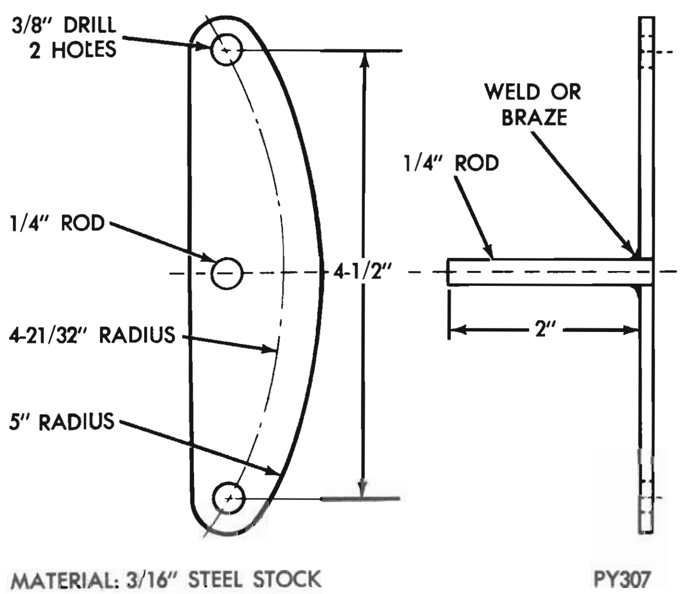


Fig. 112 – A-727—Vent plug retainer

tainer preferably using longer bolts than those removed.

(3) With rotary motion, install converter hub seal cup over input shaft, and through the converter hub seal until the cup bottoms against the pump rotor lugs. Secure with cup retainer strap *(Fig. 109)*, using converter housing to engine block retaining bolts.

(4) Attach and clamp hose from nozzle of Tool E7C15 to pipe nipple, which is in the rear cooler line fitting position in case *(Fig. 108)*.

(5) Pressurize the transmission using Tool E7C15 until the pressure gauge read 8 p.s.i. 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.

If a leak source is located, that part and all associated seals and gaskets should be replaced with new parts.

> CAUTION: Do not, under any circumstances, pressurize a transmission to more than 10 p.s.i.

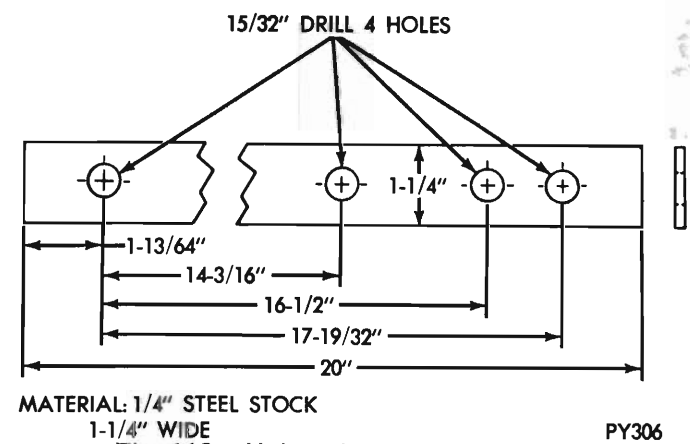


Fig. 113 – Hub seal cup retaining strap

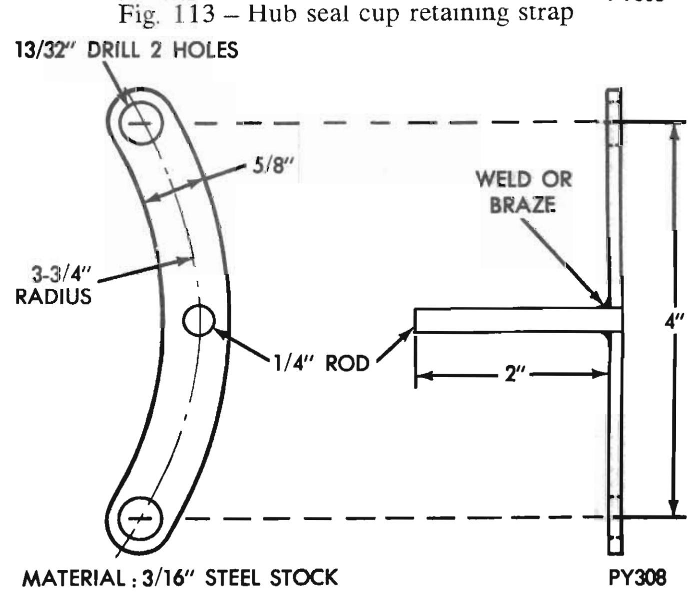


Fig. 114 – A-904—Vent plug retainer

PART 3

CONVERTER AND TRANSMISSION ALIGNMENT

The torque converter is supported at the front in engine crankshaft and at rear in a bushing in front oil pump housing. Drive plate connecting crankshaft to converter is flexible to accept a certain amount of mis-alignment of transmission case and crankshaft. Excessive mis-alignment can cause premature front pump bushing wear, converter impeller hub wear, oil seal leakage and/or damage to drive plate.

To Check Transmission Alignment

(1) Drain transmission oil pan.

(2) Remove transmission and converter assembly (see respective *para.*)

(3) Remove flexible drive plate.

(4) Check the two dowels in rear face of cylinder block, making sure they extend at least 5/16″ out of block. Drive plate damage will result if one or both dowels are missing, or if they are not positioned correctly.

(5) Slide converter assembly out of transmission and remove the oil pan.

(6) Loosen the front (kickdown) band adjusting screw and remove the apply servo and strut (on Models C and D).

(7) Remove front pump housing retaining bolts.

(8) Attach Tool E21C35D to pump housing flange (A-904 Models). Thread screws of tool into flange holes at 11 and 4 o'clock positions.

(9) Bump outward evenly on the two knocker weights to withdraw oil pump and reaction shaft support assembly from case.

(10) Carefully remove the front and rear clutch retainer assemblies and the kickdown band (to obtain access).

(11) Install dial indicator on crankshaft flange (*see Fig. 1*). An indicator post can be made by cutting a 7/16″–20 T.P.I. thread on end of a rod approximately 5½″ long.

(12) Clean all foreign material from cylinder block flange face, also from transmission case flange face.

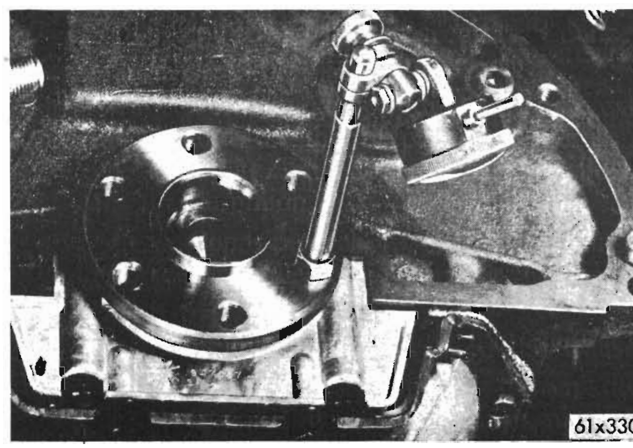


Fig. 1 – Dial indicator installation

(13) Position dial indicator plunger to the engine transmission mounting face and rotate the engine crankshaft to read any runout. (Runout should not exceed .010 inch T.L.R.).

(14) Bolt transmission case to engine, being careful not to strike indicator, when raising transmission into place. Tighten bolts to 25-30 lbs. ft. torque, adding shims, where required, between mounting surfaces to correct excess runout.

(15) Position dial plunger against bore diameter which pilots front pump assembly (*see Fig. 2*). Make sure plunger does not rest on chamfered edge of bore. To adjust dial and plunger, reach into case from front, below engine oil pan. Adjust dial and plunger to that plunger can travel in each direction.

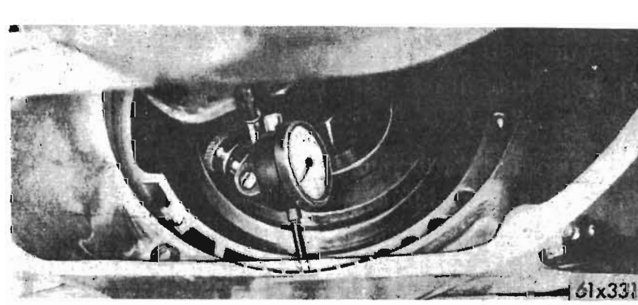


Fig. 2 – Checking transmission case (front pump bore) runout

(16) Rotate crankshaft with a wrench on a bolt in front end of crankshaft. Remove fan belt to prevent fan from interfering with wrench (where necessary).

(17) Measure bore runout by rotating crankshaft slowly, recording the readings every 45° of rotation. Also record the points of maximum and minimum readings. Use a mirror if necessary to see the dial as it is being rotated. Total runout of bore should not exceed .015".

To Correct Transmission Alignment

If the total runout of transmission on case bore exceeds .015", it may be reduced to within limits by the use of offset dowels. Dowels must be used in pairs, and are available in the following sizes: .007", .014", and .021" offset.

(1) After determining the amount and direction of transmission case bore runout, select a pair of offset dowels with offset nearest to half the amount of runout.

(2) Drive old dowels from engine block flange and install the selected offset dowels with slots parallel and offset in the direction of runout. The upper dowel must be installed with the slotted end into block flange (toward the front of engine). Install lower dowel with slotted end toward rear, as shown in *Fig. 3*. Both dowels must be installed up the shoulder of offset.

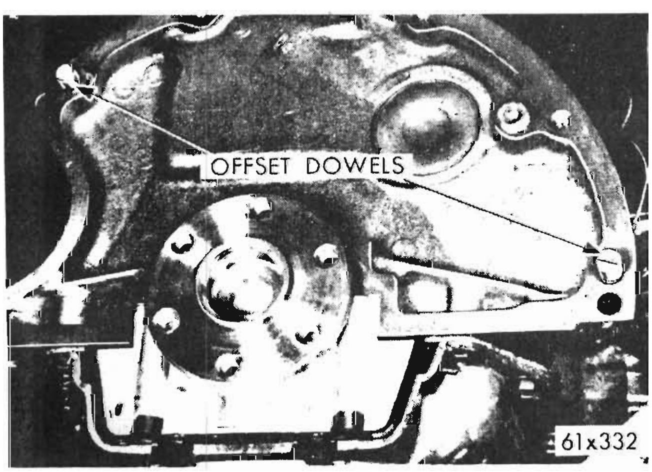


Fig. 3 – Offset dowel installation

(3) Re-install transmission case, carefully tighten attaching bolts to 25-30 lbs. ft. torque. Do not force bolts as the case might be binding on dowels. Re-check bore runout.

(4) Small corrections can be made by turning dowels with a screwdriver bit and wrench *(see Fig. 4)*, support weight of transmission and loosen case bolts slightly. Turn dowels to obtain as near zero runout as possible. The dowel slots must be kept approximately parallel to maintain correct centre distance between dowels.

(5) When transmission is correctly aligned, remove assembly without disturbing dowels.

(6) Install the rear and front clutch retainer assemblies and kickdown band components.

(7) Install pump and reaction shaft support assembly and check drive train end play.

(8) Adjust the kickdown band as outlined in *Para. 5* for 6 cylinder Models and *Para. 6 (part 2A)* for 8 cylinder Models.

Fig. 4 – Adjusting offset dowels

To Check Converter Hub Runout

If flexible drive plate is cracked or broken, install a new plate. Do not use lockwashers on retaining bolts: tighten bolts to 55 lbs. ft. torque, then proceed as follows:

(1) Install converter and tighten bolts to 270 lbs. in. torque. Do not use lockwashers on drive plate to converter bolts.

(2) Attach dial indicator to engine block flange *(see Fig. 1)*. Position dial indicator so dial plunger rests on converter hub (just ahead of pump drive slots).

(3) Rotate crankshaft with a wrench on bolt at front end of crankshaft, and check converter hub runout. Do not rotate converter by hand or with a

turning tool as flexing of drive plate will give a false reading.

(4) The total runout of converter hub should not exceed .015". Runout less than .050" may be corrected by the use of a large C clamp. Attach clamp in front of engine block flange and behind starter ring gear on converter. Draw ring gear adjacent to the low runout point of converter hub toward engine.

Release clamp and re-check runout. Do not pry converter away from engine and be careful to avoid over-correction. In some cases it may be necessary to check crankshaft flange for excessive runout.

Flange runout should not exceed .002". The clearance between converter pilot hub and bore in crankshaft should be .0005"-.010". A maximum of .003" is preferred.

(5) After correct alignment has been obtained, re-assemble, adjust and install transmission assembly.

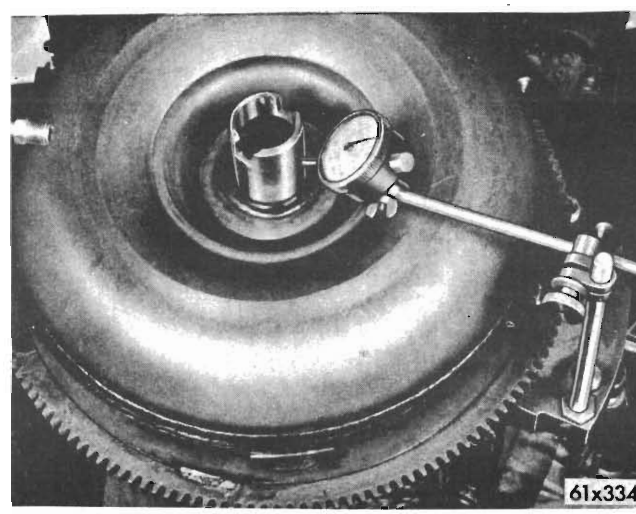


Fig. 5 – Checking converter hub runout

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PART 4 — TRANSMISSION FOUR SPEED SYNCHROMESH

SPECIFICATIONS

RATIOS:	
First	2.82:1
Second	1.84:1
Third	1.32:1
Fourth	1.00:1
Reverse	2.56:1
SYNCHROMESH	All Forward Speeds
TOLERANCES:	
First speed gear end float	.002" – .027"
Second speed gear end float	.006" – .017"
Third speed gear end float	.005" – .020"
Mainshaft bearing end float	.000" – .004"
Maindrive bearing end float	.000" – .004"
SNAP RINGS:	
Mainshaft and maindrive snap ring thickness (Selective to maintain bearing end float)	.086" – .088" .089" – .091" .092" – .094" .095" – .097"
1st and 2nd Synchronizer hub snap ring thickness (Selective to maintain 2nd gear end float)	.085" – .087" .088" – .090" .091" – .093" .094" – .096"
Number of rollers in cluster gear bore	4 sets of 27 rollers
Number of rollers in maindrive pocket bore	15 rollers
Number of cluster gear needle roller thrust washers	6
Number of cluster gear thrust washers	1 front — 2 rear
LUBRICATION:	
Type	S.A.E. 30 Engine Oil
Quantity	3.25 pints

SPECIAL TOOLS

E9C5	Stand — Universal Repair
E21C10D	Bearing Retainer Oil Seal Installer
*E21C20	Remover/Replacer — Pin Gearshift Rail
E21C20A	Spanner — Gearshift Lever
E21C50C	Extension Housing Oil Seal Remover
E21C50D	Extension Housing Oil Seal Replacer
	Universal Bearing Puller

* Essential Tools

TORQUE SPECIFICATIONS

Extension to case bolts	45-55 lbs. ft.
Transmission cover retaining bolts	8-12 lbs. ft.
Bearing retainer bolts	20-25 lbs. ft.
Gearshift housing to extension bolts	45-55 lbs. ft.
Gearshift lever ball seat	15-18 lbs. ft.
Reverse lever adjusting screw lock nut	20-25 lbs. ft.
Detent pin screw	25-30 lbs. ft.
Filler plug	20-30 lbs. ft.
Drain plug	20-30 lbs. ft.
Case to clutch housing bolts	50 lbs. ft.
Speedometer drive pinion retainer screw	150 lbs. in.
Reverse light switch	150 lbs. in.
Transmission support cross-member to frame nuts	80 lbs. ft.
Transmission rear insulator (mounting) to transmission attaching bolts	50 lbs. ft.
Transmission rear insulator (mounting) to cross-member nuts	200 lbs. ft.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. HARD SHIFTING

(1) Incorrect clutch adjustment.
(2) Shift linkage out of adjustment.
(3) Synchronizer clutch sleeve damaged.
(4) Synchronizer spring improperly installed.
(5) Broken or worn synchronizer blocker rings.
(6) Incorrect lubricant or low lubricant level.
(7) Misaligned transmission.
(8) Damaged or bent gearbox top cover.
(9) Incorrect reverse idler adjustment.

2. TRANSMISSION NOISES

(1) Misaligned or loose transmission.
(2) Worn or damaged gears.
(3) Worn or damaged bearings.
(4) Incorrect lubricant or low lubricant level.

3. TRANSMISSION JUMPS OUT OF GEAR

(1) Synchronizers worn.
(2) Clutch housing misalignment — misaligned transmission.
(3) Shift linkage misaligned.
(4) Incorrect or damaged interlock detent spring and/or loose detent screw.
(5) Bent mainshaft.
(6) Worn or damaged bearings on input or output shaft.
(7) Damaged or bent gearbox top cover.

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SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The transmission is a four-speed fully synchronized type using three strut synchronizers which give rapid silent gear changes. All forward gears are helical to give smooth operation. Reverse gear is of the spur type.

The first, second, third and fourth gear synchonizers are keyed to the output shaft (mainshaft) and permit clutching to the required gear which is in constant mesh with the cluster gear. The first, second and third gears, when not engaged by the synchronizer sleeve splines, are free to rotate on the mainshaft. It is important to maintain the running clearances specified or seizure may result owing to expansion of the components.

The inner hubs of the synchronizer assemblies are splined to the mainshaft and fitted with three shifting plates which fit into slots in the inner hubs. The plates are located by two circular synchronizer springs between the inner hubs and the synchronizer sleeves which are splined to the inner hubs. The shift plates fit into three recesses in the bronze blocker rings which fit over the taper cones of the gears.

The blocker rings have clutch teeth similar to those on the gears. When a forward gear is to be engaged the synchro sleeve, carrying with it the shift plates, moves over the inner hub bringing the shift plates into contact with the back face of the recesses in the blocker rings. There is sufficient lateral clearance for the shift plates in the blocker ring recesses to allow the blocker ring clutch teeth to move out of line with the splines on the inner hub due to the frictional drag of the blocker ring tapers on the gear cones. This prevents the synchronizer sleeve from moving over the blocker ring teeth until such time as the gear and the blocker ring are rotating at the same speed. When this occurs the shift pads centralise in the blocker ring recesses, the synchro sleeve clutch teeth move over the clutch teeth of the blocker ring and engage the clutch teeth of the gear. To engage reverse gear, the reverse idler gear is moved by the reverse idler lever into mesh with the cluster gear reverse step and the combined first speed synchro sleeve and reverse sliding gear, with the drive being transferred to the output shaft (mainshaft) through the first and second inner hub.

The cluster gear runs on four rows of needle roller bearings, the maindrive gear and mainshaft on ball bearings, the reverse idler is bushed and runs on the reverse idler shaft and the second and third gears run directly on the mainshaft. The first speed gear is bushed and runs on the mainshaft. The mainshaft is also supported by a set of rollers in the maindrive gear and the rear end splines are located in the propeller shaft slip yoke which runs in a bushing in the gearcase extension housing. The speedometer gear is located on the mainshaft by a spring retainer clip.

The interlock mechanism consists of an interlock spool, which is a sliding fit on the gearshift rail, and is located by its circular flange in the case cover. Shifts are effected by a pin pressed into the rail which moves longitudinally through a slot in the interlock spool. This pin can be rotated to pick up the required groove in the respective fork arms. The rotational movement causes the interlock spool flange to be rotated into the groove in the fork arms not required, thus preventing the forks not in line with the shifting pin to be locked in position by the flange. The gearshift rail has three grooves in it corresponding to each gear and neutral. A detent pin is forced into the grooves by a spring which must be overcome by a force applied to the gearshift lever before a gear change can be made.

The reverse light switch is located in the gearshift housing, and is actuated by rotating a flat milled on the operating rod away from the reverse light switch. This *rotation takes* place as reverse gear is selected.

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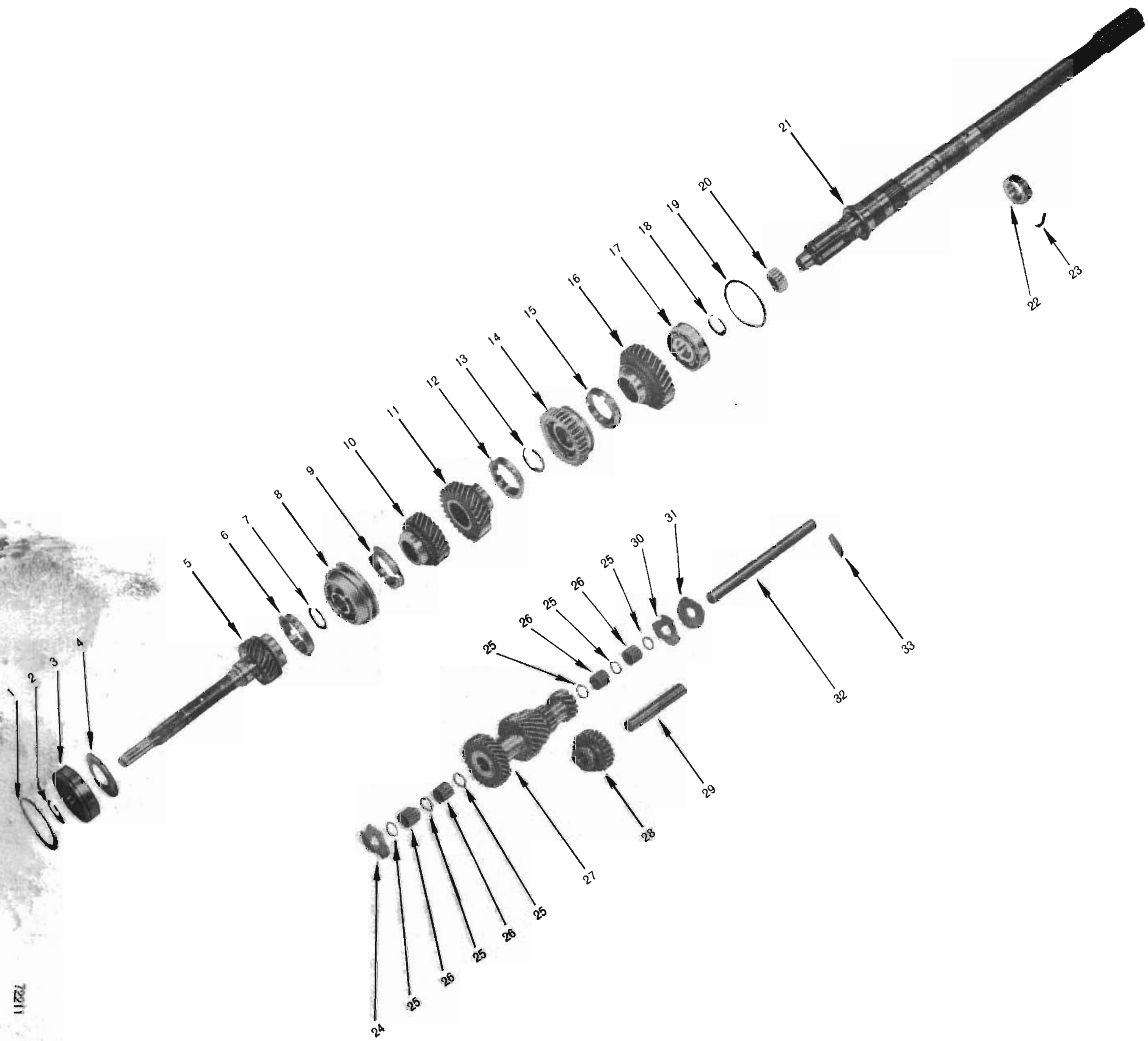

Fig. 1 -- Exploded view—maindrive mainshaft and cluster gear assemblies.

LEGEND

1. Ring Snap—Maindrive Brg. O.D.
2. Ring Snap—Maindrive Brg. Retg.
3. Bearing—Maindrive
4. Baffle—Oil Retaining Maindrive
5. Gear—Maindrive
6. Ring—Synchro. Blocking—4th Gear
7. Ring Snap—3-4 Synchro. Retg.
8. Synchronizer Assy.—3rd and 4th
9. Ring Synchro. Blocking—3rd Gear
10. Gear—3rd Speed
11. Gear—2nd Speed
12. Ring Synchro. Blocking—2nd Gear
13. Ring Snap—1-2 Synchro. Retg.
14. Synchronizer Assy.—1st and 2nd
15. Ring Synchro. Blocking—1st Gear
16. Gear—1st Speed
17. Bearing—Mainshaft
18. Ring Snap—Mainshaft Brg. Retg.
19. Ring Snap—Mainshaft Brg. O.D.
20. Bearing Needle—Mainshaft
21. Shaft—Main
22. Gear—Speedo Drive
23. Clip—Speedo Drive Gear Retg.
24. Washer—Thrust Cluster Gear Front
25. Washer Thrust—Countershaft Roller
26. Bearing—Needle Cluster Gear
27. Gear—Cluster
28. Gear—Reverse Idler Assy.
29. Reverse Idler Shaft
30. Washer Thrust—Cluster Gear Rear Inner
31. Washer Thrust—Cluster Gear Rear Outer
32. Counter Shaft
33. Plate Lock

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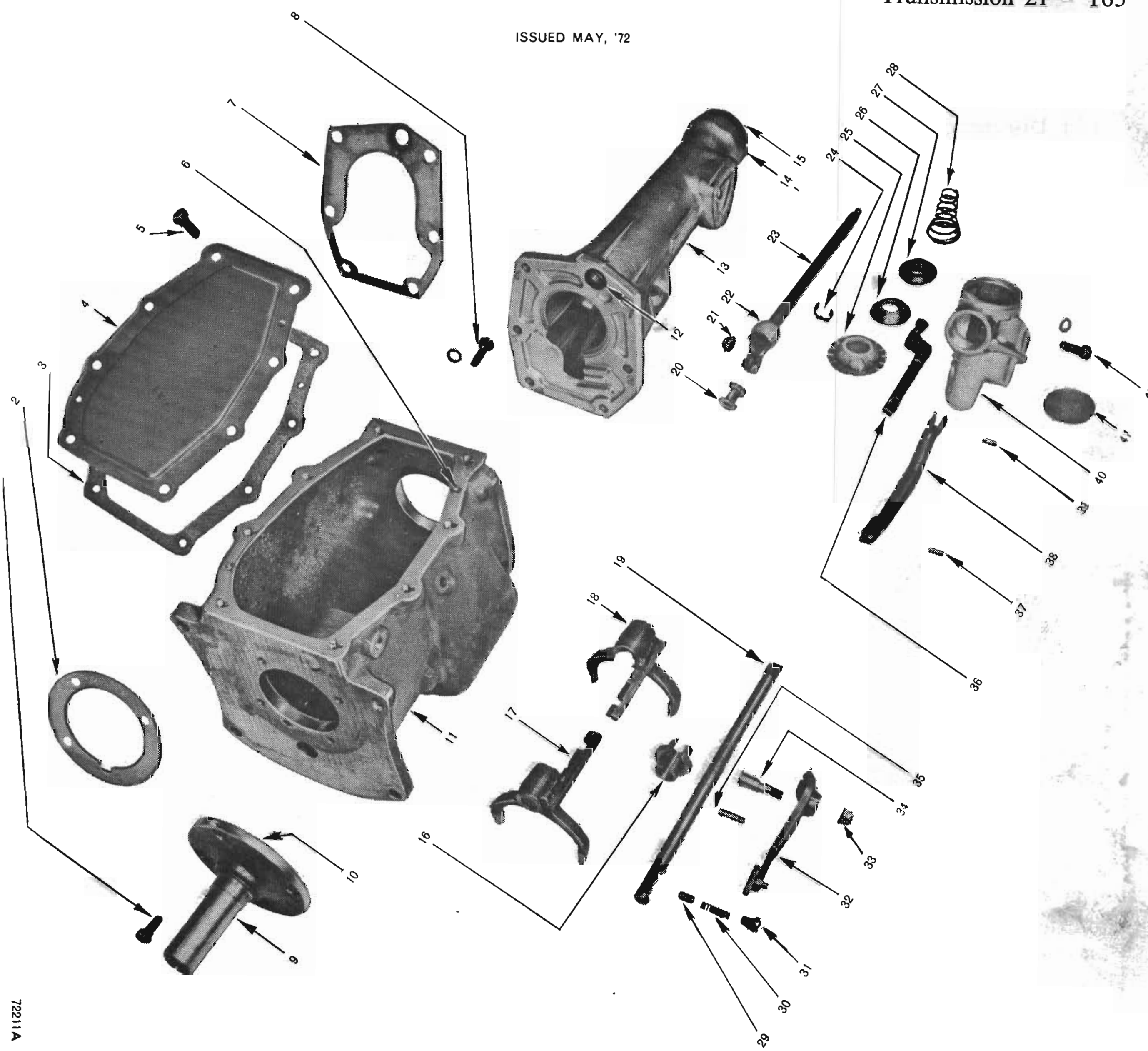


LEGEND

1. Bolt Oil Sealing Maindrive Bearing Retaining.
2. Gasket Maindrive Bearing Retainer.
3. Gasket Case Cover.
4. Cover Case Assembly.
5. Bolt Cover Assembly.
6. Dowel Pins.
7. Gasket Extension Housing.
8. Bolt Extension Housing.
9. Retainer Bearing Maindrive.
10. Seal—Oil—Maindrive*
11. Case Transmission.
12. Seal—Oil—Ext. Housing Detent Shaft.
13. Housing Extension.
14. Bush Extension Housing*
15. Seal—Oil—Extension Housing.
16. Sleeve Interlock.
17. Fork Gearshift 3rd & 4th.
18. Fork Gearshift 1st & 2nd.
19. Rail Gearshift Selector.
20. Damper Block.
21. Thrust Button.
22. Ball Pivot.
23. Lever Gearshift.
24. Ring—Snap—Gearshift Lever.
25. Seat Ball Gearshift Lever.
26. Washer Thrust Ball Seat.
27. Seat Spring.
28. Spring Conical.
29. Pin Detent.
30. Spring Gearshift Detent.
31. Screw Gearshift Detent.
32. Lever Reverse G/Shift Assy.
33. Nut—Locking
34. Pin Eccentric—Reverse Lever.
35. Pin Gearshift Rail.
36. Rod Gearshift Operating.
37. Pin—Roll—G/Shift Rod Connecting.
38. Rod Gearshift Connector.
39. Seal—Oil—Gearshift Housing.*
40. Plug Cup Gearshift Housing.
41. Housing Gearshift Assembly.
42. Belt Gearshift Housing.

* Not Shown in Diag.

Fig 1A—Exploded View — Transmission case, extension Housing and gearshift mechanism.

2. EXTENSION HOUSING YOKE SEAL REPLACEMENT

(1) Disconnect propeller shaft at rear universal joint. Carefully pull shaft yoke out of the transmission extension housing.

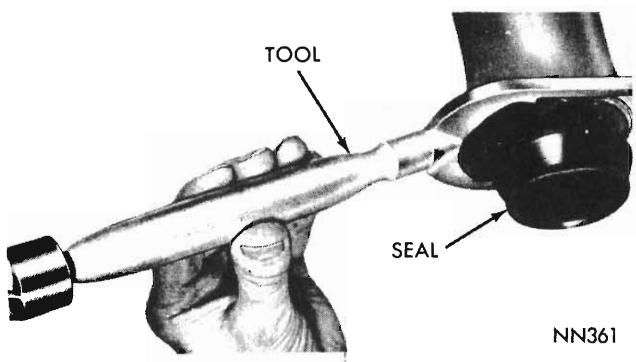


Fig. 2 – Removing Extension Housing Yoke Seal

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. 2)* with Tool E21C50D.

(3) To install a new seal, position seal in opening of extension housing and drive it into the housing with Tool E21C50C *(Fig. 3)*.

(4) Carefully guide front universal joint yoke into extension housing and on the mainshaft spline. Connect propeller shaft to rear axle pinion shaft yoke.

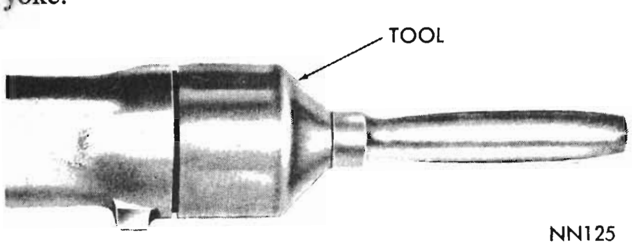


Fig. 3 – Installing Extension Housing Yoke Seal

3. EXTENSION HOUSING AND BUSHING

To remove:

(1) Disconnect propeller shaft at rear universal joint. Carefully pull shaft assembly out of the extension assembly.

(2) Remove speedometer pinion assembly. Drain approximately one pint of lubricant from the transmission.

(3) Remove bolts securing extension housing to the crossmember. Raise transmission slightly with service jack and a piece of flat wood, then remove centre crossmember and support assembly.

(4) Remove the spring pin connecting the cranked gearshift connecting rod and gearshift rail.

(5) Remove extension housing to transmission bolts and carefully remove the extension housing.

(6) Drive oil seal out of extension housing with tool. Be sure not to mark oil seal surface in the housing.

(7) Press or drive out bushing with Tool E21C50E *(Fig. 4)*.

(8) Slide a new bushing on installing end of Tool E21C50E. Align oil hole in bushing with oil slot in the housing, then press or drive bushing into place.

(9) Install a new oil seal into housing with Tool E21C50C *(refer Fig. 3)*.

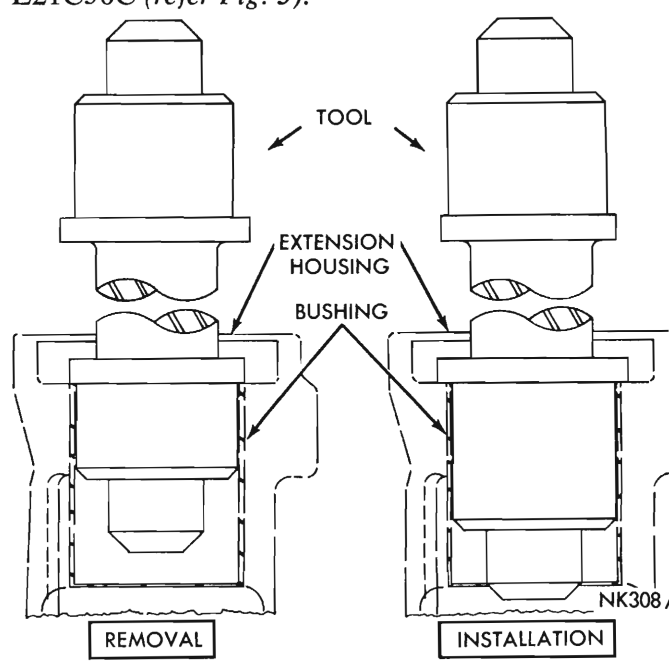


Fig. 4 – Replacing Extension Housing Bushing.

4. BACK-UP LAMP SWITCH

The reversing light switch is installed on the right hand side of the gear shift housing. When installing the switch, tighten to 150 lbs. in.

5. SPEEDOMETER DRIVE PINION

(1) The speedometer drive pinion assembly is retained on the left hand side of the extension housing with a clamp and screw.

(2) Install the seal with the lips of the seal away from the pinion.

(3) Install the pinion on the cable and secure with clip in pinion while holding firmly together.

(4) Lightly lubricate the seal with multi-purpose grease and install the cable assembly in the housing.

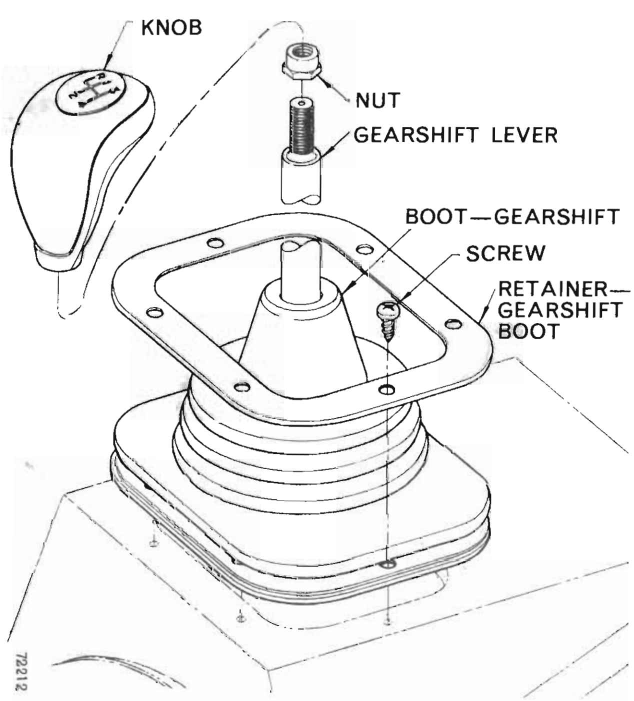
(5) Install the retainer clamp and screw, tighten to 150 lbs. in.

6. TRANSMISSION REMOVAL

(1) Disconnect the battery earth lead.

(2) Select neutral gear, loosen gear lever lock nut and unscrew gear lever knob.

(3) Remove the six screws from the gearshift boot retainer plate and remove the plate.



Gear Lever and Boot—disassembled view.

Fig. 5

(4) Remove the gearshift boot.

(5) Using a screwdriver, remove the circlip located on top of the conical spring.

(6) Remove the conical spring, spring seat and spherical washer.

(7) Using a screwdriver, unlock the bent tab on the pivot ball seat.

(8) Using special service tool No. E21C20A, unscrew the gear lever ball seat.

(9) Remove the gear lever ball seat and gear-lever pivot ball seat assembly.

(10) Drain the lubricant from the transmission.

(11) Disconnect the propeller shaft and speedometer cable.

> CAUTION: Remove the speedometer cable by hand (pinion comes out with cable), so that the cable housing is not crushed.

(12) Remove the back-up switch leads.

(13) Place a flat piece of wood on a service jack and lift the engine slightly by jacking on the flat section of the engine oil pan.

(14) Remove the two bolts attaching the rear mounting to the transmission extension housing and the four bolts attaching the crossmember to the floor pan. Remove the rear crossmember.

(15) Support the transmission using a suitable jack, then remove the four bolts attaching the transmission to the clutch housing.

(16) Slide the transmission rearward until the main drive shaft clears the clutch disc before lowering the transmission. This precaution will avoid damage to the clutch disc centre.

(17) Lower the transmission to the floor and remove from beneath the vehicle. Clean the exterior of the transmission prior to disassembly.

7. TRANSMISSION INSTALLATION

(1) Remove the transmission from the repair stand and position under vehicle.

(2) Raise the transmission using a suitable jack, until the main drive pinion is centred in the clutch housing bore.

(3) Roll the transmission slowly forward until the main drive shaft enters the clutch disc. Rotate the main drive shaft until the splines are aligned, then push the transmission forward until seated against the clutch housing.

> NOTE: Do not allow the transmission assembly to "hang" after the main drive has entered the clutch disc.

(4) Install the transmission attaching bolts and torque to 50 lbs. ft. Remove the jack.

(5) Offer the rear crossmember up to the floor pan and using a pointed drift, align the crossmember bolt holes. Install the attaching bolts and tighten to 80 lbs. ft.

(6) Lower the engine, install the rear mounting to transmission extension housing attaching bolts and torque to 50 lbs. ft.

(7) Install the speedometer drive pinion and cable assembly.

(8) Connect the back-up light switch leads.

(9) Fill the transmission with the recommended gear lubricant. (See Lubrication and Maintenance —Paragraphs 2 and 17). Connect battery earth terminal.

(10) Refit the gearlever and pivot ball seat. Using special service tool No. E21C20A, tension the pivot ball seat to 15-18 lbs. ft.

(11) Fit the spherical washer, spring seat, conical spring and circlip.

(12) Refit the gearshift boot, the boot retainer plate and the lock nut and knob. Tighten the knob lock nut to 120 lbs. ins.

8. TO DISASSEMBLE TRANSMISSION

(1) Remove the foremost spring pin connecting the cranked gearshift connecting rod and gearshift rail.

(2) Remove gearshift housing assembly.

(3) Remove the front bearing retainer and extension housing.

(4) Use a soft drift to knock the countershaft partly through from the front of the gearbox case to allow the lock plate to be removed. Remove the lock plate.

(5) Push the countershaft out through the rear of the case with a dummy countershaft. Dimensions for a dummy countershaft are as follows: Length 9.000" x Diameter .830".

(6) Remove detent screw. Turn transmission on its side and allow detent spring and detent pin to fall out.

(7) Remove the top cover and discard the gasket. Mount the gearbox on repair stand Tool No. E9C5 or vice.

(8) Rotate the gearshift rail and move rearwards so that the operating pin is free of the interlock spool. Using special Service Tool No. E21C20, remove operating pin.

The long end of the adaptor pin supplied with this tool should be fitted against the end of the pin that is flush *with the gearshift* rail. Turning the handle of the tool in a clockwise direction will press the gearshift rail operating pin out through the bottom of the tool.

NOTE: 1. Do not press on the end of the gearshift rail operating pin that protrudes from the gearshift rail.
2. Ensure that the gearshift rail operating pin is not pressed against the gears.
3. On no account should any attempt be made to hammer the gearshift rail operating pin out of the shaft, as the gearshift rail may be bent by this action.

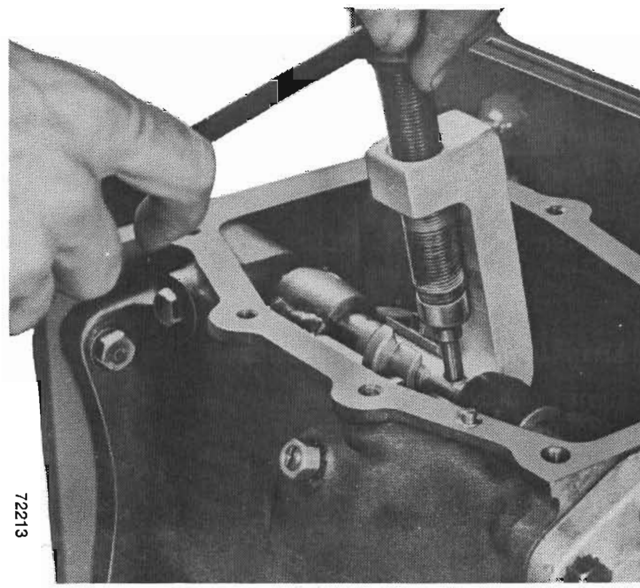


Fig. 6 – Removing gearshift rail operating pin using Tool No. E21C20.

(9) Withdraw the gearshift rail completely.

(10) Remove gearshift forks and interlock spool.

(11) Pull the maindrive gear complete with bearing from the front of the case. Remove the fourth speed blocker ring.

(12) Remove the rear (mainshaft) bearing outer snap ring.

(13) Push the mainshaft assembly forward so that the mainshaft bearing moves through into the gear case.

(14) Push the third and fourth synchronizer sleeve toward the rear of the gearbox to engage third gear. Remove the mainshaft assembly through the top of the gear case.

(15) Remove the reverse lever eccentric pin and lift the reverse lever assembly from the case.

(16) Remove the reverse idler shaft.

(17) Remove the reverse idler gear and cluster gear assembly.

Should it be necessary to disassembly the sub-assemblies the following procedure *should* be followed:

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Mainshaft

Before commencing to dismantle the mainshaft assembly, the first speed, second speed and third speed gear end floats should be checked with the aid of feeler gauges inserted between the shoulder of the mainshaft or bearing and the respective gear.

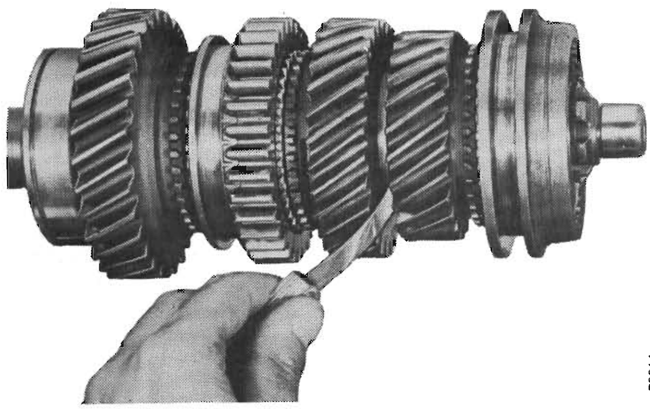

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Fig. 7 – Checking end float—third speed gear.

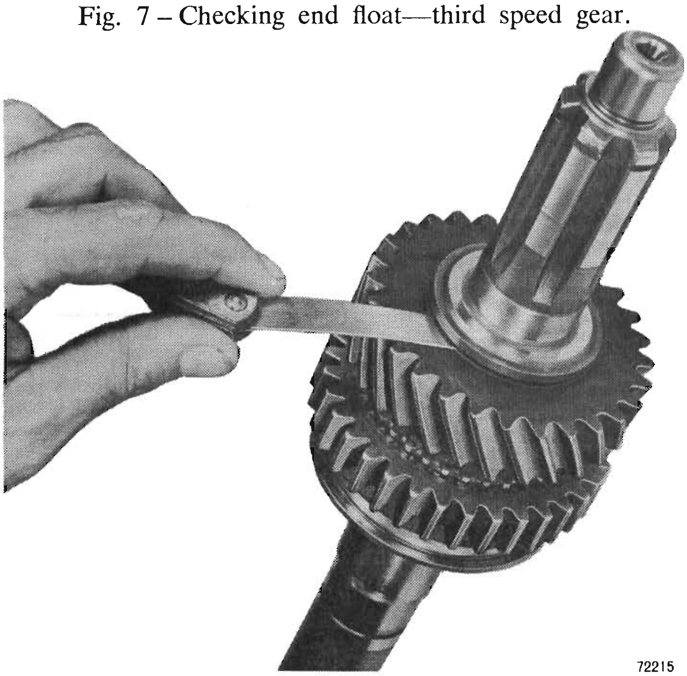

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Fig. 8 – Checking end float—second speed gear.

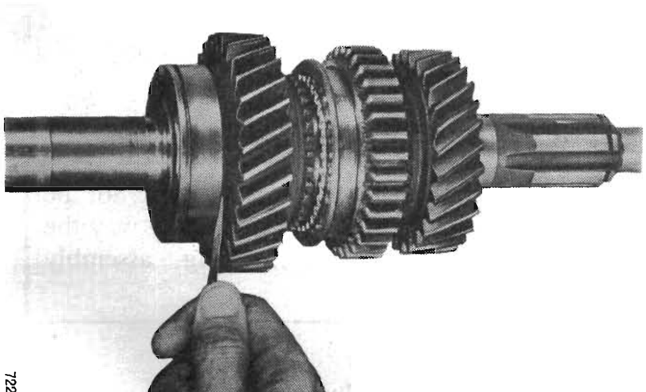

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Fig. 9 – Checking end float—first speed gear.

The end float for each gear is as listed:

Third speed gear	.005″ to .020″
Second speed gear	.006″ to .017″
First speed gear	.002″ to .027″

Should the end float of any gear fall outside the above limits the following dimensions must be checked after disassembly in order to determine which component must be replaced to bring the end float within specifications.

Gear 1st speed width	2.105″-2.108″
Synchro. Hub 1st and 2nd—width to 1st speed thrust face	.603″- .607″
Synchro. Hub 1st and 2nd width from 2nd gear thrust face to snap ring thrust face	.885″- .889″
Gear 2nd speed width	1.836″-1.839″
Gear 3rd speed width	1.825″-1.828″
Synchro. Hub 3rd and 4th width	.885″- .889″

(1) Press rear of speedometer clip down to allow speedo drive gear to slide over it. Remove clip and gear from mainshaft.

(2) Remove snap ring from front of mainshaft.

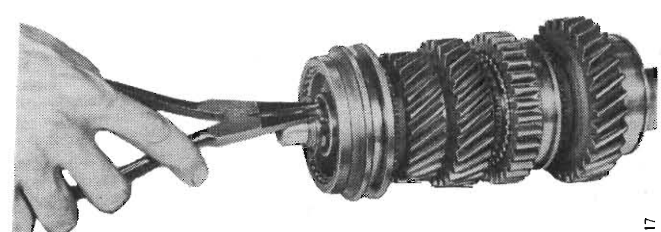

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Fig. 10 – Removing snap ring—third and fourth speed synchronizer.

(3) Remove 3rd and 4th synchronizer assembly from mainshaft.

(4) Remove 3rd speed blocker ring and 3rd speed gear from mainshaft.

(5) Remove the rear bearing snap ring. Place the jaws of a universal type puller between the synchonizer teeth of the first gear and the actual gear teeth of that gear. Note that it may be necessary to reverse the direction of the puller jaws to prevent them from pressing on the gear teeth edges. Press on the rear end of the mainshaft to remove the rear bearing and first speed gear.

CAUTION: Do not press on the front face of the second speed gear at this stage as damage to the mainshaft will result. A snap ring that is hidden when the mainshaft is assembled, holds the second speed gear and the first and second gear synchronizer in place on the mainshaft.

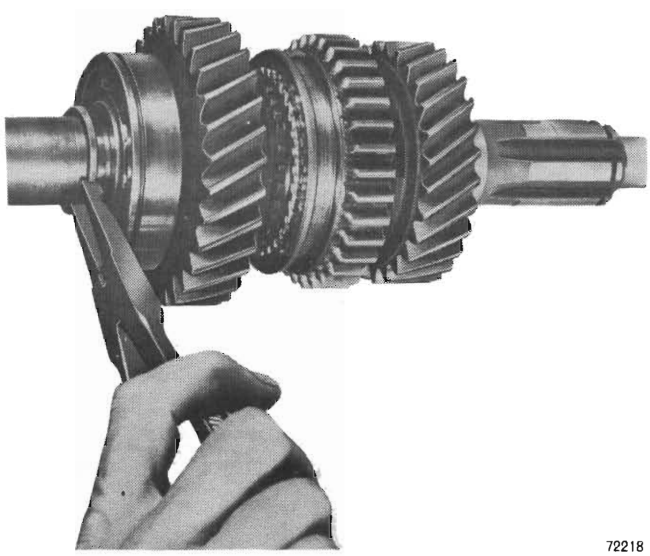

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Fig. 11 – Removing rear bearing snap ring.

(6) Remove 1st and 2nd synchronizer hub snap ring from the mainshaft.

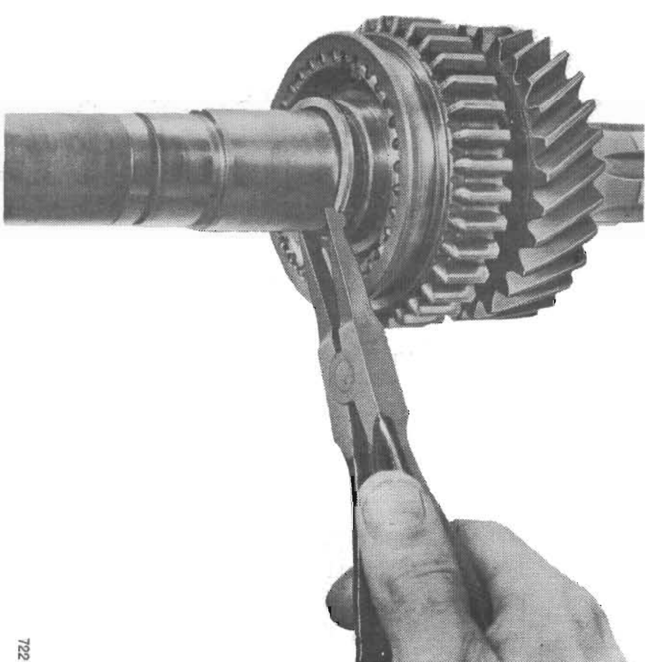

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Fig. 12 – Removing snap ring—first and second speed synchronizer.

(7) Remove the 1st and 2nd synchronizer inner hub and reverse sliding gear, the second speed gear and blocker ring by supporting the rear face of the second speed gear and pressing on the front end of the mainshaft.

CAUTION: 1. When pressing on the rear face of the second speed gear always ensure that the faces of the second speed gear, the end of the mainshaft and the blocks mounted on the press are square to each other.
2. Do not press on the thrust face flange of the mainshaft.

(8) Slide the 3rd and 4th synchronizer sleeve from synchronizer hub and remove springs and shift plates.

(9) Slide first and second speed synchronizer sleeve from synchronizer hub and remove springs and shift plates.

Countershaft

(1) Remove dummy shaft and cluster gear thrust washers.

(2) Remove needle rollers and needle roller thrust washer.

NOTE: There are 54 needle rollers and 3 needle roller thrust washers *each end.*

Maindrive Gear

(1) Remove needle rollers from bore of gear.
(2) Remove snap ring from shank of gear. *(refer Fig. 13).*
(3) Remove maindrive bearing and oil slinger.

Gearshift Housing Assembly

(1) Remove reverse light switch.
(2) Remove cup plug in rear of housing.
(3) Remove gearshift operating rod.
(4) Remove nylon damping block.

NOTE: Reverse thrust block should not be removed. If it is damaged in any way the complete gearshift housing assembly should be replaced.

Cleaning and Inspection

Clean all parts (including case) in a suitable solvent and blow dry with compressed air.

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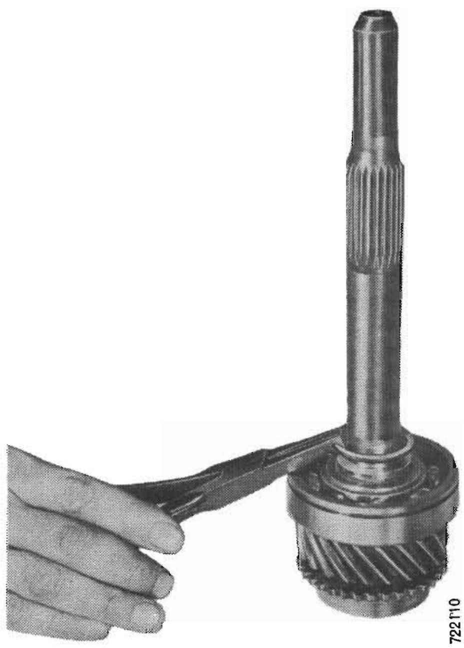

Fig. 13 – Removing snap ring—maindrive gear bearing.

CAUTION: Do not spin bearings with compressed air. The bearings should be immersed in clean solvent and rotated by hand until clean. A bearing that is spun by air pressure is likely to score due to the absence of lubrication.

Lubricate the clean bearing with light oil, then turn by hand to test for roughness, looseness or wear. Test the fit of the bearings on their respective shaft and in the bores.

Inspect the cluster gear and maindrive shaft needle bearings and bearing surfaces for scoring or wear. Inspect the mainshaft splines for galling or scoring. Inspect bearing mounting surfaces and snap ring grooves. Slight nicks or burrs can be stoned off. Inspect all gears for excessive wear or damage. Inspect synchro. springs for distortion and loss of tension. Check depth of penetration of taper of mating gears and synchro. blocker rings. Check blocker ring teeth for wear or damage. Inspect the general condition of the transmission case and extension housing and all the threaded holes and plugs for stripped and pulled threads. Inspect all mating and gasket surfaces for scratches and roughness. Examine detent pin and shaft for wear. If the pin and shaft show signs of excessive wear to the extent of not locking in gear install a new shaft and/or pin. Replace nylon damping block if excessively worn.

9. TO ASSEMBLE TRANSMISSION

Sub-Assemblies

Mainshaft

Assemble the first and second speed synchronizer assembly as follows:

(1) Lubricate the synchronizer sleeve and reverse gear and fit to the inner hub with the teeth of the gear and the inner hub spline protrusion at opposite ends.

(2) Slide the sleeve across the hub until three shift plates can be fitted into the slots in the inner hub.

(3) Install two synchronizer springs under the shift plates behind the pads with the long lug of each spring in the same shift plate.

NOTE: The spring tangs should locate on opposite sides of the same shift plate so that the spring openings do not line up *—see Fig. 14.*

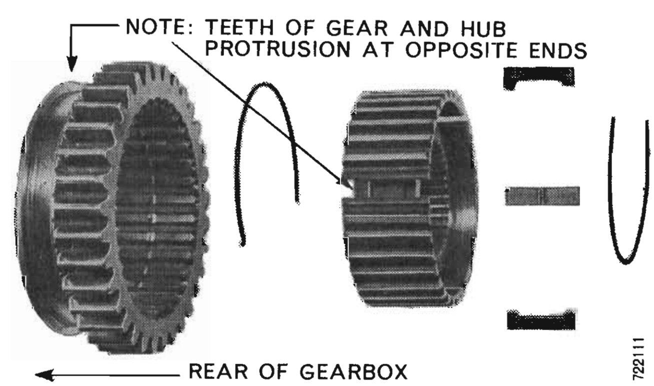

Fig. 14 – Exploded view—first and second speed synchronizer.

(4) The third and fourth speed synchronizer assembly is assembled the same way as the first and second except that the sleeve is assembled to the hub with the sleeve selector groove and inner hub spline protrusion at *opposite ends—see Fig. 15.*

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NOTE: HUB PROTRUSION AND SELECTOR GROOVE AT OPPOSITE ENDS

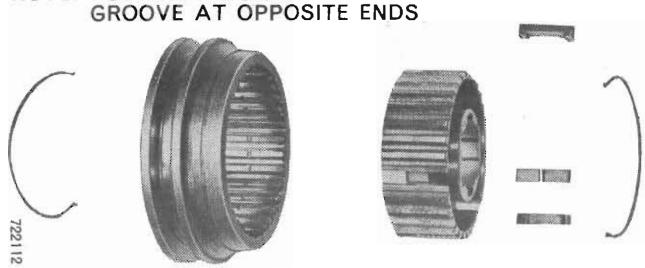

Fig. 15 – Exploded view—third and fourth speed synchronizer.

(5) Lubricate the second speed gear bore and fit with the blocker ring to the mainshaft.

> NOTE: Slots in blocker rings should be .345"-.360" wide.

(6) Install the first and second speed synchronizer assembly to the mainshaft with the reverse gear sleeve gear teeth towards the front of the mainshaft.

(7) Assemble snap ring, selecting the snap ring to keep the synchronizer hub end float to a minimum within the limits .000"-.004".

(8) Lubricate bore of first speed gear and with blocker ring fitted assemble to the mainshaft.

(9) Install mainshaft bearing and snap ring selecting the snap ring to keep end float to a minimum within limits .000"-.004". DO NOT install snap ring to the outside diameter of the mainshaft bearing.

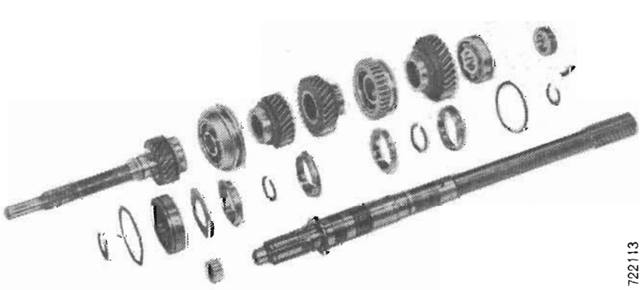

Fig. 16 – Exploded view—mainshaft and maindrive assemblies.

(10) Lubricate the third speed gear bore and install it with blocker ring to the mainshaft.

