1981 CHEVROLET

LIGHT DUTY TRUCK

SERVICE MANUAL

ST 330-81

VEHICLE MAINTENANCE SCHEDULE

When To Perform Services (Months or Miles (km), Whichever Occurs First)	Item No.	Services	OWNER'S SERVICE LOG (Miles) (km) — Insert Month, Day, and Mileage (km) (i.e. May 5/7,500) In Column Closest To Mileage (km) When Service Is Performed.					
			7,500 (12 000 km)	15,000 (24 000 km)	22,500 (36 000 km)	30,000 (48 000 km)	37,500 (60 000 km)	45,000 (72 000 km)
Section A—Lubrication and General Maintenance								
Every 12 Months or 7,500 Miles (12 000 km)	A-1	▲Fluid Levels Check	X	X	X	X	X	X
	A-2	Clutch Pedal Free Travel Check/Adjust	X		X	X	X	X
	A-3	*Engine Oil Change	X	X	X	X	X	X
See Explanation	A-4	*Oil Filter Change	X		X		X	
	A-5	▲Chassis Lubrication						
	A-6	Front Wheel Drive						
	A-7	Tire Rotation						
	A-8	Rear Axle Lubrication						
Every 12 Months or 15,000 Miles (24 000 km)	A-9	*Cooling System Check—See Explanation		X		X		X
Every 30,000 Miles (48 000 km)	A-10	Wheel Bearing Repack				X		
	A-11	Manual Steering Gear Seals Check				X		
	A-12	Clutch Cross Shaft Lubrication				X		
Every 100,000 Miles (160 000 km)	A-13	Auto. Trans. Fluid & Filter Change						
Section B—Safety Maintenance								
Every 12 Months or 7,500 Miles (12 000 km)	B-1	Owner Safety Checks	X	X	X	X	X	X
	B-2	Tire, Wheel and Disc Brake Check	X	X	X	X	X	X
	B-3	*Exhaust System Check	X	X	X	X	X	X
	B-4	Suspension and Steering Check	X	X	X	X	X	X
	B-5	Brake and Power Steering Check	X	X	X	X	X	X
Every 12 Months or 15,000 Miles (24 000 km)	B-6	*Drive Belt Check (2)				X		
	B-7	Drum Brake and Parking Brake Check		X		X		X
	B-8	Throttle Linkage Check		X		X		X
	B-9	Bumper Check		X		X		X
	B-10	*Fuel Cap, Tank and Lines Check		X		X		X
Section C — Emission Control Maintenance Schedule I								
At first 6 Months or 7,500 Miles (12 000 km) — Then 24-Month/ 30,000-Mile (48 000 km) Intervals as indicated in Log, Except C-2 and C-6, Which Require Service at 45,000 Miles (72 000 km)	C-1	Thermo. Controlled Air Cleaner Check				X		
	C-2	Carburetor Choke & Hoses Check	X			X (1)		X
	C-3	Engine Idle Speed Adjustment	X (1)			X		
	C-4	EFE System Check	X			X		
	C-5	Carburetor Mounting Torque	X (1)			X		
	C-6	Vacuum Advance System & Hoses Check				X		
Every 15,000 Miles (24 000 km)	C-7	PCV System Check		X		X		X
		PCV Valve Replacement				X		
	C-8	Spark Plug Wires Check				X		
Every 30,000 Miles (48 000 km)	C-9	Idle Stop Solenoid and/or Dashpot Check				X		
	C-10	Spark Plug Replacement				X (1)		
	C-11	Engine Timing Adjust. & Distrib. Check				X		
	C-12	Air Cleaner & PCV Replacement				X (1)		
	C-13	EGR System Check				X		

▲Also A Safety Service *Also An Emission Control Service

High Altitude Adjustment: Your 1981 General Motors vehicle has been certified to meet emission standards at low altitude. Certain vehicles sold for high altitude use have been adjusted prior to delivery for improved driveability and emission control at high altitude. These vehicles may be identified by additional underhood tune-up label, "Supplemental Vehicle Emission Control Information." Information regarding adjustment of your vehicle, if permitted, can be obtained from the Consumer Relations Office shown in the Owner Assistance Section of your Owner's and Driver's Manual. Include your Vehicle Identification Number in your request.

(1) Only these emission control maintenance items are considered to be required maintenance as defined by the California Air Resources Board (ARB) regulation and are, according to such regulation, the minimum maintenance an owner in California must perform to fulfill the minimum requirements of the emission warranty. All other emission maintenance items are recommended maintenance as defined by such regulation. General Motors urges that all emission control maintenance items be performed.

(2) A separately driven air pump belt check is recommended but not required at 15,000 miles (24 000 km) and 45,000 miles (72 000 km).

