SIX-CYLINDER ENGINE

GENERAL

The 232 and 258 CID are six-cylinder, in-line, overhead valve engines. Cylinders are numbered from front to rear. Firing order is 1-5-3-6-2-4. Crankshaft rotation is counterclockwise, viewed from the rear. The crankshaft is supported by seven (two-piece) bearings. The camshaft is supported by four one-piece (line bored) bearings. Due to the similarity of these engines, service procedures have been consolidated and typical illustrations are used, except where specific procedures and illustrations are needed to clarify the operation (fig. 1A-1 and 1A-2).

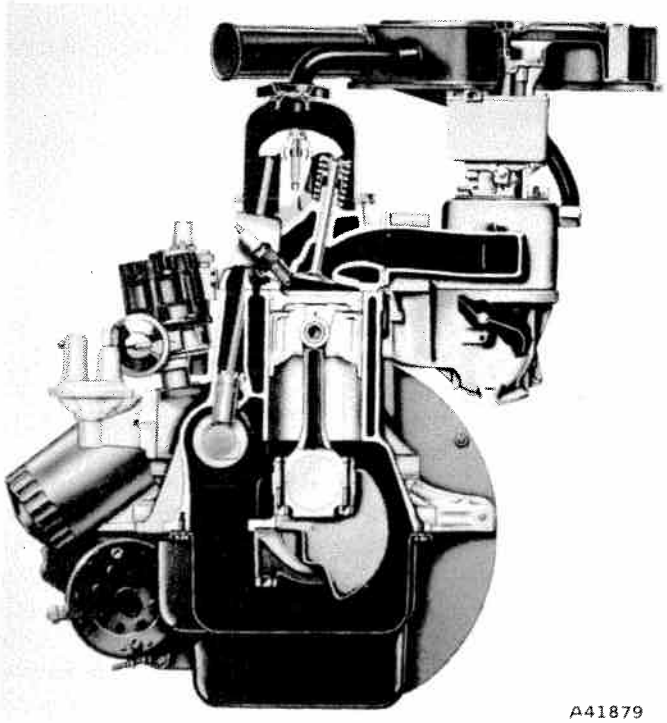


Fig. 1A-1 Engine Assembly-Sectional View

Service procedures for the 232 and 258 CID engines are basically the same. Procedures that differ are noted in the text.

Identification

Build Date Code

The engine Build Date Code is located on a machined surface on the right side of the block between the number two and three cylinders (fig. 1A-3).

The numbers of the code identify the year, month and day that the engine was built and are decoded as follows:

ENGINE BUILD DATE CODE EXPLANATION

1st Character (year)	2nd & 3rd Character (month)	4th Character (engine type)	5th Character (day)
7—1974	January	258 CID	21st Day
Example:	7	01	A	21

The letter (4th Character) contained in the code identifies the engine cubic inch displacement, carburetor type and compression ratio. The letters are decoded as follows:

Code	CID	Carburetor	Comp. Ratio
A	258	IV	8.0:1
E	232	IV	8.0:1

(2) Disconnect accelerator cable from accelerator bellcrank.
(3) Disconnect PCV vacuum hose from intake manifold.
(4) Disconnect TCS solenoid vacuum valve and bracket from intake manifold.
(5) Disconnect vacuum hoses from EGR valve.
(6) Disconnect compressor and bracket assembly from intake manifold (if equipped with air conditioning).
(7) Disconnect exhaust pipe from manifold flange.
(8) Remove manifold attaching bolts, nuts and clamps and remove intake and exhaust manifold as an assembly. Discard gasket.
(9) Separate manifolds at riser area.
(10) Clean mating surfaces of manifolds and cylinder head.

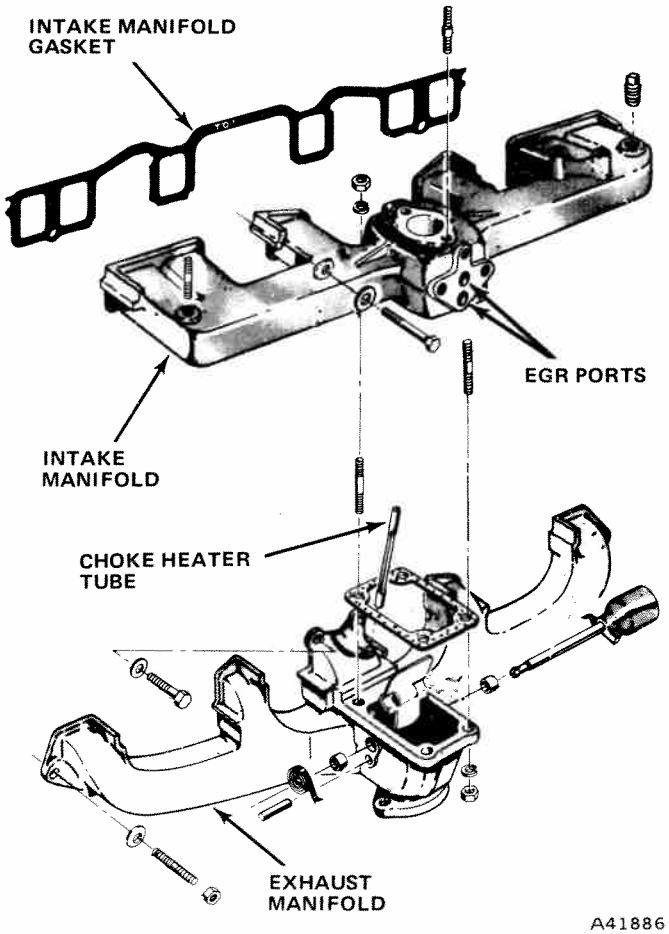


Fig. 1A-12 Intake and Exhaust Manifold Assembly

Installation

(1) Assemble manifolds and finger-tighten heat riser retaining nuts.
(2) Position new intake manifold gasket on cylinder head and install manifold assembly. Tighten manifold attaching bolts and nuts in sequence (fig. 1A-13) to 23 foot-pounds torque.
(3) Install flange gasket and connect exhaust pipe to manifold flange.
(4) Install carburetor.
(5) Install air conditioning compressor and bracket assembly to intake manifold (if equipped).
(6) Install drive belt and tighten to specified tension.
(7) Install TCS solenoid vacuum valve and bracket to intake manifold.
(8) Connect vacuum hoses to the EGR valve.
(9) Connect accelerator cable and PCV hose.
(10) Install air cleaner.

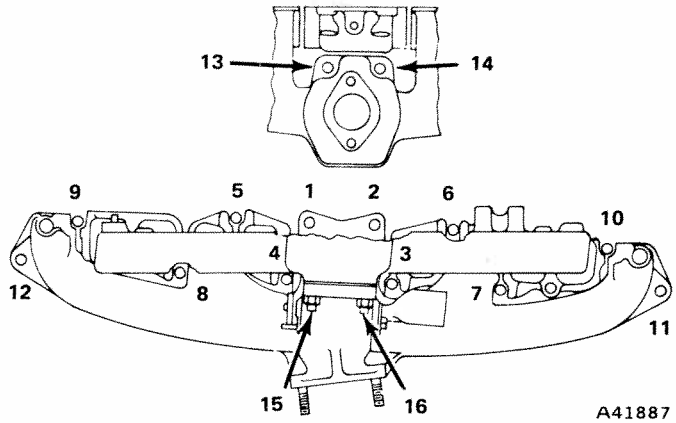


Fig. 1A-13 Intake Manifold Torque Sequence

NOTE: *Transmission throttle linkage must be adjusted after completing the manifold installation. Refer to Section 7 — Automatic Transmission.*

CYLINDER HEAD AND GASKET

Cylinder heads incorporating exhaust valve rotators do not differ from heads without rotators. These heads are interchangeable. The exhaust valve assemblies are the only difference. They have hardened exhaust valve seats and are used on either 232 or 258 CID engines.

Removal

(1) Drain cooling system system and disconnect hoses at thermostat housing.
(2) Remove cylinder head cover and gasket.
(3) Rocker arm and shaft assembly and push rods.

NOTE: *Retain push rods in the same order as removed.*

(4) Remove intake and exhaust manifold assembly from cylinder head.
(5) Disconnect spark plug wires and remove plugs.
(6) Disconnect temperature sending unit wire, battery ground cable, and ignition coil and bracket assembly.
(7) Remove cylinder head bolts, cylinder head, and gasket.

(6) Install oil pan and tighten drain plug securely.

(7) If disconnected, lower engine and connect right support cushion bracket to block. Remove the jack.

(8) Install starter motor.

(9) Lower vehicle and fill the crankcase with new oil.

OIL FILTER

A full flow oil filter, mounted on the lower right hand side of the engine, is accessible through the hood opening. A bypass valve incorporated in the filter mounting boss provides a safety factor if the filter becomes inoperative as a result of dirt or sludge accumulation (fig. 1A-31). Tool J-22700 will facilitate removal of the oil filter.

Before installation apply a thin film of oil to the new filter gasket. Install filter until gasket contacts the seat of the adapter. Then tighten securely, by hand only. Operate engine at fast idle and check for leaks.

OIL PUMP

A positive displacement gear type oil pump is used and is driven by the distributor shaft, which in turn is driven by a gear on the camshaft. Crankcase oil enters the pump through a inlet tube and screen assembly which is a press fit in the pump body (fig. 1A-31). The pump incorporates a pressure relief valve to regulate maximum pressure. It is not adjustable. A setting of 75 pounds maximum pressure is built into the tension of the spring. In the relief position, the valve permits oil to bypass through a passage in the pump body to the inlet side of the pump.

NOTE: *Oil pump removal or replacement will not affect distributor timing as the distributor drive gear remains in mesh with the camshaft gear.*

Removal

(1) Drain engine oil.

(2) Remove oil pan.

(3) Remove oil pump retaining screws, oil pump and gasket.

CAUTION: *Do not disturb position of oil inlet tube and screen assembly in pump body. If tube is moved within pump body, a new tube and screen assembly must be installed to assure an airtight seal.*

Disassembly and Inspection

(1) Remove cover retaining screws, cover and gasket from pump body.

(2) Measure gear end clearance by placing a straightedge across gears and pump body. Select a feeler gauge which will fit snugly but freely between straight edge and oil pump body (fig. 1A-32). Refer to specifications for correct clearance.

If gear end clearance is less than specified, replace the oil pump assembly.

(3) Measure gear-to-body clearance by inserting a feeler gauge between gear tooth and pump body inner wall directly opposite the point of gear mesh. Select a feeler gauge which fits snugly but freely (fig. 1A-33). Rotate gears to check each tooth in this manner. Refer to specification for correct clearance.

If gear-to-body clearance is more than specified, replace idler gear, idler shaft, and drive gear assembly.

(4) Remove cotter pin and slide spring retainer, spring and oil pressure relief valve out of pump body. Check for sticking condition. Clean or replace as necessary.

NOTE: *The oil inlet tube must be moved to allow removal of the relief valve; therefore, the pickup tube assembly must be replaced upon installation.*

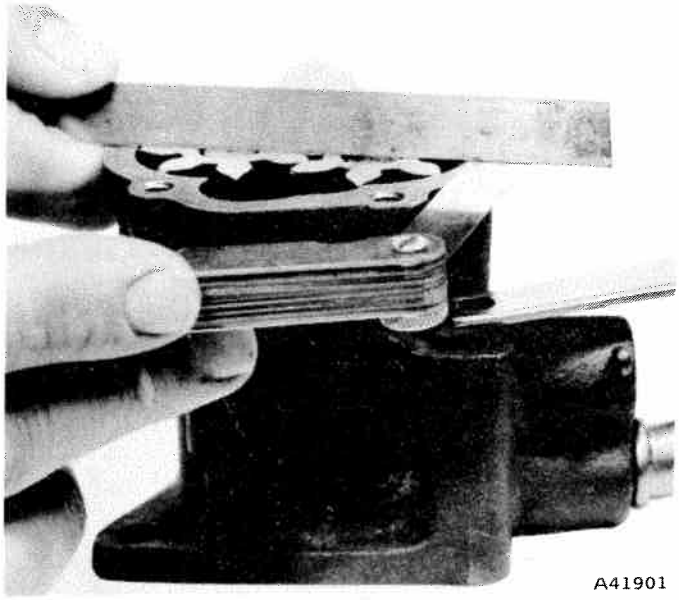


Fig. 1A-32 Oil Pump Gear End Clearance Measurement

Assembly and Installation

(1) Install oil pressure relief valve, spring, retainer, and cotter pin.

(2) If position of the inlet tube in the pump body has been disturbed, install new tube and screen assembly. Apply a light film of Permatex No. 2 or equivalent around end of tube. Using tool J-21882 (fig. 1A-34) drive tube into body making sure that support bracket is properly aligned.

(3) Install idler shaft, idler gear and drive gear assembly.

NOTE: *To ensure self-priming of the oil pump, the pump must be filled with petroleum jelly prior to the installation of the oil pump cover. Do not use grease.*

SPECIFICATIONS
(232 and 258 CID Engines)

Type . . . . . In-Line, OHV, 6-cylinder
Bore . . . . . 3.75 inches
Stroke
  232 . . . . . 3.50 inches
  258 . . . . . 3.395 inches
Displacement
  232 . . . . . 232 cubic inches
  258 . . . . . 258 cubic inches
Compression Ratio 8.0:1
Compression Pressure
  232 . . . . . 140 psi
  258 . . . . . 150 psi
Maximum Variation Between Cylinders . . . . . 20 psi
Firing Order 1-5-3-6-2-4
Net Brake Horsepower
  232 . . . . . 100 at 3600 rpm
  258 . . . . . 110 at 3500 rpm
Net Torque
  232 . . . . . 185 at 1800 rpm
  258 . . . . . 195 at 2000 rpm
Taxable Horsepower 33.75
Fuel . . . . . regular, low lead, or no-lead

CAMSHAFT

Fuel Pump Eccentric Diameter . . . 1.615 to 1.625 inches
Tappet Clearance . . . . . Zero Lash (Hydraulic tappets)
End Play . . . . . Zero (engine operating)
Bearing Clearance . . . . . 0.001 to 0.003 inch
Bearing Journal Diameter
  No. 1 . . . . . 2.029 to 2.030 inches
  No. 2 . . . . . 2.019 to 2.020 inches
  No. 3 . . . . . 2.009 to 2.010 inches
  No. 4 . . . . . 1.999 to 2.000 inches
Base Circle Runout . . . . . 0.001 inch (max)
Cam Lobe Lift . . . . . 0.254 inch
Intake Valve Timing
  Opens . . . . . 12.5° BTDC
  Closes . . . . . 66.5° ABDC
Exhaust Valve Timing
  Opens . . . . . 53.5° BBDC
  Closes (With EGR) . . . . . 25.5° ATDC
Valve Overlap
  With EGR . . . . . 38°
Intake Duration . . . . . 259°
Exhaust Duration . . . . . 259°

CONNECTING RODS

Total Weight (Less Bearings)
  232 . . . . . 557 to 665 grams
  258 . . . . . 695 to 703 grams
Total Length (Center-to-Center)
  232 . . . . . 6.123 to 6.127 inches
  258 . . . . . 5.873 to 5.877 inches
Piston Pin Bore Diameter . . . . . 0.9288 to 0.9298 inches
Bearing Clearance . . . . . 0.001 to 0.003 inch
(0.0025 inch preferred)
Side Clearance . . . . . 0.005 to 0.014 inch
Maximum Twist . . . . . 0.001 per inch
Maximum Bend . . . . . 0.0005 per inch

CRANKSHAFT

End Play . . . . . 0.0015 to 0.0065 inch
Main Bearing Journal Diameter 2.4986 to 2.5001 inches
Main Bearing Journal Width
  No. 1 . . . . . 1.086 to 1.098 inches
  No. 3 . . . . . 1.271 to 1.273 inches
  No. 2-4-5-6-7 . . . . . 1.182 to 1.188 inches
Main Bearing Clearance . . . . . 0.001 to 0.003 inch
(0.0025 inch preferred)
Connecting Rod Journal
  Diameter . . . . . 2.0934 to 2.0955 inches
Connecting Rod Journal Width . . . 1.070 to 1.076 inches
Connecting Rod Bearing Clearance 0.001 to 0.003 inch
(0.0025 inch preferred)
Maximum Out-of-Round . . . . . 0.0005 inch
Maximum Taper . . . . . 0.0005 inch

CYLINDER BLOCK

Deck Height . . . . . 9.528 to 9.534 inch
Deck Clearance
  232 . . . . . 0.575 inch (below block)
  258 . . . . . 0.110 inch (below block)
Cylinder Bore (standard) . . . . . 3.7501 to 3.7533 inches
  Maximum Cylinder Taper . . . . . 0.005 inch
  Maximum Cylinder Out-of-Round . . . . . 0.003 inch
Tappet Bore Diameter . . . . . 0.905 to 0.906 inch
Cylinder Block Flatness . . . . 0.001/1 inch, 0.002/6 inch;
0.008 inch (max)

CYLINDER HEAD

Combustion Chamber Volume . . . . . 62.5 to 65.5 cc
Valve Arrangement . . . . . EI-IE-IE-EI-EI-IE
Valve Guide ID (Integral) . . . . . 0.3735 to 0.3745 inch
Valve Stem-to-Guide Clearance . . . . 0.001 to 0.003 inch
Intake Valve Seat Angle . . . . . 30°
Exhaust Valve Seat Angle . . . . . 44.5°
Valve Seat Width . . . . . 0.040 to 0.060 inch
Valve Seat Runout . . . . . 0.0025 inch
Cylinder Head Flatness . . . . 0.001/1 inch; 0.002/6 inch;
0.008 inch (max)

LUBRICATION SYSTEM

Engine Oil Capacity . . . . . 5 quarts
(Add 1 quart with filter change)

ENGINE REMOVAL

The engine is removed without the transmission and bell housing.

(1) On Cherokee, Wagoneer and Truck the hood must be removed. Mark hinge locations at hood panel for alignment during installation. Remove hood from hinges.

(2) Remove air cleaner assembly.

(3) Drain cooling system and disconnect upper and lower radiator hoses.

(4) If equipped with automatic transmission, disconnect cooler lines from radiator.

NOTE: *If vehicle is equipped with a radiator shroud, it is necessary to separate the shroud from the radiator to facilitate removal and installation of the radiator and engine fan.*

(5) Remove radiator.

(6) Remove engine fan.

If equipped with power steering, remove fluid from pump reservoir and disconnect hoses.

(7) If equipped with air conditioning, turn both service valves clockwise to the front seated position. Bleed compressor refrigerant charge by slowly loosening service valve fittings.

(8) Disconnect condenser and evaporator lines from compressor.

(9) Disconnect receiver outlet at the disconnect coupling.

(10) Remove condenser and receiver assembly.

(11) Remove the battery and tray if required.

(12) On Wagoneer, Cherokee, and Truck models, remove the heater core housing and charcoal canister from firewall.

(13) Disconnect the following wires (if so equipped) at:

- starter motor
- coil positive terminal
- temperature gauge sending unit
- alternator
- oil pressure gauge sending unit
- solenoid vacuum valve
- solenoid control switch
- throttle stop solenoid

(14) Disconnect the following lines (if so equipped):

- fuel line from tank at fuel pump
- vacuum line for power brake unit at intake manifold
- vacuum line for heater damper doors at intake manifold

(15) If equipped with automatic transmission, disconnect the transmission filler tube bracket from right cylinder head. Do not remove filler tube from the transmission.

(16) Remove both engine front support cushion-to-frame retaining nuts.

(17) Support weight of engine with a lifting device.

(18) On CJ models, remove transfer case shift lever boot, floor (if so equipped) and transmission access cover.

(19) On vehicles equipped with automatic transmission, remove upper bolts securing the transmission bell housing-to-engine.

If equipped with manual transmission, remove upper bolts securing clutch housing-to-engine.

(20) Disconnect exhaust pipes at exhaust manifolds and support bracket.

(21) Remove starter motor.

(22) Support transmission with a floor jack.

(23) If equipped with automatic transmission, remove engine adapter plate inspection cover. Mark assembled position of converter and flex plate and remove the converter to flex plate cap screws.

(24) Remove remaining bolts securing transmission bell housing to engine.

If equipped with manual transmission, remove clutch housing lower cover and remaining bolts securing clutch housing to engine.

(25) Remove engine by pulling upward and forward.

CAUTION: *If equipped with power brakes, care must be taken to avoid damaging the power unit while removing the engine.*

ENGINE INSTALLATION

(1) Lower engine slowly into engine compartment and align with transmission bell housing (automatic transmission) or clutch housing (manual transmission). On manual transmissions, make certain clutch shaft is aligned properly with splines of clutch driven plate.

(2) Install the transmission bell housing-to-engine bolts (automatic transmission) or the clutch housing-to-engine bolts (manual transmission). Tighten bolts to specified torque (Automatic Trans: 28 foot-pounds; Manual Trans: 27 foot-pounds).

(3) Remove floor jack which was used to support transmission.

(4) If equipped with automatic transmission, align marks previously made on converter and flex plate, install converter-to-flex plate cap screws and tighten to torque.

(5) Install inspection cover (automatic transmission) or the clutch housing lower cover (manual transmission).

(6) Install starter motor.

(7) Lower engine onto frame supports, remove the lifting device.

(8) Install front support cushion retaining nuts. Tighten the nuts to 33 foot-pounds torque.

(9) Connect exhaust pipes at exhaust manifolds and support bracket.

(10) If equipped with automatic transmission, connect transmission filler tube bracket to right cylinder head.

NOTE: *The oil seal should always be replaced whenever the timing chain cover is removed. refer to Oil Seal Replacement later in this section for procedure.*

Installation

(1) Remove lower locating dowel pin from engine block.

NOTE: *The dowel pin is required for correct cover alignment and must be either reused or a replacement dowel installed after the cover is in position.*

(2) Use a sharp knife or razor blade to cut both sides of oil pan gasket flush with engine block.

(3) Using the old gasket as a guide, trim a new gasket to correspond to the amount cut off at the oil pan (fig. 1B-21).

(4) Apply cement to both sides of new gasket and install gasket on the timing chain cover.

(5) Install new front oil pan seal.

(6) Align tongues of new oil pan gasket pieces with oil pan seal and cement into place on cover (fig. 1B-21).

(7) Apply a stripe of Permatex No. 2, or equivalent, to cut-off edges of original oil pan gaskets.

(8) Place timing chain cover into position and install the two front oil pan bolts.

(9) Tighten bolts slowly and evenly until cover aligns with upper locating dowel.

(10) Install lower dowel through cover and drive into corresponding hole in engine block.

(11) Install cover retaining bolts in the same location as removed. Tighten to 25 foot-pounds torque.

(12) Install vibration damper. Tighten retaining bolt to 55 foot-pounds torque.

(13) Install drive pulley and retaining bolts.

(14) Install fuel pump.

(15) Install distributor with the rotor in the same position as it was prior to removal.

(16) Install the distributor cap. Connect the heater hose.

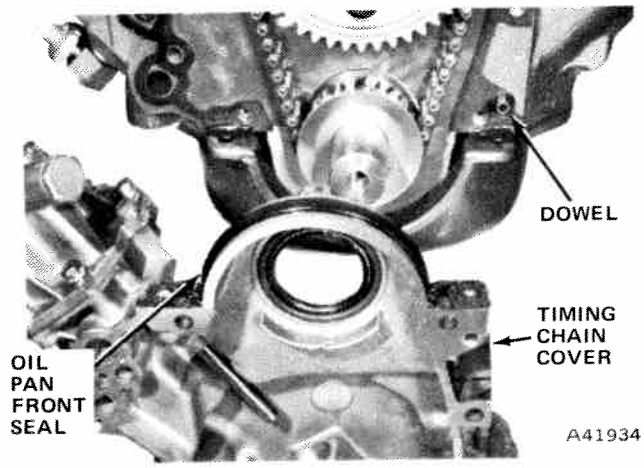


Fig. 1B-21 Oil Pan Front Seal Installation

(17) Install the power steering pump and/or air pump and bracket (if equipped).

(18) Install alternator and front portion of alternator bracket.

(19) Install air conditioning back idler pulley assembly (if equipped).

(20) If removed, install air conditioning compressor and bracket assembly.

(21) Install fan and hub assembly.

(22) Install all drive belts and tighten to the specified tension.

(23) Connect radiator hoses and bypass hose.

(24) Fill cooling system to specified level.

(25) Start engine and check for oil or coolant leaks.

(26) Adjust initial ignition timing to specified setting.

Fig. 1B-22 Timing Chain Cover Oil Seal Replacement

Oil Seal Replacement

Timing chain cover must be removed to replace seal.

(1) Pry out original seal from inside timing chain cover and clean seal bore.

(2) Apply a light coat of perfect Seal compound, or equivalent, to outer surface of a new seal.

(3) Drive the seal into place from inside the cover with Seal Installer Tool J-22533 until it contacts the outer flange of the cover (fig. 1B-22).

(4) Apply a light film of engine oil to the lips of neoprene seal.

TIMING CHAIN

To ensure correct valve timing, install the timing chain with the timing marks of the crankshaft and

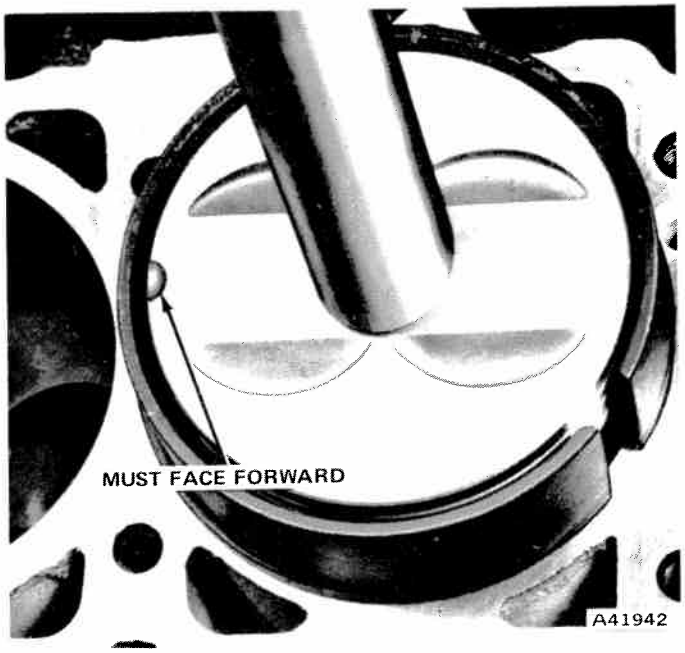


Fig. 1B-33 Installing Piston Assembly Into Bore

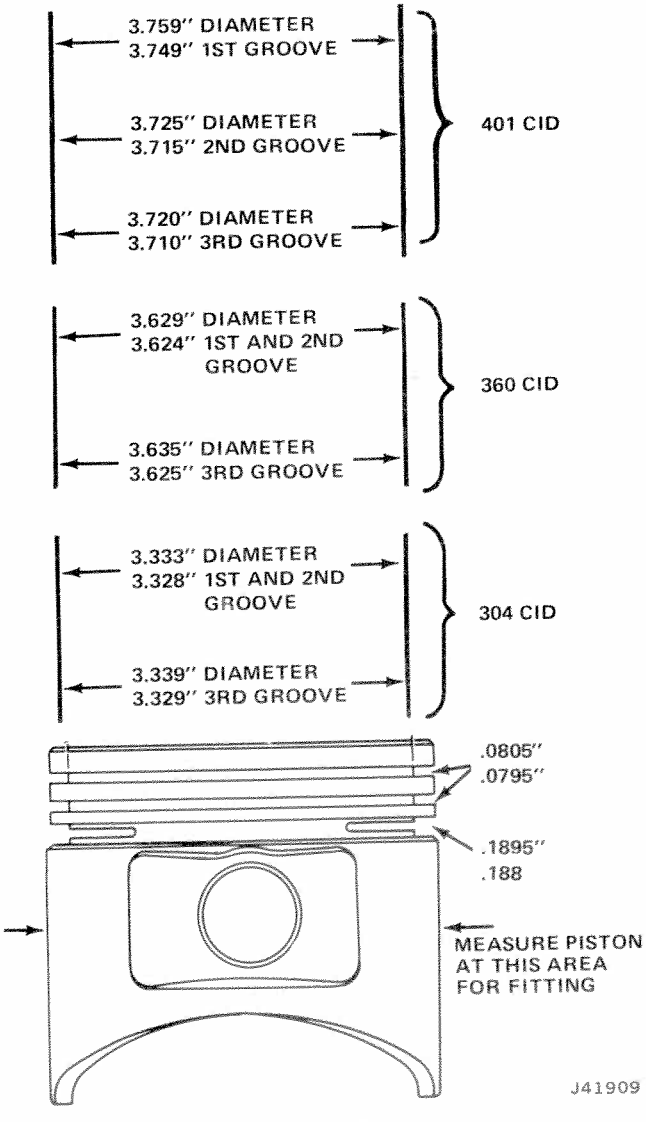


Fig. 1B-34 Piston Measurements

Piston Pins

The piston pins are a 2000 pound press-fit into the rods and require no locking device. The piston pins for 304 and 360 CID engines are the same diameter, while the piston pin for 401 CID engines is larger in diameter. Two different tools are required to service piston pins; J-21872 is used on 304 and 360 pins and J-23194 is used on 401 pins.

Removal

(1) Using Piston Pin Remover (J-21872 or J-23194) and an arbor press, place piston on remover support (J-21872-1 or J-23194 or J-23194-3) as shown in figure 1B-35.

(2) Using piloted driver (J-21872-3 or J-23194-3), press pin completely out of piston. Note position of pin through gauge window of remover support (fig. 1B-35).

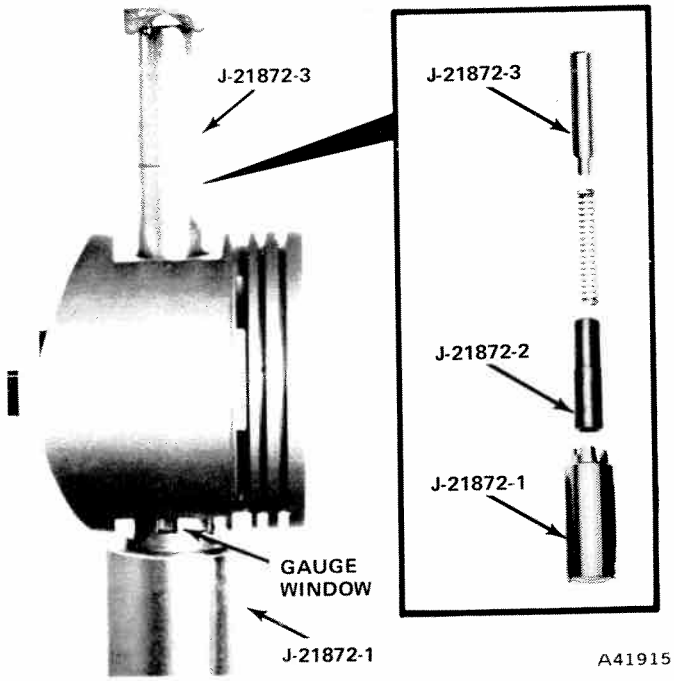


Fig. 1B-35 Piston Pin Removal and Installation

Pin Fitting

(1) Inspect pin and pin bore for nicks and burrs; remove as necessary.

(2) With pin removed from piston, clean and dry piston pin bore and piston pin.

(3) Position piston so that pin bore is in a vertical position. Insert pin in bore. At room temperature, pin should slide completely through pin bore without pushing.

(4) Replace piston and pin if pin jams in bore.

Installation

(1) Place pin pilot (J-21862-2 or J-23194) through piston and connecting rod pin bores (fig. 1B-35).

TORQUE SPECIFICATIONS (Continued)

	Service Set-To Torque	Service In-Use Recheck Torque
Crankshaft Pulley-to-Damper	23	18 to 28
Cylinder Head Capscrews	110	100 to 120
Cylinder Head Cover Screws	50 in-lb	42 to 58 in-lb
Distributor Bracket Screw	13	10 to 18
Drive Plate-to-Converter Screw	22	20 to 25
EGR Valve-to-Manifold	13	9 to 18
Exhaust Manifold Bolts	25	20 to 30
Exhaust Pipe-to-Manifold Nuts	23	18 to 28
Fan and Hub Assembly Bolts	18	12 to 18
Flywheel or Drive Plate-to-Crankshaft	105	95 to 120
Front Support Cushion Bracket-to-Block	28	22 to 38
Front Support Cushion-to-Bracket	33	27 to 38
Front Support Cushion to Frame	33	27 to 37
Fuel Pump Screws	16	13 to 19
Idler Pulley Bearing Shaft-to-Bracket Nut	33	28 to 38
Idler Pulley Bracket-to-Front Cover Nut	7	4 to 9
Intake Manifold Screws	43	37 to 47
Main Bearing Capscrews	100	90 to 105
Oil Pump Cover Screws	55 in-lb	45 to 65 in-lb
Oil Pan Screws		
1/4 inch - 20	7	5 to 9
5/16 inch - 18	11	9 to 13
Oil Release Valve Cap	28	22 to 35
Power Steering Pump Adapter Screw	23	18 to 28
Power Steering Pump Bracket Screw	43	37 to 47
Power Steering Pump Mounting Screw	28	25 to 35
Rear Insulator Bracket-to-Trans. Stud Nut	33	27 to 38
Rear Support Insulator-to-Bracket Nut	48	40 to 55
Rear Support Cushion-to-Crossmember Screw Nut	18	12 to 25
Rocker Arm Capscrew	19	16 to 26
Spark Plugs	28	22 to 33
Thermostat Housing Screw	13	10 to 18
Timing Chain Cover-to-Block	25	18 to 33
Automatic Transmission to Block	28	22 to 38
Vibration Damper Screw	55	48 to 64
Water Pump Screws	48 in-lb	40 to 55 in-lb

NOTE: *New belt tension specifications apply only to service replacement belts. Once a belt has been tensioned and run, it is considered a used belt and should be adjusted to used belt specifications.*

Make adjustments at the mounting brackets of each unit.