(11) Lubricate the third and fourth speed synchronizer assembly and install to the mainshaft with the inner hub spline protrusion to the front of the mainshaft. Install a snap ring to the mainshaft.

(12) Check all gears as specified in disassembly procedure to ensure correct end float.

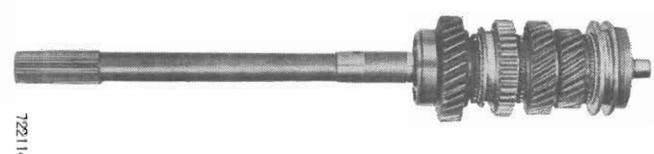

Fig. 17 – Mainshaft—assembled condition.

(13) Move the third and fourth speed synchronizer sleeve to engage third gear and the first and second synchronizer sleeve to engage second gear. The mainshaft is now completely assembled ready for assembly into the case.

Countershaft

Assemble the cluster gear, dummy countershaft and bearings as follows:—

(1) Insert the dummy countershaft into the cluster gear. Install a cluster gear needle roller thrust washer into each end of the gear. Fit two sets of 27 needle rollers at each end separating each row with a needle thrust washer.

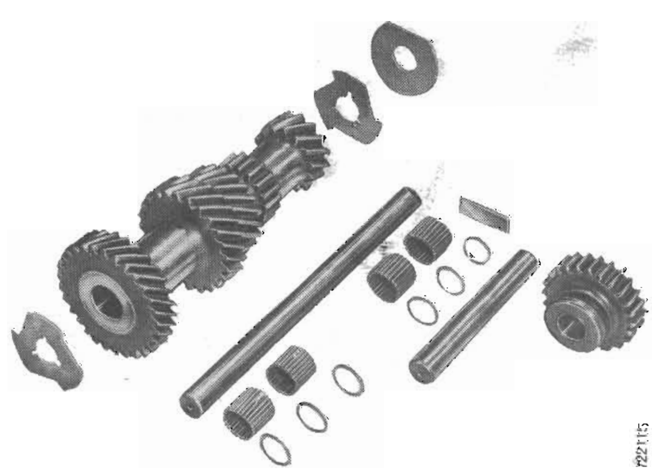

Fig. 18 – Exploded view—cluster gear and reverse idler gear.

(2) Install needle thrust washers at each end of the dummy countershaft together with two thrust washers at the rear (smallest step end) of the cluster gear and one thrust washer at the front end of the gear.

NOTE: The thrust washers at the rear consist of one bronze and one steel washer. The steel washer sits against the thrust face of the case with the tang inserted in the slot. The bronze thrust washers are opposite in hand and must be assembled as follows:— The front washer has one wide tang which fits into a slot in the case, the rear washer has two small tangs which fit in grooves provided in cluster gear. These washers may be retained with grease.

Maindrive Gear

(1) Fit oil slinger with the step in the centre of slinger contacting the bearing. Fit maindrive bearing selecting a snap ring to keep end float to a minimum within the limits .000″ to .004″. Fit the fourth speed synchronizer blocker ring to the maindrive gear.

Install 15 needle roller bearings into the maindrive. Retain with grease.

Gearshift Housing

(1) Install new gearshift housing oil seal into the gearshift housing. Fill bottom of reverse light switch hole with grease.

(2) Install gearshift operating rod with damper block.

(3) Fit new cup plug to housing, ensuring that bottom of plug is abutting the machined shoulder of the housing. Centre punch the housing flange in three equally spaced locations to further retain the cup plug.

(4) Assemble cranked rod to the operating rod with a roll pin. The split in the roll pin must face in the direction of the load applied, i.e. toward the front of the gearbox.

To Install Sub Assemblies

(1) Fit the reverse idler gear and bush assembly to the reverse idler shaft with the fork groove towards front of case. The shaft must be inserted with locking plate groove at rear of case and in the correct location relative to the cluster gear countershaft locking plate groove.

(2) Assemble reverse gear lever assembly into position, then fit eccentric pin through the lever and case.

Install eccentric pin with centre punch mark, at threaded end, towards the top of the case. Fit lockwasher and tighten nut finger tight.

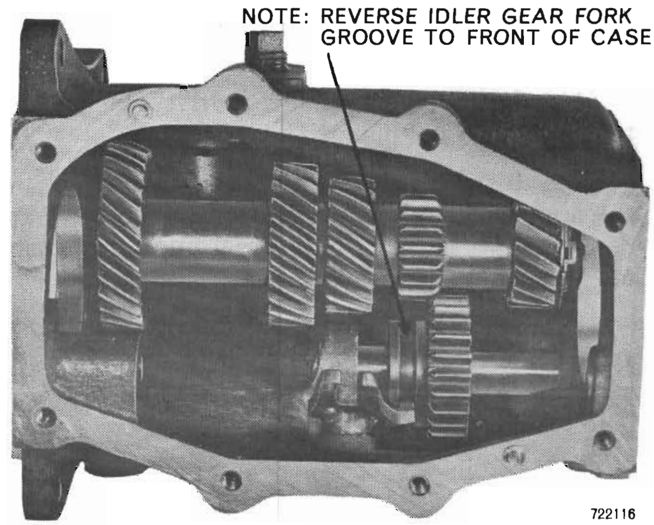

Fig. 19 – Cluster and reverse idler gear—assembled condition.

(3) Lower cluster gear assembly into the bottom of the gear case, ensuring that the tangs of the thrust washers enter the grooves of the case.

(4) Lower mainshaft assembly into case and locate bearing in case bore. Tap front of mainshaft assembly with a soft hammer, until the mainshaft bearing snap ring can be assembled to locate on rear face of case.

(5) Assemble maindrive assembly and fourth speed blocker ring into case from the front. Fit maindrive bearing outside diameter snap ring and tap end of maindrive with a soft hammer until the snap ring abuts the front of the case. Take care not to dislodge the maindrive rollers.

(6) If removed press new bearing retainer oil seal into the bearing retainer with tool No. E21C10D. Coat the oil seal outside diameter with a light coat of gasket cement.

(7) Use a light coating of gasket cement to position the bearing retainer gasket and install the bearing retainer with four bolts, tightening up the bolts to 20-25 lbs. ft. torque. Coat threads of bolts with jointing compound.

(8) Bring the cluster gear into mesh by carefully turning the gear case upside down and allowing the cluster gear to drop into place. It may be necessary to rotate the maindrive to ensure proper meshing.

(9) Using the countershaft, drive out the dummy shaft through the front of the case until the locking plate slot in the countershaft is flush with the rear face of case. The slots in the countershaft and the reverse idler shaft must be parallel and adjacent.

(10) Install the locking plate to the countershaft and reverse idler shaft, tapping to bring the plate against the case.

(11) Install the speedometer drive gear and retaining clip to the mainshaft.

(12) If necessary install a new bush in the extension housing end as previously shown. Press new gearshift selector rail oil seal into front flange of extension housing as required.

(13) Place a suitable protector over the mainshaft splines to prevent damage to the extension housing oil seal and bush whilst installing extension housing assembly.

(14) Install the extension housing gasket using a light coating of gasket cement. Install the extension housing with six bolts and lock washers and tighten to 45-55 lbs. ft. torque.

(15) Position both synchro. sleeves in neutral and fit gearshift forks into sleeve grooves. Ensure that the slots in the fork arms and the slot in the reverse lever line up.

(16) Position interlock spool between the two fork bosses with the flange located in the fork arm slots. Insert the detent shaft through the extension housing and rear of case. Take care not to damage the oil seal in extension housing flange. Thread the shaft through the first and second fork, the interlock spool, the third and fourth fork towards the front of the case, until the shift pin hole is vertical and midway between the first and second fork and the interlock spool.

> NOTE: Ensure that when the shaft is rotated, with the shift pin hole vertical, that the detents at the end of the shaft are facing towards the top of the transmission. This must be done to ensure that, when the detents are rotated back to their correct position, the shift pin will operate the gearshift forks.

(17) Press the shift pin into the selector shaft using special Service tool No. E21C20. The short end of the adaptor supplied with tool No. E21C20 should be used for pressing the gearshift rail operating pin into the gearshift rail. Start the pin in the shaft, fit the inside bore of the adaptor over the pin and screw the handle of the tool in a clockwise direction. The depth of the bore in the adaptor is pre-set so that when the end of the adaptor seats on the gearshift rail, the dimension from the end of the pin to the opposite side of the shaft will fall within the limits of 1.055"-1.045".

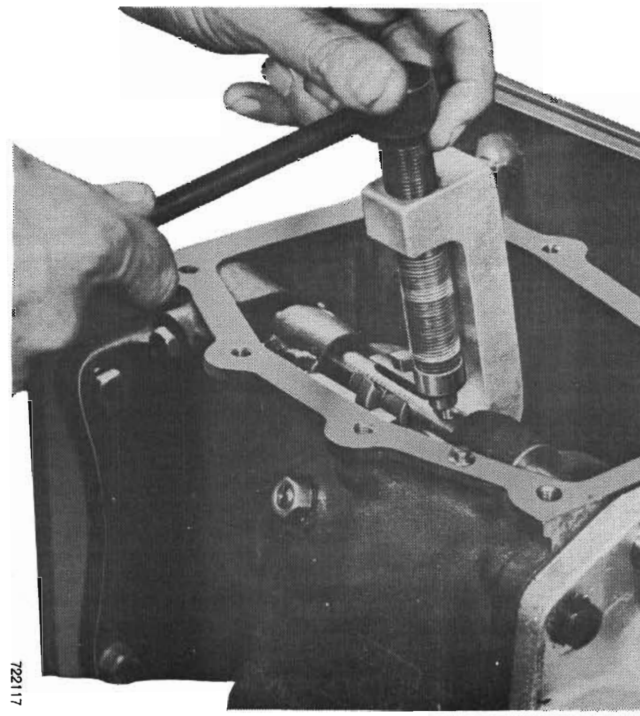

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Fig. 20 – Replacing gearshift rail operating pin— using tool No. E21C20.

(18) Rotate the interlock spool until the slot, in the spool, and the shift pin are aligned.

(19) Push the selector shaft forward through the slot until the pin is in alignment with the interlock spool flange.

(20) Rotate the pin to enable it to sit in the fork arm slot of one of the gearshift forks.

(21) Fit the detent pin, spring and screw into the detent hole at the side of the case. Tighten the screw to 25-30 lbs. ft, torque.

(22) Position the gear box top cover gasket and top cover tightening the eight bolts and lock washers to 8-12 lbs. ft. torque.

(23) Adjust position of reverse idler gear against location face in the transmission case as follows:

Gearshift rail to be in neutral position.

Ensure that centre punch mark on the eccentric pin is towards the top. Using a screwdriver rotate the eccentric pin in a clockwise direction until it becomes tight then back off to ensure that gearshift rail rotates freely whilst in neutral position. Tighten clamp nut to 20-25 lbs. ft. torque. Again check for free rotation of the gearshift rail. Readjust if necessary.

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(24) Assemble gearshift housing assembly onto extension housing with three bolts and lockwashers, tighten to 45-55 lbs. ft. torque. Fill the gearshift housing with wheel bearing grease.

(25) Press roll pin into gearshift rail end to connect the cranked gearshift connecting rod and the gearshift rail.

(26) Assemble gearshift lever with pivot ball into gearshift housing and screw down the nylon ball seat, tighten to 15-18 lbs. ft. torque. Secure by bending tab against rib.

(27) Assemble the ball seat thrust washer, spring seat assembly and conical spring onto the gearshift lever, compress the spring and fit the circlip.

(28) Test the gearshift operation to ensure all gears can be selected.

(29) Install the drain and filler plugs, tightening to 20-25 lbs. ft. torque.

(30) Install the breather in the extension housing with the flat towards the flat on the extension housing.

NOTE: Gear lever must be removed before installing transmission into vehicle.

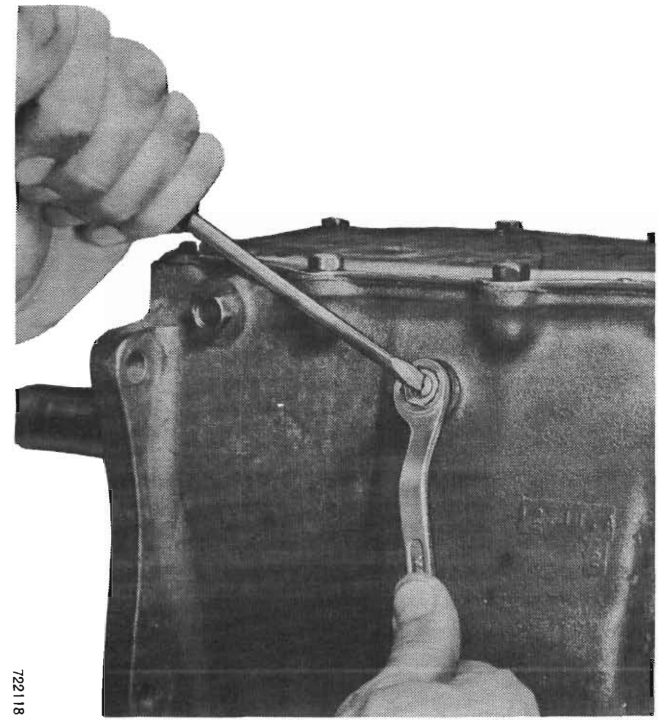

Fig. 21 – Adjusting location of reverse idler gear.

GROUP 22

WHEELS, BEARINGS AND TYRES

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SPECIFICATIONS

WHEELS

TYPE	Pressed steel disc/Cast **aluminium alloy**
RIM	Drop centre safety
SIZES	
All models except *	14 x 5.5″ JJ
*Pacer, Regal 770, Charger RT & 770	14 x 6.5″ JJ Styled Wheel
Charger RT (with A84 or A87 Opt.)	14 x 7.0″ JJ Cast Aluminium Alloy

TYRE PRESSURES (P.S.I.)

TYRE SIZE	Light load (cold) F	Light load (cold) R	Full load (cold) F	Full load (cold) R
6.95L 14 x 4 Ply	24	24	24	28
7.35L 14 x 4 Ply	24	24	24	32
185SR 14	28	26	28	32
E70HR 14	28	26	28	32
7.35 14 x 6 Ply	24	24	32	36

DO NOT FIT 6.95L 14 TYRES to 6½″ or 7″ RIMS
DO NOT FIT 7.35L 14 TYRES to 7″ RIMS

TYRE AND RIM RELATIONSHIP IS CRITICAL. DO NOT DEVIATE FROM THE STANDARDS OF THE TYRE AND RIM ASSOCIATION OF AUSTRALIA.

WHEEL NUT TORQUE

1st Stage	30 lbs. ft. Tightened Alternately
2nd Stage	55 lbs. ft. Tightened Alternately

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. SIDE WEAR

(1) Outside — excessive positive camber.

(2) Inside — excessive negative camber.

(3) Outside and inside — under-inflation or vehicle overload.

2. CENTRE RIBS WEAR

(1) Over-inflation.

3. SHARP RIB WEAR

(1) Inside edges — toe-in.

(2) Outside edges — toe-out.

(3) One tyre sharp inside, opposite tyre sharp outside — bent arm or knuckle.

4. TYRE THUMP, TRAMP, SQUEAL

(1) Fabric damage.
(2) Out of balance condition.
(3) Incorrect air pressure.
(4) Incorrect steering geometry.

5. ABRASIVE ROUGHNESS ACROSS TREAD

(1) Excessive cornering speed.

6. UNIFORM SPOTTY WEAR

(1) Lack of tyre rotation.

7. UNEVEN SPOTTY WEAR

(1) Driving habits.
(2) Improper inflation.
(3) Loose or worn parts.

8. WHEEL TRAMP

Wheel tramp usually develops at high speeds and is caused by the bouncing of the wheels on the road. The effects of wheel tramp can be felt, not only in the steering wheel, but also throughout the car. Wheel tramp is caused by excessive looseness of wheel bearings, lack of control in shock absorbers or out of balance wheels.

9. WHEEL BEARING NOISE

To determine if the wheel bearings are worn or damaged, road test the car and apply brakes.

This action will take some of the load off the wheel bearings, and noise, if present, will diminish, indicating that the bearings are at fault. Raise front wheels and check for loose bearings by shaking wheels in and out.

If a wheel is loose, remove it and check condition of bearings and bearing cups before tightening the bearings.

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The safety rim wheel has raised sections between the rim flanges and the rim well *(see Fig. 1)*. Initial inflation of the tyre forces the beads over these raised sections. In case of a blowout, the raised sections tend to hold the tyre in position on the wheel, thus permitting control of the vehicle until it can be brought to a safe stop.

Tubeless tyres have a uniformly smooth bead contact area in order to form an air seal with the wheel rim.

Any foreign matter accidentally forced between the tyre bead and rim, may cause an immediate air leak, or the formation of rust, which would eventually cause an air leak.

Fig. 1 – Safety type rim

Each time the car is lubricated, the air pressure of all tyres should be checked to specifications. They should also be inspected for damage and embedded foreign matter at the same time.

Tyres and Rim Sizes

The tyre and rims have been matched to the performance of the vehicle to which they have been fitted.

If variations in tyre and rim sizes are desired, ensure that the tyre size to rim size relationship meets the standards laid down by the Tyre and Rim Association of Australia.

Radial Ply Tyres

Radial ply tyres must be used in sets of five (5) and under no circumstances should they be used on the front only. If snow tyres are installed on the rear wheels, conventional (cross bias) tyres must be mounted on the front wheels. Not doing this will result in over-steer and could possibly cause spins on wet or icy roads. The safest policy is *never intermix radial ply tyres with conventional (cross bias) tyres.*

Wide Tread 70 Series Tyres

The use of standard 70 series wide tread or extra wide tread bias tyres is acceptable on your vehicle *if the size is listed* in the tyre chart. The use of oversize tyres of this construction (that are not listed) may cause interference with vehicle components under extremes of suspension and steering travel and may cause tyre damage.

For maximum satisfaction these tyres should be used only in sets of five and *under no circumstances* should they be *used on the front only.* If snow tyres are used they must also be of the same wide tread — low profile 70 series design.

2. INFLATION

Tyre inflation pressure is one of the most important elements of tyre care. Inflation pressures recommended for all vehicle models have been carefully selected to provide a proper balance between ride, handling, and tyre life. *See Tyre Pressure Chart.*

Tyre pressures should be checked at least once a month and should be checked and adjusted before any long trips. Check and adjust tyre pressures with the tyres cold if possible. It is normal for tyre air pressure to increase (2 – 4 P.S.I.) due to temperature increases caused by tyre flexing. *Under no circumstances* should inflation pressure of warm tyres be reduced.

When it is not possible to check tyre air pressure cold, assume a (2 – 4 P.S.I.) increase over cold pressures. It may be recognised that this method is not as accurate as checking pressures when the tyres are cold. Always check tyre 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 centre of tyre treads and poor steerihg returnability.

Lower tyre pressures than those recommended on the chart can result in greater fuel consumption, rapid wear toward the edges of tyre tread, less resistance to rim bruises and various types of ply and tread separation, cord fatigue or breakage and increased steering effort.

Tyre valve caps (or valve extensions) should always be re-installed on the valve and tightened finger tight. They assist in retaining air and also keep foreign matter out of the valve.

3. TYRE ROTATION

With increased road speeds and faster cornering, abnormal tyre wear may exist on certain wheels. By rotating tyres regularly the tyres that show the abnormal wear may be placed in another location where the rotation of the wheel is reversed. This will tend to eliminate the wear pattern and lengthen tyre life. Tyre rotation should be carried out in accordance with the schedule in *Group 1, "Lubrication and Maintenance"*. Spare tyres age and deteriorate almost as much as tyres in use, therefore the rotation plan *(see Fig. 2)* should be used consistently to obtain maximum life of all tyres.

Under normal operating conditions it is recommended that tyres be rotated at every oil change. This reduces the possibility of tyre noise and equalises tyre wear. *Figs. 2a and 2b* are the recommended sequence for the rotation of tyres. Under conditions of severe service, they should be rotated more frequently. Uneven tyre wear is frequently the cause of tyre 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 tyre noises.

When rotating the road wheels on Charger RT models equipped with 7″ Cast Aluminium Alloy rims, ensure that the rear brake drums are not fitted with the retainer on the axle shaft stud. This allows a better seating of the rim to the brake drum.

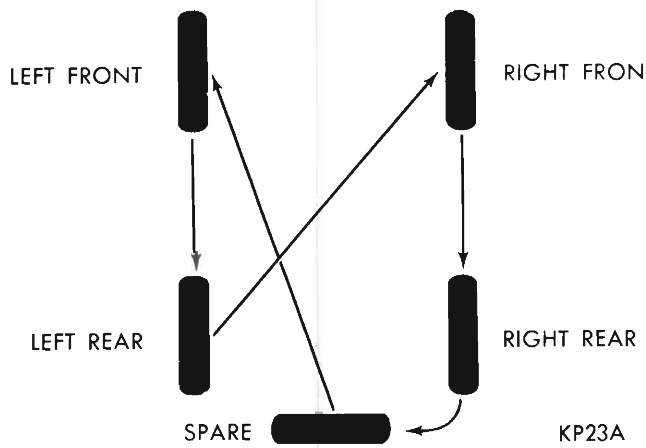

Fig. 2a – Tyre rotation diagram – 5 tyres

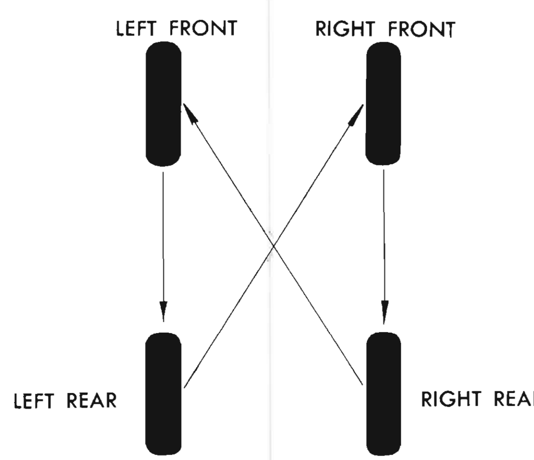

Fig. 2b – Tyre rotation diagram – 4 tyres

4. WHEEL AND TYRE RUN-OUT

Wheels and tyres may be checked for both radial and lateral run-out. Radial run-out is the difference between the high and the low points on the treads of the tyre; lateral run-out is the wobble of the wheel and/or tyre.

Prior to checking wheels and tyres for run-out, the face of the hub at the mounting bolts should be inspected and checked for run-out. The hub should be free to rotate, but tight enough to prevent wobble.

The car should be driven a short distance before the check is made so that flat-spotting of the tyre from being parked does not affect the run-out measurement. This check should precede tyre balancing.

(1) Attach the dial indicator to a firm base so it will be held steady whilst taking run-out readings.

(2) Place the plunger of the dial indicator against one of the centre ribs of the tyre tread and rotate the wheel slowly to check radial run-out. This measurement should not exceed .060″.

(3) To check lateral run-out (wobble) position the dial indicator against the side of the tyre. This measurement should not exceed .080″. Rotating the tyre on the wheel may reduce the run-out, or it may be necessary to take dial indicator measurements of the wheel itself in order to determine which unit has the excessive run-out.

Since the exterior surfaces of the wheel rim may have paint runs or bubbles, scratches or other imperfections, it is better to dial indicate the protected areas 'A' and 'B' *(see Fig. 3)*. The radial run-out 'A' should not exceed .030″. The lateral run-out (wobble) 'B' should not exceed .040″.

5. WHEEL BALANCE

The need for balancing wheels is indicated by heavy vibration of the steering wheel of the car when driving at speeds above 40 M.P.H. over a smooth, straight highway.

Static (still) balance is equal distribution of the weight of the wheel and tyre around the spindle in such a manner that the wheel assembly has no tendency to rotate by itself, regardless of its position. A wheel that has a heavy spot is statically out of balance, resulting in a hopping or bouncing action.

Fig. 3 – Run-out checking areas A and B

A wheel and tyre to be in dynamic balance must first be in static balance, and also be in balance from side to side when the wheel is at right angles to the axis of rotation. A wheel not in dynamic balance tends to wobble or shimmy.

Correction of static unbalance is made by first finding the location of the heavy spot, then adding sufficient weight to counterbalance it at a location opposite the heavy section. A dynamic balancer is then used to add equal and opposite weights on the inside and outside rims to produce a smooth running wheel at all speeds.

6. REPAIRING LEAKS

In the case of slow air leakage, the puncturing object may be seen or the escaping air can be heard. At times it may be necessary to apply soapy water solution to the tyre or to submerge the tyre and rim in water in order to locate the leak.

Leaks between the tyre and wheel require the removal of the tyre. Leaks in the tyre can often be temporarily repaired without removing the tyre. *(refer para's. 13 and 14).*

7. DISMOUNTING AND MOUNTING TYRES

Any tools used for dismounting and mounting tyres must be smooth, free from sharp edges or projections which could damage the tyre.

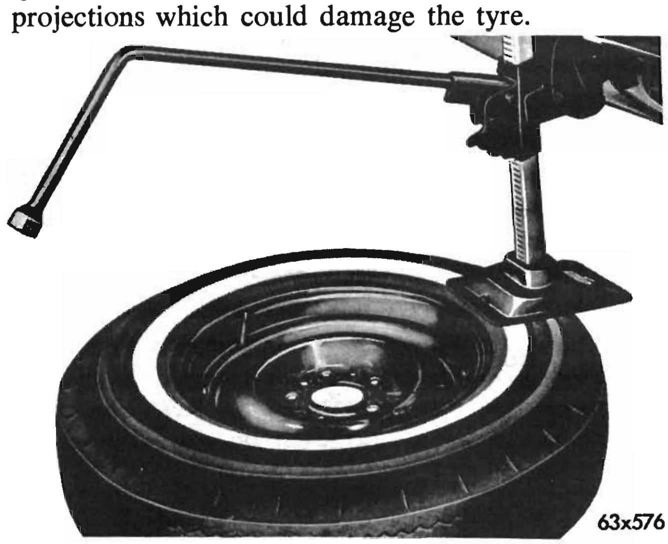

Fig. 4 – Removing tyre with car jack

To Remove

(1) Remove the valve core and completely deflate the tyre.

(2) Carefully force both tyre beads over the safety raised rim section into the drop centre section. A Tyre Bead Breaking Tool should be used to force the tyre beads over the raised rim section. However, the car jack may be used as an alternate method. *(See Fig. 4)*.

(3) Whilst holding one bead in the centre section, pry the other bead off the wheel. Then remove the remaining bead to complete the removal.

To Clean and Inspect

(1) Remove any rust inside the wheel rim and any roughness on the butt weld in the tyre contact area.

(2) The sealing areas of both tyre beads must be smooth and uniform.

To Install

(1) Apply a mild soap and water solution to both tyre beads.

(2) Place the one bead over the rim of the wheel, working the entire bead into the low section of the rim.

(3) Place the other bead over the wheel rim and work the entire bead into the low section of the rim.

(4) Whilst applying air through the valve stem, strike the tread sharply with a rubber hammer to force both beads outwards over the raised irm section. It may be necessary to use a bead expander *(see Fig. 5)* or a rope torniquet *(see Fig. 6)*.

(5) When both tyre beads are fully seated, adjust air pressure to specifications.

8. FRONT WHEEL BEARINGS

Front wheel bearing lubricant should be changed at regular intervals. The recommended lubricant is multi-purpose extreme pressure lithium base grease, grade 2. This grease should not be mixed with other types of lubricants.

To Remove

(1) Raise the front wheels clear of the floor.

a. Drum Brake Models only —

Remove the wheel cover, grease Cup, bearing, adjusting nut, and slide the wheel, hub and assembly off the spindle.

b. Disc Brake Models only —

1. Remove the wheel cover, wheel nuts, then wheel assembly.
2. Remove disc brake caliper assembly to steering knuckle attaching screws.
3. Carefully slide the caliper assembly off the disc and suitably support caliper assembly.

> CAUTION: Do not allow caliper assembly to hang by brake hose, as possible hose damage may result.

4. Remove the grease cap, cotter pin, lock and adjusting nut, washer and outer bearing, then slide the disc assembly carefully off the spindle.

Both Brake Models —

Drive out the inner oil seal and remove the bearing cones.

To Clean and Inspect

(1) Clean the hub assembly and the bearings in kerosene, mineral spirits or other similar cleaning fluids.

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Fig. 5 – Expanding tyre beads

(2) Examine the bearing cups for pits, brinnel marks or other imperfections. If cups are damaged, drive them from the hub with a soft steel drift, positioned in the slots in the hub.

(3) Bearing cup areas in the hub should be smooth, without scored or raised metal which could keep the cups from seating against the shoulders in the hub.

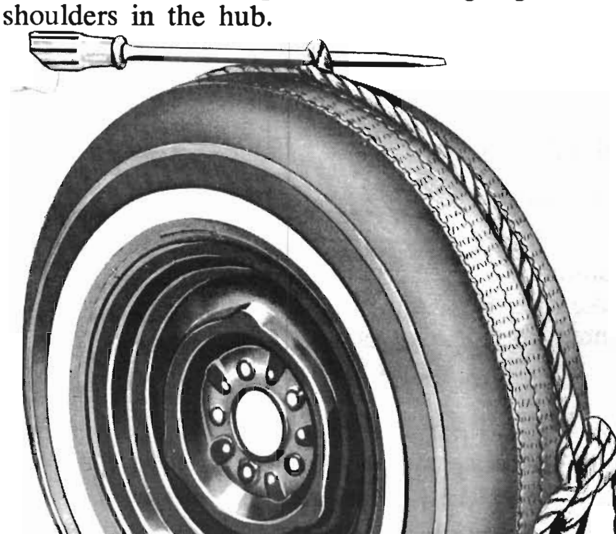

Fig. 6 – Expanding tyre beads (Rope tourniquet)

(4) The cones and rollers should have smooth, unbroken surfaces without brinnel marks. The end of the rollers and both cone flanges should also be smooth and free from chipping or other damage.

To Install

(1) If bearing cups were removed, start the new cups into the hub evenly, driving them flush with the hub, using a soft steel block and a hammer. Seat the cups against the shoulders in the hub using a soft steel drift and a hammer.

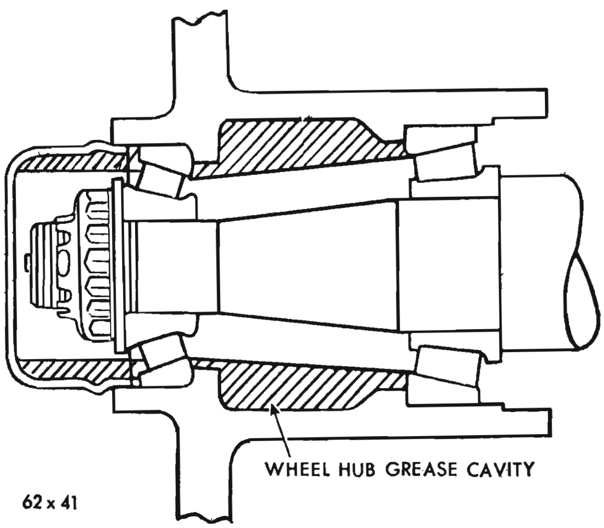

Fig. 7 – Fill cavity with wheel bearing lubricant

(2) Fill the hub cavity with wheel bearing lubricant *(see Fig. 7)*. Lubricant should be even with inner diameter of bearing cups.

(3) Force lubricant between bearing cone rollers or repack with a suitable bearing packer.

(4) Install inner cone and a new oil seal with lip of seal facing inward. Use a wood block to drive seal flush with end of the hub.

(5) Clean the spindle and install hub assembly.

(6) Install the outer bearing cone, flat washer and adjusting nut.

Disc Brake Models Only

(7) Install caliper carefully over the mounting position and check position of caliper relative to brake disc. Re-install the two mounting screws and tighten to 55 lbs./ft. and bend over lock tabs. Check caliper to disc clearance.

(8) Install wheel and tyre assembly and tighten nuts.

To Adjust

(1) Tighten the wheel bearing adjusting nut to 70 lbs./in. torque whilst rotating the wheel.

(2) Position nut lock on adjusting nut so that one pair of cotter pin slots aligns with pin hole in the spindle *(see Fig. 8)*.

(3) Back off adjusting nut and nut lock assembly one slot and install cotter pin.

(4) Clean the grease cap, coat the inside with wheel bearing lubricant (do not fill) and install the cap.

(5) Install the wheel, tighten nuts to 55 lbs./ft. torque *(see Para. 10* for correct tightening sequence). Install wheel cover.

9. TYRE WEAR

Waves, flat spots, gouges, and cupping in the tyre tread are types of wear.

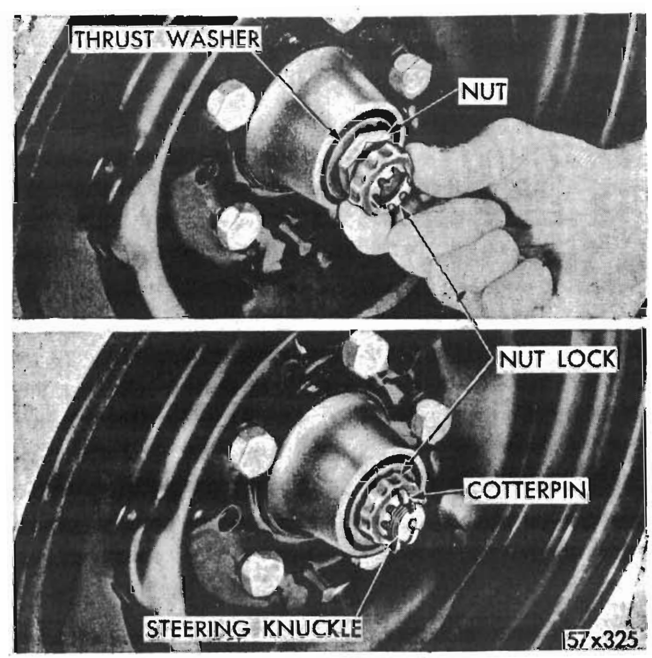

Fig. 8 – Adjusting front wheel bearings

Wear of these types may be caused by one or more factors, which may be difficult to isolate. For example, a single flat spot may be worn in the tread and caused by an unbalanced wheel, due either to wheel and tyre static unbalance or to an out-of-round brake drum. Looseness in the front suspension parts (ball joints, bushings, upper and lower suspension arm mountings, shock absorbers and steering linkage) will permit erratic and irregular wheel movement and cause uneven tyre wear. Mechanical inspection, repair and alignment, together with wheel and tyre balancing, usually will disclose and correct the causes of uneven tyre wear. Be sure, at the time of correction, to rotate wheels *(see Para. 3)*.

Certain types of tyre wear are caused by incorrect adjustments or condition of the vehicle; other irregular tyre wear is due to poor driving habits or incorrect tyre inflation. Rapid acceleration, sudden, severe brake application, rounding curves too fast, or too sharply, and high speed driving will contribute to increased and uneven tyre wear.

Spotty Wear

Spotty wear occurs on front wheels *(see Fig. 9)*. This condition does not progress to any great extent prior to 3,000 miles. It is the natural result of free rolling wheels and tyres. Wheel alignment or front wheel balancing will not correct this condition. The only known method to control the formation of spotty wear is to rotate tyres every 4,000 miles *(see Para. 3)*.

Camber Wear

Excessive positive camber will develop noticeable wear on the outer ribs of the tyres *(see Fig. 10)*. Excessive negative camber will develop noticeable wear on the inside ribs of the tyres. Camber should be adjusted only if this type of wear is evident.

Toe-in and Toe-out Wear

The amount of front wheel toe-in or toe-out affects the rate of tyre wear more than any other single cause *(see Fig. 11)*.

Excessive toe-in or toe-out causes wear on the edges of the front tyres. An excessive amount of either toe-in or toe-out actually drags the tyre instead of letting the tyre 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.

Over and Under Inflation Wear

Tubeless tyres are subject to over-inflation wear in the same way as tube tyres. Over-inflation reduces deflection from normal and causes the tyre to wear in the centre of the tread *(see Fig. 12)* with little or no wear on the outside edges. Over-inflation also causes abnormal tyre growth which subjects the tread to excessive stretching and tread cracking. Over-inflation reduces traction, skid resistance and braking efficiency, increases the possibility of cuts and bruises and lowers the resistance of the fabric to injuries.

Tubeless tyres are subject to under-inflation wear in the same way as tube tyres *(see Fig. 13)*. This type of wear is characterised by excessive wear on the two tread ribs adjacent to the inner and outer shoulder ribs. When a condition of this kind

Fig. 9 – Spotty wear

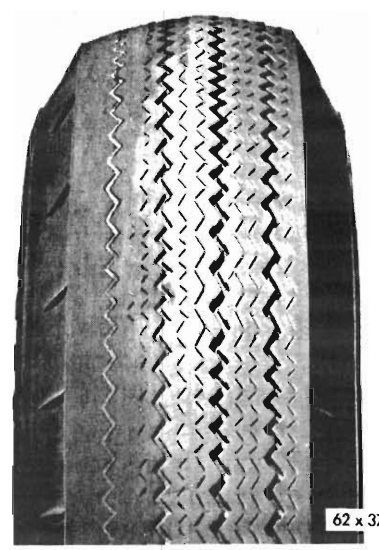

Fig. 10 – Camber wear

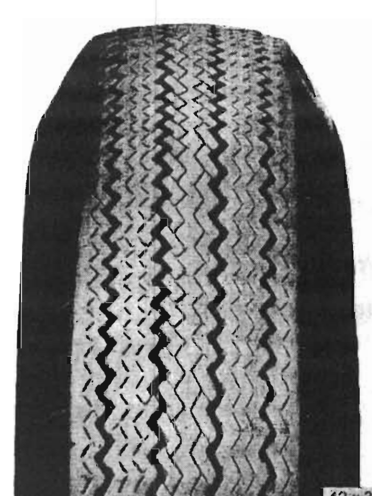

Fig. 11 – Toe-in or Toe-out wear

develops, it is an indication that the tyre has been run at a lower operating pressure than that for which it is designed. Over-inflation wear can be detected by excessive wear at the centre of the tread.

Fig. 12 – Over inflation wear

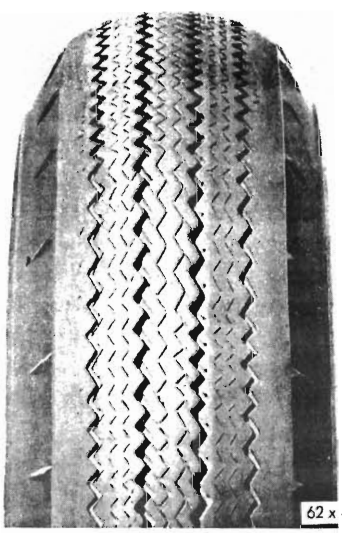

Fig. 13 – Under inflation wear

Cracked Treads

This is the result of alternate under- and over-inflation, exceeding the recommended full rated load, high temperature and high speed driving.

Tyre Tread Wear Indicators

Your potential driving, cornering and braking traction decreases as your tyres wear. Furthermore, as the tread depth is decreased the tyres have less resistance to road *hazards* and are more likely to hydroplane on wet surfaces. Tread wear indicators have been provided to assist in determining when tyres are worn and require replacement. These indicators are moulded into the bottom of the tread grooves and will appear as approximately ½ inch wide bands when this tread depth has been reduced to 1/16 inch *(Fig. 14)*. Tyre replacement due to tread wear is necessary when these indicators appear in two or more adjacent grooves or a localised worn spot eliminates all the tread.

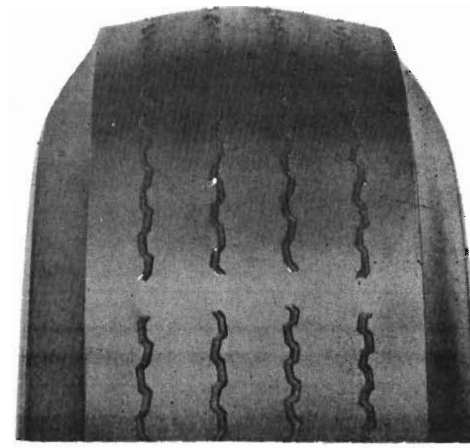

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Fig. 14 – Tyre tread wear indicator (typical)

10. WHEEL STUD TIGHTENING

Tightening sequence and torquing of the wheel stud nuts is of great importance to ensure efficient brake operation.

The use of an impact or long handled wrench may distort the drum. A criss-cross tightening sequence should be used. Tighten all stud nuts to one-half the specified torque first (30 lbs./ft.) and repeat the sequence of tightening to specified torque of 55 lbs./ft.

Tyre Noise or Vibration Complaints

To determine whether tyres 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 tyre noise will usually remain constant. If, after road testing the vehicle, it was determined that tyres may be causing the noise, balance all tyres very carefully and inflate to 50 P.S.I.

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 over-inflating the tyres, continue the road test by deflating one tyre at a time to normal pressure.

When the disturbance returns, the last tyre deflated will usually be the offender. Tyre thump

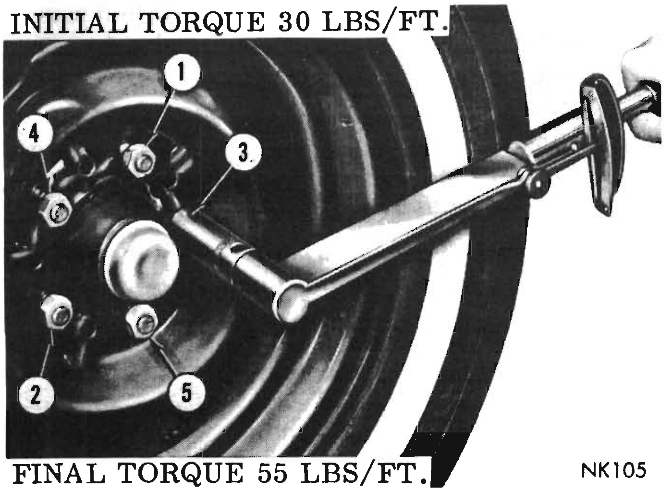


Fig. 15 – Wheel stud tightening sequence

(sometimes referred to as "tramp") usually occurs in the speed range of 20-40 M.P.H. and can usually be located this way. If you have a "thumper", replace the tyre.

Tyre roughness can be caused by a single tyre with two or more "thump" spots in it, or by two or more thumping tyres at speeds of 40-70 M.P.H. To isolate the cause of this condition, you may have to substitute the spare for each of the four tyres, with all tyres inflated to normal pressure. Tyre roughness is recognised 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 tyres or by towing the vehicle with the propeller shaft removed. To correct tyre roughness, replace the offending tyres.

11. WHEEL COVERS AND TRIM

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 tyre 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.

12. WHEEL CENTRE ORNAMENTS

Where diecast wheel centre ornaments are used these are retained under the wheel nuts.

To install, locate the wheel in the correct position and "offer-up" the ornament. Hold in place with at least 3 wheel nuts screwed down *finger tight*. Complete installing rest of wheel nuts and tighten as in paragraph 10.

13. WARNING ON UNSAFE TYRES

(1) Car tyres fitted to Passenger cars, Station Wagons, Utilities, Caravans and Trailers:—

From the safety aspect, a tyre should not continue in service where any of the following conditions are evident.

(a) The tread pattern does not have a depth of at least 1/32" throughout at least three-quarters of the tread width around the whole tyre circumference. It is recommended that tyres be replaced or retreaded when worn to a depth of 1/16" of any major groove.

(b) Fabric breaks, exposed or broken bead wires.

(c) Tread and side wall cracks, ruptures, cuts or localised wear any of which are deep enough to expose the body cords.

(d) Tread, side wall and ply separation or partial casing failure as indicated by any bump or bulge on the tyre surface including the bead area.

(e) Regrooving or recutting below the original tread pattern depth, except for special tyres which have been made with extra undertread rubber for this purpose. (Tyre manufacturers should be consulted on tyres in the special category.)

(f) Where a tyre is matched on the same axle with a tyre of totally different construction, for example a cross ply tyre with a radial ply tyre. (Where radial ply tyres and cross ply tyres are fitted to the vehicle in axle pairs, the radial ply tyres must be on the rear axle, fitting them to the front is unsafe.)

(g) Where a tyre is operated at an inflation pressure less than the minimum recommended for the load being carried taking into account the speed of operation.

(h) Where a tyre is fitted to a damaged rim, a rim of incorrect size, or is not properly seated on its rim.

(j) Where a tyre is fitted with a tube of a size not recommended by the manufacturer.

NOTES:

(1) Any tyre that has been damaged as mentioned in the appropriate items above, should be inspected internally and externally by a competent technician to establish whether it could be repaired or should be scrapped. Worn tyres can be retreaded providing the casing is in satisfactory condition.

(2) When fitting a passenger tyre to a rim, it is dangerous to exceed 40 p.s.i. inflation pressure. If the beads are not seated at this pressure, the tyre should be deflated and the reason determined before re-inflation.

(3) Irregular tread wear is usually evidence of a mechanical defect in the vehicle and should be investigated.

(2) Tyres fitted to Trailers, and Utilities used in highway service:—

From the safety aspect, a tyre should not continue in service where any of the following conditions are evident.

(i) For rib pattern tyres, the tread pattern does not have a depth of at least 1/16″ excluding tie bars throughout at least three-quarters of the tread width around the *whole* tyre circumference.

(ii) For tyres of other patterns not fitted to front wheels, the tread pattern remaining must extend at least half the width of the tread to a minimum depth of 1/16″ around the whole tyre circumference.

(b) Fabric breaks, exposed or broken bead wires.

(c) Tread and side wall cracks, ruptures, cuts or localised wear any of which are deep enough to expose the body cords.

(d) Tread, side wall and ply separation or partial casing failure as indicated by any bump or bulge on the tyre surface including the bead area.

(e) Regrooving or recutting below the original tread pattern depth except for special tyres which have been made with extra undertread rubber for this purpose. (Tyre manufacturers should be consulted on tyres in this special category.)

(f) Where a tyre is matched on the front axle with a tyre of a totally different construction, for example, a cross ply tyre with a radial ply tyre (radial ply tyres must be fitted as a complete set of four tyres or as a *pair* on the *rear* axle only.

(g) Where a tyre is operated at an inflation pressure less than the minimum recommended for the load being carried, taking into account the speed of operation.

(h) Where a tyre is fitted to a damaged rim, a rim of incorrect size or is not properly seated on its rim.

(j) Where a tyre is fitted with a tube of a size not recommended by the manufacturer.

NOTE:

(1) Any tyre that has been damaged as mentioned in the appropriate items above, should be inspected internally and externally by a competent technician to establish whether it could be repaired or should be scrapped. Worn tyres can be retreaded providing the casing is in a satisfactory condition.

(2) Irregular tread wear is usually evidence of a mechanical defect in the vehicle which should be investigated by a competent technician.

14. REPAIR OF TUBELESS TYRES

If a tyre loses all or most of its air pressure, particularly when driving at high speeds, it must be removed from the wheel at a tyre service station for complete internal inspection to be sure it is not damaged. Surveys have shown that as many as two out of three tyres run even short distances while flat are damaged beyond repair.

Tread punctures up to quarter inch may be repaired permanently, only from the inside of the tyre.

Temporary repairs, such as stick-in patches, or *any repair made from the outside of the tyre are for emergency use only*. Such stop-gap devices as plugs and pressure type sealants are good only for up to 100 miles of driving at speeds not over 50 m.p.h. If such temporary repairs are used, permanent repairs should be made as soon as possible.

RECOMMENDED REPAIRS

(1) Temporary plug repairs should be confined to puncture holes caused by nails or similar small objects and *not used for cuts or fractures*.

(2) Such temporary plugs should be used *only in the tread area, never through the side-walls.*

(3) Punctures, nail holes or small cuts up to quarter inch in size, confined to the tread area, should be repaired permanently from inside the tyre.

(4) These repairs should be made permanent by plugging the hole and applying a self-vulcanising or hot vulcanised rubber patch over the plug on the inside of the tyre. It is *essential* to *ensure* that the *tubeless liner is airtight* in this area to prevent direct air leakage into the casing.

> NOTE:
> For *tubeless radial* ply tyres which have belt plies under the tread, the above procedures may be used but repairs should be made only in the *central tread* area between the major out-side grooves, that is *no closer* than three-quarters to one inch from the tread *shoulders* depending on tyre size.
> This is to ensure repairs are not attempted on or outside the belt edges.

REPAIRS SHOULD NOT BE MADE ON ANY TYRE WITH —

(1) Ply separation.

(2) Chafer belt fabric injuries which would affect the tubeless air seal. (Where cord plies are not damaged and the bead structure is sound otherwise the tyre may be used with a tube.)

(3) Broken or exposed bead wires.

(4) Flex breaks.

(5) Tread separation.

(6) The tread worn below one-sixteenth inch depth in the major grooves. (Tyres worn to this stage can be repaired then retreaded for further service.)

(7) Cracks which extend into the tyre fabric.

(8) Open liner splices which show exposed cords. (Provided no ply separation is evident in the tyre a tube may be used to obtain further service.)

(9) The liner and first ply showing evidence of having been run flat, underinflated or overloaded.

GROUP 23

BODY AND SHEETMETAL

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SERVICE INFORMATION — PROCEDURES

1. GENERAL INFORMATION

The body and frame *(see Fig. 1)* are combined into a welded and reinforced shell of exceptional strength and twist resistance. Sturdy reinforcements are used throughout the lower body structure to carry driving, braking and suspension loads. They are formed of heavy box sections which distribute the major road forces to broad areas of the body structure. The box sections also provide solid supports for the bumpers, springs and shock absorbers.

All door pillars, sills, roof rails, windshield headers, and belt line rails are fully boxed to provide maximum strength. The heavy gauge front fender side shields are welded to the dash panel side sills, and radiator yoke to form a rigid front end structure. The side shields also protect the engine from road splash. The deck lid and hood are reinforced for greater strength, rigidity, and twist resistance. More than 5,300 spot welds and seam welds are used to join the many steel stampings which make up the body structure. Two structural members are bolted in place, one is the K-shaped engine support crossmember, and the other is the short member which supports the transmission. The front fenders and grille are attached with bolts which provides ease and low cost in replacement.

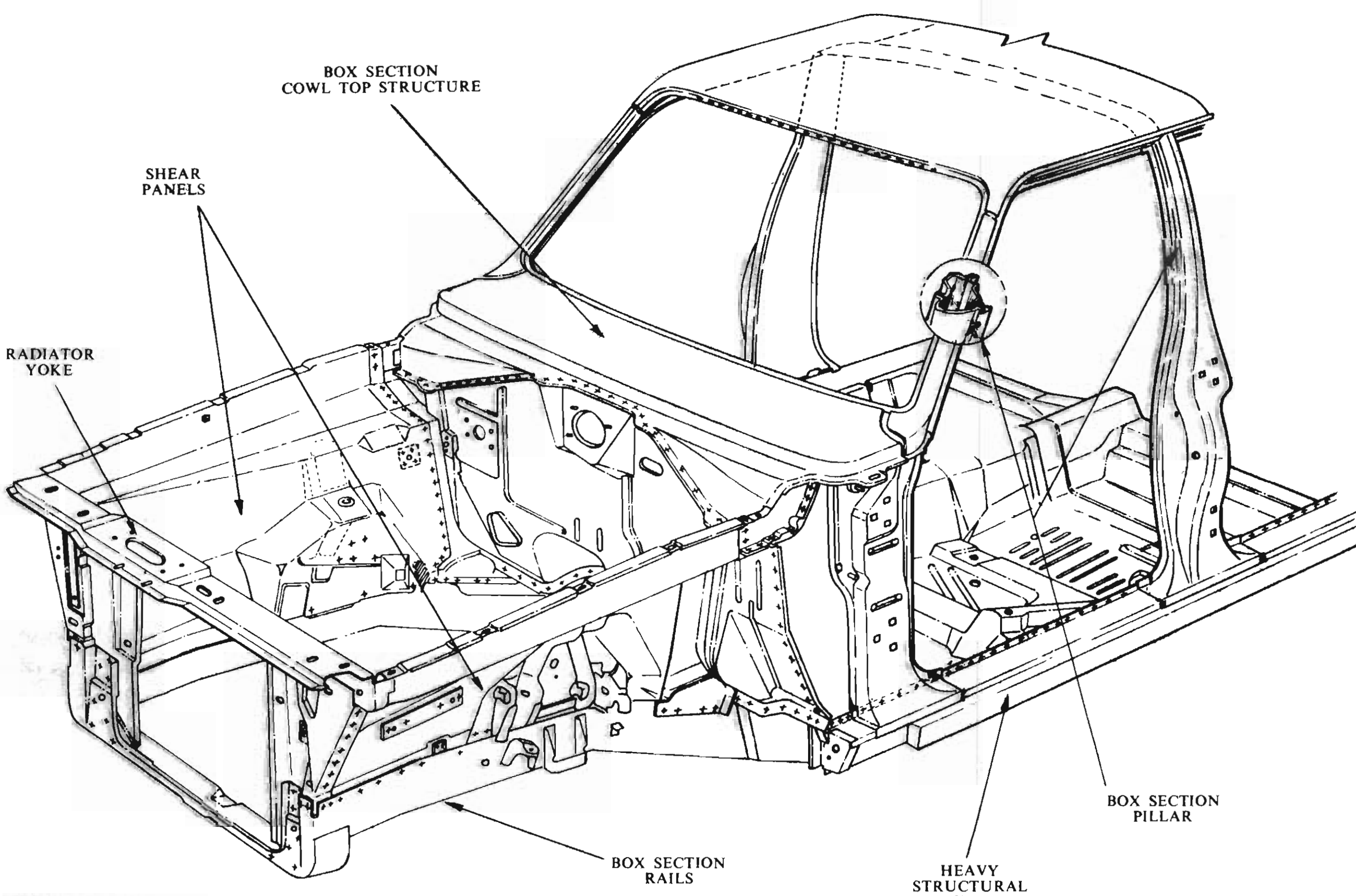


Fig. 1 – Unit Body Construction

When necessary to hoist or raise the vehicle to perform maintenance operations or repairs, refer to the information described in Group 1 Lubrication and Maintenance *Para. 26, page 1 - 13.*

2. FRONT DOOR TRIM AND HARDWARE

Inside Handles

Window Regulator Handles.

The window regulator handles are retained by cross-headed screws.

Remote Control Lock Handles.

The remote control handles are attached to the control unit with a screw at the forward inner end. *Refer to Fig. 2.*

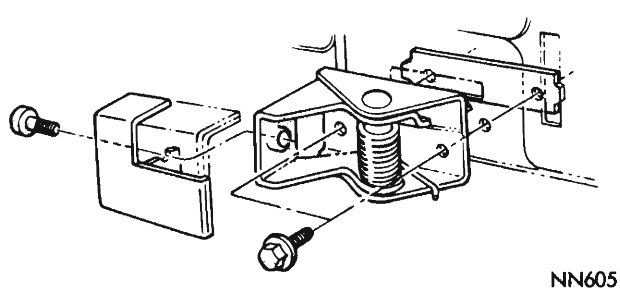


Fig. 2 – Remote control handle

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 if necessary.

Door Trim Panel

(1) Remove inside handles and arm rests.

(2) Insert a wide blade screwdriver between the trim panel and the door frame next to the retaining clips and snap out the retaining clips around the edge of the trim panel. Remove trim panel from door.

(3) Before installing door trim panel, observe the condition of the weather curtain cemented to the door frame.

(4) Align trim panel retaining clips with holes of door frame and bump into place with heel of hand.

(5) Install escutcheon washer, handles and arm rest.

Outside Door Handle/Lock Cylinder Combination

(1) Remove arm rest, inside handles, trim panel and weather curtain.

(2) With door glass in the UP position, through the upper access hole of the inner door panel, remove door handle and retaining plate attaching nut.

(3) Disconnect the remote control connecting rod and door lock connecting rod.

(4) Lift handle out and up and remove it from door.

(5) With door lock handle removed, the lock cylinder can now be removed by removing the screw attaching the door lock cylinder to the door handle.

(6) Installation is the reverse of the above procedure.

Door Glass with Vent
Sedans, Station Wagons, Utility

To Remove

(1) Remove the inside door handles, arm rest trim panel, and weather curtain.

(2) With window in "DOWN" position remove the three window regulator attaching bolts.

(3) Slide the regulator arm from the glass lower channel and remove the regulator assembly from the door.

(4) Remove the bolt attaching the lower end of the vent wing division channel to the bracket on the door.

(5) From the bottom of the door frame, remove the glass stop attaching nut and remove the glass stop.

(6) Remove both "baily" mouldings from the top of the door.

(7) Remove the three screws attaching the vent wing frame to the door.

(8) From the front upper corner of the door glass opening, pull the weatherstrip away about 2″ to 3″ to allow the door glass and vent wing assembly to be tilted and removed from the door.

To Install

Installation is the reverse of the removal procedure.

Adjustments (Door Glass)

Lower the glass and move the vent wing division channel rearward to remove excessive looseness of glass without creating a binding action. It may be necessary to readjust the lower end of the channel to gain alignment of the channel and the rear glass run. If necessary adjust the down-stop so that the top edge of the glass is flush with the top edge of the glass opening in the door *(Refer Fig. 3).*

Regulator Replacement

The regulator assembly is attached to the door inner panel by three bolts. When removing the regulator, the door glass should be fully lowered. Slide the regulator arm from the glass lift bracket and remove from door. Lubricate the tooth area of the regulator when reinstalling.

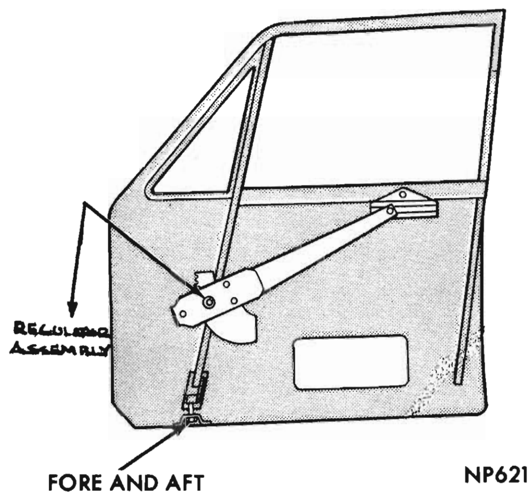


Fig. 3 – Front Door Glass Adjustment

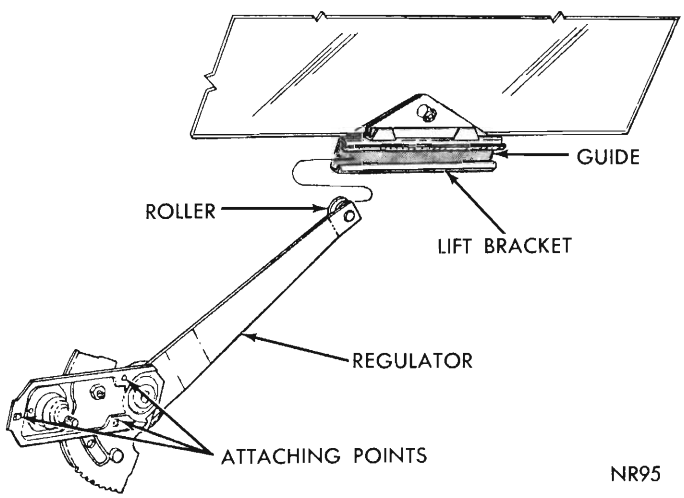


Fig. 4 – Regulator Assembly

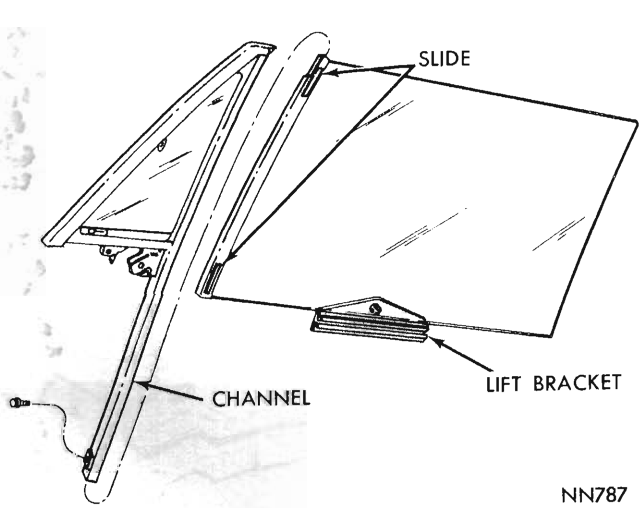


Fig. 5 – Door and Vent Glass Assembly

Door Glass with Vent (Two Door Models)

To Remove

(1) Remove the inside door handles, arm rest, trim panel and weather curtain.