Fig. 0B-1b--Maintenance Schedule, Gasoline, Light Duty Emissions, California

out and/or catch fire, possibly resulting in damage to the vehicle and its contents and/or personal injury to its occupants and persons in the area.

Truck-Type Snow Tires:

When using truck-type snow tires, cold inflation pressures should be increased 10 psi (70 kPa) above the advised pressures for the load being carried. However, do not exceed the wheel capacity limit shown in Section 3E. **Sustained speeds above 65 mph (100 km/h) are not advised.**

3. For proper inflation pressures when towing trailers, the following is recommended:
   When towing trailers on dead-weight hitches, inflate tires to the pressures shown on the Certification Label (on either the left door latch post or the left door edge next to the driver) or, if applicable the "Tire Inflation Pressure" charts in Section 3E.
   For trailers using weight-distributing hitches, increase front tire pressure 2 psi (14 kPa) above the pressure shown on the Certification Label (or "Tire Inflation Pressure" charts). This increase should never exceed the maximum pressure shown on the side of the tire.
   It should be remembered that when a trailer is connected, the trailer tongue weight is part of the load being carried by the vehicle and, therefore, is included in the GVW of the vehicle.
4. Always use a tire pressure gage (a pocket-type gage is advised) when checking inflation pressures. A visual inspection of tires for inflation pressures is not enough, especially in the case of radial tires. Underinflated radial tires may look similar to correctly inflated radial tires. If the inflation pressure on a tire quite often is found to be low, correct the cause.
5. Be sure to reinstall the tire inflation valve caps, if so equipped, to prevent dirt and moisture from getting into the valve core which could cause air leakage.
6. If an air loss occurs while driving, do not drive on the deflated tire more than is needed to stop safely. Driving even a short distance on a deflated tire can damage a tire and wheel beyond repair.

A-8 Rear Axle

Drain and refill to level of filler plug hole every 7,500 miles (12 000 km) on light duty emissions or 12,000 miles (19 200 km) on heavy duty emissions when using vehicle to pull a trailer or severe operating conditions. Use SAE 80W GL-5 or SAE 80W-90 GL-5 gear lubricant. In Canada, use SAE 80W GL-5 gear lubricant. On 20 and 30 series trucks, change lubricant every 24,000 miles (38 400 km).

A-9 Cooling System

(Also a LD Emission Control Service)

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the recovery tank. When the system cools down, the coolant is drawn back into the radiator.

The cooling system has been filled at the factory with a quality coolant that meets General Motors Specification 1899-M. The coolant is a 50/50 mixture of water and ethylene glycol antifreeze.

Service

- Maintain cooling system freeze protection at -34°F (-37°C) to ensure protection against corrosion and loss of coolant from boiling. This should be done even if freezing temperatures are not expected.
- Add ethylene glycol base coolant that meets GM Specification 1899-M when coolant has to be added because of coolant loss or to provide added protection against freezing at temperatures lower than -34°F (-37°C).
- Alcohol or methanol base coolants or plain water alone should not be used in a vehicle at any time.

The cooling system should be serviced each year (15,000 miles, 24 000 km, on light duty emission service) (12,000 miles, 19 200 km, on heavy duty emission and diesel engine vehicle service) as follows:

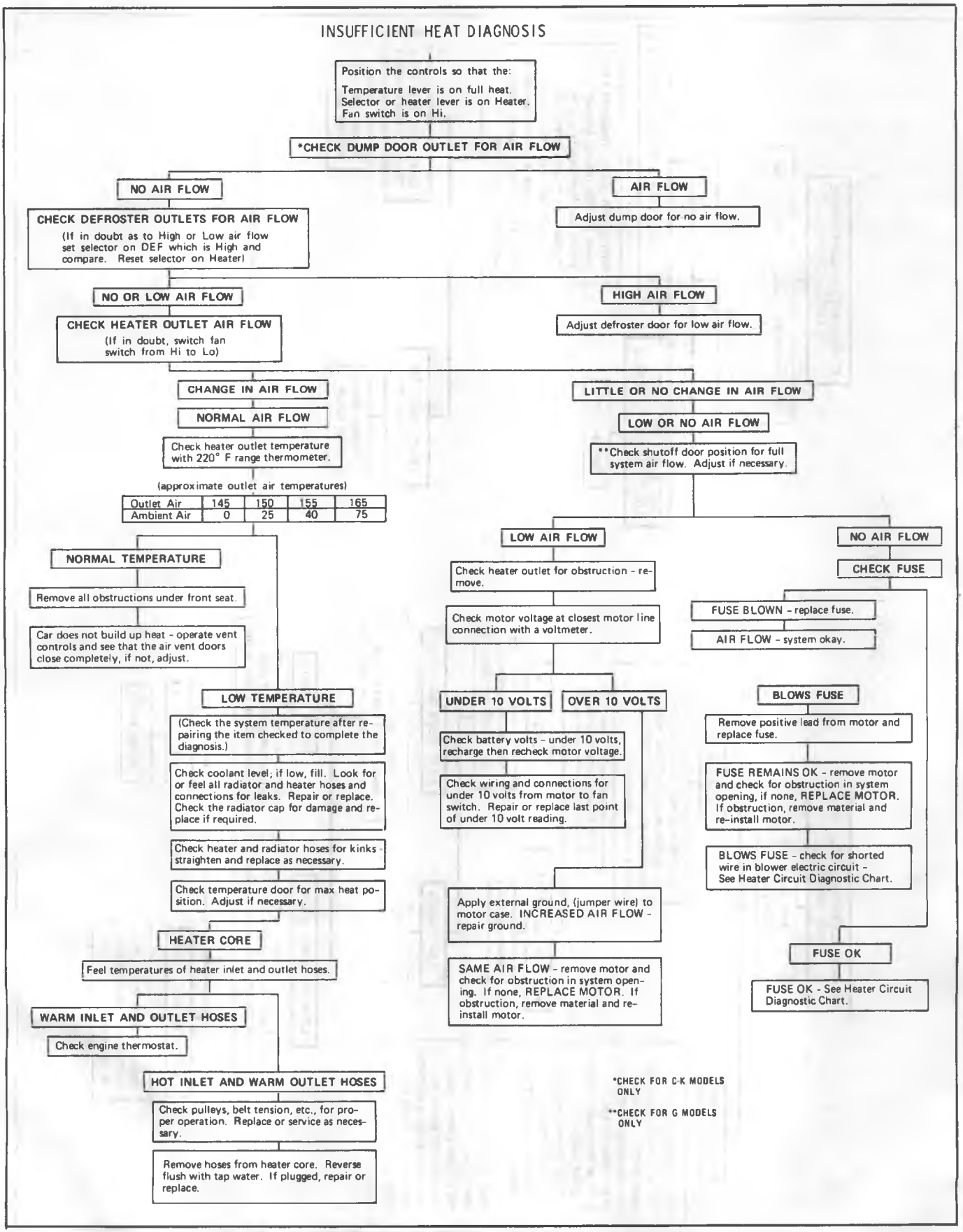
1. Wash radiator cap and filler neck with clean water.
2. Check coolant level and test for freeze protection.
3. Test system and radiator cap for proper pressure holding capacity, 15 psi (105 kPa). If replacement cap is needed, use a cap designed for coolant recovery systems and specified model.
4. Tighten hose clamps and inspect all hoses. Replace hoses if swollen, "checked", or otherwise deteriorated.
5. Clean frontal area of radiator core and air conditioning condenser.

Flush and Refill

Every two years, 30,000 miles (48 000 km) on light duty emissions or 24,000 miles (38 400 km) on heavy duty emissions and diesel engine vehicles, whichever occurs first, the cooling system should be flushed and refilled as follows:

1. Remove radiator cap when engine is cool:
   - Turn cap slowly to the left until it reaches a "stop" (Do not press down while turning the cap).
   - Wait until pressure is relieved (indicated by a hissing sound); then press down on cap and continue to rotate to the left.

   CAUTION:To help avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if the cap is taken off too soon.
2. With radiator cap removed, run the engine until upper radiator hose is hot (this shows that the thermostat is open and the coolant is flowing through the system).
3. Stop engine and open radiator drain valve to drain coolant. (Drainage may be speeded by removing drain plugs in the block.)
4. Close drain valve (install block drain plugs, if removed). Add water until system is filled.
5. Repeat steps 3, and 4 several times until the drained liquid is nearly colorless.
6. Drain system and then close radiator drain valve tightly. (Install block drain plugs, if removed.)
7. Remove recovery tank cap, leaving hoses in place. Remove coolant recovery tank and empty fluid. Scrub and clean inside of tank with soap and water. Flush well with clean water and drain. Reinstall tank.