NOTE: *Consult Specifications for proper tensions.*

Fan and Alternator Belt Adjustment

(1) Loosen alternator pivoting mount bolt.
(2) Loosen alternator adjusting bolt.
(3) Adjust belt using pry bar or 1/2-inch square drive bar. Snug adjusting bolt (fig. 2-9 and 2-10).

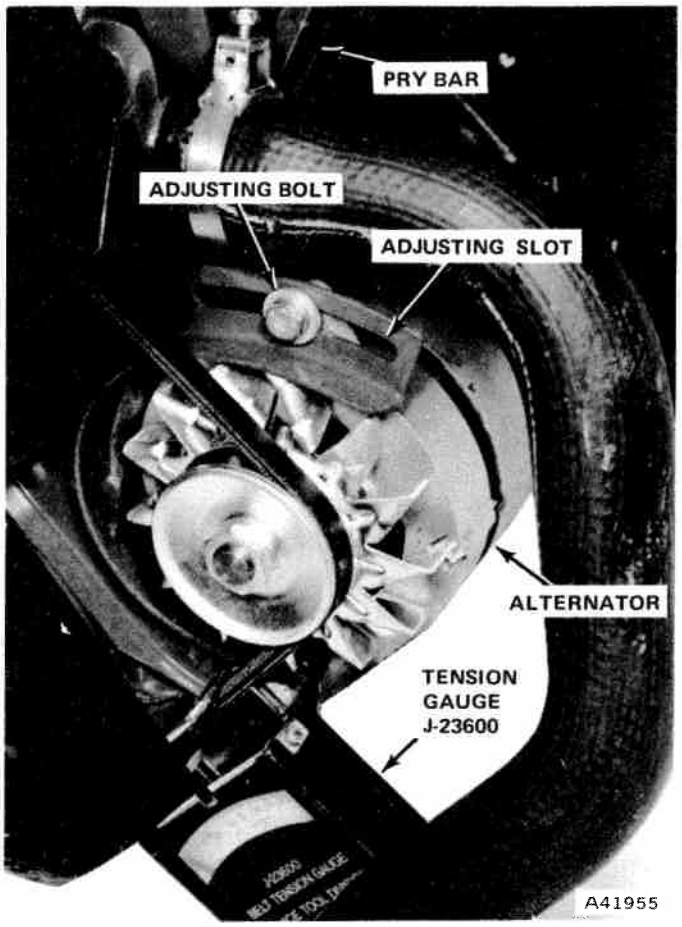


Fig. 2-9 Adjusting Fan Drive Belt - Six-Cylinder

(4) Check belt tension using Tension Gauge J-23600 (fig. 2-11).
(5) Tighten adjusting bolt to 18 foot-pounds torque and mounting bolts to 28 foot-pounds torque.

Hose Position

In places where hoses do not have specific routing clamps, make sure hoses are moved to clear exhaust pipes, fan blades, and drive belts. Otherwise hoses will be damaged resulting in coolant loss and overheating.

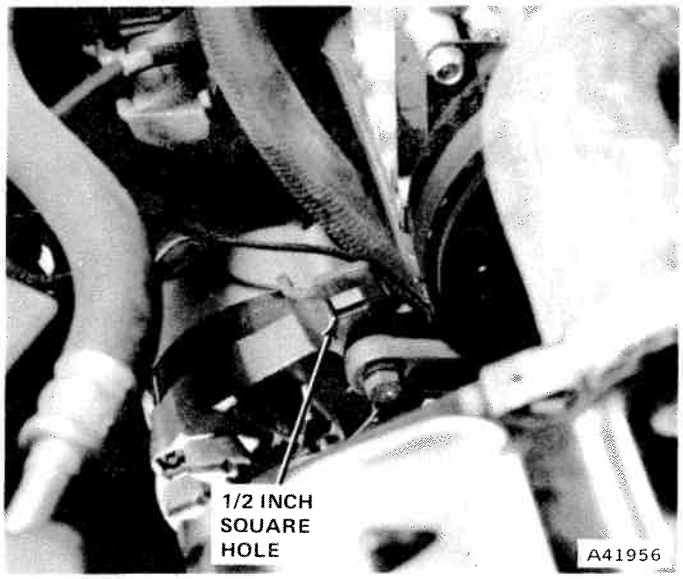


Fig. 2-10 Alternator Adjustment Bracket - V-8

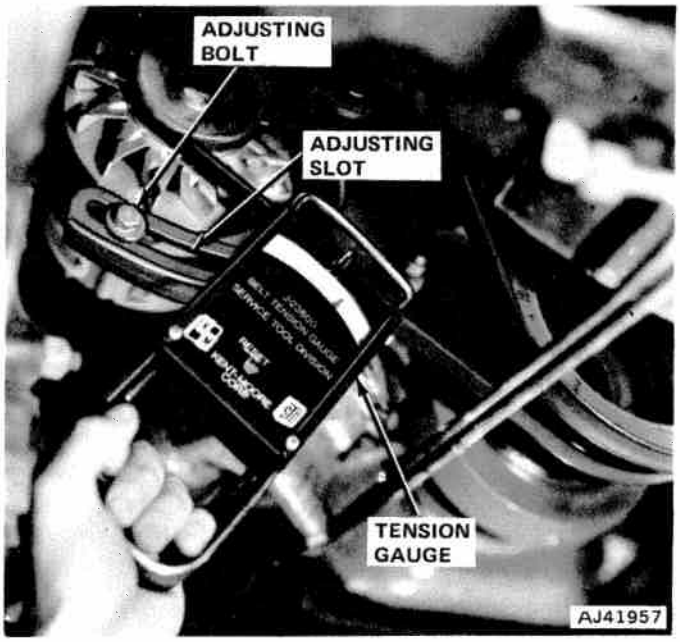


Fig. 2-11 Checking Fan Drive Belt Tension

Shroud Position

In some extreme cases, the engine fan may contact the shroud. An examination of proper engine mounting should locate the trouble. If not, examine the shroud position. To compensate for normal engine movement, loosen the shroud mounting screws and relocate shroud to prevent fan-to-shroud contact.

DIAGNOSIS TESTS

Freeze Protection

Cooling system freeze protection should be checked with an antifreeze hydrometer to determine protection level.

ELECTRICAL

GENERAL

A 12-volt, negative ground, dc system is used which utilizes the frame and body for the ground return circuit.

CAUTION: *Burns or other damage may be caused by accidentally grounding circuits through careless use of tools or by not tightening connections in energized circuits.*

A 12-volt electrical system can generate an arc that can ignite gasoline that has been spilled or seeped from the fuel system. Disconnect the battery ground cable before removing any electrical component.

GROUND CONNECTIONS

First check for a poor or no ground condition when checking for electrical malfunctions such as erratic temperature and fuel gauge readings, directional lights glowing when headlights are operated, windshield wiper motor attempting to operate when some other electrical component is operated.

All models have the battery grounded directly to the engine and to the right front fender inner panel. To complete the ground return circuit from the load (bulb, gauge, etc.) back to the battery, the ground connections and their locations are as follows:

Instrument Panel - The hi-beam lamp, turn signal indicator lamps, panel lighting lamps and the constant voltage regulator (CVR) for the fuel and temperature gauges ground at the instrument cluster or panel for all models.

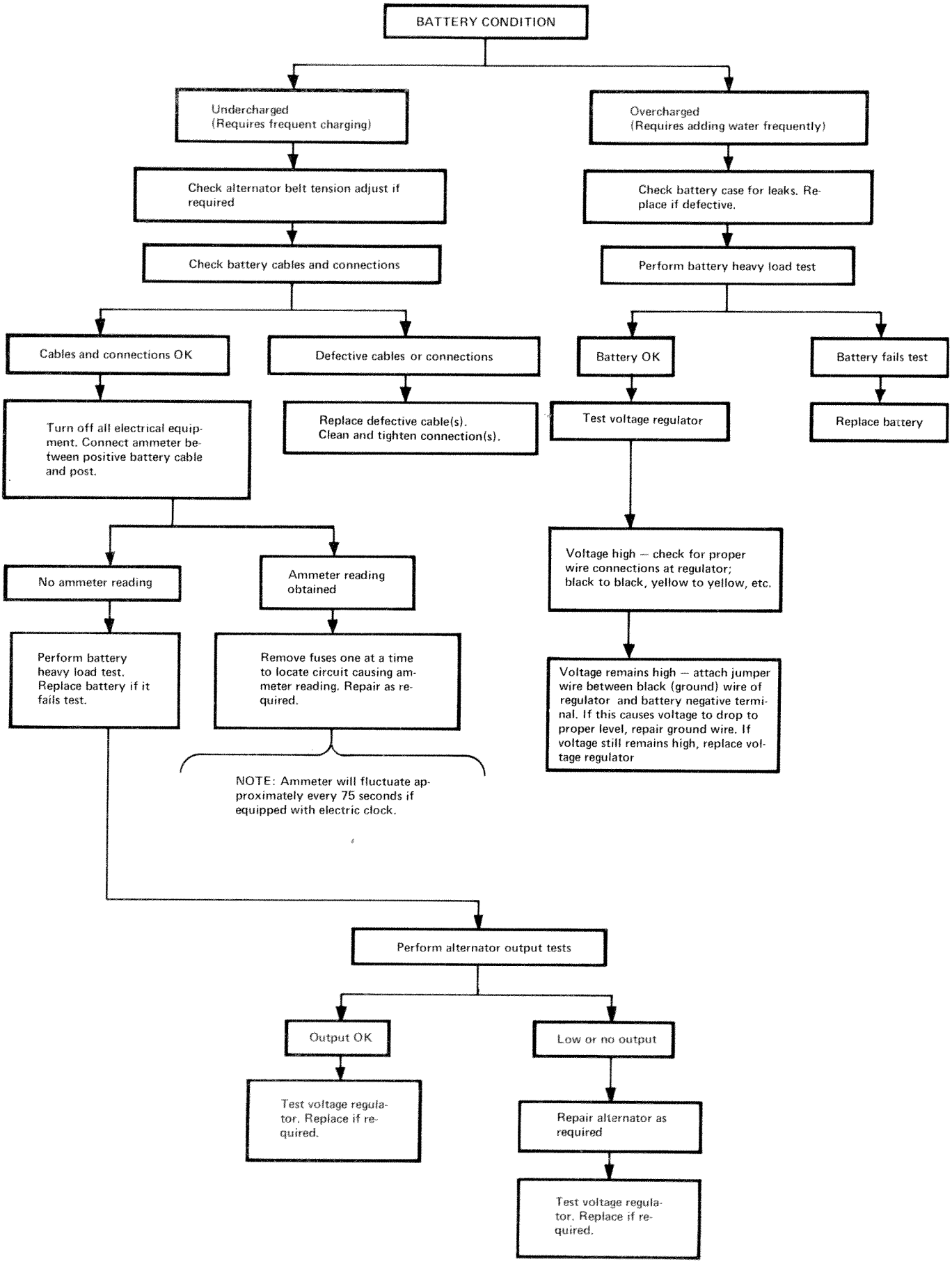
Frame-to-Engine Ground - All models utilize a ground strap. Six-cylinder engines have a strap attached to the left motor mount; V-8 engine strap is attached at the right motor mount.

CJ Models

The instrument cluster is grounded by the four mounting studs welded to the instrument panel (fig. 3-1).

Note the ground contact for the CVR (fig. 3-2). The regulator is part of the fuel gauge and depends on this ground to regulate voltage to the gauges.

The Hazard, Wiper Washer, and Lights panel lights are grounded by a ground wire attached to a screw at the lower lip of the instrument panel.


BATTERY CONDITION
Undercharged (Requires frequent charging)
Overcharged (Requires adding water frequently)
Check alternator belt tension adjust if required
Check battery case for leaks. Replace if defective.
Check battery cables and connections
Perform battery heavy load test
Cables and connections OK
Defective cables or connections
Battery OK
Battery fails test
Turn off all electrical equipment. Connect ammeter between positive battery cable and post.
Replace defective cable(s). Clean and tighten connection(s).
Test voltage regulator
Replace battery
No ammeter reading
Ammeter reading obtained
Voltage high – check for proper wire connections at regulator; black to black, yellow to yellow, etc.
Perform battery heavy load test. Replace battery if it fails test.
Remove fuses one at a time to locate circuit causing ammeter reading. Repair as required.
Voltage remains high – attach jumper wire between black (ground) wire of regulator and battery negative terminal. If this causes voltage to drop to proper level, repair ground wire. If voltage still remains high, replace voltage regulator
NOTE: Ammeter will fluctuate approximately every 75 seconds if equipped with electric clock.
Perform alternator output tests
Output OK
Low or no output
Test voltage regulator. Replace if required.
Repair alternator as required
Test voltage regulator. Replace if required.

A42150

ening in the front housing and compressing the washer while exerting pressure toward the rotor (fig. 3-28). Remove the washer only after the rotor and front bearing have been removed. The rotor and front bearing can be removed from the front housing by tapping the rotor shaft lightly.

NOTE: *The split ring washer must be removed from its retaining groove before attempting to remove the front bearing from the front housing.*

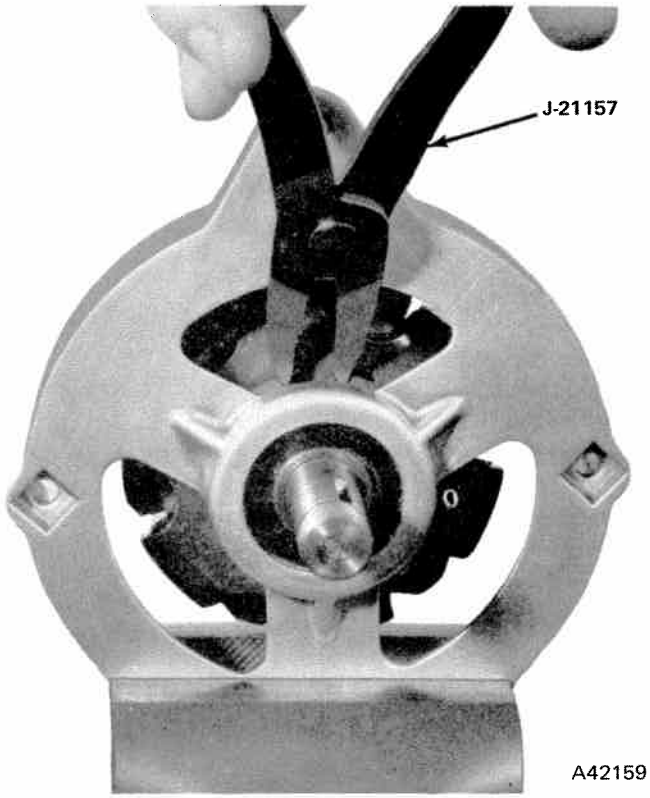


Fig. 3-28 Removing Spit Ring Washer

Rotor - Bench Test (Field Coil Test)

Test the rotor for grounds and shorted turns in the winding. The ground test is made with the test probes connected in series with a 110-volt test lamp. Place one test probe on a slip ring and the other on the rotor core. If the bulb lights, the rotor winding is grounded.

To test for shorted turns, check rotor field current draw (fig. 3-29). Slowly reduce resistance of rheostat to zero. With full battery voltage (12.6 plus, minus 0.2 volts) applied to field coil (rotor), the field current should be 1.8 amperes minimum to 2.5 amperes maximum. Excessive current draw indicates shorted turns in the field windings. Less than minimum indicates open windings.

Front and Rear Bearing Removal

The bearings are removed from the rotor as shown in figures 3-30 and 3-31 using Tool J-21155.

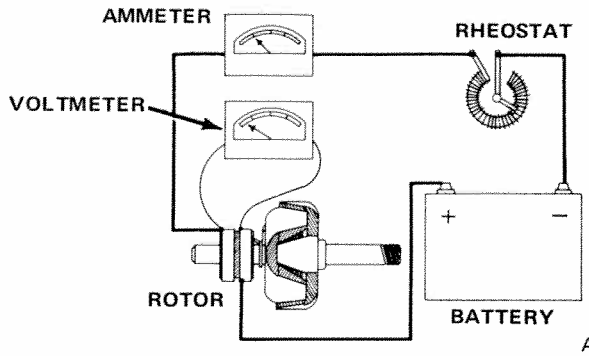


Fig. 3-29 Rotor Test

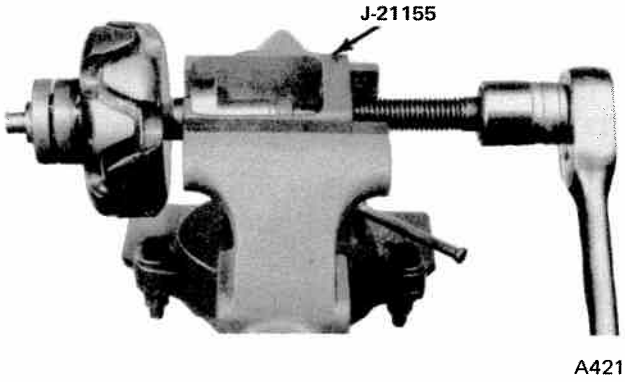


Fig. 3-30 Front Bearing Removal

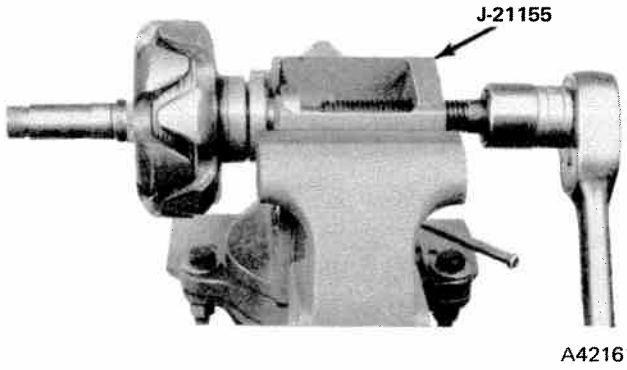


Fig. 3-31 Rear Bearing Removal

ALTERNATOR ASSEMBLY

(1) Clean bearing and inside of bearing hub of front housing.

(2) Support front housing and using Drive Tool J-21154, J-8092, or J-8592 Driver Handle, apply sufficient pressure to outside race of bearing to seat bearing as shown in figure 3-32. A 1-1/8-inch socket also can be used to seat bearing in front housing.

(3) Insert split ring washer into hub of front housing and use Tool J-21154 to seat washer into groove of hub.

CAUTION: *Do not use a screwdriver or any small object to compress washer that can slip off and damage bearing seal.*

conditions. If the current draw is not 180 to 220 amperes at room temperature, remove the starter motor from the engine for bench testing.

NOTE: *Do not take ampere draw reading until starter motor has obtained maximum rpm.*

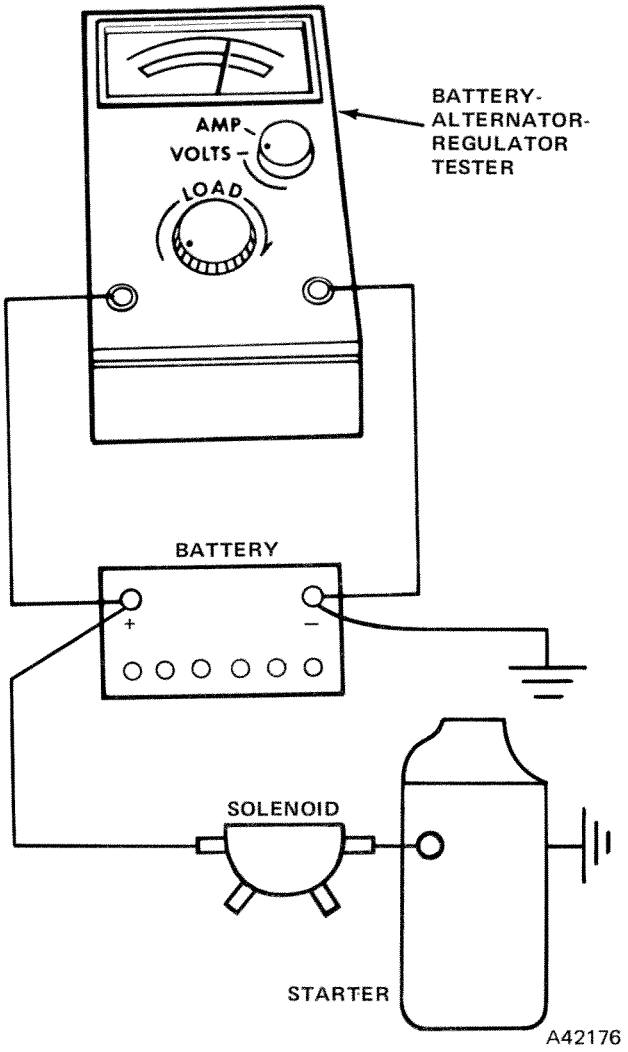


Fig. 3-40 Starter Motor Current Draw Test

No-Load Test - Out of Vehicle

The starter motor no-load test will indicate such faults as open or shorted windings, worn bushings (rubbing armature), or bent armature shaft. This test is run with the starter on the bench.

NOTE: *The tester load control knob must be in the Decrease or extreme counterclockwise position.*

(1) Operate starter with test equipment connected as shown in figure 3-41. Note voltage reading.

(2) Determine exact starter rpm using a mechanical tachometer (not shown).

NOTE: *To use a mechanical tachometer, remove seal from drive end housing and clean grease from end of armature shaft.*

(3) Disconnect starter from battery.

(4) Turn load control knob clockwise (Increase) until voltmeter reading is exactly the same as it was with the starter connected to the battery.

(5) If ammeter reading at no-load speed is below specifications, starter has high electrical resistance and should be repaired or replaced.

(6) If ammeter reading is higher than specifications and starter is running slower than it should, starter should be disassembled, cleaned, inspected, and tested as outlined in the following paragraphs.

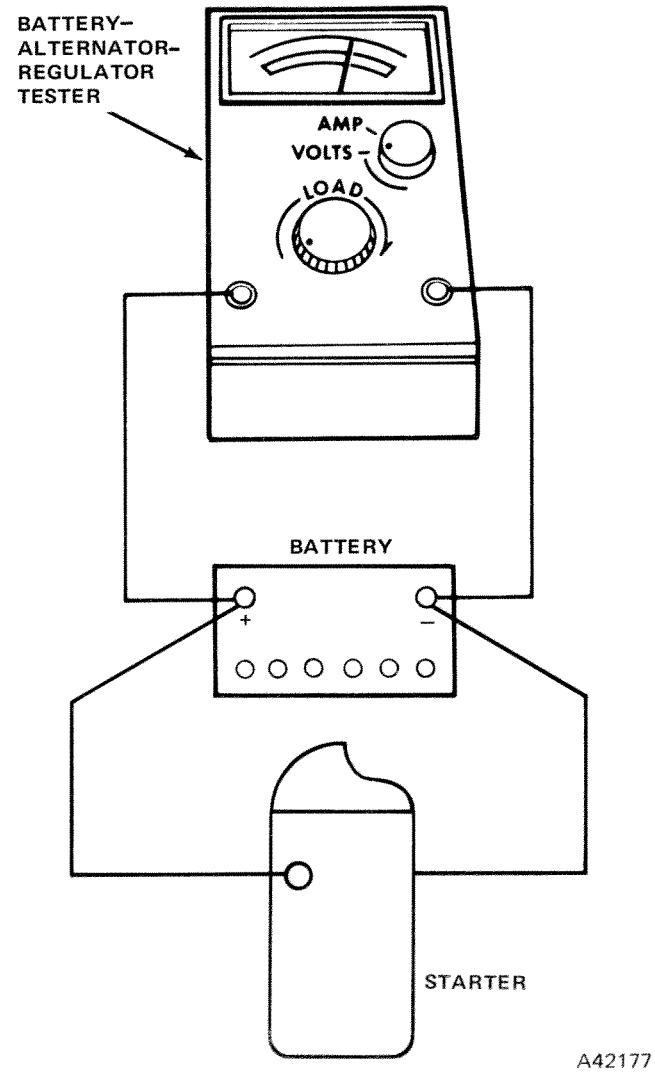


Fig. 3-41 Starter Motor No-Load Test

Disassembly

Refer to figure 3-42 for parts identification.

(1) Remove brush cover band and protective tape, drive yoke cover and gasket.

(2) Remove brushes from brush holders.

EMISSION CONTROL

GENERAL

Emission control systems are required to meet existing standards for exhaust, crankcase and raw fuel vapor emissions. The systems are designed to control the emission of hydrocarbons, carbon monoxide, and oxides of nitrogen at the levels specified by Federal or California Standards.

For 1974, Nationwide Federal Standards and the standards which apply in the State of California differ. This necessitates a number of differences between emission control systems on vehicles built for sale in California and Nationwide. The following general descriptions of emission control systems apply to Nationwide vehicles. Deviations from Nationwide, which apply to the California vehicles only, will follow the general description.

Emission control system usage varies in relation to engine, transmission, and series aplication. The Emission Control Systems Application Chart (at the end of this section) may be used to determine the current system usage for any particular vehicle.

NOTE: *Engines in heavy-duty trucks are painted red to distinguish them from standard engines. The emission control systems used on these red engines differ from standard engines because of the weight classification of heavy-duty trucks.*

This section outlines service procedures for all Jeep Emission Control Systems. In addition, tuneup specifications and procedures as prescribed by the U. S. Emission Control Services Maintenance Chart are also included.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ROUGH IDLE OR STALLING	(1) Improper idle mixture adjustment	(1) Adjust idle mixture
	(2) Damaged tip on idle mixture screws	(2) Replace mixture screw
	(3) Clogged air bleed or idle passages	(3) Clean passages
	(4) Vacuum leak	(4) Check manifold vacuum and repair as necessary
	(5) Improper fuel level	(5) Adjust fuel level
	(6) Restricted air cleaner	(6) Clean or replace air cleaner
	(7) Improper choke setting	(7) Adjust choke
	(8) Choke binding	(8) Locate and eliminate binding condition
	(9) Exhaust manifold heat valve inoperative	(9) Lubricate or replace heat valve as necessary
	(10) Secondary throttle valves not closing (4300 Model, 4V carburetor)	(10) Locate and eliminate binding condition

Installation - Six-Cylinder

(1) Position injection tube in exhaust manifold openings.

NOTE: *Two different length injection tubes are used on six-cylinder engines. The shorter length injection tubes must be inserted into cylinders 3 and 4.*

(2) Install intake and exhaust manifold assembly. Refer to Section 1A - Six-Cylinder Engine.

(3) Install air inejction manifold and tighten retaining nuts to 15 foot-pounds torque.

Removal - V-8

(1) Disconnect air delivery hose at check valve.

(2) Loosen injection tubes.

(3) Remove air injection manifold and injection tubes as an assembly.

NOTE: *Some inteference to removal may be encountered due to carbon buildup on the tubes.*

(4) Remove the injection tubes and sealing gaskets from the air injection manifold.

Installation - V-8

(1) Install injection tubes through the air injection manifold openings using a new sealing gasket at either side of each opening.

(2) Assemble air injection manifold and injection tubes to exhaust manifold; tighten the tubes to 38 foot-pounds torque.

(3) Connect air delivery hose.

Check Valve Test

To check the air injection manifold valve for proper operation, disconnect the air supply hose at the injection manifold. With the engine running above idle speed, listen and feel for exhaust leakage at the check valve. A slight leak is normal.

ENGINE MODIFICATIONS

The design of certain engine components is directly related to emission standards. The operation of such items as the camshaft, carburetor, ignition distributor and cylinder head affects the amount of emissions. Therefore, the correct combination of engine components, as prescribed by government certification, must be used in service. Refer to the appropriate sections of this manual for servicing these components.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL

The EGR System consists of a diaphragm-actuated flow control valve (EGR valve), coolant temperature override switch (EGR CTO), and connecting hoses (fig. 4A-8 and 4A-9).

Oxides of nitrogen (NOx) are formed by high heat created during combustion. The purpose of the EGR system is to limit the formation of oxides on nitrogen by diluting the intake charge with a metered amount of exhaust gas, thereby reducing the peak temperatures of the gases in the engine combustion chambers.

Exhaust gas enters the combustion chamber with the intake charge. The exhaust gas introduced is inert, and much cooler than combustion temperature. Since it will not burn, peak combustion temperature is lowered.

EGR VALVE

The EGR valve is mounted on a machined surface at the rear of the intake manifold on V-8 engines and on the side of the intake manifold on six-cylinder engines. Valves used with automatic transmissions are calibrated differently than those used with manual transmissions. Calibration is accomplished by the use of differently shaped pintles (fig. 4A-10).

The valve is held in a normally closed position by a coiled spring located above the diaphragm (fig. 4A-11). A special fitting is provided at the carburetor to route ported (above the throttle plate) vacuum through hose connections to a fitting on the valve which is located above the diaphragm. A passage in the intake manifold directs exhaust gas from the exhaust cross over passage (V-8 engine) or from below the heat riser area (six-cylinder engine) to the EGR valve.

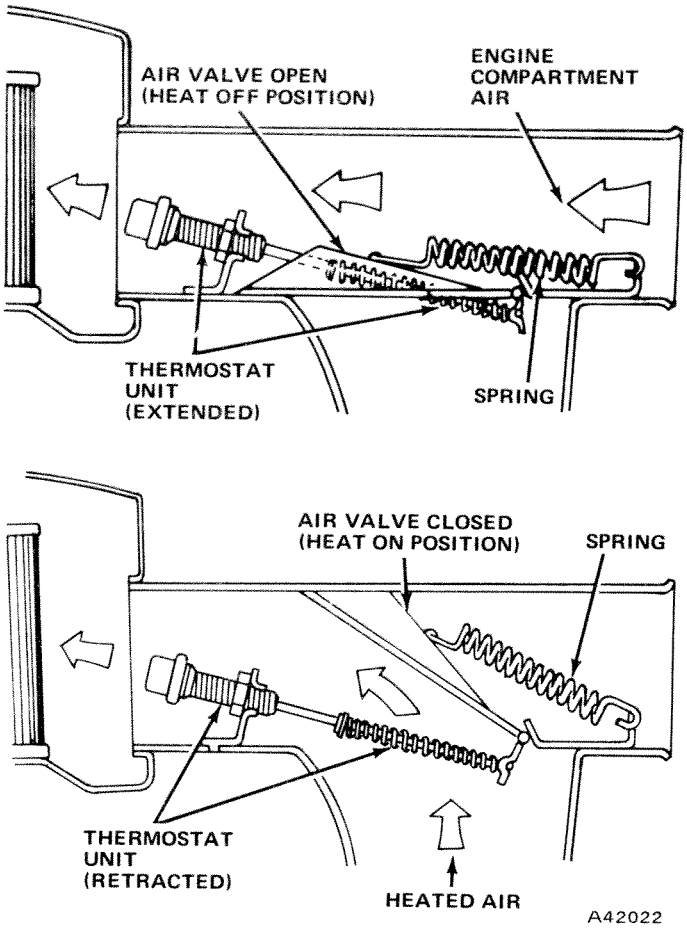


Fig. 4A-23 TAC System - Six-Cylinder

TAC Operational Test - Six-Cylinder

(1) Remove air cleaner top half and immerse snorkel in cold water making certain thermostat unit is covered.

(2) Place a thermometer in water and observe the temperature while heating water slowly.

NOTE: *With water temperature at 105 degrees F or less, air valve must be in closed (heat on) position.*

(3) Heat water until temperature reaches 130 degrees F; air valve must be in fully open (heat off) position.

NOTE: *If air valve does not open and close at temperatures specified, check valve mechanism for a binding condition or a disconnected or defective spring. If valve mechanism is in satisfactory condition, thermostat unit is defective and air cleaner assembly must be replaced.*

V-8 ENGINE

This system consists of a heat shroud which is integral with the right-hand exhaust manifold, a hot air hose, a special air cleaner assembly (equipped with a thermal sensor), and a vacuum motor and air valve assembly.

The thermal sensor incorporates an air bleed valve which regulates the amount of vacuum applied to the vacuum motor, thereby controlling the air valve position to supply either heated air from the exhaust manifold or air from the engine compartment (fig. 4A-24).

During the warmup period when underhood air temperatures are low, the air bleed valve is closed and sufficient vacuum is applied to the vacuum motor to hold the air valve in the closed (heat on) position.

As the temperature of the air entering the air cleaner approaches approximately 115 degrees F, the air bleed valve opens to decrease the amount of vacuum applied to the vacuum motor. The diaphragm spring in the vacuum motor then moves the air valve into the open (heat off) position, allowing only underhood air to enter the air cleaner.

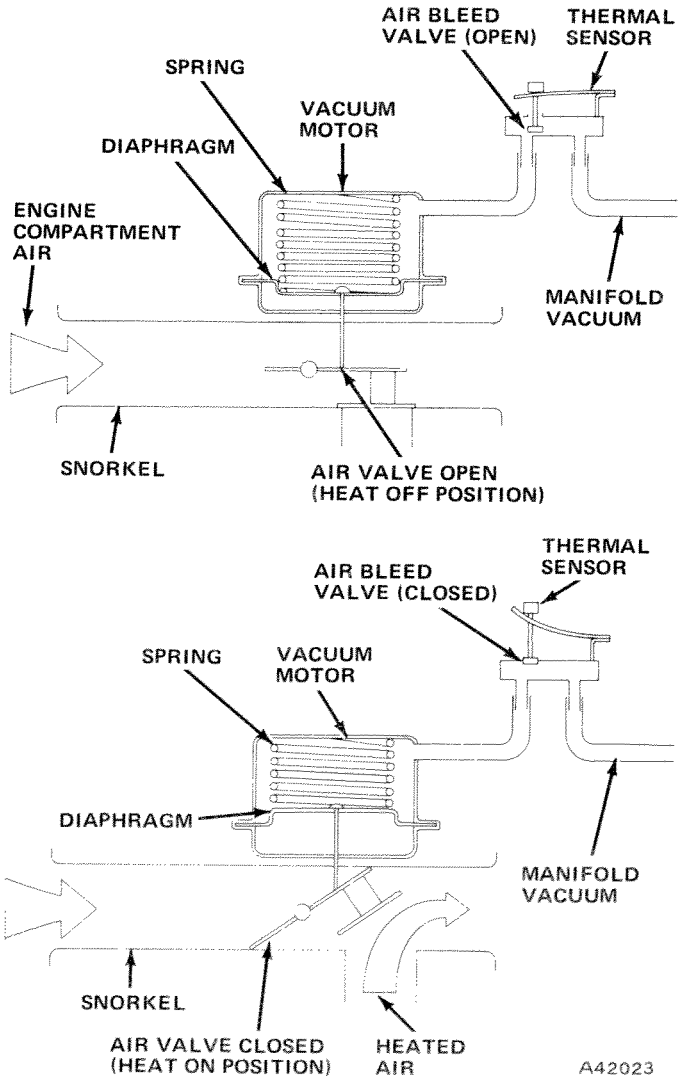


Fig. 4A-24 TAC System - V-8

The air valve in the air cleaner snorkel will also open, regardless of air temperature, during heavy

in-town driving; when the engine is suddenly put under heavy load, this material can melt and bridge the gap.