(2) With window in down position remove the three window regulator attaching bolts.

(3) Slide the regulator arm from the glass lift bracket and remove the regulator assembly from the door.

(4) Remove the bolt attaching the lower end of the vent wing channel to the bracket on door.

(5) Remove the plug below the vent wing on inner door panel and using a suitable "Allen key" loosen the screw.

(6) Remove the two screws attaching the upper half of the door weatherstrip (behind vent wing) and remove the vent wing assembly securing bolt and the adjustment lock nut.

(7) Remove both "baily" mouldings from the top of the door and remove glass and vent wing assembly from the door.

(8) Installation is the reverse of the removal procedure.

Adjustments (Door Glass)

(Refer Fig. 6)

(1) Raise door glass two thirds way up. Adjust the upper attachment of rear glass track (view in letter N *Fig. 6*) to centre glass between inner and outer weatherstrips and tighten screw.

(2) Raise window, seating the top of the glass and the front of the vent wing fully against and parallel to the roof rail weatherstrip. Tighten the vent wing belt line front screw (view at circle D).

(3) Adjust the hinge face stud to align the upper edge of the glass to the roof rail weatherstrip and tighten nut (view at circle D *Fig. 6*).

(4) Tighten the vent wing belt line rear screw (view in direction of arrow M *Fig. 6*).

(5) Position up stop against regulator arm and tighten screw.

(6) Lower glass half way and tighten rear-track lower screws.

(7) Tighten vent wing lower division channel adjusting bolt at bracket.

(8) Lower the glass so stop is even or slightly below belt line outer panel.

(9) Position lower edge of rear track adjust glass and tighten screws.

Regulator Replacement

The two door regulator replacement is the same as the sedan and wagon.

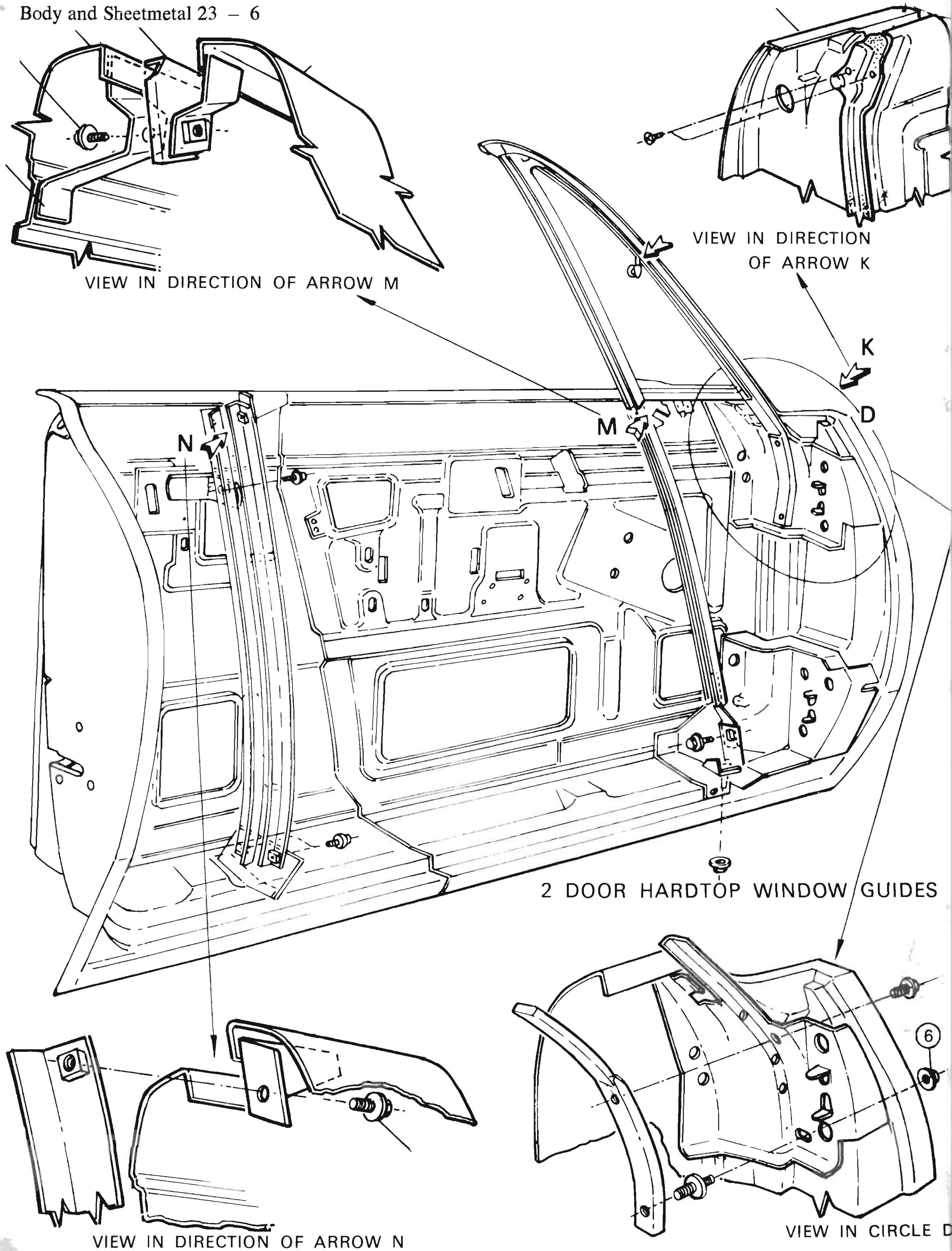


Fig. 6 – Two Door Models Door Glass Adjustment

Ventless Door Glass
Sedan and Station Wagon

To Remove (Fig. 7)

(1) Remove the inside door handles, arm rest, trim panel and weather curtain.

(2) Remove the door belt line weatherstrips.

(3) Lower the glass, remove the two screws attaching the glass to the stabilizer and the screw attaching the glass to the lift channel and remove the glass from the door opening.

To Install

Installation is the reverse of the removal procedure.

Adjustments (Door Glass)
(Refer Fig. 7)

(1) Before making any adjustments to the door glass ensure that the regulator arm guide bolts are loose.

(2) Adjust the rollers (view in arrow "F") to ensure contact with the rear track, this avoids the regulator effort substantially increasing. However heavy pressure must not be applied, as overtightening of the screws may result in glass breakage.

(3) Raise glass completely, loosen the front track bolt to door bracket and move the glass fore or aft (in direction of letters "A" and "B" in *Fig. 7*) and ensure correct glass engagement with door glass opening. Always compensate this adjustment with vertical channel adjustment at arrows "C" and "D" in *Fig. 7*.

(4) Side adjustment of the front glass track (at arrow "E" *Fig. 7*) will control engagement of glass into door frame weatherstrip.

Regulator Replacement

(1) Remove the two bolts attaching the regulator arm guide to the door panel and remove the guide from the door.

(2) Remove the upper and lower track attaching bolts and window regulator bolts and remove the track, stabilizer and regulator assembly from the door.

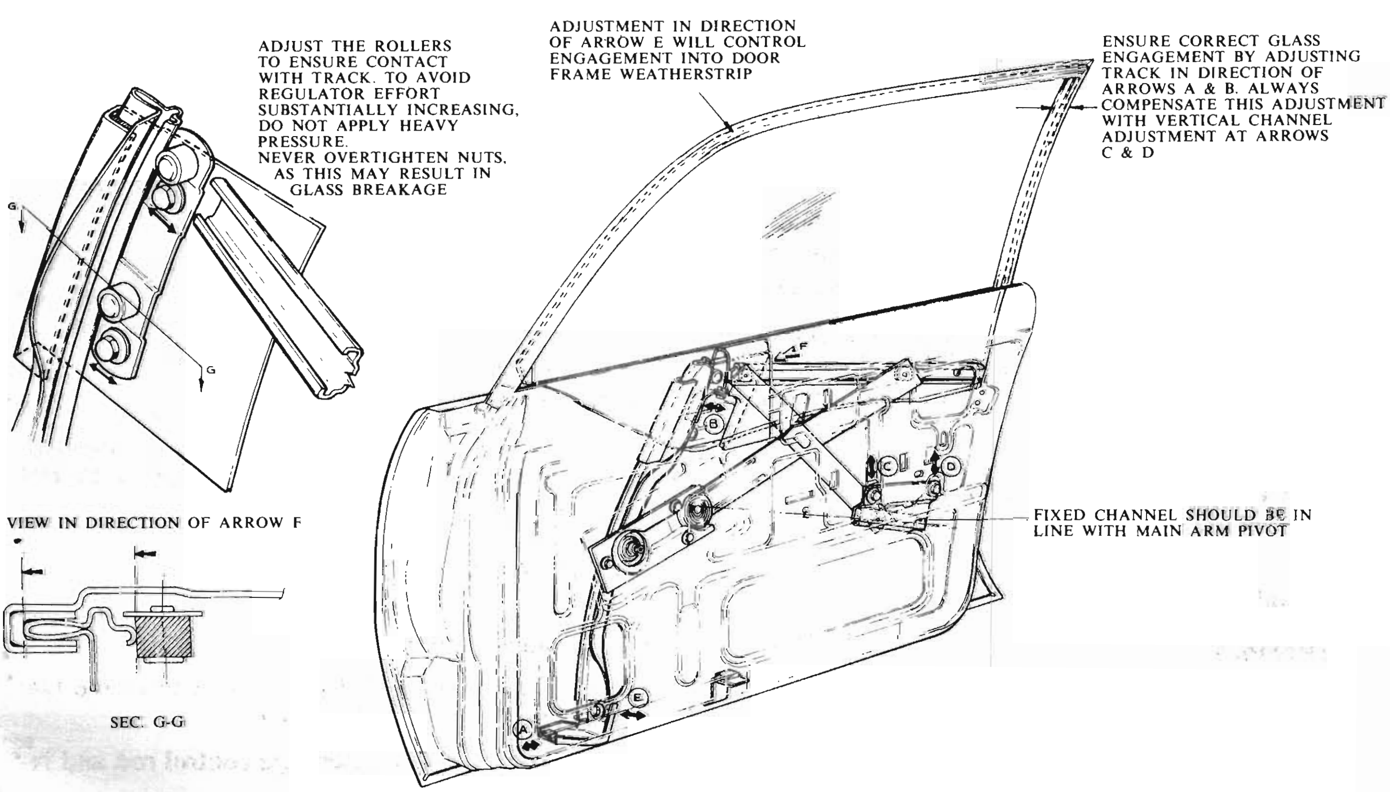


Fig. 7 – Ventless Door Glass Adjustment

Ventless Door Glass Two Door Models (Fig. 8)

To Remove

(1) Remove the inside door handles, arm rest, door trim and weather curtain.

(2) With window in "DOWN" position remove the door belt line weatherstrips.

(3) Remove the four screws attaching the glass to the glass frame and remove the glass from the top of the door opening.

(4) Installation is the reverse of the removal procedure.

Adjustments (Ref. Fig. 8)

(1) Before making any adjustments to the door glass ensure that the regulator arm guide bolts are loose (arrow "K").

(2) Raise the glass fully and adjust the glass up stops to ensure that the glass will not hit the roof rail when the door is opened.

(3) Adjust the rollers (view in direction of arrow "L") to ensure contact with the tracks to avoid the regulator effort substantially increasing. Do not apply heavy pressure as overtightening of the screws may result in glass breakage.

(4) Adjust the mountings at the top and bottom of the tracks (arrows D, E, F and G) to ensure a positive interference of glass to roof rail seal.

(5) Fore and aft adjustment at the top and bottom of the tracks (arrows A, B, C) will ensure engagement of glass weatherstrip to quarter glass.

(6) If it is necessary to tip the glass to maintain a parallel seal with the quarter glass, this may be achieved by firstly using fore and aft adjustment at the top and bottom of the front track (arrows A and C), then adjusting the rear track to maintain a parallel movement of the stabilizer to track.

Regulator

To Remove

(1) Remove the rear glass track upper and lower bolts and remove the rear track from the door.

(2) Remove the two bolts attaching the regulator arm guide to the door, slide the guide from the regulator arm and remove the guide from the door.

(3) Remove the three bolts attaching the regulator arm pivot bracket to the inner door panel.

(4) Remove the stabilizer assembly and front glass track from the door panel.

(5) Remove the three bolts attaching the regulator assembly to the inner door panel and remove the assembly from the door.

To Install

(1) Installation of the regulator is the reverse to the removal procedures.

(2) Raise and lower the glass, test for ease of operation and adjust if necessary.

To Adjust Vent Window Glass Pivot Tension

(1) Open the vent window and peel back the weatherstrip on the inside of the vent window just forward of the pivot.

(2) Insert a thin walled $\frac{3}{8}''$ S.A.E. spanner between the vent window frame and the inner door panel and engage the head of the screw.

(3) Turn screw clockwise if additional tension on the pivot is required.

(4) Having tensioned the pivot, re-position weather strip to its original position.

Door Glass Run Channel

(1) Remove inside handles, washers, trim panel, weather curtain and door glass.

(2) Pry out the run channel from the door frame. (The run channel is held in place by its own expansion in the door frame.)

(3) When replacing the run channel, align the end of the channel with the end of the channel frame and press the channel into place by hand.

(4) Work the channel tightly into the rear upper corner of the door.

(5) Install door glass (check for free operation as above), weather curtain, trim panel, arm rest washers and inside handles.

Remote Control

(1) Remove inside handles, arm rest, trim panel and weather curtain.

(2) With glass in UP position, remove the two screws attaching control to door.

(3) Manoeuvre to disengage control rod and remove assembly from door.

(4) Installation is the reverse of the removal procedure.

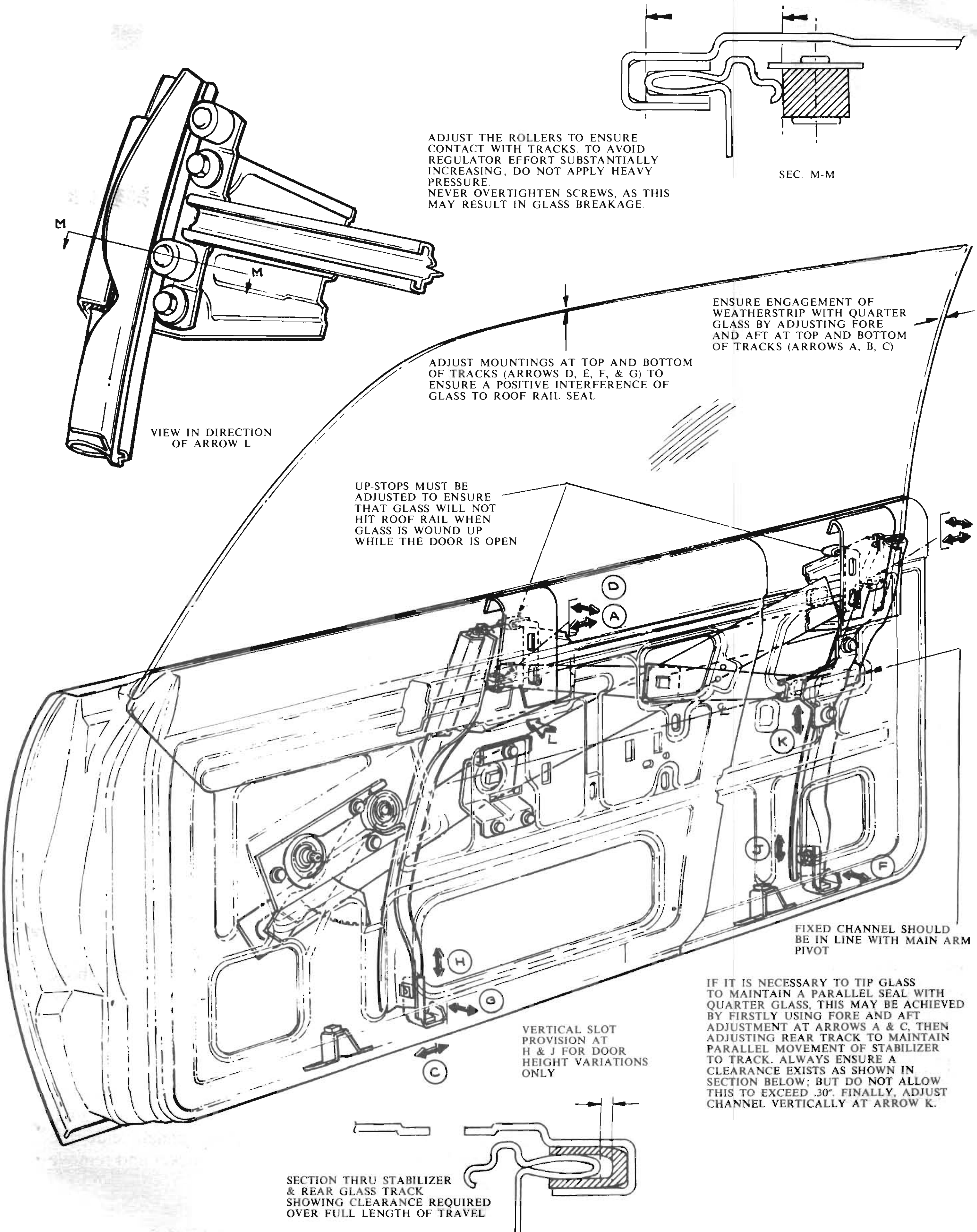


Fig. 8 – Ventless Door Glass Adjustment

To Adjust Door Locks

The silent type door latch and striker pin provides full width bearing surfaces to ensure secure latching at all times when the doors are either fully or partially latched.

To test the engagement of the door latch with the striker pin close the door and watch if the door rises as the latch passes over the striker pin. If the door rises the pin is too high and must be lowered.

The striker pin can be moved in or out and controls the fit of the door against the body.

The up and down adjustment will determine the actual point of engagement between the door lock arm and the lower portion of the striker pin.

Use Tool No. E23C15 for adjusting the striker pin position.

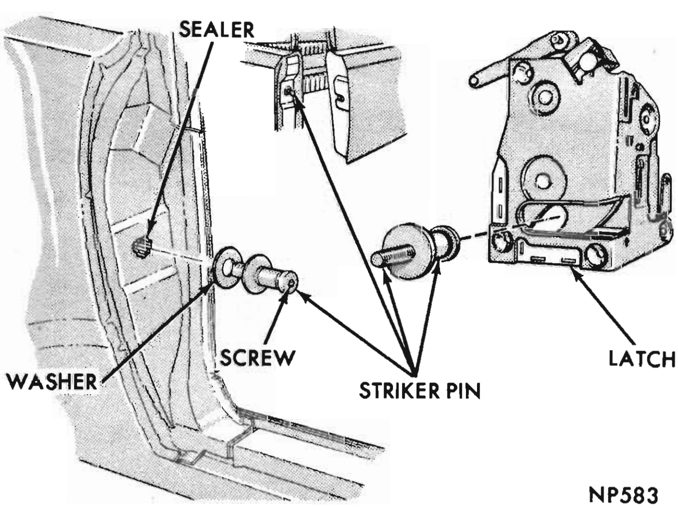


Fig. 9 – Latch and Striker Pin

Door Weatherstrip Assembly

(1) Remove attaching screws and step plate from the door sill.

(2) Starting at one end of trim and weather seal; pull the assembly off the door opening flange, as shown in *Fig. 10.*

(3) When installing the trim and seal assembly, locate the ends at the centre of the step plate.

(4) Place the weather seal over the door opening flange and bump into place with the heel of the hand.

(5) Install door step plate and attaching screws.

Fig. 10 – Removing or Installing door weatherstrip (typical view)

3. REAR DOOR

The procedure for the removal and installation of rear door components are similar to the procedures for the front doors *(see Para 2)*, with exception of the door glass.

Door Glass

To Remove

(1) Remove inside door handles, arm rest, trim panel and weather curtain.

(2) With the glass in down position remove the two screws attaching the glass lift bracket to the glass.

(3) Lift the glass, tilt toward the rear of vehicle and remove the glass from the door.

To Install

(1) Installation is the reversal to the above procedure.

Window Regulator

To Remove

(1) Repeat step (1) of Door Glass (to remove).

(2) Remove the five bolts attaching the regulator assembly to the inside door panel, slide the regulator arm from the glass lift bracket and remove assembly from the door.

To Install

(1) Lubricate all moving parts of the regulator assembly prior to installation in the door.

(2) Install the regulator assembly in the door, slide the regulator arm into the glass lift bracket and tighten the bolts attaching the regulator assembly to the door panel.

(3) Install weather curtain, trim panel, inside handles and arm rest.

Adjustments

(1) The glass should be in fully raised position.

(2) Loosen the pivot channel attaching screws this allows the glass to seat in the door frame.

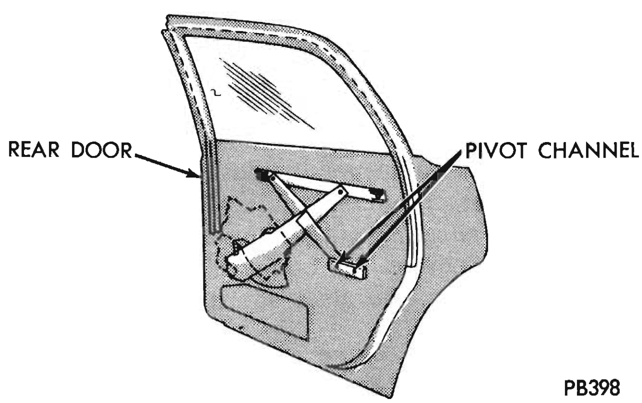


Fig. 11 – Sedan Rear Door Glass Adjustments

Rear Quarter Window Glass Two Door Hardtop

To Remove

(1) Remove the rear seat and cushion squab.

(2) Remove the quarter trim, handles and garnish mouldings.

(3) Remove all window stops and attaching bolts.

(4) Remove the three bolts attaching the window regulator, slide the regulator out of the glass lift channel, and remove from quarter panel.

(5) Remove the glass track upper and lower bolts, outer weatherstrip, door opening weatherstrip and retainer and inner window mouldings.

(6) Work the track and glass assembly up and out of quarter panel from inside of vehicle.

(7) To remove the glass from the track and glass frame, remove the track attaching bolt and roller and slide the track from the glass frame. Remove the two bolts and the screw attaching the glass frame to the glass and remove the glass.

Adjustments

(1) Raise the glass fully, loosen the glass track lower bracket attaching bolts and move the track in or out to ensure a positive glass interference between the glass and the roof rail weatherstrip.

(2) Loosen the glass track upper bracket bolts and move the track fore and aft to give the glass a positive seal between the quarter glass and the front door glass.

(3) Loosen the bolt attaching the glass track to the bottom bracket, this allows the track to be tilted fore and aft and is the final adjustment allowing the glass to seat squarely into window opening.

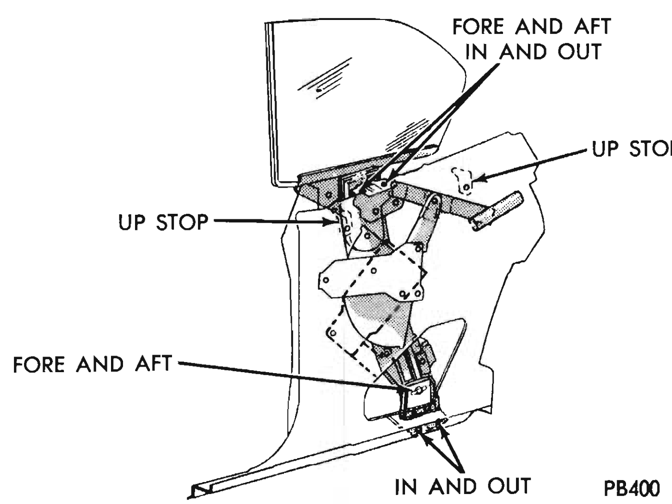


Fig. 12 – Rear Quarter Glass Adjustments

Rear Quarter Window Glass Hinged Two Door Coupe (Fig. 13)

To Remove

(1) Remove the two glass hinge screws at the rear quarter end.

(2) Remove the two screws from the glass upper pivot, the three screws from the glass lower pivot and remove the glass assembly complete.

(3) To remove the handle from the glass, remove the circlip from the hinge pin.

(4) When reinstallation of the glass assembly the elongated holes in the rear quarter end, where the hinge plate is located, allow correct positioning of the glass assembly to the window opening. *(Refer Fig. 13).*

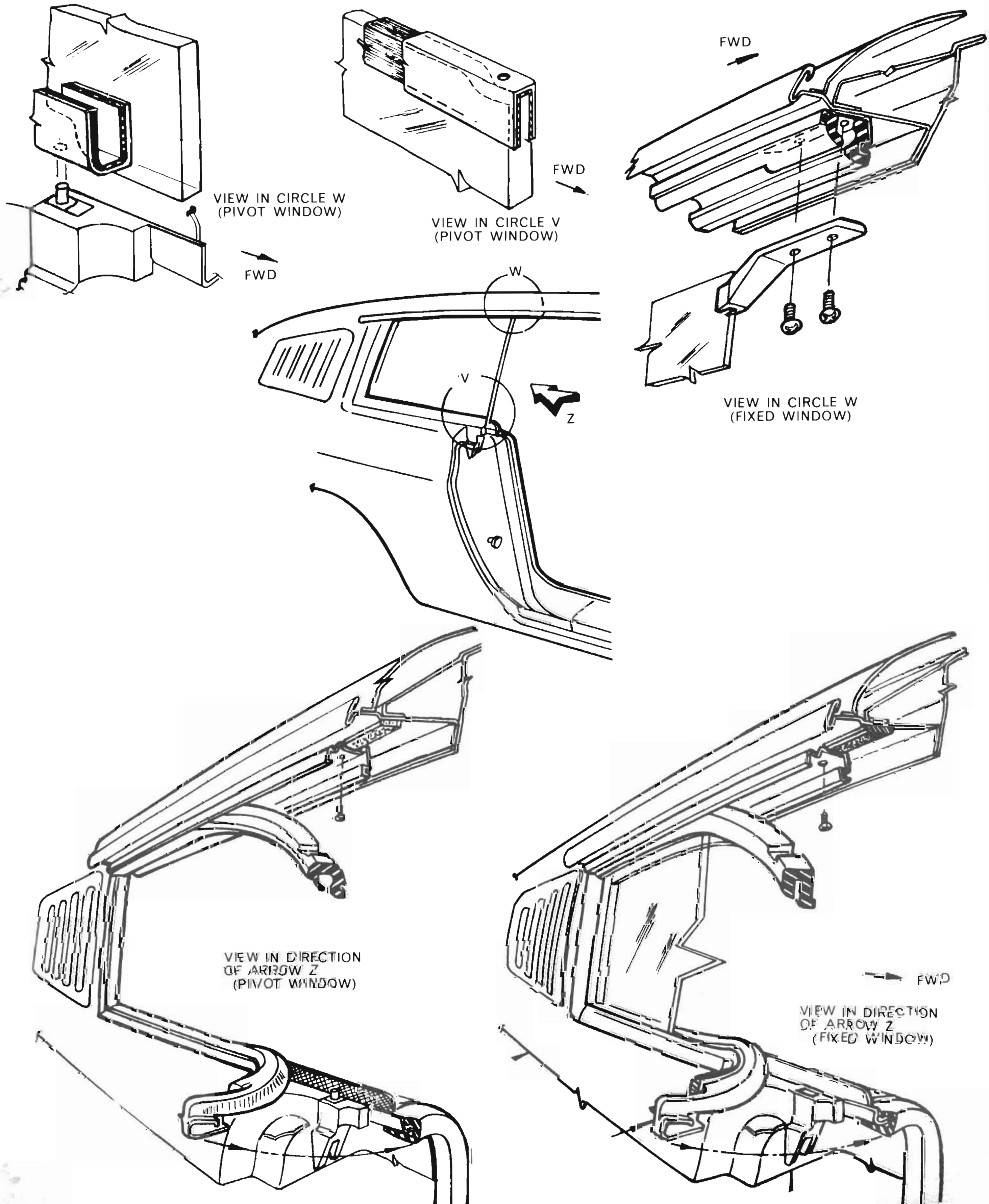


Fig. 13 – Charger Read Quarter Window (Hinged & Fixed)

Rear Quarter Window Glass Fixed Two Door Coupe (Fig. 13)

To Remove

(1) With the front door open, remove the quarter glass stop located into the roof rail weatherstrip.

(2) Insert a fibre stick between the edge of the glass and weatherstrip (rear edge) and manoeuvre the glass out of the weatherstrip.

To Install

To install apply a soap solution and/or suitable rubber lube and reverse the removal procedure.

4. DOOR HINGES

Both front and rear door hinges are constructed to permit up and down, fore and aft, and in and out adjustment. This permits close alignment and weather control. All hinge adjustments are exposed in the door opening except for the front door hinge mounting bolts.

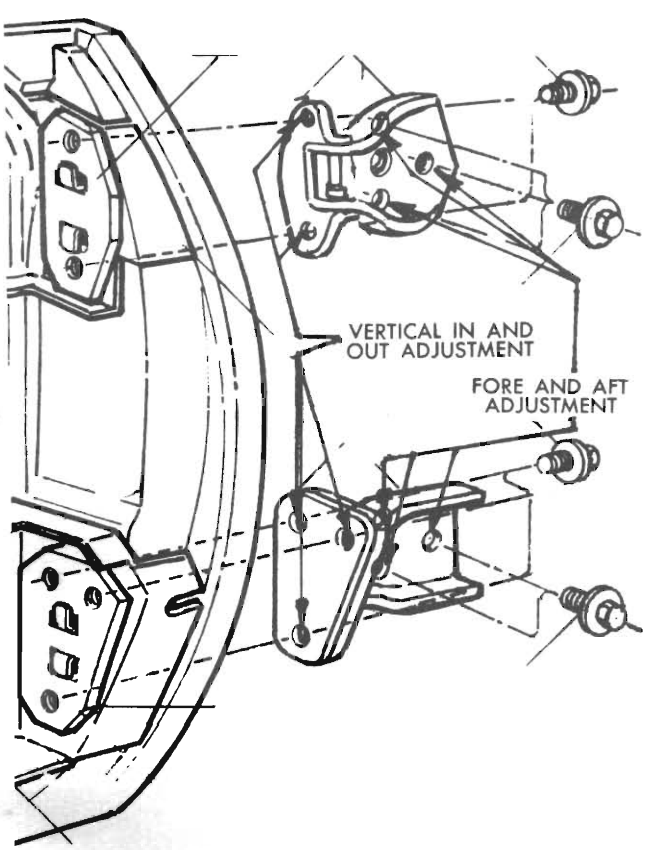


Fig. 14 – Front door hinge adjustment (typical view)

To gain access to the front door hinge mounting bolts, it is necessary to remove the splash shield from beneath the front fender. The fore and aft adjustment can then be carried out.

Front Door Hinge Adjustments (Up and Down)

(1) Scribe a line around upper and lower hinge straps.
(2) Place a wooden block on the lifting plate of a floor jack and position it under the door. (Support the door near the centre of balance when attaching bolts are loosened.)
(3) Loosen the upper and lower door hinge attaching bolts.
(4) Observing the scribe mark, raise or lower the jack until the door is in the desired position.
(5) Tighten attaching bolts and remove floor jack.
(6) Open and close the door several times and check clearance around all edges of the door, check location of door striker in door lock.
(7) Repeat steps 5, 6, and 7 until the door is centred in the door opening.

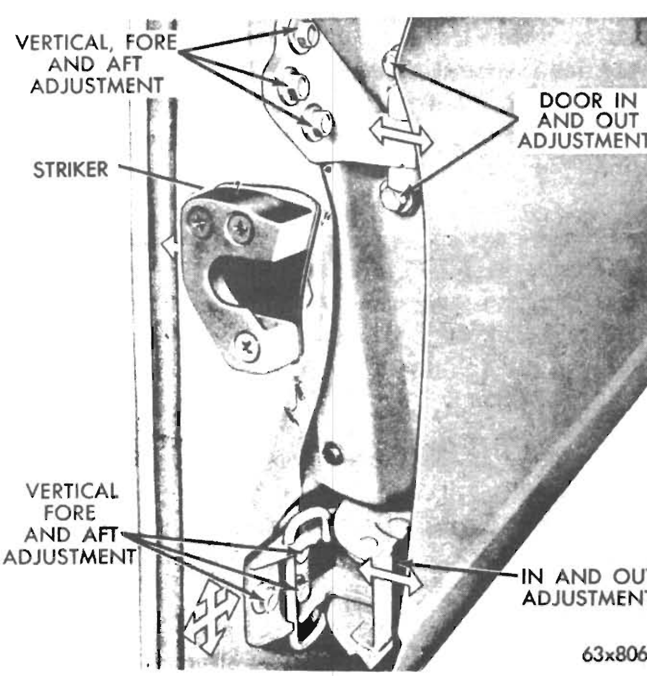


Fig. 15 – Rear door hinge adjustment (typical view)

(Fore and Aft)

(1) With the door in a full open position repeat steps 1 and 2 of Up and Down adjustments.
(2) Place a wooden block on the lifting plate of a floor jack and position it under the outer end of the door.

(3) Loosen upper door hinge attaching bolts only.

(4) Observe the scribe marks and raise or lower the door to the desired position. (Raising outer end of the door moves the upper part of the door forward when in closed position.)

(4) Tighten attaching bolts.

(6) Loosen lower door hinge attaching bolts and raise or lower door to desired position. (Lowering the outer end of the door moves the lower part of the door forward when in closed position.)

(7) Tighten attaching bolts.

(8) Open and close door several times and check the clearances around all door edges, and lock and striker engagement.

(9) Repeat steps 4, 5, 6, and 7 until the door is centred in the door opening.

(In and Out)

(1) With the door in a full open position, place a wooden block on the lifting plate of a floor jack and position it under the outer edge of the door.

(2) Loosen the upper hinge to door attaching bolts.

(3) Raise or lower the jack until upper part of the door has moved in or out the desired amount. (Raising the outer end of the door will move the upper part of the door into the door opening.)

(4) Tighten the upper hinge to door attaching bolts.

(5) Loosen the lower hinge to door attaching bolts.

(6) Raise or lower the jack until lower part of the door is in the desired position. (Lowering the jack moves the door into the door opening.)

(7) Tighten the attaching bolts.

(8) Close the door and observe flush alignment of the door panel with body sill, fender, cowl and B post.

Rear Door Hinge Adjustment

(Up and Down)

(1) With the rear door fully closed and front door open, scribe the location of both upper and lower hinges on the frame of the door, as shown in *Fig. 15*.

(2) With the door slightly ajar, position a floor jack under the centre of the door.

(3) Loosen the hinge to door attaching bolts.

(4) Observe the scribe mark and raise or lower the door to the desired position.

(5) Tighten attaching bolts, close the door and check alignment in the door opening, also lock and striker engagement.

(Fore and Aft)

(1) With the rear door in the closed position and front door open, scribe around the pillar post hinge plate.

(2) Loosen both upper and lower pillar post hinge bolts *(see Fig. 15)*.

(3) With the rear door slightly ajar, push the door forward or back to the desired position.

(4) Tighten pillar post hinge bolts.

(5) Close the door and check alignment in the door opening and striker engagement.

(6) Replace lower hinge cover and screws.

(In and Out)

(1) Scribe a mark on the door around the door hinge plate (Upper).

(2) Loosen upper hinge attaching bolts *(see Fig. 15)*.

(3) Grasp the front edge of the door at the hinge and push door in or pull out to the desired position.

(4) Tighten the hinge attaching bolts. (Adjust one hinge at a time to prevent door from dropping in the door opening.)

(5) Scribe the lower hinge door plate and loosen attaching bolts.

(6) Adjust lower portion of door as in steps 3 and 4.

5. HOOD, HOOD LOCK AND HINGES

The hood is attached to the cowl panel through two counter-balanced hinges, as shown in *Fig. 16*. The attaching bolt holes of the hinges are oversize, permitting movement of both the hinge and the hood panel for alignment purposes.

The hood hinge assemblies are secured to the cowl panel studs with push nuts *(Refer Fig. 16)*. These are accessible after removing the splash shield from the fender.

Hood Removal

(1) Support the front edge of hood in full open position and protect paint finish areas.

(2) Scribe location of hinge on hood panel.

(3) With the aid of an assistant, remove the hood attaching bolts from both hinges.

(4) Remove hood from vehicle.

Hood Installation

(1) Protect paint finish, then, with the aid of an assistant, place hood on hood hinges and install attaching bolts.

(2) Align scribe marks and tighten attaching bolts to 180 lbs. in.

(3) Close hood and check alignment at all edges.

Hood Hinge Replacement

The following procedure is to be followed for changing either the right hand or left hand hood hinge assembly.

(1) Protect the rear edge of the front fender with a split length of rubber hose or tape to prevent paint damage.

(2) Remove the front door after marking hinge position.

(3) Prop the hood open with a suitable length of hardwood.

(4) With a padded block of wood support the rear corner of the hood in such a manner as to carry the weight of the hood when the hinge assembly is removed.

(5) With a long, thin chisel split the spring push nuts retaining the hinge to the body and remove nuts.

(6) Mark the position of the hood hinge and remove two screws securing hinge to hood. Remove the hinge from the body.

(7) Paint the replacement hinge to match the body colour.

(8) Assemble the replacement hinge to the body using three new spring push nuts. One nut is used to retain the hinge to the top cowl stud and two to the bottom cowl stud. When replacing the hinge ensure that the fibre spacers are *between* the hinge and the body *(refer Fig. 16)*.

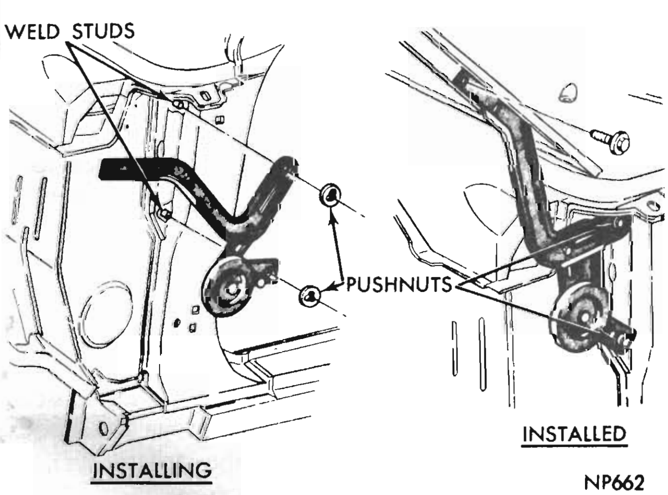


Fig. 16 – Hood hinge and support spring assembly (typical view)

(9) Drive the press nuts on to the cowl studs (with the front fenders in place) using a suitable installing tool *(as illustrated in Fig. 16A)*.

(10) Re-install screws retaining hinge to hood, check hood alignment and adjust if necessary.

(11) Check operation of the hood and, if the new hinge is noisy, force H.M.P. grease between the coils of the spring.

(12) Re-install door, check alignment and adjust if necessary.

(13) Remove protecting hose or tape from fender.

(14) Touch up screw heads (body colour).

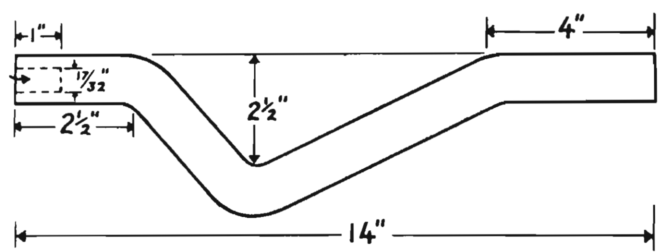


Fig. 16A – Hood hinge retaining "push-nut installer (manufacturing sketch)

(Material: ⅞" M.S. Bar — drilled 17/32" x 1" deep, and bent as shown)

To Align Hood

Prior to making any hood adjustments, inspect and note clearances and alignment of all sides of the hood in relation to cowl, fenders and grille. The cowl adjustment must be made first.

Hood to Cowl

(1) Inspect cowl alignment for clearance, uneven gap, and high or low elevation at the corners.

(2) Prior to adjustment, scribe the hinge position on the hood.

(3) Loosen hood attaching bolts *(see Fig. 16)* and move hood to desired position to correct alignment at cowl.

(4) Tighten attaching bolts to 180 lbs. in. torque.

(5) Re-check hood and cowl alignment.

(4) Adjust the hood levelling bumper stops so that there is no bump stop to hood contact.

(5) Adjust the hood lock striker dowel until an even hood line is obtained.

(6) Adjust the hood levelling bumpers so that they just contact the hood.

(7) Close the hood and check for correct latch operation.

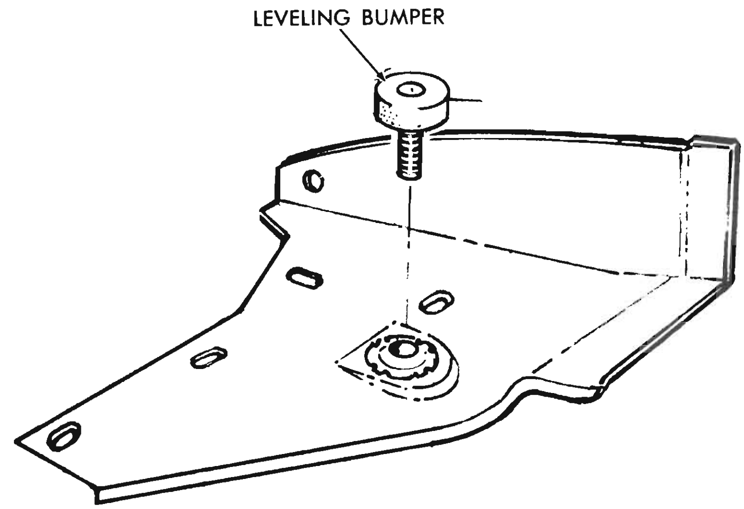


Fig. 17 – Hood levelling adjustment

(6) If corners of the hood are found to be high or low in relation to the cowl panel, loosen hinge attaching bolts *(Fig. 16)* and raise or lower the hood as required and re-tighten the bolts to specified torque.

(7) (After step 6, if rear of hood and fender are not flush, it will be necessary to reset the fender to align with cowl and hood by adjustment of shims or packers in upper and lower rear of fender mountings.)

Hood Side Contour

When the side contour of the hood does not follow the curve of the fender, the hood should be re-shaped. To correct this condition, adjust as follows:

(1) Insert a small block of wood about 1"square between the fender flange and hood, just opposite the low spot on the hood.

(2) Close the hood slowly. With the hands placed just ahead of the block, gently apply pressure to the hood.

(3) Repeat this operation about every 6" until the contour of the fender and hood conform evenly.

Hood to Fender Clearance

After completing step 7, inspect front of hood to fender clearance. This clearance is adjusted by the addition or removal of shims between the fender and the radiator support. The height of the hood to fender can be adjusted by turning the hood bumper *(see Fig. 17)* adjusting screws in or out. It may also be necessary to loosen the fender attaching bolts and move the fender up or down to the desired position.

Hood Lock Adjustment

(1) The hood lock is mounted on an extension just above the radiator grille. The hood striker is mounted on the forward edge of the hood *(Fig. 18)* and is released by an internal catch which is operated from within the vehicle by a pull release cable.

(2) The hood lock has elongated bolt holes to allow for adjustment. To adjust the hood, loosen the hood lock retaining bolts and move the hood lock as required to align it with the striker.

(3) Tighten the lock retaining bolts, open and close the hood several times to ensure that the hood is latching securely.

6. FRONT FENDER

To Remove

(Fig. 19)

(1) Position tape to protect adjacent panels.

(2) Remove the park/turn signal lamp assembly from the fender where applicable.

(3) Remove the headlamp bezels, headlamp assembly/s and the grille.

(4) Remove the bumper bar assembly.

(5) Disconnect the two bolts attaching the fender to the stone shield.

(6) Disconnect the fender lower brace to the bumper bar support and the upper brace to the front fender shield.

(7) Disconnect the fender headlamp panel from the radiator yoke panel.

(8) Remove the three bolts attaching the fender to the radiator grille upper panel.

(9) Disconnect the four bolts attaching the fender to the front fender shield.

(10) Remove the six bolts attaching the splash shield to the front fender.

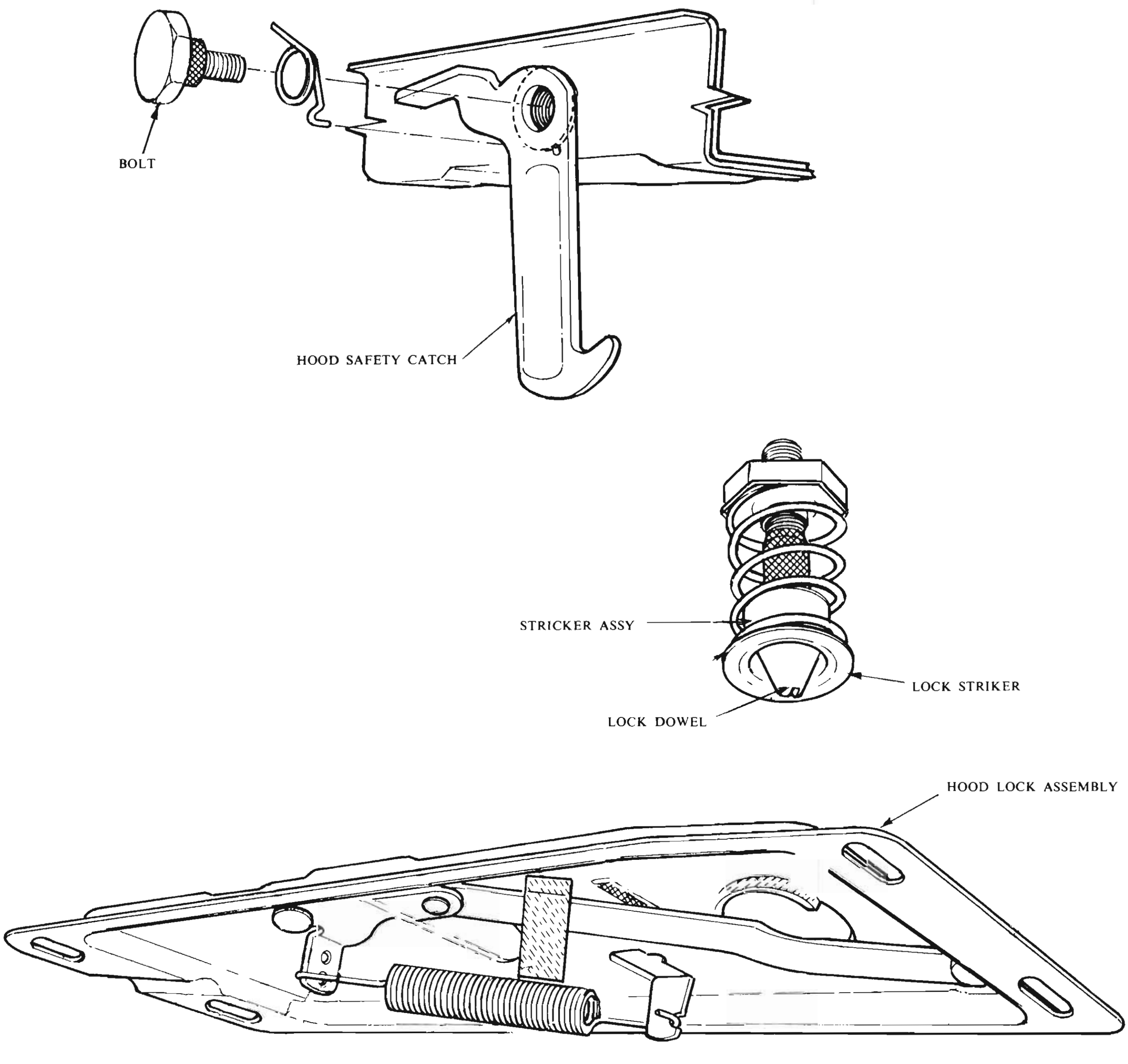


Fig. 18 – Hood lock assembly

(11) Remove the nut securing the front fender to the cowl panel upper corner.

(12) Remove the two bolts attaching the front fender to the side sill inner panel.

(13) Carefully remove the fender and retain any adjusting shims where installed.

To Install

(1) Installation is the reverse of the removal procedure.

(2) Check headlamp aiming and adjust if necessary.

7. DECK LID

The weight of the deck lid is counter-balanced in all positions by spring tension of two torsion bars. Fore and aft adjustment of lid is available through slotted holes in the hinge arms. Both the latch and striker plate are adjustable.

To Remove

(1) Scribe the location of hinge to deck lid securing bolt washers.

(2) With an assistant supporting one side of the deck lid, remove the hinge to deck lid attaching bolts.

(3) Remove the deck lid from the vehicle. Remove hinge retainer spring nuts to replace hinge.

To Install

(1) With an assistant supporting one side of the deck lid, place the deck lid on the hinge arms.

(2) Install attaching bolts and align scribe marks.

(3) Tighten attaching bolts to 115 lbs. in. torque.

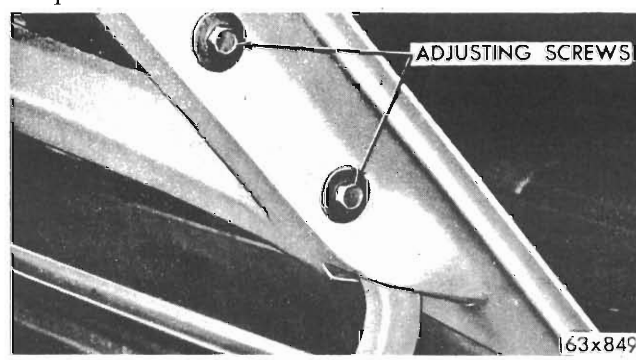


Fig. 20 – Deck lid adjusting points (typical view)

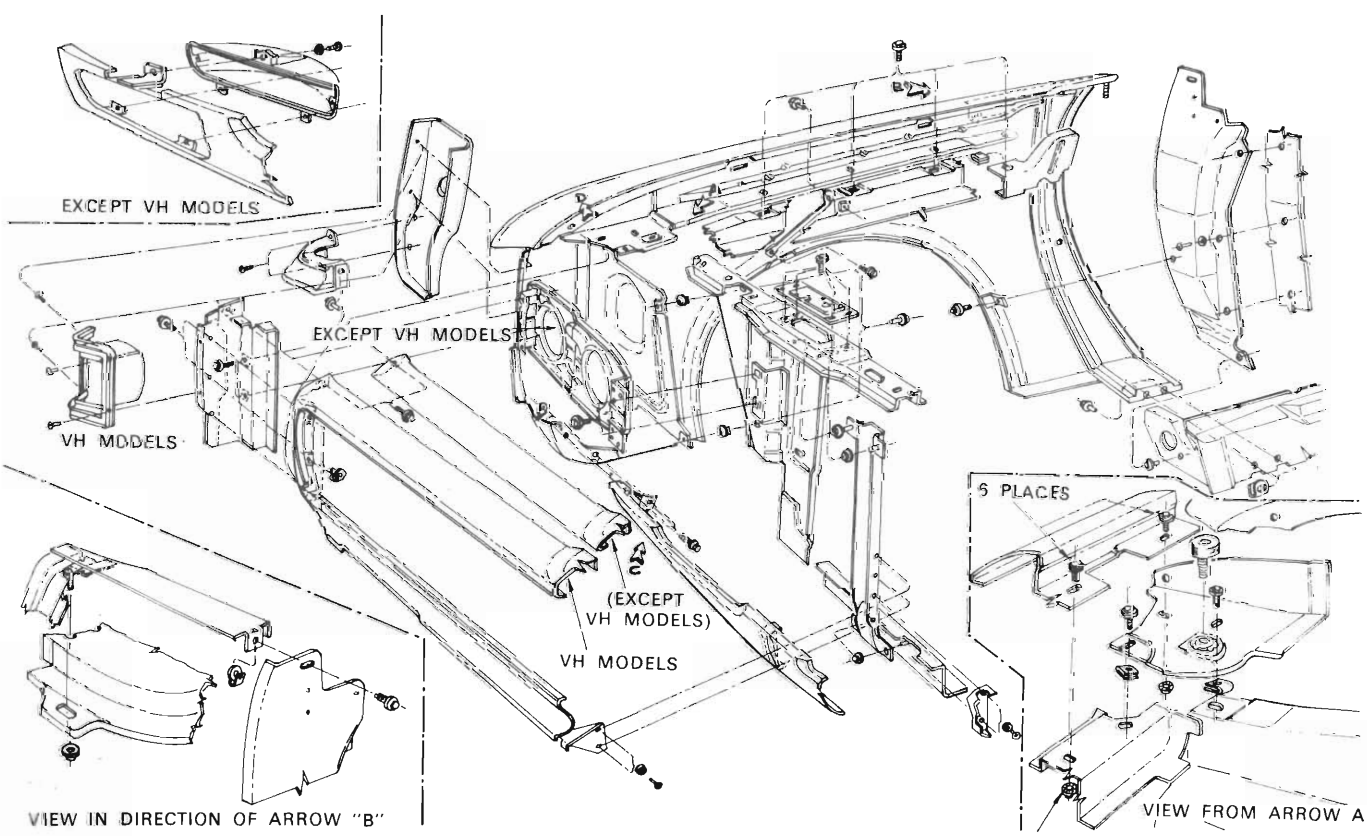


Fig. 19 – Fender Assembly Components

To Replace Deck Lid Torsion Bars

(1) With a suitable tool installed on the torsion bar, pry torsion bar out of adjustment slots *(see Fig. 21)*.

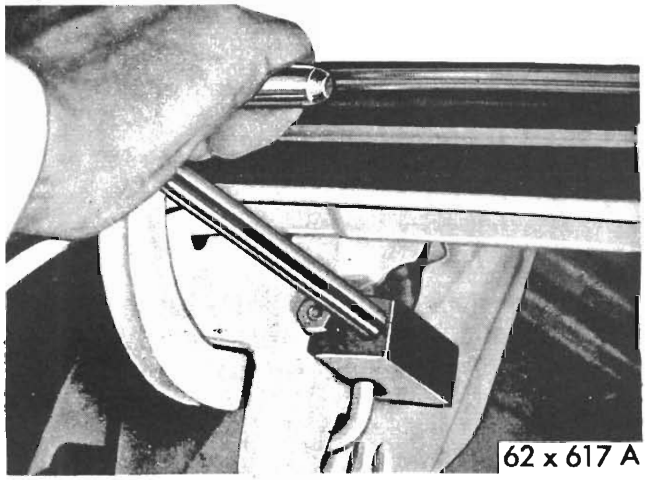


Fig. 21 – Removing or installing torsion bar (typical view)

(2) Unwind the torsion bar.

(3) Unhook the torsion bar from the support bracket.

(4) Push the torsion bar and slide out of the hinge arm and remove torsion bar from the hinge support.

(5) To install torsion bar, insert bar into hinge support.

(6) Insert torsion bar and slide in hinge arm.

(7) Hook torsion bar into support bracket.

(8) Using a suitable tool, wind torsion bar and insert one end of bar into first adjusting slot.

Fig. 22 – Deck lid lock adjustment

(9) Place the deck lid in various open positions and check tension of torsion bars.

(10) Adjust torsion bars progressively until deck lid stays in open position.

Deck Lid Lock Adjustment

Vertical adjustment of the deck lid lock is made at the lock attaching screws *(see Fig. 22)*. The side adjustment is made at the striker attaching bolts *(see Fig. 23)*.

Deck Lid Lock Cylinder

The deck lid lock cylinder is retained in the body by a spring steel U-shaped clip accessible through the access hole provided above the lock.

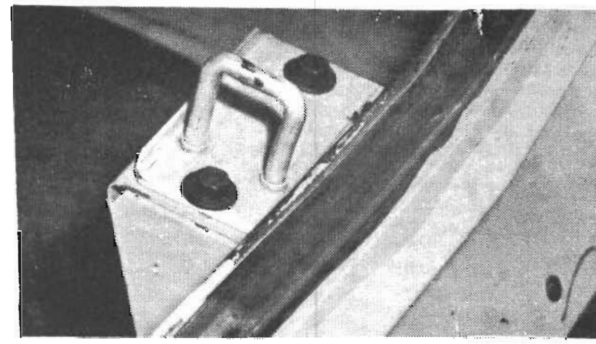


Fig. 23 – Deck lid striker adjustment

8. RADIATOR GRILLE — VH Models

To Remove

(Fig. 24)

(1) Remove the two radiator grille end pieces by removing the two screws located in each upper corner of the grille end pieces and the retaining nuts at the rear of the grille panel.

(2) Remove the two headlamps' bezel screws and remove the bezels.

(3) Remove the five screws attaching the radiator grille bars to the upper grille panel.

(4) From the rear of the grille panel (along the lower end behind the bumper bar) remove the five attaching "whizlock" nuts.

(5) The radiator grille can now be removed by pulling the assembly out of the bolt locating holes.

To Install

(1) Place the grille in position and install the attaching screws. (Do not tighten until all screws are started and the grille is aligned correctly.)

(2) Reverse the removal procedure.

Chrysler Models

To Remove

(1) Remove the grille centre piece ornament.

(2) Remove the six screws holding the grille to yoke panel and remove the grille.

To Install

Installation is the reverse of the removal procedure.