INSUFFICIENT HEAT DIAGNOSIS
Position the controls so that the:
Temperature lever is on full heat.
Selector or heater lever is on Heater.
Fan switch is on Hi.
*CHECK DUMP DOOR OUTLET FOR AIR FLOW
NO AIR FLOW
AIR FLOW
Adjust dump door for no air flow.
CHECK DEFROSTER OUTLETS FOR AIR FLOW
(If in doubt as to High or Low air flow set selector on DEF which is High and compare. Reset selector on Heater)
NO OR LOW AIR FLOW
HIGH AIR FLOW
Adjust defroster door for low air flow.
CHECK HEATER OUTLET AIR FLOW
(If in doubt, switch fan switch from Hi to Lo)
CHANGE IN AIR FLOW
NORMAL AIR FLOW
LITTLE OR NO CHANGE IN AIR FLOW
LOW OR NO AIR FLOW
Check heater outlet temperature with 220° F range thermometer.
**Check shutoff door position for full system air flow. Adjust if necessary.
(approximate outlet air temperatures)
Outlet Air 145 150 155 165
Ambient Air 0 25 40 75
NORMAL TEMPERATURE
LOW AIR FLOW
NO AIR FLOW
Remove all obstructions under front seat.
Check heater outlet for obstruction - remove.
CHECK FUSE
Car does not build up heat - operate vent controls and see that the air vent doors close completely, if not, adjust.
Check motor voltage at closest motor line connection with a voltmeter.
FUSE BLOWN - replace fuse.
AIR FLOW - system okay.
LOW TEMPERATURE
UNDER 10 VOLTS
OVER 10 VOLTS
BLOWS FUSE
(Check the system temperature after repairing the item checked to complete the diagnosis.)
Check battery volts - under 10 volts, recharge then recheck motor voltage.
Remove positive lead from motor and replace fuse.
Check coolant level; if low, fill. Look for or feel all radiator and heater hoses and connections for leaks. Repair or replace. Check the radiator cap for damage and replace if required.
Check wiring and connections for under 10 volts from motor to fan switch. Repair or replace last point of under 10 volt reading.
FUSE REMAINS OK - remove motor and check for obstruction in system opening, if none, REPLACE MOTOR. If obstruction, remove material and re-install motor.
Check heater and radiator hoses for kinks - straighten and replace as necessary.
BLOWS FUSE - check for shorted wire in blower electric circuit - See Heater Circuit Diagnostic Chart.
Check temperature door for max heat position. Adjust if necessary.
Apply external ground, (jumper wire) to motor case. INCREASED AIR FLOW - repair ground.
HEATER CORE
FUSE OK
Feel temperatures of heater inlet and outlet hoses.
SAME AIR FLOW - remove motor and check for obstruction in system opening. If none, REPLACE MOTOR. If obstruction, remove material and re-install motor.
FUSE OK - See Heater Circuit Diagnostic Chart.
WARM INLET AND OUTLET HOSES
Check engine thermostat.
HOT INLET AND WARM OUTLET HOSES
Check pulleys, belt tension, etc., for proper operation. Replace or service as necessary.
Remove hoses from heater core. Reverse flush with tap water. If plugged, repair or replace.
*CHECK FOR C-K MODELS ONLY
**CHECK FOR G MODELS ONLY