Scavenger Deposits - (B) - Fuel scavenger deposits shown may be white or yellow. They may appear to be harmful but this is a normal appearance with certain brand fuels. Such materials are designed to change the chemical nature of deposits to lessen misfire tendencies. Notice that accumulation on the ground electrode and shell areas may be unusually heavy, but the material is easily removed. Such plugs can be considered normal in condition, and can be cleaned with standard practices.

Chipped Insulator - (C) - Usually results from bending the center electrode during regapping of the plug. Under certain conditions, severe detonation can also split insulator firing ends.

Pre-ignition Damage - (D) - Caused by excessive temperatures, produces melting of the center electrode and, somewhat later, the ground electrode. Insulators will appear relatively clean of deposits. Check for correct plug heat range, overadvanced ignition timing and similar reasons for overheating.

Cold Fouling (or Carbon Fouled) - (E) - Dry, black appearance of one or two plugs in a set. Check for sticking valves or bad ignition leads. Fouling of the entire set may be caused by a clogged air cleaner, a sticking exhaust manifold heat valve, or a faulty choke.

Overheating - (F) - Indicated by a dead white or gray insulator which appears blistered. Electrode gap wear rate will be considerably in excess of 0.001 inch per 1000 miles. This may suggest that a cooler heat range should be used; however, overadvanced ignition timing, detonation, and cooling system stoppages can also cause overheating.

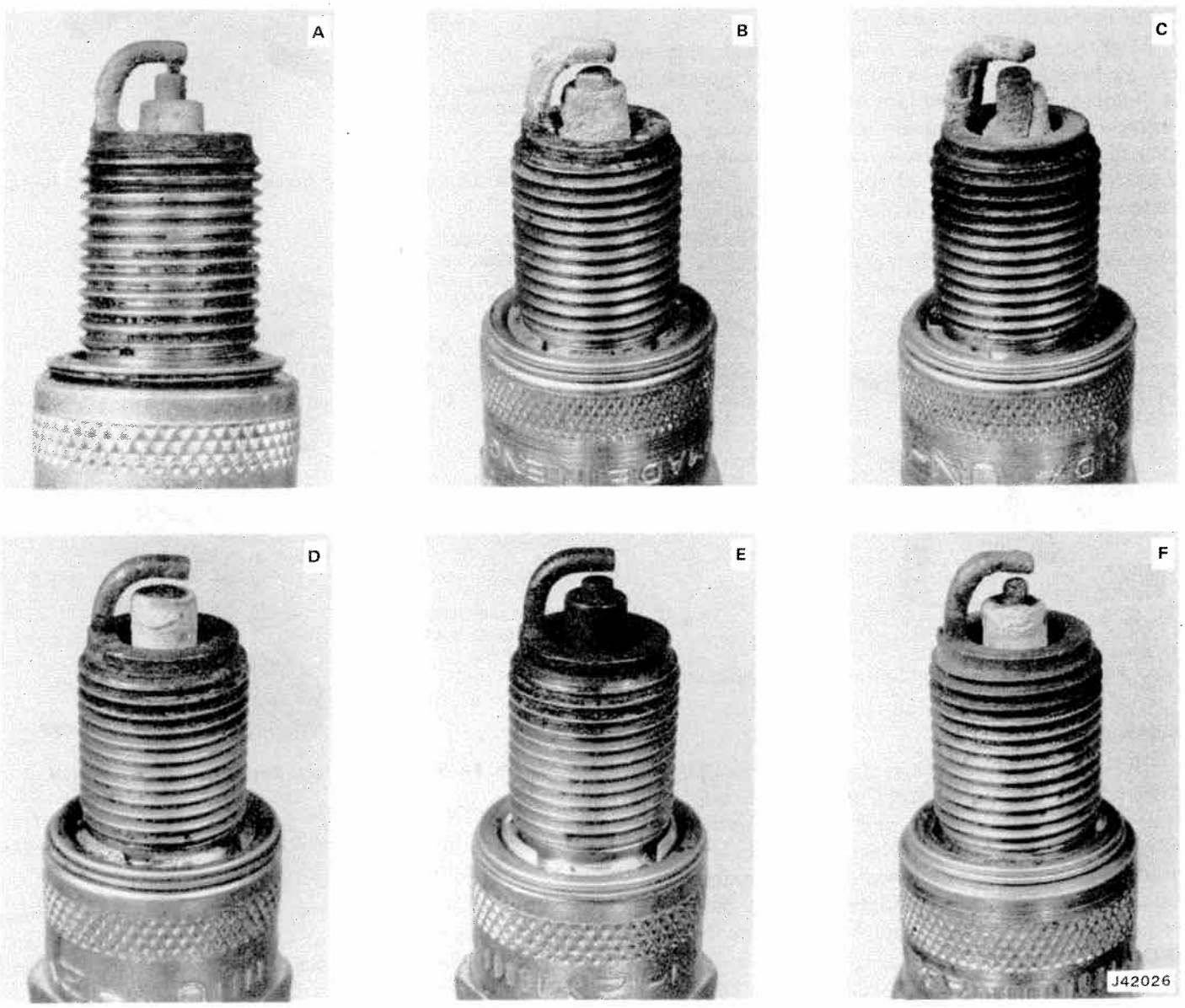


Fig. 4A-36 Spark Plug Conditions

required to fire the spark plug and bridge the rotor gap, sometimes referred to as the firing or ionization voltage.

Firing voltage is the amount of voltage required to establish a spark across the electrodes of a spark plug. In a running engine, the actual amount of voltage required to fire a particular spark plug at a particular instant depends on the net result of many factors such as rotor gap, breaks in the secondary wires, spark plug gap, spark plug electrode shape, improperly connected wire terminals, temperature, compression, air-fuel ratio, engine speed, and load.

Since current does not flow in the secondary until the arc is formed across the plug, the peak voltage is created with no current flowing in the secondary. In order to detect resistance in a circuit, current must be passed through the circuit. Therefore, peak voltage readings do not indicate resistance in the secondary.

Actual firing voltages can be easily measured at any reasonable engine speed by observing the height of the firing line on the secondary pattern of each cylinder. At any given engine speed, the firing voltage of all cylinders of an engine should be fairly uniform and within a normal range for that particular engine.
engine.

Available voltage is the maximum voltage an ignition system is able to produce under a given operating condition. The ignition coil will produce its maximum secondary voltage whenever it attempts to fire an impossible gap, such as when a spark plug wire is removed from a spark plug and held at a distance from ground. Available voltage is always greater than the voltage requirements generally encountered under normal operating conditions. The difference in available voltage and that actually required to fire the spark plugs is the Ignition Reserve.

The maximum secondary voltage available from the ignition system depends on the combined effect of coil design, coil condition, applied primary voltage, primary circuit resistance, distributor contact condition, dwell angle and engine speed. The normal functioning ignition system is capable of producing well over 20,000 volts and may even produce as high as 30,000 volts. However, should any of the factors involved in the operation of the ignition system deteriorate from their normal condition or adjustment, it will usually result in a change in available voltage values. Therefore, measuring the available voltage or coil reserve provides a quick means of determining the overall efficiency of any particular system.

Once the plug fires, there is a noticeable drop in secondary voltage to point B. As the spark continues to bridge the gap, the spark voltage remains at a fairly constant low value until the spark extinguishes at point C.

A normal spark line is 4 degrees to 7 degrees (read on horizontal scale of scope) at 1000 rpm. If the spark line is not normal, then the spark plug is not firing correctly, probably due to condition of spark plugs, secondary wiring, rotor, cap, or combustion chamber problems.

Once the arc has been formed across the spark plug gap, the voltage reduces to a value needed to maintain the arc across the plug. As long as the coil can supply the lower voltage, the arc will remain. The duration of this spark forms the spark line.

The spark will burn as long as the coil can supply the proper energy. The spark line ends only because the coil has run out of energy. The spark line length is a measure of the reserve of the coil. If the coil has very little reserve after ionizing the gap, all spark lines will be short. If the reserve is high, all spark lines will be long. This will not indicate the maximum reserve of the coil due to its built-in capacity, but does indicate the voltage left in the coil after the plug gap is fired. This reserve or remaining voltage is basically controlled by degrees of dwell and resistance in the secondary circuit.

Intermediate (Coil-Condenser) Section

This portion of the pattern, which immediately follows the Firing Section, is seen as a series of gradually diminishing oscillations which disappear or nearly disappear by the time the Dwell Section begins. Beginning at Point B, the remaining coil energy dissipates itself as an oscillating current which gradually dies out as it approaches Point C. The oscillation results from the combined effects of the coil and the condenser in dissipating energy.

The Intermediate Section represents the dissipation of the energy remaining in the coil after the spark plug has ceased firing and can be observed when each cylinder's pattern is displayed individually.

The number of oscillations that can be observed depends on a number of factors such as dwell angle, engine speed, duration of spark, degree of coil saturation and coil and condenser condition. There must be at least 4 oscillations in this section (at 1000 rpm). Usually there are 5 or 6. Note the rate at which these oscillations diminish. Normally, they should diminish gradually, but should the system contain a weak coil or leaky condenser, they will dimish to zero rapidly. In this case, probably only one or two oscillations will be seen at an engine speed of 1500 rpm, providing the dwell angle and firing section are normal.

Under operating conditions where the firing line is quite long or the dwell angle is greater than specified, the intermediate section may be shortened by the closing of the breaker points before all of the coil energy has been dissipated. Under these conditions, fewer than normal oscillations having a fairly high amplitude at the instant of point closing may be displayed.

This indicates that the energy level in the coil is

DRILL SIZES

Letter Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches
Z	0.413	1	0.2280	28	0.1405	55	0.0520
Y	0.404	2	0.2210	29	0.1360	56	0.0465
X	0.397	3	0.2130	30	0.1285	57	0.0430
W	0.386	4	0.2090	31	0.1200	58	0.0420
V	0.377	5	0.2055	32	0.1160	59	0.0410
U	0.368	6	0.2040	33	0.1130	60	0.0400
T	0.358	7	0.2010	34	0.1110	61	0.0390
S	0.348	8	0.1990	35	0.1100	62	0.0380
R	0.339	9	0.1960	36	0.1065	63	0.0370
Q	0.332	10	0.1935	37	0.1040	64	0.0360
P	0.323	11	0.1910	38	0.1015	65	0.0350
O	0.316	12	0.1890	39	0.0995	66	0.0330
N	0.302	13	0.1850	40	0.0980	67	0.0320
M	0.295	14	0.1820	41	0.0960	68	0.0310
L	0.290	15	0.1800	42	0.0935	69	0.0292
K	0.281	16	0.1770	43	0.0890	70	0.0280
J	0.277	17	0.1730	44	0.0860	71	0.0260
I	0.272	18	0.1695	45	0.0820	72	0.0250
H	0.266	19	0.1660	46	0.0810	73	0.0240
G	0.261	20	0.1610	47	0.0785	74	0.0225
F	0.257	21	0.1590	48	0.0760	75	0.0210
E	0.250	22	0.1570	49	0.0730	76	0.0200
D	0.246	23	0.1540	50	0.0700	77	0.0180
C	0.242	24	0.1520	51	0.0670	78	0.0160
B	0.238	25	0.1495	52	0.0635	79	0.0145
A	0.234	26	0.1470	53	0.0595	80	0.0135
		27	0.1440	54	0.0550		

into the bowl. If the throttle is opened suddenly, the upper pump spring is compressed resulting in a smooth pump discharge.

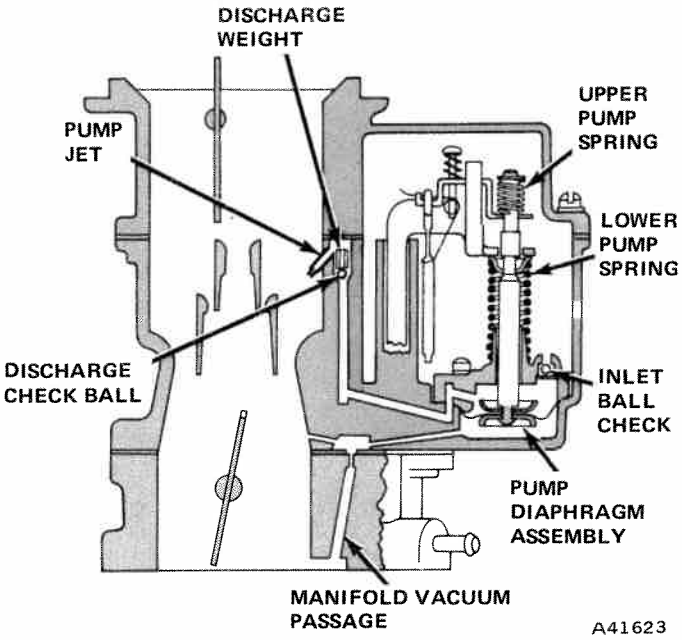


Fig. 4-14 Pump Circuit

A pump relief bushing, located near the top of the pump discharge passage, allows fuel bowl air pressure to enter the passage. The pump relief serves two purposes. One is to prevent fuel being drawn out of the pump circuit during high speed constant throttle operation. The other is to bleed off a calibrated portion of the pump discharge back to the fuel bowl, thereby regulating the amount of discharge through the pump jet.

Choke Circuit

The automatic choke provides the richer mixture necessary for quick cold engine starting and proper warmup performance (fig. 4-15). When the engine is cold, thermostatic coil tension holds the choke valve closed. As the engine is cranked, air pressure against the offset choke valve causes the valve to open slightly against the thermostatic coil tension. Intake manifold vacuum, applied to the choke piston, also tends to pull the choke valve open. When the engine starts, the choke valve assumes a partially open position where thermostatic coil tension is balanced by the pull of vacuum on the piston and force of the air stream against the offset choke valve. This choke valve opening is known as "initial choke valve clearance"

As the choke piston moves down in the cylinder, it exposes slots located in the sides of the cylinder. This allows intake manifold vacuum to draw warm air, heated by the exhaust manifold, through the thermostatic coil housing. This warm air causes the thermostatic spring to gradually lose its tension until the choke valve is in a wide-open position.

If the engine is accelerated during the warmup period, the corresponding drop in manifold vacuum allows the thermostatic coil to momentarily close the choke valve to provide a richer mixture.

To prevent stalling during the warmup period, it is necessary to provide a faster idle speed. The fast idle cam, actuated by the choke shaft through connecting linkage, rotates into position against the fast idle screw. The cam is progressively stepped to provide the correct speed in proportion to the choke valve opening. When the choke valve reaches the fully open position, the fast idle cam rotates free of the fast idle screw, allowing the throttle lever to return to curb idle position.

If the engine floods during starting, the choke valve may be opened manually to clean out excessive fuel in the intake manifold. This is accomplished by depressing the accelerator pedal to the floor and cranking the engine. With the accelerator linkage in this position, a tang on the throttle lever contacts the fast idle cam, causing the choke rod to move upward and open the choke valve a predetermined amount.

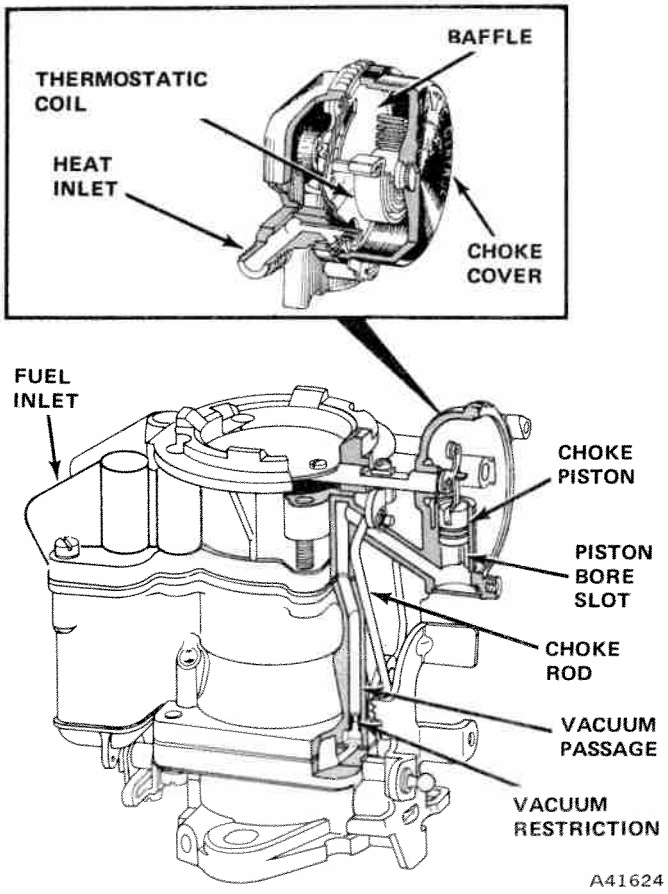


Fig. 4-15 Choke Circuit

REMOVAL

Flooding, stumble on acceleration, and other performance problems are in many instances caused by the presence of dirt, water, or other foreign matter in the carburetor. To aid in diagnosing the problem, the car-

tions at the lower end of the diagonal passages and then enters the idle passages in the main body (fig. 4-34).

Air enters the idle system through air bleeds which are located in the main body directly below the booster venturi. The air bleeds serve as anti-siphon vents during off-idle, high speed operation, and when the engine is stopped.

The fuel-air mixture moves down the idle passages past the idle transfer slots which serve as additional air bleeds during curb idle opeartion. The fuel-air mixture then moves past the idle mixture adjusting screw tips which control the amount of discharge. From the adjusting screw ports, the fuel-air mixture moves through short horizontal passages and is discharged below the throttle valves.

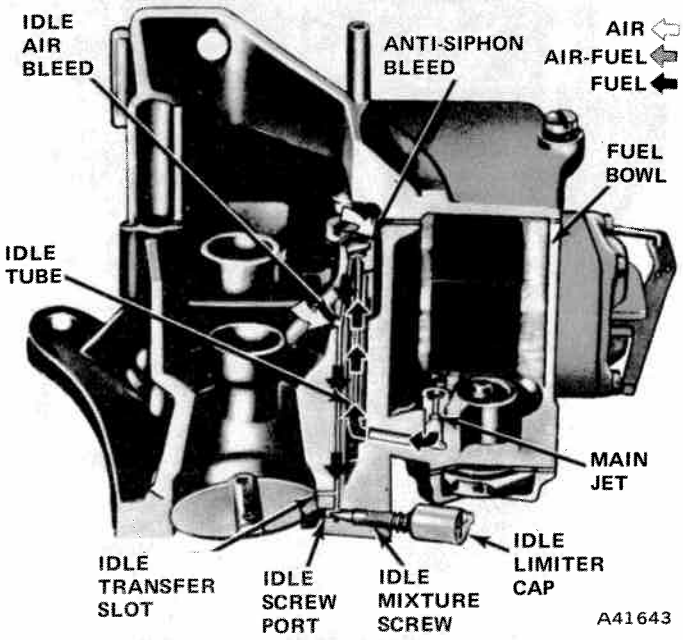


Fig. 4-34 Idle Circuit

At speeds slightly above idle, the idle transfer slots begin discharging the fuel-air mixture as the throttle valves expose them to manifold vacuum as the throttle valves continue opening and engine speed increases, the airflow through the carburetor increases proportionately. This increased airflow creates a vacuum in the venturi and the main metering system begins discharging a fuel-air mixture. The discharge from the idle circuit tapers off as the main metering circuit begins discharging.

Main Metering (High Speed) Circuit

As engine speed increases, the air velocity through the booster venturi creates a vacuum (low pressure area). Fuel begins to flow through the main metering circuit due to atmospheric pressure in the fuel bowl and low pressure at the main discharge ports. Fuel flows from the fuel bowl, through the main jets, and into the main wells. The fuel then moves up the main well tubes where it is mixed with air. The air, supplied through the main air bleeds, mixes with the fuel through small holes in the sides of the main well tubes. The main air bleeds meter an increasing amount of air, whenever venturi vacuum increases, to maintain the proper fuel-air ratio. The mixture of fuel and air, being lighter than raw fuel, responds quickly to changes in venturi vacuum. It also atomizes more readily than raw fuel.

The fuel-air mixture moves from the main well tubes to the discharge ports and is discharged into the booster venturi (fig. 4-35).

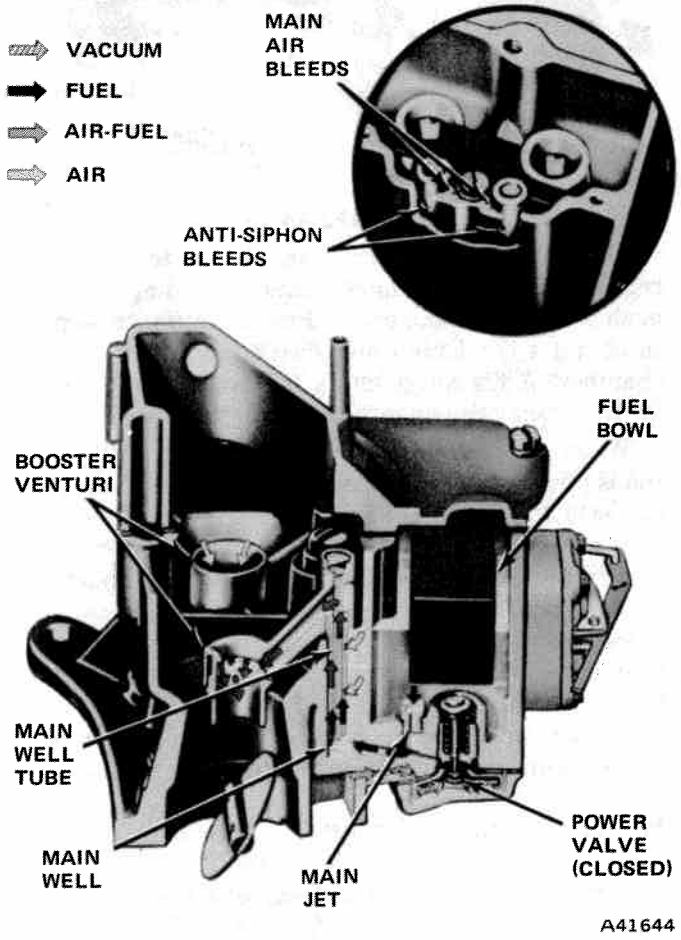


Fig. 4-35 Main Metering Circuit

Anti-siphon air bleeds, located near the top of the main well tubes, prevent siphoning of fuel from the main well when decelerating.

Pump Circuit

When the throttle valves are opened quickly, the airflow through the carburetor responds almost immediately. Since the flowing fuel is heavier than air, there is a brief lag in time before the fuel flow can gain sufficient speed to maintain the proper fuel-air ratio. During this lag, the pump circuit supplies the required fuel until the proper fuel-air ratio can be maintained by the other metering circuits (fig. 4-36).

rod through clip and overtravel lever. Release clip to engage rod.

Idle Speed and Mixture Adjustment

Refer to Engine Idle Setting Procedures in Emission Control Section.

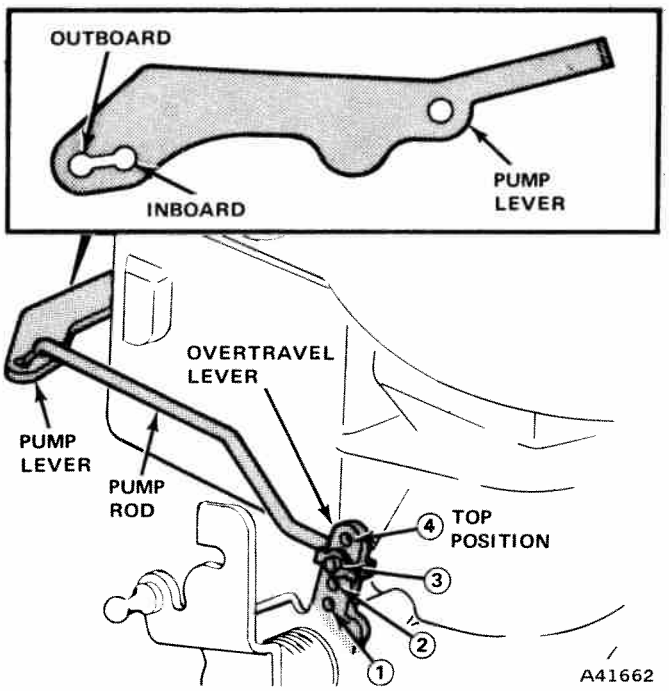


Fig. 4-53 Accelerating Pump Sroke Adjustment

Dashpot Adjustment (On Car)

With the throttle set at curb idle position, fully depress the dashpot stem and measure the clearance between the stem and the throttle lever (fig. 4-54).

Refer to Carburetor Service Specifications for correct setting. Adjust by loosening the locknut and turning the dashpot.

Fast Idle Speed Adjustment (On Car)

Set the fast idle speed with the engine at operating temperature and the fast idle speed adjusting screw against the index mark (second step) of the fast idle cam (refer to Carburetor Service Specifications for the correct rpm setting). Adjust by turning the fast idle speed adjusting screw.

NOTE: *When adjusting fast idle speed, disconnect electrical connector from TCS solenoid vacuum valve.*

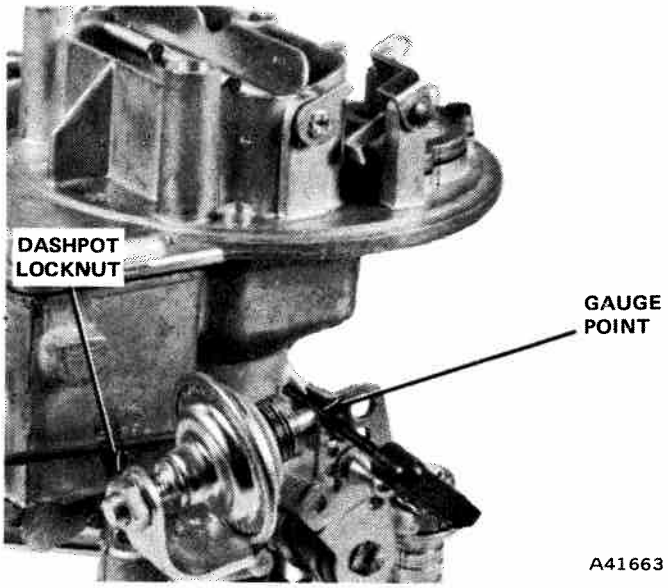


Fig. 4-54. Dashpot Adjustment

MODEL 2100 CARBURETOR CALIBRATIONS

List No.	4DMJ2	4DM2	4RA2	4RHD2
Throttle Bore Size	1.562	1.562	1.562	1.562
Main Venturi Size	1.080	1.080	1.080	1.080
Fuel Inlet Diameter	0.101	0.101	0.101	0.101
Low Speed Jet (Tube)	0.035	0.035	0.035	0.038
Economizer	0.046	0.046	0.046	0.055
Idle Air Bleed	0.101	0.101	0.099	0.106
Main Jet Number	48	48	47	47

(Continued)

parts. Force compressed air through all passages of the carburetor.

CAUTION: *Do not use a wire brush to clean any parts or a drill or wire to clean out any openings or passages in the carburetor. A drill or wire may enlarge the hole or passage, changing the calibration of the carburetor.*

Check the choke shaft for grooves, wear, and excessive looseness or binding. Inspect the choke plate for nicked edges and ease of operation and free it if necessary. Make sure all carbon and foreign material has been removed from the automatic choke housing and the piston. Check operation of choke piston in choke housing to make certain it has free movement. Check the throttle shafts in the bores for excessive looseness or binding and check the throttle plates for burrs which prevent proper closure. Inspect the main body, throttle body, air horn, choke housing, and thermostatic spring housing for cracks. Replace the float if the arm needle contact surface is grooved. If the floats are serviceable, polish the needle contact and surface of the arm with crocus cloth or steel wool. Replace float shafts if worn. Replace all screws and nuts that have stripped threads. Replace all distorted or broken springs. Inspect all gasket mating surfaces for nicks and burrs. Repair or replace any parts that have a damaged gasket surface.

Assembly

(1) If throttle plates and shafts are removed, slide primary throttle return spring (coiled clockwise) on primary throttle shaft (flat milled) and slide shaft into primary shaft holes (mixture needle side of body).

(2) Position primary throttle plates (smaller diameter) in primary bores with ground flat edge of plates facing up and towards idle mixture needles. Install plate attaching screws snug but not tight.

(3) Rotate throttle shaft to closed position and tap plates lightly with screwdriver handle or similar tool, so that plates are properly and fully seated in throttle bores (when viewed with a light behind the plates, little or no light should be observed). Tighten throttle plate screws.

(4) Install secondary throttle lockout lever.

(5) Install fast idle speed lever and adjusting screw.

(6) If the fast idle cam and bushing were removed, insert automatic choke shaft bushing through choke housing. Position fast idle cam between choke housing and bushing column. Slide bushing through fast idle cam. Press bushing in choke housing and into column. Clean bushing with 1/4-inch reamer.

(7) Insert automatic choke shaft and lever in bushing.

(8) Position automatic choke piston in choke cylinder and lever on automatic choke shaft. Install attaching screw.

(9) Insert secondary throttle to primary throttle connecting rod into throttle levers and install retainers.

(10) Position main body on a working surface with fuel bowl down.

(11) Position main body to throttle body gasket on main body.

(12) Position throttle body on main body and install attaching screws.

(13) Invert main body and throttle body so fuel bowl is upward.

(14) Install power valve and main jets in main body.

(15) Install choke-to-throttle lockout lever.

(16) Place accelerator pump ball check in pump inlet hole of pump chamber. Install ball check retaining ring.

(17) Place accelerator pump discharge needle into pump discharge cavity.

(18) Install components removed from air horn in the following order:

(a) Fuel inlet needle seat with a ½-12 point socket.

(b) Auxiliary fuel inlet valve and gasket using Tool J-10185.

(19) Assemble accelerator pump plunger and insert into air horn.

(20) Compress pump plunger and insert accelerator pump arm into plunger stem. Insert the split pivot pin through the specified hole in the lever and the air horn casting (refer to Carburetor Service Specifications).

(21) If choke plate and shaft were removed, slide choke shaft through holes in air horn. Install choke shaft lever on end of shaft on automatic choke side.

NOTE: *The lever and shaft are tapered and the attaching screw has a left-hand thread. Insert choke plate into slot in choke shaft and install plate attaching screws snug but not tight.*

(22) Close choke plate and gently tap the plate to position plate in air horn. Tighten attaching screws.

(23) If air valve plates and shaft were removed, slide shaft through holes on secondary side of air horn with slotted end of shaft in air valve spring chamber.

(24) Position air valve plate in air horn opening on underside of air horn and adjacent to spring chamber.

(25) Install plate attaching screws snug but not tight. Position other air valve plate in the air horn opening with the eye retainer for air valve control rod facing upward. Install plate attaching screws snug but not tight.

(26) Close air valves plates and lightly tap plates to properly position them in air horn. Tighten attaching screws.

NOTE: *Be sure plates and shaft turn freely after assembly.*

(27) Insert fuel inlet needle into fuel inlet seat.

(28) Position float and lever assembly between hinge post and over fuel inlet valves. Insert float hinge pin through the post and float lever.