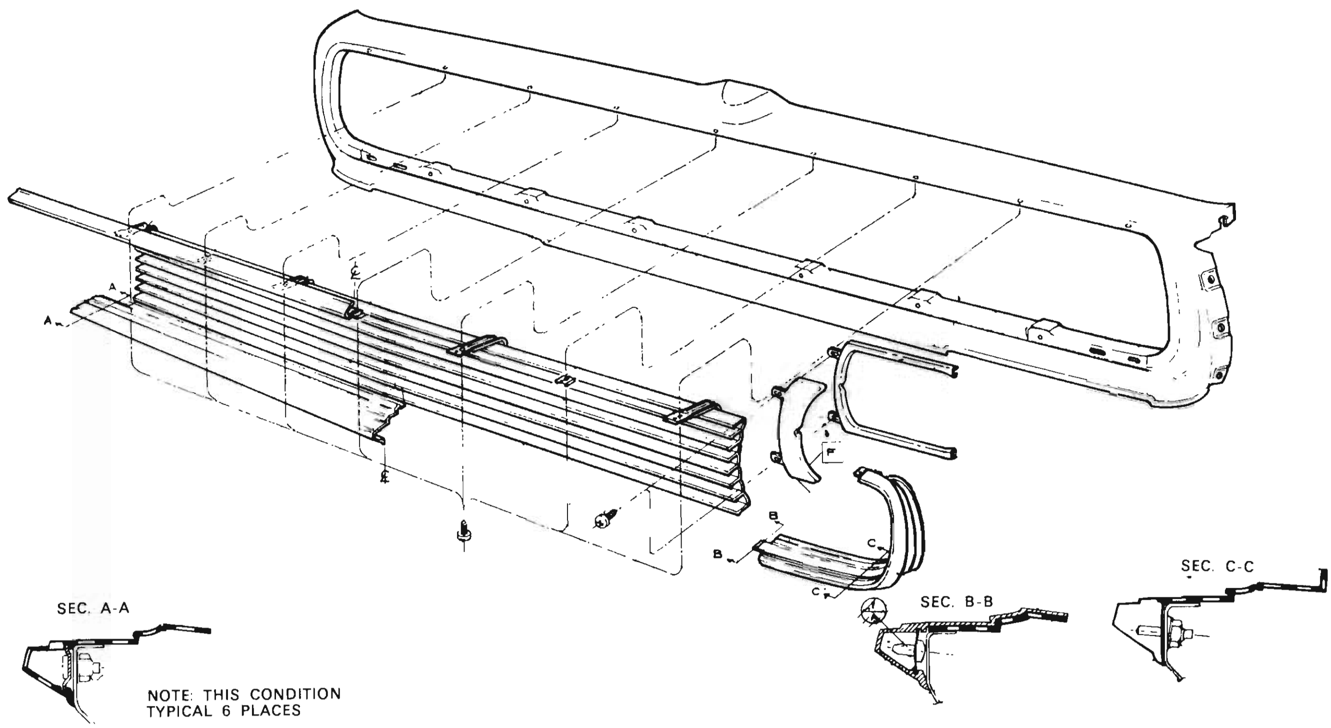


Fig. 24 – VH radiator grille

9. FRONT BUMPERS — VH Models

To Remove

Ref. Fig. 26

(1) Remove the six bolts attaching the bumper bar to the bumper support bars and remove the bumper bar.

Chrysler Models

To Remove

Ref. Fig. 27

(1) Remove the grille centre piece ornament.

(2) Remove the bolts and nuts attaching the bumper bar to the radiator grille upper panel.

(3) Remove the bolts attaching the bumper bar supports to the side rails.

(4) Remove the bolts attaching the fender braces to the bumper bar supports and remove the bumper bar and supports from the body.

To Install

(1) Installation is the reverse of the removal procedure.

(2) The elongated holes at each attaching end of the bumper bar supports allow correct adjustment of bumper bar to body alignment.

10. REAR BUMPERS

All Models except Station Wagon, Utility

Ref. Fig. 28

To Remove

(1) Disconnect the licence plate light wiring connections.

(2) From inside the luggage compartment, remove the four bolts attaching the bumper bar and support bars assembly to the deck lid lower panel and remove the bumper assembly.

Station Wagon

(1) Disconnect the licence plate light wiring.

(2) From the rear of the bumper bar, remove the four bolts attaching the bumper bar to the

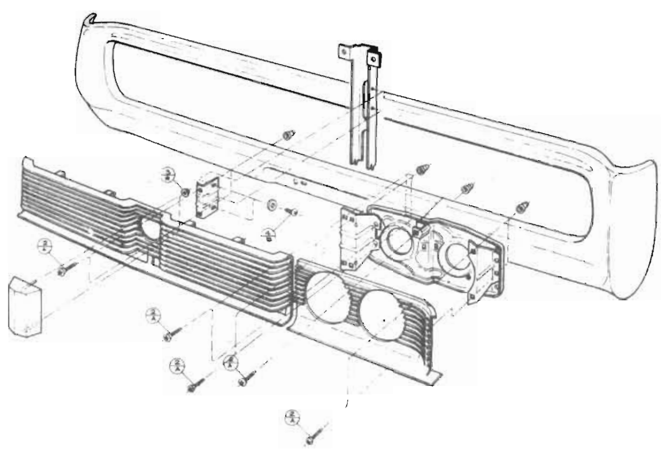


Fig. 25 – CH radiator grille

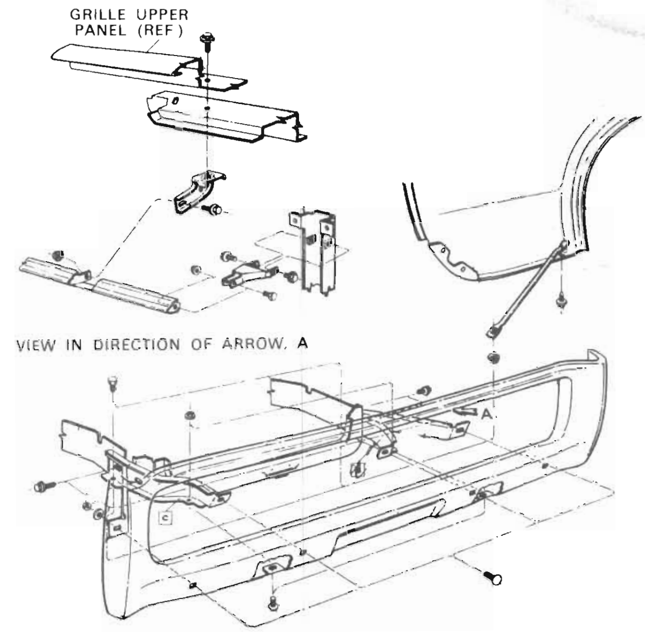


Fig. 27 – CH front bumper mounting

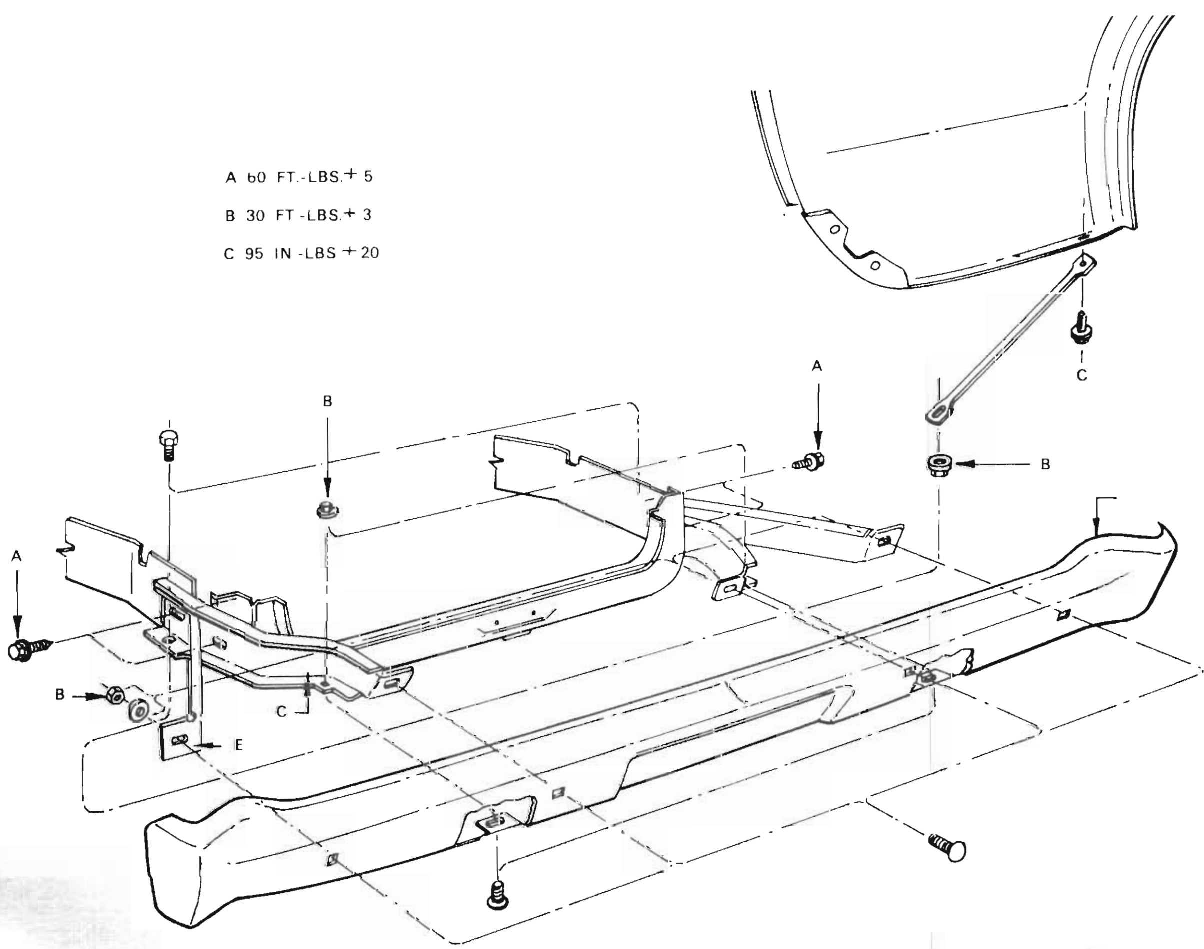


Fig. 26 – VH front bumper mounting

support bars and the two bolts and nuts attaching the bumper bar ends to the impact brackets. The bumper assembly can now be removed.

Utility

(1) From the rear of the bumper bar, remove the bolt attaching the bumper bar support to the body.

(2) Remove the bolt attaching the bumper bar stabilizer to the body.

(3) Remove the bolt at the upper part of the bumper attaching the rubber buffer to the body.

(4) From the front of the bumper bar, remove the screw attaching the bumper mounting rubber to the body and remove the assembly.

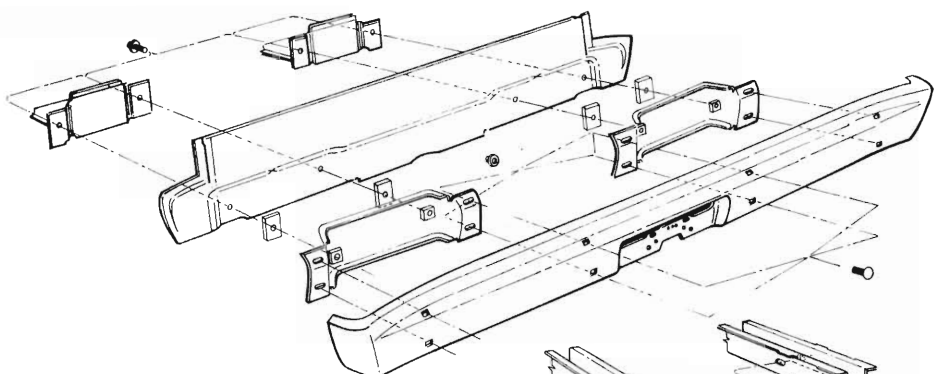


Fig. 28 – Rear bumper mounting (All models except station wagon, utility)

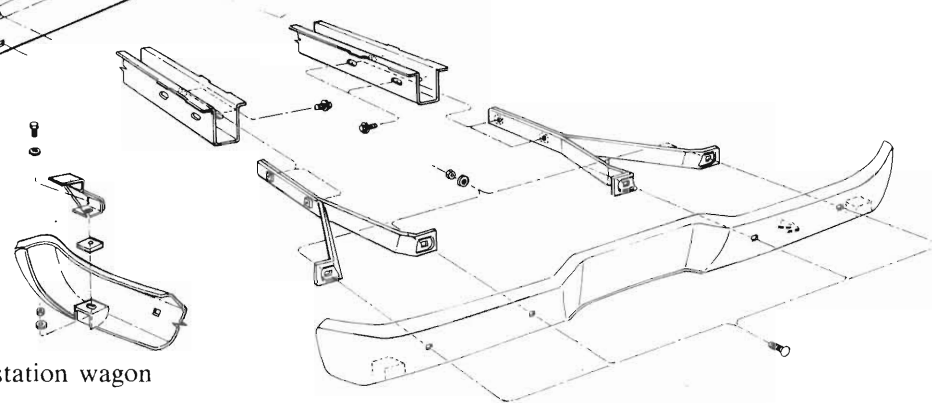


Fig. 29 – Rear bumper mounting station wagon

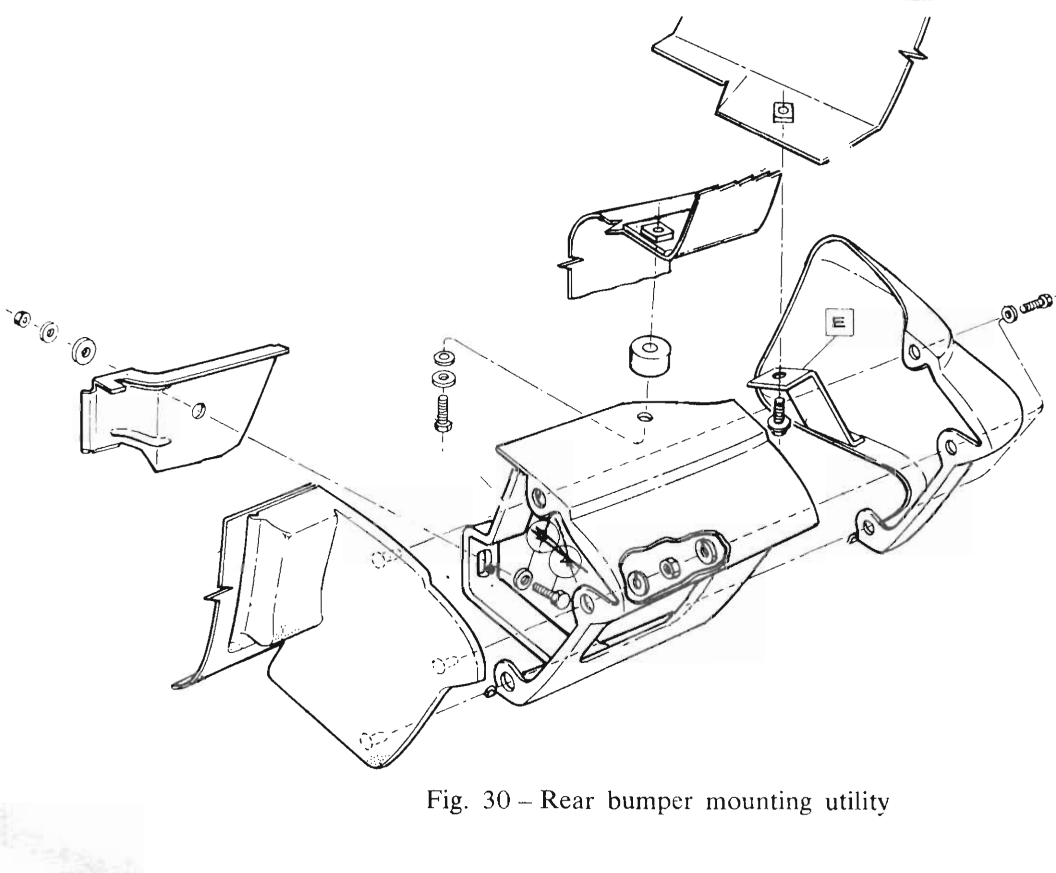


Fig. 30 – Rear bumper mounting utility

11. WINDSCREEN GLASS AND WEATHERSTRIP

To Remove

(1) Carefully mask all areas of paintwork around the windscreen rubber.

(2) Place a protective covering on the engine hood.

(3) Remove the wiper arms and blades.

(4) Remove the Mylar joint covering clip (where applicable) and pry out the Mylar locking trim from the weather strip.

(5) Insert a tapered wedge of fibre or hardwood into the weatherstrip lock groove and free off the windshield seal *(refer Fig. 31)*.

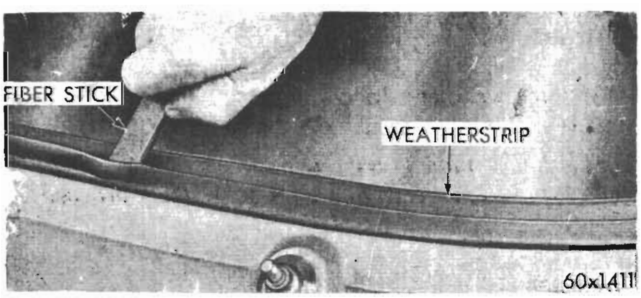


Fig. 31 – Unlocking windshield or rear window weatherstrip (typical view)

(6) Insert a tapered end of fibre stick between the weatherstrip and the glass and work the weatherstrip from the glass *(see Fig. 32)*.

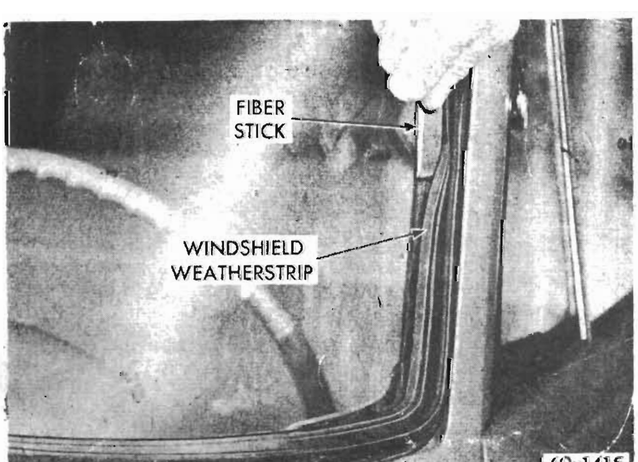


Fig. 32 – Freeing weatherstrip from windshield (typical view)

(7) With an assistant holding the glass, apply hand pressure to upper inside corner of glass, and push glass out of the windshield opening.

(8) Remove the windshield weatherstrip from the body flange, if found distorted, cut or torn *(see Fig. 33)*. Check flange (fence) for bends and rough surfaces, and repair as required.

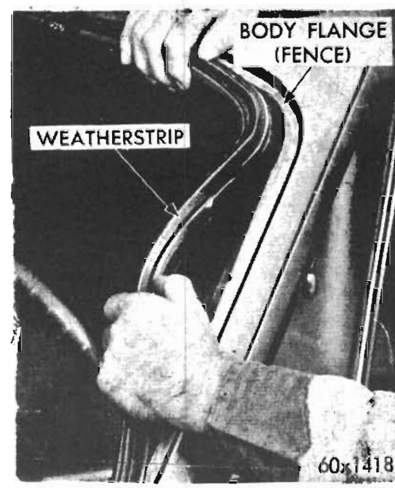


Fig. 33 – Removing or installing weatherstrip (typical view)

To Install

(1) Apply a bead of sealer into the body flange groove of weatherstrip.

(2) Apply approximately ½" bead of sealer along the tabs at the lower edge of the windscreen opening.

(3) Carefully position the weatherstrip over the body flange. Extra care should be taken to ensure the rubber is fitted smoothly in each corner.

(4) Coat the glass groove of the weatherstrip with a liquid soap solution, or suitable rubber lube.

(5) With the aid of an assistant, insert the lower edge of the glass into the weatherstrip.

(6) Holding the glass centred in the opening, insert the fibre or hardwood wedge in the groove of the weatherstrip and pry the rubber over the edge of the glass *(see Fig. 34).*

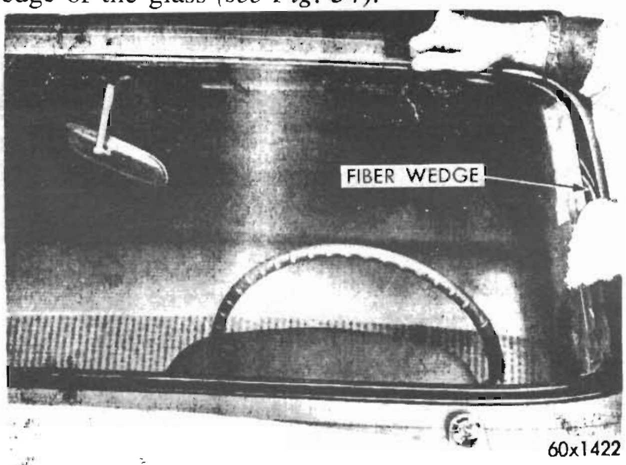


Fig. 34 – Installing windshield glass in weatherstrip (typical view)

(7) Apply a small bead of sealer between the glass and the weatherstrip and between the body and the weatherstrip *(see Fig. 35).*

(8) Lock the weatherstrip by installing the mylar locking trim with Tool No. E23C5C *(Fig. 36).*

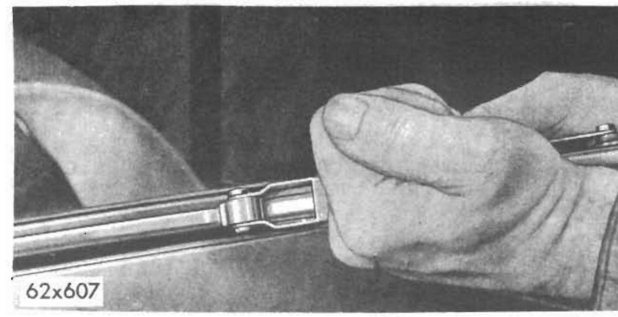


Fig. 36 – Locking windshield or rear window weatherstrip (typical view)

(9) Clean all the excess sealer and all the finger marks from the glass and surrounding body areas and re-install the wiper arm and blade assemblies.

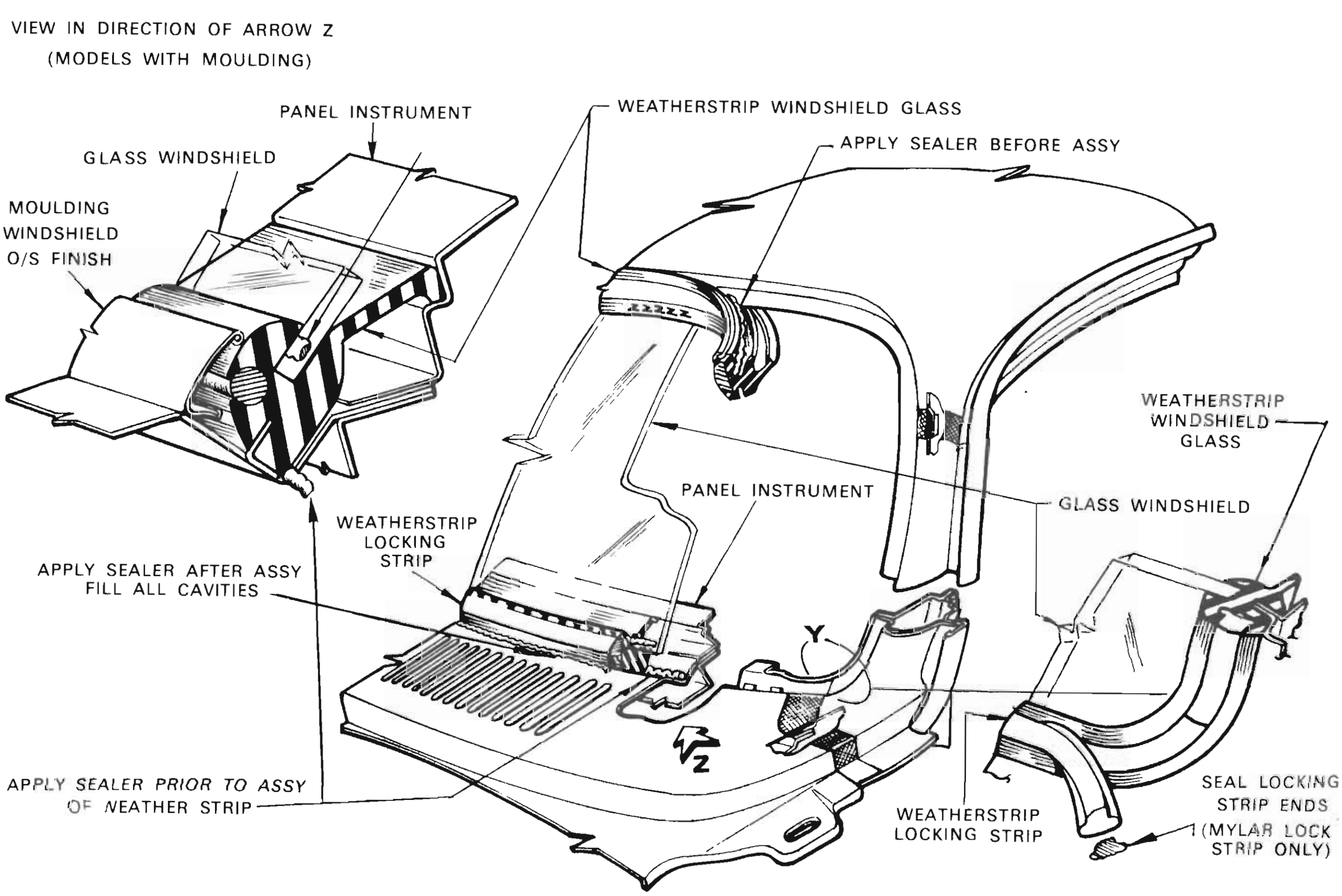


Fig. 35 – Windshield Sealing Diagrams

12. REAR WINDOW AND WEATHERSTRIP

To Remove

(1) Suitably protect deck lid and paint work, remove the corner trim pieces and Mylar internal lock-type trim. Starting at joint of trim at bottom corner of rear window, pry out edge of strip and pull trim strip from rubber.

(2) Insert fibre stick between weatherstrip and glass, and work weatherstrip free from glass *(see Fig. 37)*.

(3) With an assistant holding glass, push out glass from either upper corner of body opening.

(4) Remove rear window weatherstrip from body flange if found distorted, cut or torn. Check flange (fence) for bends and rough surfaces, repair as required, and remove old sealer.

To Install

(1) If weatherstrip was removed, apply a small bead of cement to body flange groove of weatherstrip.

(2) Carefully position weatherstrip over body flange, making sure it fits smoothly and evenly over entire flange, especially at corners *(see Fig. 38)*.

(3) Coat channel of weatherstrip with a liquid soap solution.

(4) Centreing glass in opening, insert lower edge of glass into lower channel of weatherstrip.

(5) Using a tapered fibre stick, work weatherstrip over edge of glass *(see Fig. 37)*. Bump glass into place with palm of hand.

(6) Air dry weatherstrip.

(7) Apply weather-sealing compound between glass and weatherstrip. Lock weatherstrip by installing Mylar trim. Use a liquid soap solution as lubricant and with Tool E23C5C work trim strip into rubber.

Fig. 37 – Removing or installing rear window glass (typical)

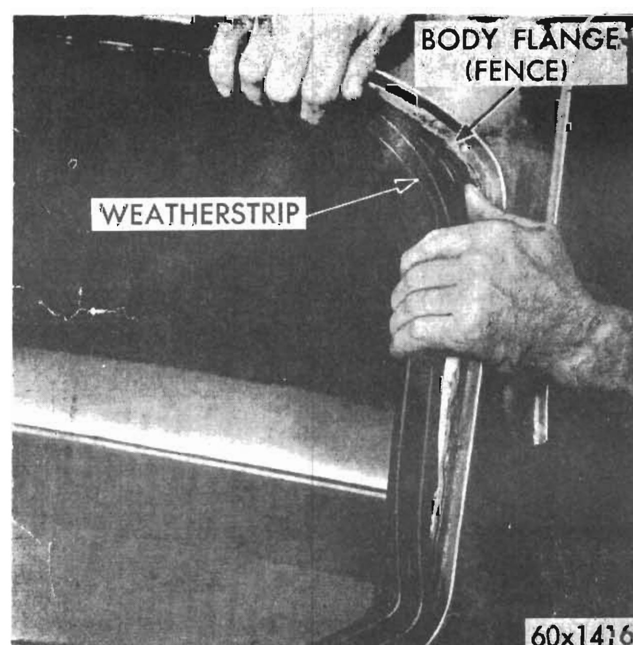


Fig. 38 – Removing or installing weatherstrip (typical)

(8) Start at lower corner of window and trim strip to length after it is fully inserted around window *(see Fig. 36)*.

(9) Re-install corner trim pieces correctly. Test seal as described in *para. 25*.

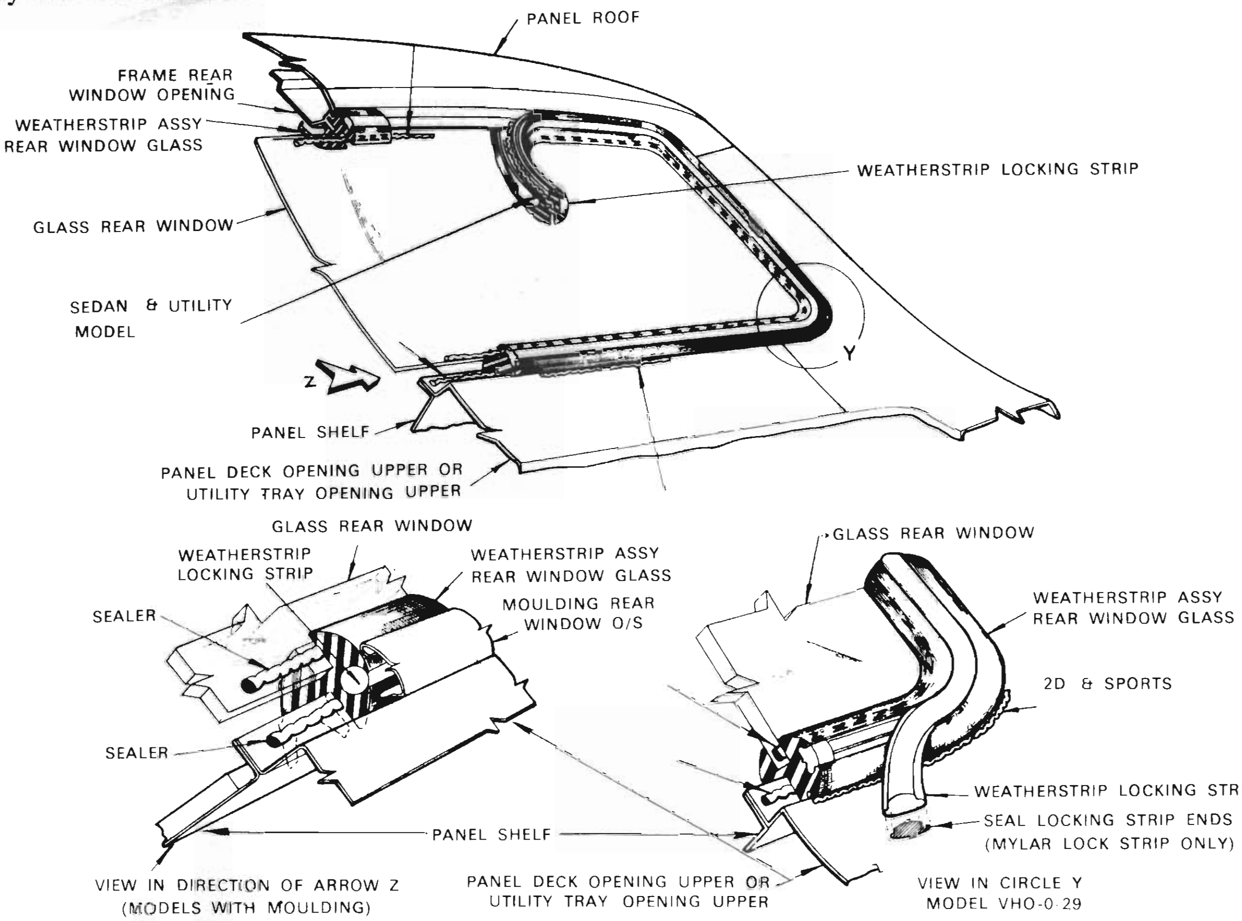


Fig. 39 – Rear Window Sealing Diagram. (Models except Station Wagon)

13. STATIONARY GLASS

Station Wagon Rear Quarter Glass

Fig. 40

To Remove

(1) Position suitable protective covering where necessary.

(2) From inside the vehicle, unlock the weatherstrip by inserting a fibre stick into the locking groove of the weatherstrip upper corner ("C" pillar end) and along the lower part of the weatherstrip, forcing the hinged tab out of groove. Insert the fibre stick in the upper corner of the weatherstrip ("C" pillar end), pry out and pull the Mylar locking strip from the weatherstrip.

(3) With an assistant holding the glass from inside the vehicle, apply hand pressure at the outside upper corner of the glass ("C" pillar end) and remove the glass from inside the vehicle.

To Install

(1) Apply a bead of sealer into the glass groove of the weatherstrip.

(2) Coat the glass outer edges with a suitable rubber lube.

(3) From inside the vehicle, insert the lower edge of the glass firstly into the bottom corner of the weatherstrip (tailgate end) and press the glass firmly into place along the bottom part of the weatherstrip.

(4) From inside of vehicle, place two suitable levers on the top edge of glass and with the upper tips of the glass levers protruding into the weatherstrip glass groove seat the glass whilst an assistant on the outside of the vehicle, using a fibre stick, pulls the lip of the weatherstrip over the glass.

(5) Apply rubber lube to weatherstrip locking grooves and insert the hinged locking tab into the weatherstrip groove using a fibre stick.

(6) With Tool No. E23C5 install the Mylar locking strip into place in the weatherstrip.

(7) Clean excess sealer and all finger marks from the glass and surrounding areas.

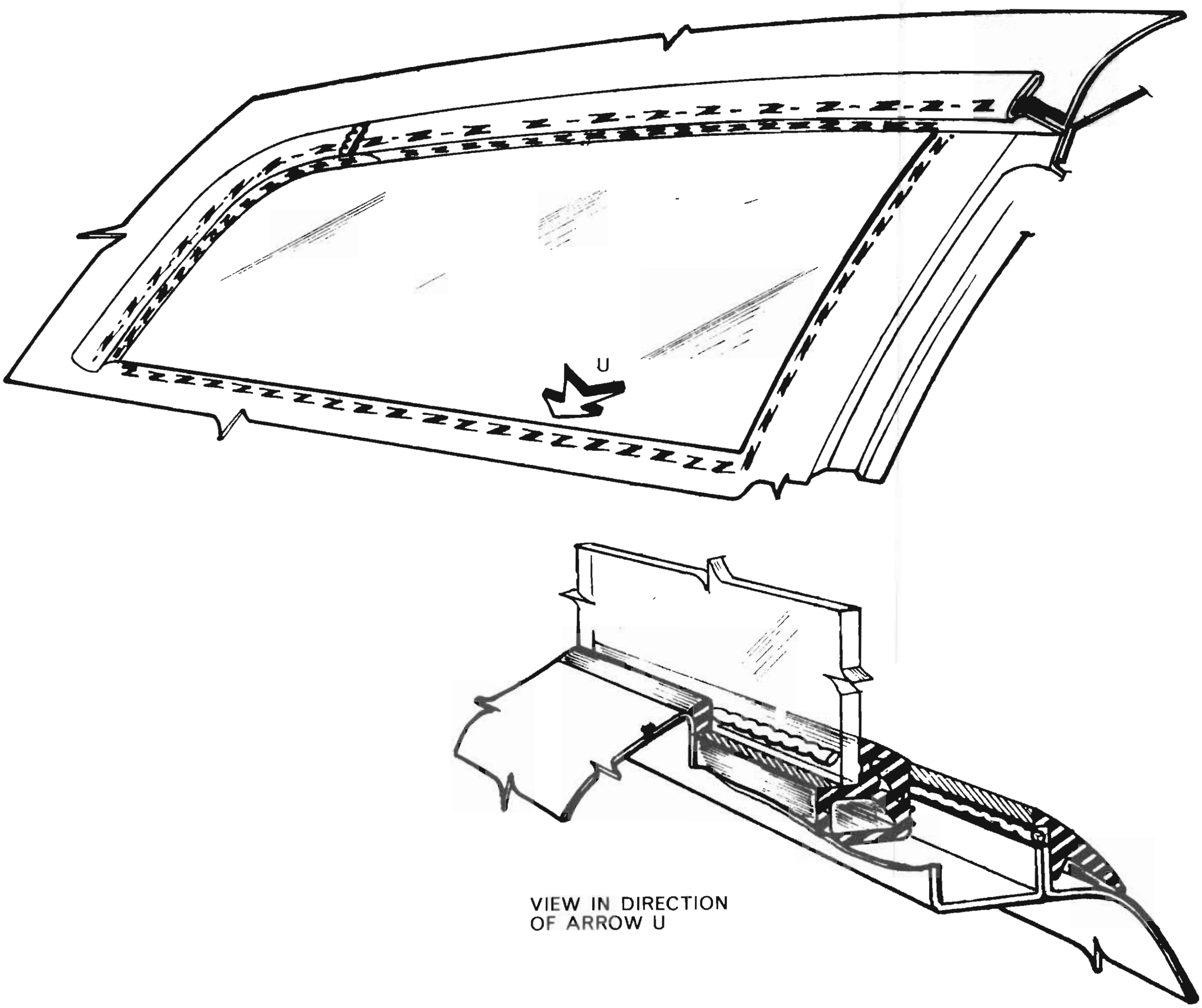


Fig. 40 – Station Wagon quarter window sealing diagram

14. TAILGATE

The Tailgate of the Station Wagon Model is hinged at the lower corners and is counter-balanced by one torsion bar to aid in lowering and raising. The tailgate window retracts into the tailgate when in the lowered position. (The window must be fully lowered to open tailgate).

The Regal and XL Models Station Wagon Tailgate window mechanisms are electrically operated by a key switch in the tailgate exterior or from the control switch on the instrument panel.

Incorporated in the electric motor is a thermal overload switch which open circuits the motor in the event of it overheating due to an electrical or mechanical malfunction.

> DO NOT continue to operate the panel switch or the tailgate key after the window has been fully closed or opened.

Should the electric motor become unserviceable, it can only be serviced as an assembly. An isolator switch is attached to the left hand side of the tailgate. This switch is operated by a metal strip which, when the tailgate is closed, presses a spring-loaded insulated contact which completes the circuit and allows the tailgate window to be operated.

When the tailgate is opened, the spring-loaded contact is released, open circuiting the connection.

> The isolator switch can be operated manually with the tailgate open, should it be necessary to obtain access to the tailgate mechanism, as this operation requires the window to be in the raised position with the tailgate open.

Tailgate Alignment

Tailgate alignment is essential to ensure ease of window operation and weather sealing.

Prior to changing the alignment of the tailgate, scribe an aligning mark around the tailgate latch and tailgate hinge plate.

Repeat this on both pillar posts. This provides marks to show the amount of movement. Vertical adjustment and IN and OUT adjustment are made at the hinge plates. IN and OUT alignment of the top of the tailgate is adjusted by moving the latch IN or OUT to permit ease of entry of the tailgate glass into the upper run channel.

Tailgate Removal and Installation

To Remove

(1) Fully lower the tailgate window and open the tailgate.

(2) Scribe the location of the torsion bar guide plate to the right hand rear pillar.

(3) Remove the three screws which attach the tailgate torsion bar guide plate to the right hand rear pillar.

(4) Place padded jacks or stands under the fully opened tailgate.

(5) Remove the left tailgate support arm step bolt from the left rear pillar post.

Electric Operated Models Only

(a) Remove cover panel screws and cover panel.

(b) Raise tailgate window by operating tailgate key switch while holding the isolator switch closed.

(c) Disconnect wiring loom from connections taking note of the connections to the key switch, i.e., *from the left,* BLACK, RED, GREEN.

> NOTE: Incorrect assembly may cause damage to electrical parts, or reverse direction of operation with regard to switch operation.

(d) Remove loom through hole provided in bottom of tailgate.

Both Models

(6) Remove both hinge attaching screws from the pillar posts and remove the tailgate from the body.

To Install

(1) Place the tailgate on padded jacks or stands adjacent to the body opening.

(2) Align the hinges with the scribe marks and install the attaching screws finger-tight.

(3) Attach the tailgate support arm on the left hand side.

(4) Align the torsion bar guide bracket with the scribe marks and install and tighten screws. Ensure that the weight of the tailgate is evenly supported when it is fully open.

(5) Check the tailgate hinge alignment, and adjust if necessary. Tighten attaching screws securely.

Electric Operated Models Only

(a) Insert loom through hole provided and re-connect all terminals.

(b) Two black wires to isolator switch.

(c) Black and green wires to corresponding wires on motor.

(d) Black, red and green to key switch, starting from the left.

(e) Operate isolator switch and key switch and lower tailgate window, as described in *sub-paragraph (5b)* — To Remove.

(6) Re-install cover panel and tighten screws securely.

(7) Check tailgate hinge alignment and adjust if necessary. Tighten attaching screws securely.

Tailgate Glass Assembly

To Remove

(1) Lower tailgate glass and open the tailgate.

(2) Remove the panel cover attaching screws and remove the panel and "raise" the glass.

(3) Operate the isolator switch and key switch (electric models), raise the glass sufficiently to enable the bolts attaching the window regulator to the panel to be removed, and slide the regulator arms out of the glass channels.

(4) Remove the tailgate weatherstrip and re-move the tailgate window glass and channel assembly from the tailgate.

To Install

To install the tailgate glass, reverse the foregoing removal procedures, paying particular attention to the glass adjustment.

Tailgate Glass Alignment

(1) Remove the tailgate inner cover panel.

(2) Close the tailgate and with the window glass in the fully lowered position, adjust the upper tail-gate side channels in the body side pillars as fore and aft alignment is necessary to allow the window glass to enter into the channels. (Side channels can be moved when the attaching screws are loosened.)

(3) Raise the window glass about half way up and adjust the lower run channels fore and aft bolts as found necessary to centre the run on the window.

(4) Raise the window to approximately ½" below the top glass run. Adjust the regulator

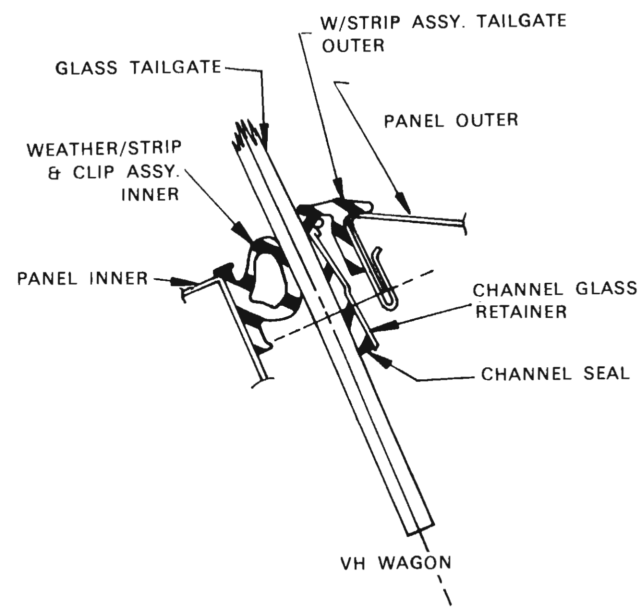


Fig. 41 – Tailgate glass sealing detail

assembly so the top of the glass is parallel to the top of the body opening.

(5) To raise the left side of the window assembly, raise the left side of the regulator assembly.

(6) To lower the left side of the window assembly, lower the left side of the regulator assembly.

(7) Install tailgate inner cover panel.

Tailgate Glass Regulator

To Remove

(1) Lower the tailgate glass and open the tail-gate.

(2) Remove the panel cover attaching screws and panel, then "raise" the glass.

Electric Operated Models Only

(3) Operate isolator switch and key switch and raise tailgate window as in *sub-paragraph 3* — Tail-gate Glass — To Remove.

Electric Operated Models Only

(4) Disconnect the wiring loom from the electric motor and the key switch, taking note of the posi-tions of the various coloured wires as described in *Tailgate* — To Install.

(5) Remove the screws attaching the regulator assembly to the tailgate and remove the regulator.

Manual Models Only

> NOTE: Before removing the regulator assembly from the tailgate, note the position of the regulator handle to avoid error whilst re-assembling.

Handle or Switch Assembly Replacement

Remove the retaining nuts/screws and washers and remove the assembly from the panel, retaining the gasket. The switch and lock barrel are retained by a spring U-clip to the panel ornament.

To Install

(1) Install the regulator assembly into the tailgate.

> NOTE: Manual Models only:
> Ensure that the regulator handle engages the regulator shaft in such a position that the handle will come to rest positioned horizontally when the glass is fully raised.

(2) Insert the regulator arms into the glass channels.

(3) Install the regulator attaching screws and tighten finger-tight only.

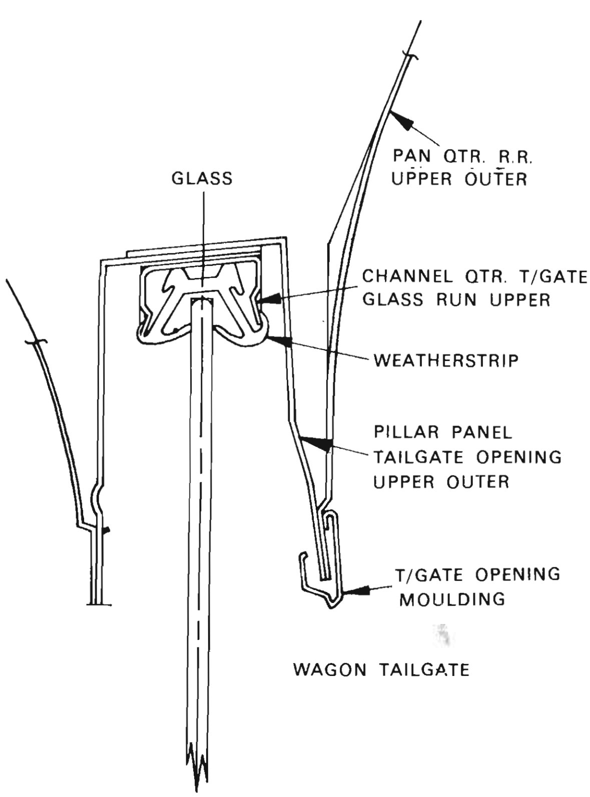


Fig. 42 – Tailgate glass detail

Electric Operated Models Only

(a) Connect the wiring loom to the electric motor and key switch in the position as described in *Tailgate* — To Install.

(4) Close the tailgate and raise the window glass to within ½" of the top glass run.

(5) Working from the inside of the vehicle, position the regulator assembly on the mounting screws so the top of the window glass is parallel to the top of the body opening. Tighten mounting screws securely.

(6) Lower windows, open tailgate and install tailgate inner cover panel.

Window Regulator Motor and Driving Gear Housing

(Electric operated window models only)

To Remove

> WARNING: Whenever it is necessary to remove the electric motor from the regulator, it is imperative the linkage be in the fully raised position. Failure to do this allows the assist spring to drive the linkage to the fully raised position with considerable force.

(1) Remove the two nuts and washers securing the electric motor to the regulator.

(2) Withdraw the motor from the drive coupling. A flat on the motor shaft and a corresponding internal flat in the coupling bore provides the means of driving the regulator. The regulator driving gear housing may be removed, if required, by removing the three hex head screws and one cross recessed screw. The housing is located on the regulator by two dowels.

To Install

The driving gear housing and electric motor are re-installed by reversing the above procedure.

Electric Motor

To Test

The electric motor may be tested in or out of the regulator assembly.

(1) Connect a test wire to the black wire from a battery positive terminal and another from the battery earth terminal to a good ground on the motor or regulator. The shaft should rotate.

(2) Disconnect the test wires and reconnect to the green wire and a good ground. The shaft should rotate in the opposite direction. If the motor does not rotate on one or either of the tests, check the connections or leads, if satisfactory, replace the motor.

Isolator Switch

To Test

(1) Connect a lead to each terminal of the switch from the positive and negative terminals of a battery. One lead containing a series test lamp.

(2) Press down the metal strip which will connect the insulated terminal and complete the circuit.

(3) The series lamp should light.

(4) If it does not light, the isolator switch is faulty and should be replaced.

Circuit Breaker

(1) Connect two leads, one containing a series lamp, to the positive and negative terminals of a battery or similar power source to the two terminals of the circuit breaker.

(2) If the series lamp does not light, the circuit breaker is faulty and should be replaced.

Wiring Loom

To Test

(1) Disconnect loom connectors at motor.

(2) Connect one lead from a series test lamp to green wire.

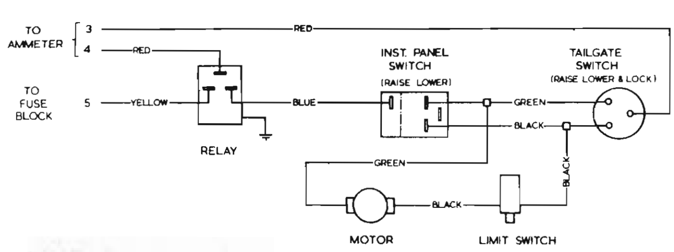


Fig. 43 – Tailgate wiring diagram

(3) Connect other lead of series lamp to a good ground.

(4) Operate tailgate instrument panel window switch in "DOWN" position. Lamp should light, if not, check loom between terminal and instrument panel for continuity.

(5) Repeat test with black wire and instrument panel switch in "UP" position.

(6) An open circuit in either wires indicates a replacement loom is necessary.

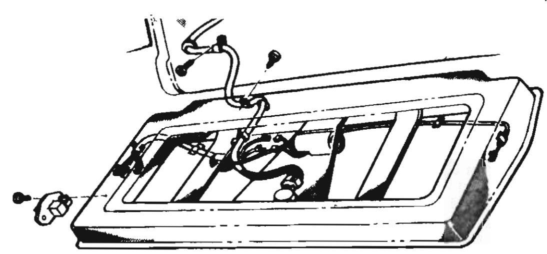


Fig. 44 – Wire harness routing

(7) If the test lamp does not light with both wires showing continuity and—

(a) all connections are tight,

(b) the circuit breaker is not faulty,

the instrument panel switch is faulty and requires replacement.

To Test

(1) Connect a lead from the negative terminal of a battery to the centre terminal of the switch.

(2) Connect a lead containing a series lamp to the positive terminal of the battery and touch the end of the lead to the "GREEN" terminal and turn the key in a clockwise direction.
The lamp should light.

(3) Repeat the operation on the "BLACK" terminal. If the lamp does not light on either one of the terminals, the switch and housing unit should be replaced.

(4) The lock unit can be used in the replacement switch.

15. ROOF REAR AIR DEFLECTOR

The rear air deflector *(Figs. 45 and 46)* used on station wagon models is mounted on the roof by inserting the deflector studs through the holes drilled in the panel and secured with "sealing" type nuts from the vehicle interior.

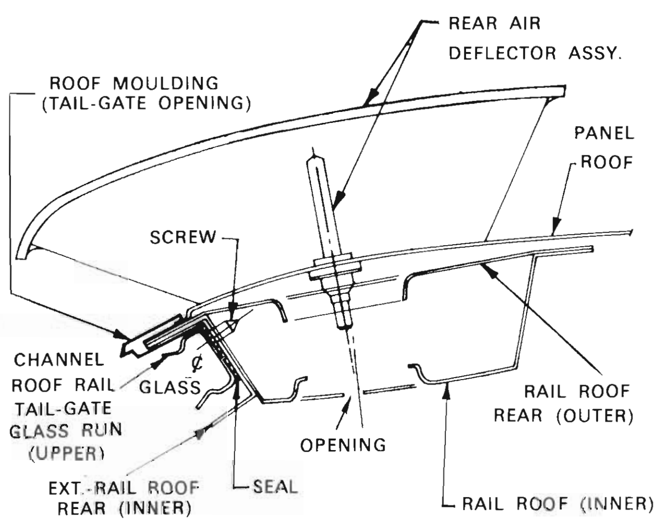


Fig. 45 – Station wagon rear air-deflector mounting diagram

To Remove

(1) Remove the tailgate window opening piping.

(2) Peel back the headlining from the tailgate window opening and the "D" pillar ends. Care must be taken not to tear the headlining.

(3) Lift the quarter window glass weatherstrip and carefully peel back the headlining approximately 7″ to 9″ to give access to remove the air deflector attaching nuts and screws.

(4) Remove the five nuts and the four screws (two on each side) attaching the air deflector to the roof *(see Fig. 46)* and remove the air deflector.

To Install

(1) Installation is the reverse to the removal procedure.

(2) Tighten the air deflector attaching nuts to 45 lbs. in. and the screws to 40 lbs. in.

(3) Apply neoprene cement to the headlining and body mating surfaces and fasten the headlining to the quarter windows and tailgate opening.

(4) Reposition the side window weatherstrips and the tailgate opening piping.

(5) Clean off any surplus neoprene from the headlining and/or any surrounding body areas.

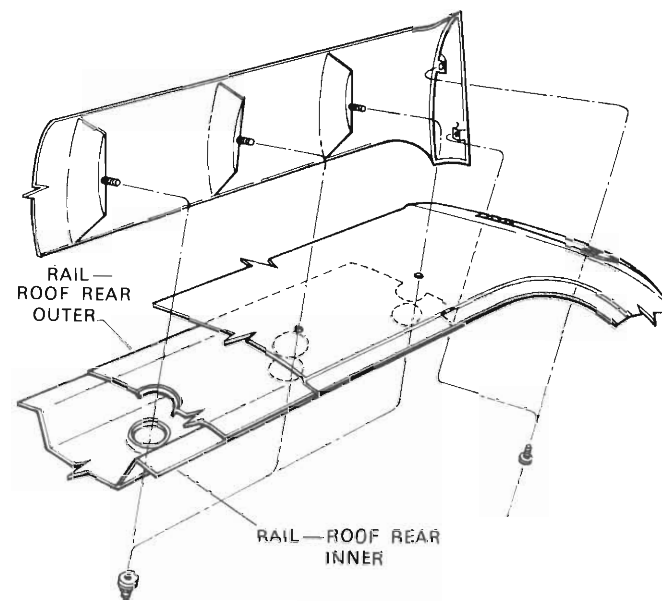


Fig. 46 – Wagon air-deflector detail

16. HEADLINING

(1) For ease of operation, remove all seats.

(2) Remove sunvisors, rearview mirror, dome lamp, coat hooks, cargo area lamp (station wagon) and quarter trims (utility).

(3) Remove the front and rear windscreens and weatherstrips.

Station Wagon Only

(a) Remove the piping at the tailgate opening.

(4) Lower all door pipings sufficiently to allow removal of the headlining above the door opening.

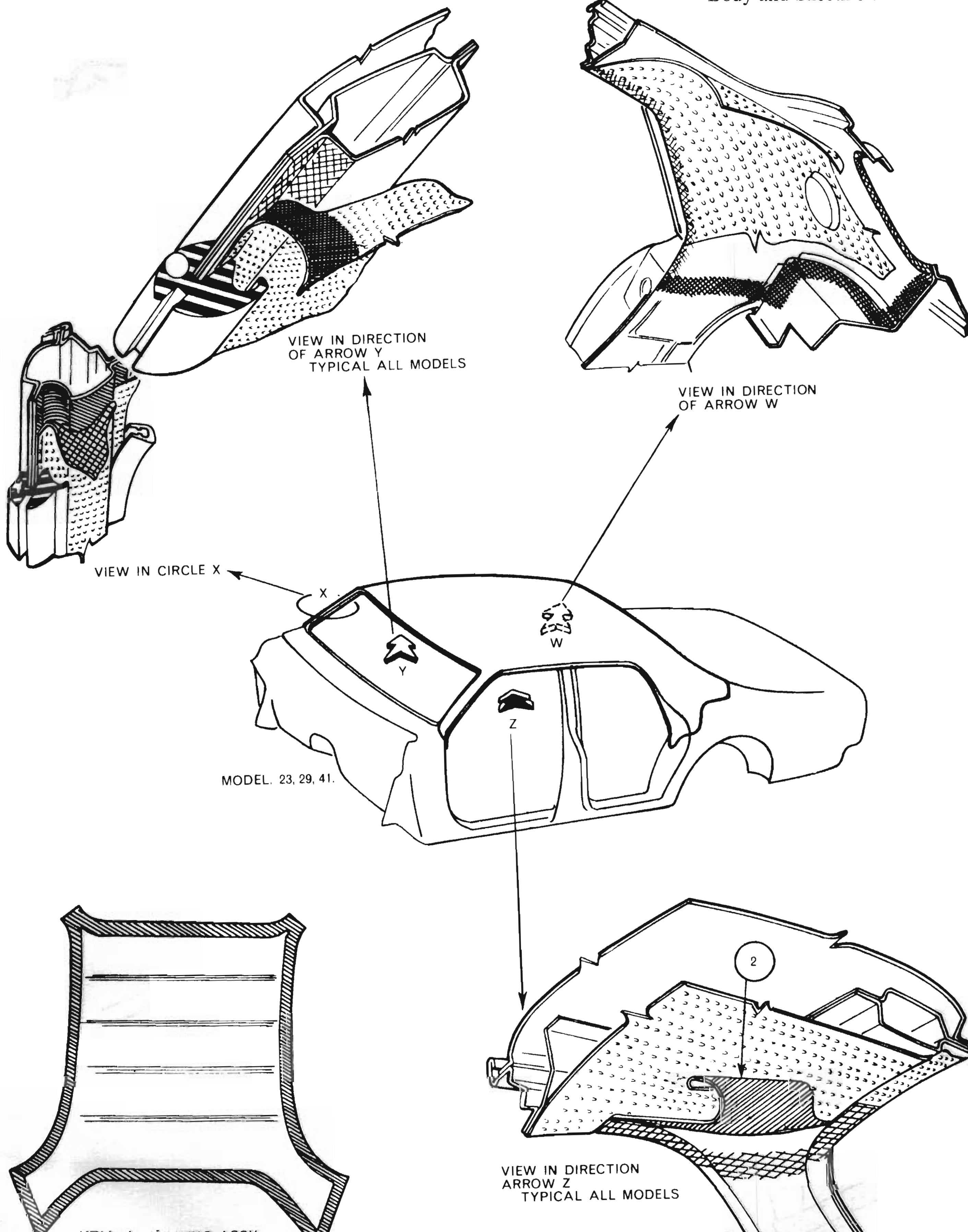


Fig. 47 – Headlining application

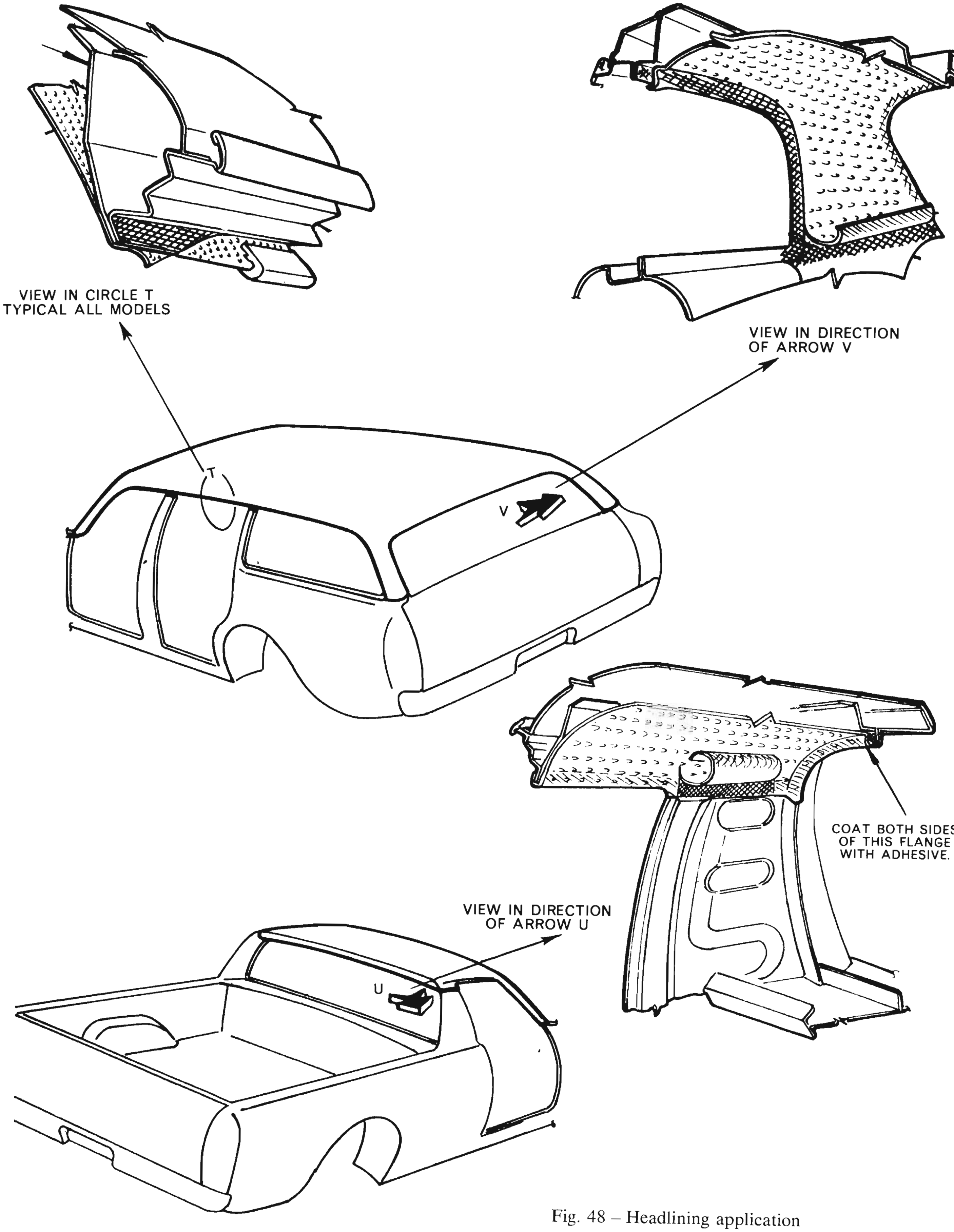


Fig. 48 – Headlining application

(5) Carefully remove the headlining from the door and window opening flanges where cemented and remove the headlining from the vehicle.