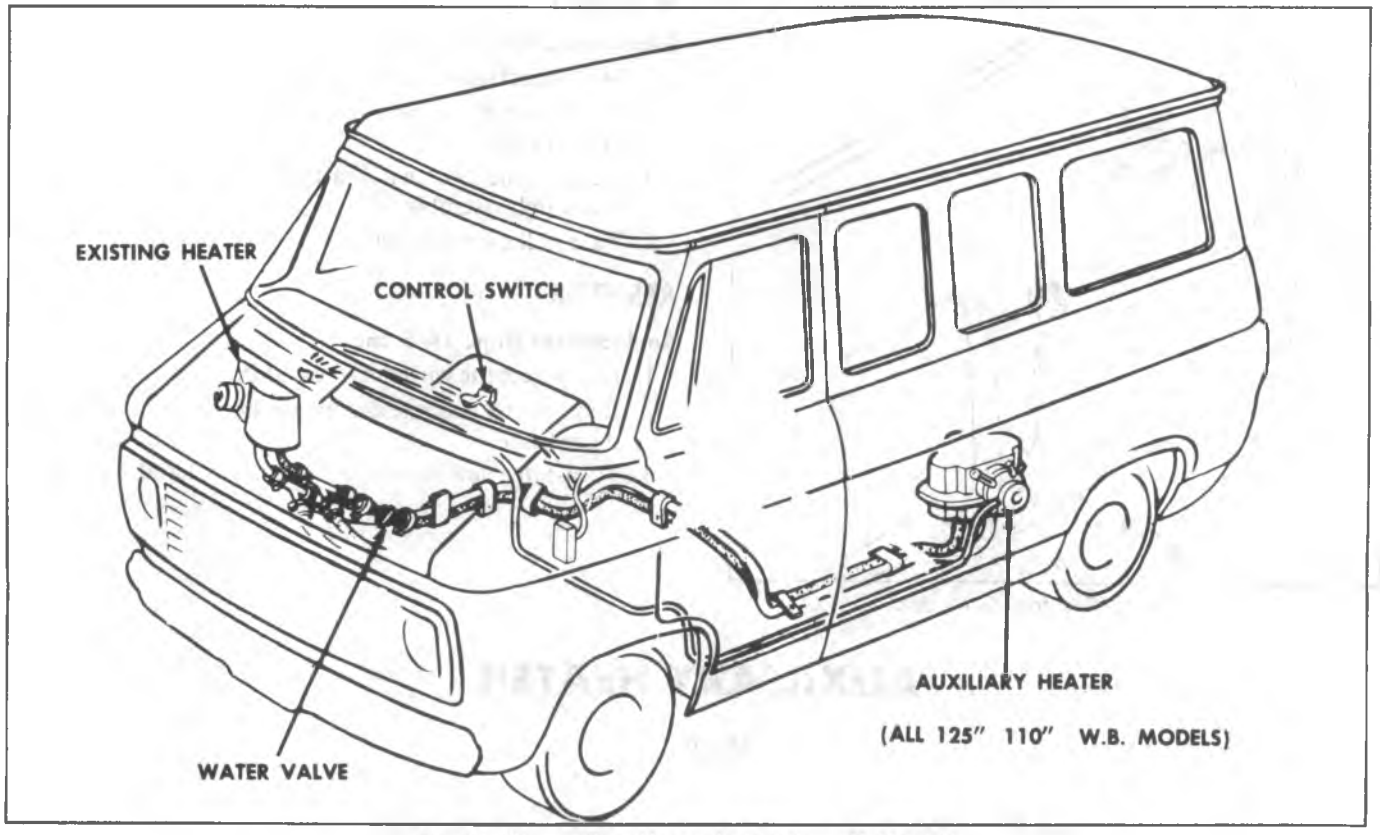


Fig. 1A-19--Auxiliary Heater Installations (G Models)

Fig. 1A-20--Auxiliary Heater Control

DIAGNOSIS

Refer to the "Standard Heater" section of this manual for diagnostic information; Refer to Electrical Diagram Fig. 1A-21.

SYSTEM CONTROLS

C60 SYSTEM (C-K & G SERIES) - FIG. 1B-5

System Operation - C-K Truck

System operation is shown in Fig. 1B-6.

Vacuum Schematic - C-K Truck

The C-K Truck air conditioning vacuum schematic is shown in Fig. 1B-7.

System Operation - G Models

System operation is shown in Fig. 1B-8.

Vacuum Schematic - G Models

G Model vacuum schematic is shown in Fig. 1B-9.

OVERHEAD SYSTEM (C-K & G SERIES)

This system operates in conjunction with the C60 system. Since refrigerant flow is controlled by the front system, the only control provided for on the overhead system is a three-speed fan switch (LOW, MED, HI). The fan switch is mounted in the instrument panel, to the right of the steering coloumn (Fig. 1B-10).

SYSTEM OPERATION - CK TRUCK

SELECTOR LEVER POSITION	COMPRESSOR	BLOWER SPEEDS AVAIL	AIR SOURCE	AIR ENTERS VEHICLE	HEATER A/C DOOR- OPEN TO:	HEATER DEFROSTER DOOR- OPEN TO:
OFF	OFF	LOW	OUTSIDE	FLOOR OUTLETS	HEATER	HEATER
MAX A/C	ON	HI	INSIDE%	DASH OUTLETS	A/C	HEATER
NORM A/C	ON	ALL	OUTSIDE	DASH OUTLETS	A/C	HEATER
BI-LEVEL	ON	ALL	OUTSIDE	FLOOR AND DASH OUTLETS	A/C & HEATER	HEATER
VENT	OFF	ALL	OUTSIDE	DASH OUTLETS	A/C	HEATER
HTR	OFF	ALL	OUTSIDE	FLOOR OUTLETS	HEATER	HEATER
DEF	ON	ALL	OUTSIDE	DEFROST OUTLETS	HEATER	DEFROST

NOTE % 100% Inside air is not available, some bleed through of outside air is allowed.