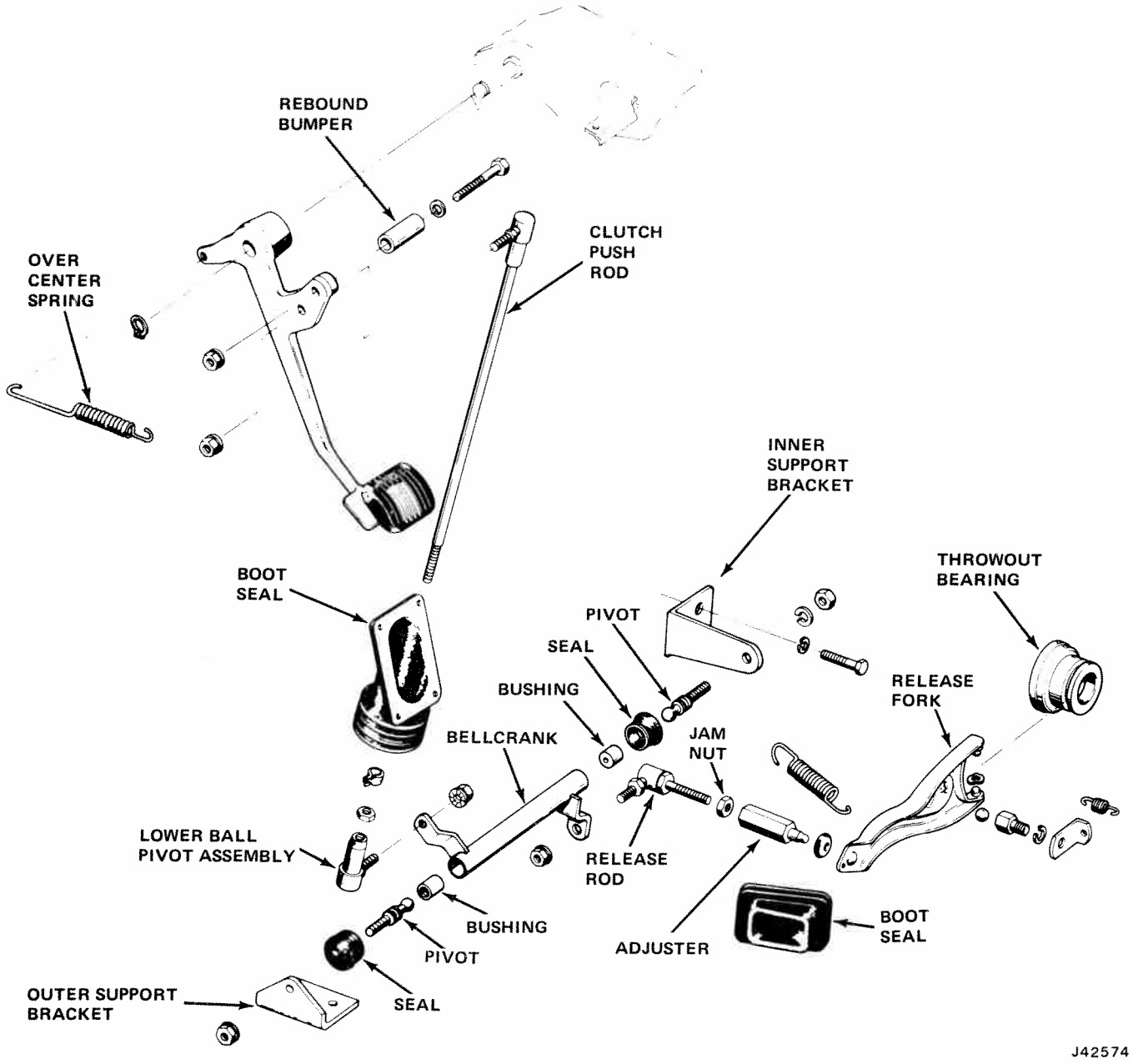


Fig. 5-3 Clutch Operating Linkage Components - Cherokee, Wagoneer, and Truck

Removal

(1) Fill crankshaft cavity and pilot bushing bore with an all-purpose lubricant.

(2) Insert clutch aligning tool straight into bushing and tap end of tool with a lead or brass hammer. Hydraulic pressure will force the bushing out of crankshaft without damaging bushing.

Installation

(1) Clean all grease from the crankshaft cavity.

(2) Soak bushing in engine oil. Soak lubrication wick in engine oil. Apply film of chassis grease to clutch shaft pilot hub.

(3) Use clutch aligning tool as a bushing driver and install bushing straight into crankshaft until bushing is seated.

FLYWHEEL

Inspect the condition of the flywheel as well as the pressure plate for any roughness. Check all flywheel capscrews for tightness. Tighten the capscrews to 105 foot-pounds.

TRANSMISSION CLUTCH SHAFT

Slide the clutch driven plate onto the transmission clutch shaft to make sure that it is free on the splines. If the splines on the transmission clutch shaft are bur-

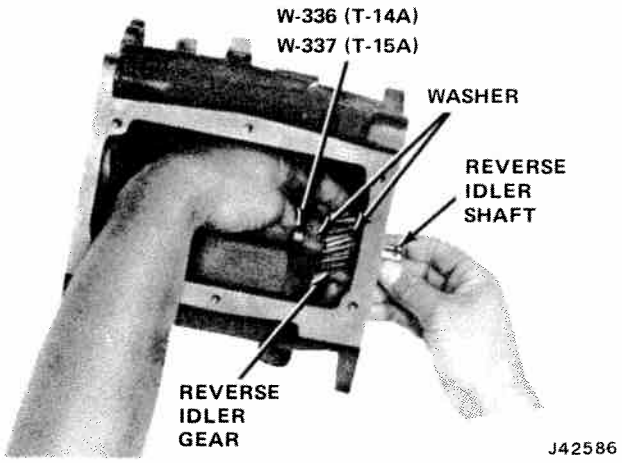


Fig. 6-9 Reverse Gear Idler Gear Removal and Installation

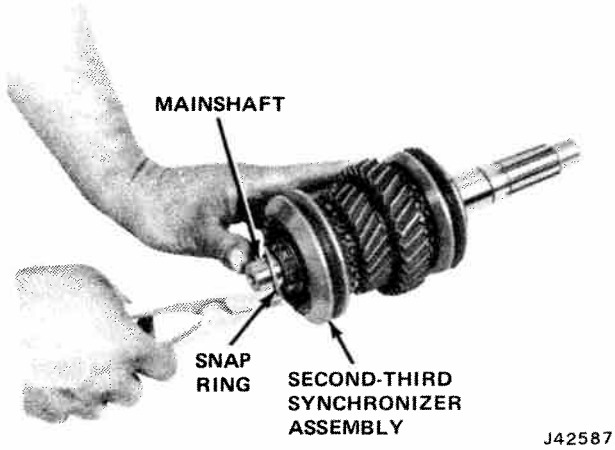


Fig. 6-10 Second-Third Clutch Hub Snap Ring Removal and Installation

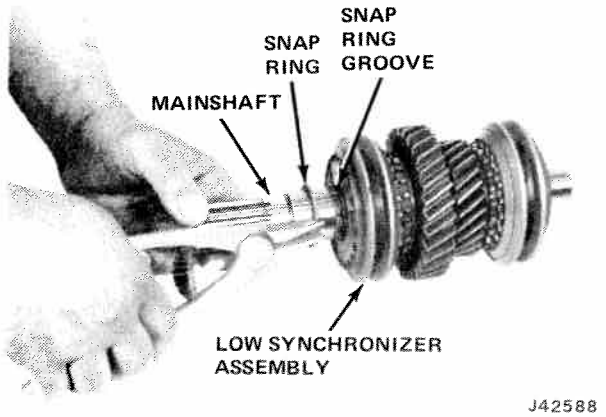


Fig. 6-11 Low Clutch Hub Snap Ring Removal and Installation

Synchronizer Assemblies

Second-Third Synchronizer Unit - Disassembly

(1) Remove springs (one on each side of unit).

(2) Mark sleeve and hub before separating to ensure proper installation at assembly.

(3) Remove hub from sleeve.

(4) Remove three synchronizer plates from third-speed side of hub.

(5) Clean and inspect synchronizer assembly parts.

(6) Assemble synchronizer in reverse order of disassembly, **making certain the two synchronizer spring openings are installed 120 degrees opposite each other, with spring tension opposed** (fig. 6-12).

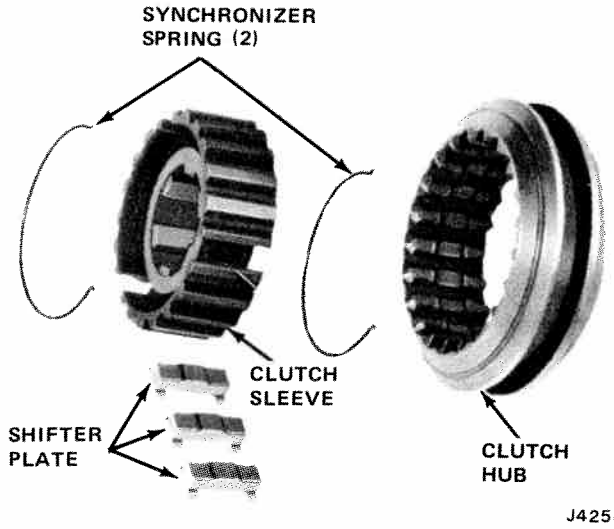


Fig. 6-12 Second-Third Synchronizer Assembly

Low Synchronizer Unit - Disassembly

The low synchronizer assembly is serviced in the same manner as second-third with the exception of one synchronizer spring (fig. 6-13).

NOTE: *Should a synchronizer assembly (either low-and-reverse or second-and-high) be replaced for any reason on a floor shift transmission, the shift fork that operates the synchronizer being replaced must have an identifying letter A appearing just under the shaft hole on the side opposite the pin. If the letter A does not appear on the existing fork, it must be replaced with a letter A fork.*

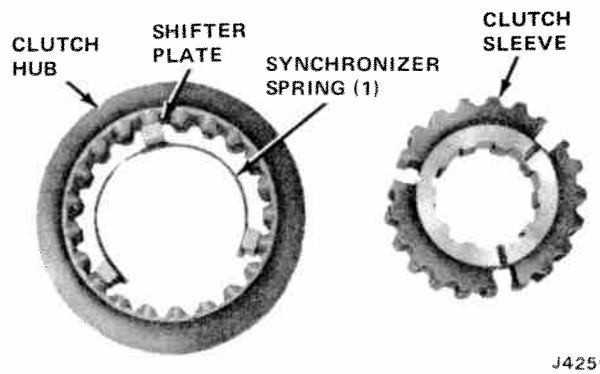


Fig. 6-13 Low Synchronizer Assembly

retainer with oil return hole located in front face of transmission case. Install capscrews and tighten to 8 to 15 ft-lb torque.

(26) Install reverse shifting arm. Move first- and second-speed synchronizer sleeve toward rear of transmission case to provide clearance.

(27) For installation of reverse shifting arm, install O-ring seal on reverse shifting arm pivot pin.

(28) Place reverse shifting arm into transmission case, indexing shoe of arm with groove in reverse idler gear.

(29) Hold reverse shifting arm in position and install pivot pin into case and through arm. Install tapered pin from rear of pivot pin boss and tap in with hammer until snug.

(30) Position new gasket on power takeoff cover and with nonhardening sealer applied to capscrews, install to transmission case. Tighten capscrews to 8 to 15 ft-lb torque.

(31) Install transmission and drain and fill plugs. Pour a pint of recommended gear lubricant over all gears in case while rotating main drive gear. Position synchronizer units in neutral position.

(32) Place new gasket on top of transmission case. Lower shift control housing down on top of case making sure shift forks are started into synchronizer sleeves and reverse shifting arm upper end engages flat portion of reverse shift rail. Install capscrews and tighten alternately and evenly to 8 to 15 ft-lb torque.

(33) Check operation of transmission by shifting gears in all ranges.

(34) Install transfer case drive gear spacer, drive gear, washer and retaining nut.

(35) Using a new gasket, assemble transfer case to transmission.

SHIFT CONTROL HOUSING

Disassembly

The rear shift lever, spring, seat and pivot are removed during transmission removal.

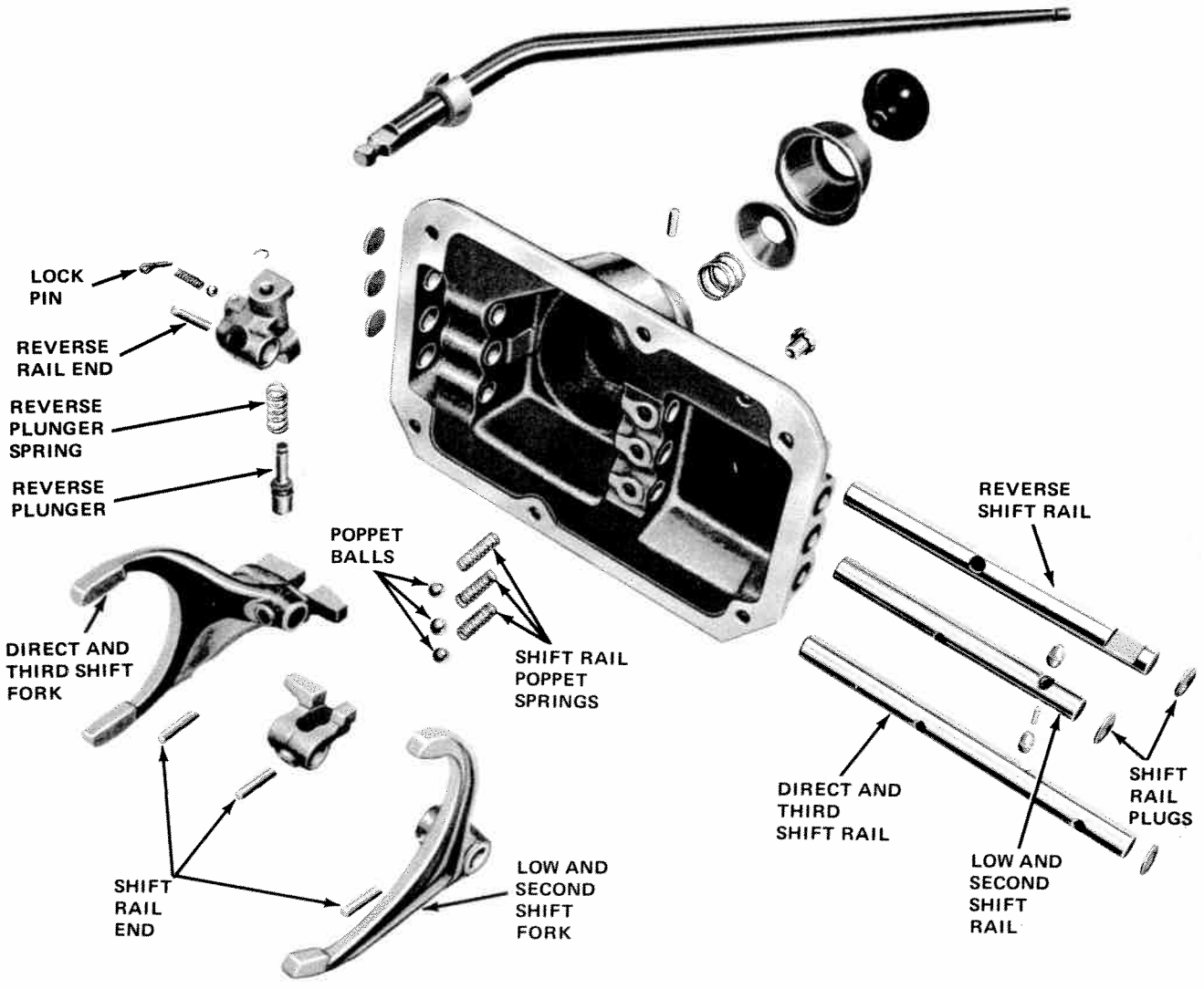


Fig. 6-36 4-Speed Transmission Shift Control Housing

Front End Leak

- Front seal — damaged (check converter necks for nicks, etc., also for pump bushing moved forward), garter spring missing.
- Pump attaching bolts, and seals — damaged, missing, bolts loose.
- Converter — leak in weld.
- Pump O-ring seal — damaged. (Also check pump oil ring groove and case bore.)
- Porous casting (pump or case).
- Pump — drain-back hole not open.

Oil comes out vent pipe

- Transmission overfilled.
- Water in oil.
- Filter O-ring damaged or improperly assembled causing oil to foam.
- Foreign material between pump and case or between pump cover and body, or variable stator solenoid screws too long — holding pump halves apart.
- Case — porous, pump face improperly machined.
- Pump — shy of stock, porous.
- Pump breather hole blocked or missing.
- Hole in intake pipe.
- Check ball in forward clutch housing stuck open or missing.

Oil Cooler Lines

- Connections at radiator loose or stripped.
- Connections at case loose or stripped.

Modulator Assy.

- Diaphragm defective.

Causes of Burned Clutch Plates

Forward Clutch

- Check ball in clutch housing damaged, stuck or missing.

(Continued on page 7-13).

TRANSMISSION MALFUNCTION RELATED TO OIL PRESSURE

(Pressures Obtained By The Preliminary Checking Procedures)

Malfunction	Drive Brakes Applied 1000 rpm	Reverse Brakes Applied 1000 rpm	D-2 or D-1 Brakes Applied 1000 rpm	Neutral Brakes Applied 1000 rpm	Drive 30 mph Closed Throttle	Drive Idle	Pressure Drop Occurs While Engine rpm Increases From 1000 to 3000 rpm Wheels free to Move *	Possible Cause of Malfunction
	Oil Pressure	Oil Pressure	Oil Pressure	Oil Pressure	Oil Pressure	Oil Pressure		
No 1-2 Upshift and/or Delayed Upshift	Normal	Normal	Normal	Normal	Normal	Normal	Drop	Malfunction in Control Valve Assy.
	Normal	Normal	Normal	Normal	Normal	Normal	No Drop	Malfunction in Governor or Governor Feed System
	High	Normal	Normal	Normal	High	—	—	Malfunction in Detent System
	High	High	Normal	High	—	—	—	Malfunction in Modulator or Vacuum Feed System to Modulator
Slipping — Reverse	Normal	Low	Normal	Normal	Normal	—	—	Oil Leak in Feed System to The Direct Clutch
Slipping — 1st Gear	Low	Normal	Low to Normal	Normal	Low to Normal	—	—	Oil Leak in Feed System to The Forward Clutch
Downshift With Zero Throttle and No Engine Braking In Drive	Normal	Normal	Normal	Normal	High	High	—	Stator and Detent Wires Switched

*Drive Range, Vacuum Line Disconnect to Modulator.

J42427

Damaged Modulator

- Stuck valve.
- Water in modulator.
- Not operating properly.

Detent System

- Detent switch (plunger stuck, or shorted, or misadjusted).
- Detent wiring shorted.
- Detent solenoid stuck open.
- Detent feed orifice in spacer plate blocked.
- Detent solenoid loose.
- Detent valve bore plug damaged.
- Detent reg. valve pin short.

Pump

- Pressure regulator and/or boost valve stuck.
- Incorrect pressure regulator spring or valve.
- Too many pressure reg. valve spacers.
- Pump casting bad.
- Pressure boost valve installed backwards or defective.
- Aluminum bore plug has hole or otherwise defective.
- Pressure boost bushing broken or otherwise defective.

Control Valve Assembly

- Control valve assy. to spacer gasket off location.
- Gaskets installed in reverse order.

Causes of Improper Vacuum At Modulator

Engine

- Tune up.
- Loose vacuum fittings.
- Vacuum operated accessory leak (hoses, vacuum advance, etc.)
- Engine exhaust system restricted.

Vacuum Line To Modulator

- Leak.
- Loose fitting.
- Restricted orifice, or incorrect orifice size.
- Carbon buildup at modulator vacuum fitting.
- Pinched line.
- Grease in pipe (delayed or no upshift-cold).

Control Valve Assembly— Governor Line Pressure Check

(1) Install line pressure gage.
(2) Disconnect vacuum line to modulator.
(3) With car on hoist (rear wheels off ground, foot off brake, in drive) check line pressure at 1000 rpm.
(4) Slowly increase engine rpm to 3000 rpm and determine if a line pressure drop occurs (7 psi or more).
(5) If pressure drop occurs, disassemble, clean and inspect control valve assembly.
(6) If no pressure drop occurs:

Inspect Governor.

- Stuck valve.
- Weight freeness.
- Restricted orifice in governor valve.

Governor Feed System.

- Check screen in control valve assembly or case.
- Check for restrictions in governor pipe.

Modulator Assembly Diagnosis Procedure

Vacuum Diaphragm Leak Check

(1) Insert a pipe cleaner into the vacuum connector pipe as far as possible and check for the presence of transmission oil.
(2) If oil is found, replace the modulator.
(3) Transmission oil may be lost through diaphragm and burned in engine.

NOTE: *Gasoline or water condensation may settle in the vacuum side of the modulator. If this is found without the presence of oil the modulator should not be changed.*

Atmospheric Leak Check

(1) Apply a liberal coating of soap bubble solution to vacuum connector pipe seam, crimped upper-to-lower housing seam, and threaded screw seal.
(2) Use short piece of rubber tube, apply air pressure to vacuum pipe by blowing into tube and observe for leak bubbles. If bubbles appear, replace the modulator.

NOTE: *Do not use any method other than human lung power for applying air pressure, as pressure over 6 psi may damage the modulator.*

MINOR MAINTENANCE AND ADJUSTMENTS

Services outlined below can be performed without removing the transmission from the vehicle. Complete procedures are not given for all of these services, since they are covered in detail under disassembly and reassembly.

to bring the end play within specification, it can be selected from the following chart.

Thickness (Inch)	Notches and/or Numeral	
0.074 to 0.078	None	1
0.082 to 0.086	1 Tab Side	2
0.090 to 0.094	2 Tabs Side	3
0.098 to 0.102	1 Tab OD	4
0.106 to 0.110	2 Tabs OD	5
0.114 to 0.118	3 Tabs OD	6

Intermediate Clutch Removal

(1) Remove bolt which secures center support to case, using a ⅜ inch 12-point thin wall deep socket (fig.7-32).

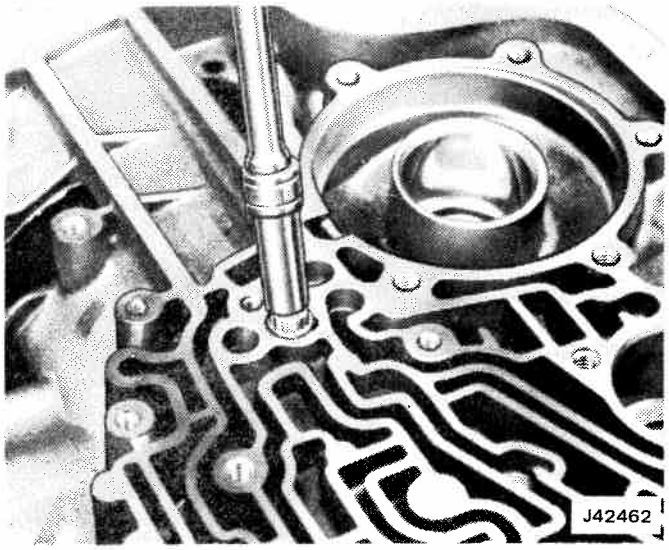


Fig. 7-32 Removing Center Support Bolt

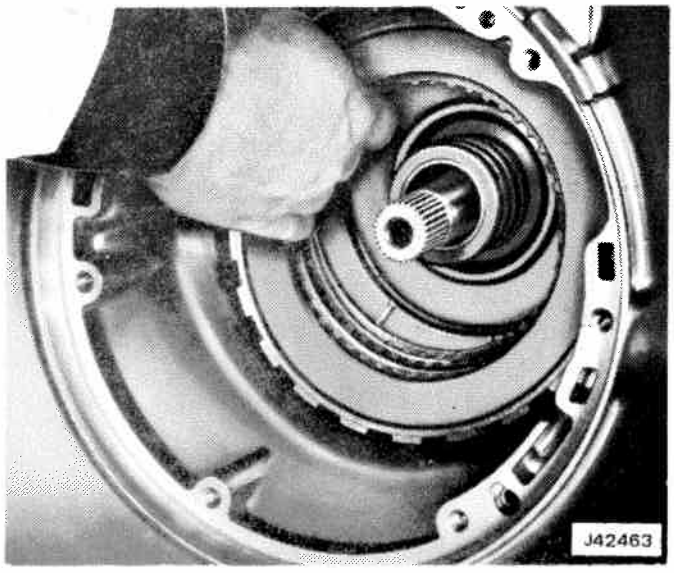


Fig. 7-33 Intermediate Clutch

(2) Remove intermediate clutch backing plate to case snap ring.

(3) Remove intermediate clutch backing plate, three composition, and three steel clutch plates from transmission case (fig. 7-33).

Center Support and Gear Unit Assembly, Support-to-Case Spacer, Rear Band Assembly Removal

(1) Remove center support to case snap ring as shown in fig. 7-34.

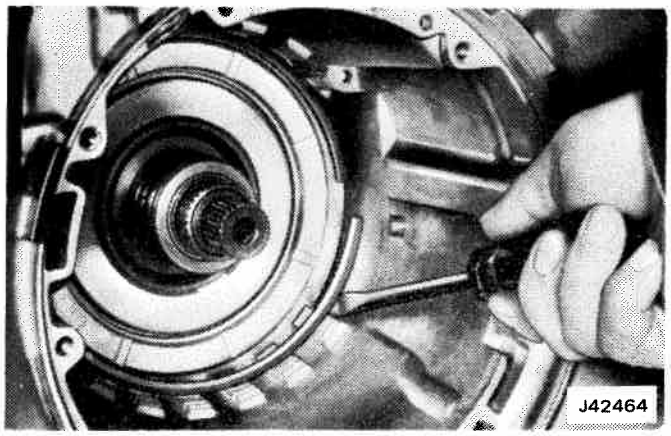


Fig. 7-34 Removing Center Support Snap Ring

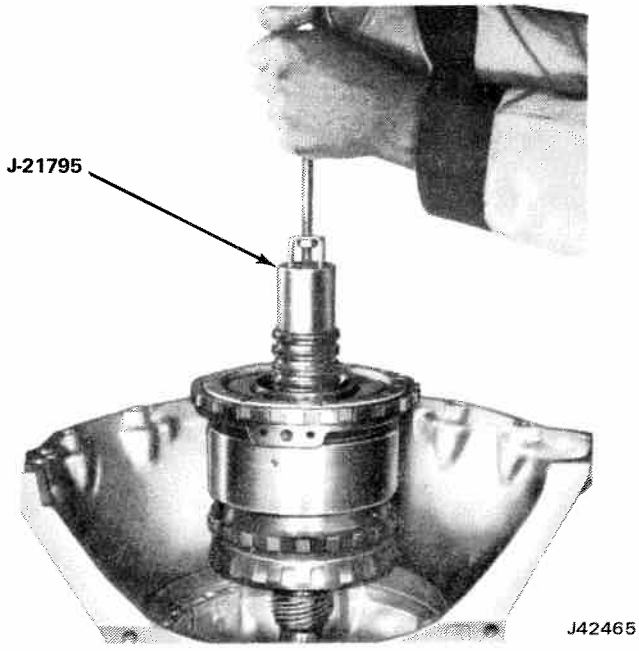


Fig. 7-35 Removing Center Support and Gear Unit

(2) Remove entire gear unit asssembly from transmission case by lifting with Gear Assembly Installing and Removing Tool J-21795, with Slide Hammer C-3752 (fig. 7-35).

(3) Remove output shaft-to-case thrust washer from rear of output shaft or inside case.

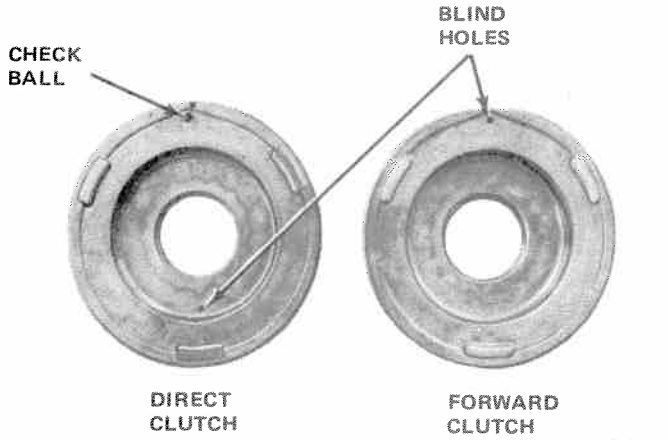


Fig. 7-66 Forward and Direct Clutch Piston Identification

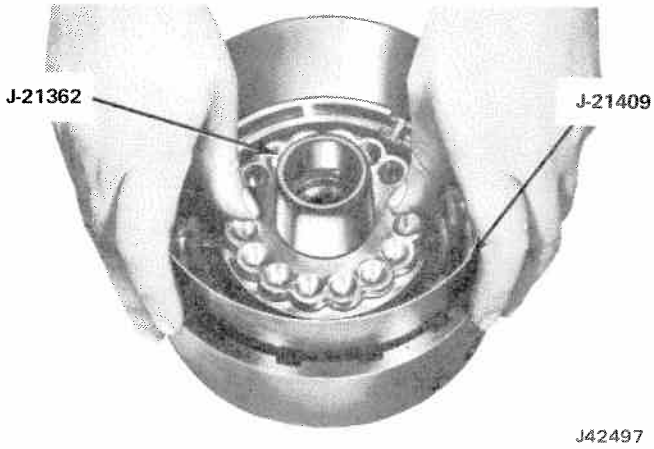


Fig. 7-67 Installing Forward Clutch Piston

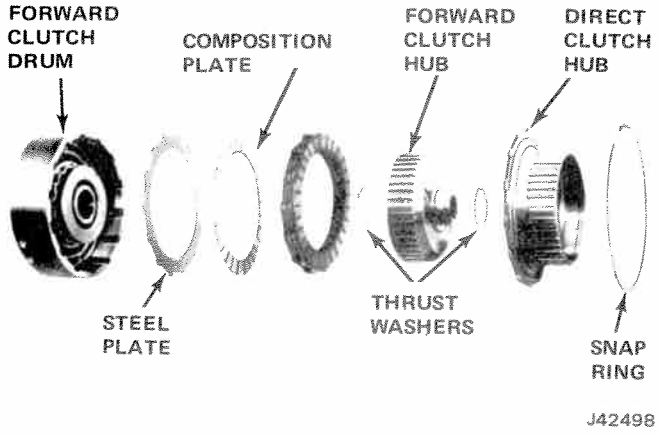


Fig. 7-68 Forward Clutch Assembly

(6) Use Clutch Spring Compressor W-306 and arbor press to compress springs; then fasten spring retainer to piston with snap ring.

(7) If removed, press short-spline end of turbine shaft into forward clutch housing, using arbor press.

(8) Place thrust washers on forward clutch hub. Retain with petroleum jelly or equivalent.

(9) Install hub and washers in clutch housing, as shown in fig. 7-70.

(10) Oil and install four composition, three flat steel, and one waved steel clutch plate (plate with U-notches) in clutch housing; install waved steel plate first, then install alternately composition plates and steel plates (figs. 7-68, -69).

CAUTION: *Do not confuse the flat steel clutch plate (plate with V-notch) with the waved steel clutch plate (plate with U-notch). See fig. 7-73.*

NOTE: *Radially grooved composition clutch plates are installed at the factory only. All service composition plates have the smooth surface configuration.*

(11) Install direct clutch hub in clutch housing, and secure with snap ring, (fig. 7-61).

(12) Place forward clutch assembly on delivery sleeve of oil pump, and apply compressed air to check clutch operation (fig. 7-71).

Fig. 7-69 Installing Forward Clutch Plates

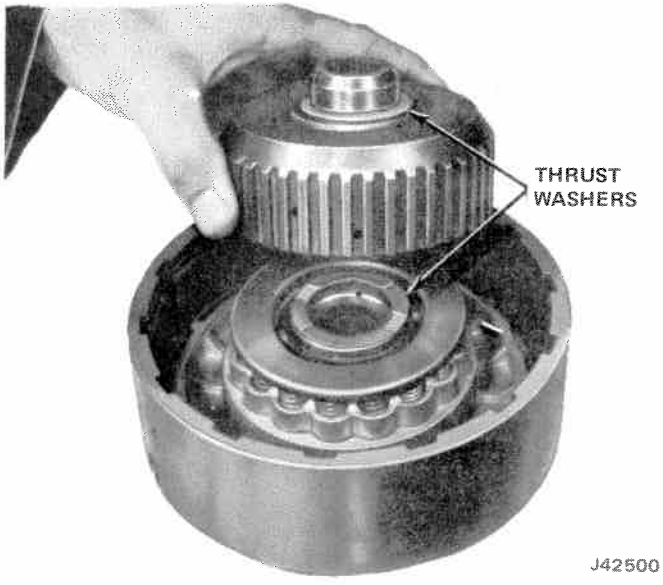


Fig. 7-70 Installing Thrust Washers On Forward Clutch Hub

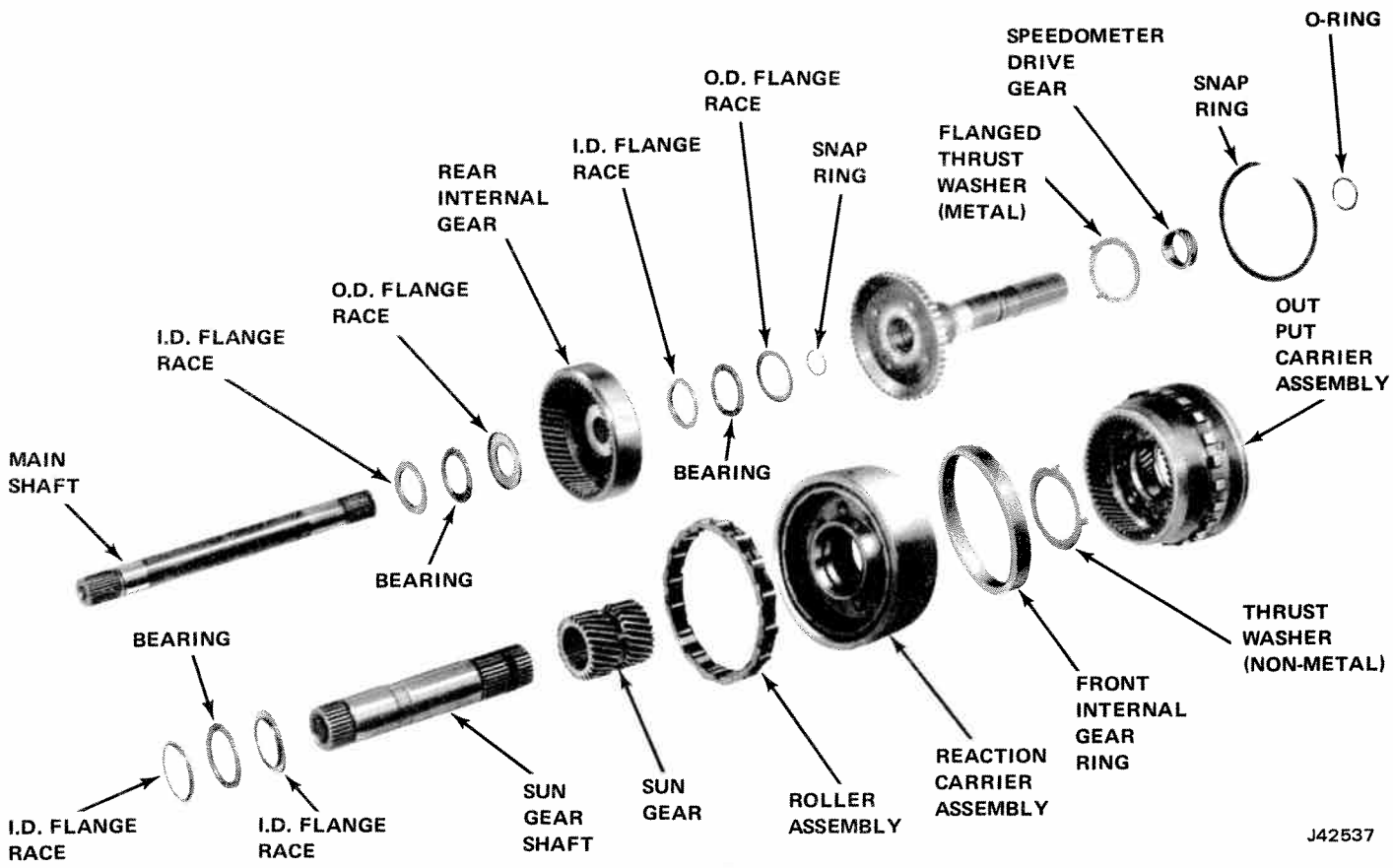


Fig. 7-107 Gear Unit Assembly

TRANSMISSION CASE

Inspection

Inspect case assembly for cracks, porosity, or interconnected or clogged oil passages.