(6) Note position and identify bows for future installation.

To Install

(1) Apply neoprene cement to window and door opening flanges.

(2) Spread the headlining on a flat surface and position the roof bows in the headlining.

(3) Apply approximately 6″ of neoprene cement around the edge of the headlining and allow to dry.

(4) Carry the headlining into the vehicle.

(5) Starting from the rear of the body, position the bows in the attaching holes on the side-rail, working towards the front of the body.

(6) Grasp the front of the headlining — pull lightly and fasten to the centre of the windshield header panel, taking care to position the bows upright.

(7) Pull the headlining hard to the rear of the vehicle and fix to the centre of the rear window opening (or tailgate opening—station wagon).

(8) Work the headlining slowly to stretch out any wrinkles and fasten the headlining above the door openings and onto the wheel arches, etc.

(9) Trim any surplus material from the windows and door openings.

(10) Re-fit and seal all windows and weatherstrip and re-position the door piping.

(11) Locate the position for the dome light (and cargo area light where applicable). Cut the headlining to connect the wires and install the light/s.

(12) Re-fit the rearview mirror, sun visors and coat hooks.

17. GLOVE BOX AND INSTRUMENT PANEL

Glove Box

To Remove

(1) Remove the screws that attach the lid to the glove box and remove the glove box.

Glove Box Lid

If the glove box lid is to be removed, *first scribe* the location of the hinge arms to the lid, remove the four attaching screws and then remove the lid.

Glove Box Hinges

From under the instrument panel, remove the screws attaching the hinges to the instrument panel and remove the hinges.

To Install

Installation is the reverse of the removal procedures. Open and close glove box several times and adjust if necessary.

Instrument Panel

To Remove

To remove the instrument panel, first remove the windshield as described in paragraph 10.

(1) Disconnect the battery negative lead.

(2) From the engine compartment, disconnect the instrument panel loom plug and earth wire, ignition switch plug, and the dash panel grommet to allow the loom to be pulled through.

(3) Remove the five upper mounting screws from windshield "fence" flange.

(4) Remove the two steering column clamp bolts at the bottom of the instrument panel and the two bolts attaching the instrument panel to the steering column support.

(5) Loosen the four bolts attaching the steering column support plate to the dash panel, lower the steering column and support.

(6) Remove both side trim kick panels to expose the instrument panel lower mounting bolts and loosen.

(7) Lower the instrument panel away from windshield "fence" flange and balance instrument panel on the lower mounting bolts.

(8) With instrument panel lowered, disconnect all wiring loom connections, heater demister tubing and/or air conditioner duct to panel (where fitted), fresh air duct cables, speedometer cable, and choke cable (where applicable).

18. INTERIOR REAR VISION MIRROR

The break-away interior rear view mirror is a safety item allowing the mirror to "break away" in an event of part of the body contacting the mirror at "impact". It is held in place by spring tension exerted on two lugs at the end of the mirror stem. These lugs protrude into a recess on the header panel.

To Remove

Hold the stem of the mirror firmly and exert pressure until the spring tension is overcome.

To Install

Place the stem in position at the recess, hold firmly and with the palm of the hand bump the stem into place.

Ensure that both lugs have properly seated into the recess.

19. REMOTE CONTROL MIRROR

The mirror is operated from within the vehicle by a control knob mounted on the inner door panel. Three cables connect the mirror head and the control knob which move the mirror head to the desired position.

To Remove (Figs. 48A and 48B)

(1) Remove the inside door handles, arm rest, door trim and weather curtain.

(2) Remove the decorative nut securing the threaded end of the control unit to the front door inner panel.

(3) Push the control unit end out of the locating hole in the door inner panel and ensure to retain the lock plate attached to the control unit.

(4) On ventless doors, unhook the cable assembly from the clip as shown in *Fig. 48A*.

(5) With the window in the "UP" position and using a 7/16" AF box spanner, remove the two "whiz-lock" nuts holding the mirror assembly and spacer to the front door outer panel and remove the mirror.

To Install

(1) Installation is the reverse of the removal procedure.

(2) Ensure that the plastic sheath over the cables is pushed up to the base of the mirror to prevent cables from chafing on the door outer panel.

(3) On ventless doors, route the cable to the clip as indicated in *Fig. 48A*, prior to attachment on the door inner panel.

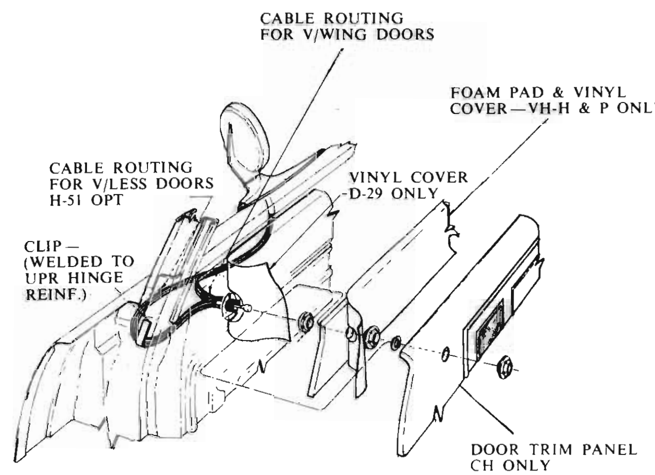


Fig. 48A – Remote control mirror cable routing

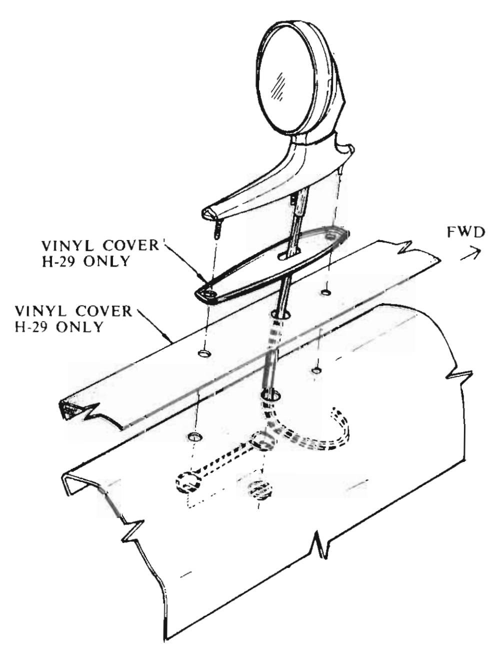


Fig. 48B – Remote control mirror to body application

20. SEATS — SQUABS — CUSHIONS

ALL MODELS

To Remove Front Seat

(1) The front seat assembly can be removed by unscrewing the four nuts from under the vehicle and carefully removing the seat assembly from the vehicle.

To Install Front Seat

(1) Carefully place seat assembly in vehicle and tighten the four nuts to an even tension of 200 lbs./in.

SEDANS

To Remove Rear Cushion

(1) From inside the vehicle, place both hands in between the squab and cushion and pull the back of the cushion out past the squab.

(2) Unhook front of cushion from locating tags on the rear floor. Remove cushion from vehicle.

To Install Rear Cushion

(1) Hook front of cushion into locating tags and press rear of cushion down past the bottom of the squab.

STATION WAGON

Station Wagon Rear Seat

The rear seat squab can be laid forward to increase the capacity of the luggage compartment. To lay the rear squab flush with the luggage compartment floor, proceed as follows:

Press the release lever knob situated at the upper centre part of the squab and pull the squab forward on its hinges until it touches the rear seat cushion. Exert sufficient pressure on the squab to enable the spring-loaded (hinged) cover panel behind the seat to snap into a horizontal position.

To Remove Rear Seat Cushion

(1) Lay the seat squab forward and raise the hinged cover panel at the rear of the seat squab to expose the two bolts which attach the seat cushion assembly to the floor pan.

(2) Remove the bolts which attach the seat cushion to the floor pan.

(3) Move the seat cushion slightly rearward to disengage the locking bars at the front bottom side of the seat cushion, from the floor brackets.

(4) Remove the seat cushion assembly.

To Install Rear Seat Cushion

(1) Place the seat cushion in position, making certain the locking bars at the front bottom of the seat cushion are engaged in the brackets on the floor pan.

(2) Raise the hinged portion of the floor panel, at the rear of the seat squab, and install the bolts which attach the seat cushion mounting straps to the floor pan.

(3) Raise the seat squab rearwards into its vertical position.

To Remove Rear Seat Squab

(1) Remove the screws which attach the hinge assemblies to the body.

The squab cushion is retained to the seat frame with screws.

To Install Rear Seat Squab

(1) Position the seat squab assembly on the seat frame.

(2) Install the hinge to body attaching screws and tighten.

Bucket Seats

Forward Tilt Mechanism Assembly (Fig. 49)

For ease of assembling, the following procedures should be performed in sequence as listed.

(1) Before assembling the trim to the frame assembly (A), attach the cable and latch assembly (F) to the actuator assembly ensuring that the cable is located correctly in the actuator hole as shown in *Fig. 49*.

(2) Assemble the actuator assembly (C) to the spring and frame assembly with screws (S_2 and S_3) and spacers (U), and bend the tabs of the actuator (C) against the frame tube.

(3) Attach the front seat latch spacer (G_1) to the pivot on the frame assembly, connect the latch return spring (H) to the cable and latch assembly (F), and place the assembly onto the pivot. Place the spacer (G_2) on the pivot and retain it with the latch retainer snap ring. Attach the screw (S_4) securing the cable and latch assembly (F) lower bracket to the spring and frame assembly (A).

(4) Assemble the trim, and then assemble the button and bezel (D and E) with the two attaching screws (T) to the actuator assembly (C).

(5) Attach the eccentric sleeve (N) with screw (P) on the seat cushion frame assembly (B) and adjust the sleeve (N) until all free movement between latch and stop is eliminated.

(6) Check operation of latch mechanism. Depress the button (D), the latch should have between 0.58″ and 0.68″ of travel over its full range. Check for any failure and rectify obstructions, replace any bent or defective components.

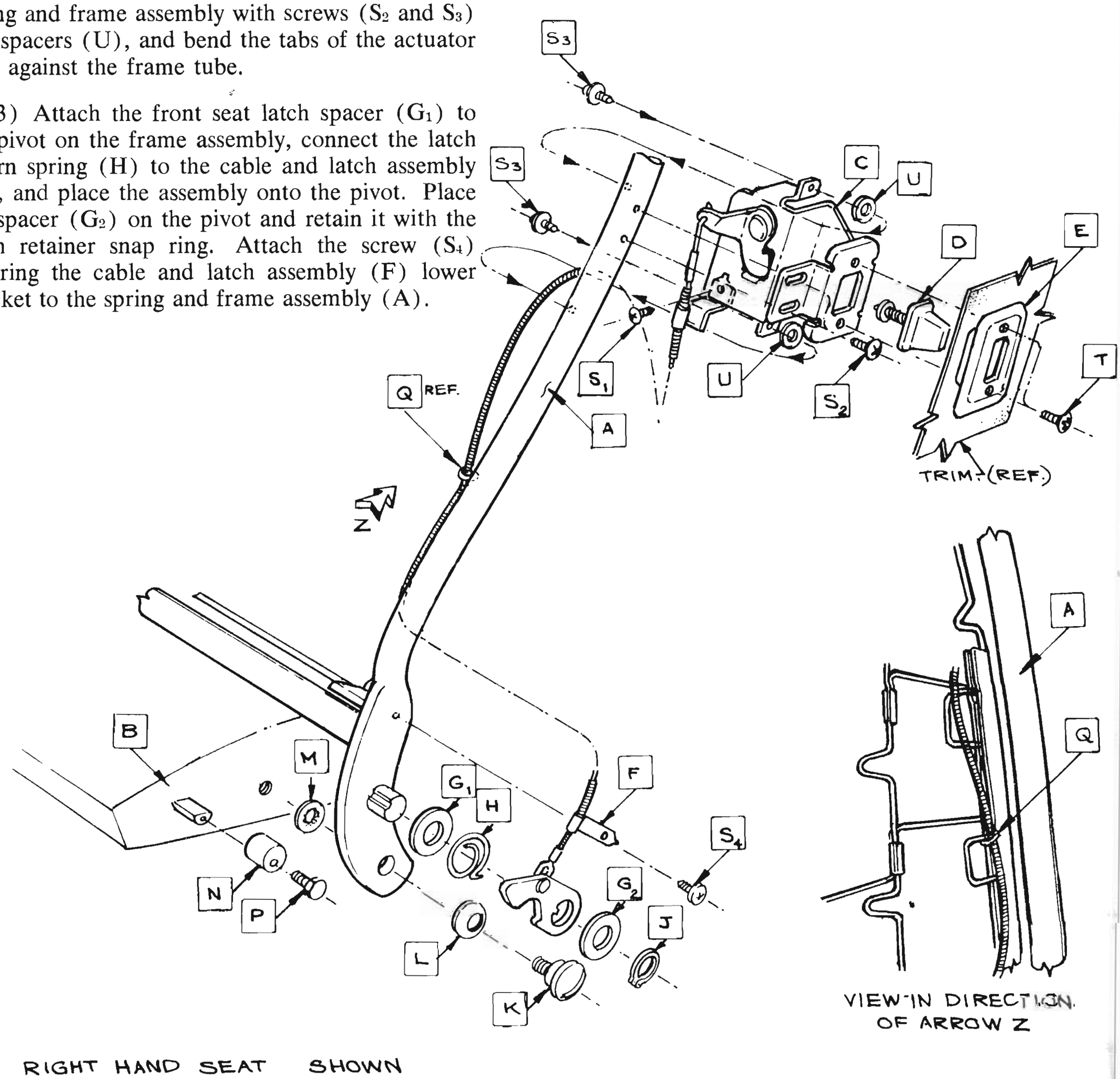


Fig. 49 – Forward tilt mechanism bucket seat

Recliner Mechanism Assembly (Fig. 50)

For ease of assembling, the following procedures should be performed in sequence as listed:

(1) Before assembling the trim pad, install the recliner assembly (D) from the rear of the seat back to the frame assembly (A).

(2) Align the holes in the clevis end of the recliner assembly (D) with the holes in the upper pivot bracket of the seat back frame (A) and the lower pivot holes, align and insert the slotted spring pins (X).

(6) Re-position the trim and slide the recliner handle (AA) onto the splined end of the lever and shaft (V) and secure with spring clip (AD).

NOTE: The recliner handle must be correctly aligned. Adjust by re-positioning on spline if incorrect.

(7) Check the recliner mechanism.

(8) Should the seat not lock in position, it may be necessary to adjust the recliner mechanism.

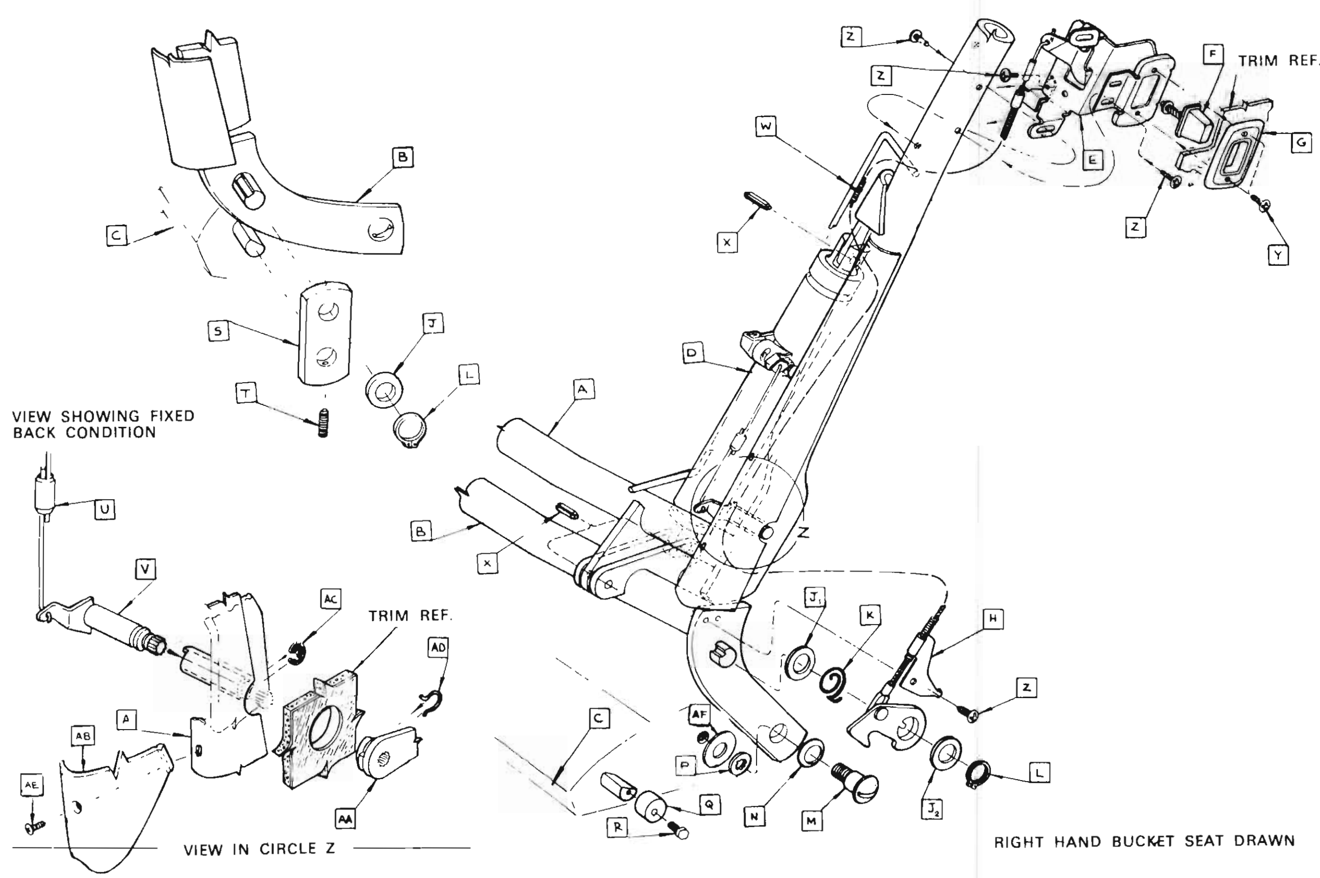


Fig. 50 – Recliner mechanism and fixed back recliner bucket seats

(3) Attach the link control adjusting actuator (U) to the recliner assembly (D), inserting the wire from the outboard side.

(4) Attach the lever and shaft assembly adjusting actuator (V) to the link control (U) (retain by sliding ferrule over wire at both ends). Adjust at assembly to achieve location of recliner release lever.

(5) Insert the lever and shaft assembly (V) into the frame bearing tube (refer in view of circle Z) and retain the shaft by installing the circlip (AC).

NOTE: It is imperative that the adjustment of the recliner is made only after the following preliminary checks have been made.
(a) Ensure that the foam padding is not interfering with the recliner mechanism.
(b) The recliner handle is correctly aligned.
(c) The link control between the recliner and the lever and shaft actuator is not absorbing the lever free play.

Adjustment can be made by the screw and locknut located half-way up the front of the recliner mechanism.

(9) Loosen the locknut, tighten the screw one half turn, lock the locknut and test the recliner.

(10) If the recliner does not lock, repeat step 9 until the correct adjustment has been obtained.

NOTE: Do not overtighten the screw as this will cause the recliner to lock, thus preventing any reclining action.

(11) If the seat fails to lock after step (9) and (10), the recliner mechanism should be replaced.

(12) Re-install the cover front seat back side (AB) and secure with screws (AE).

Fixed Back Recliner (Fig. 50)

(1) For fixed back application install the lock seat back to cushion (S) to the base assembly recliner (B) and to the bucket seat cushion assembly (C), position the spacer (J) and retain with the snap ring latch (L).

(2) Final tightness is achieved by tightening screw (T).

21. POWER SEATS

GENERAL INFORMATION

This power seat can be adjusted in six different directions — up, down, forward, back, tilt forward, or tilt rearward.

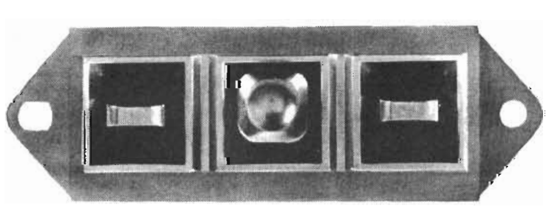


Fig. 51 – Switch assembly

The control switch is located on the lower outboard side of the seat. The front lever on the switch *(Fig. 51)* raises or lowers (tilts) the front of the seat, the centre lever raises or lowers the complete seat by moving switch up or down. It also moves it forward or backward by moving switch forward or rearward. 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 instrument panel support channel.

SERVICE PROCEDURES

Electrical Tests

Before any testing is attempted, the battery should be fully charged and all connections and terminals cleaned and tightened to ensure proper continuity and grounds. With everything connected and the dome 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.

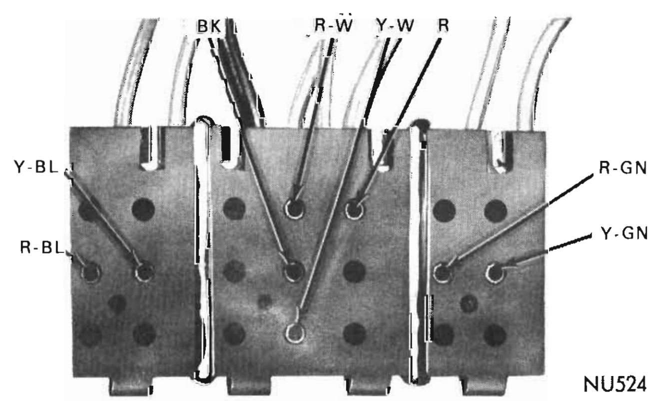


Fig. 52 – Electrical test area location

(1) Disconnect wire from instrument panel feed at circuit breaker.

(2) Connect test lamp 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 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 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 centre section *(Fig. 52),* either the red with blue (R-BL) tracer, or yellow with blue (Y-BL) tracer connection in the front section. Connect a second covered jumper wire between the black (BK) terminal in the centre 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.

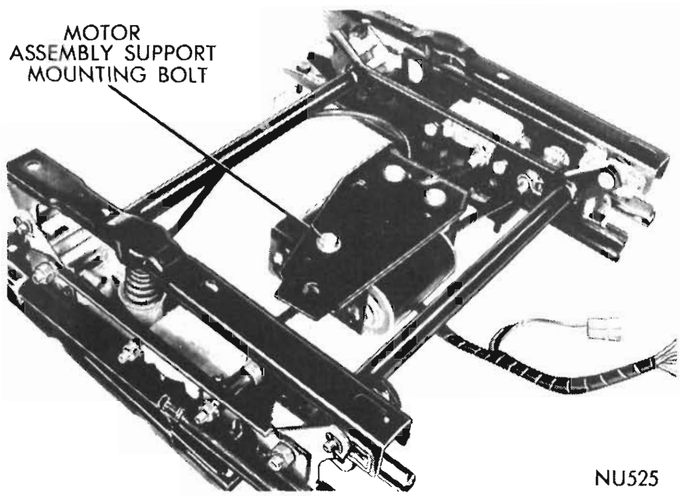


Fig. 53 – Mounting bolt location

(10) To check centre motor, connect a covered jumper wire between the red (R) terminal of the centre section *(Fig. 52)* and either the yellow with white (Y-W) tracer, or red with white (R-W) tracer connection in the centre section. Connect a second covered jumper wire between the black (BK) terminal in the centre section and the open connection in the centre 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 centre section *(Fig. 52)* and either the red with green (R-GN) tracer, or yellow with green (Y-GN) tracer connection in the rear section. Connect a second covered jumper wire between the black (BK) terminal in the centre 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.

(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.

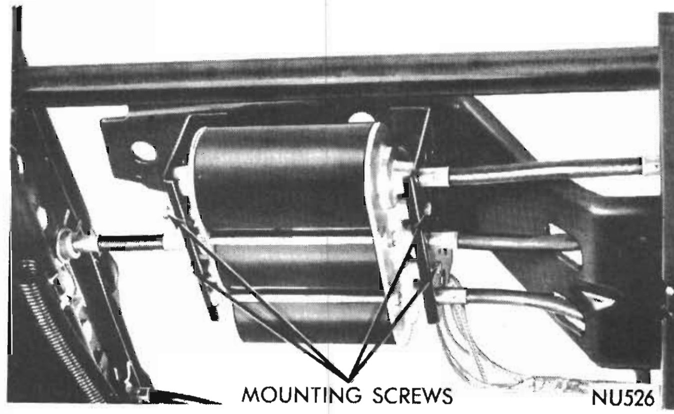


Fig. 54 – Mounting screw location

Seat Assembly and Adjuster

To Remove

(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.

To Install

(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

To Remove

(1) Remove seat assembly from vehicle following procedure outlined under "Seat Assembly and Adjuster".

(2) Lay seat on its back on some clean object.

(3) Remove bolts attaching adjuster to seat assembly.

To Install

(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

To Remove

CAUTION: Anytime the motor, cable and housing assemblies or vertical and horizontal transmission assemblies require maintenance, the assemblies must be synchronized to ensure 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.

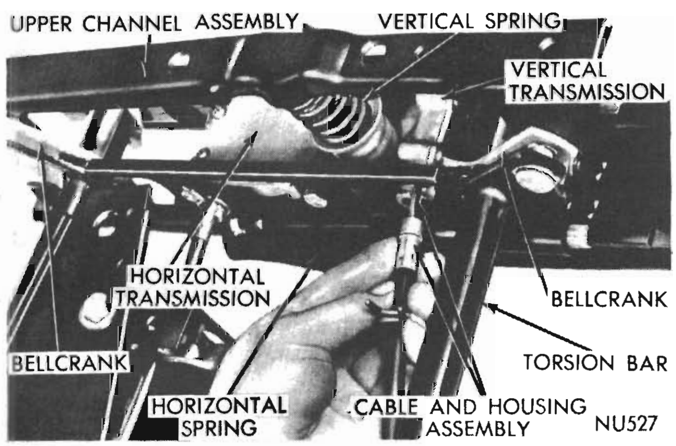


Fig. 55 – Removing or installing cable and housing

(3) Remove bolt which holds motor to support *(Fig. 53)*. Then remove mounting *(Fig. 54)* screws.

(4) Carefully disconnect housings and cables from motor assembly.

To Install

(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 Adjuster".

Cable and Housing

To Remove

CAUTION: Anytime the motor, cable and housing assemblies or vertical and horizontal transmission assemblies require maintenance, the assemblies must be synchronized to ensure easy and proper operation.

It is recommended that anytime a cable is to be replaced 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. 55)*.

To Install

(1) Insert cable and housing into connector and install corbin clamp.

(2) Install motor assembly.

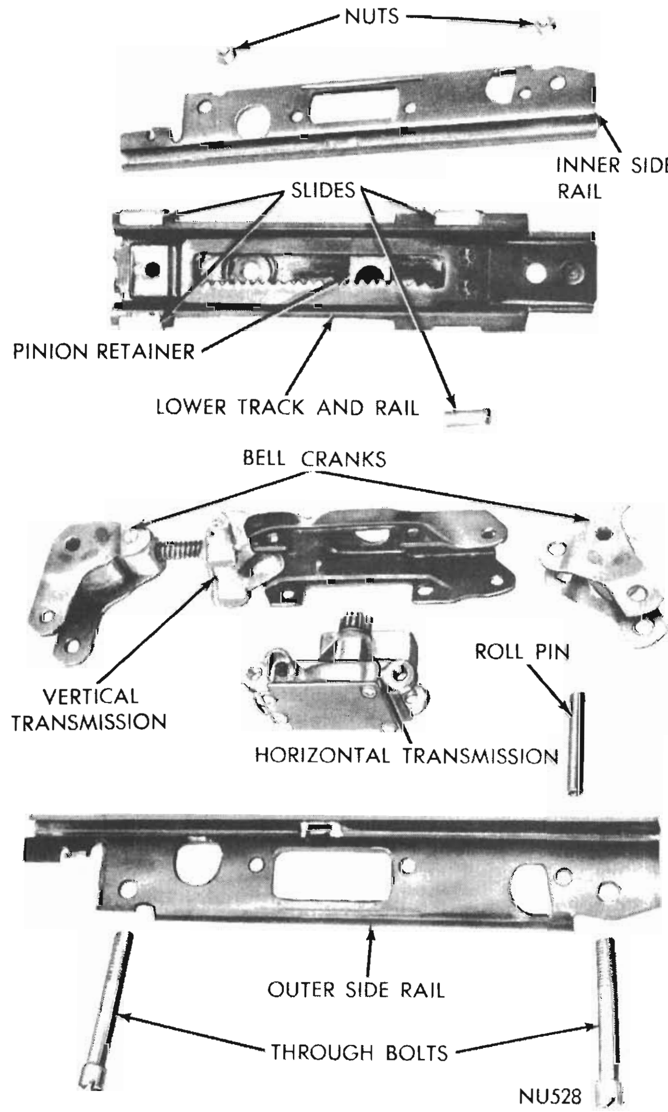


Fig. 56 – Side rail (disassembled)

Horizontal and Vertical Transmissions

To Remove

CAUTION: Anytime the motor, cable and housing assemblies or vertical and horizontal transmission assemblies require maintenance, the assemblies must be synchronized to ensure 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″ "C" clamp from the mounting base assembly to the upper channel assembly just 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 (⅜″) 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. 56).*

To Install

During assembly, constant care should be exercised to keep both track and rail assemblies synchronised.

(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.

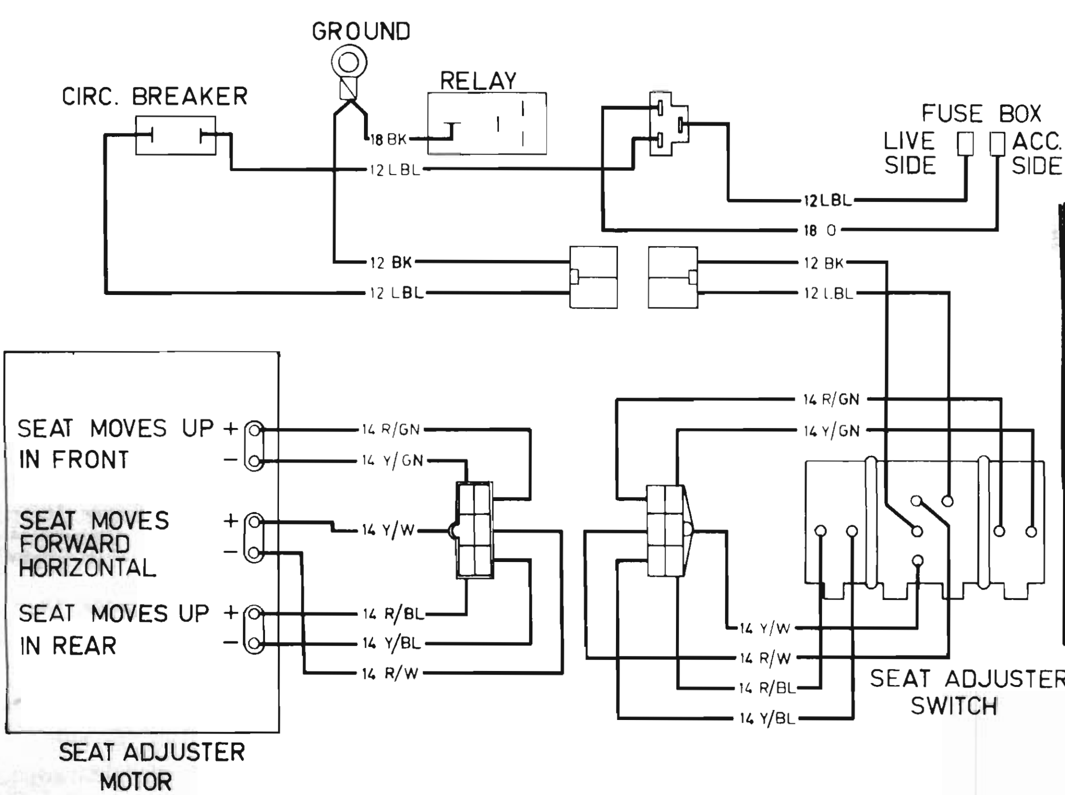
(3) Install horizontal spring.

(4) Position rail assemblies at end of torsion bars. Line up holes and upper channel and install rear (⅜″) 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".



COLOUR CODE	
BK	BLACK
BR	BROWN
D BL	DARK BLUE
D GN	DARK GREEN
GY	GREY
LBL	LIGHT BLUE
L GN	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
T	TAN
V	VIOLET
W	WHITE
Y	YELLOW
Y/BK	YELLOW/BLACK TRACE
SPLICE	

Fig. 57 – Power seats wiring diagram model application: Chrysler models only

22. SEAT BELTS

(1) For seat belt fitting instructions, refer to *Figs. 60 to 62*.

(2) Whenever fitting the seat belts, ensure that they are adjusted so that the webbing that passes across the wearer's body is not twisted and that the seat belt buckle is at or below the wearer's hip.

(3) Ensure that the inboard half of lap/sash belts and both halves of the centre seat belt pass between seat back and cushion. DO NOT pass through arm rests.

(4) The buckle half of centre seat belt is to be fitted to the left hand side anchor point.

(5) All seat belts must pivot freely about their anchorages except the "cable" belt which must be securely clamped.

(6) The lap/sash seat belts with "cable" belt must pass around the bucket seat and be against it in the clamped position.

> NOTE: When removing the seat belts from the anchor points, it is essential to identify the individual bolt, spacer and wave washers, etc., in order to place them in their relevant position upon re-assembly. This is necessary due to some differences in bolt and spacer dimensions.

(7) All seat belt securing bolts are to be torqued to 35 lbs. ft. ± 5 lbs. ft.

Lap/Sash with Automatic Retractors

The design of this type of belt allows the wearer to move the upper portion of his or her body to reach various controls, the glove box compartment, etc. Locking of this type of belt is automatic and is activated by rapid speed changes and changes in vehicle direction, NOT by movement of the wearer's body.

On occasions when the vehicle is parked or ranked on a particularly steep curb or hill, the locking mechanism of the retractor may be activated. This will prevent the wearer from pulling the belt out of the retractor. This condition is rectified by placing the vehicle on a more level surface.

It is essential that the roof rail or centre pillar mounting point, for front seat belts fitted with a retractor, DOES NOT have a wave washer. This is to allow the mounting point to pivot easily about the securing bolt. Lubrication with high melting point grease will assist in achieving this condition.

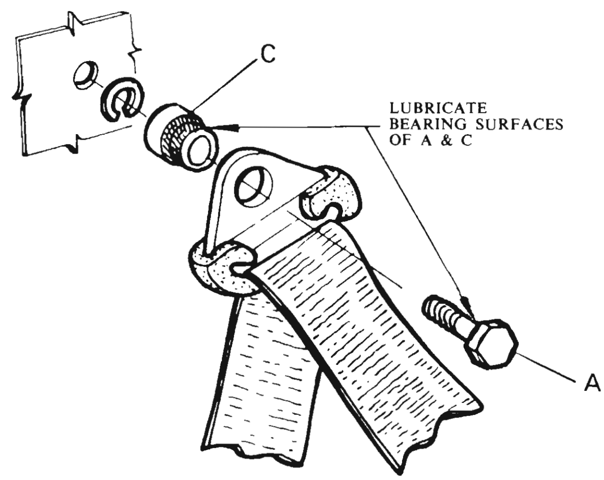


Fig. 58 – Roof rail or centre pillar mounting point for front seat lap/sash safety belt fitted with retractor

Retractor

1. Adjustment (Refer Fig. 59)

To enable the retractor to function correctly, it is essential that the arrow in the red button be vertical ± 2° and that the retractor body be mounted in a vertical plane in a fore and aft direction ± 2°. Although an angled bracket is spot-welded to the body sill to assist this vertical location, it is possible to vary the angle $3\frac{1}{2}°$ either side of vertical due to tolerances and bolt hole clearance. Care must be taken when tightening the securing bolt that the retractor does not move from the vertical. It is recommended that a spirit level be used to check that top edge of retractor is horizontal.

2. Belt Not Retracting

If the retraction is incorrect, firstly ensure that the arrow is vertical *(Fig. 59)*. Should the belt still not retract, it will be necessary to increase the tension of the rewind spring. This can be done by carefully removing the two screws from the retractor on the opposite side to the arrow.

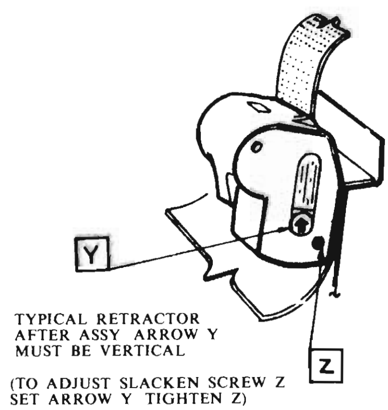


Fig. 59 – Retractor vertical adjustment

> NOTE 1: Care must be taken not to pull the end cover too far from the retractor housing or the spring will be disengaged.

> NOTE 2: Once the screws are removed, the cover will spin under spring tension if not held securely.

Rotate the cover to increase the spring tension. This action will increase seat belt retraction. Rotate the cover one complete turn ONLY and then test the retractor operation.

3. To Test Retractor Operation

After removal of the retractor housing as a result of seat replacement, carpet replacement, etc., it is essential that the retractor operation is tested. Road test the vehicle, and, with a firm application of the brakes, the belt should lock while being worn. If the belt does not lock, refer to *Para. 1 (Retractor)* for correct method of adjustment.

4. Maintaining of Seat Belts

Care should be taken to avoid contamination of the webbing with polishes, oils and chemicals and particularly battery acid. Cleaning may safely be carried out, using mild soap and water. However, avoid getting solutions into the buckle and retractor mechanism where they may attack the lubricant or cause corrosion. Webbing should be replaced if it becomes frayed, contaminated or damaged, and it is essential to scrap the entire assembly after it has been used in a severe impact, even if damage to the assembly is not obvious.

No attempt should be made to shorten or lengthen a seat belt by cutting and restitching.

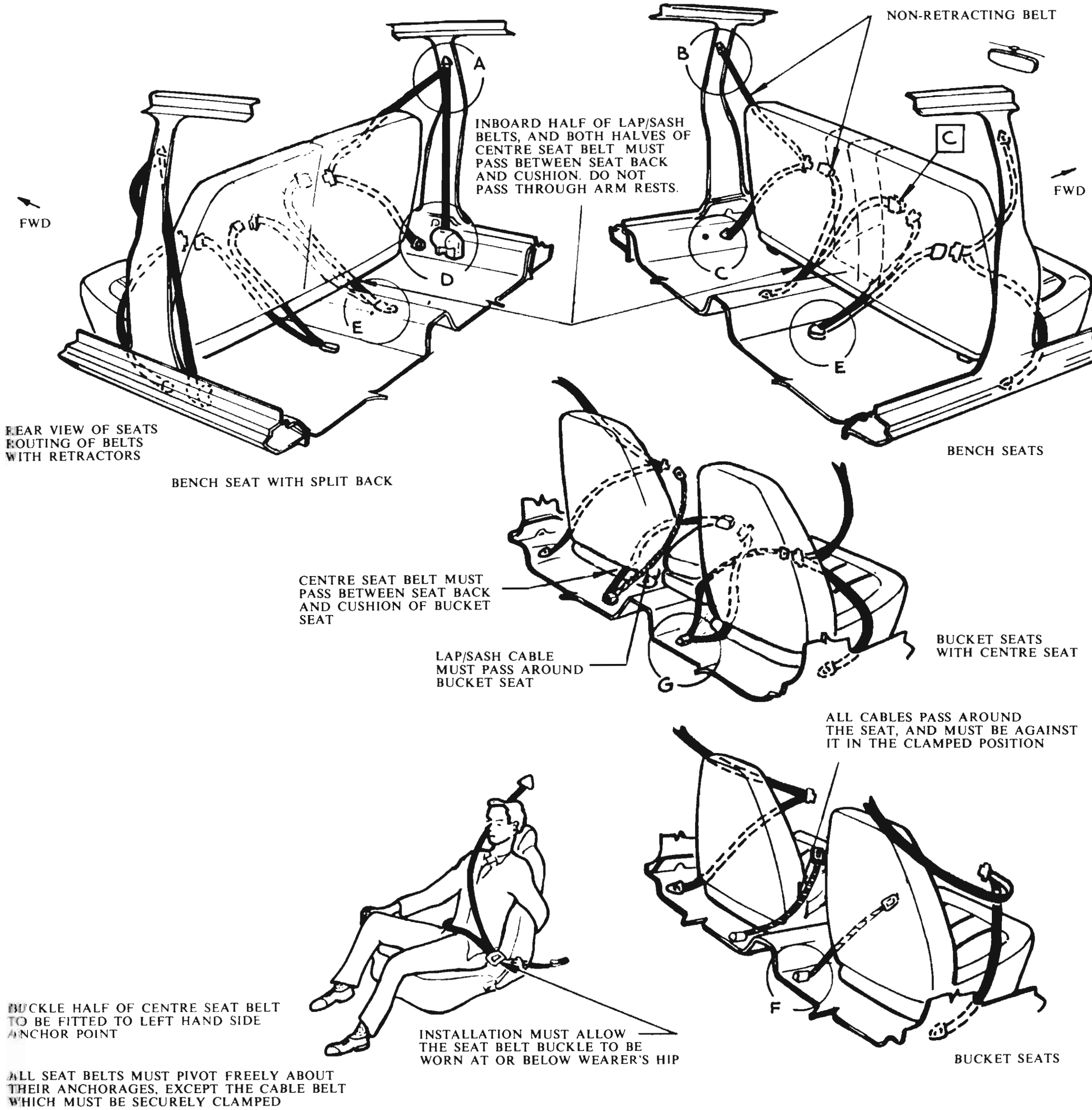


Fig. 60 – Front seat belts fitting instructions

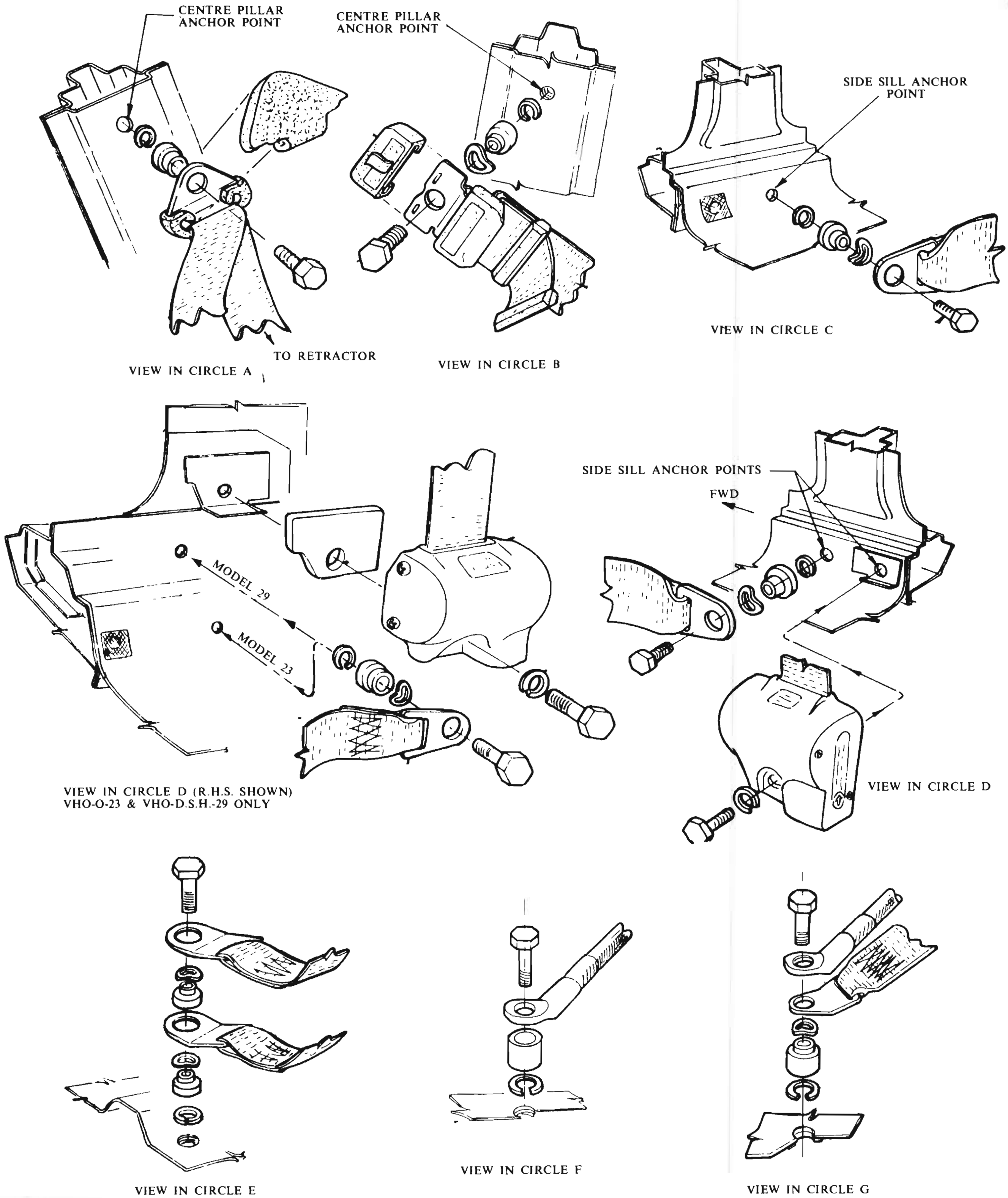


Fig. 61 – Front seat belt anchor points (read in conjunction with Fig. 60)

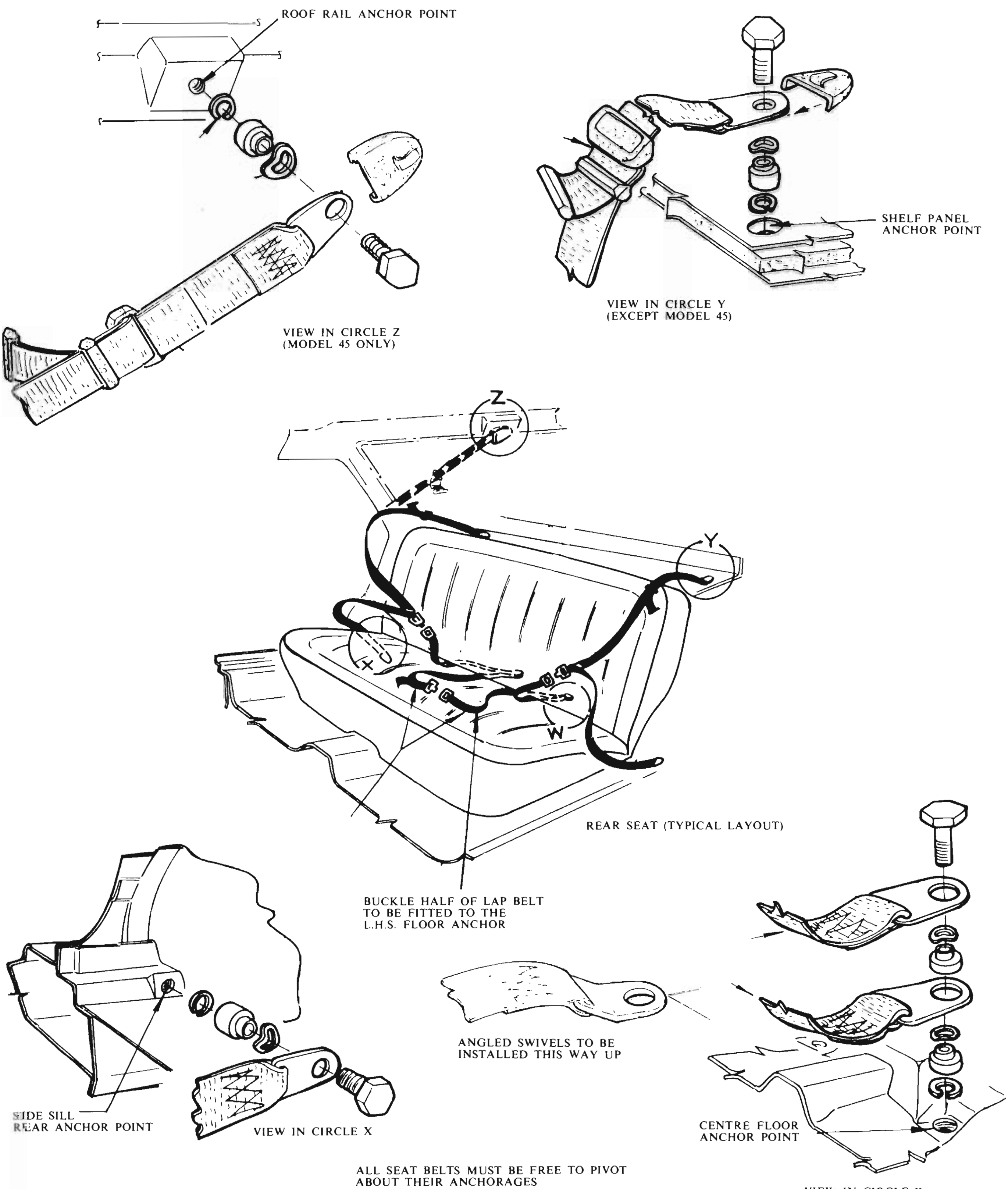


Fig. 62 – Rear seat belts fitting instructions & anchor points

23. POWER WINDOWS

GENERAL INFORMATION

The front, rear and quarter panel window lift motors are of the permanent magnet type. The motors are grounded through the master switch by a black lead attached to the instrument panel support channel at the relay.

Electrical Tests

Glass may not move due to a binding condition between the glass and run channels. Correct the binding condition before making electrical tests.

Window Lift Switch Test

Remove switch from trim panel for testing purposes. Carefully separate multiple terminal block from switch body. Connect one lead of a test light to black wire terminal and touch other lead to yellow 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 yellow 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. 63)*.

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.

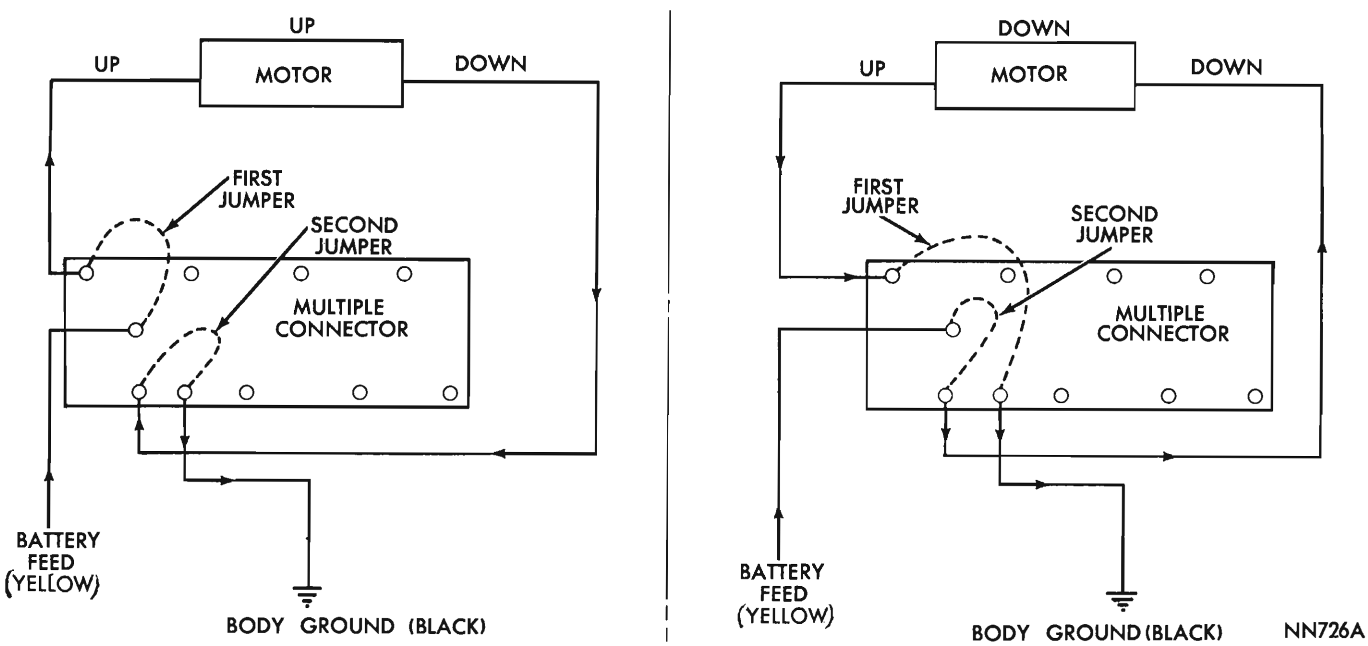
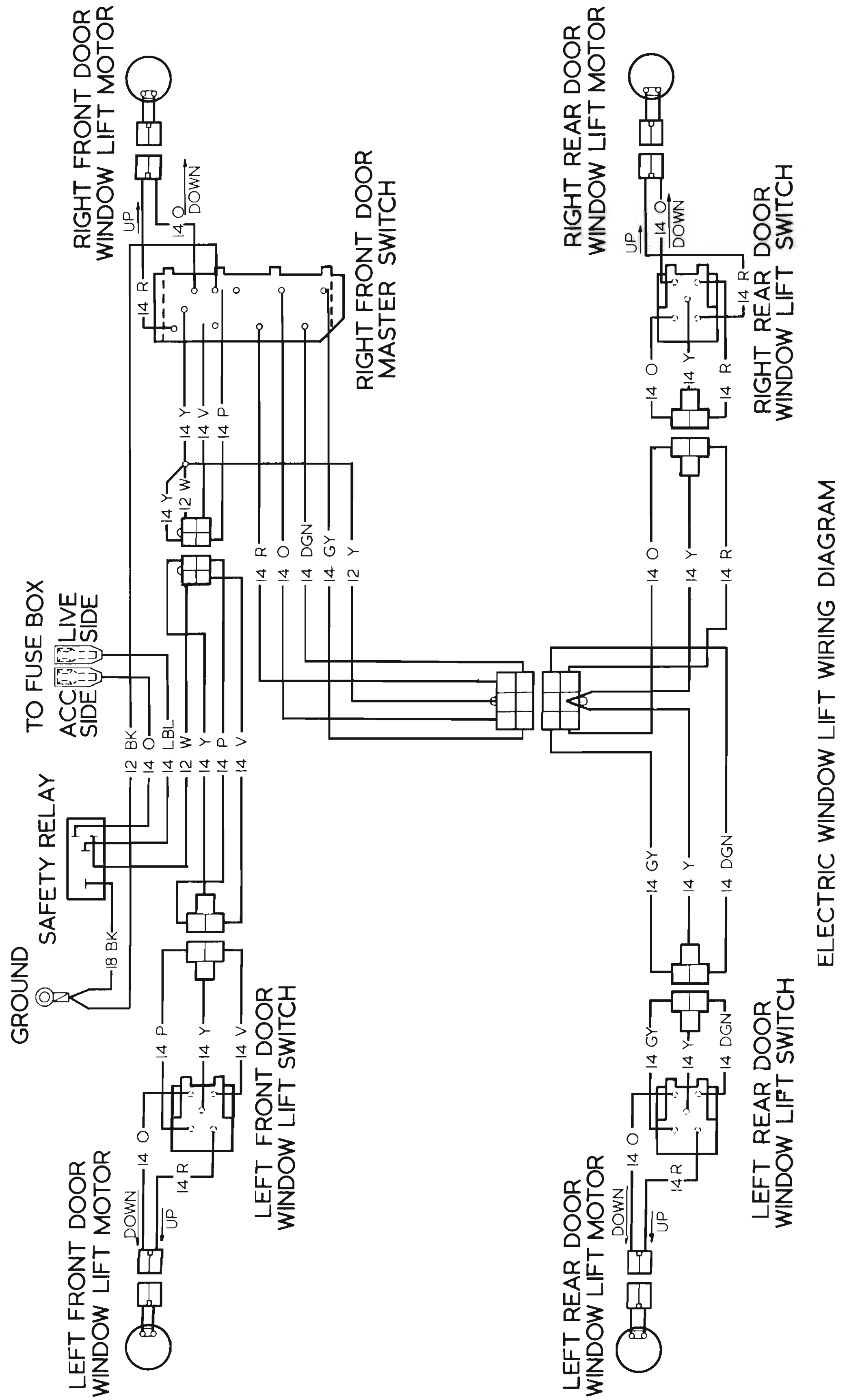


Fig. 63 – Testing electrical switch

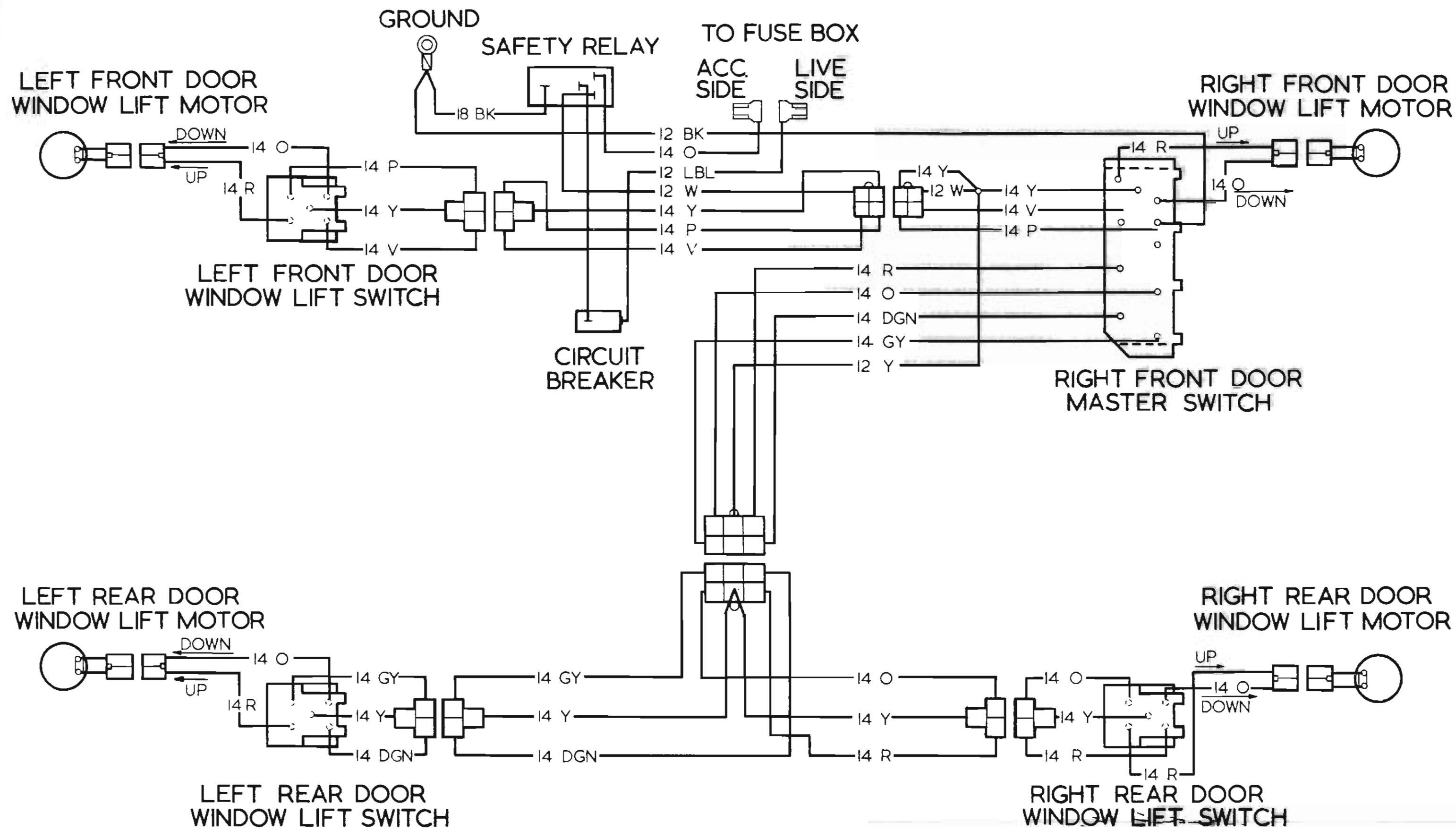
Window Lift Motor Test

Connect the positive lead from a test battery to one of the two motor terminals. Connect the negative lead from the test battery to the other motor terminal. The motor should rotate in one direction to move the window up or down. Reverse the battery leads and the motor will rotate in the opposite direction. If the motor does not operate in both directions, replace the motor assembly.