Fig. 1B-6--System Operation - C-K Truck

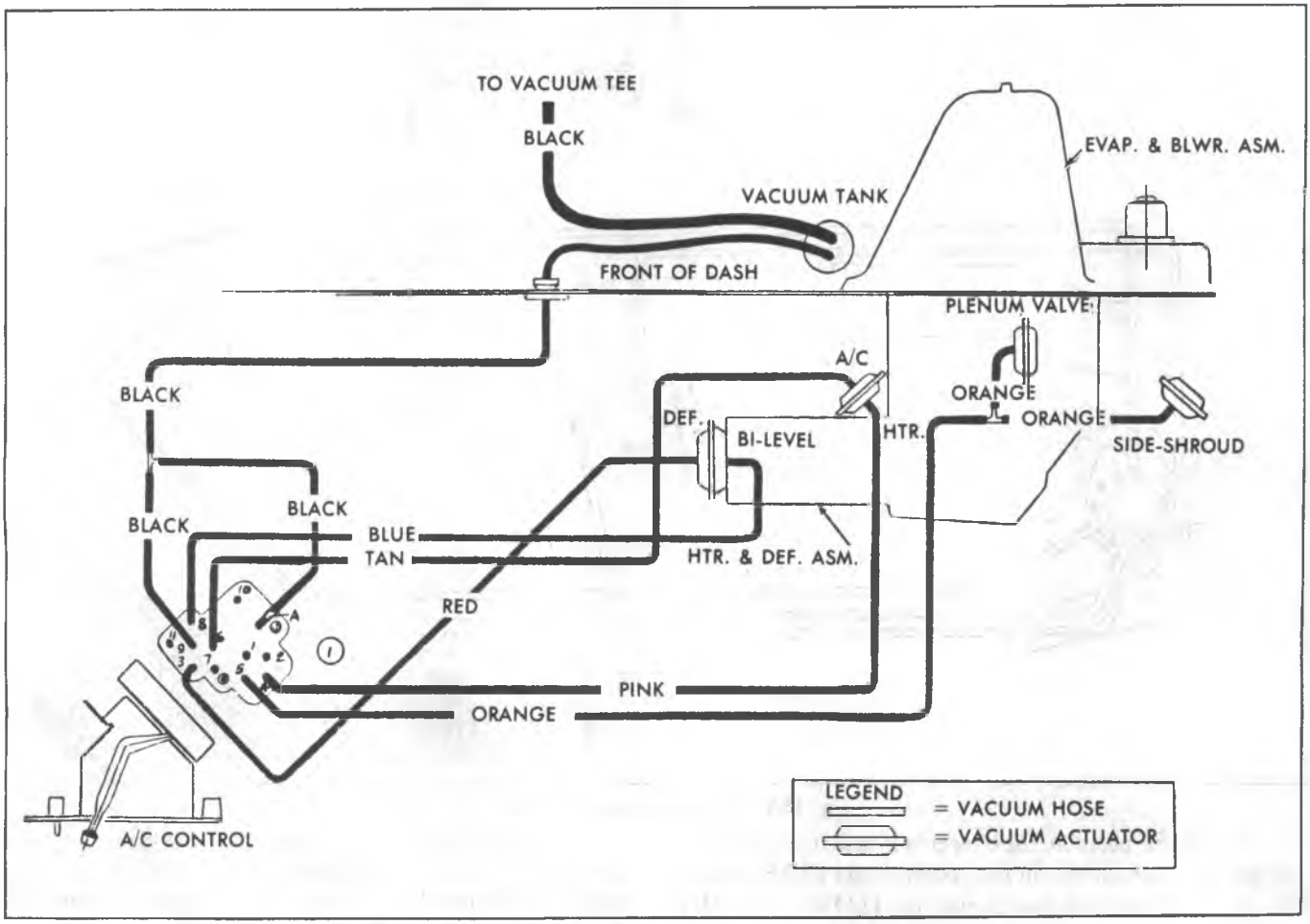


Fig. 1B-7--Air Conditioning Vacuum Schematic - C-K Truck

INSUFFICIENT COOLING DIAGNOSIS CHART

DASH MOUNTED UNIT (MOTOR HOME CHASSIS UNITS)

The following procedures should be applied before performance testing an A/C System.

1. Check for proper belt installation and tension with J-23600.
2. Check for proper clutch coil terminal connector installation.
3. Check for clutch air Gap (.022 - .057).
4. Check for broken, burst, or cut hoses. Also check for loose fittings on all components.
5. Check for condenser air blockage due to foreign material.
6. Check for proper air ducting hose connections.
7. Check heater temperature door adjustment, adjust if incorrect.
8. Check evaporator sealing for air leak, repair if leaking.
9. Install pressure gages and thermometer and make performance test.