Check for good retention of band anchor pins.

Inspect all threaded holes for thread damage.

Inspect intermediate clutch driven plate lugs for damage or signs of wear.

Inspect two snap ring grooves for damage.

Inspect bore of governor assembly for scratches or scoring.

Inspect modulator valve bore for scoring or damage.

Inspect cup plug inside case for good staking and sealing.

Inspect case bushing for wear or galling.

TORQUE CONVERTER

Inspection

Check hub surfaces of torque converter for scoring or wear. Check drive lugs for damage. Check torque converter housing for leaks as follows:

Install and tighten Leak Detecting Fixture J-21369 on torque converter housing (fig. 7-106).

Apply 80 psi air pressure to fixture.

Submerge housing in water and check for leaks.

GEAR UNIT

Assembly

(1) If rear internal gear has been removed from mainshaft, insert rear spline of shaft into gear, then secure gear to shaft with snap ring (fig. 7-107).

2) Install sun gear-to-internal gear races and thrust bearings against inner face of rear internal gear as follows retaining with petroleum jelly: place large race against internal gear with flange facing forward or

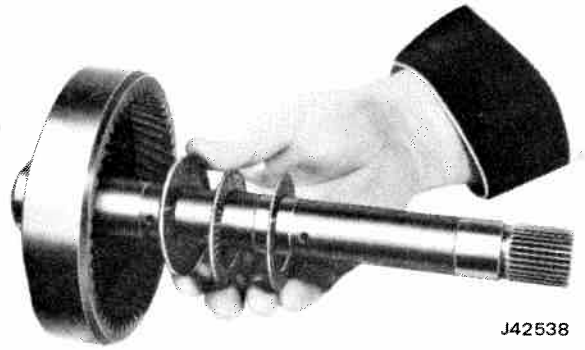


Fig. 7-108 Mainshaft and Bearing

TRANSFER CASE

MODEL 20 TRANSFER CASE

GENERAL

The Model 20 transfer case provides two gear ratios in 4-wheel drive (high and low), a 2-wheel drive, and a neutral position.

When the vehicle is driven in 2-wheel drive, the gear that drives the front propeller shaft is freewheeling on the output shaft. Power flow in 2-wheel drive is shown in figure 8-1, and power flow in 4-wheel drive high range is shown in figure 8-2.

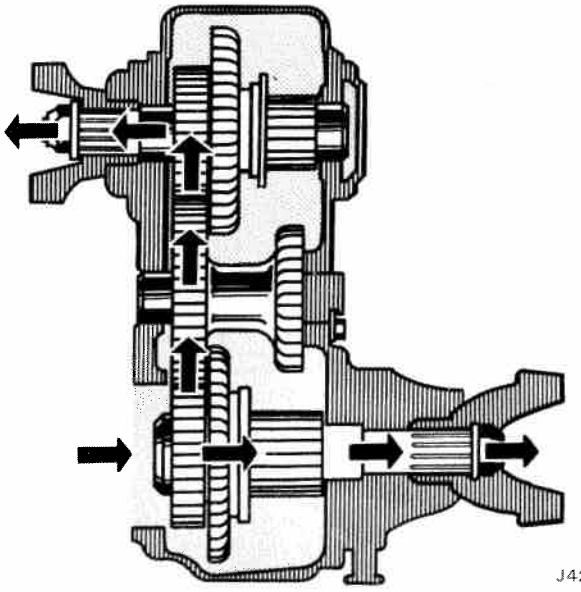


Fig. 8-1 Silent Transfer Case in 2-Wheel Drive

Transfer case gears and drives are controlled by a single lever located forward and just to the right of the transmission shift lever. This lever is connected through linkage to the shift rods on the transfer case.

Lubricant circulates between the transfer case and the transmission on manual 3-speed transmission only.

All vehicles have a transfer case shift diagram located on the top face of the shift lever knob (fig. 8-3).

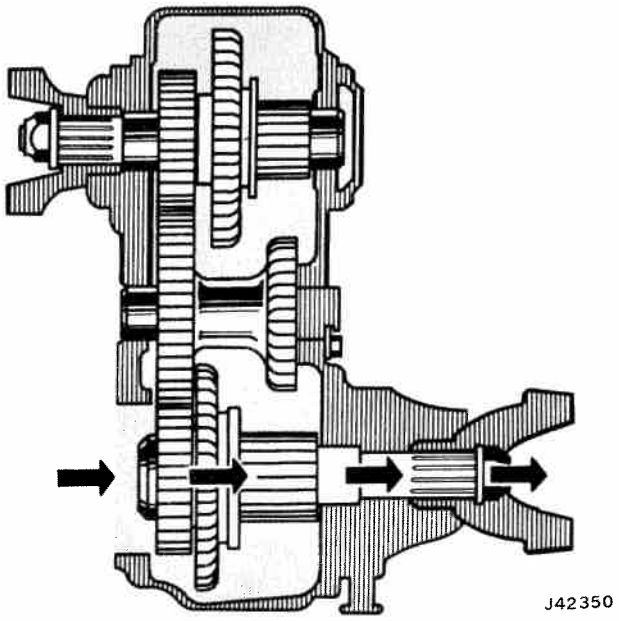


Fig. 8-2 Silent Transfer Case in 4-Wheel Drive

Fig. 8-3 Transfer Case Shift Knobs

lockout device will permit 2-wheel drive operation until repair or replacement can be made. To engage the lockout device, slow the vehicle to under 5 mph and turn the control knob inside the glove box counterclockwise.

The Lockout reminder light in the instrument panel cluster will come on immediately after Lockout occurs, and will glow continuously until disengaged.

NOTE: *A slight delay may occur until front and rear axles become synchronized.*

To disengage the lockout device, turn the control knob clockwise. If the lockout light does not go off, back the vehicle in an S pattern for approximately 15 feet.

As the lockout device is infrequently used, it is recommended that the system be activated and deactivated at least once a month.

LOW RANGE - REDUCTION UNIT OPERATION

For operation under unusually severe on- or off-road conditions, the low gear reduction unit provides maximum braking and maximum torque at low speed.

To engage LOW RANGE drive:

- Take foot off accelerator.
- Come to a rolling stop - under 5 mph.
- Shift automatic transmission into neutral with vehicle moving.
- Pull firmly out on the LOW RANGE lever (located just below the instrument panel to the right of the steering column).

To disengage LOW RANGE Drive:

- Shift automatic transmission into neutral at low speed - under 5 mph.
- Push LOW RANGE lever in firmly.

If low Range Drive is infrequently used, it is recommended that it be engaged and exercised for at least five minutes each month.

REDUCTION UNIT SHIFT CABLE ADJUSTMENT

Clamp-Type Attachment

(1) Loosen nut which clamps cable to shift lever pivot. Be sure cable can move freely in pivot.

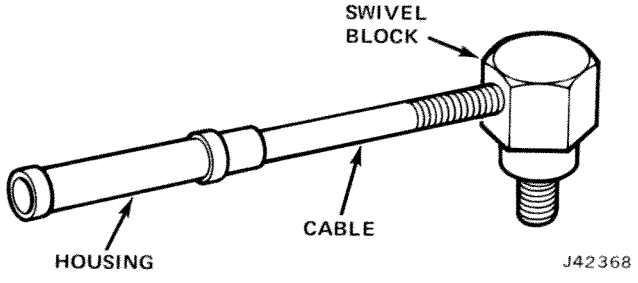


Fig. 8-17 Low Range Swivel Block

(2) Move reduction shift lever to most rearward detent position (Hi-Range position).

(3) Push LOW RANGE lever inward until lever stops.

(4) Push LOW RANGE lever inward until lever stops. Pull LOW RANGE lever out slightly; no more than 1/16 inch.

(5) Tighten cable clamp nut.

(6) Check operation of reduction unit.

Swivel-Type Attachment

(1) Remove swivel block from control lever.

(2) Move reduction unit control lever to most forward position.

(3) Thread swivel block in or out on cable end to obtain free fit in reduction unit control lever (fig. 8-17).

(4) Secure swivel block to control lever.

(5) Check operation of reduction unit.

STICK-SLIP CONDITION

When the clutch elements of the Quadra-Trac drive system stick, it is under a torque windup condition as in a conventional transfer case. Sudden release of the clutch under this condition results in a constant, pulsating, grunt-like or rasping noise. This is a low-frequency stick-slip noise that, if it occurs, is evident to the driver at slow speeds, such as when slowly turning a corner, or when maneuvering to park.

The stick-slip noise will not occur when the vehicle is driven in a straight-ahead position. If a noise similar to stick-slip, but much louder, occurs in the straight-ahead position, the chain should be inspected for excessive looseness.

Lubricant plays a major role in preventing stick-slip noise; therefore, detergent and heavy-duty (10W-30) type motors oils are not recommended. Vehicles experiencing stick-slip due to the usage of improper lubricants, may be corrected by completely draining the units, and refilling with the specified lubricants.

NOTE: *If a vehicle is not driven for a week or more, the stick-slip condition may occur when the vehicle is first driven. This is considered normal and should be of no concern, as the noise will disappear with continued driving.*

LUBRICATION

The Quadra-Trac transfer case does not require periodic or scheduled lubrication. However, should a stick-slip condition occur in the transfer case, a full eight fluid ounces of concentrate, Jeep Part Number 8123004, should be added (this applies to the Quadra-Trac transfer case with or without the reduction unit). It may be necessary to drain a slight amount (minimum) of lubricant at the transfer case drain plug to

(11) Install speedometer gear on rear output shaft (fig. 8-45).

(12) Use Seal Drive W-360 to install rear output shaft oil seal (fig. 8-46).

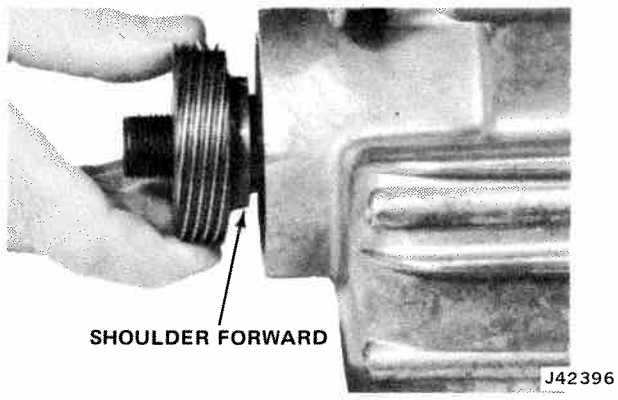


Fig. 8-45 Installing Speedometer Drive Gear

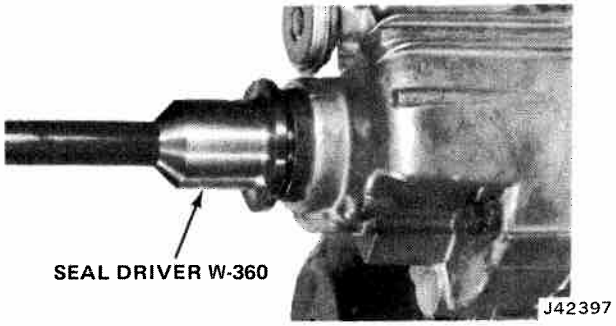


Fig. 8-46 Installing Rear Output Shaft Oil Seal

(13) Install rear yoke and nut. Tighten nut (refer to Torque Specifications).

Installation

(1) Clean oil seal groove and install seal ring.

(2) Install two 3/8-16 x 2 inch long pilot studs into transfer case (front housing).

(3) Insert oil tube into case bore at front output shaft bearing boss. Insert a 6-inch length of 5/16 inch drill rod into tube. Rod will be used as a pilot to align tube with case cover (fig. 8-47).

(4) Lift cover assembly and align tube pilot with hole in cover. Move assembly forward over pilot studs.

(5) Move cover assembly forward to mesh with front output shaft and transmission output shaft.

NOTE: *It may be necessary to slightly rotate the rear output shaft to allow two sets of splines to engage.*

(6) After cover assembly has been moved forward and evenly touches the case, remove pilot studs and install cover to case attaching bolts. Alternately and evenly tighten bolts (refer to Torque Specifications).

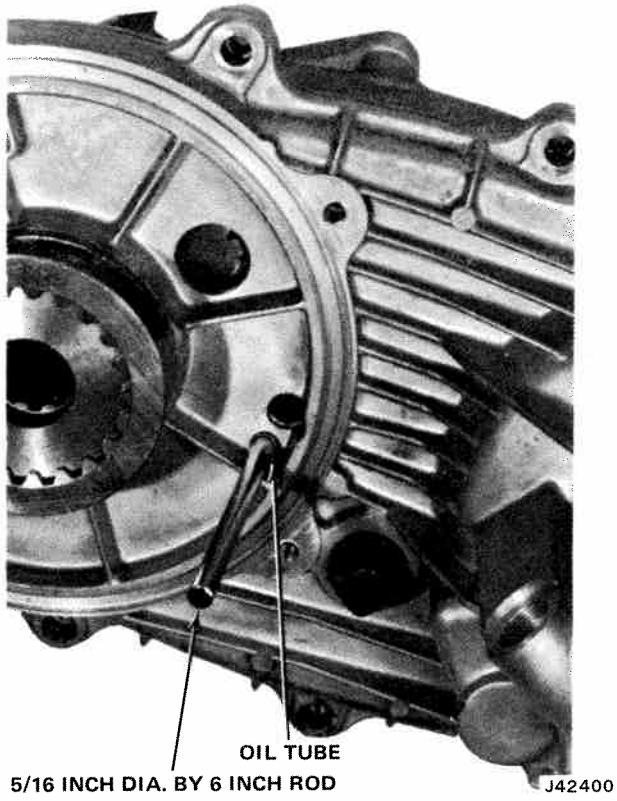


Fig. 8-47 Aligning Oil Tube for Cover Assembly Installation

(7) Install lockout indicator switch. Connect Lockout switch wire, diaphragm control vacuum hoses and speedometer cable.

(8) Connect rear propeller shaft front universal joint to rear output shaft. It may be necessary to lift rear wheels free of hoist to allow proper alignment for installation.

(9) Connect parking brake cable guide to pivot on right frame side.

(10) If equipped with reduction unit, install reduction unit and adjust cable. Refer to Reduction Unit Installation for procedure.

(11) Install proper amount of specified lubricant. Refer to Lubrication for quantity, type, and procedure.

(12) Lower vehicle.

TRANSFER CASE ASSEMBLY

Removal

Complete assembly removal is normally not required except when the front output shaft, front annular bearing, transmission output shaft seals or the transfer case (front housing) require service. For chain, drive sprocket, differential unit, diaphragm control system, needle bearing, thrust washer, or rear output shaft service, refer to Transfer Case Cover - Removal.

(1) Lift and support vehicle.

(2) Mark front and rear output shaft yokes and universal joints to provide alignment references to be

BRAKES AND WHEELS

BRAKE DIAGNOSIS CHARTS

In most instances, the customer will describe the difficulty as one or more of the conditions listed in the Brake Diagnosis Chart. Road test the vehicle with the customer to confirm the difficulty and obtain additional information.

Vibration Diagnosis

Vibrations can be divided into two categories: mechanical and audible. Mechanical vibrations are those which are felt through seats, floorpan, or steering wheel or which may also be visible and sensed by fender, mirror, or dash panel motion. Audible vibrations are heard above normal background noise and may or may not be accompanied by a mechanical vibration.

Mechanical and audible vibrations are torque sensitive, vehicle speed sensitive, or engine speed sensitive:

Torque Sensitive means that the condition can be made better or worse when accelerating, decelerating, coasting, or maintaining a steady speed.

Vehicle Speed Sensitive vibrations occur at the same speed regardless of which transmission gear is selected or how much torque is applied.

Engine Speed Sensitive vibrations occur at different car speeds when a different transmission gear is selected, and can sometimes be isolated by increasing or decreasing engine speed with the transmission in neutral or by stall-testing with the transmission in gear.

Road Test

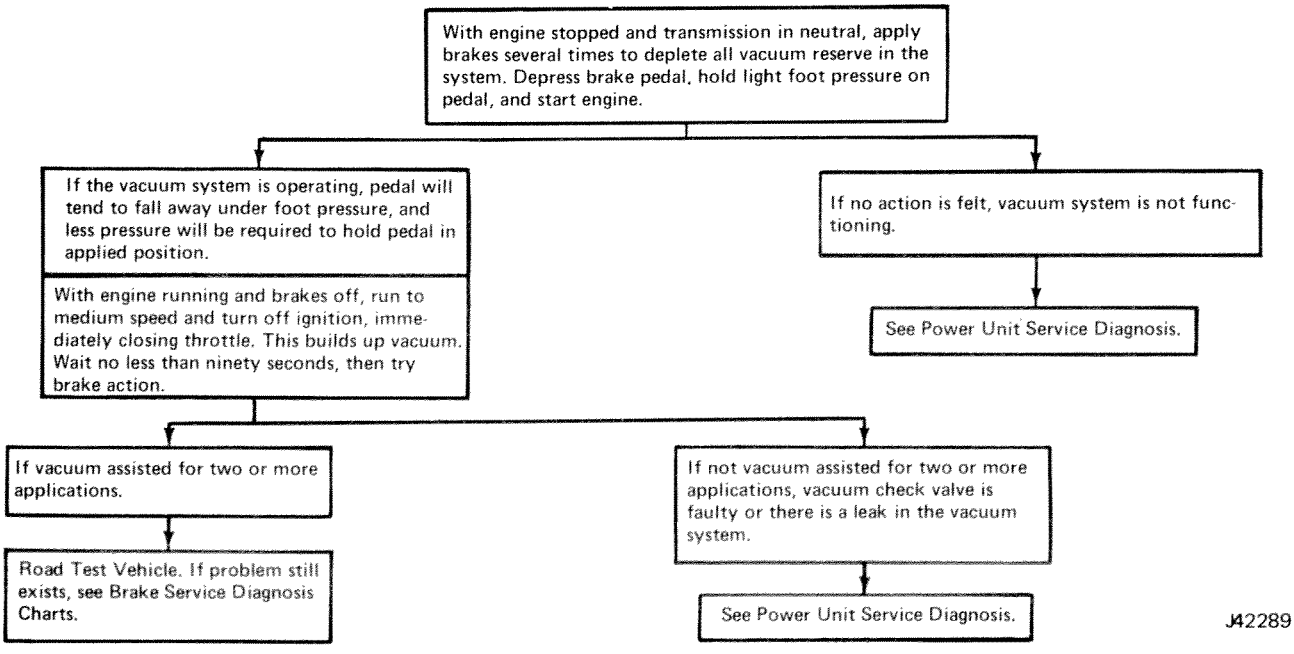
Road test vehicle on a smooth road. If vibration is apparent:

(1) Determine speed ranges at which disturbance occurs.

(2) At each speed range, determine whether vibration is mechanical or audible.

(3) At each speed range, determine whether vibration is torque sensitive, speed sensitive, or engine speed sensitive.

POWER BRAKE DIAGNOSIS PROCEDURE



DISC BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
DRAGGING BRAKES (Continued)	(4) Rear shoes not returning to normal position.	(4) Return springs weak. Shoes dragging on support plate due to lack of lube or ridges on support plate ledges. Wheel cylinder cups swollen or pistons sticking. Repair or replace faulty parts as required.
	(5) Caliper pistons not releasing. Pistons stuck due to piston scoring or corrosion or piston cocking in bore.	(5) Repair or replace pistons or caliper as required.
	(6) Lines to combination valve installed incorrectly.	(6) Check and correct as required. Port marked inlet goes to master cylinder; port marked outlet goes to calipers.
	(7) Bind in brake pedal and booster linkage.	(7) Check and correct as required.
	(8) Push rods too long.	(8) Replace with proper parts.
	(9) Check valve installed in master cylinder outlet to disc brake calipers.	(9) Check outlet. Remove valve if present. Bleed brakes.
GRABBING BRAKES	(1) Refer to all conditions listed under PULLS WHEN BRAKES ARE APPLIED.	(1) See PULLS WHEN BRAKES ARE APPLIED.
	(2) Power brake unit malfunction.	(2) Check operation and replace or repair as required. Refer to POWER UNIT SERVICE DIAGNOSIS Chart.
	(3) Combination valve malfunction.	(3) Replace valve and bleed system.
	(4) Brake pedal or power unit linkage binding.	(4) Check and correct as required. Lube all pivot points.
	(5) Incorrect power unit.	(5) Check and replace as required.
PULLS WHEN BRAKES ARE APPLIED	(1) Incorrect tire pressures.	(1) Inflate to spec.
	(2) Mismatched tires on same axle.	(2) Install equal size, type tires.
	(3) Wheel bearings misadjusted or worn.	(3) Adjust or replace as required.
	(4) Malfunction in caliper.	(4) Check for stuck piston.

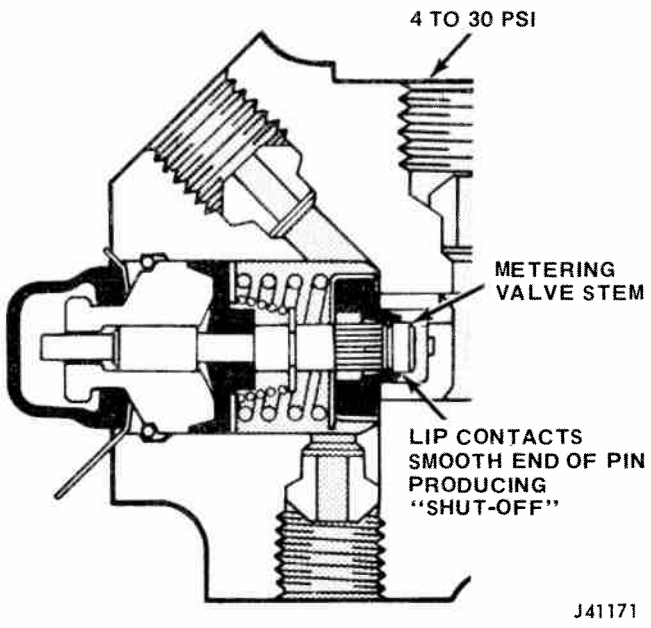


Fig. 9-15 Shut-Off Point

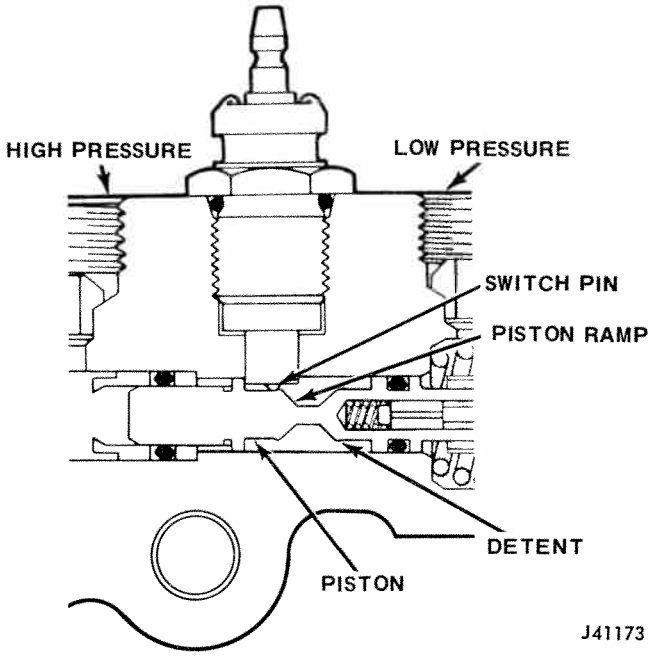


Fig. 9-17 Rear System Failure

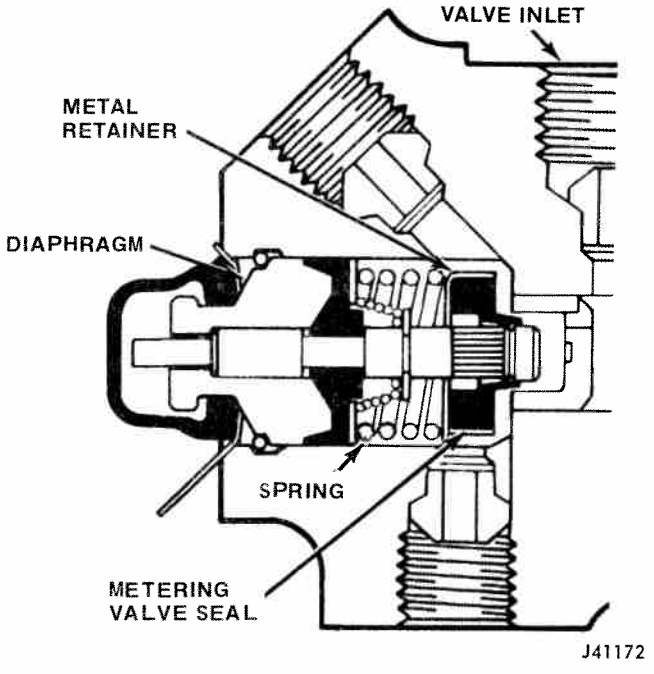


Fig. 9-16 Holdoff and Blend Pressure

Pressure Differential Warning Switch Section

The warning switch in the valve is activated when a hydraulic pressure loss occurs in either the front or rear brake systems, and when activated, completes the electrical circuit to the brake warning light on the dash.

Should a failure occur in the rear brake system (fig. 9-17), the switch piston is forced to the right (toward the rear brake outlet port in the valve) by pressure from the good front system. As the piston moves, the piston ramp forces the switch pin up into the switch, making contact, and completing the electrical circuit which activates the dash light. In the event of a front brake system failure, the switch is activated in the same manner except that the switch pistons will move to the left.

Proportioner Section

The proportioner section provides balanced front-to-rear braking action during high pedal pressure stop. During light pedal pressure application, the proportioner does not operate (fig. 9-18). Brake fluid normally flows into the proportioner through the space between the piston center hole and valve stem, then through the stop plate and the rear brakes. Spring pressure loads the piston, holding it against the stop plate for normal brake pressures.

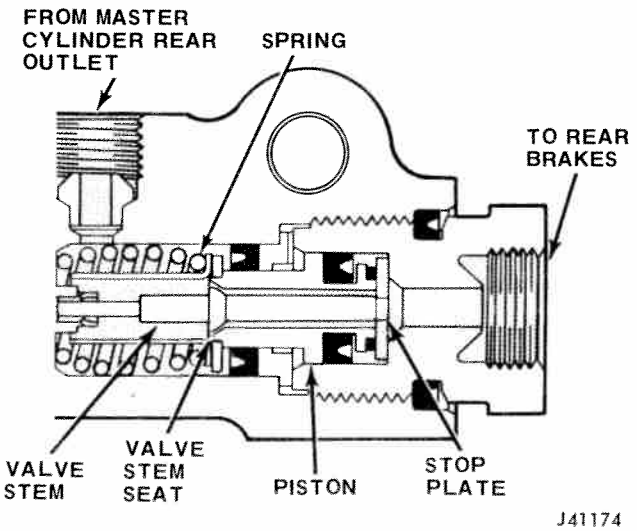


Fig. 9-18 Light Pedal Pressure Application

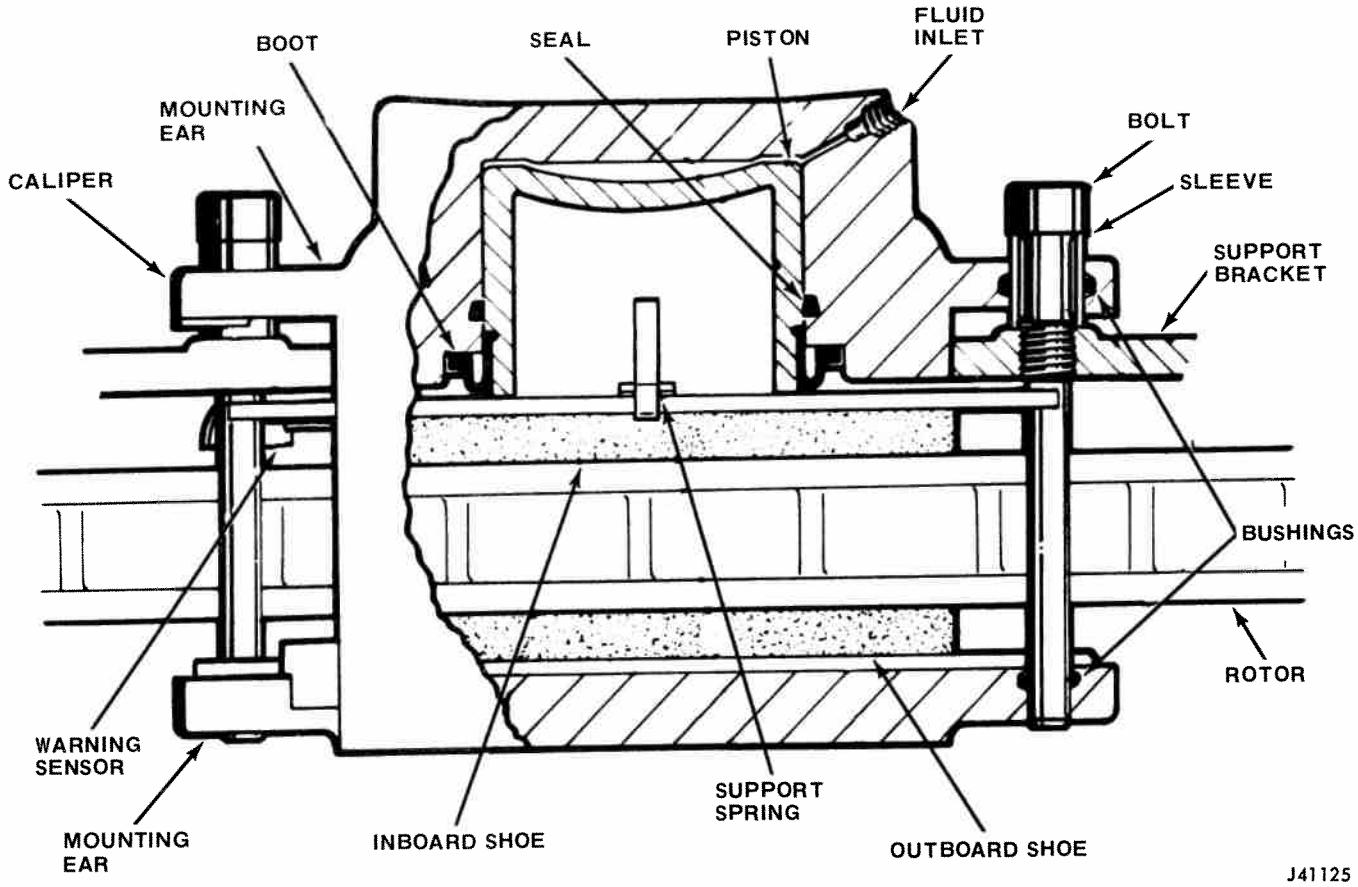


Fig. 9-33 Caliper and Rotor - Single Piston

al sliding movement of the caliper and increased piston extension (fig. 9-35).

The caliper assembly has two mounting ears at each end. Holes are machined into each of the ears, with the holes in the inboard ears being larger than the holes in the outboard ears. A groove is machined in the inside diameter of each hole to accommodate rubber bushings. A sleeve is assembled through each of the larger holes in the inboard ears (fig. 9-33). The caliper assembly is attached to the support bracket which is welded to, and is a part of, the disc brake shield. The disc brake shield and integral support bracket are bolted to the steering assembly.

Two special allen head support bolts are used to attach the caliper to the support bracket. The bolts are inserted through the sleeves (in the inboard mounting ear holes of the caliper), under the ears on the inboard shoe, and then through the outboard ears on the caliper. The threaded portion of the bolts heads are tightened against the sleeve ends. The caliper is then free to slide on the sleeves in the inboard ears and on the unthreaded portion of the bolt that fits in the outboard ears (fig. 9-33).

Each caliper contains a set of two shoe and lining assemblies, each assembly consisting of a stamped metal shoe and a lining riveted to the shoe (fig. 9-33).