COLOUR CODE			
BK	BLACK	P	PINK
DGN	DARK GREEN	R	RED
GY	GRAY	V	VIOLET
LBL	LIGHT BLUE	W	WHITE
O	ORANGE	Y	YELLOW

Fig. 64 – Electric window lift wiring diagram model application: Chrysler sedan



COLOUR CODE			
BK	BLACK	P	PINK
DGN	DARK GREEN	R	RED
GY	GRAY	V	VIOLET
LBL	LIGHT BLUE	W	WHITE
O	ORANGE	Y	YELLOW

Fig. 65—ELECTRIC WINDOW LIFT WIRING DIAGRAM: Chrysler Sedans (Built after Dec '71)

722301

24. VINYL ROOF COVERING

The roofs of some models are covered with a hard-wearing weather-resistant vinyl cover. Whenever the cover is replaced, sealer MUST be used to ensure satisfactory sealing conditions.

Vinyl Roof Covering Care

Do not use volatile cleaners or solvents on the top cover.

Wash the vinyl covering with mild soap and luke-warm water, lathering well with a soft brush, cloth, or sponge. Avoid heavy brushing. Rinse all traces of suds away with clear water. Rinse all soap suds from the paint brush.

To Remove

> CAUTION: If solvents are used to remove the old covering and cement, care must be taken to prevent damage to the surrounding areas.

(1) Remove both front and rear windshields.

(2) Remove the gutter mouldings.

(3) Remove the front pillar lower retaining mouldings.

(4) Remove the roof side mouldings and emblems.

> CAUTION: The entire roof panel and centre pillar surface must be clean and smooth so the new covers will fit perfectly.

To Install

(1) Mask the body from the edge of the drain trough down the front pillar, across the windshield deck upper panel and the bottom of the roof panel and rear window reveal and across the top of the roof panel at the belt line.

(2) Mark the centre line of the roof panel and vinyl cover at the front and rear ends.

(3) Apply a thin layer of cement to the centre 4 inches of the roof panel and vinyl cover.

(4) When the cement becomes tacky, but not wet to the touch, position the vinyl cover on the roof panel aligning the centre line marks.

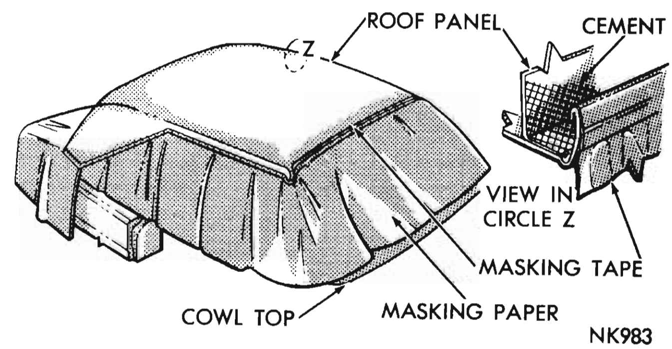


Fig. 66 – Masking the body (typical)

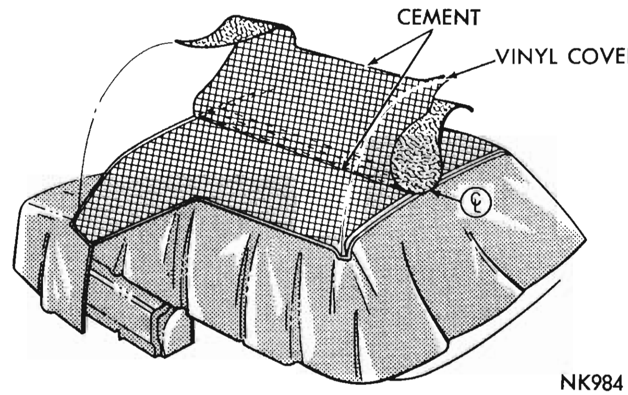


Fig. 67 – Positioning cover to roof panel (typical)

(5) Apply cement to one half of the roof panel and extension and to the vinyl cover half on the same side.

(6) When the cement becomes very tacky, but not wet to the touch, position the cover on the panel.

(7) Repeat steps (5) and (6) for the opposite side.

(8) Using a new paint roller, pressurise the cover to the roof panel, working from the centre out toward the drain troughs.

(9) Press the cover into the windshield and rear window reveals using a dull pointed fibre tool.

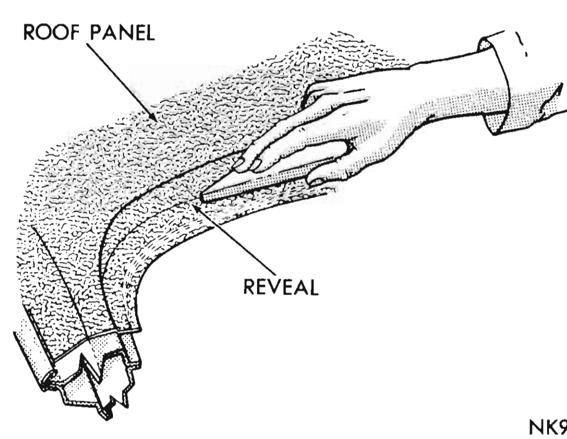


Fig. 68 – Positioning cover in window reveal (typical)

(10) Position the cover to the roof panel extension, making certain all wrinkles are removed. Starting at top centre, secure cover to rear window reveal.

(11) Trim the fabric at the base of the windshield reveal half way between upper and lower edges of pillar moulding and at the lower edge of the front pillars.

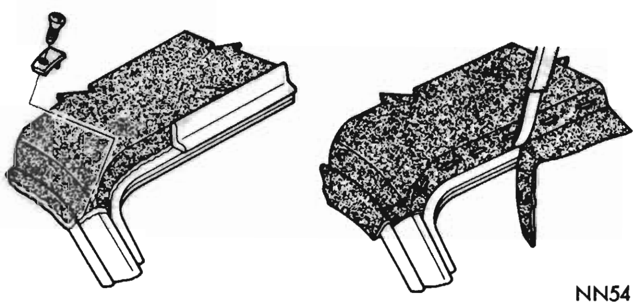


Fig. 69 – Trimming and sealing covers at windows

12) Grasp the outboard edge of cover and, while pulling material outward and down, use the upper edge of drain trough flange as a break-over for draping the cover onto the outboard drain trough flange face. Care must be taken to avoid pulling loose the cover material applied to base of drain trough.

(13) Press material against drain trough flange face for the full length of outboard sides of roof cover.

(14) Trim excess material hanging below drain trough about ⅛" above lower edge of the flange *(Fig. 70)*.

(15) Apply sealer over raw edge of trim cover at roof extension and refit moulding.

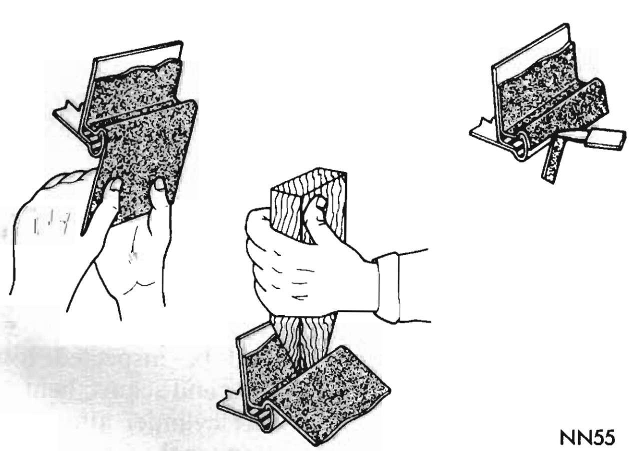


Fig. 70 – Positioning cover at drain trough

(16) Apply a bead of sealer to the edge of trimmed cover at front and rear windshield opening and blend upward to form a seal over the edge of the cover. *(Refer Fig. 71)*.

(17) Apply sealer over raw edge of trimmed cover at base of front pillar and rivet moulding to gutter.

(18) Install windshield and rear windows.

(19) Install the windshield and rear window Mylar lock trims. Install gutter mouldings and emblems.

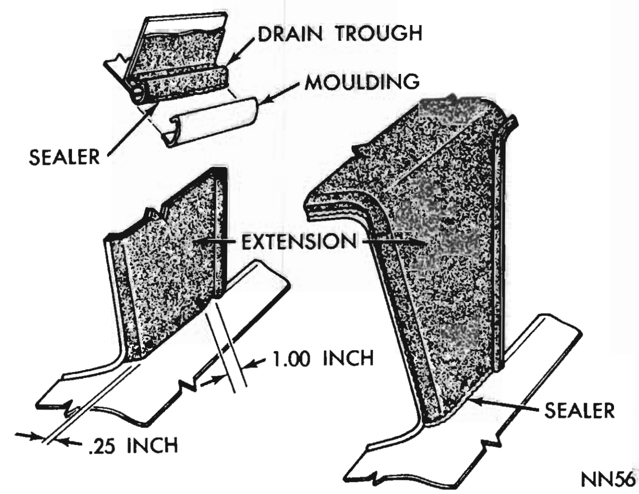


Fig. 71 – Sealing cover at roof extension

(20) Remove the masking tape and masking paper.

(21) The centre pillar cover should be fitted neatly and evenly around the pillar and locked securely under the draught moulding.

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. 8064, or equivalent, into bubble area. *Extreme care must be used to avoid depositing any adhesive on the top surface of the vinyl cover.* The perforation must be made in centre of bubble, through masking tape and vinyl material. Approximately 0.5 mil. of adhesive per square inch should be used.

(3) Remove needle and work adhesive to cover affected area by pressing vinyl to roof carefully. This will also transfer some of adhesive to surface of vinyl cover.

(4) Allow cement to dry 5 minutes at room temperature.

(5) Heat bubble area with relative 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 will be beneficial.

(7) Using a DRY No. 19 hypodermic needle, puncture cover four times equidistant around outer circumference of bubble to provide an escape route for entrapped solvent and air.

(8) After bubble collapses, press cover to metal surface, starting from one side of bubble and working toward opposite side until it conforms to metal surfaces and all raised surfaces disappear.

(9) Keep car from hot sunlight and other direct heat sources.

(10) Examine top after a 24-hour period.

25. WATER TESTING PROCEDURES

When making water tests of any part of the car, use a garden hose without the nozzle and regulate the pressure to an approximate 3″ stream. All water tests must be made starting at the bottom of door opening or weatherstrip and slowly move up the joint, seam or suspected area.

Note the position of the stream of water when an assistant within the car notes the first evidence of leakage. Inspect and correct the cause of the leak before proceeding further.

In the case of suspected floor pan leaks, observe for evidence of dust leaks that can indicate the exact point of leakage. Seal with a rubber type cement.

In some cases, a water leak in the luggage compartment may be caused by a leak at the rear window and appear in the luggage compartment, therefore it is important to pin-point the source of the leak. Simple leaks around doors and deck lids may often be found by testing with a rubber syringe filled with talcum powder. By blowing the powder around the weatherstrip with the door or lid closed, any leak at the weatherstrip will show tracings into the interior of the car. With the door or deck lid opened, a sharp line of powder will show all around the weatherstrip where a tight seal is being made. Inspection of the mating areas where a sharp line is not evident should reveal the cause of the leak.

26. BODY SEALING

NOTE: Use manufacturer approved materials.

Rubber cement is used where a bond of rubber to metal is desired. This is not injurious to painted or unpainted surfaces and may be used to attach weatherstrips to doors, or luggage compartment and felt pads.

Windshield cement is a heavy rubber cement used to seal the glass and weatherstrip, and serves to prevent movement of the glass in the weatherstrip and prevent water leakage.

NOTE: Before sealing, clean all surfaces with Naptha or suitable solvent.

Seam sealing material is a heavy duty type putty used to fill body seams and joints. The area to be filled or sealed must be free from dirt, oil or water. This sealer must be pressed or forced firmly into seam or joint *(see Fig. 72)*.

Windshield and Rear Window Weatherstrip to Body

If leakage occurs between the windshield and body fence, remove the Mylar internal lock-type trim and apply a continuous $\frac{1}{8}$″ diameter bead of windshield cement under lip of weatherstrip, and body fence. Install Mylar lock-type trim.

Weatherstrip to Glass

Using a paint brush and Naptha solution, thoroughly clean the junction of the weatherstrip and glass. Using compressed air, blow out any dirt or moisture between weatherstrip and glass. Insert the nozzle of a pressure type sealing gun under the lip of the weatherstrip and lay a continuous $\frac{1}{8}$″ bead of windshield cement all around the glass. Surplus cement may be cleaned off with Naptha or suitable solvent. It is recommended to mask with tape the edge of weatherstrip to glass prior to applying windshield cement.

Front Door Ventilation Glass

If the ventilator glass rubber weatherstrip is found to be torn or distorted, replace the weatherstrip.

Adjustment of the vent glass may be made by adding shims between the upper pivot bracket and the glass grommet. This will move the glass in against the weatherstrip.

Cowl (front door area)

The cowl front panel should be inspected for possible water leaks at body joints and seams, heater plenum chamber to cowl, master cylinder attaching plate to cowl, steering column seal and wiring grommets.

These areas may be sealed with rubber cement except for deep or wide body joints which should be sealed with a putty type sealer.

Door Opening

Weather leaks at doors usually are caused by damaged weatherstrip assembly, or mis-aligned doors. Replace if weatherstrip is damaged or distorted.

Weather fitting of doors may be accomplished by following procedures recommended in *paragraph 5.* Inspect for open coach joints and seams of door openings.

Luggage Compartment

The luggage compartment should be thoroughly inspected for weather fit of deck lid and possible damaged or distorted deck lid weatherstrip. Distorted or damaged tail light gaskets may show evidence of weather leaks in luggage area. Inspect seal at fuel tank filter tube and filler tube to floor pan seal. Inspect floor pan and wheel housing joints and seams. These may all be sealed with putty type sealer.

27. BODY ALIGNMENT AND REPAIR

With unitised body construction, it may be advisable to check body alignment in the event of extensive collision damage.

The sturdy reinforced box sections of the front lower structure ahead of the cowl will be of vital concern as they carry the suspension load and engine support. The box sections of the body are also of vital concern. The door pillars, sills, roof rails, rear window and windshield headers provide added strength to assist the lower body reinforcing members.

To Remove Body Panels and Sub-Assembly

When repairing collision damage it may be found advisable to replace damaged panels.

Proper installation of these units will maintain the structural strength and alignment of the entire vehicle. Separation of the damaged panels may be accomplished by drilling or by cutting the spot welds with a chisel. Welded seams may be separated with a cutting torch or grinder.

In event of severe collision damage, the adjoining body sections may be mis-aligned. These adjoining sections should be re-aligned before removing the damaged panels.

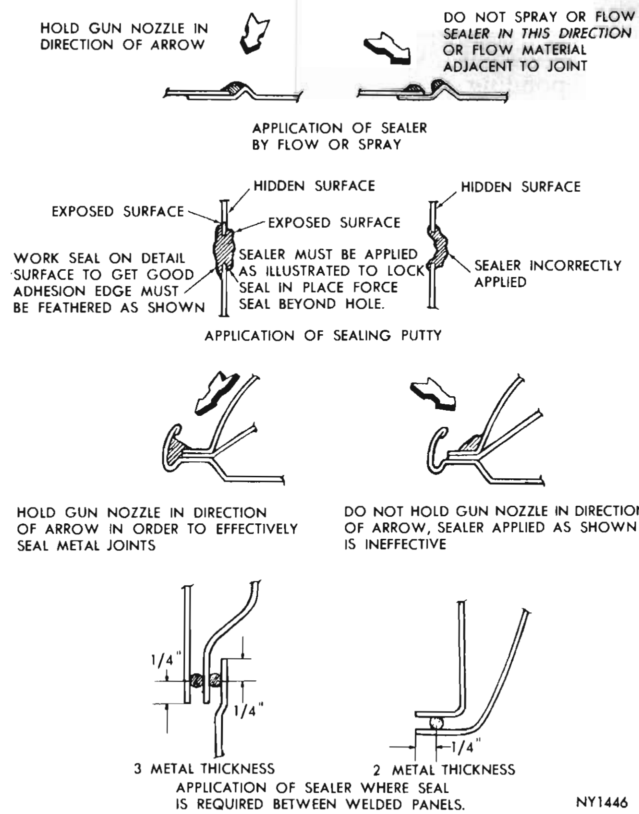


Fig. 72 – Methods of applying body sealing compounds

To Install Body Panels and Sub-Assembly

When replacing large panels requiring long welds, care should be taken to prevent distortion due to excessive heat. Spot weld the panel at the centre of the joint and tack weld toward each end, alternately tack welding approximately 12″ apart. Wet asbestos putty surrounding the weld will prevent heat distortion. Make certain that sufficient welds are applied to maintain original strength.

To Align Body

Body alignment may be checked accurately by the following method.

(1) Elevate the car to a level position over a clean, smooth floor.

(2) Place the line of a plum-bob on point A *(see Figs. 73 to 76)* with the plum-bob just contacting the floor. Mark the plum-bob contact point on the floor. Repeat the process at points B, C, D, E at both sides of the body. Snap a chalk line between points as illustrated.

(3) Compare dimensions with specifications. All matching point to point connections should agree within ¼ inch.

NOTE: Care should be taken that all diagonals compared represent corresponding check points.

(4) Upper body alignment may be checked by diagonal measurements from various points of the door opening sills to the roof rail of the opposite side of the body. Equal dimensions of these check points made at both sides of the body will ensure proper body alignment.

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 ensure uniform measurements.

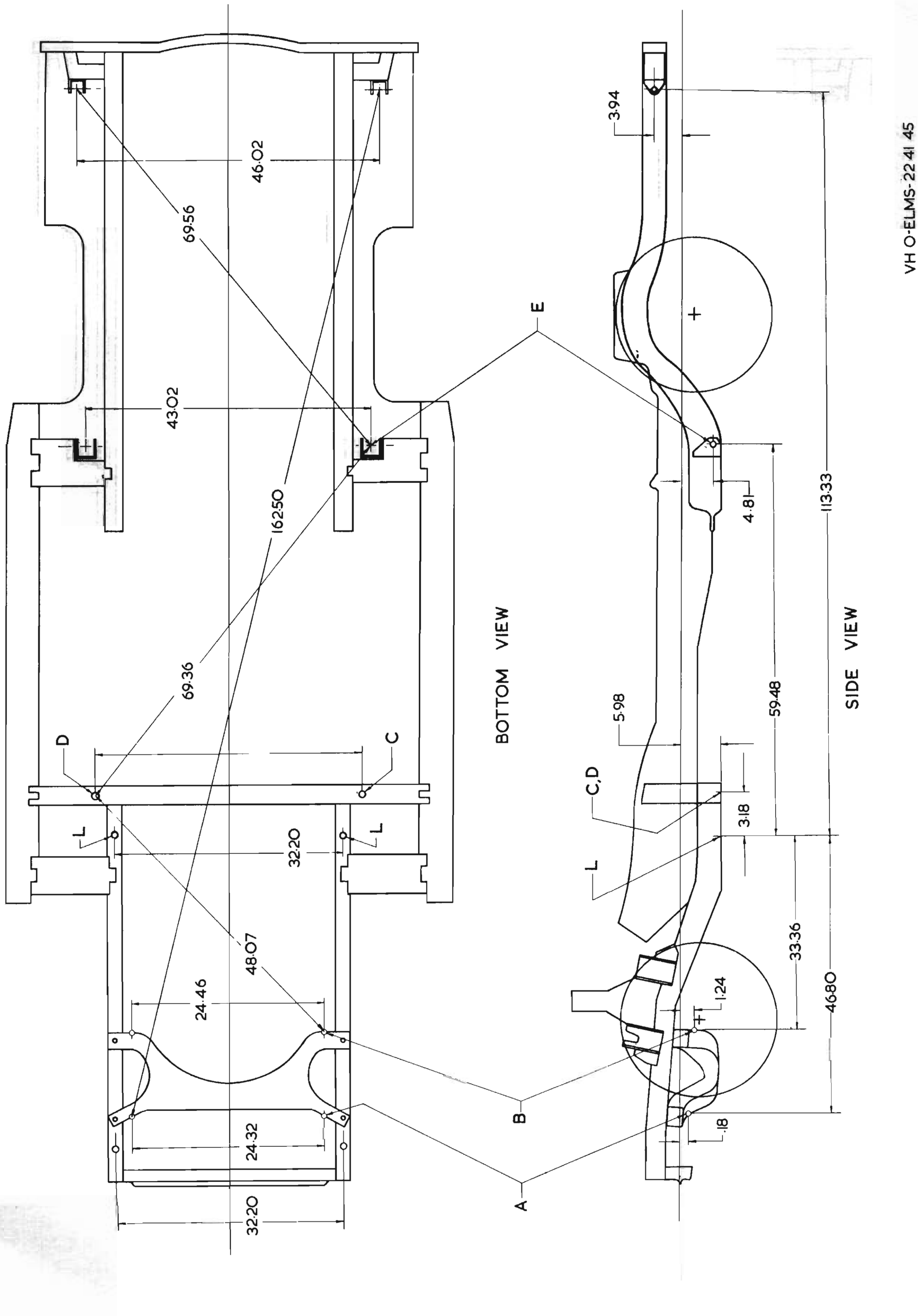


Fig. 73 – Body alignment dimensions (111" wheelbase models)

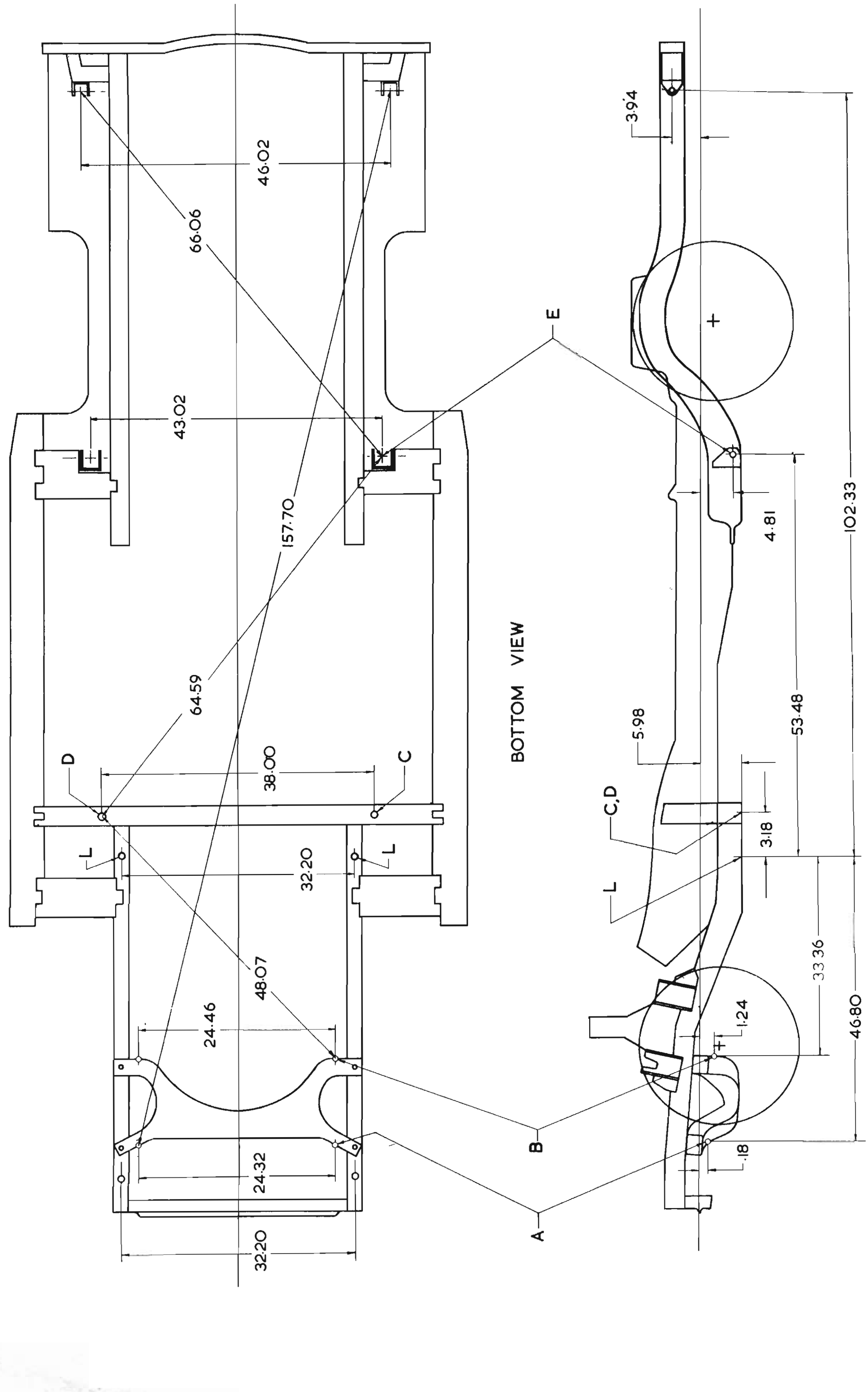


Fig. 74 – Body alignment dimensions (105" wheelbase models)

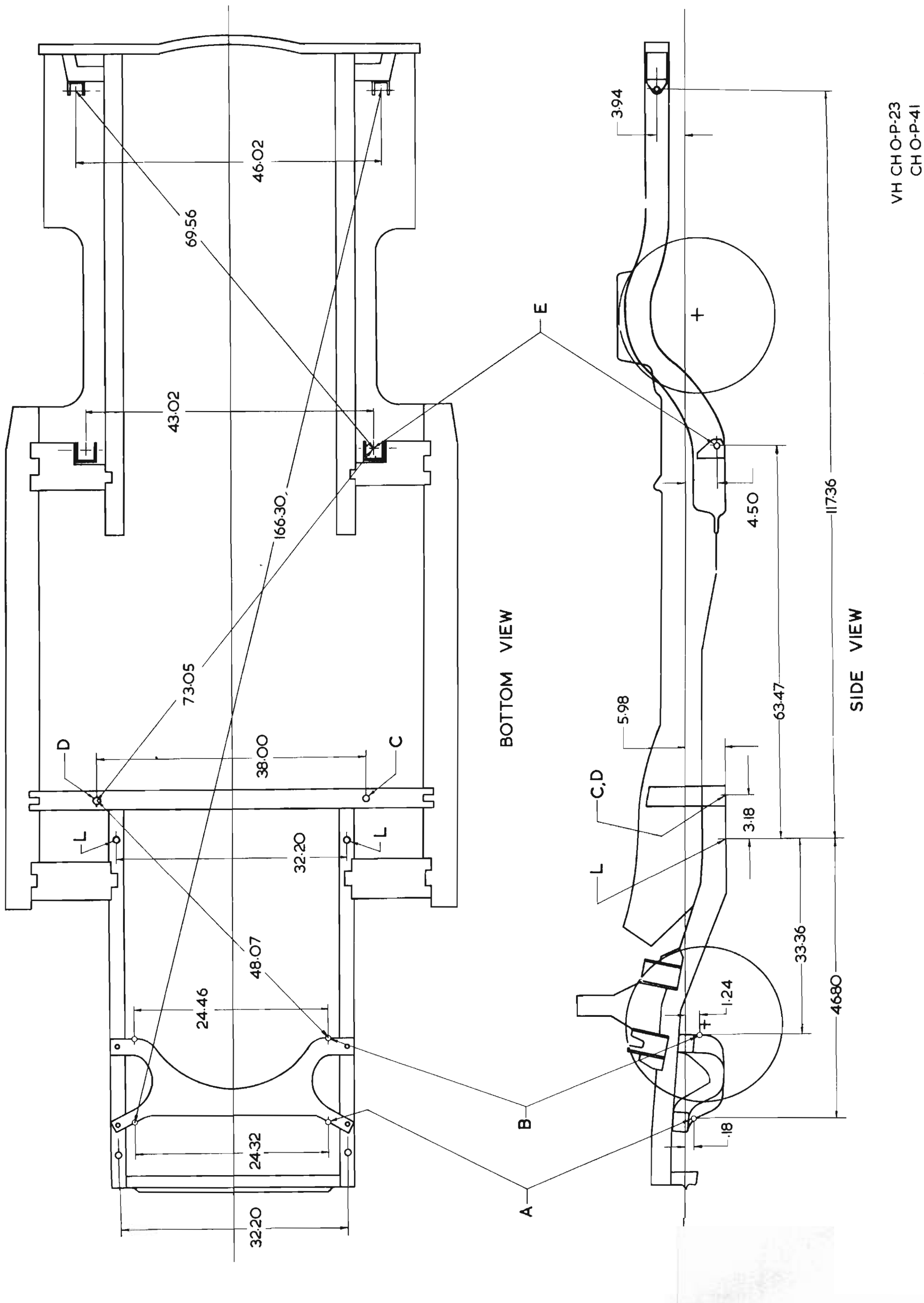


Fig 75 – Body alignment dimensions (115″ wheelbase models)

GROUP 24

AIR CONDITIONING & HEATING

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SPECIFICATIONS

Models:	
Compressor Type	Tecumseh
Compressor Configuration	2 cylinder In-line type
Bore x Stroke	$1\frac{7}{8}''$ x $1\frac{7}{8}''$
Displacement	10.35 cu. ins.
Valve Type	Reed
Oil Capacity (refrigerant oil)	11 fluid ounces (wax-free)
Clutch	Electro-magnet
Clutch Control	Stationary coil
Mufflers	In compressor casing (integral)
Condenser location	Forward of radiator yoke
Receiver-strainer-drier	
Type	Cylindrical steel container
Location	Right side splash shield
Refrigerant	
Type	"Refrigerant 12"
Capacity (dry fill)	2 lbs. 10 ozs. — 2 lbs. 14 ozs.
Evaporator	
Location	In unit (attached to engine compartment sheet metal)
Blower Motor	
Type	Centrifugal
Location	In unit (attached through hole in engine compartment sheet metal)
Stationary Cooling Performance (Max. A/C selected)	Reduce ambient air temperature by 20°F in 2 minutes with 200 C.F.M. airflow (min). from outlets.

SPECIAL TOOLS

(Mechanical and Electrical)

0–20 Amp. Test Ammeter
Cooling System Pressure Test Set (Proprietary line)
Pressure Gauge — Vacuum Testing

(Mechanical, Electrical and Refrigeration)

Thermometer Test Set (0–150°F Mercury glass)
Vacuum Pump (240 volt Dynavac 2R or similar)
Humidity Tester — (Wet bulb thermometer or sling Psychrometer)

(Refrigeration)

Safety Goggles
Refrigerant filling Ratchet
Tube Bending Set
Weighing Scale (40 lbs. in ounce graduations)
Torch — Refrigerant leak detector (electric or flame)

250 p.s.i. — Test set and Manifolding with tubes
Gauge refrigerant pressure testing
500 p.s.i. — Gauge refrigerant pressure testing (Imperial 461C or similar)

TORQUE SPECIFICATIONS

	"TECUMSEH"
Clutch field coil retaining screws	85–120 lbs. in.
Clutch hub retaining nut	15–20 lbs. ft.
Compressor service valve nut "Rotalock"	65–70 lbs. ft.
Connecting rod bearing cap retaining screws	7 lbs. ft.
Cylinder head retaining screws	20–24 lbs. ft.
Manifold nuts and refrigerant container	6–8 lbs. ft.
Mounting bracket bolt/nuts	14–17 lbs. ft.
$\frac{1}{8}$" pipe plug (oil filler plug)	18–22 lbs. ft.
Service port valve	20–24 lbs. ft.
Seal plate	6 lbs. ft.
Front Bearing Plate bolts	6 lbs. ft.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES

1. SYSTEM OPERATES ONLY IN MAXIMUM COOLING AND HI-BLOWER SELECTION

(1) Vacuum leak external to control unit assembly.

(2) Internal control unit assembly leak.

(3) Short circuit in the evaporator temperature control switch.

(4) Defective control unit assembly.

(5) Vacuum tubes incorrectly connected or pinched closed.

2. SYSTEM OPERATES ONLY ON MAXIMUM HEATING AND HI-BLOWER SELECTION

(1) Defective control unit assembly.

3. BLOWER AND COMPRESSOR INOPERATIVE AND SYSTEM WILL NOT OPERATE AS SELECTED

(1) Open electric circuit.

(2) Vacuum leak at engine manifold connection tube.

(3) Vacuum leak at connection of harness and push button switch.

(4) Vacuum leak in push button switch.

4. BLOWER INOPERATIVE

(1) Open blower electric circuit.

(2) Defective blower motor.

(3) Defective blower switch.

(4) Resistor block open circuit.

5. COMPRESSOR INOPERATIVE

(1) Clutch/wire open circuit.

(2) Defective control unit assembly.

(3) Defective temperature control switch.

6. TEMPERATURE CONTROL SELECTION FUNCTIONS REVERSED

(1) Control vacuum tubes reversed on control unit.

7. AIR ESCAPING FROM CONDITIONER OUTLETS IN BOTH HEATING SELECTIONS

(1) Function control vacuum tubes reversed on actuators.

(2) Conditioning door binding on distribution duct.

8. AIR ESCAPING FROM DEFROSTERS, HEATER OUTLETS AND CONDITIONER OUTLETS WHEN COOLING SELECTED

(1) Conditioning door binding on distribution duct.

9. MORE AIR ESCAPING FROM DEFROSTERS THAN HEATING OUTLETS WHEN HEATING SELECTED

(1) Heating and defroster vacuum tubes reversed on actuator.

(2) Defrost door binding.

10. EXCESS AIR ESCAPING FROM HEATER OUTLETS WHEN EITHER HEATING FUNCTION SELECTED

(1) Heating and defrost vacuum tubes reversed on actuator.

(2) Defrost door binding.

11. NO HEATING WHEN SELECTED

(1) Conditioner/heating/defroster vacuum control tubes interchanged and reversed on actuator.

(2) Vacuum control tubes on water valve reversed.

12. AIR ESCAPING FROM DEFROSTER WHEN COOLING SELECTED

(1) Conditioner/heating/defroster vacuum control tubes interchanged and reversed on actuator.

(2) Conditioning door binding.

13. INSUFFICIENT AIR FLOW FROM COOLING OUTLETS WHEN MAXIMUM COOLING AND HIGH-BLOWER SELECTED

(1) Air intakes or passages restricted.

(2) Blower motor power low (motor failing).

(3) Blower motor circuit resistance too high.

(4) Evaporator core “frozen up”.

14. COLD AIR BLOWING ON FEET FOR A PERIOD WHEN HEATING SELECTED

(1) Water valve faulty.

(2) Cooling system thermostat inoperative, or not installed.

(3) Vacuum leak in water valve actuator.

15. INSUFFICIENT HEAT WHEN MAXIMUM HEATING REQUIRED

(1) Water valve faulty.

(2) Vacum leak at water valve actuator.

(3) Heater core or hoses blocked. Temperature control cable mal-adjusted.

16. ERRATIC HEAT OUTPUT

(1) Heater hoses reversed at core.

(2) Air in heater core.

(3) Engine coolant level low.

(4) Intermittent vacuum or electrical control connection.

17. INSUFFICIENT COOLING WHEN MAXIMUM COOLING SELECTED

(1) Refrigerant quantity insufficient.

(2) Expansion valve malfunction.

(3) Temperature control switch malfunction.

(4) Compressor clutch wire loose.

(5) Compressor drive belt loose.

18. COOLING AIR TOO COLD

(1) Temperature control switch malfunction.

(2) Expansion (TX) valve malfunction.

19. COOLING AIR VOLUME DECREASES AFTER A PERIOD – BLOWER EFFORT AT MAXIMUM

(1) Evaporator coil "frozen up".

(2) Expansion (TX) valve malfunction.

(3) Temperature control switch malfunction.

20. AIR ESCAPING FROM UNIT OUTLETS WHEN DRIVING WITH CONTROLS TURNED "OFF"

(1) Fresh air/recirculation control door incorrect operation (open).

(2) Fresh air door actuator vacuum tubes reversed.

21. MAXIMUM HEATING (UNCONTROLLED) ON HI-DEFROST

(1) Push button switch faulty.

22. PUSH BUTTON OPERATION REVERSED (HI-DEFROST AND OFF)

(1) Push button extensions incorrectly installed.

23. WATER (CONDENSATE) SPLASHING ON FEET OR FLOOR FROM AIR OUTLETS

(1) Evaporator drain tube blocked.

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1. DESCRIPTION AND OPERATION

The air conditioner combines both heating and cooling in one system and also provides fresh air cooling. Controls and cooling air outlets are integral with the instrument panel.

Three cooling air outlets are contained in one unit secured to the lower edge of the instrument panel. Each outlet can be adjusted independently to direct air up, down, or to either side. Two fixed openings in the distribution duct installed under the instrument panel direct cooling air to the floor.

Controls for the system consist of five push buttons, a temperature control slide lever and a fan blower switch.

Push Buttons

Control the source and route of circulating air. "Off" (turns off the entire system); "Max. A/C" (maximum air conditioning); "A/C" (fresh air air conditioning); "Heat" (for heater use only); "Def" (windshield defrosting). *(Fig. 9.)*

Temperature Control Slide Lever

Maintains any desired temperature by sliding the lever right or left when operating either the heater fan or air conditioner and controls the automatic cycling of the refrigeration system.

Fan Combination Control Switch

Permits selection of "Low", "Medium" or "High" blower speed. "Low" (far left), "Medium" (centre) and "High" (far right) used when operating either the heater or the air conditioner.

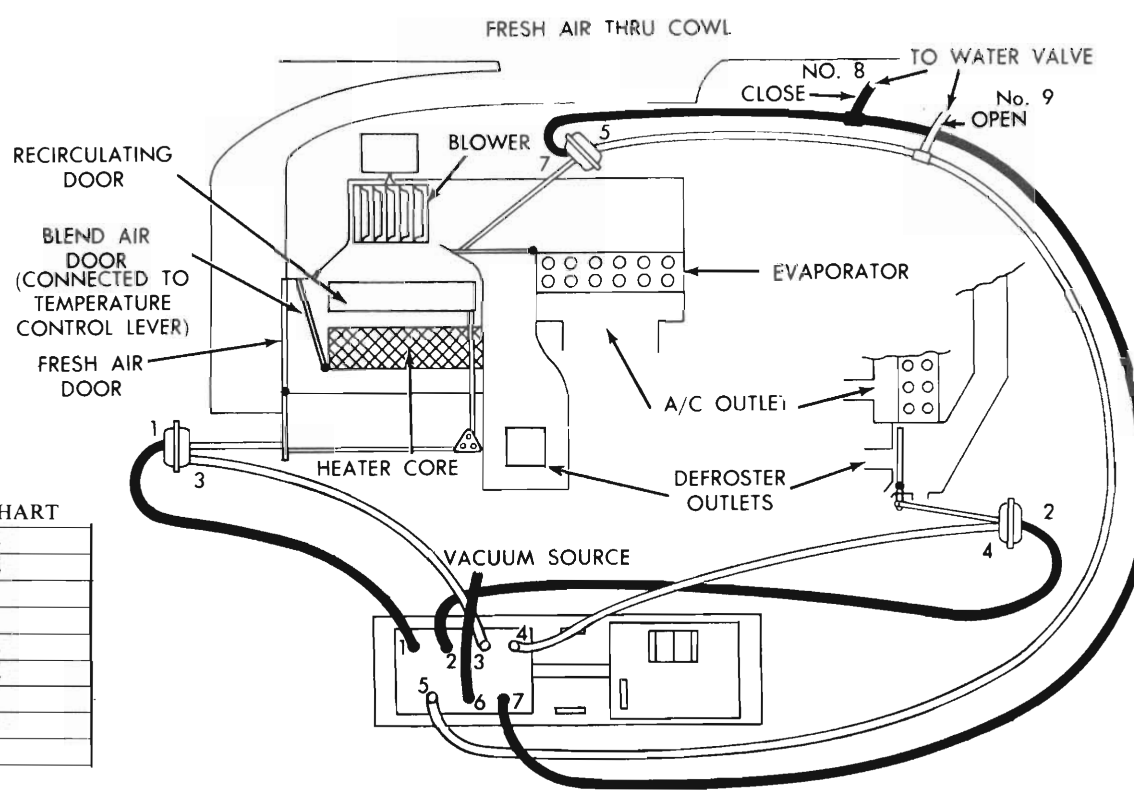
Air Directional Vanes

Located on the lower edge of the instrument panel. These are manually adjusted up, down, or to either side to deflect cool air to suit requirements of driver and passengers.

2. AIR FLOW FOR EACH PUSH BUTTON POSITION (Figures 1 to 7)

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.

Warm weather ventilation—two "fresh air ventilators" are provided, one below each end of the instrument panel. These can be opened manually for fresh air ventilation during warm weather. When using the air conditioner be sure both ventilators are closed.



TUBE COLOUR CHART

1	WHITE
2	WHITE
3	RED
4	RED
5	WHITE
6	BLACK
7	RED
8	WHITE
9	RED

NK1432A

BLACK TUBES ARE "VACUUM ENERGISED"

Fig. 1 – Air flow "off" position

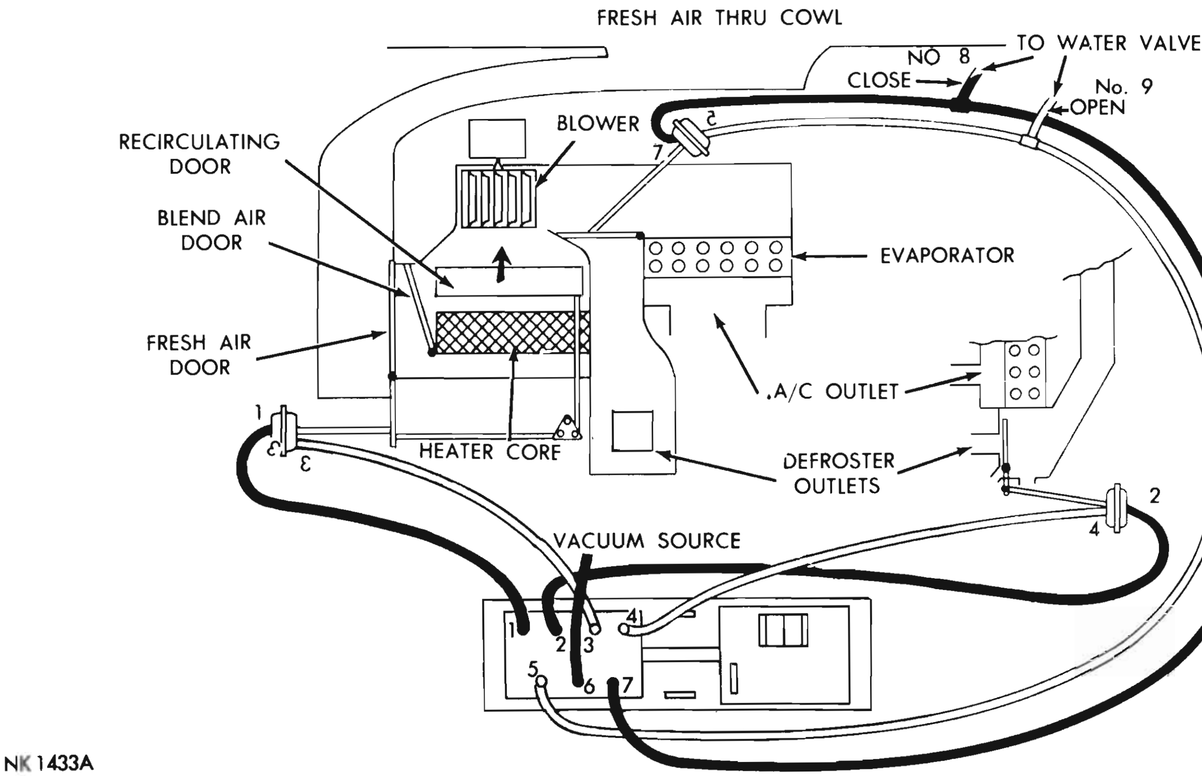


Fig. 2 – Air flow – "Max. A/C" position

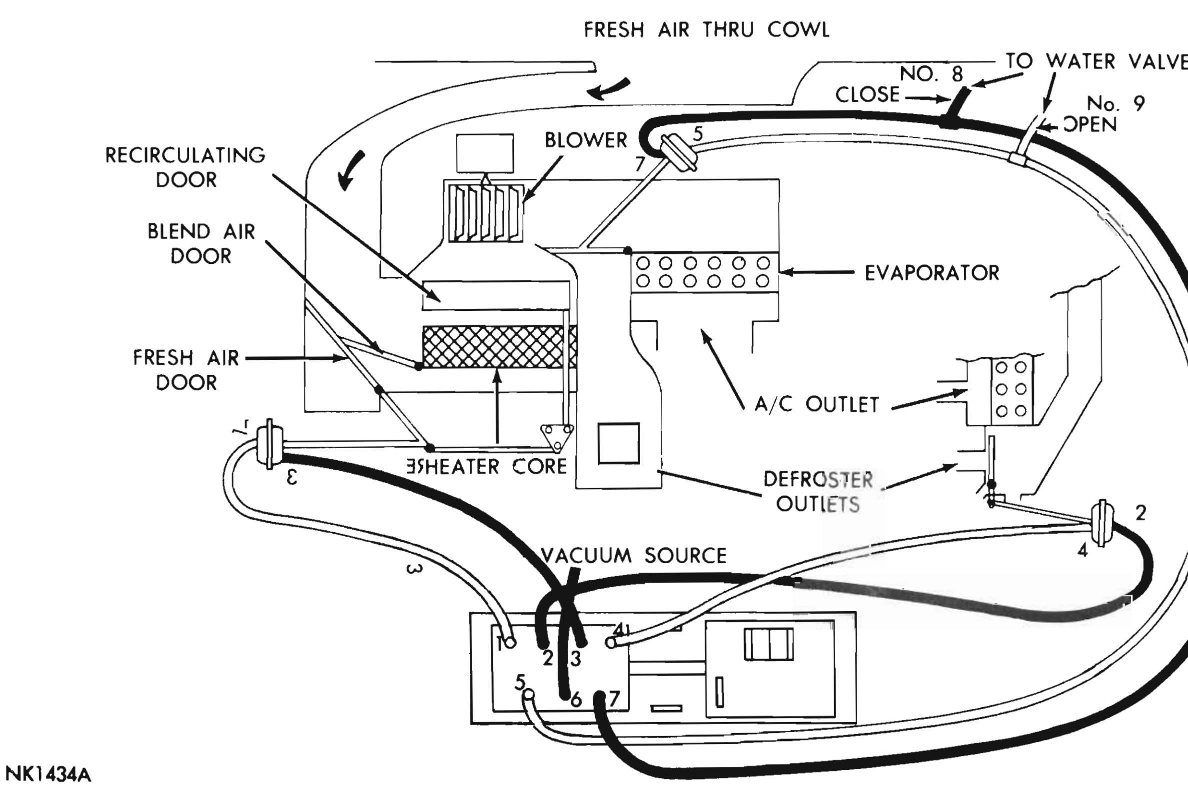


Fig. 3 – Air flow – "A/C" position

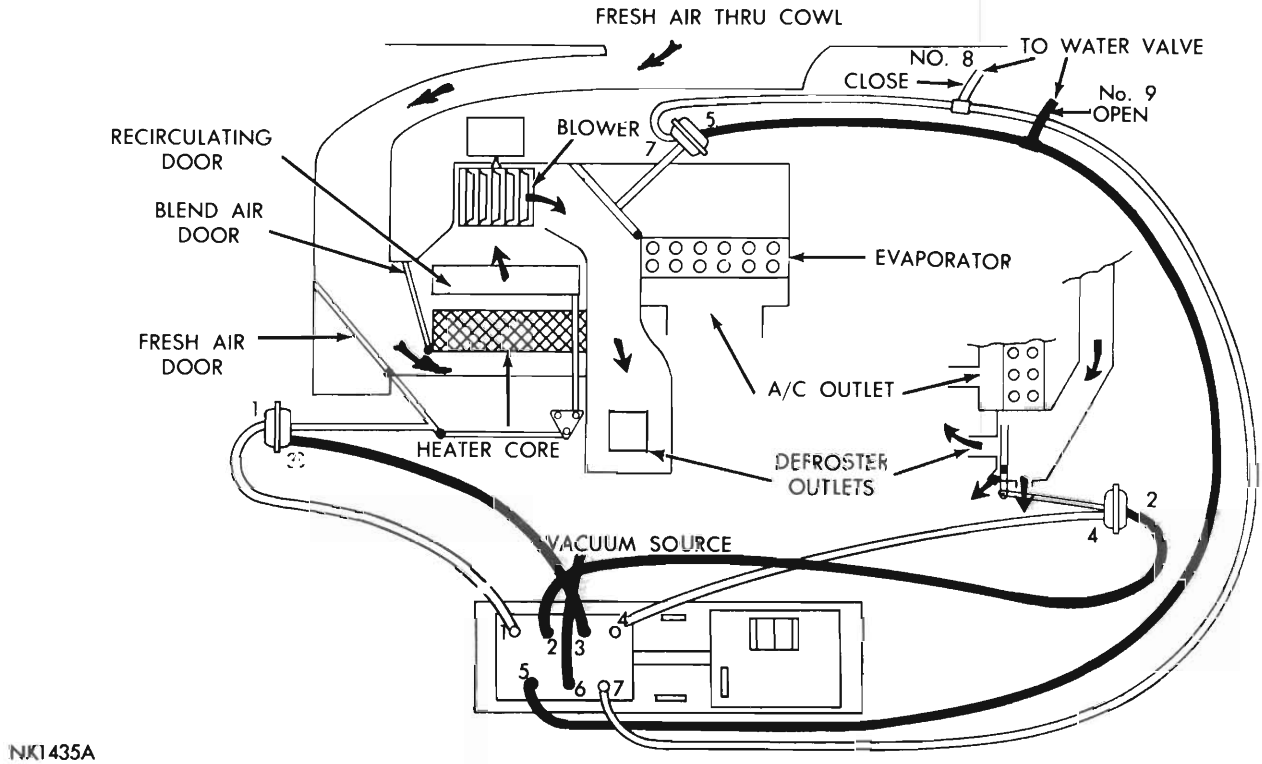


Fig. 4 – Air flow – "Heat" position

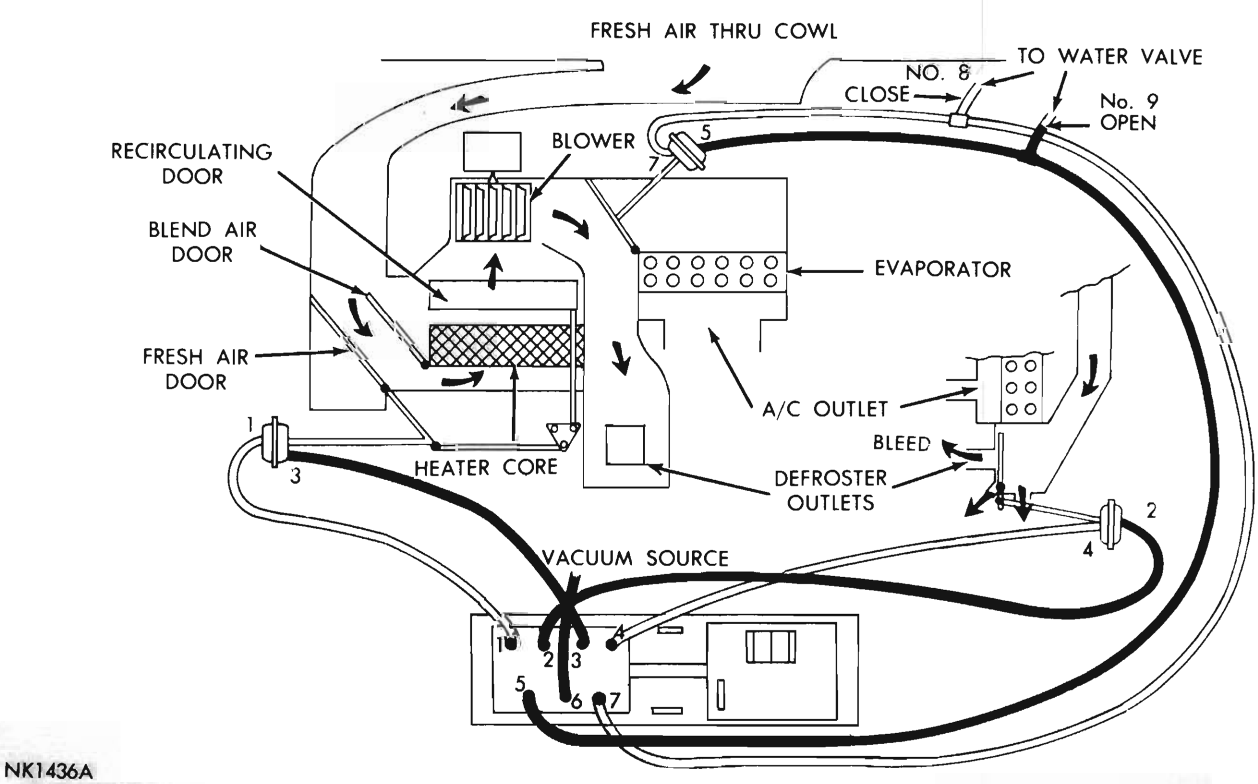


Fig. 5 – Air flow – "Heat" position, blend door half open

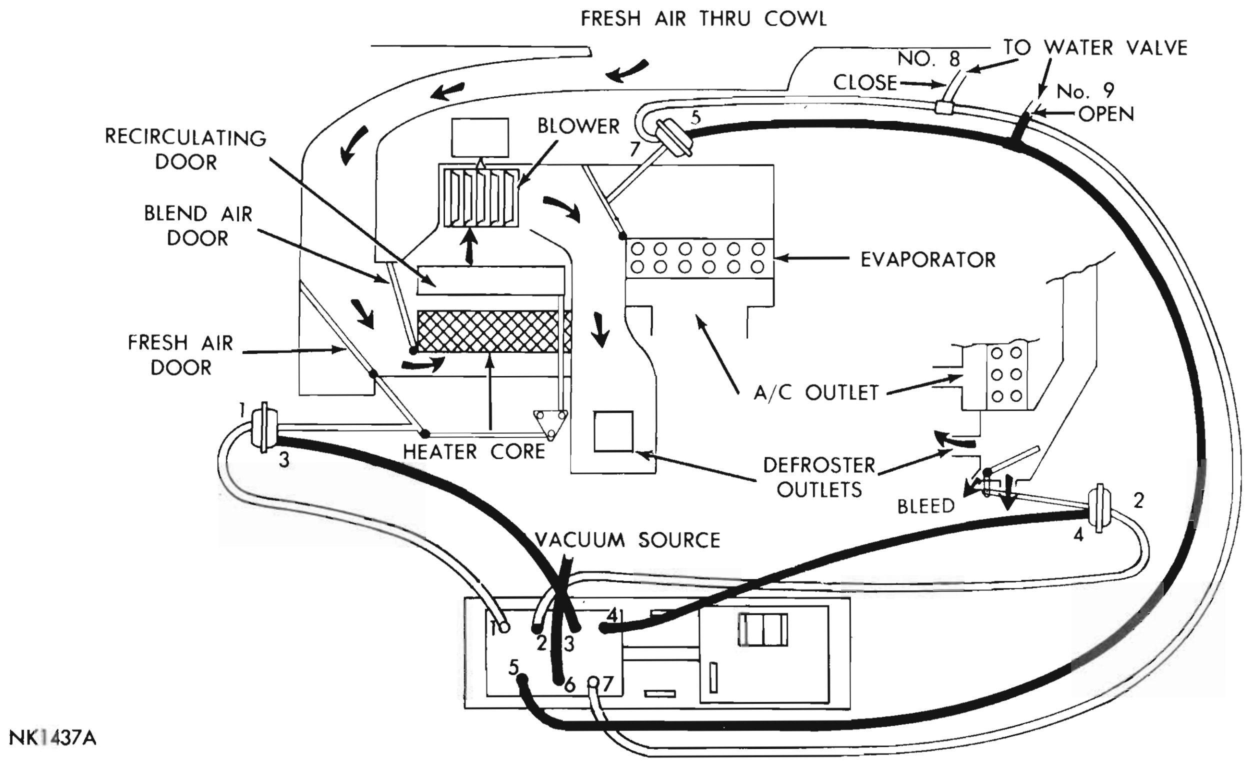


Fig. 6 – Air flow – "Defrost" position

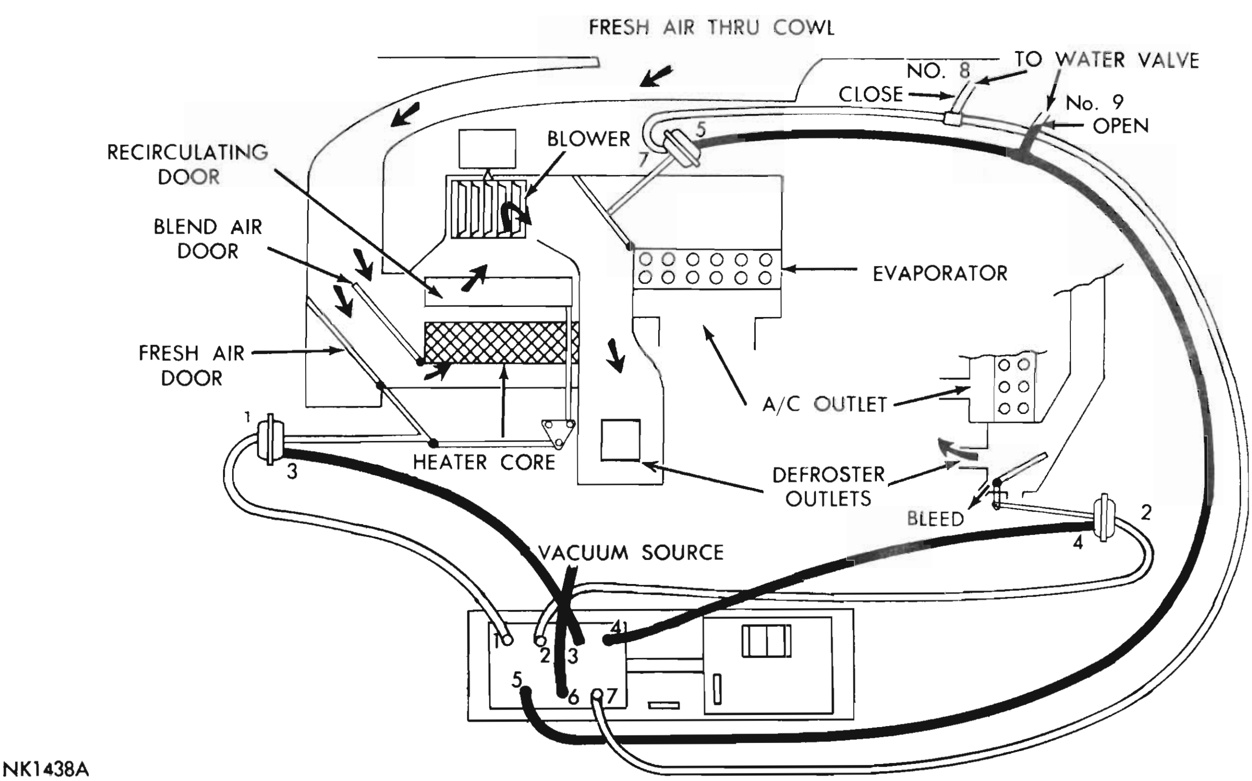


Fig. 7 – Air flow – "Defrost" position, blend door half open

3. ELECTRICAL CONTROLS AND CIRCUITS

The system is controlled by the following switches:—

(a) Push button switch (air conditioner and heater vacuum switch).