CHECK AIR FLOW

- NORMAL AIR FLOW
  - CHECK DISCHARGE AIR TEMPERATURE (SEE PERFORMANCE DATA)
    - DISCHARGE TEMPERATURE AT OUTLET COLD
      - CHECK FOR AIR LEAKS THROUGH DASH PANEL, DOORS, WINDOWS, OR FROM HEATER.
    - HIGH OUTLET AIR TEMPERATURE
      - CHECK SIGHT GLASS
        - FOAMING
          - SYSTEM IS PROBABLY LOW ON REFRIGERANT. CHECK FOR LEAKS, REPAIR, AND ADD REFRIGERANT. IF FOAMING STILL OCCURS, CHECK FOR RESTRICTION IN REFRIGERANT SYSTEM BETWEEN CONDENSER AND SIGHT GLASS.
        - NO FOAMING
          1. SYSTEM MAY BE EITHER FULLY CHARGED OR EMPTY. FEEL HIGH AND LOW PRESSURE PIPES AT COMPRESSOR. HIGH PRESSURE PIPE SHOULD BE WARM. LOW PRESSURE PIPES SHOULD BE COLD.
          2. IF PIPES ARE NOT INDICATING PROPER TEMPERATURES, RECHARGE SYSTEM AS RECOMMENDED. IF NOZZLE AIR TEMPERATURE IS STILL HIGH, CHECK EVAPORATOR PRESSURE.
          - *CHECK EVAPORATOR PRESSURE
            - LOW EVAPORATOR *PRESSURE
              - CHECK EVAPORATOR OUTLET LINE
                - EVAPORATOR OUTLET LINE WARM
                  1. CHECK FOR LIQUID LINE RESTRICTION (FROST SPOT ON LINE). IF NOT,
                  2. CHECK FOR PLUGGED INLET SCREEN IN EXPANSION VALVE. IF NOT,
                  3. CHECK FOR DEFECTIVE EXPANSION VALVE BY REMOVING VALVE AND BLOWING THROUGH VALVE. IF UNABLE TO BLOW THROUGH VALVE, BULB IS DISCHARGED. REPLACE EXPANSION VALVE.
                - LOW DISCHARGE * PRESSURE
                  - Check for malfunctioning expansion valve-See Component Diagnosis.
            - HIGH EVAPORATOR * PRESSURE
              - CHECK COMPRESSOR DISCHARGE PRESSURE
                - * HIGH DISCHARGE PRESSURE
                  1. Check engine cooling system, fan clutch and check for restricted air flow thru condenser.
                  2. Check expansion valve bulb contact. Correct if necessary.
                  3. Check for refrigerant restriction in condenser. Return bends at equal elevation should be approximately same temperature. If temperature of bends is appreciably different, the cooler bend indicates a restricted circuit, replace condenser if restriction is found, If condenser is OK, check for air in system. To check observe outlet air temperature and compressor discharge pressure while slowly discharging system at receiver inlet connection.
                  - OUTLET AIR TEMPERATURE DROPS AS COMPRESSOR DISCHARGE PRESSURE DROPS
                    - LEAK TEST SYSTEM, REPAIR AS NECESSARY, DISCHARGE, EVACUATE, AND RECHARGE.
                  - OUTLET AIR TEMPERATURE INCREASES AS COMPRESSOR DISCHARGE PRESSURE DROPS
                    - REPLACE EXPANSION VALVE
            - NORMAL EVAPORATOR PRESSURE
              - Check Compressor Discharge Pressure.
                - LOW DISCHARGE PRESSURE
                  - Check for restriction in liquid line, partially plugged inlet screen at expansion valve, or defective expansion valve, replace valve if defective.
                - NORMAL DISCHARGE PRESSURE
                  - Refrigeration System is ok
                    1. Check for proper function of heater TEMPERATURE door.
                    2. Check for proper sealing of evaporator case.
                    3. Check for proper operation and seal around temperature door.
                    4. Non-Foaming sight glass does not always indicate a fully charged system. Add 1/2 lb. refrigerant and observe performance.
                    5. Check for excess oil in system. A symptom of excess oil is a slipping clutch or belt or broken belt. To remove excess oil in system see "CHECKING COMPRESSOR OIL CHARGE".
- NO OR LOW AIR FLOW
  - CHECK BLOWER OPERATION
    - BLOWER NOT OPERATING
      - CHECK FOR BLOWN FUSE, DEFECTIVE BLOWER SWITCH, BROKEN WIRE, LOOSE CONNECTIONS, LOOSE BLOWER MOTOR GROUND WIRE OR INOPERATIVE BLOWER MOTOR.
    - NORMAL BLOWER OPERATION
      - Check for loose or disconnected air distribution ducts, restricted or leaking air ducts, partially closed air outlet valve or clogged evaporator core, if above check is OK, check for ice blocking evaporator.
        - ICE BLOCKING EVAPORATOR
          - CHECK FOR LOW EVAPORATOR PRESSURE
            1. ALLOW SYSTEM TO WARM UP.
            2. STOP AND RESTART ENGINE.
            3. CHECK EVAPORATOR PRESSURE IMMEDIATELY AFTER RESTART AND PULL DOWN OF EVAPORATOR PRESSURE.
          - NORMAL EVAPORATOR * PRESSURE
            - SYSTEM HAS EXCESS MOISTURE. REPLACE RECEIVER DEHYDRATOR AND EVACUATE THOROUGHLY. RECHARGE SYSTEM.
          - LOW EVAPORATOR * PRESSURE
            - Check for malfunctioning expansion valve-See Component Diagnosis.