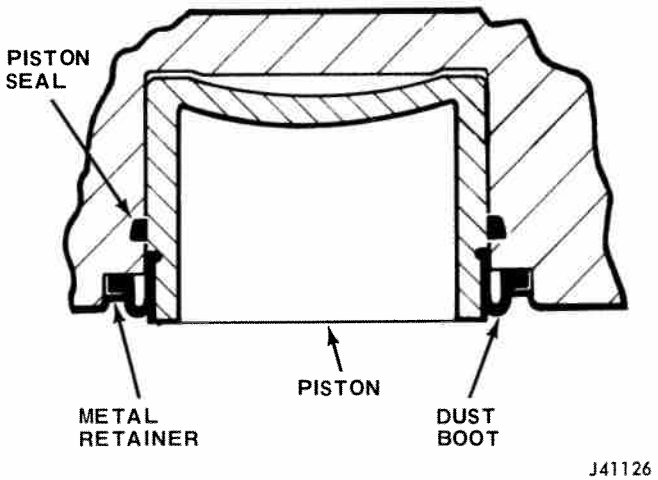


Fig. 9-34 Cross-Section of Caliper Cylinder and Piston

Installed in the caliper, the shoe and lining assemblies straddle the disc brake rotor. The inboard and outboard lining differ as follows:

(1) Inboard shoe and lining are slightly thicker.

(2) Outboard shoes have bent-over ears at top ends.

(3) Outboard shoes have large tab at bottom of shoe, bent at right angle to shoe.

(6) Replace lockwasher and locknut, bend lockwasher lip.

(7) Check adjustment.

(8) Assemble driving flange and hub cap. Make certain gasket is properly installed between hub and flange.

Front Wheel Bearing Adjustment - Cherokee, Wagoneer, Truck

(1) Remove hubcap, snap ring, drive gear, pressure spring, outer locknut, and lockwasher.

(2) Loosen inner wheel bearing adjusting nut (nut has peg on side).

(3) Tighten inner wheel bearing adjusting nut to 50 foot-pounds torque with wheel bearing wrench W-372.

(4) Rotate hub, then back off inner wheel bearing adjusting nut 1/4 turn (maximum).

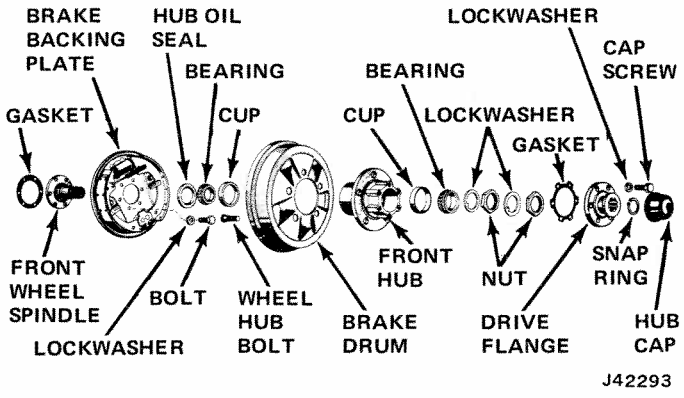


Fig. 9-58 Front Wheel Attaching Parts, CJ Models

(5) Install lockwasher with inner tab lined up with keyway in spindle and turn inner wheel bearing adjusting nut until the peg engages the nearest hole in the lockwasher.

(6) Install outer locknut and tighten to 50 foot-pounds torque (minimum) using wheel bearings wrench W-372.

Checking Rear Wheels - All Models

Place a jack under the axle housing. Shake the wheel. If bearings are correctly adjusted, shake will be just perceptible and the wheel will turn freely.

Rear Wheel Bearing

Adjustment - Flanged Axle - All Models (Except 8000 GVW Truck)

Flanged Axle Shaft - Semi-Float Axles

Vehicles equipped with the flange type rear axle (fig. 9-59) shaft require no wheel bearing adjustment. The flanged axle shaft is equipped with a single row, preadjusted, tapered roller unit-bearing capable of accepting thrust in either direction. The unit-bearing adjustment is built in at the factory making shimming or bearing adjustment unnecessary. Refer to Fig. 9-61.

(1) Remove axle shaft (fig. 9-60).

(2) Bend lip of lockwasher so that locknut and lockwasher may be removed.

(3) Jack up wheel so it can be rotated. Use an axle stand under axle.

(4) Rotate wheel and tighten adjusting nut with Tool DD-1245 until wheel binds. Then back off about one-sixth turn until wheel rotates freely without side shake.

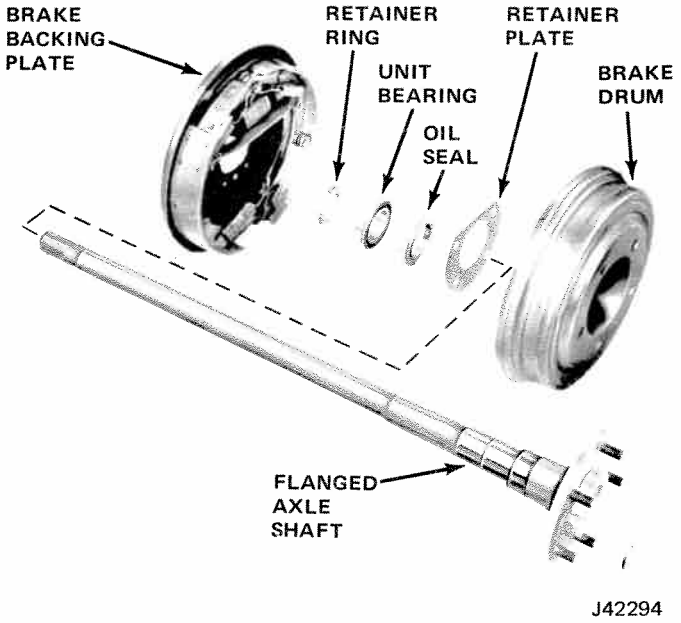


Fig. 9-59 Rear Wheel Attaching Parts - Flanged Axle

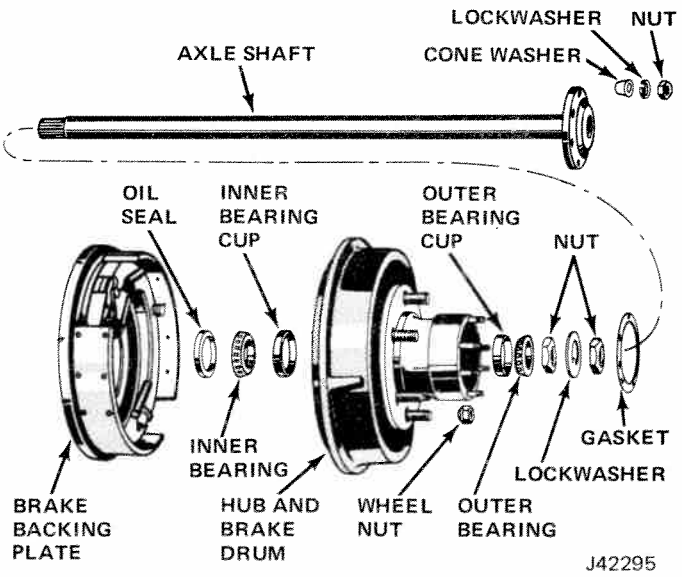


Fig. 9-60 Rear Wheel Attaching Parts - Full-Float Axle-(8000 GVW Truck)

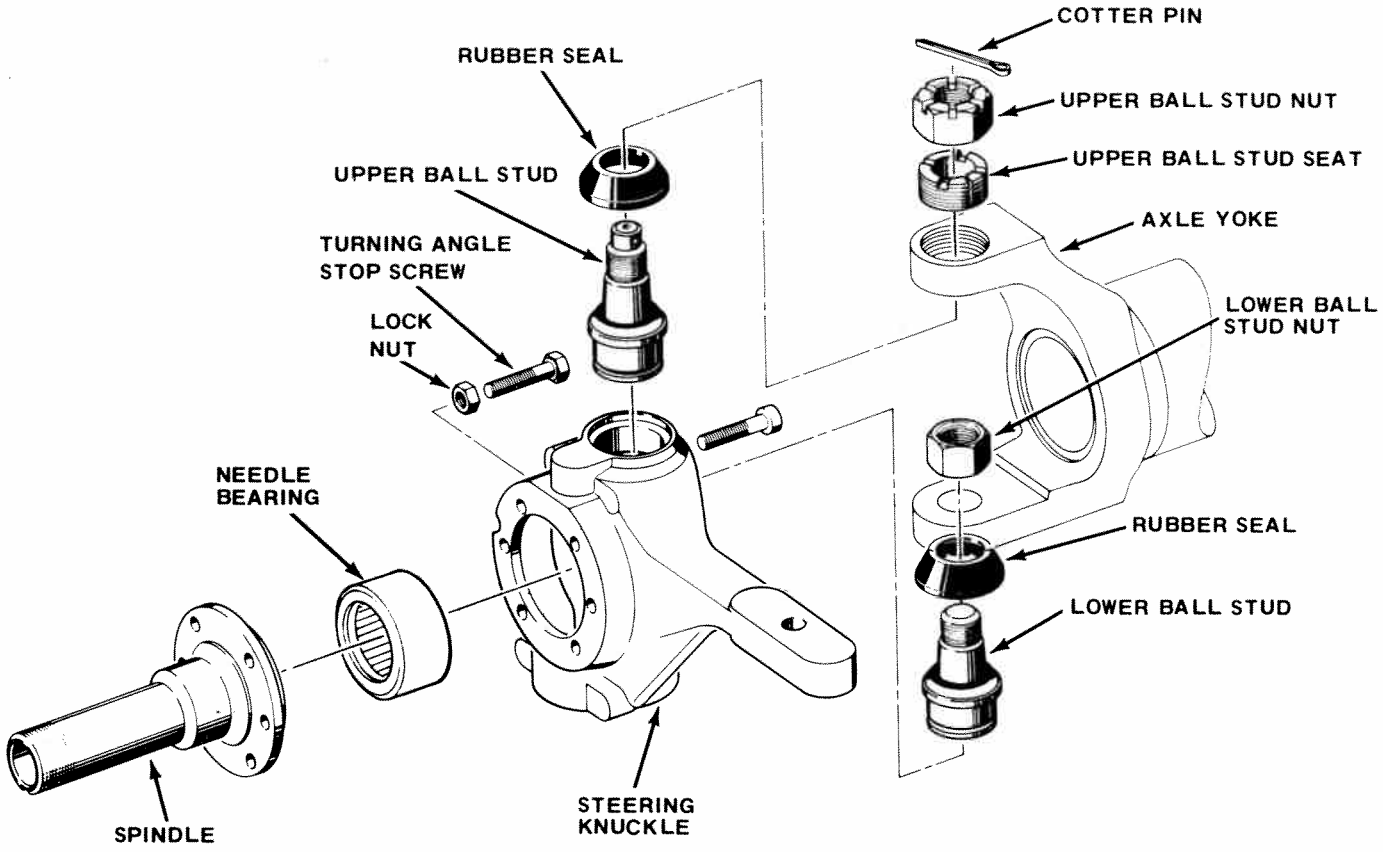


Fig. 10-3 Model 44F Steering Knuckle Assembly

Install lockwasher with inner tab lined up with keyway in spindle. Turn adjusting nut until the peg engages the nearest hole in the lockwasher. Install outer locknut and tighten to 50 foot-pounds torque (minimum) using wheel bearing wrench.

(4) Install spring retainer, spring, and drive gear.

(5) Push on gear to allow clearance for installation on axle shaft snap ring.

(6) Install wheel and dust cover.

(7) Remove support stands and lower vehicle.

UNIVERSAL JOINT REPLACEMENT

(1) Remove axle shaft.

(2) Remove snap rings from the bearing cup assemblies (fig. 10-4).

(3) Press on end of one bearing cup assembly until opposite bearing is pushed from yoke half.

(4) Turn yoke over and press first bearing back out by pressing on exposed end of journal shaft.

NOTE: *To avoid damaging the bearing, use a soft drift with a flat face about 1/32 inch smaller in diameter than the hole in the yoke arm to drive out the bearing.*

(5) Repeat step (4) for other two bearings. Then lift out bearing cross-journal by sliding it to one side.

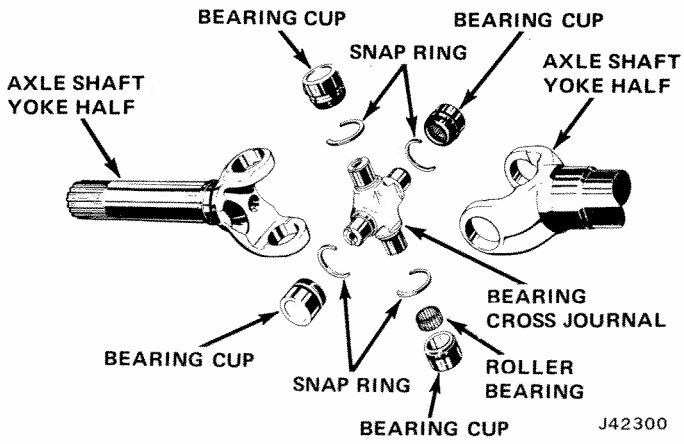


Fig. 10-4 Axle Shaft Universal Joint

(6) Wash all parts in cleaning solvent and inspect parts after cleaning. Replace any part that indicates extensive wear.

(7) Pack bearing cups one-third full of lubricant and install rollers.

(8) Insert bearings into axle shaft yoke half and seat them firmly against bearing shoulders.

(9) Insert bearing cross-journal while holding bearings in a vertical position to prevent needles from dropping out.

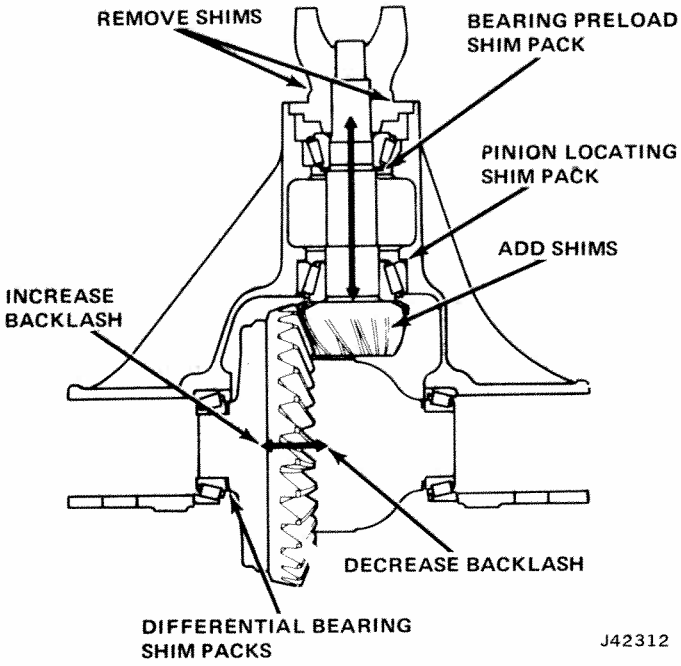


Fig. 10-25 Differential Shim Pack Locations

NOTE: *The pinion adjusting fixture must first be set by the use of a master gauge which is included in the W-99 kit. Gauge Block SP-5433 or SP-5434, stamped with the letter J is used on Model 60 axles; Gauge Block W-101-A-22 or SP-5453, stamped E is used on Model 44 axles; and Gauge Block SP-5291 stamped K is used on Model 30 axles. SP-5264 is used with the dial indicator in W-99 tool set for setting pinion depth.*

(6) Place gauge block against machined surface of dial indicator mount (fig. 10-27).

(7) Set dial indicator on zero.

(8) Install pinion adjusting fixture on pinion with stationary guide pin and adjustable guide pin seated in pinion shaft lathe centers (fig. 10-28).

NOTE: *Use the C-clamp type alignment fixture vertically as shown in figure 10-28) so that weight of jig assembly is always directly centered and supported on pinion shaft center. The function of the fixture is to accurately hold the dial indicator and its mount in alignment to the pinion shaft while it is pivoted on the stationary guide pin. If a consistent repeat dial reading cannot be obtained, look for dirty or burred pinion centers or a bent or twisted aligning jib. Keep jig flat in metal case when not in use. Do not allow other tools to rest on it. Treat the C-clamp fixture tool carefully (as a precision instrument).*

(9) Seat gauge mount firmly on pinion head and swing dial indicator through differential bearing bore (fig. 10-27).

(10) Observe reading.

The lowest reading indicates the center of the differential bearing bore. At this point, the dial indicator should read the same as mark etched on the pinion head. If the reading does not agree, add or remove shims behind the inner pinion bearing cup until the readings agree.

The end of each pinion is etched with a plus (+) number, a minus (-) number or zero (0) number to indicate the best running position for each particular gear set. This dimension is controlled by shimming behind the inner pinion bearing cup. Therefore if a pinion is etched (+2), this pinion would require 0.002 inch less shims than a pinion etched 0. By removing shims the mounting distance is **increased** which is just what a (+2) etching indicates. Or if a pinion is etched (-2), add 0.002 inch more shims than would be required if the pinion were etched 0. By adding 0.002 inch shims, the mounting distance is **decreased** which is just what a (-2) etching indicates.

NOTE: *To increase the dial reading, decrease shims; to decrease the dial reading, increase the shims. Example: With a dial reading of minus 0.001 inch and a pinion marking of plus 0.002 inch, remove 0.003 inch shims to obtain a higher dial reading of plus 0.002 inch.*

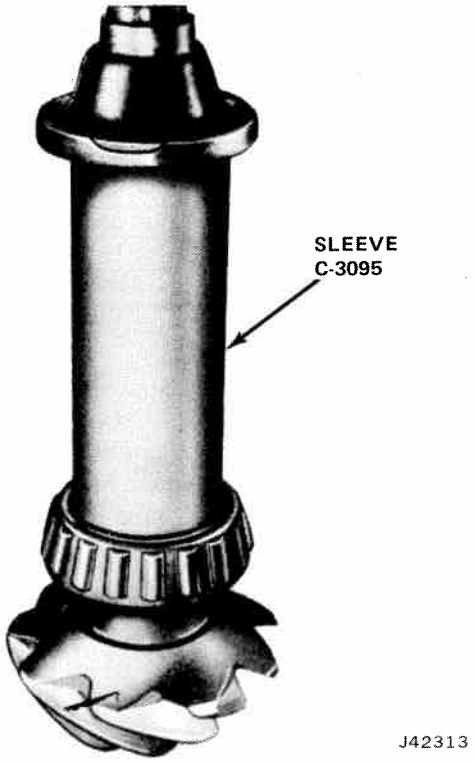


Fig. 10-26 Pinion Bearing Installing Sleeve

(1) If the original ring and pinion set is to be reused, measure the old pinion shim pack and build a new shim pack to this dimension. Collect shim pack saved from teardown. Measure each shim separately with a micrometer and add together to get total shim pack thickness from original buildup. Note the (+) or (-) etching on both the old pinion and the new one, and

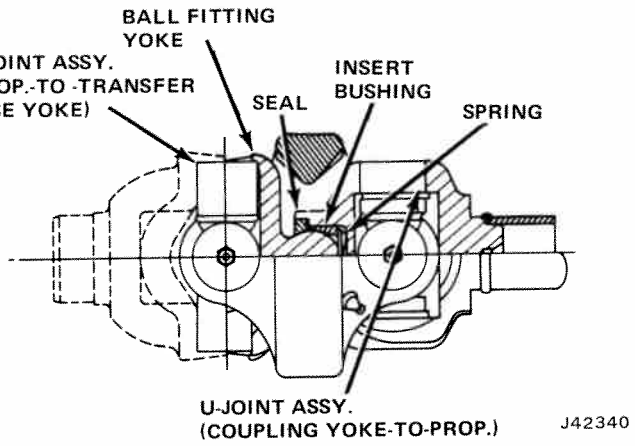


Fig. 10-52 Double Cardan Joint

bearing cups with a brass hammer to release pressure on retainer rings before removal.

(3) Place joint between open jaws of a soft-jawed vise so that ears on one yoke are supported on vise jaws.

(4) With a brass hammer, strike the ear of yoke behind bearing. This will drive out bearing. Remove opposite bearing in same manner.

(5) Remove cross from yoke.

(6) Disengage and remove tie link from two bearing block retainers. Remove retainers and two roller bearing cups from cross. Remove four bearing seals and four seal retainers from cross.

(7) Clean tube yoke of propeller shaft with a suitable cleaning solvent and dry thoroughly.

(8) Inspect yoke for wear and damage. If it is bent out of alignment with propeller shaft tube, or if its bearing bores are worn or damaged, replace propeller shaft.

Assembly

(1) If cross of universal joint has not been replaced, install four new seal retainers and bearing seals, one on each arm of cross.

(2) Install two roller bearing cup assemblies, on opposite arms of cross.

(3) Install a bearing block retainer on each bearing cup, and connect retainers with tie link to fasten bearings to cross.

(4) Thread remaining arms of cross, which do not carry bearings, into tube yoke.

(5) Position yoke in a soft-jaw vise, so that its inner surface is supported by vise jaws.

(6) With brass hammer, tap roller bearing cup assembly into bearing bore of yoke, so that bearing fits over ends of cross. Drive bearing cup downward until its retaining ring groove is fully exposed below yoke inner surface.

(7) Secure bearing to yoke with a retainer ring; be certain retainer ring is properly seated.

(8) Reverse yoke on vise and repeat steps (5) through (7) to install other bearing assembly.

MODEL 30 FRONT AXLE SPECIFICATIONS

Torque Specifications	Foot-Pounds
Axle Housing Cover	15 to 25
Pinion Yoke Nut	200 to 220
Differential Bearing Cap Screw	35 to 50
Drive Gear-to-Case Screws	45 to 65
Universal Joint U-Bolts	13 to 18
Wheel-to-Hub Nuts	65 to 90
Lower Ball Joint Nut	80
Upper Ball Joint Nut	100
Upper Ball Stud Seat	50
Adjustments	
Drive Pinion Bearing Break-Away Preload	
Original Bearings	15 to 25 in lbs
New Bearings	20 to 40 in lbs
Differential Bearing Preload	.015 inch
Drive Gear-to-Pinion Backlash	.005 to .009 inch
Differential Side Gear-to-Case Clearance	.000 to .006 inch

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MODEL 44 AXLE SPECIFICATIONS
(Full-Floating and Semi-Floating Types)

Torque Specifications	Foot-Pounds
Axle Housing Cover	15 to 25
Pinion Yoke Nut	200 to 220
Differential Bearing Cap Screw	70 to 90
Drive Gear-to-Case Screws	45 to 65
Universal Joint U-Bolts	13 to 18
Universal Joint Flange Bolts	25 to 45
Wheel-to-Hub Nuts	65 to 90
Backing Plate Mounting Bolts/Nuts	
Front Brakes	25 to 30
Rear Brakes	25 to 35
Disc Brake Shield Nuts	30 to 40
Disc Brake Shield Bolt	5 to 10
Lower Ball Joint Nut	80
Upper Ball Joint Nut	100
Upper Ball Stud Seat	50
Adjustments	
Drive Pinion Bearing Break-Away Preload	
Original Bearings	10 to 20 in-lbs
New Bearings	20 to 40 in-lbs
Differential Bearing Preload	.015 inch
Drive Gear-to-Pinion Backlash	.005 to .010 inch
Differential Side Gear-to-Case Clearance	.000 to .006 inch

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MODEL 60 AXLE SPECIFICATIONS

Torque Specifications	Foot-Pounds
Axle Housing Cover Screws	15 to 25
Pinion Yoke Nut	250 to 270
Differential Bearing Cap Screw	70 to 90
Drive Gear-to-Case Screws	100 to 110
Universal Joint U-Bolts	13 to 18
Universal Joint Flange Bolts	25 to 45
Wheel-to-Hub Nuts	110 to 125
Backing Plate Mounting Bolts/Nuts	45 to 55
Adjustments	
Drive Pinion Bearing Break-Away	
Original Bearings	10 to 20 in-lbs
New Bearings	20 to 40 in-lbs
Differential Bearing Preload	.015 inch
Drive Gear-to-Pinion Backlash	.005 to .009 inch
Differential Side Gear-to-Case Clearance	.000 to .006 inch

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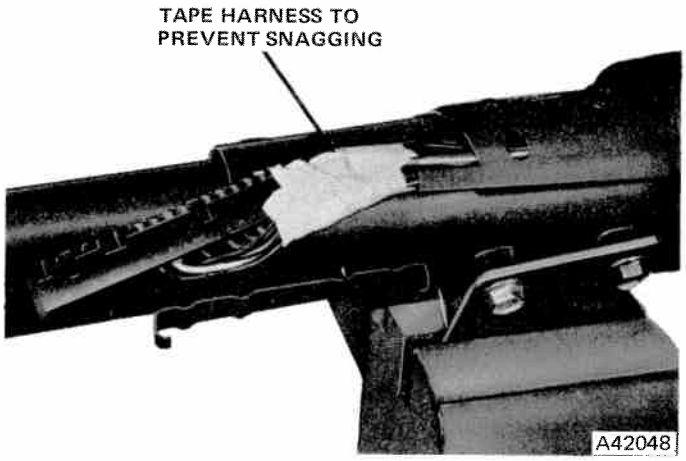

Fig. 11-8 Steering Column Harness Removal

(18) Place lock in LOCK position, depress lock cylinder retaining tab, and remove lock cylinder (fig. 11-10).

NOTE: *If tab is not visible through hole, scrape flashing from hole.*

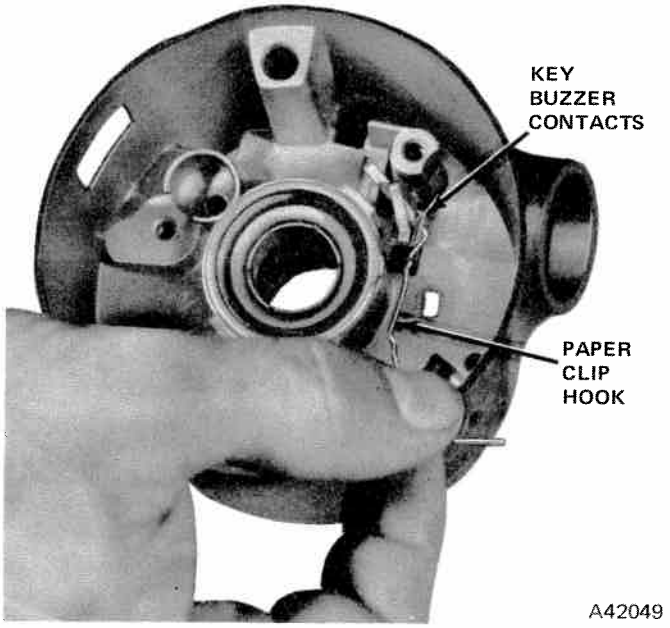

Fig. 11-9 Removal of Key Warning Buzzer Contacts

(19) Remove ignition switch from lower column.

(20) Remove four hex head screws retaining upper housing, then remove upper housing. Remote lock rod and automatic column shift quadrant light wire, if equipped, will be removed with upper housing.

NOTE: *Proceed with steps (21) through (28) for complete disassembly of column shift steering columns. To complete the disassembly of floor shift columns, skip to step (29).*

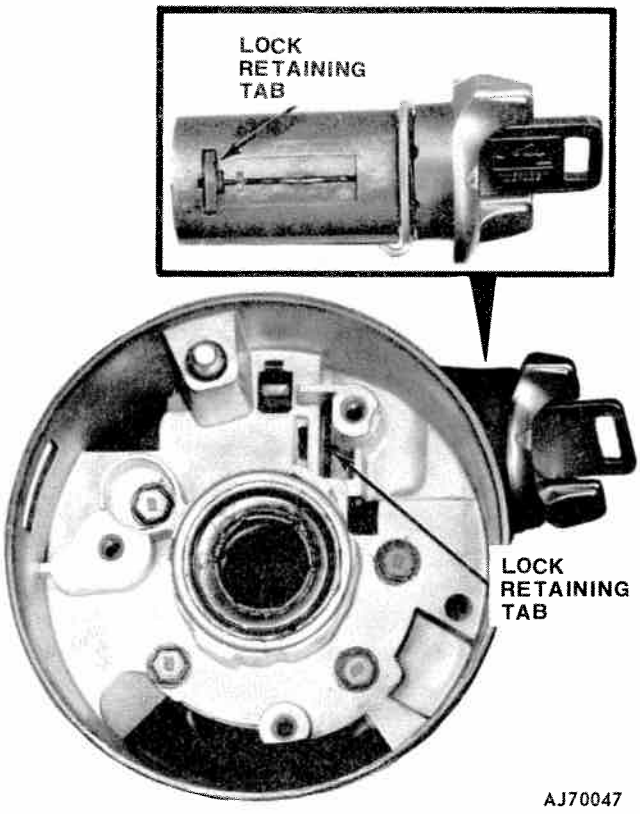

Fig. 11-10 Lock Cylinder Retainer Tab Location

(21) Remove thrust cup from upper housing (fig. 11-11).

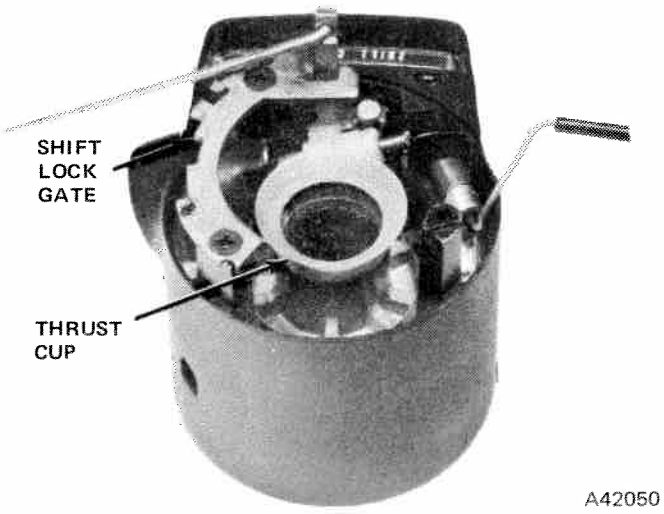

Fig. 11-11 Thrust Cup Position

(22) Remove lock bolt and rack. If rack preload spring requires service, remove at this point (fig. 11-12).

(23) If sector gear requires service, note position of sector on shaft for aid in assembly, and remove by driving it from its shaft with a suitable punch (fig. 11-12).

splines and place lock plate in position with directional signal canceling cam shaft protruding through dogleg opening in lock plate (fig. 11-20).

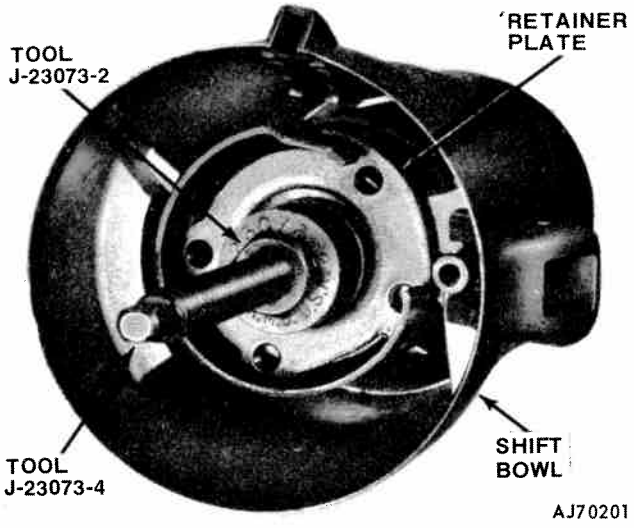

Fig. 11-28 Shift Tube Installer Seated in Tube

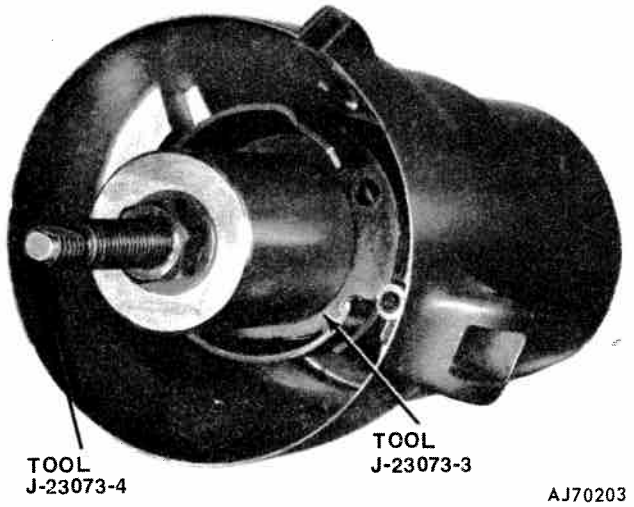

Fig. 11-29 Pulling Shift Tube Into Bowl

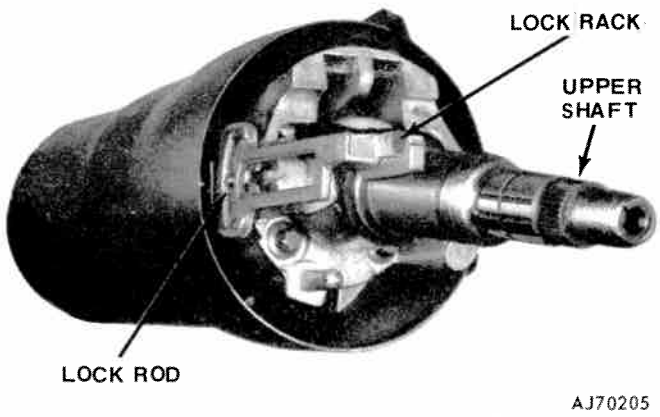

Fig. 11-30 Lock Rack and Remote Rod Position

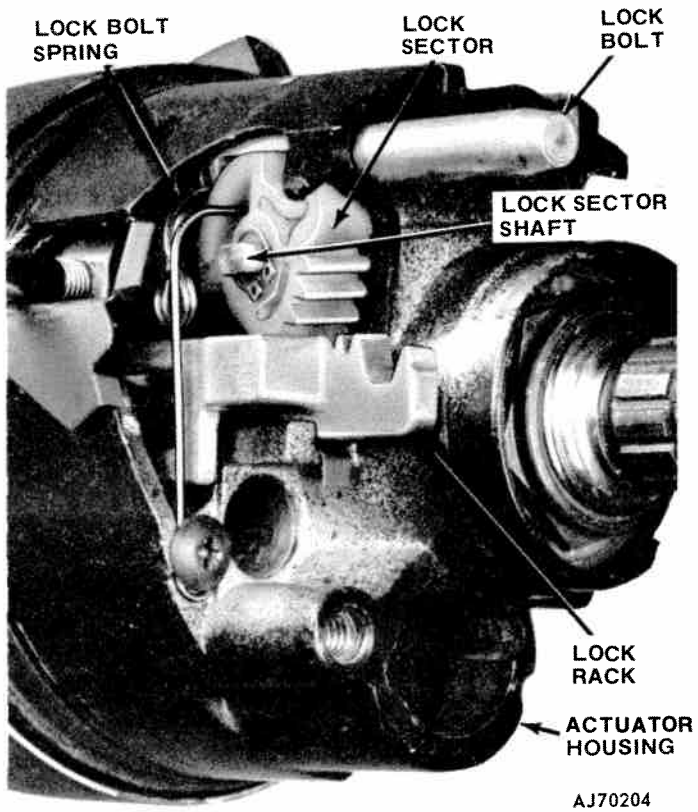

Fig. 11-31 Position of Lock Sector Tension Spring

(35) Place steering shaft snap ring onto Lock Plate Compressor Tool J-23653. Install tool onto steering shaft. Compress lock plate and push snap ring into place (Fig. 11-32).