(b) Fan switch (air conditioner and heater blower switch).

(c) Temperature control switch (temperature control slide lever).

Push Button Control

The power feed circuit is shown in *Fig. 8.* A 25-ampere fuse protects the circuit. The compressor clutch circuit is energised 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.

Blower Motor (Fan) Switch

The power feed line from the push button switch to the blower switch is energised only when the ignition is on and any push button other than "Off" is depressed. The fan switch is controlled by moving the control lever from "Low" to "Med." to "High".

Temperature Control Switch

The temperature control switch controls the temperature of the evaporator by automatically cycling the compressor clutch. As the clutch is cycled on and off, the temperature of the evaporator is held at the setting of the temperature control lever.

4. OPERATING INSTRUCTIONS

Fast Cool Down

(1) Make sure the "fresh air ventilators", located under each end of the instrument panel, are closed.

(2) Slide temperature control lever to the "far left position.

(3) Depress push button marked "Max. A/C".

(4) Rotate fan switch to "High".

(5) Adjust the three air directional vanes to direct cooled air to the desired area to suit occupants' requirements.

(6) Drive vehicle for a couple of minutes to expel warm air; then close all windows. When less cooling is desired, press button marked "A/C" and re-adjust fan switch and temperature control lever to occupants' comfort.

Normal Cooling (Cooling with fresh air)

(1) Make sure the "fresh air ventilators", located under each end of the instrument panel, are closed.

(2) Slide temperature control lever to the 'far left" position.

(3) Depress push button marked "A/C".

(4) Rotate fan switch to desired speed.

(5) Adjust the three air directional vanes to suit occupants' requirements.

When less cooling is desired, move the fan switch to "Low" and re-adjust the air directional vanes (up) for indirect cooling. For warmer air move the temperature control lever to the right.

Cooling for special conditions

The air conditioner provides maximum de-humidified air at the most comfortable weather conditions above 50°F. During damp or extremely humid weather operate the heating 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 fresh air cooling, push the "Max. A/C" button. This is also recommended when driving through areas which are extremely dusty or have objectionable odours.

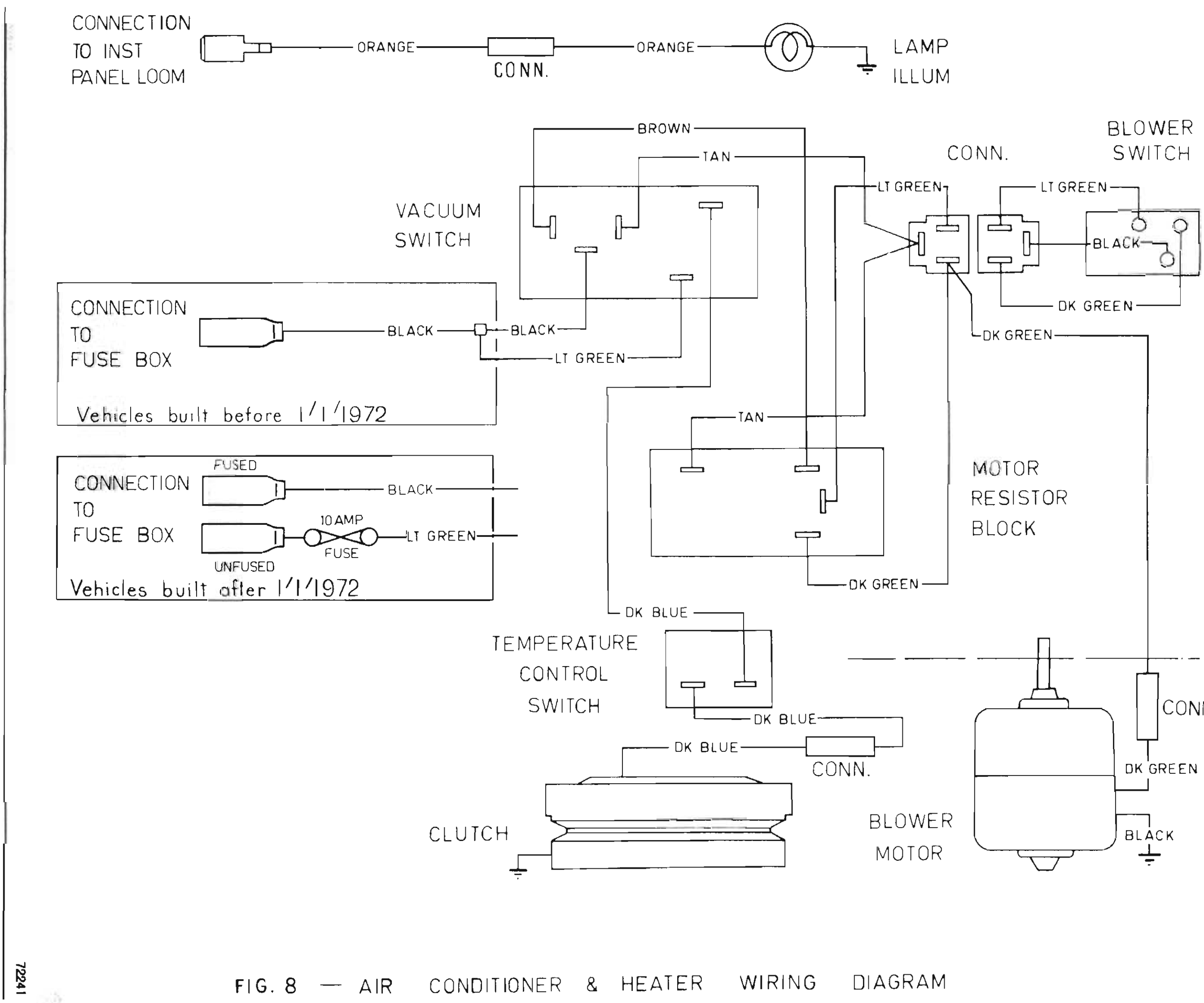


FIG. 8 — AIR CONDITIONER & HEATER WIRING DIAGRAM

Operation in Traffic

In extremely slow traffic, additional cooling may be required.

When pulling a trailer, when driving through heavy traffic at 10–15 m.p.h., 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.* When driving, it is normal to *hear* the air conditioner clutch engage and disengage, and experience minor variations in vehicle speed.

Off-season Operation

During the "off cooling" season, ensure that the owners do operate the air conditioning system for at least five minutes once a week with the "Max. A/C" button depressed and the temperature control lever in the warm position. This will cause the air conditioner compressor to pump oil to the compressor seal, preventing the seal from drying out and allowing loss of refrigerant.

SERVICE INFORMATION — PROCEDURES

NOTE TO SERVICE PERSONNEL

The following instructions apply to the servicing of the controls and components which are not pressure sealed, however, *care must be taken* to ensure that the *refrigerant connections* are not disturbed in the process of obtaining access by *inadvertently* loosening pressure unions, as *this action could cause serious bodily injury – refer to Safety Precautions on Page 24 – 23.*

5. INSPECTION AND TEST PROCEDURES

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 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. Ensure that *only* qualified personnel service the items contained under Air Conditioning Units.

6. CONTROLS

To Test

Testing operations must be carried out as described in the following sequences.

(1) Inspect, test, and adjust compressor drive belt.

(2) Remove radiator pressure cap.

(3) Start engine and adjust engine speed to 1150 r.p.m. for 6 cylinder and 1100 r.p.m. for 8 cylinder engines. Use a reliable tachometer.

(4) Move temperature control lever to the left position (cooler) and push the "A/C" button.

(5) The fresh air door should be open to fresh air and the vehicle windows open.

(6) Test the blower operation at all three speed positions. If the blower does not operate correctly, refer to *"Electrical Control Circuit" (Page 11).* Leave the blower switch in the "High" position.

(7) The compressor should be running and the air conditioning system in operation.

Push Button

Reduce engine speed to normal idle; with engine operating at idle speed, vacuum will be high and vacuum actuators should operate quickly.

If actuator operation is slow, check the source hose connection at engine manifold. Push each button to test overall operation of the electrical and vacuum controls.

The *"Push Button Control Chart" (below)* summarises the actions that should take place when each button is pushed *(refer "Chart").* Also, refer to *"Air Flow for each Push Button Position (Pages 7 to 10).*

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.

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
Inlet Door	Open	Open	Open	Closed	Closed
Water Valve	Closed	Closed	Closed	Open	Open
Defroster Door	Closed	Closed	Closed	Closed with Air Bleed	Open
Heater Door	Open	Open	Open	Open	Closed with Air Bleed
Blower Speed	Off	Hi.-Med. Low	Hi.-Med. Low	Hi.-Med. Low	Hi.-Med. Low
Compressor Clutch	Off	On	On	Off	Off

Temperature Control Cable

To Adjust (Unit Lever to Panel Levers)

(1) Remove the cool air distribution duct by removing two 7/16″ A.F. nuts, washers and spacers, using a narrow (tube) type spanner.

(2) Position the selection lever to the extreme right (warmer) position.

(3) Remove the lower spring clip from control unit to allow cable to reposition.

(4) Check position of lever and replace the cable clip, ensuring that the fresh air door lever is in the (closed) right hand position.

(5) Check operation of the temperature control.

Temperature Control Cable to Switch

To Adjust

(1) Remove the glove box compartment.

(2) Remove both the control cable retaining clips from the brackets.

(3) Position the control cable lever to the extreme right (warmer) position.

(4) Move the door lever arm to the extreme right and secure both cables in the "compressed" position using the cable spring clips, i.e., switch in the "Heat" (far right) position *(Fig. 10)*.

Cable Replacement

Carry out the above procedures to remove the cable clips from both ends of the cables, then slip the looped ends off the cable arm pivots. Replace by reversing the removal procedures and ensuring the black sheathed cable is connected to the outer pivot *(refer Fig. 10)*. Re-adjust as previously described.

Panel Control Assembly

> NOTE: Removal of the front seat will give additional access to the rear of the control panel.

To Remove

(1) Remove the cool air distribution duct by removing two 7/16″ nuts, washers and spacers which secure the duct to the panel.

(2) Remove the seven electrical lead plugs from the unit.

(3) Disconnect the control cable clip and remove cable at heater end.

(4) Remove the control lever knob using a small "Allen" wrench.

(5) Remove the two retaining nuts and washers which secure the control unit to the panel and carefully remove the control from the panel *(refer Fig. 9)*. Replace the unit by reversing the foregoing procedures and readjust cables as described previously.

Water (On/Off Type Only) Valve Test

The water on/off valve is mounted on left hand splash shield and is vacuum operated when the engine is running and whenever "heat" (on) or "A/C" (off) is selected.

To Test

Remove the radiator cap to minimise pressure in the vehicle's cooling system and start the engine. With the "Max. A/C" or "A/C" button pushed in, test water valve by momentarily disconnecting heater inlet hose. A slight spillage of water when the hose is removed is normal. A continuous flow of water indicates that the valve is not closing properly or the vacuum hoses are reversed. If the water valve does not close completely, replace the valve. Ensure that the water tubes are connected correctly.

7. COMPRESSOR DRIVE BELT

Satisfactory performance of the air conditioning system is dependent upon drive belt condition and tension. If the proper tensions are not maintained, belt slippage will greatly reduce air conditioning performance and drive belt life. To avoid such adverse effects, the following service procedure should be followed:—

(1) Ensure than only the special air conditioning drive belts part No. 2899938 (6 cyl.) and 3428520 (8 cyl.) are used.

(2) Any belt that has operated for a minimum of half an hour is considered to be a "used" belt. Adjust air conditioning drive belt to ½″ deflection (6 cylinder models) or 7/16″ deflection (8 cylinder models) for new belts under a 10 lb. load, refer *Group 7, Page 7–12.*

(3) Measure drive belt tension at regular service intervals and adjust as needed.

(4) On all "new belt" installations, new belt tension specifications should be used when the belt is first installed to obtain proper tension. Thereafter these replacement belts should be serviced according to the above procedure.

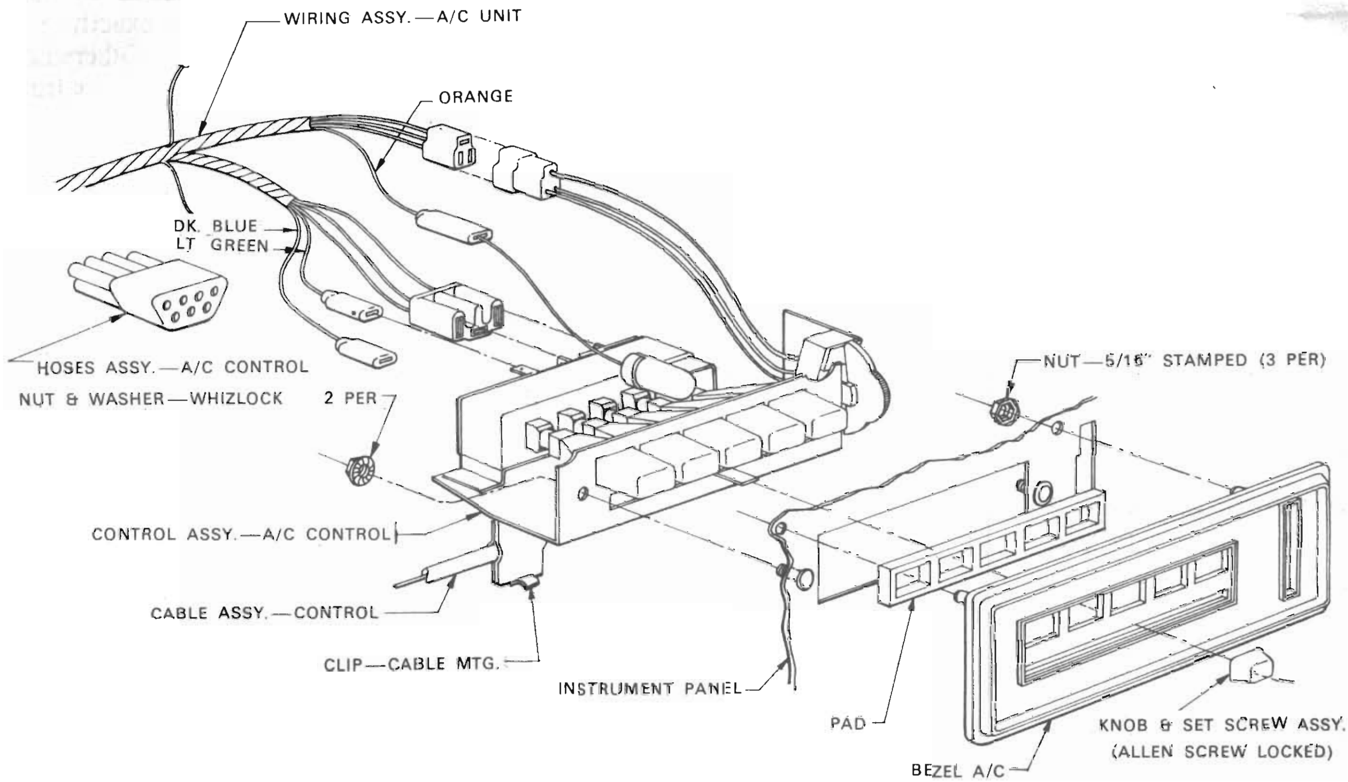


Fig. 9 – Air conditioner control panel (disassembled view)

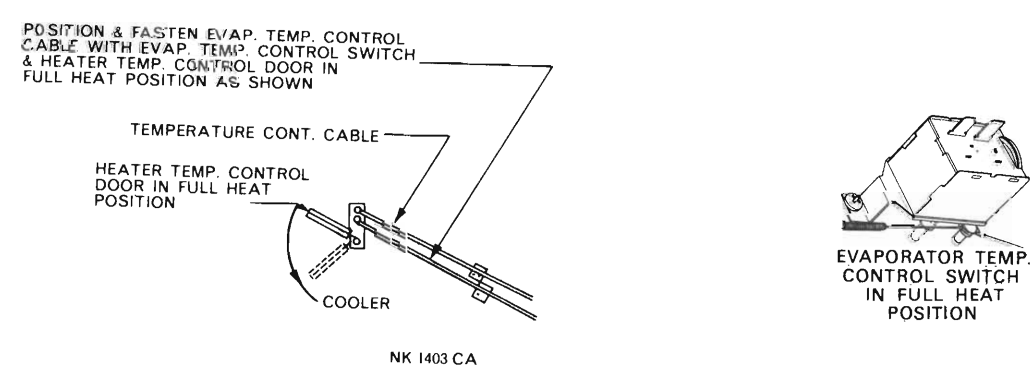


Fig. 10 – Temperature Control Lever Adjustment

NOTE: Should the compressor drive belt be found rolled over, check that the idler bracket is not bent or misaligned — also check that the drive pulleys are correctly aligned. Remedy any misalignment, where necessary. Where the guide roller sheave is damaged, it must be replaced. Check also for a non-uniform V-section drive belt, uneven pulley groove and/or roller sheave.

8. COOLING SYSTEM

Radiator Pressure Cap

All air conditioned vehicles are equipped with a 16 p.s.i. radiator cap.

Testing the pressure cap is detailed in *Group 7, Cooling System, Paragraph 6.*

Flushing System

At the recommended frequencies the cooling system should be flushed clean. When flushing heater equipped models, the heat or defrost button should be pressed before the engine is turned off — to enable the heater core to be flushed also.

Refilling System

Refill, using demineralised (soft or rain) water and a *recommended* anti-freeze solution to cover the expected temperatures of operation and the recommended corrosion inhibitors (Chrysler Parts Corrosion Inhibitor) as directed.

Do not use discarded anti-freeze solutions or mix unknown types of anti-freeze, as they may be incompatible and produce undesirable reactions.

9. VACUUM CONTROL SYSTEM

Tests and Adjustments

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 properly at high speeds. Before starting this test, stop the engine. Start the vacuum pump, and connect to the vacuum test set gauge. Adjust the bleed valve on the test set to obtain exactly 8″ of vacuum, with a finger blocking the prod on the end of the test hose *(Fig. 11)*. It is absolutely essential that the bleed valve be adjusted so the vacuum gauge pointer will return to exactly 8″ 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 re-block the hose prod several times. Make sure the bleed valve is adjusted so the vacuum gauge pointer returns to exactly 8″ of vacuum when the prod is covered with a finger.

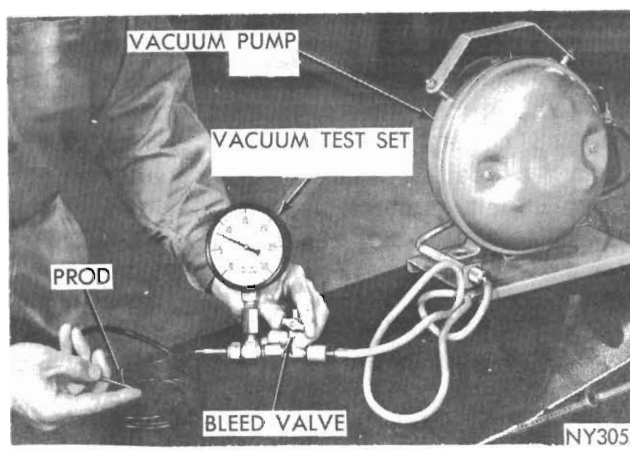


Fig. 11 – Adjust vacuum test bleed valve (typical)

Disconnect the engine vacuum source hose at the engine intake manifold and insert the vacuum tester hose prod into the source hose leading to the control switch. Place the vacuum gauge on the cowl so it can be observed from the driver's position, as the push buttons are operated.

Start the test by pushing the "Def" button (defroster). The vacuum tester gauge needle will drop until the actuator has operated and then will return to 8″.

Continue to push buttons "Heat", "A/C", "Max. A/C", and "Off", allowing time for actuators to operate after each button is pushed, and note the vacuum drop below 8″ after each complete operation. The maximum allowable vacuum drop is ¾″ after each complete operation. If the vacuum drop is more than ¾″ first recheck the tester for reading exactly 8″. If correct, inspect the fit of the 7-hole connector plug on the control switch *(Fig. 12)*. This plug must be positioned all the way on the seven prods on the control switch.

This plug must be positioned all the way on the seven prods on the control switch.

CAUTION: Do not use lubricant on the switch prods or in the holes in the plug, as lubricants 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 switch prods.

If vacuum drop is now within limits, proceed with *Test 1 — System Pressure Test (Page 24 – 26).*

If vacuum drop is still in excess of $\frac{3}{4}$", remove connector plug from switch. In some cases access is obtained by removing the cool air distribution assembly from the unit. Insert the vacuum test prod alternately in each of the connector holes except the source hose connector hole *(Fig. 13)*. Note the amount of vacuum drop below 8" after each actuator has operated. If the vacuum test gauge comes back to 8" at each of the 6 holes, the hoses and actuators are not leaking. The control switch is faulty and must be replaced.

The button control unit is removable from the instrument panel by removing the retaining nuts. If excessive vacuum drop shows up at one or more holes in the connector plug, isolate the faulty hose or actuator. If the vacuum drop occurs at No. 5 or 7 holes, first check the tee connectors under the instrument panel that tie Nos. 5 and 7 to 8 and 9 respectively. No. 8 and 9 hoses operate the water valve actuator. Test whether the actuator or hose is at fault; use the test hose on the actuator involved *(Fig. 14)*.

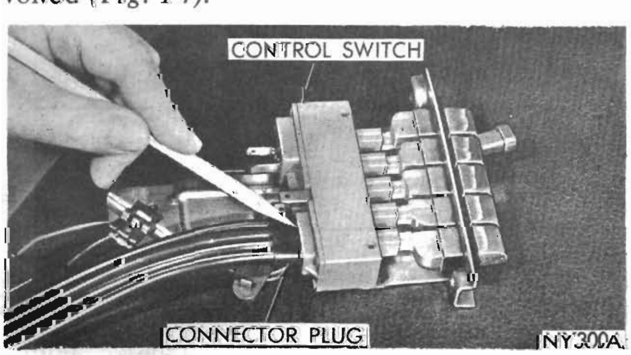
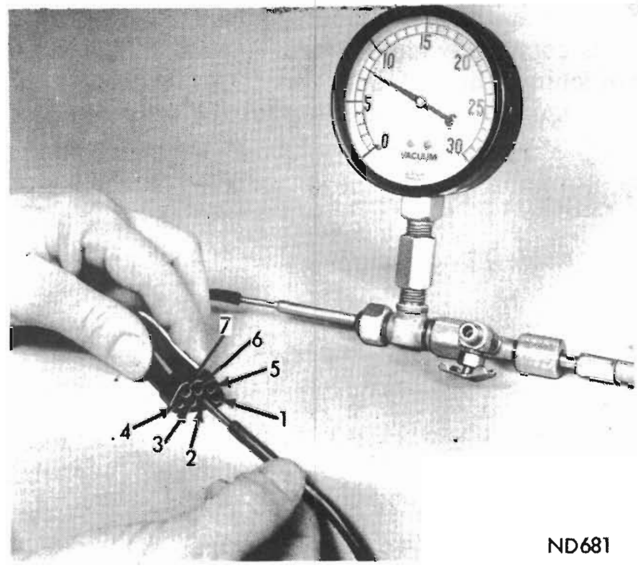


Fig. 12 – Push button vacuum test – connector plug installed (typical view)



1. Fresh Air Door Closed
2. Defroster Door Open
3. Fresh Air Door Open
4. Defroster Door Closed
5. A/C Inlet Door Closed
6. Vacuum Source
7. A/C Inlet Door Open

Fig. 13 – Vacuum tube assembly test

To Adjust

To adjust the recirculation door, remove the glove box, push the "Max. A/C" (Maximum Air Conditioning) button in. Vacuum will then be applied to the top of the fresh air recirculation actuator closing the fresh air door, opening the recirculating door *(Fig. 15)*. For removal of glove box refer to *Para. 6, Page 24 – 14.*

The top connecting rod has a turnbuckle nut and lock nut. The length of the rod can be adjusted by using two 7/16" open-end wrenches.

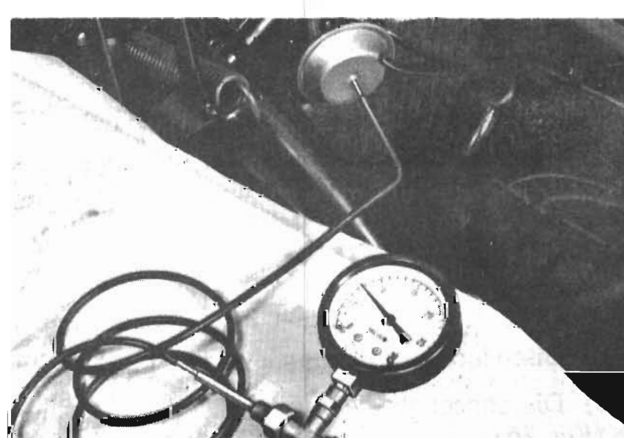


Fig. 14 – Vacuum actuator test

The recirculation door should be adjusted to give the maximum possible opening when the fresh air door is completely closed. Push in the "A/C" (air conditioning) button and inspect to see that the recirculation door has moved to its fully closed position.

10. VACUUM ACTUATOR REPLACEMENT

Lower (Heater) Door Actuator

(Refer Fig. 16)

(1) Remove the nut securing the rod arm to the door shaft and carefully lever the arm from shaft.

(2) Disconnect the vacuum tubes from the actuator connections (noting that the red tube is connected to the rod side of actuator).

(3) Loosen the two retaining nuts and remove the diaphragm assembly from the bracket.

(4) Remove the retaining snap washer and remove the shaft arm from rod. Replace the assemblies in the reverse order.

Upper (Fresh Air/Recirculation) Door Actuator

Remove the glove compartment box and remove the retaining nuts and connections noting the vacuum tube (red) is connected to the rod side.

Inner Upper Actuator

(Fig. 17).

To Remove

(1) Lever off the rod pivot and retaining snap washer.

(2) Disconnect the vacuum tubes and remove the diaphragm assembly after loosening the retaining nuts. Re-install in the reverse procedure, connecting the red tube to the rod side tube connection.

11. BLOWER MOTOR RESISTOR REPLACEMENT

Access to the resistor is provided after the removal of the glove box lid and compartment.

To Remove

(1) Disconnect the battery positive lead.

(2) Disconnect the leads to the resistor terminals *(Fig. 16).*

(3) Remove the two screws which secure the resistor in the housing and carefully lift the resistor out. Re-install by reversing the foregoing procedures.

12. TEMPERATURE CONTROL SWITCH (Refer Fig. 10)

Located at the right hand end of the evaporator upper surface.

(1) Disconnect the battery earth lead.

(2) Remove the right hand demister tube.

(3) Disconnect the two electrical connection plugs from the switch.

(4) Remove the two retaining cross head screws from the switch.

(5) Carefully withdraw the sensor tube of the switch from the evaporator by pulling the tube outward (note that the tube is straight and is "bottomed" in the housing). It is not necessary to remove the insulating rubber grommet *(refer Figs. 18 and 35).*

13. HEATER CORE

The heater core is located behind a separate cover in the heater unit assembly forward of the instrument panel. The core assembly is secured within by four sheet metal attaching screws.

It is not necessary to remove the air conditioning unit, as the heater section can be dis-assembled from the air conditioning unit and further dis-assembled as described below:—

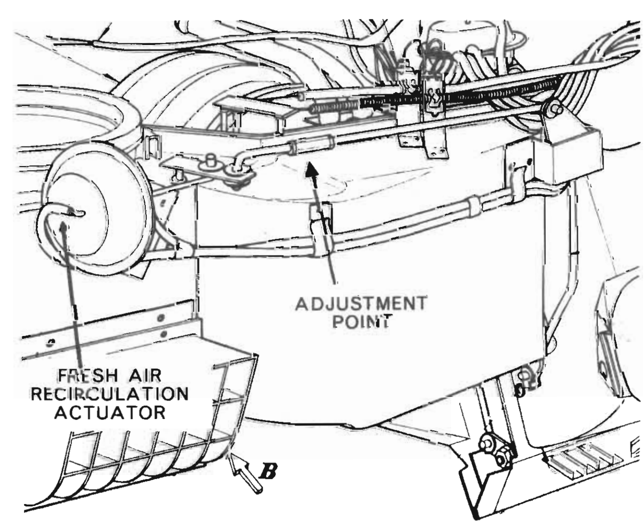


Fig. 15 – Recirculation door linkage

To Remove — Refer Figs. 16 and 18

(1) Disconnect the battery lead.

(2) Drain cooling system and remove both heater hoses from the core extension tubes (noting the hose positioning) and plugging ends of the core tubes to prevent spillage.

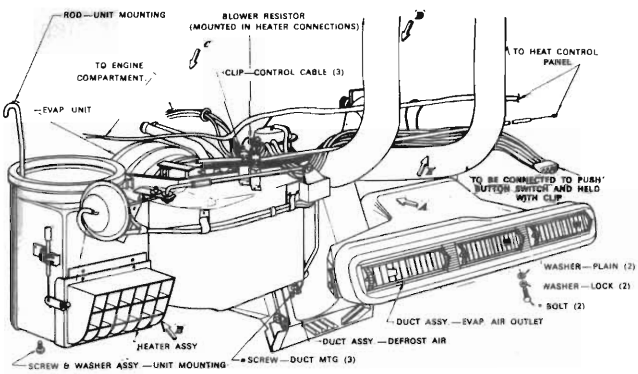


Fig. 16 Heater and Evaporator complete assembly

(3) Remove the cool air distribution outlet assembly, glove box assembly and left defroster tubing.

(4) Disconnect electrical wires from resistor block, vacuum hoses from the fresh air recirculating actuator, the temperature control cable, evaporator temperature control switch control cable from the brackets and arm pivots.

(5) Remove the screws securing the heater assembly to the evaporator assembly *(view A, Fig. 16)*.

(6) Disconnect heater housing support rod from the fresh air duct *(Fig. 16)*.

(7) Remove heater assembly from the vehicle.

(8) Remove operating link between bellcrank and recirculating door.

(9) Remove the fresh air inlet seal from either front or rear heater housing half only.

(10) Remove the retainer clips attaching the heater housing halves together and separate the heater housing halves.

(11) Remove the screws attaching the heater core to heater housing and remove the core.

To Install

(1) Place a small bead of sealer in heater housing flange.

(2) Install heater core in the heater housing and secure the four attaching screws.

(3) Cement the weather seal on the inner lip of heater core flange *(Fig. 18)*.

(4) Place a small bead of sealer on heater housing cover and position the "air mix" door.

(5) Position both housing halves together and install the eleven retainer spring clips. Remove any excess sealer

(6) Cement fresh air inlet seal into position.

(7) Check the operating link between bellcrank and recirculation door. Adjust if necessary. With recirculation door closed, fresh air door should be fully open.

(8) Position heater assembly in the vehicle and proceed as follows:—

a. Install temperature control cable on outer operating arm in full heat position (toward evaporator) with end of cable housing beyond edge of retainer clip *(Fig. 16)*.

b. Install the evaporator temperature control switch cable on the inner pivot of operating arm in full heat position, with the end of the cable housing beyond the edge of the cable bracket. Install the clip. Position heater assembly on the air conditioning unit and secure heater support rod to the fresh air duct and the screws to the evaporator assembly, then tighten all support screws evenly.

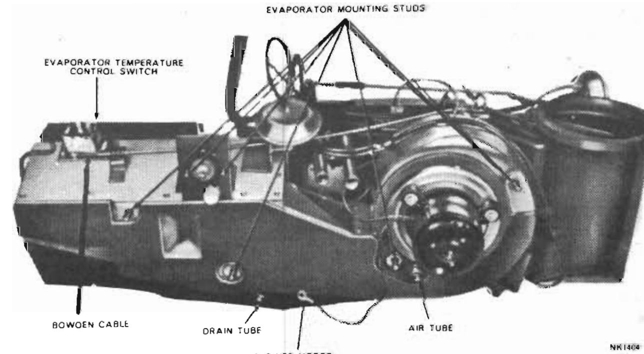


Fig. 17 – Heater and evaporator assembly — engine side (typical view)

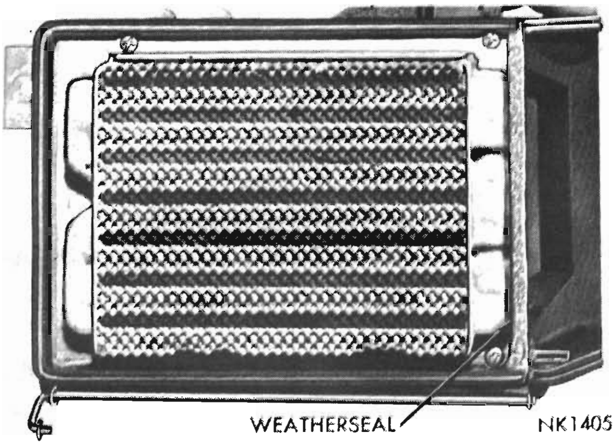


Fig. 18 – Weather seal positioned

(9) Test the operation of the controls and adjust where required — *refer Paragraph 6.*

(10) Install electrical wires to resistor block, vacuum hoses to fresh air recirculating actuator (red stripe to rod side).

(11) Install defroster duct, tubing and glove box assembly.

(12) Install heater hoses *(Figs. 24 and 25),* fill cooling system, connect battery terminal.

(13) Start engine, operate until normal engine operating temperature is obtained and test operation of heater assembly.

14. MAGNETIC CLUTCH

The magnetic clutch *(Fig. 19)* utilises a stationary electromagnet attached to the compressor. Since the electromagnet does not rotate, collector rings and brushes are eliminated.

Testing Electromagnet Current Draw

To test the coil for a short or open circuit, connect an ammeter (0–20 ampere scale) in series with a fully charged 12 volt battery and the field coil lead. The current draw at 12 volts and 68°F. temperature should be 2.7 to 4.6 amperes for copper wire models, 4.0 to 4.6 for aluminium models. Note — "AL" on housings.

To Remove

(1) Loosen and remove the drive belt. Disconnect clutch field lead wire at the connector.

(2) Remove the special locking bolt and the washer from the compressor crankshaft at the front centre of the clutch.

(3) Remove the fan shroud to provide access, (where equipped).

(4) Install a $\frac{5}{8}''$ 11 t.p.i. x $2\frac{1}{2}''$ cap screw into the threaded portion of the hub assembly.

(5) Support clutch with one hand, then tighten cap screw until clutch is removed.

(6) Remove the three hexagon head screws attaching the clutch field assembly to the compressor and lift off the assembly.

To Install

(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 lbs. in

(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

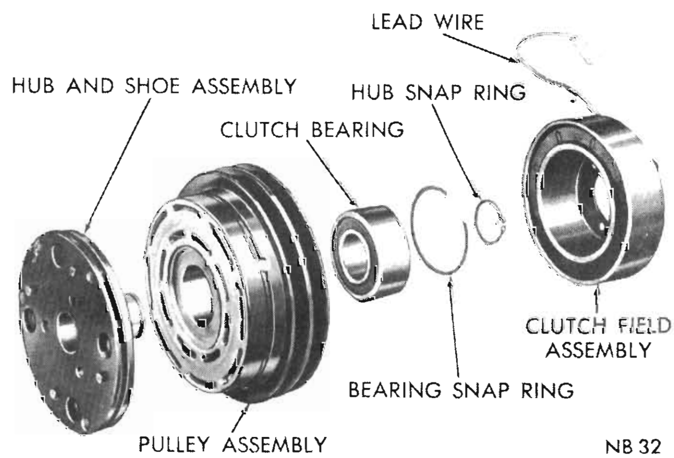


Fig. 19 – Warner clutch components

inserted in the holes on front bumper plate. Tighten to 20 lbs. ft. torque.

(5) Connect field lead wire.

(6) Install belts and tighten to specified tension *(Page 24–14).*

(7) Reinstall the fan shroud, where removed.

To Disassemble

(1) Remove the small snap ring from the drive hub with circlip pliers.

(2) With a suitable mandril, support the pulley assembly and drive the hub and shoe from the assembly.

(3) Remove bearing snap ring from pulley.

(4) Place pulley assembly on an arbor press, with pulley side down, and bearing hub centred. Install a mandril on inner race of bearing and press the bearing from pulley assembly *(Fig. 21)*.

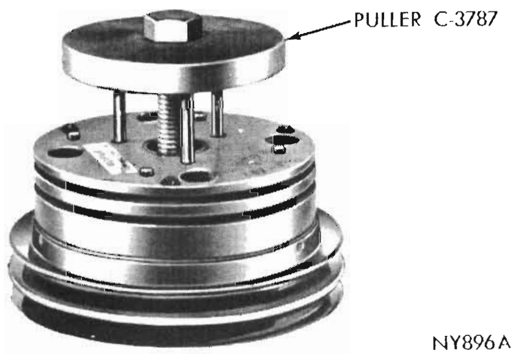


Fig. 20 – Removing hub and shoe assembly

NOTE: A new bearing must be installed every time the magnetic clutch is disassembled.

To Assemble

(1) Install pulley assembly with pulley side up on an arbor press and insert a *new* bearing into the bore. Install a mandril against the bearing and press into position *(Fig. 22)*.

(2) Install pulley assembly with pulley side facing down.

(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. No attempt should be made to replace either unit separately as this may reduce the initial torque of the clutch.

15. BLOWER MOTOR

All service to the blower motor is made from the engine compartment side.

To Remove

(1) Disconnect feed wire at connector and ground wire. Remove air tube.

(2) Remove the three sheet metal screws located on the outer surface of mounting plate.

(3) Remove mounting plate, blower motor and fan as an assembly.

To Install

NOTE: If the blower was removed from the mounting plate, be sure the mounting grommets are installed at the attaching bolts. Be sure the blower wheel is free and does not rub.

(1) Install blower motor assembly to the evaporator case (with air tube opening to the bottom). Secure with the three sheet metal screws.

(2) Install (air tube) motor ground wire and connect the feed wire.

(3) Test operation of blower motor.

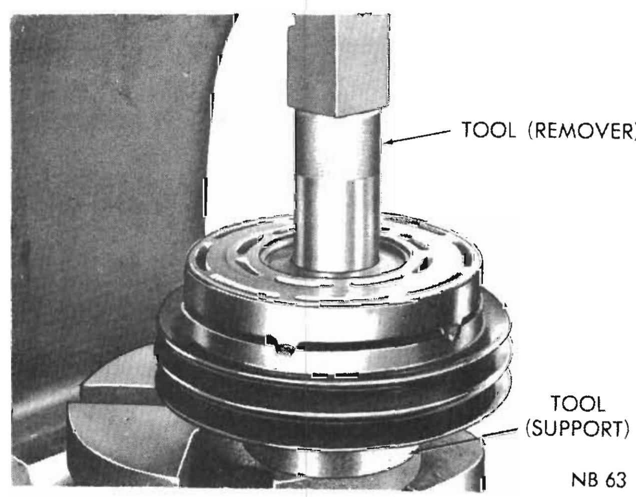


Fig. 21 – Removing bearing from the pulley assembly

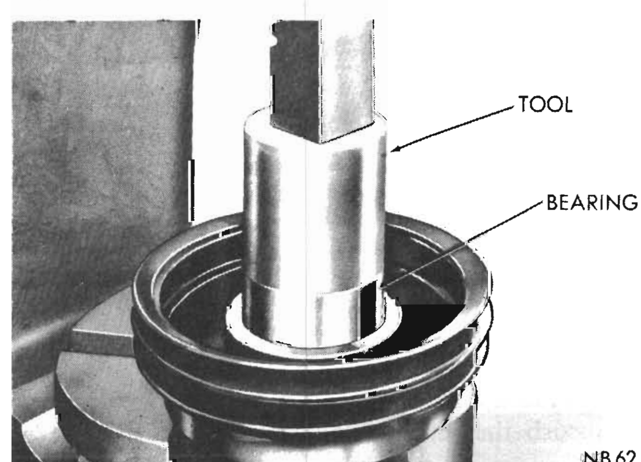


Fig. 22 – Installing a new bearing in the pulley

16. CONDENSER INSPECTION

Inspect the condenser fins for obstructions or foreign matter. Clean if necessary. Any obstructions to the free flow of air across the condenser will decrease that dissipation from the condenser, decrease the efficiency of the condenser and, in turn, decrease the evaporator's efficiency. The conditions result in increasing the discharge pressure and horsepower load on the engine.

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.

At extremely high temperatures overheating may be experienced if the vehicle is equipped with an insect screen and is travelling at a high speed or is towing a heavily laden trailer or caravan. First check fan belt tension and then if necessary remove insect screen.

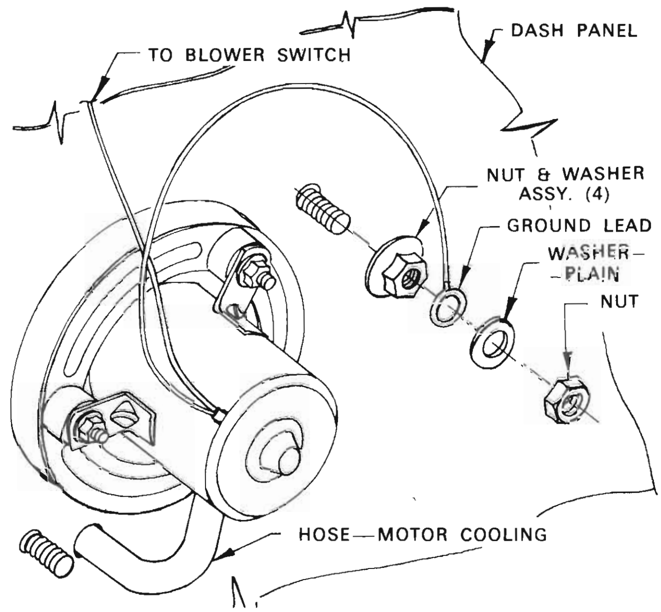


Fig. 23 – Blower motor unit

AIR CONDITIONING UNITS

> WARNING: DO NOT ATTEMPT ANY SERVICING OF THE FOLLOWING AIR CONDITIONING SYSTEM COMPONENTS UNLESS COMPLETELY QUALIFIED.

SAFETY PRECAUTIONS

The refrigerant used is colourless in both the liquid and vapour state and, as the boiling point is 21.7°F. below zero at normal atmospheric pressure, it will revert to a vapour immediately upon release, FREEZING ANYTHING IT CONTACTS. DO NOT ALLOW ANY BODY EXPOSURE TO CONTACT THE VAPOUR — PARTICULARLY THE EYES — AS PERMANENT BLINDNESS RESULTS DUE TO "FROSTBITE" — ALWAYS WEAR SAFETY GOGGLES AND GLOVES.

Also keep a bottle of STERILE mineral oil and a WEAK solution of BORIC acid handy when servicing the refrigeration components.

17. FIRST AID

To Eyes

(1) Add a few drops of mineral oil to wash out and absorb the refrigerant.

(2) Wash the eyes with the *weak boric acid* solution.

(3) Obtain a *doctor's aid* and *examination immediately,* even if relief is obtained.

> CAUTION: DO NOT heat any part of container containing refrigerant *above 125°F. Do not weld or steam clean* on or adjacent to the *refrigeration system components.*

> CAUTION: DO NOT allow the refrigerant vapours to be consumed by flame as this will convert the vapour INTO A POISONOUS GAS. DO NOT inhale the fumes from the leak detector.

> CAUTION: Do not allow the refrigerant to contact bright metal surfaces, as corrosion damage will occur.

> CAUTION: Work in a *well ventilated area* taking care to discharge any vapours into the exhausting system. Although the refrigerant vapours are *not normally* poisonous, they are heavy, thus causing the air to be displaced, which can cause suffocation.

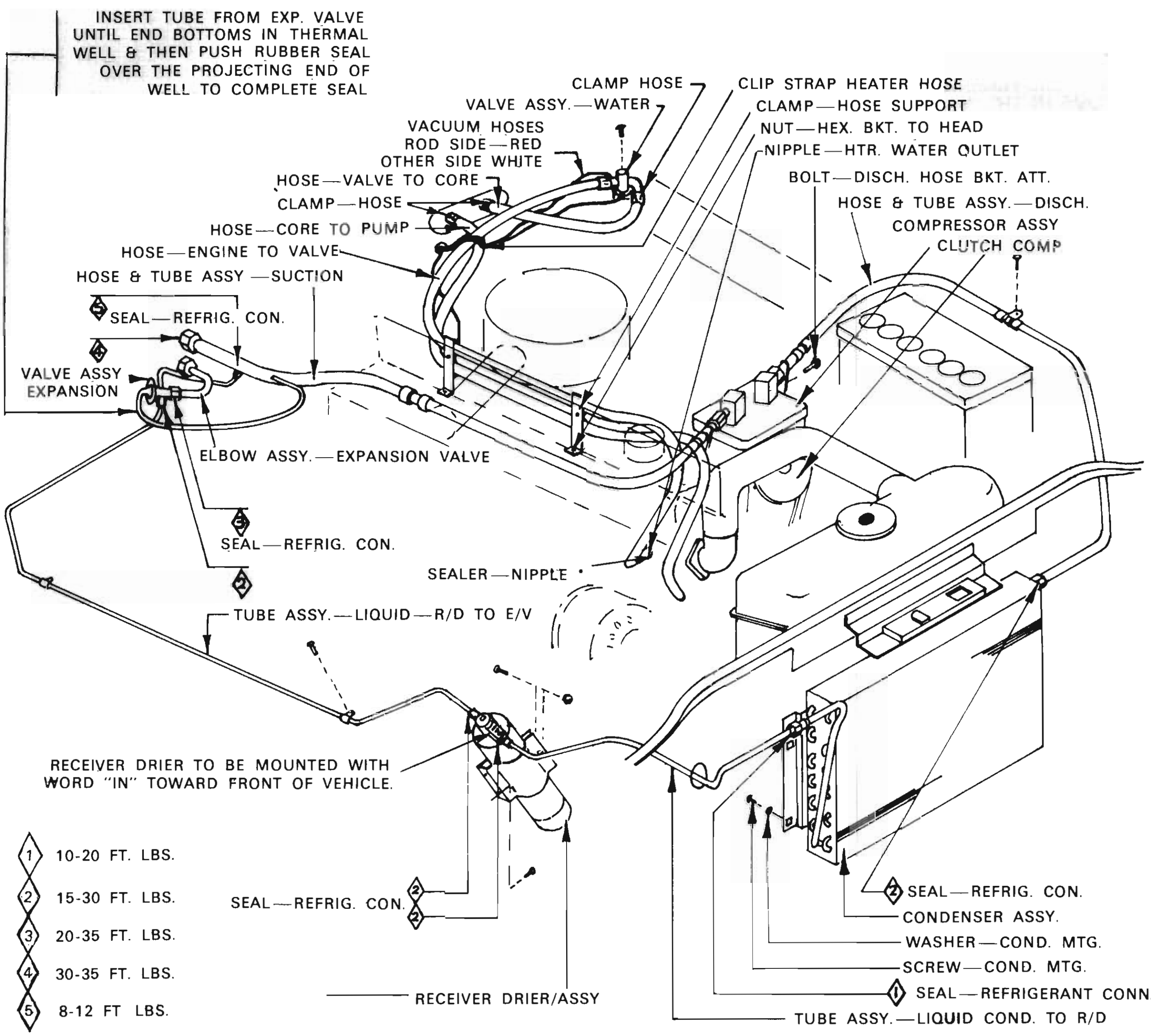


Fig. 24 – Air conditioning and heater plumbing. 6 cyl. engine

18. TEST GAUGE SET AND MANIFOLD

The gauge set manifold is an indispensable test and diagnosis instrument. The gauge set manifold has a compound suction gauge and a discharge pressure gauge. *Refer to Fig. 26.* The hoses are shown in the test illustrations for quick reference to distinguish the various adaption connections.

Evaporator Suction Gauge — at the left side of the manifold set is calibrated to register 0–30″ of vacuum and 0–250 p.s.i. This gauge is connected to the compressor inlet service port on the cylinder head. A special service port adaptor, supplied with the gauge set, provides the means of connecting the gauge set manifold hose to the service port. When the adaptor 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 right side of the manifold set — is calibrated to register 0–500 p.s.i. For all tests this gauge is connected to the discharge service port of the compressor. A service port adaptor is used to make this connection.

The needle valve (where equipped), located below the discharge pressure gauge, is used to damp out gauge needle oscillation so that accurate readings can be obtained.

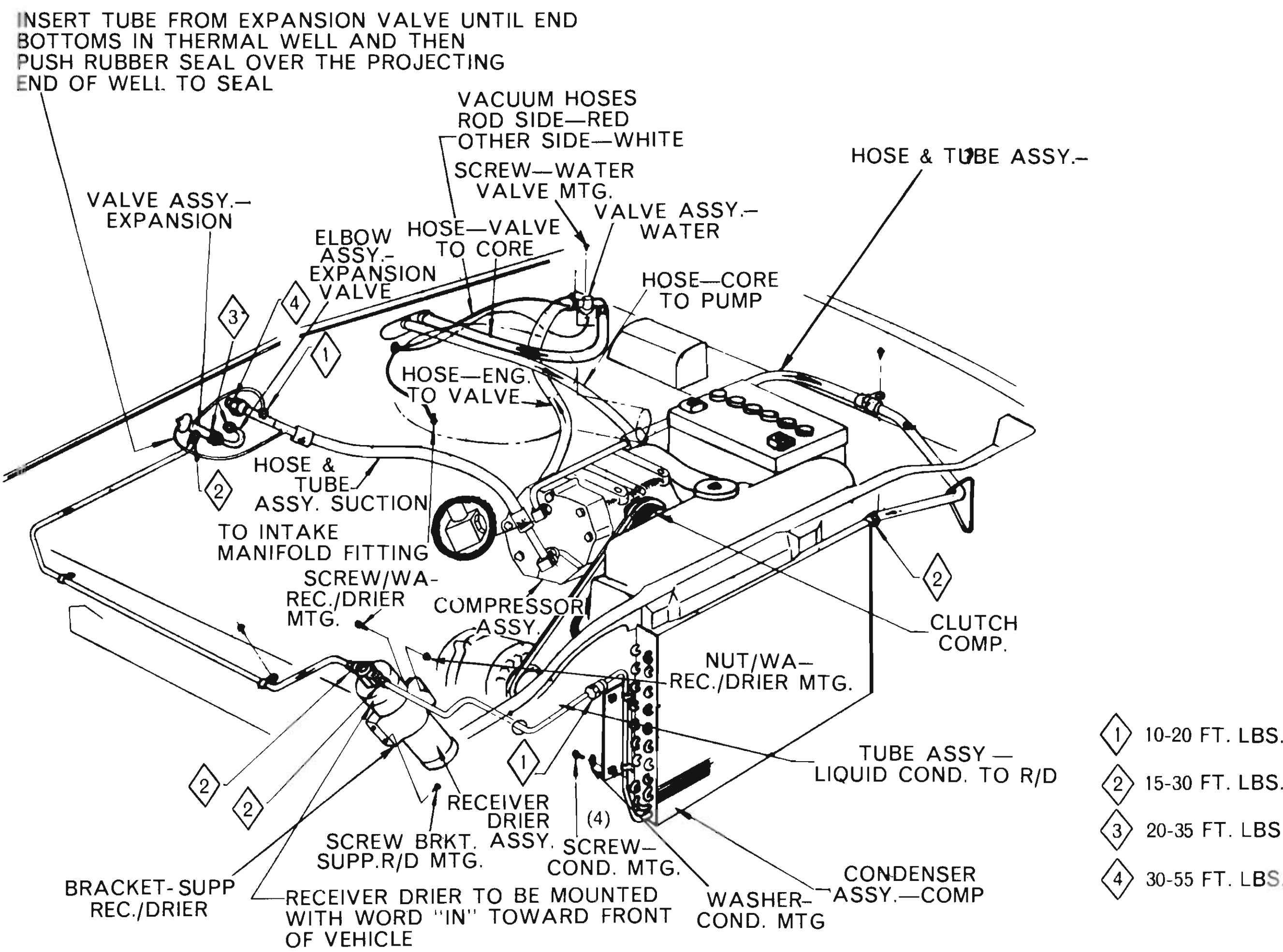


Fig. 25 – Air conditioning and heater plumbing – 8 cyl. engine

Centre 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 centre manifold outlet. The discharge gauge valve at the right is opened to provide a passage between the discharge pressure gauge and the centre 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.

> NOTE: CARE OF TEST SET
> The test set should be stored after use with the open ends plugged and gauges and tubes supended to allow them to hang straight.

19. SYSTEM PRESSURE TESTS

Test 1

Engine not running

Install the gauge set manifold. *For identification to test hose connections at service ports, see Figs. 26, 30 and 31.* After tightening service port adaptors make sure that the needle valve (where equipped) located below the discharge pressure gauge is open. Purge air from the gauge hose *(Fig. 27)* as follows:

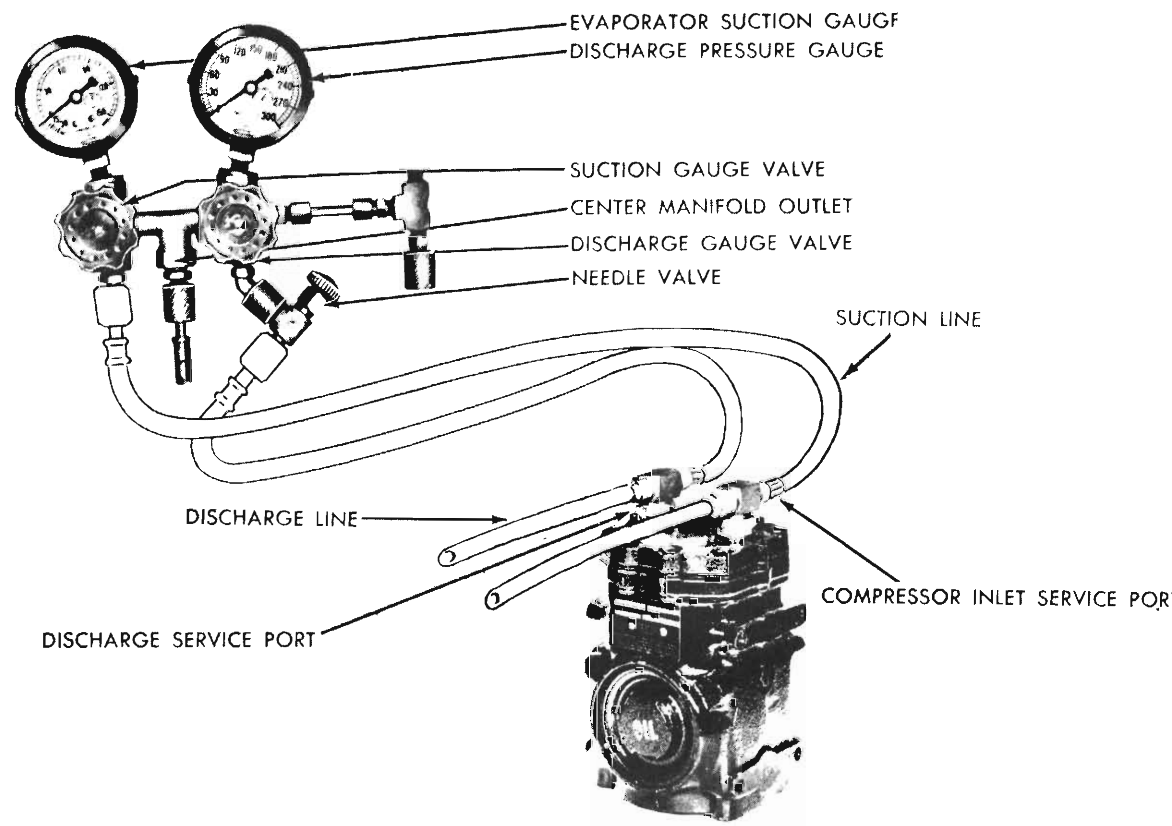


Fig. 26 – Gauge set manifold connections

(1) Open suction gauge valve momentarily, then close it.

(2) Open discharge gauge valve momentarily, then close 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 — Page 24–28.*

If no pressure is indicated on the gauge 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.

20. REFRIGERANT LEVEL

Test 2

The system must be operated at high blower speed, with vehicle doors and windows open, 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. 28)*. If the receiver-strainer-drier is reversed and the lines are connected wrongly, 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 p.s.i., 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.