(36) Install anti-theft cover.

(37) Carefully guide gear shift lever over tension spring and into shift bowl, aligning pivot pin holes with a suitable size punch. Drive pivot pin through lever with a fiber mallet or brass drift.

(38) Install key lock cylinder.

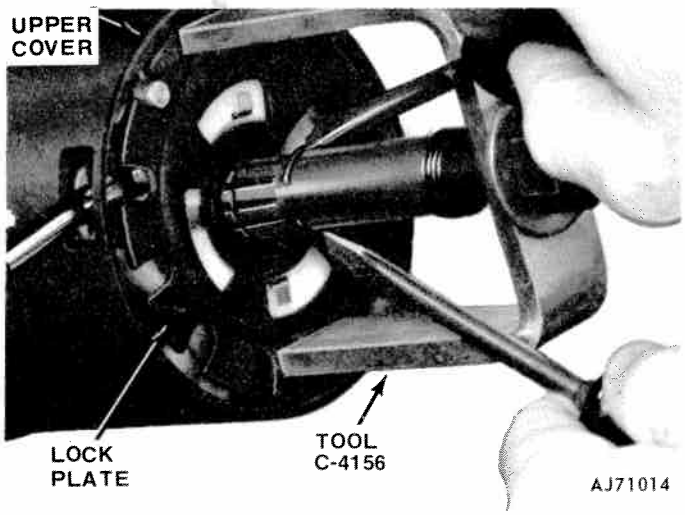

Fig. 11-32 Lock Plate Snap Ring Installation

(3) Remove locknut securing push rod to tie rod bracket and remove damper assembly.

Installation

(1) Insert rubber bushings in damper eyelets.
(2) Secure eyelet at push rod end to stud on tie rod bracket with attaching parts.
(3) Extend push rod by pulling back on damper body until eyelet can be located on, and secured to stud on damper bracket at spring pad.
(4) Tighten all locknuts securely.

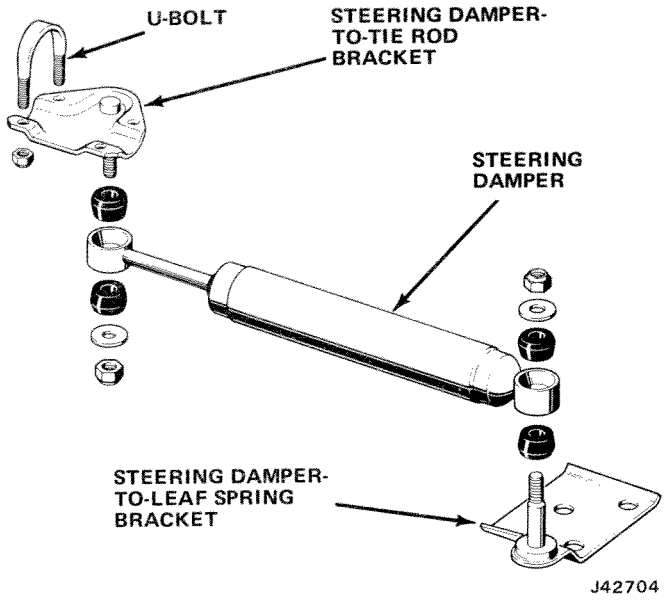

Fig. 11-48 Steering Damper

FRONT WHEEL ALIGNMENT ADJUSTMENTS

To assure correct alignment, a definite procedure for inspection of the steering system is recommended. It is suggested that the following sequence be used.

(1) Equalize tire pressures and level vehicle.
(2) Check steering-gear-to-steering column alignment.
(3) Inspect steering knuckle pivots, spindle and wheel bearing looseness.
(4) Check wheel runout.
(5) Test wheel balance and bearing adjustment.
(6) Check for spring sag.
(7) Inspect brakes and shock absorbers.
(8) Check steering gear assembly adjustment and steering connecting rod.
(9) Check caster.
(10) Check toe-in.
(11) Check toe-out on turns.
(12) Check camber.
(13) Check tracking of front and rear wheels.
(14) Check frame alignment.

The factors of alignment, caster, camber, and toe-in, are all interrelated. After an alignment job is completed, make a complete recheck of all the adjustments to be sure the settings are within the limit. Be sure all front suspension and steering system nuts and bolts are all properly torqued before taking wheel alignment readings.

Toe-In

Refer to figure 11-49.

To adjust the wheel toe-in, first raise the front of the vehicle to free the front wheels. Turn the wheels to the straight ahead position. Use a steady-rest to scribe a pencil line in the center of each tire tread as the wheel is turned by hand. A good way to do this is to first coat a strip with chalk around the circumference of the tread at the center to form a base for a fine pencil line.

Measure the distance between the scribed lines at the front and rear of the wheels using care that both measurements are made at an equal distance from the floor. The distance between the lines should be greater at the rear than the front by 3/64 inch to 3/32 inch. To make adjustment to obtain this distance, loosen the clamp bolts and turn the tie rod with a small pipe wrench. The tie rod is threaded with right and left hand threads to provide equal adjustment at both wheels. Do not overlook retightening the clamp bolts to specified torque.

It is common practice to measure between the wheel rims. This is satisfactory providing the wheels run true. By scribing a line on the tie tread, measurement is taken between the road contact points which will reduce error of wheel runout.

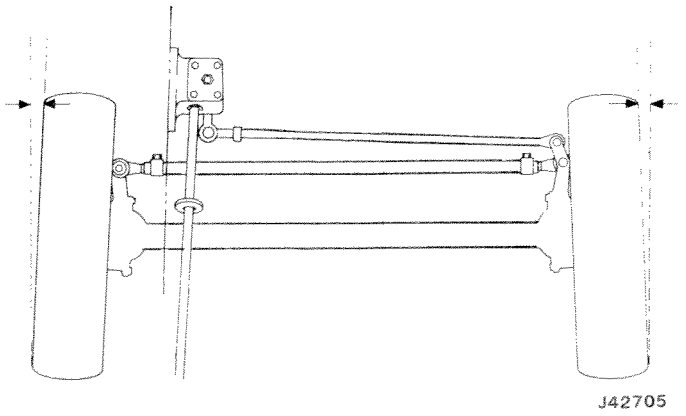

Fig. 11-49 Front Wheel Toe-In (Top View)—Typical

Camber

Refer to figure 11-50.

Correct wheel camber of 1-1/2° is set in the solid front axle at the time of manufacture and cannot be altered by any adjustment. It is important that the camber is the same on both front wheels. Caster angle should be checked using wheel aligning fixture. Heating any of these parts to facilitate straightening

SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
STEERING GEAR OIL LEAKS	(1) Loose hose connections	(1) Tighten
	(2) Damaged hose	(2) Replace
	(3) Side cover O-ring seal	(3) Replace seal
	(4) Pitman shaft seal	(4) Replace seal
	(5) Housing end plug O-ring seal	(5) Replace seal
	(6) Adjuster plug O-ring seal	(6) Replace seal
	(7) Torsion bar O-ring seal	(7) Replace valve
	(8) Pitman shaft lash adjuster nut	(8) Replace nut
	(9) Stub shaft seal	(9) Replace seal
PUMP OIL LEAKS	(1) Reservoir too full	(1) Remove oil to proper level
	(2) Oil leaking at top of reservoir caused by air bubbles in oil	(2) Locate source of air leak and correct
	(3) Reservoir O-ring seal damaged or improperly installed	(3) Replace O-ring
	(4) Pressure union or reservoir to housing bolt and stud not tightened sufficiently	(4) Tighten union and stud and bolt to 35 foot-pounds torque
	(5) Pressure union or reservoir to housing bolt and stud cross threaded or damaged	(5) Replace damaged parts
	(6) Defective pressure fitting seat on hose end	(6) Replace hose
	(7) Damaged reservoir to housing or pressure union O-ring seals	(7) Replace seals
	(8) Leaks in metal parts	(8) Replace defective part
	(9) Defective shaft seal	(9) Replace seal
	(10) Damaged shaft at seal area	(10) Replace shaft
STEERING GEAR RATTLE OR CLUCK	(1) Loose overcenter adjustment	(1) Adjust to specification

NOTE: A slight rattle may occur on turns because of the increased lash when off the "high point". This is normal and the lash must not be reduced below the specified limits to eliminate this slight rattle.

	(2) Gear loose on frame	(2) Tighten mounting bolts
STEERING GEAR HISS	(1) Normal when steering wheel is at end of travel or when parking	(1) Replace valve only if noise is extremely objectionable Investigate clearance around safety drive rivet pins Be sure there is no metal-to-metal contact around flexible coupling, as hiss will be transmitted through vehicle Re-align steering column if necessary
	(2) Gear loose on frame	(2) Tighten mounting bolts
STEERING GEAR SQUAWK WHEN TURNING OR RECOVERING FROM A TURN	(1) Cut or worn damper O-ring on valve spool	(1) Replace O-ring

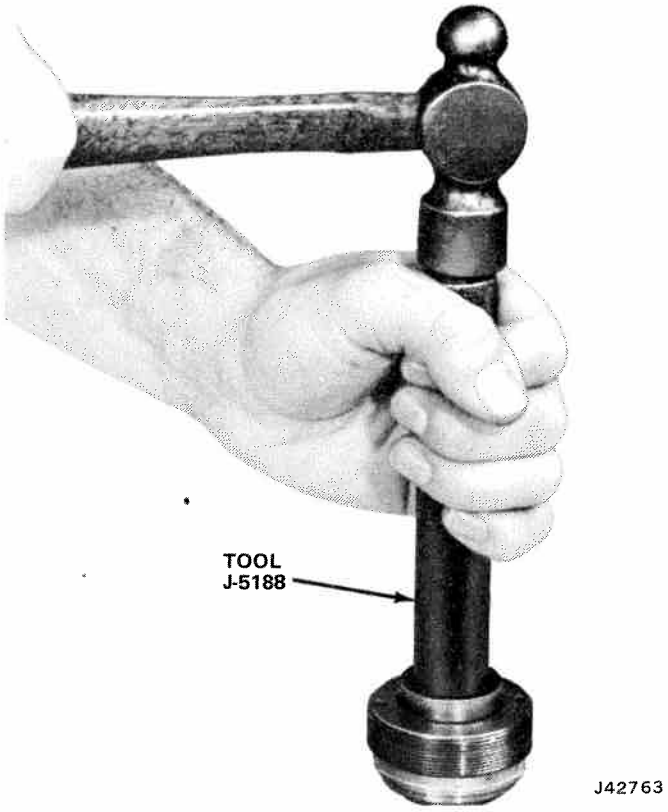

Fig. 11-82 Installing Stub Shaft Seal in Adjuster Plug

With Conical Races

(a) Mark housing opposite one of the holes in adjuster plug (fig. 11-83).

(b) Measure counterclockwise 3/16 to 1/4 inch and remark housing (fig. 11-84).

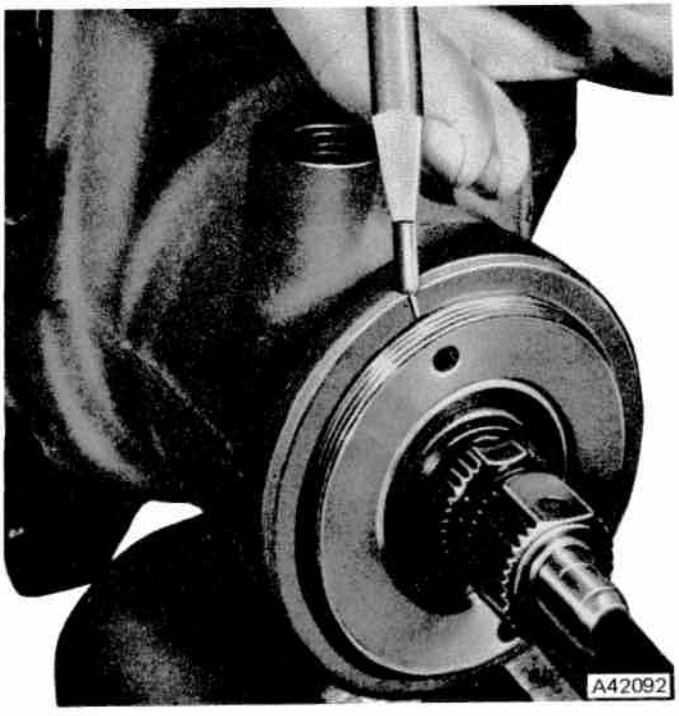

Fig. 11-83 Marking Housing

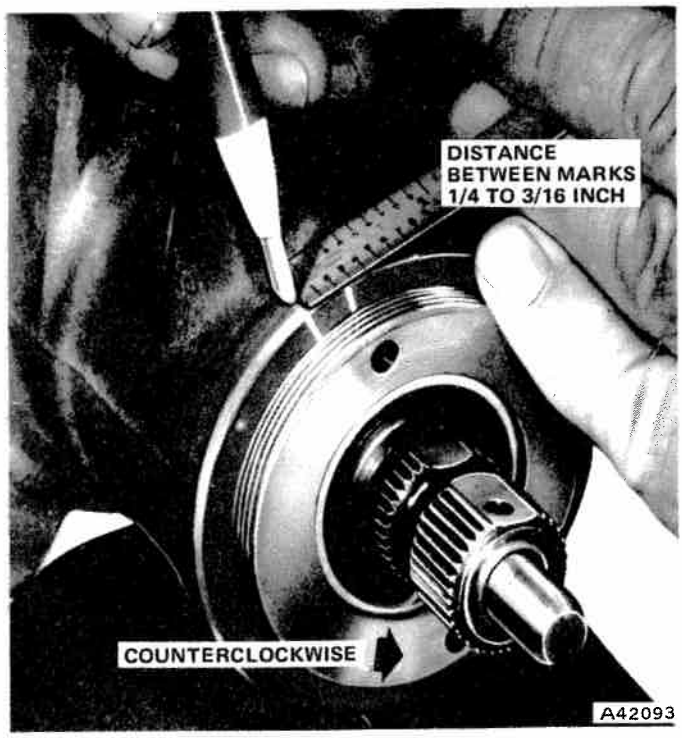

Fig. 11-84 Position of Second Mark

(c) Rotate adjuster plug counterclockwise until hole in plug is in line with second mark.

(d) Install and tighten adjuster plug locknut (80 foot-pounds torque) while holding adjuster plug in position.

(e) With an inch-pound torque wrench and a 3/4-inch deep socket, measure drag torque required to turn stub shaft, and record reading (fig. 11-85).

With Flat Races

(a) Turn adjuster plug 1/4-turn counterclockwise.

(b) With inch-pound torque wrench and a 3/4-inch deep socket, turn stub shaft and measure valve body drag torque. Record reading (fig. 11-85).

(c) Tighten adjuster plug to obtain 3 to 4 inch-pounds in addition to drag torque noted above.

(d) Tighten adjuster plug locknut securely (80 foot-pounds torque), while holding adjuster plug in position.

(e) Recheck torque and record reading.

NOTE: *Preload tends to drop when locknut is tightened.*

(18) Install Ring Compression Tool J-8947 into gear housing. Hold it tightly against shoulder in housing. Insert rack-piston nut into housing until arbor engages worm. Turn stub shaft clockwise, drawing rack-piston nut into housing. When piston ring is in housing bore, arbor may be withdrawn from rack-piston nut. Remove ring compressor tool. Move rack-piston to center position.

SUSPENSION

GENERAL

All vehicles have semi-eliptical leaf springs and double-action hydraulic shock absorbers. A front axle stabilizer is standard on the 8000 GVWR Model 46 Truck.

SPRINGS

Springs are mounted parallel to the frame side rails. The forward end of the front springs and the rear end of the rear springs are attached by pivoting shackles to the

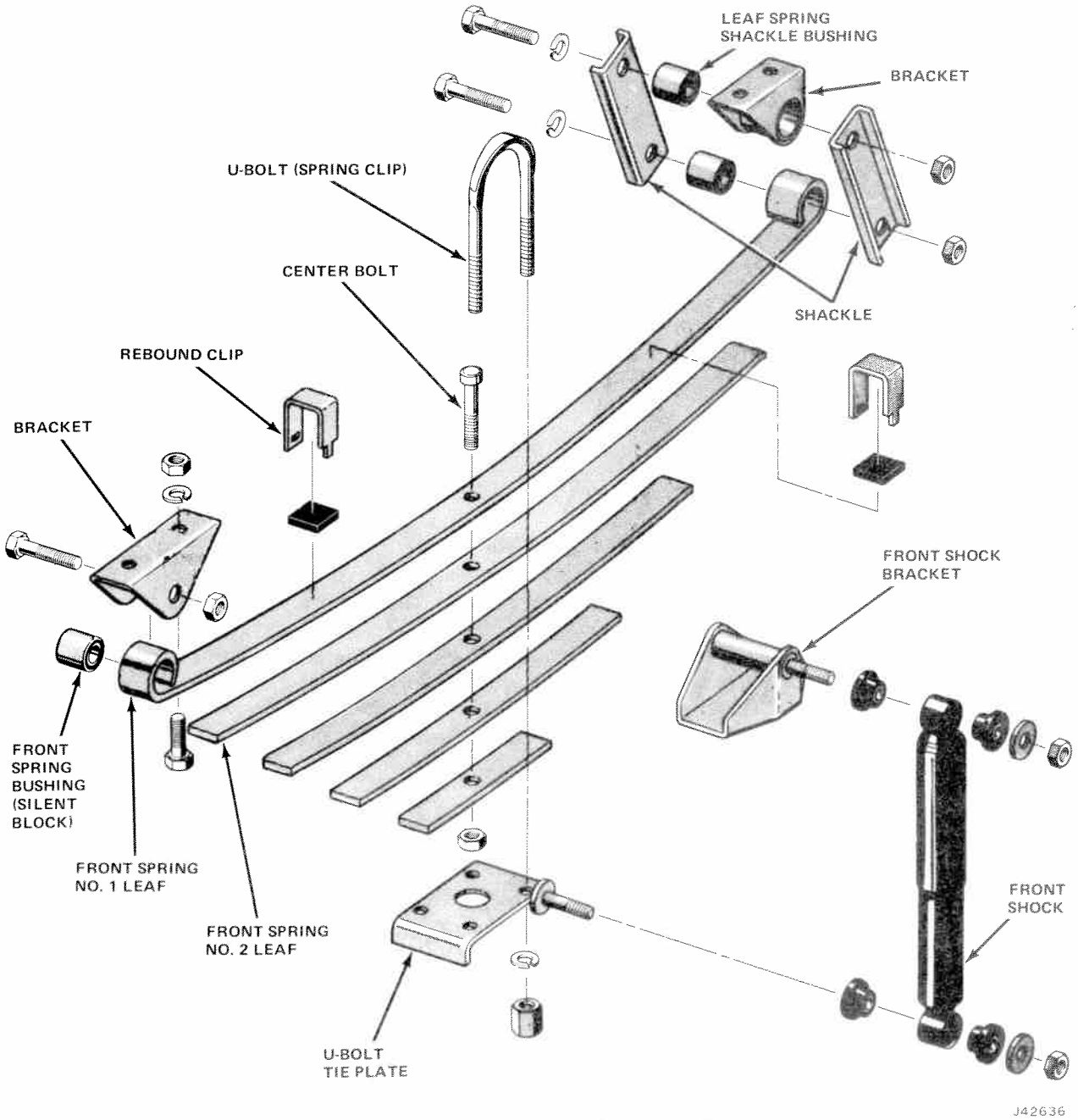

Fig. 12-1 Front Spring and Shock Absorber - CJ Models

acts as a reservoir to furnish refrigerant to the expansion valve at all times. From the receiver, the high pressure liquid refrigerant passes to the expansion valve. The expansion valve meters refrigerant into the evaporator where a low pressure is maintained by the suction side of the compressor. As it enters the evaporator, the refrigerant immediately begins to boil by absorbing heat from the air passing over the evaporator core. Having given up its heat to boil the refrigerant, the air is cooled and passes into the passenger compartment of the vehicle. The refrigerant continues to boil in the evaporator until all the liquid has vaporized. From the evaporator the refrigerant is drawn back to the compressor to repeat the cycle.

REFRIGERANT SAFETY PRECAUTIONS

The refrigerant used in air conditioning systems is dichlorodifluoromethane, commonly known as Refrigerant 12 (or R-12). It is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of **21.7°F below zero**, at atmospheric pressure, it vaporizes at all normal temperatures and pressures. The vapor is heavier than air, nonflammable and nonexplosive. It is nonpoisonous except when in direct contact with open flame, and is noncorrosive except when combined with water. Observe the following precautions when handling R-12.

R-12 evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes.

WARNING: *Always wear safety goggles when servicing the refrigeration part of the air-conditioning system. Keep a bottle of sterile mineral oil and a weak solution of boric acid handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out (R-12 is rapidly absorbed by the oil). Next, wash the eyes with the weak solution of boric acid. Call a doctor immediately, even though irritation has ceased after first aid treatment.*

WARNING: *Do not heat R-12 above 125°F.*

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant. A bucket or large pan of hot water not over 125°F is all the heat required for this purpose. Do not heat the refrigerant container with a blowtorch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

When metering R-12 into the refrigeration system, **keep the supply tank or cans in an upright position.** If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

WARNING: *Always maintain good ventilation in the working area. Always discharge the refrigerant into the service bay exhaust system or outside the building. Large quantities of refrigerant vapor in a small, poorly ventilated room can displace the air and cause suffocation.*

Although R-12 vapor is normally nonpoisonous, it can be changed into a very poisonous gas if allowed to come in contact with an open flame. Do not discharge large quantities of refrigerant in an area having an open flame. A poisonous gas is produced when using the halide torch leak detector. Avoid inhaling the fumes from the leak detector.

CAUTION: *Refrigerant will tarnish bright metal and chrome surfaces. Avoid splashing refrigerant on any surface. Refrigerant in combination with moisture is very corrosive and can cause great damage to all metal surfaces.*

SERVICE VALVES

The discharge and suction service valves are mounted on the compressor cylinder head and are used for diagnosis, charging, discharging, evacuating and component removal.

The service valves are three-position valves (fig. 13A-3). The normal operating position, shown in figure 13A-3, View B, has the valve stem turned **counter clockwise** to the **back-seated** (full-out) position.

When the valve stem is turned **clockwise to the front-seated** (full-in) position (fig. 13A-3 View A), the compressor is isolated from the system. This position is used when removing the compressor or when checking compressor oil level.

When the valve is **midpositioned** (cracked) (fig. 13A-3 View C), the gauge port is **open.** This position is used when charging, discharging, evacuating and checking system pressures.

PRESSURE GAUGE AND MANIFOLD SET

The Pressure Gauge and Manifold Set, Tool J-5725-04 (fig. 13A-4), is the most important tool used to service the air conditioning system. The gauge set is used to determine system high and low

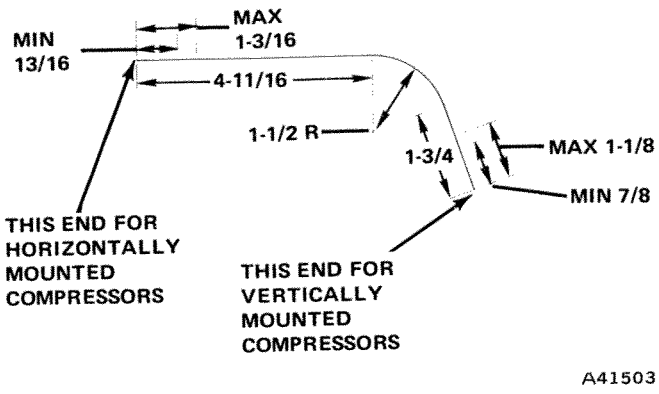

Fig. 13A-15 Oil Dipstick Fabrication Dimensions (Inches)

(6) Install oil check plug O-ring seal. Be sure O-ring is not twisted.

NOTE: *Oil filler plug leaks are usually due to a damaged O-ring or dirt on the seat.*

(7) Install plug, being careful not to overtighten it.
(8) Purge compressor of air.

Purging Compressor of Air

The compressor must be purged of air whenever it has been isolated for oil level check or other service procedures without discharging the entire system.

(1) Cap service gauge ports on both service valves.
(2) Back-seat the suction service valve to allow system refrigerant to enter compressor.
(3) Place the discharge service valve in the mid or cracked position.
(4) Loosen the discharge service valve gauge port cap to permit the refrigerant to force any air out of the compressor.
(5) Back-seat the discharge service valve and tighten the gauge port cap.
(6) The compressor is now ready for service.

MAGNETIC CLUTCH

The magnetic clutch consists of a stationary electromagnetic coil, and a rotating pulley and plate assembly.

The electromagnetic coil is mounted on four bosses on the compressor. The pulley and plate assembly is mounted on the compressor shaft. When the air conditioner is off, the pulley is free to turn on the clutch hub bearing. When the clutch is energized, the plate is magnetically attracted to the pulley and turns the compressor crankshaft.

Do not attempt to replace the bearing, pulley or clutch plate separately. These components are serviced only as a complete assembly. The coil is serviced as a separate unit.

Electrical Diagnosis

Refer to the Magnetic Clutch Troubleshooting guide when diagnosing magnetic clutch malfunctions.

Diagnosis for Noisy Clutch

Spin the pulley by hand. There must be no interference between the field and the rotor assembly. The clutch coil must be mounted properly using the special capscrews which position the field coil to the compressor.

A worn pulley bearing can be detected by the roughness felt when spinning the pulley. Do not attempt to replace the bearing.

A new clutch may emit a short squeal when initally engaged. After a few cycles of operation the noise will disappear.

Clutch Removal

(1) Remove compressor belt.
(2) Energize the clutch or use a spanner wrench to hold the clutch plate while removing the clutch-to-shaft attaching bolt and washer.
(3) Install a 5/8-inch-11 standard thread bolt in the threaded center of the clutch plate.
(4) Tighten the bolt and pull the clutch from the shaft.

CAUTION: *Do not pry on clutch to remove.*

(5) Remove four capscrews which retain the magnetic coil and disconnect coil wire. Remove coil.

Clutch Installation

(1) Install magnetic coil with the four special capscrews provided with the replacement unit. These capscrews are used to ensure the coil is positioned properly on the compressor.
(2) Tighten capscrews to 7 to 10 foot-pounds torque.
(3) Install woodruff key on compressor shaft.
(4) Align clutch assembly with key and install clutch on shaft.
(5) Install clutch-to-shaft attaching bolt and tighten to 20 foot-pounds torque. Connect clutch coil wire and energized clutch to hold unit when tightening.
(6) Install compressor belt and adjust belt tension to specifications.

Cherokee-Wagoneer-Truck

Removal

(1) Drain engine cooling system.
(2) Disconnect temperature control cable at heater.
(3) Disconnect heater hoses at inlet and outlet of heater.
(4) Disconnect heater resistor wires at plug type connector on heater resistor.
(5) Remove four nuts that secure heater core and duct to fire-wall.

NOTE: *Two of the nuts are on the inside of the vehicle just to the right of the transition duct.*

(6) Remove heater core and duct.
(7) Mark duct halves to be sure they are reassembled properly.
(8) Remove screws that fasten two halves of duct together.
(9) Remove four screws that secure heater core to the duct.
(10) Remove heater core.

Installation

(1) Install heater core in housing and install four attaching screws.
(2) Assemble two halves of heater core duct and install unit in vehicle. Install all attaching nuts.
(3) Connect heater resistor wires, heater hoses, and temperature control cable.
(4) Fill cooling system to proper level.

HEATER CONTROL SWITCH AND CABLE REPLACEMENT—CJ MODELS

(1) Remove knob by inserting wire into hole at side to release spring retaining clip.
(2) Remove trim nut on face of heater control panel.
(3) Disconnect wires from fan switch which is part of center control cable.
(4) Disconnect cable at damper end and remove cable.
(5) To install, route new cable through hole in control panel and to respective damper door.
(6) Connect and adjust cable; install trim nut and knob.
(7) Connect fan control wires if center cable has been removed.

HEATER CONTROL PANEL—CHEROKEE-WAGONEER-TRUCK

Removal

(1) Remove three vacuum lines from heater control.
(2) Remove clamp and cable from temperature control lever.
(3) Unsnap lamp bulb from heater control and disconnect terminal connector located in wiring.
(4) Remove two nuts and mounting bracket from bottom of control.
(5) Remove control panel by pushing out on bottom.

Installation

(1) Install heater control panel, bulb, and cable.
(2) Replace vacuum tubes as follows:
(a) Number 1 on the vacuum control valve goes to the defroster vacuum actuator.
(b) Number 3 on the vacuum control valve goes to the vacuum storage tank.
(c) Number 4 on the vacuum control valve goes to the vacuum actuator.

BLOWER MOTOR

Blower motor can be removed for repairs as follows:
(1) Disconnect electrical connection.
(2) Remove screws that hold motor in place.
(3) Remove blower motor and fan.

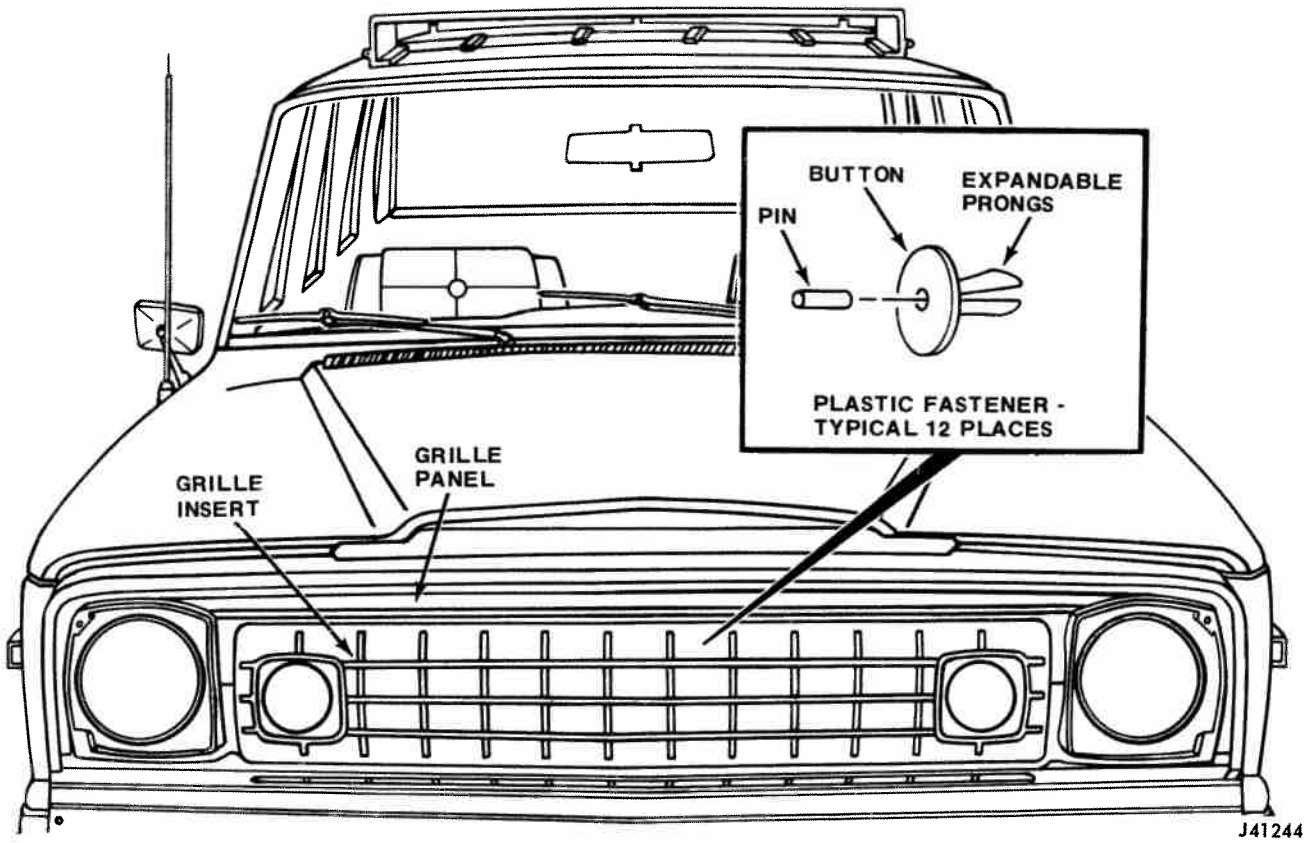

Fig. 14-10 Grille Insert and Fasteners - Wagoneer

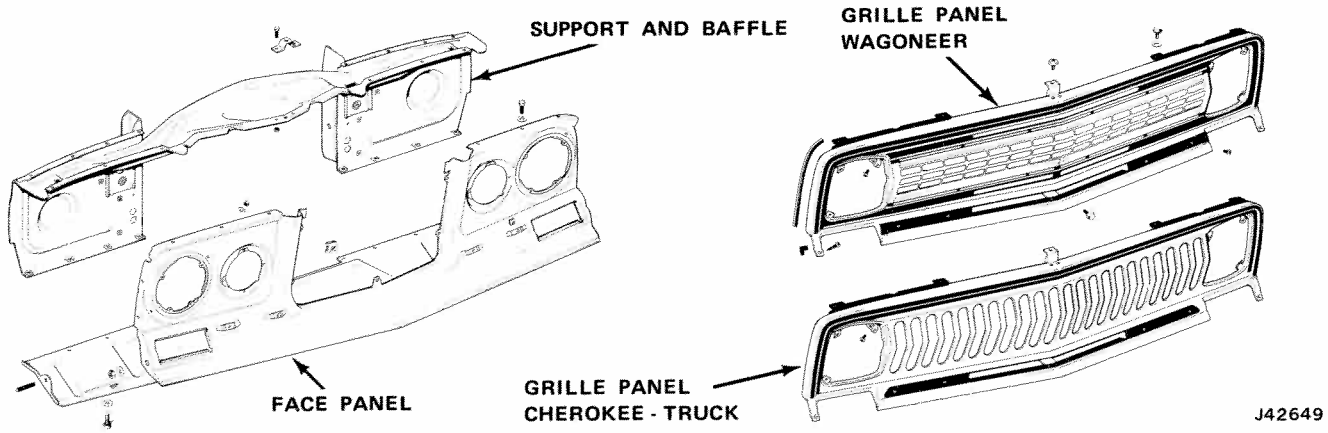

Fig. 14-11 Grille Panel - Cherokee - Wagoneer - Truck

(4) Loosen nuts securing the two radiator support rods to the radiator grille guard support brackets.

(5) Remove rods from brackets.

(6) Tilt guard panel forward and disconnect electrical wiring at head lamp sealed beam unit, and parking lamp assembly wire harness at connectors.

(7) Lift radiator guard panel from vehicle.

Cherokee - Wagoneer - Truck

(1) Remove headlamp doors, headlamp housing and disconnect headlamp wiring at sealed beam unit.

(2) Remove screws, bolts and washers securing grille.

(3) Remove grille.

WAGONEER GRILLE INSERT

Replacement

(1) Push the pin through and out the back of the button-shaped plastic fasteners using a 1/8-inch diameter tool (fig. 14-10).

(2) Remove and discard plastic fastener buttons.

(3) Remove grille insert from grille panel and disconnect parking light wiring at harness connectors.

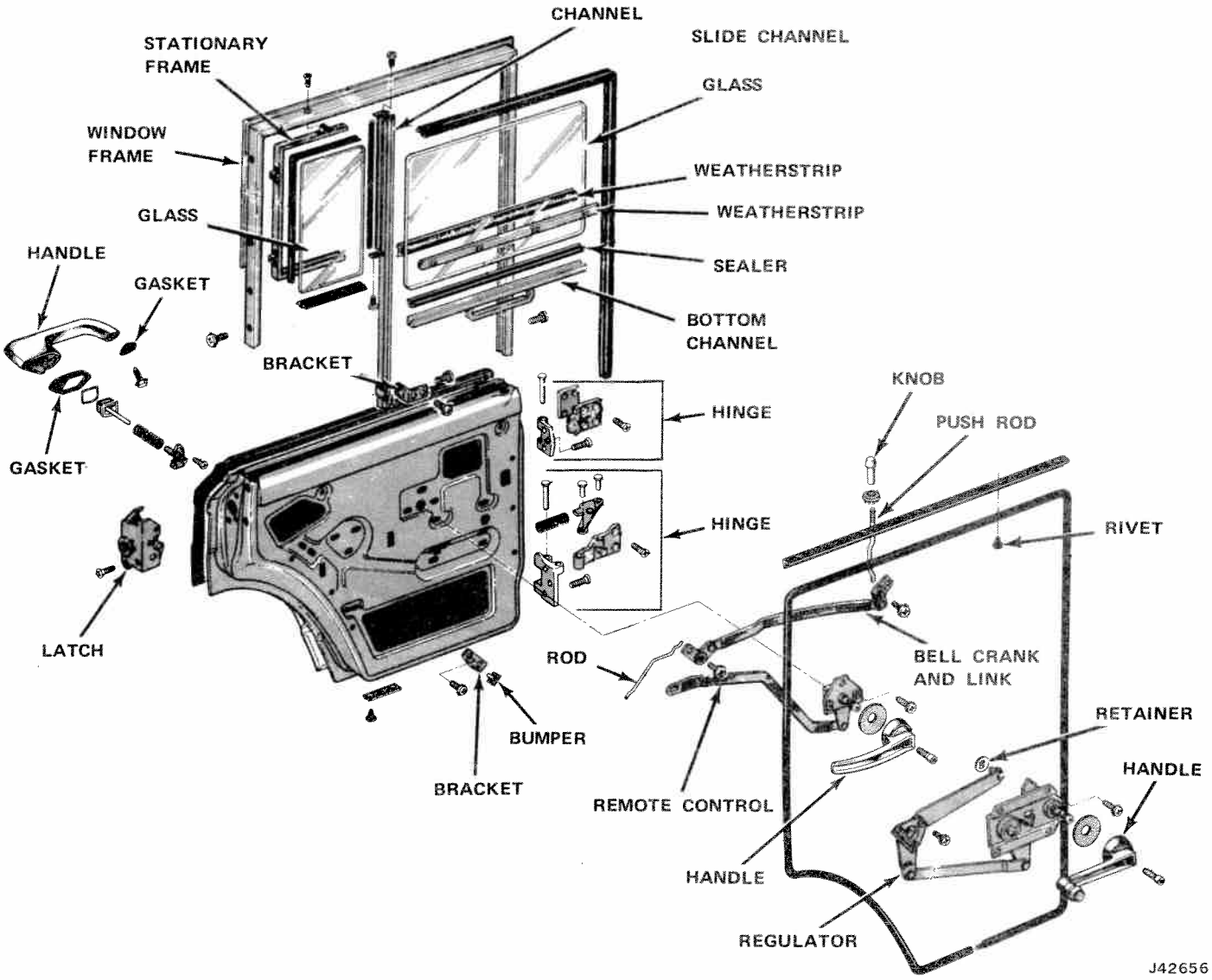

Fig. 15-3 Rear Door - Wagoneer

(12) Rotate glass 90 degrees and guide glass between inner and outer door panels.

Installation

(1) Position door glass in lower section of door so channel has recessed portion toward inner door panel.

(2) Position door glass in front run channel and push rear channel over glass.

(3) Slide glass up and crank regulator arm down until pin on regulator arm can be inserted in slot of lifter channel.

(4) Install retainer.

(5) Position stationary vent assembly and install attaching screws.

(6) Install upper glass run channel.

(7) Install inner and outer belt weatherstrip.

(8) Install rear channel attaching bracket.

(9) Install glass stop bracket.

(10) Check operation of glass.

(11) Install water shield and door trim panel.

REAR DOOR VENT ASSEMBLY

Removal

(1) Remove door glass.

(2) Apply soap solution under vent weatherstrip and along inner and outer door panels.

(3) Slide vent assembly forward to center of door glass opening.

(4) Push vent assembly down through opening between inner and outer door panels to disengage assembly from upper door frame.

(5) Lower top of vent assembly down to clear upper door frame.

(6) Pull vent assembly straight up until all weatherseal is clear of door panel and vent assembly can be rotated.

(7) Rotate assembly to position lower attaching bracket on channel and pull assembly up and out between panels.

WINDSHIELD - REAR WINDOW - WINDSHIELD WIPER

WINDSHIELD

GENERAL

The windshields on all models consist of two sheets of glass, some flat and some curved, laminated together to form a one-piece safety glass.

All windshields are retained in their respective openings by similar lock-type rubber weatherstrips (channels).

The safety type glass is designed with adequate clearance to prevent stress and strains. When replacing cracked glass resulting from causes other than a direct blow or a known instance of temporary misalignment, it is very important that the cause of the breakage be determined and the condition corrected.

The inside rear view mirror bracket for Cherokee, Wagoneer, and Truck models is bonded directly to the windshield glass with a polyvinyl-butyral compound through a heat-induction process.

Service replacement windshield glass may have the rear view mirror bracket bonded to the windshield glass. In this case the mirror is simply transferred from the unserviceable windshield to the bracket on the replacement windshield.

If the replacement windshield does not have the mirror bracket bonded to it, or if on serviceable windshields the bracket bond has been lost, a service kit is available for bracket installation. The kit is available from your local parts distribution center and consists of a replacement bracket and firm-setting, two-component adhesive. Installation instructions are included in this section, as well as in the kit.

NOTE: *Do not attempt to remount the original bracket. For best results use a new bracket with the proper adhesive, available as a service kit.*

INSERT REMOVAL

A V-shaped rubber insert is set into a molded groove in the rubber weatherstrip on some units, to provide a snug fit to the glass and the opening flange.

On others an interlocking type lip is part of the weatherstrip as shown in figures 17-3 and 17-4.

The weatherstrip should be 75° F (24° C) or above before windshield removal is attempted.

(1) Cover adjoining painted surfaces to protect finish.

(2) Remove windshield wiper arms using a wiper arm removal tool if available. If not, use a wide blade screwdriver.

(3) On vehicles so equipped, remove the windshield insert moulding or V-shaped rubber strip from around the outside of the windshield using a screw-driver blade and carefully pry the insert from the slit in the weatherstrip (fig. 17-1).

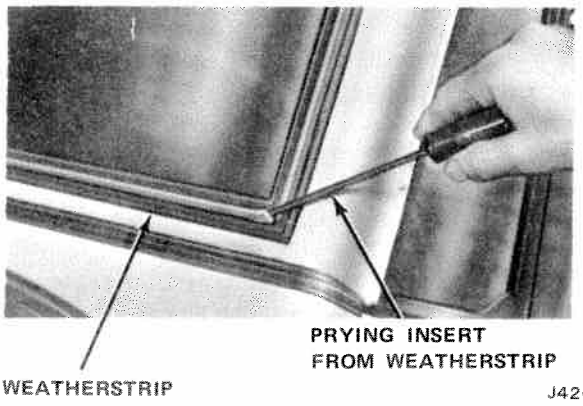

Fig. 17-1 Removing Windshield Moulding Insert from Weatherstrip

(4) On units with locking-type weatherstrip, use a wedge shaped fiber or hardwood stick or wand as shown in figure 17-2 to unlock the weatherstrip as shown in figures 17-3 and 17-4.

(5) On vehicles with the stainless steel mouldings, remove the moulding screws at the top and bottom of the side mouldings.

(6) Remove top corner moulding by lifting the bottom and pulling outboard.

INSTRUMENT PANEL AND MOUNTED ASSEMBLIES

INSTRUMENT PANEL

All instrument panels are of formed sheet metal construction reinforced with braces and fastened to adjacent body panels with welds or bolts. The instrument panels contain the instrument cluster, ignition switch, switch control panel, and/or individual switches and the glove box. Also attached to the panel are the steering column, brake and clutch pedal supports, and the hand brake.

CJ Models

The instrument panel is bolted to the cowl and dash panel area with capscrews. Eight of these capscrews are located on the face of the panel and one at each side, accessible from under the instrument panel.

Cherokee - Wagoneer - Truck

The instrument panel is bolted to the surrounding body sheet metal and to the brake and clutch support brackets. When removing the instrument panel, the windshield must be removed to obtain access to the bolts under the windshield weatherstrip that attach the instrument panel to the cowl. Other instrument panel attaching bolts must also be removed.

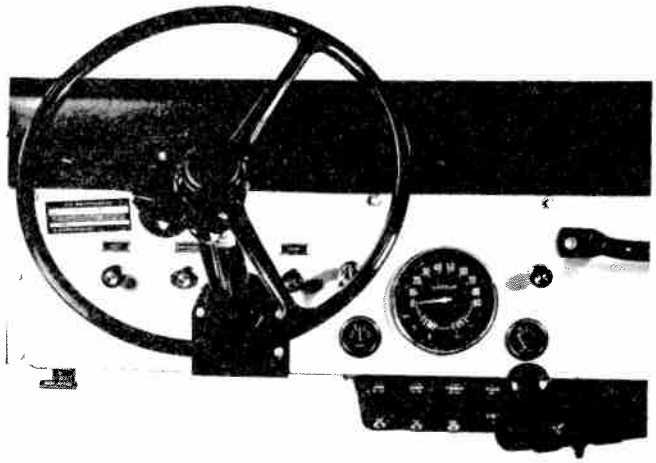

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Fig. 18-1 Instrument Panel - CJ Models

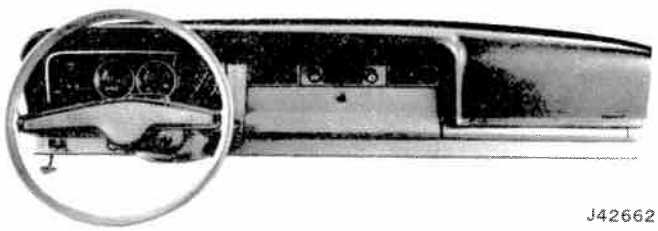

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Fig. 18-2 Instrument Panel - Wagoneer - Cherokee - Truck

Instrument Panel Overlay Pad (Crash Pad)

A vinyl-coated polyurethane safety pad is attached to the instrument panel on the Cherokee, Wagoneer, and Truck Models. A similar crash pad which attaches to the lower frame of the windshield is also available as a factory option on CJ Models.

The safety pads are fastened to the instrument panel or windshield frame with pressure type clips, studs with nuts, or sheet metal screws.

Replacement - CJ Models

(1) Remove five retaining screws along top edge of crash pad.

NOTE: *Lower edge of crash pad is retained with compression type spring retainers.*

(2) Insert a stiff putty knife between crash pad and frame at each of the four clips, and pry the pad away from the frame to release the clip.

(3) To install the crash pad, align the spring clips with the retaining holes and snap the panel into place.

(4) Install the screws along the top edge at the base of the windshield.

Replacement—Cherokee-Wagoneer-Truck

(1) Remove windshield and windshield weatherstrip to expose crash pad retaining screws at base of the windshield. Refer to Windshield Removal.

(2) Remove exposed crash pad retaining screws.

(3) Remove instrument cluster and ash receiver.

(4) Remove nuts from studs located around perimeter of crash pad. The nuts are accessible through the cluster and ash receiver openings and from under the instrument panel at the right side.

(5) When installing, start all attaching screws and nuts and tighten them evenly, beginning at the center and working toward each end.

(6) Install the windshield weatherstrip and the windshield.

GLOVE BOX

The glove box is attached to the glove box opening

(4) Swing decal up using strips of masking tape as hinges (fig. 20-3).

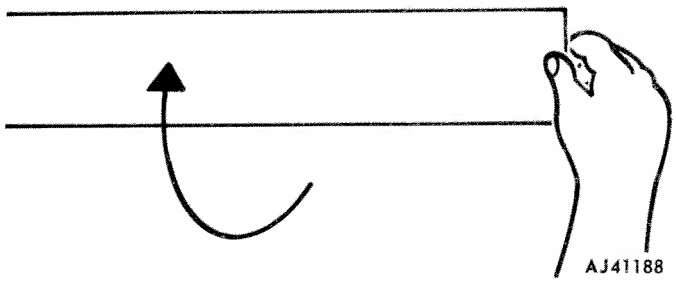


Fig. 20-3 Lifting Decal

(5) Remove approximately six inches of paper backing from one end (fig. 20-4).

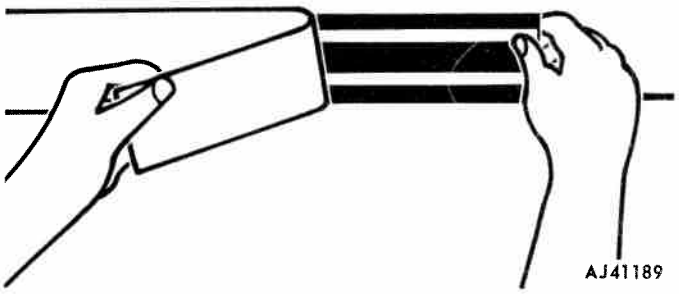


Fig. 20-4 Removing Backing Paper

(6) Swing decal back down to aligned position. Squeegee decal to panel using firm strokes while removing remainder of paper backing (fig. 20-5).

NOTE: *To avoid pre-adhesion or stretching of the decal, do not remove more than six inches of paper backing at one time.*

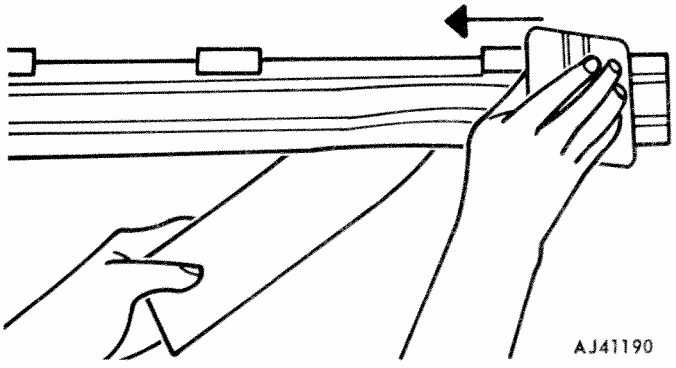


Fig. 20-5 Installing Decal with Squeegee

(7) Where possible, extend decal 1/2-inch beyond corners or edges (fig. 20-6) and wrap firmly using finger pressure and squeegee. Avoid trapping air in these areas.

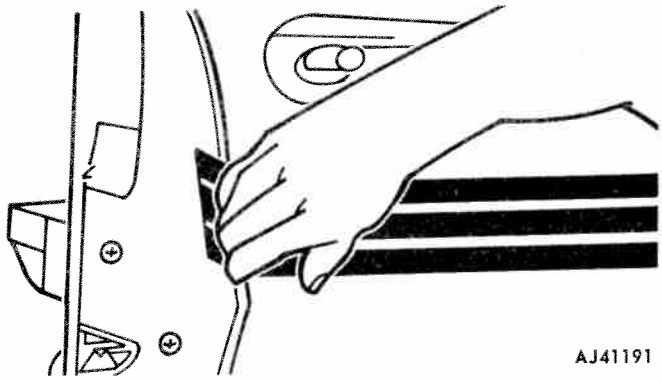


Fig. 20-6 Overlapping Decal at Corners or Edges

(8) Remove easy-release paper from face of decal (if applicable).

(9) Inspect decal installation using reflected light to detect any irregularities that may have developed during installation. Remove all air or moisture bubbles.

(10) Install previously removed parts and clean vehicle as required.

Installation of Intricate Decals

For large intricately-shaped decals, the following procedure will simplify installation.

(1) The use of wetting solution assures a better bond between decal and painted surfaces. Prepare a supply of wetting solution by thoroughly mixing two or three teaspoons of detergent (Joy, Vel, or equivalent) in one gallon of water.

NOTE: *Too much detergent will reduce the effectiveness of the bond.*

(2) Place decal on clean, flat surface with paper backing side up. Bend up a corner and separate edge of paper backing from the decal. Hold decal firmly to the surface of a table and in a smooth motion, remove entire paper backing. Under hot, humid conditions, a slight jerking motion will aid in removing the paper backing.

CAUTION: *Always remove the paper backing from the decal; never the decal from the backing, as possible film stretching may result. Hold decal in corners when removing paper backing as fingerprints will adversely affect the adhesion.*

(3) Using clean sponge, apply ample wetting solution to decal adhesive and panel surface. The wetting solution permits ease of movement of the decal while positioning it on panel surface.

(4) Immediately apply wetted decal to the panel surface. Apply wetting solution to decorative face of decal to allow the squeegee to slip during application.

(5) Squeegee a short section of decal at the center. Lift right or left side of decal, position it straight and

WIRING DIAGRAM—CHEROKEE—WAGONEER

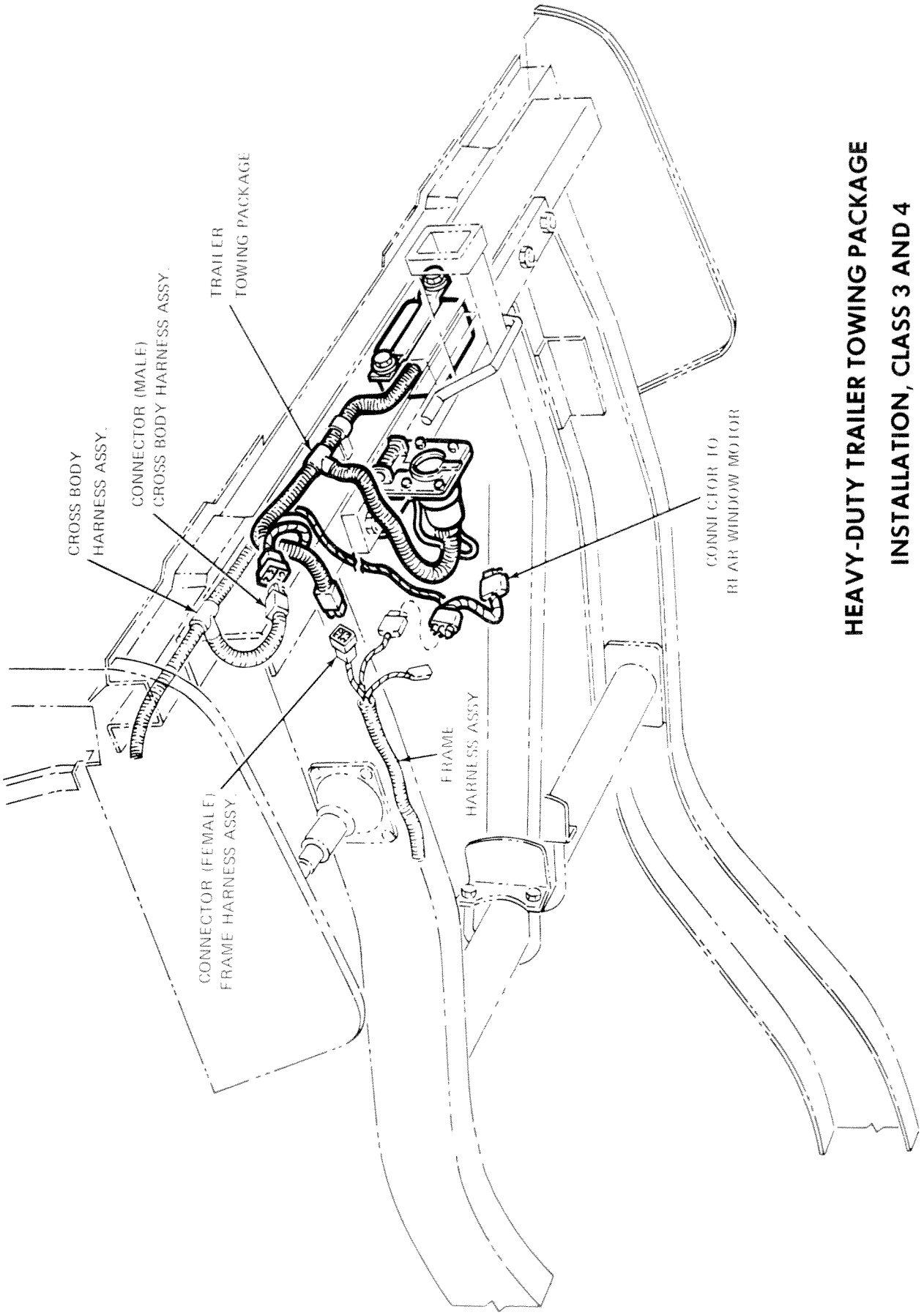
LAMP ASSY.—MARKER & REFLECTOR —AMBER (BULB—G.E. NO. 194)
HEADLAMP ASSY
PARKING & SIGNAL LAMP ASSY. — RT (FOR 1600 & 1700)
PARKING & SIGNAL LAMP ASSY.—RT. (FOR 1400 & 1500)
PARKING & SIGNAL LAMP ASSY.—LT. (FOR 1400 & 1500)
PARKING & SIGNAL LAMP ASSY.—LEFT (FOR 1600 & 1700)
HEADLAMP ASSY.
LAMP ASSY.—MARKER & REFLECTOR —AMBER (BULB—G.E. NO. 194)
BATTERY
BATT. GRD. CABLE ASSY.
BATT. TO SOL. START SW. CABLE ASSY.
SOLENOID STARTER
ALTERNATOR REGULATOR
START. SW. TO STARTING MOTOR CABLE ASSY.
STARTING MOTOR
ALTERNATOR
OIL PRESSURE SENDER
ENGINE WIRING
IGNITION COIL
DISTRIBUTOR
A/C COMP.
TEMP. SENDER
THROTTLE STOP SOLENOID
VACUUM SOLENOID SWITCH
HEADLAMP HARNESS ASSY.
HORN RELAY ASSY.
RELAY TO HORN CABLE
DUAL HORN ASSY.
BULKHEAD CONNECTOR VIEW FROM ENGINE COMPARTMENT
DASH PANEL
HEATER BLOWER
HEATER
W/S WIPER MOTOR
BRAKE DIFFERENTIAL PRESSURE WARNING SWITCH
FOOT DIMMER SWITCH
DOOR SWITCH HARNESS
DOOR SWITCH
DOOR SWITCH (REAR DOOR)
BACK—UP LIGHT & TCS HARNESS
INSTRUMENT PANEL
INSTRUMENT GROUND ATTACHMENT
KICKDOWN SWITCH — AUTOMATIC TRANSMISSION ONLY
FOR STANDARD TRANSMISSION TAPE CIRCUITS 54 & 68 TO CONTROL HARNESS
CIGAR LIGHTER
STOP LIGHT SWITCH
SAFETY SWITCH
JUMPER
BACK—UP SWITCH
BACK—UP SWITCH JUMPER
STARTING POSITION ONLY
IGNITION SWITCH
STEERING COLUMN
HEATER LAMPS.
HEATER CONTROL
AMMETER
FUEL
RADIO NOISE SUPPRESSOR
TEMP.
OIL
QUADRA—TRAC (LOCKOUT)
TAILGATE SWITCH
W/S WIPER SWITCH
IN DOME LAMP POSITION
LIGHT SWITCH
CLUSTER PLUG
DOME LAMP HA
HARNESS
CARGO L
BACK—UP SWITCH
FUSE 3 AMP
FUSE 10 AMP
CIRCUIT BREAKER 30 AMP.
FUSE 15 AMP.
FUSE 20 AMP.
FUSE 25 AMP.

65 DIR. SIG. FEED
17 STOP LIGHT SW. FEED
60 CIGAR LIGHTER FEED
14A IGN. START
14B IGN. START
34 BACK—UP LIGHTS
52 BACK—UP LIGHT SW. FEED
57D IGN. GND. WARNING LTS.
75 IGN. (3) FEED TO FUSE BLOCK
67 IGN. ACC. FEED
12E BATT. TO IGN.
13C IGN. TO SPLICE
14A IGN. START
P DIR. SIG. FEED FROM STOP LT. SW.
N RT. TURN SIG. REAR
M LT. TURN SIG. REAR
L DIR. SIG. FEED FROM FLASHER
K HAZ. SW. TO HAZ. FLASHER
J RT. TURN IND. & SIG.
H LT. TURN IND. & SIG.
G HORN BUTTON
D PANEL LIGHTS

NOTE: JUMPERS USED FOR STANDARD TRANSMISSION ONLY

A WARNING LTS.
L GAS GAUGE
K HI—BEAM INDICATOR
J CLUSTER LIGHTS
G LEFT TURN INDICATOR
F RIGHT TURN INDICATOR
E IGNITION
C TEMPERATURE

D DOME LIGHT (—)
H FOOT DIM. SW.
I INST. CLUSTER LIGHTS
B2 DOME LIGHT (—)
R TAIL LAMP
B1 SOLENOID—"B" TERM



HEAVY-DUTY TRAILER TOWING PACKAGE

INSTALLATION, CLASS 3 AND 4

NOTES

1974 MECHANICAL MAINTENANCE SCHEDULE

Engine Oil and Oil Filter	Engine Coolant	Tires
Change required (R) every 5,000 miles or 5 months, whichever comes first. If most vehicle uses involve trips under 6-8 miles, change oil once in between the oil-and-filter changes. Change Heavy-Duty (HD) every 3,000 miles or 3 months, whichever comes first.	Change required (R) at 25,000 miles or 25 months and then at the start of every winter season. **Wheel Nuts** Torque (R) after first 200 miles.	Tires and tire services are excluded from both the New Vehicle Guarantee and this maintenance schedule. Tires are warranted directly by their manufacturers. Their normal maintenance recommendations appear as guides under Tire Condition and Tire Rotation.

SERVICES SCHEDULED by ACCUMULATED MILEAGE

HD – If you operate your Jeep vehicle under heavy-duty conditions such as off-road or dusty driving conditions for over 30% of use; extended idling during normal uses; towing heavy trailers (over 2,000 lbs.); or short run uses (most trips under 6-8 miles); more frequent servicing intervals are required. HD service intervals are in addition to others indicated.

R – Required for function and durability.

E – Required to help assure compliance with U.S. National Emission Control Standards.

	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Fluids (including battery) – inspect/correct level (a) Chart 1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
COMPLETE BODY LUBRICATION AND BRAKE INSPECTION (b) Chart 2	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD
Front Suspension – inspect/correct caster and toe	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD
Manual Transmission Clutch – inspect/correct adjustment			R			R			R			R			R			R		
Automatic Transmission – adjust linkage			R			R			R			R			R			R		
COMPLETE CHASSIS LUBRICATION (Chart 3) – CJ	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
COMPLETE CHASSIS LUBRICATION (Chart 3) – Cherokee/Wagoneer/Truck	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD
Shock Absorber Mountings and Bushings – inspect	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD
Spring Bushings – inspect	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD	R	HD	HD
Exhaust System – inspect	R	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD
U.S. EMISSION CONTROL SERVICES (Chart 4) – Scheduled routine service	E	E		E	E		E	E		E	E		E	E		E	E		E	E
U.S. EMISSION CONTROL SERVICES (Chart 4) – E.G.R. valve service*		E		E		E		E		E		E		E		E		E		E
U.S. EMISSION CONTROL SERVICES (Chart 4) – Complete precision tune-up			E			E			E			E			E			E		

a. Check engine oil level at each gasoline fill.

b. Immediately after operating in sand, mud, water, etc., inspect the brake assemblies and clean if necessary

*Service at 10,000-mile intervals if leaded fuel is used. Service at 25,000-mile intervals if lead-free is used.

conditions, use only engine oil meeting API Engine Oil Service Classification "SE". The term "SE" must appear on the oil container singly or in conjunction with other designations. SE engine oils provide more protection against oil oxidation, high-temperature engine deposits, rust and corrosion.

Engine Oil Viscosity

Multi-viscosity or single-viscosity types of oil are equally acceptable if refined and sold by reputable oil companies. However, multi-viscosity oil is your best choice since it covers a broader range of operating temperatures and driving conditions. Oil viscosity should be determined by the lowest air temperature anticipated before your next oil change, as follows:

ENGINE OIL VISCOSITY

Lowest Temperature Anticipated	Recommended Single Viscosity	Recommended Multi-Viscosity
Above + 32° F	SAE 20W-20	SAE 10W-30 or 10W-40
Above 0° F	SAE 10W*	SAE 10W-30 or 10W-40
Below 0° F	SAE 10W*	SAE 5W-20 or 5W-30

*Sustained high speeds (above 65 mph) should be avoided when using SAE 10W engine oil since oil consumption may be greater.

TIRE INFLATION PRESSURES (PSI)

Inflate tires cold, before running. Do NOT reduce pressure if tires are warm.

MODEL	GVW RATING	TIRE	LOAD RANGE	NORMAL LOAD (1)				MAXIMUM LOAD (2)			
				SUSTAINED DRIVING OVER 65 M.P.H.(3)		UNDER 65 M.P.H.		SUSTAINED DRIVING OVER 65 M.P.H.(3)		UNDER 65 M.P.H.	
				FRT.	RR.	FRT.	RR.	FRT.	RR.	FRT.	RR.
CJ-5 & CJ-6	3750 (3900 CJ-6)	E78x15	B	24	24	20	20	28	28	24	24
		F78x15	B	24	24	20	20	28	28	24	24
		H78x15	B	24	24	20	20	28	28	24	24
		7.00x15	D	40	40	30	30	45	45	35	35
		6.00x15	C	40	40	30	30	45	45	35	35
WAGONEER & CHEROKEE	5600	F78x15	B	31	31	27	27	32*	32*	32	32
		H78x15	B	25	25	21	21	28	28	24	24
WAGONEER & CHEROKEE	6000	H78x15	B	26	26	22	22	32	32	28	28
TRUCK 25/45	5200	G78x15	B	32	32	28	28	32*	32*	32	32
	5600	H78x15	B	28	28	24	24	32	32	28	28
		7.00x15	D	45	45	35	35	45	45	35	35
TRUCK 46	6500	8.00x16.5	D	45	45	35	35	55	65	45	60
		7.50x16	C	40	40	30	30	45	55	35	45
	7200	8.75x16.5	D	45	45	35	35	65	70	45	60
		7.50x16	D	40	40	30	30	55	70	45	60
	8000	9.50x16.5	D	45	45	35	35	55	70	45	60
		7.50x16	E	40	40	30	30	55	85	45	75

*Speed limited to 75 M P H

(1) **Normal Load** – Frequently selected accessories plus driver & two passengers (with CJ models, driver and one passenger)

(2) **Maximum Load** – Gross Vehicle Weight Rating (GVWR)

(3) Sustained driving over 75 M P H for Cherokee and Wagoneer

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes Information on Page No.