If the foam shows in the sight glass when the discharge pressure is 225 to 250 p.s.i., 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 p.s.i., add refrigerant gas through the suction side of the system until foam is cleared from sight glass, then add exactly one-half ($\frac{1}{2}$) pound (8 ounces) of refrigerant.

Sweep Test Charge

The purpose of the sweep test charge is to pressurise the system so that a leak test can be made. The sweep test charge also serves the purpose of

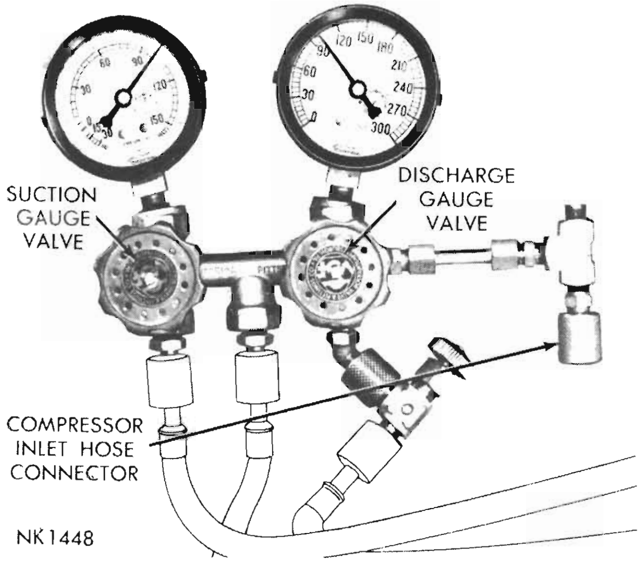


Fig. 27 – Purge gauge hoses

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 (where equipped).

(2) Attach the free end of the long hose used for discharging to the refrigerant dispensing manifold.

(3) Attach the refrigerant cylinder to the dispensing manifold. For detailed instructions for charging, see *"Charging the System", Paragraph 24.*

(4) With vehicle windows open and hood up, proceed with test as follows:

(5) Start engine and adjust r.p.m. to 1,150 (6 cylinder) or 1,100 (8 cylinder).

(6) Push in "AC" button, fan switch on high.

(7) Slowly open the left hand gauge set manifold valve to meter the refrigerant into the system. When the 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 adaptors from the compressor service ports.

21. TESTING THE SYSTEM FOR LEAKS

Test 3—(Using flame type leak detector)

The Leak Detector Torch Tool is a propane gas burning torch used to locate a leak in any part of the refrigerant system. Refrigerant gas drawn into the sampling or "snifter" tube will cause the flame to change colour 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 vapours are present.

To Test

(1) First blow the area to be tested clear of oil or accumulated deposits as even the slightest residue will contain sufficient refrigerant to cause a false detection reaction.

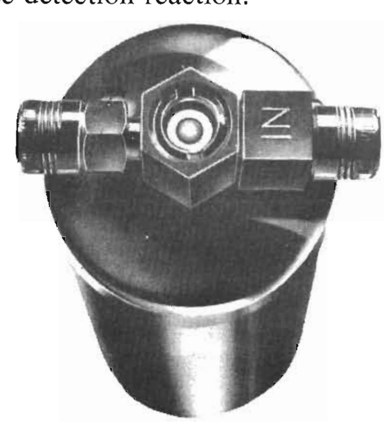


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Fig. 28 – Receiver drier

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

(2) Check that all joints and plugs are correctly tightened and cleaned.

(3) 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.

(4) 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 colour change.

(5) Watch for a change in the colour of the flame. Small leaks will produce a green colour and large leaks a bright blue colour. If leaks are observed at tube fittings, tighten the connection, using the proper flare wrenches and retest.

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. Remedy leaks before continuing further.

> NOTE: Minute reaction is normal at the compressor seal.

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, "Refrigerant Partial Recharge"*. 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.

22. REPLACING THE RECEIVER-DRIER-STRAINER (WHEN NECESSARY)

The system must be discharged and swept with a test charge before replacing the receiver-drier-strainer.

To remove the receiver-drier, simply unscrew it at the fittings. When installing a new receiver-drier, use new 'O' rings (lubricated with refrigerant oil). Tighten the new unit to 40 lbs-ft. DO NOT over-tighten as this might damage the 'O' rings.

> 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.

23. EVACUATING THE SYSTEM

Whenever the system has been opened to atmosphere, it is absolutely essential that the system be 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 centre connection to vacuum pump as shown in *Fig. 29.*

(2) Open both gauge set manifold valves, and the needle valve (where equipped).

(3) Start the vacuum pump and operate until the evaporator suction gauge registers at least 26″

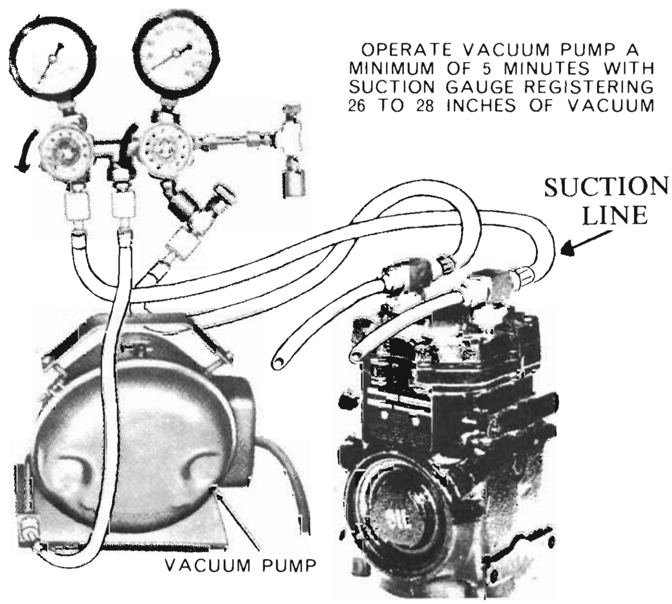


Fig. 29 – Evacuating the system

of vacuum. If system is tight and pump in good condition vacuum will go as low as 28″.

(4) Allow vacuum pump to operate with the suction gauge registering 26″ to 28″ of vacuum for a minimum of 5 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″ of vacuum indicates a leak in the refrigeration system or a defective vacuum pump. Locate and correct the trouble before recharging the system.

24. REFRIGERANT PARTIAL RECHARGE

Test 4

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.

25. PARTIAL CHARGING OF SYSTEM

Install and connect gauge set manifold valves *(Fig. 30).*

(1) Close both of the gauge set manifold valves. Open the gauge set manifold needle valve (where equipped).

(2) Connect the suction gauge test hose to the compressor inlet service port. Connect the discharge gauge test hose to the discharge service port of compressor.

(3) Connect one end of long test hose to centre 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) Connect a cylinder of Refrigerant 12 to the opened manifold valve. (Be sure gasket is in place and in good condition.) Tighten refrigerant connection and manifold locking nut to ensure a good seal. Do not over-tighten.

(6) Turn manifold valve (above the refrigerant cylinder).

(7) Place the refrigerant cylinder on an accurate scale so that the amount of refrigerant added can be weighed. Open the refrigerant manifold valve, and charge only *gas* into the system.

(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 condensing 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 connections 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 engine hood up, operate engine at 1,150 r.p.m. for 6 cylinder models, or 1,100 r.p.m. 8 cylinder models.

(12) Push in "A/C" button, fan switch on high.

(13) If necessary, block the condenser to maintain a discharge pressure of 225 to 250 p.s.i. The system must 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 p.s.i.

NOTE: Keep refrigerant container upright.

b. Add refrigerant gas until there is no foam visible at the sight glass. As soon as all foam clears, note the weight registered on the refrigerant scale.

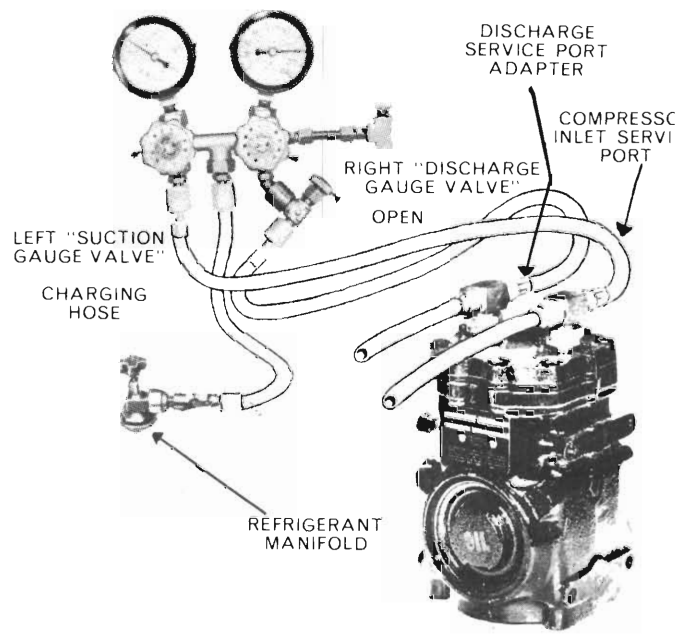


Fig. 30 – Adding partial refrigerant charge

c. Watch the refrigerant weighing scale and *add exactly ½ lb. (8 ounces) 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 taken so that exactly ½ lb. (8 ounces) of refrigerant is added after foam clears in the sight glass.

d. Close dispensing manifold valve. Remove test hoses and adaptors from the service ports of compressor, and install protective caps at service ports.

26. PERFORMANCE TEST

Test 5

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 under-stand 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 through 4, outlined previously, should be made before the *"Performance Test"*. Install gauge set as shown in *Fig. 27*. Air temperature must be 75°F. dry bulb minimum for this test.

Start the engine, open the windows, temperature control lever must be in the "cooler" position, push in "A/C" button and move fan switch to high. Open grille outlets.

Adjust engine r.p.m. to 1,150 r.p.m. (6 cylinder models) or 1,100 r.p.m. (8 cylinder models).

Arrange gauge set manifold hoses and tachometer leads to allow hood to be lowered, then close hood.

Place psychrometer at cowl inlet opening. Distilled water should be used with this meter to prevent drying out and hardening the wet sock.

Place thermometer fully into right outlet grille opening. The left outlet should be fully extended and directed towards rear of vehicle. Operate the air conditioning system until a stabilised condition on the gauge and thermometers has been established. One of the most important steps in making the overall performance test is that the engine must be operated at the r.p.m. as indicated above for approximately five minutes to allow all the under hood components of the system to reach their operating temperature.

Partially close the needle valve (where equipped) located below the discharge pressure gauge, to minimise 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 p.s.i. *The 190 to 210 lb. 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.

Observe and record both the "Inlet dry bulb temperature" and the "Inlet wet bulb temperature" as registered on the psychrometer — *refer Page 32*.

Observe and record "discharge air temperature" registered by thermometer at left hand grille outlet.

From the "Performance Temperature Chart" 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.

If discharge air temperature at the outlet grilles is above the maximum allowable on Performance Chart, then perform the expansion valve test until proper performance is obtained.

27. EXPANSION VALVE TEST
Test 6

Test must be made at room ambient temperature of 75°F, under engine hood temperature 86°F minimum.

After performing TESTS 1 through 5, conduct the Expansion Valve Test as follows:—

(a) Close the windows and operate the engine at the R.P.M. shown below. Set air conditioning controls for "Max. A/C", high blower and temperature control lever to Maximum Cool.

Set R.P.M.'s at:—

800 for 8 cylinder engines.

900 for 6 cylinder engines.

(b) Operate the system for a few minutes to obtain partial stabilization (to load the evaporator). The pressure at the discharge service port should read between 140 and 210 p.s.i. before starting the test (expansion valve thermobulb in well).

(c) Remove the expansion valve thermobulb from the suction line *(Fig. 31)* and immerse bulb 5 inches in a container of 32°F ice water *(Fig. 32)*.

PERFORMANCE CHART

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	40	41	42	43	44	45	46	47	48	49	50	50	51	51	52	52	53	53	54	54	55	56	57	58	59	60	61	62	64	66	68	69	70	71	72	73

INLET AIR DRY BULB TEMPERATURE MUST BE BETWEEN 75° AND 100°F NK1341A

ıe evaporator suction pressure should read 21 25 p.s.i. Any expansion valve which does not oduce this reading is defective and should be placed — *Refer Para. 29.*

(d) Then, hold the expansion valve thermobulb your hand for several minutes until the suction essure stabilizes. The evaporator suction pressure ould read a minimum of 35 p.s.i. Any expansion lve which does not produce this reading is defec-'e and should be replaced — *refer Para. 29.*

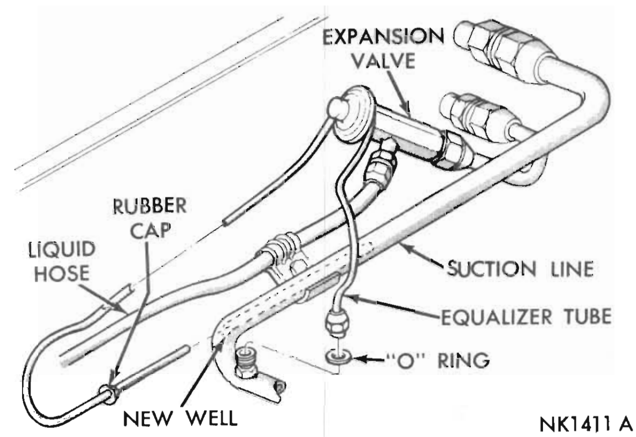


Fig. 31 – Expansion valve details

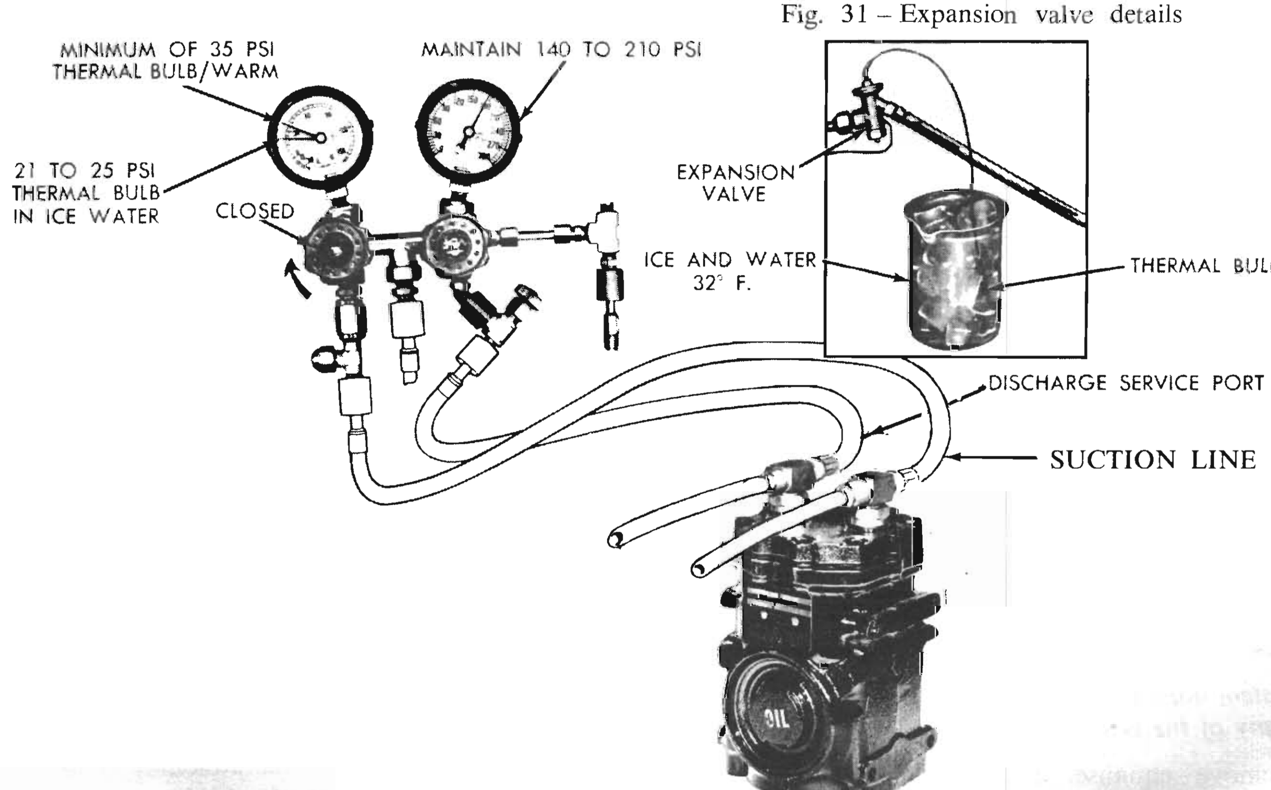


Fig. 32 – Expansion valve test

If the expansion valve passes Tests A through D. 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.

28. DISCHARGING 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 centre connection of the gauge set manifold. Lead the other end of the hose into an exhaust ventilation system outlet or to the outside of the building.

(2) Open the gauge set manifold needle valve (where equipped) and close both of the gauge set manifold gauge valves.

(3) With the vehicle windows open and hood up, operate the engine at 1,150 R.P.M. (6 cylinder models) or 1,100 R.P.M. (8 cylinder models).

(4) Push in "A/C" button, fan switch on high.

(5) Allow the system to operate at full capacity for at least 15 minutes at the R.P.M. shown in the 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 vapour 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 vapour trapped at the suction side of the system.

29. EXPANSION VALVE

To Remove

The system must be completely discharged before opening any of the refrigerant lines.

(1) Remove equaliser tube from evaporator suction line fitting *(Fig. 31).*

(2) Disconnect expansion valve from elbow assembly and liquid line. Use two wrenches to loosen each of these connections.

(3) Carefully pull out capillary sensing tube from well located in suction line. Remove rubber seal from capillary sensing tube. Inspect inlet screen.

To Install

(1) With new 'O' rings and clean refrigerant oil on all fittings, install the expansion valve to the liquid line and elbow assembly using two wrenches to prevent rotation and twisting of the lines.

(2) Connect equaliser tube to the fitting on the evaporator suction line.

(3) With a rubber seal on the capillary sensing tube, carefully install the tube in the well located in the suction line as far as it will go (approximately five inches in depth).

(4) After expansion valve is installed, it must be completely tested. Then the system must be tested for leaks and recharged *(refer Paragraphs 19 to 27, Tests 1 to 6, Pages 24 – 26 to 24 – 31.*

30. EVAPORATOR ASSEMBLY

The evaporator assembly includes the evaporator core, the evaporator housing with the evaporator inlet and defroster doors. To remove the evaporator assembly it is necessary to remove the heater assembly first. *The system must be completely discharged by a refrigerant specialist before opening any of the refrigerant lines.*

To Remove

(1) Disconnect elbow assembly and suction lines from evaporator. Use two wrenches to loosen each of these connections. Cap all the refrigerant openings to prevent entrance of dirt and moisture.

(2) Disconnect blower motor wires and air tube and remove the blower motor from housing.

(3) Disconnect actuator hose.

(4) Remove mounting stud nuts and remove evaporator assembly as a unit *(Fig. 33).*

(5) Remove evaporator temperature control switch, and carefully withdraw the capillary sensing tube *(Fig. 35).* Remove the weather seal around the air outlet opening, and remove the attaching cover screws and cover. Remove the attaching stud nuts and remove adaptor from case *(Fig. 34).*

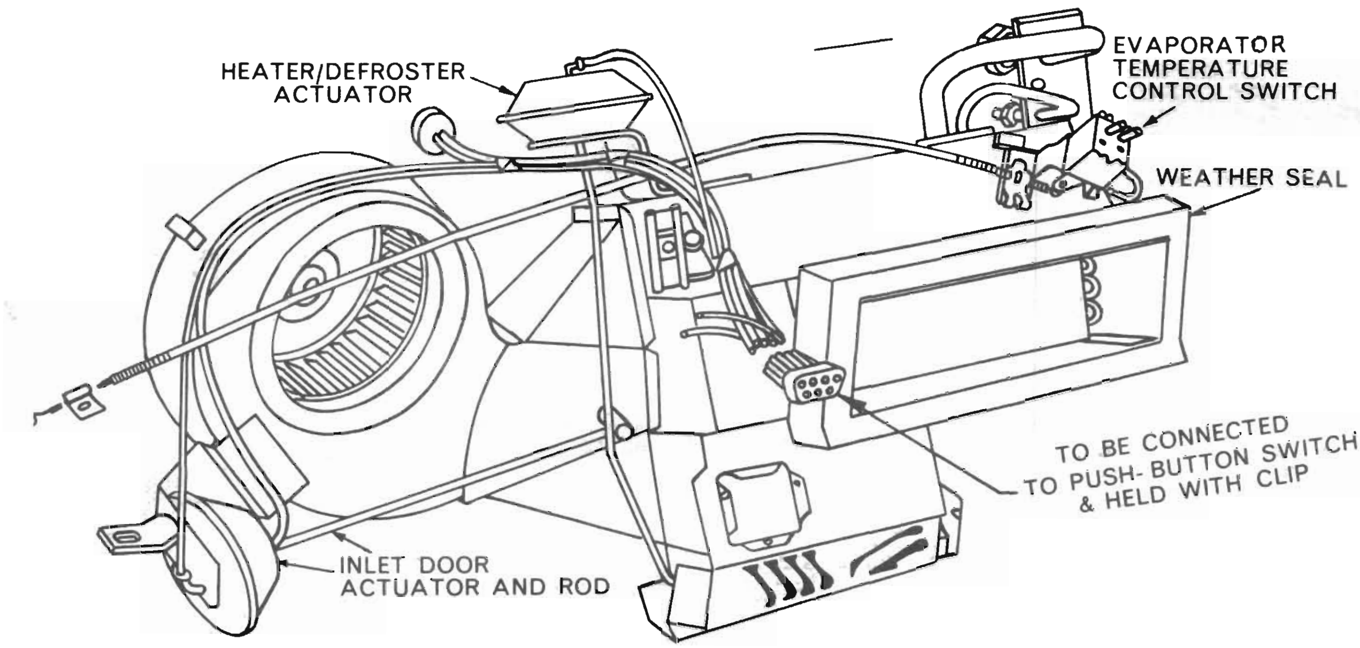


Fig. 33 – Evaporator assembly (heater unit removed)

(6) Disconnect the condensate drain tube.

To Install

(1) Position evaporator in the case and secure with attaching stud nuts.

(2) Place a small bead of sealer on case flange, install case cover and secure the attaching screws. Remove any excess sealer.

(3) Carefully install capillary sensing tube through the case into the evaporator to the full depth *(Fig. 35).* Position evaporator temperature control switch and secure with attaching screws *(Fig. 33).*

(4) Install and cement the weather seal around air outlet opening.

(5) Position evaporator assembly on the dash panel and install the stud nuts that attach the assembly to dash panel and install the drain tube.

(6) Install blower motor wires and air tube and vacuum line.

(7) Use new 'O' rings with clean refrigerant oil on all connections, install the inlet elbow assembly and suction line. Use two wrenches to prevent rotation and twisting of the lines.

(8) Install actuator hoses (hose with red strip to rod side).

(9) Install heater as described in "Heater Core", *Para. 13.*

(10) After the evaporator (and heater) assemblies are 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, (as described in *Page 24 – 26, Tests 1 to 6).* It is recommended that the operation of all controls be tested and an overall performance test be made after the repair or replacement of the evaporator assembly.

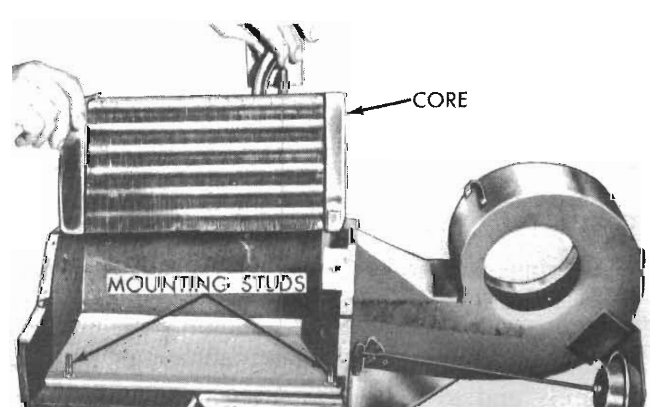


Fig. 34 – Removing evaporator core (typical view)

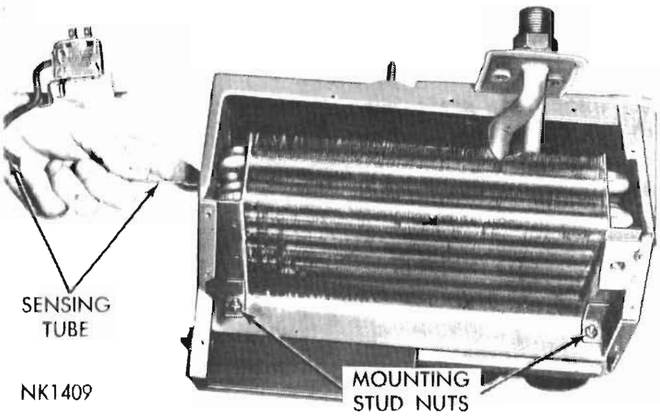


Fig. 35 – Installing capillary sensing tube (typical view)

31. TUBES AND FITTINGS

> NOTE: The following precautions must be observed. The system must be completely discharged before opening any fitting or connection in the refrigerant 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.

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. Use a suitable tube bending tool 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. 37)*. The use of proper wrenches when making connections is very important.

Improper wrenches or improper use of wrenches can damage the fittings. Always use two wrenches when loosening or tightening tube fittings to prevent distorting of lines and components.

The internal parts of the refrigeration system will remain in a state of chemical stability as long as pure moisture free Refrigerant 12 and refrigeration 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.

> NOTE: Do not use corks or cotton waste as these could cause blockage or malfunction in the system.

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

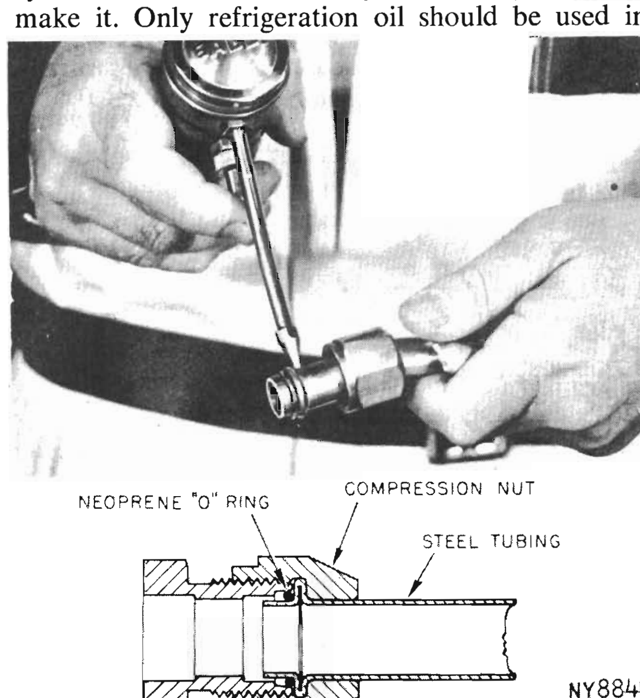


Fig. 36 – Lubricate with refrigerant oil (typical view)

the system or on the fittings and lines. The oil container should be kept tightly capped until it is ready for use, and then tighten cap again after use to prevent entrance of dirt and moisture. Refrigerant oil will quickly absorb any moisture with which it comes in contact.

32. COMPRESSOR SERVICING PRECAUTIONS

The compressor is a two cylinder reciprocating type designed specifically for the Chrysler air conditioning system.

> 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 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 replacement compressor is installed on the vehicle.

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. 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 repair* service to the compressor. Before bleeding system down, cover clutch with a cloth to prevent contamination of clutch pole faces. Cleanliness is extremely important. The work area must be clean and free of airborne dust and dirt. All parts must be thoroughly cleaned and blown dry before reassembly, 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.

33. OIL LEVEL

When a new or replacement compressor is installed 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.

To Check

(1) Install a suction gauge and while the engine is running at idle speed, close the suction valve.

(2) When "suction" pressure of approx. 2" hg. is reached, stop engine and immediately close the discharge service valve.

(3) The oil plug can now be removed with a minimum of refrigerant loss and least introduction of air and moisture into the refrigerant system.

(4) Adjust oil level as required by removing or adding fresh oil, then recharge the system as described in paras. 23 to 27 inclusive.

"TECUMSEH" DIPSTICK READING TABLE

Compressor	Oil height recommended	
Position	Minimum	Maximum
Vertical	7/8"	1-3/8"
Horizontal	7/8"	1-5/8"

(After connection to system and operated for 2 minutes).

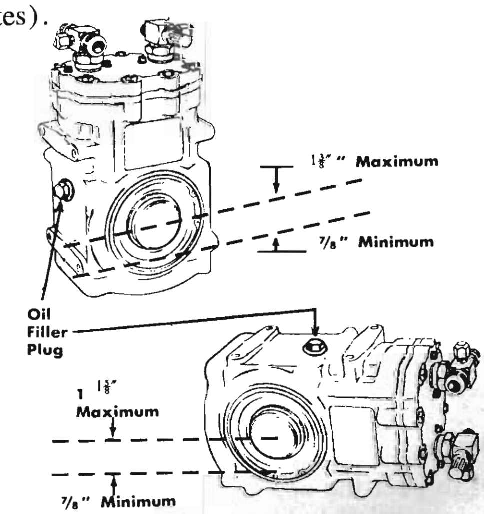


Fig. 37 – Compressor oil level diagram (Tecumseh Compressor)

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 energised to avoid damaging the compressor reed valves.

34. "TECUMSEH" COMPRESSOR REPLACEMENT

To Remove

(1) Clean off the union connections and connect a pressure gauge to the suction gauge port and test the pressure. If gauge indicates any pressure the compressor is safe to operate.

(2) Close the suction service valve and operate compressor until suction pressure is reduced to approximately 2″ hg.

(3) Stop engine and close the compressor discharge service valve, then discharge system as described in para. 28.

(4) Remove suction and discharge service valves from compressor head and loosen the drive belt tension.

(5) Disconnect the clutch control wire.

(6) Remove the 7 compressor mounting bolts retaining the compressor to brackets and carefully dismount the assembly. Cover the valve openings to prevent the entry of dirt or contaminants, immediately they are disconnected.

(7) Remove the special locking bolt and washer which retains the clutch pulley assembly to the compressor crankshaft.

(8) Insert a ⅝″—11 TPI x 2½″ cap screw into the threaded portion of the hub assembly, and screw the bolt in, to draw the hub off.

CAUTION: Do not hammer the shaft or pulley to assist removal.

(9) Remove the clutch coil support from the compressor.

To Install

(1) Inspect the approved replacement compressor refrigerant oil level with a suitable dipstick *(see Fig. 37).*

(2) Install the magnetic clutch coil support onto the compressor—Tighten screws to 85-120 lbs. in.

(3) Carefully position the "non-rok" drive key into crankshaft keyway.

(4) Install the pulley assembly *carefully* to the crankshaft and secure with a new retaining bolt and special washer. Tighten screw to 15-20 lbs. ft.

(5) Position the compressor on the engine brackets and install the 7 mounting screws. Tighten screws evenly to 14-17 lbs. ft.

(6) Readjust the drive belt tension and reconnect the clutch control wire.

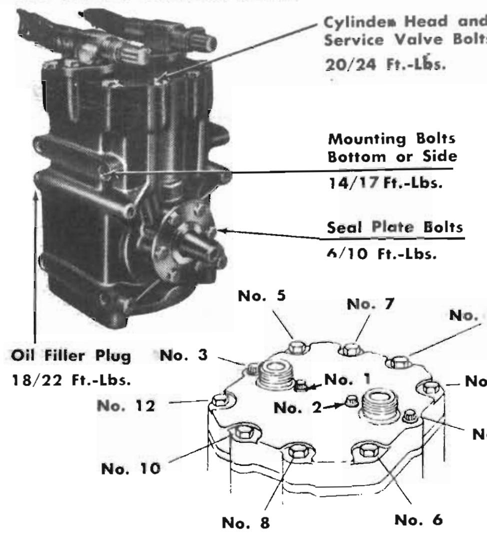


Fig. 38 – Compressor assembly torques and head tightening sequence

(7) Reconnect the service valves to the compressor head as quickly as possible to minimise moisture and air contamination of the exposed refrigerant system. Also ensure that the utmost care and cleanliness is attained when making all connections.

(8) Recharge and check the refrigerant system as described in paras. 20 and 33.

(9) Again re-tighten the cylinder head, valve plate and service valve retaining bolts after two hours of assembly.

35. CONDENSER REPLACEMENT

Where the condenser is required to be removed for any reason, the air conditioning refrigerant must be first discharged as detailed in *Paragraph 28, Page 24–32.*

The condenser is mounted forward of the radiator core and secured by four screws to the radiator support.

To Remove

(1) Loosen and release the connection tube union nuts from the condenser and cap all openings with plastic caps (do not use cloth, etc.).

(2) Drain the cooling system and remove the radiator (and shroud where fitted).

(3) Remove the 4 nuts retaining the condenser and remove the condenser.

Installation is a reversal of the above procedures, making sure to use demineralized or soft water with Chrysler Parts Corrosion Inhibitor in the coolant.

36. AIR CONDITIONING UNIT ASSEMBLY REPLACEMENT

Removal of the air conditioning and heating assembly is only possible after the removal of the windshield glass and the instrument panel assembly to provide sufficient clearance to remove the whole assembly. Alternatively, the heating and evaporator assemblies may be removed separately after the blower motor has been removed. *These service procedures are detailed in Paragraphs 13, 15 and 30.*

37. "TECUMSEH" COMPRESSOR SERVICING

(a) Valve Plate Replacement

This operation should be undertaken with the compressor discharged and removed.

To Remove and Disassemble

(1) Remove the compressor assembly as described in Compressor Replacement, *para. 34,* then *refer to Fig. 42.*

(2) Remove the cylinder head bolts.

(3) Remove valve plate and cylinder head assembly by lightly tapping with a hide hammer to separate each.

(4) Clean all gasket residue and foreign material from the cylinder head and cylinder block surfaces, taking care not to scratch or nick the machined surfaces.

To Install

(1) Position the new (dry) valve plate gasket correctly on the cylinder block.

(2) Place the new valve plate assembly on the gasket with the letter 'S' (stamped on plate) visible and located to the suction side.

(3) Install the new (dry) cylinder head gasket onto the plate, with the large hole over the top suction port and all other holes aligned.

(4) Position the cylinder head "suction" side to cylinder block "suction" side and carefully align all bolt holes.

(5) Install the (12) head bolts, tightening finger tight then tighten evenly diagonally opposite bolts in alternate rotation, until torqued to 20-24 lbs. ft.

(6) Inspect the "Rotolock" service valve joint surfaces and the valve surfaces for imperfections.

> NOTE: The cylinder head bolts should be retorqued, after 2 hours, to specified torque.

(7) Reinstall the compressor (where removed) and recharge the system, *refer para. 20.*

(b) Seal Assembly Replacement

(1) Remove the compressor assembly, as described in Compressor Replacement, *para. 34,* and clean thoroughly.

(2) Place compressor on bench, clutch side up.

(3) Remove the clutch pulley assembly using a $\frac{5}{8}''$ x 11 puller thread—*Do not hammer* any parts, *refer to para. 14, Magnetic Clutch Removal.*

(4) Carefully clean off the seal plate area to ensure absolute freedom from contamination.

(5) Remove the drive key and dust shield (where equipped), to prevent damage to sealing face of shaft.

(6) Remove the seal plate retaining screws then remove plate by carefully prying with a lever being careful to prevent damage to all components surfaces.

(7) Remove the carbon seal and spring assembly from shaft by prying BEHIND the drive ring (outer portion of seal spring assembly). Remove rubber seal using long nose pliers (where seal rubber remained on shaft).

(8) Carefully clean off all gasket material residue and foreign matter from the seal surfaces and joint surfaces.

To Install

(1) Immerse the new seal assembly and washer in clean refrigerant oil.

(2) Place the bellows seal assembly over the lubricated shaft with the shaft seal washer end (drive ring) outward.

(3) Carefully position the bellows seal on shaft clear of the taper.

DO NOT push into seal cavity.

(4) Position the shaft seal washer in bellows seal assembly, ensuring that the sealing surfaces are clean.

(5) Assemble seal washer with raised rim outward and the notches in washer aligning with "knobs" in the bellows seal assembly.

(6) Coat the exposed shaft seal washer surface with clean refrigerant oil.

(7) Insert a new "O" ring into the joint face seal groove.

(8) Place the new seal plate on the shaft carefully aligning the screw holes, push the plate and seal assembly against the casing.

(9) Install the retaining screws, tightening evenly to 6 lbs. ft. in sequence.

(10) Rotate shaft by hand 15-20 revolutions to seat the seal.

(11) Install the drive key and reinstall the clutch assembly. Tightening retaining bolt to 15-20 lbs. ft. torque.

(c) Rear Bearing Replacement

To Remove

(1) Remove the compressor assembly as described in *paragraph 34* "Compressor Replacement".

(2) Place the cleaned compressor assembly upright on the bench.

(3) Remove one oil filler hole plug and drain the oil (after first checking the oil level).

(4). Using special snap ring pliers, remove the snap ring which secures rear bearings housing in position.

(5) Remove bearing housing, using a suitable end plate puller or slide hammer attachment.

(6) Remove the rectangular sectioned "O" ring seal.

(7) Remove the rear bearing from shaft, using two suitable levers diametrically apart, under inner edge of outer race, prying evenly.

(8) Remove base plate by inverting the compressor and removing the snap ring, using circlip pliers.

(9) Carefully remove the base plate (using puller or magnet).

(10) Thoroughly flush out the interior parts with a suitable solvent, and blow clean.

To Install

(1) Install new rear bearing with the compressor supported on the drive end of shaft.

(2) Position the new bearing on shaft and press on the inner race of bearing, until bearing is abutting the shaft shoulder.

(3) Position the new rectangular sectioned "O" ring into seal recess in the bearing housing, ensuring that it is properly seated.

(4) With the compressor supported on the seal plate retaining screws, carefully install the housing (properly aligned with the casing) over the bearing and press the bearing housing into the casing bore to full depth.

(5) Install the snap ring to secure the bearing housing in the casing.

(6) With the compressor inverted, insert the rectangular sectioned "O" ring into base seal recess.

(7) Place the base plate ("domed" side out) into the base counter-bore.

(8) Install the base plate retaining snap ring securely after pushing the base firmly inward to expose the groove.

(9) Recharge the compressor with the correct amount of refrigerant oil, *refer to Fig. 38 diagram* and install filler hole plug.

(d) Front Bearing Replacement

To Remove

(1) Remove the front seal assembly as described in *paragraph 37B* "Seal Assembly Replacement".

(2) Remove the rear bearing housing as described in *paragraph 37C* "Rear Bearing Replacement".

(3) Remove the base plate as described in *paragraph 37C* "Rear Bearing Replacement".

(4) Remove the cylinder head and valve plate assembly as described in *paragraph 37A* "Valve Plate Replacement".

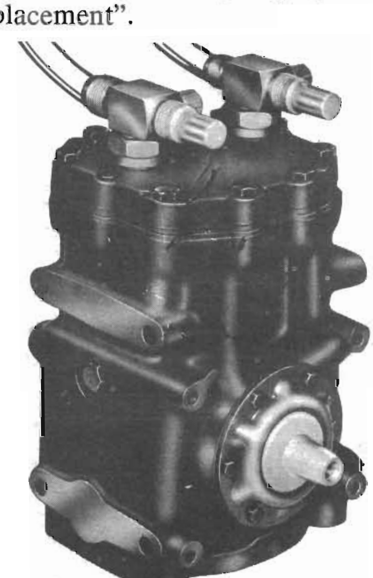


Fig. 39 – Tecumseh Compressor Assembly

(5) Remove the cap from each connecting rod assembly by removing the retaining screws.

NOTE: Identify each cap location to provide for correct re-assembly.

(6) Push the connecting rod assembly from the compressor.

(7) With the crankcase supported on rear bearing end, press front bearing end of crankshaft toward compressor until crankshaft has moved out of front bearing.

NOTE: Some model compressor front bearings are retained by two bolts.

(8) Remove the crankshaft and rear bearing assembly from compressor.

(9) Insert a socket extension through rear bearing housing opening and remove two bearing retaining bolts.

(10) Carefully press out the front bearing from case.

(11) Thoroughly clean all parts, blow dry and inspect.

To Install

(1) Carefully install the front bearing into the bearing bore by pressing evenly on the outer bearing race until bottomed.

(2) Where required, install the two bearing retaining bolts to secure bearing, tighten bolts to 6 lbs. ft. torque.

(3) With the front bearing inner race supported, install the crankshaft into the front bearing squarely and, carefully pressing on the rear of crankshaft, bottom the bearing against the crankshaft shoulder.

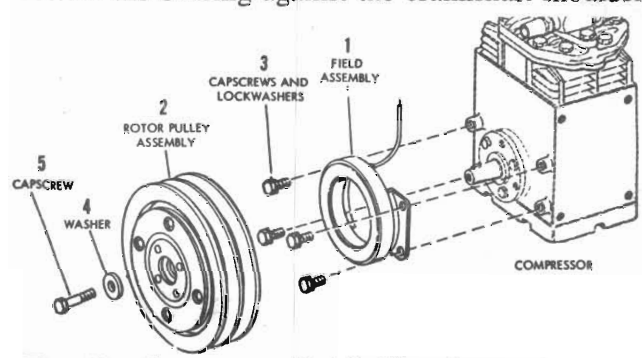


Fig. 40 – Compressor Clutch Mounting arrangement

(4) Re-install the connecting rod assembly by removing the bearing cup (noting the marked related position).

(5) Lubricate the piston, ring assembly and piston pin surfaces with clean refrigerant oil.

(6) Correctly install the connecting rod assembly into its respective bore, being careful to protect the crankshaft from damage.

(7) Using a suitable piston ring compressor, compress the piston rings and push the piston assembly into bore while guiding the connecting rod onto the crankshaft journal.

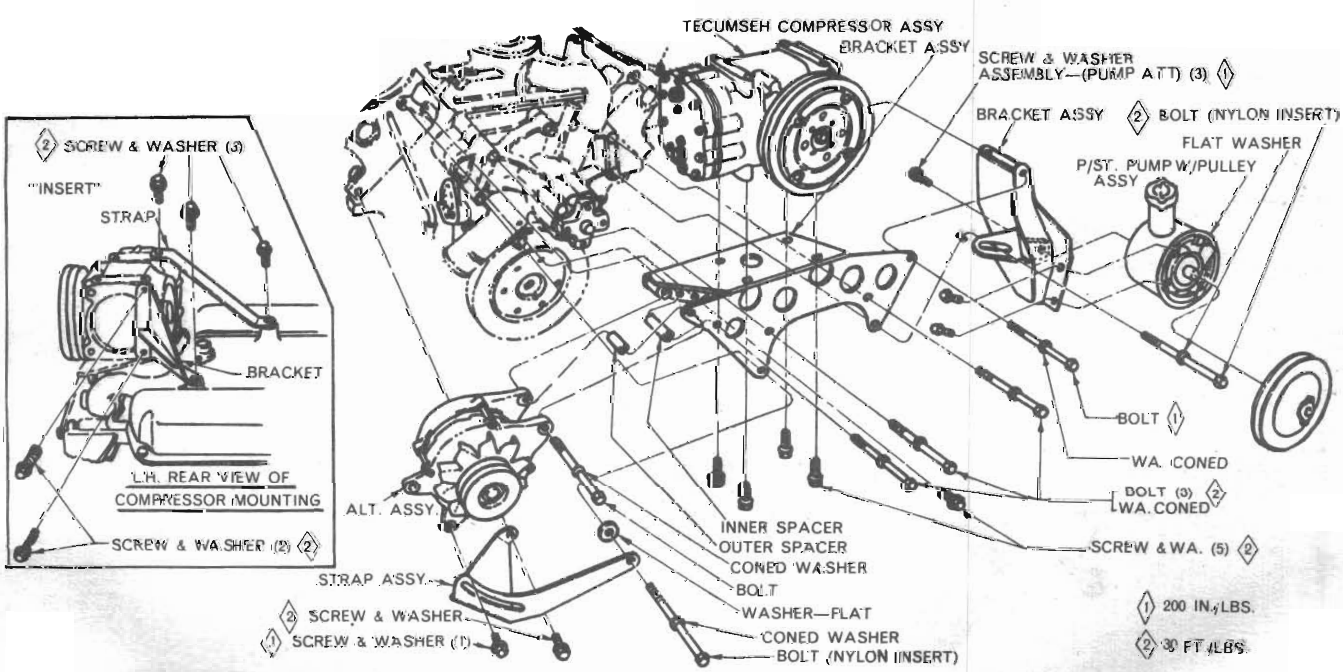


Fig. 41 – Accessory Drive Component mounting arrangement showing Compressor positioning

(8) Lubricate the connecting rod journal and bearing, then correctly install the con rod bearing cap and screws.

(9) Tighten bearing cap screws carefully to 7 lbs. ft. torque.

(10) Re-install the second piston assembly in similar manner.

NOTE: Over-size pistons are stamped number "2" on piston crown.

(11) Rotate the crankshaft to inspect for any indications of malalignment or binding.

(12) Re-install the rear bearing and bearing housing as described in "Rear Bearing Replacement" *paragraph 37C.*

(13) Re-install the seal assembly as described in "Seal Assembly Replacement" *paragraph 37B.*

(14) Ensure that the crankcase interior is clean, then install the base plate as described in "Rear Bearing Replacement" *paragraph 37C.*

(15) Refill the compressor crankcase with fresh clean refrigerant oil as specified in *paragraph 33* and *paragraph 34.*

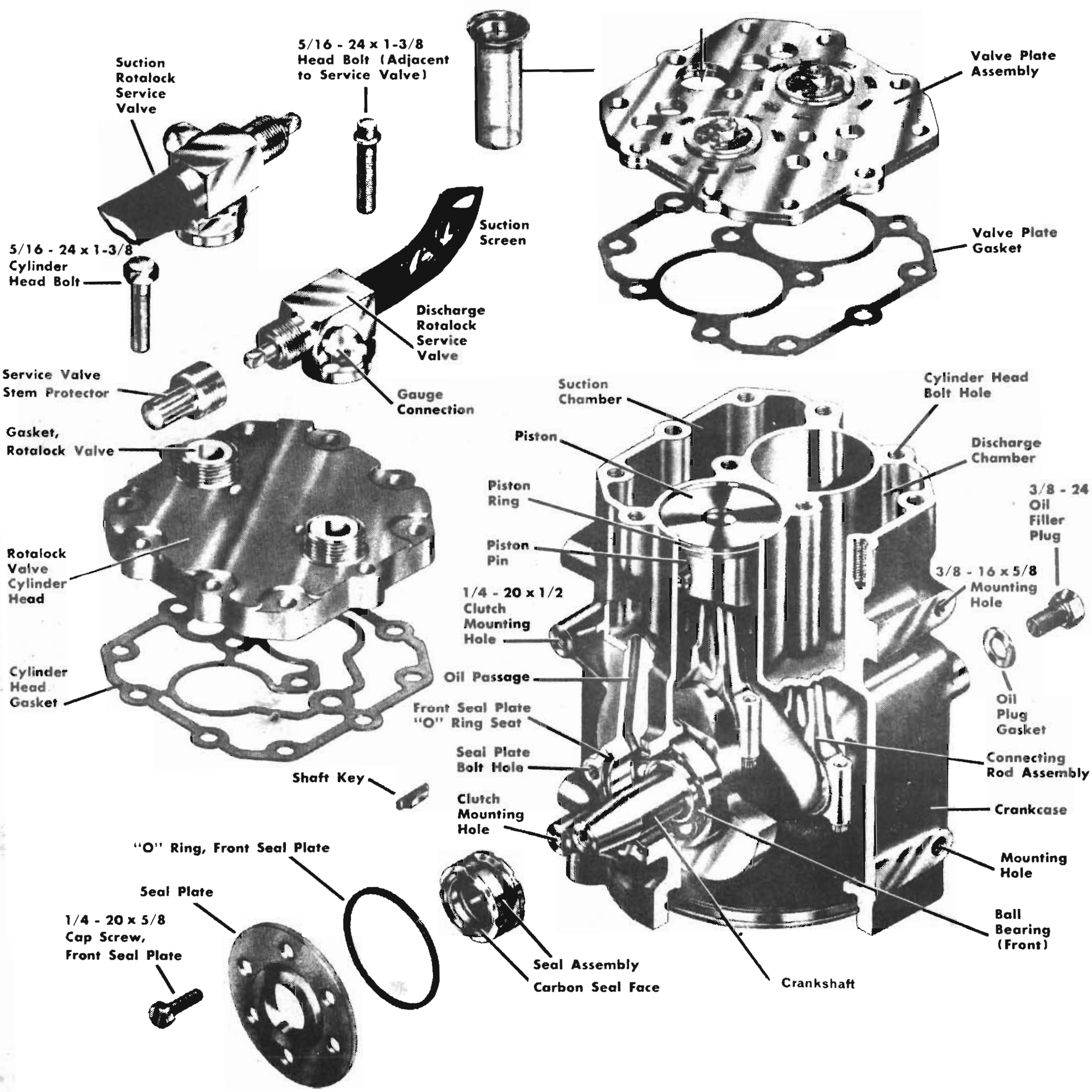


Fig. 42 – Tecumseh A.C. Compressor Components (disassembled view)

VENTILATION & HEATING

(NON AIR-CONDITIONED VEHICLES)

A fresh-air heater *(Fig. 1)* is fitted to all models, its features include demister and/or heating by ram effect, supplemented by a two-speed fan boost. The unit is adjusted on assembly and normally requires no attention. However, if adjustment is found to be necessary, the following procedure should be adopted:

1. AIR DISTRIBUTION CONTROL CABLE

To Adjust:

(1) Release the cable retaining clip on the air distribution control assembly and set control lever to "Off" *(Fig. 2)*.

(2) Set the air distribution lever on the heater to the fully closed position (fully left).

(3) Reclip the cable to the control assembly, leaving a slight amount of tension on the cable. (This ensures that the door in the heater unit is fully closed.)

(4) Check the system for free operation and full lever movement.

2. TEMPERATURE CONTROL CABLE

To Adjust:

(1) Release the cable retaining clip on the control assembly *(Fig. 2)*.

(2) Set the temperature control to the coolest position (fully left).

(3) Move the temperature control lever on the heater unit to the full heat position (fully left).

(4) Reclip the cable to the control assembly.

(5) Check the system for free operation and full lever movement.

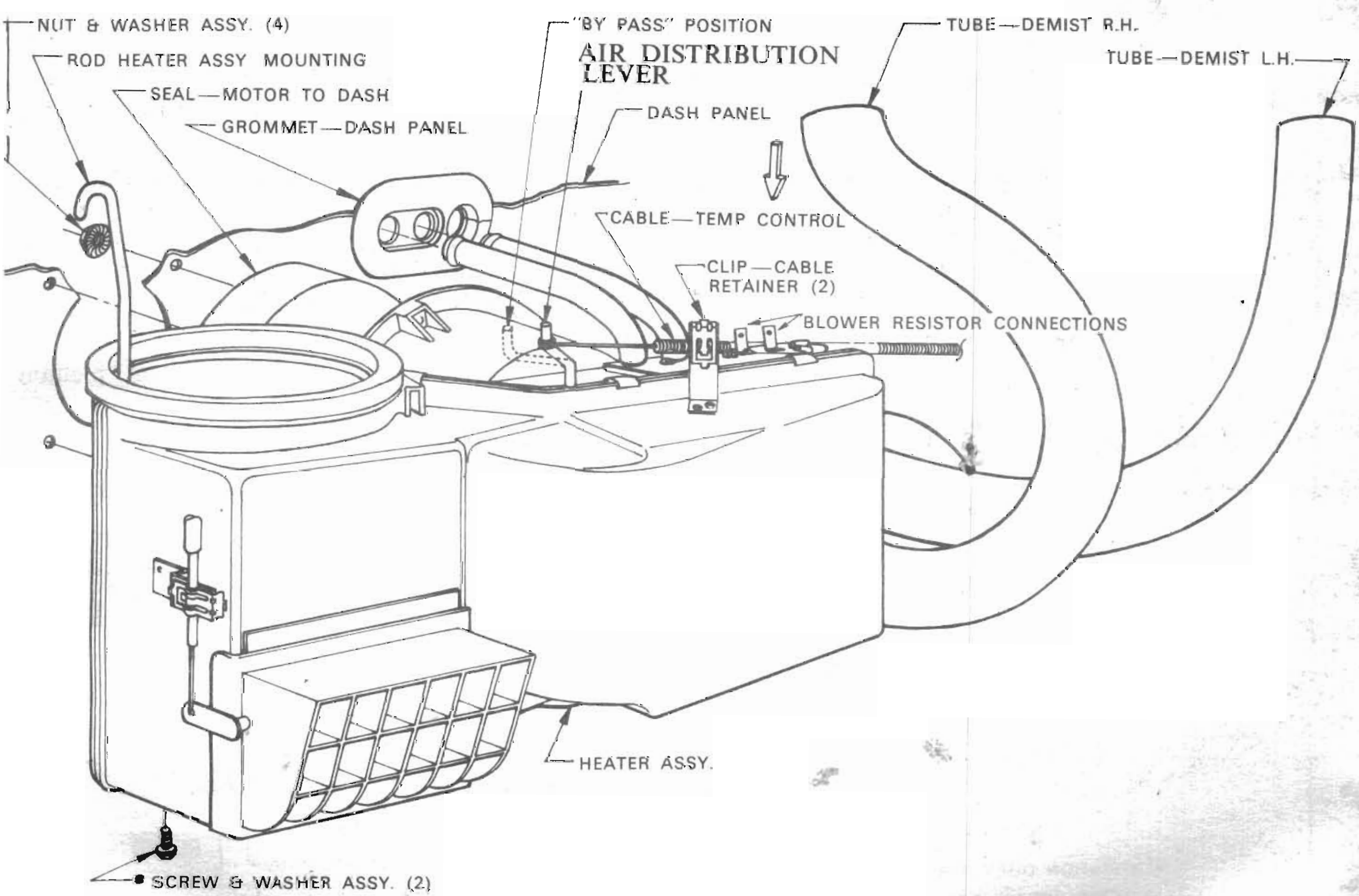
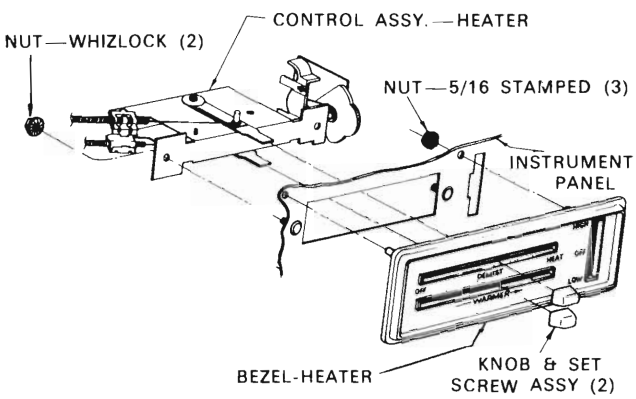


Fig. 1 – Heater/Demister assembly



HEATER/DEMISTER CONTROL ASSY MOUNTING DIAGRAM

Fig. 2 – Control assembly

3. CONTROL & CABLES

To Remove and Install:

(1) Disconnect the battery.

(2) Remove the control knob by loosening the Allen screws that retain them.

(3) Remove two whizzlock nuts and lower the control assembly (complete with cables).

(4) Disconnect temperature and air control cables at heater. (Removal of the glove box facilitates this operation.)

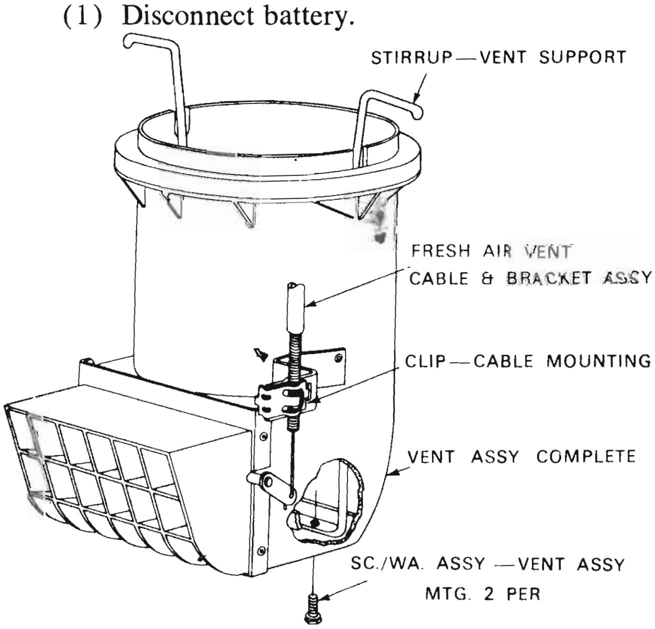
(5) Disconnect the blower wires from the switch and note their positions.

(6) Withdraw control and cables.

Installation is a reversal of the above procedures.

4. HEATER REMOVAL

(1) Disconnect battery.



VENTILATION DUCT ASSEMBLY
(REMOTE CONTROLLED TYPE)

Fig. 3 – R.H. fresh air ventilator

(2) Release cooling system pressure at radiator cap.

(3) Disconnect heater hoses at heater connections under hood.

(4) Remove glove box.

(5) Disconnect control cables by removing spring clips at heater end of cable.

(6) Remove demister tubes from heater.

(7) Disconnect blower wiring at resistor connections *(see wiring diagram, Fig. 4).*

(8) Remove the four nuts that retain the heater assembly to the dash panel (these are accessible from the engine compartment) and the two screws and washers from the bottom of the L.H. Summer Ventilator.

(9) Move the heater assembly away from the dash panel and lower, taking care not to strain the water pipes. (To prevent water spillage whilst removing, do *not* tip heater upside down.) For heater core removal, *refer to Paragraph 13, Page 24–18).*

Installation is a reversal of the above procedures. (After fitting, warm engine and check cooling system coolant level.)

5. FRESH AIR VENTILATORS

The L.H. Ventilator is part of the heater assembly and is not removable as a separate item. However, the R.H. Ventilator can be removed in the following manner:

(1) Disconnect control cable spring clip at ventilator.

(2) Remove two screws and washers from bottom of ventilator. These retain the unit by means of a hook which fits up into the plenum chamber *(Fig. 3).*

(3) Lower ventilator assembly from plenum chamber.

(4) Installation is a reversal of the above procedures.

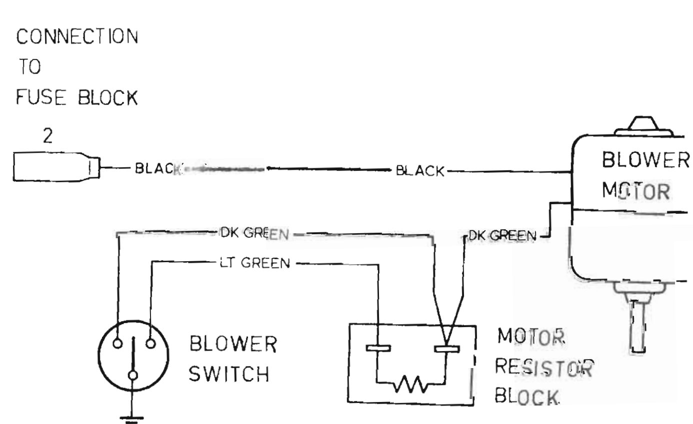


Fig. 4 – Heater wiring diagram