*REFER TO PERFORMANCE CHART FOR CORRECT PRESSURES

Dash Mounted Unit (Motor Home Chassis)

(Refrigerant Charge — 3 lbs. 4 oz.)						
Temperature of Air Entering Condenser	70°	80°	90°	100°	110°	120°
Engine rpm	2000					
Compressor Head Pressure*	110-120	135-145	160-170	190-200	220-230	260-270
Suction Pressure psi*	6	7	9	10	10	13
Discharge Air Temperature*	40-45	41-46	41-46	42-47	44-49	44-49

*Just prior to compressor clutch disengagement.

system head pressure by partially blocking the condenser. Disconnect the blower lead wire and repeat the "performance check" to determine if the evaporator pressure can be obtained.

3. The system will also indicate a low refrigerant charge by bubbles occurring in the sight glass (Motor Home Chassis Systems).

EVAPORATOR

When the evaporator is defective, the trouble will show up as an inadequate supply of cool air. A partially plugged core due to dirt, a cracked case, or a leaking seal will generally be the cause.

REFRIGERANT LINE RESTRICTIONS

Restrictions in the refrigerant lines will be indicated as follows:

1. Suction Line - A restricted suction line will cause low suction pressure at the compressor, low discharge pressure and little or no cooling.
2. Discharge Line - A restriction in the discharge line generally will cause the pressure relief valve to open.
3. Liquid Line - A liquid line restriction will be evidenced by low discharge and suction pressure, and insufficient cooling.

Sight Glass Diagnosis (Motor Home Chassis Units)

At temperatures higher than 70°F (21°C), the sight glass may indicate wheter the refrigerant charge is sufficient. A shortage of liquid refrigerant is indicated after above five minutes of compressor operation by the appearance of slow-moving bubbles (vapor) or a broken column of refrigerant under the glass. Continuous bubbles may appear in a properly charged system on a cool day. This is a normal situation. If the sight glass is generally clear and performance is satisfactory, occasional bubbles do not indicate refrigerant shortage.

If the sight glass consistently shows foaming or a broken liquid column, it should be observed after partially blocking the air to the condenser. If under this condition the sight glass clears and the performance is otherwise satisfactory, the charge shall be considered adequate.

In all instances where the indications of refrigerant shortage continues, additional refrigerant should be added in 120 ml (1/4 lb.) increments until the sight glass is clear. An additional charge of 240 ml (1/2 lb.) should be added as a reserve after the glass clears. In no case should the system be overcharged.

ON VEHICLE SERVICE

EVACUATING AND CHARGING PROCEDURES

PRECAUTIONARY SERVICE MEASURES

Before any service is attempted which requires opening of refrigerant lines or components, the person doing the work should be thoroughly familiar with the information under PRECAUTIONS IN HANDLING REFRIGERANT-12, PRECAUTIONS IN HANDLING REFRIGERANT LINES AND FITTINGS MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM, AND REFRIGERANT CHARGING PRECAUTIONS and should follow very carefully the DISCHARGING, EVACUATING, OIL ADDITION AND CHARGING THE REFRIGERANT SYSTEM instructions given on the following pages for the unit being serviced.

The major reasons behind these measures are safety and the prevention of dirt and moisture in the system which can restrict A/C system refrigerant flow.

The presence of moisture can also cause the formation of hydrochloric or hydrofluoric acids in the system.

All subassemblies are dehydrated and sealed prior to shipping. They are to remain sealed until just prior to making connections. All subassemblies should be at room temperature before uncapping (this prevents condensation of moisture from the air that enters the system). If, for any reason, caps are removed but the connections are not made, parts should be resealed as soon as possible.

All precautions should be taken to prevent damage to fittings or connections. Any fittings getting grease or dirt on them should be wiped clean with a cloth dampened with stoddard solvent, kerosene (or equivalent) may be used. Make sure fittings are dry prior to reassembly. If dirt, grease or moisture get inside pipes and cannot be removed, the pipe should be replaced.

Sealing caps should be removed from subassemblies just prior to making connections for final assembly. Use a small amount of clean 525 viscosity refrigerant oil on all tube and hose joints. Always use new "O" rings dipped in the clean refrigerant oil when assembling joints. The oil will aid in assembly and help provide a leak-proof joint. When tightening joints, use a second wrench to hold stationary part of connection so that a solid feel can be attained. This will indicate proper assembly.

NOTICE: Tighten all tubing connections as shown in torque chart (Chart 1B-9). Insufficient or excessive torque when tightening can result in loose joints or deformed joint parts. Either condition can result in refrigerant leakage.

CCOT REFRIGERANT OIL DISTRIBUTION

A-6 COMPRESSOR SYSTEM -- requires 300 ml (10 oz.) of 525 viscosity oil.

R-4 COMPRESSOR SYSTEM -- requires 180 ml (6 oz.) of 525 viscosity oil.

New oil quantities must be added to the system during Service component replacement and conditions stated as follows:

A. When there are no signs of excessive oil leakage, for the -

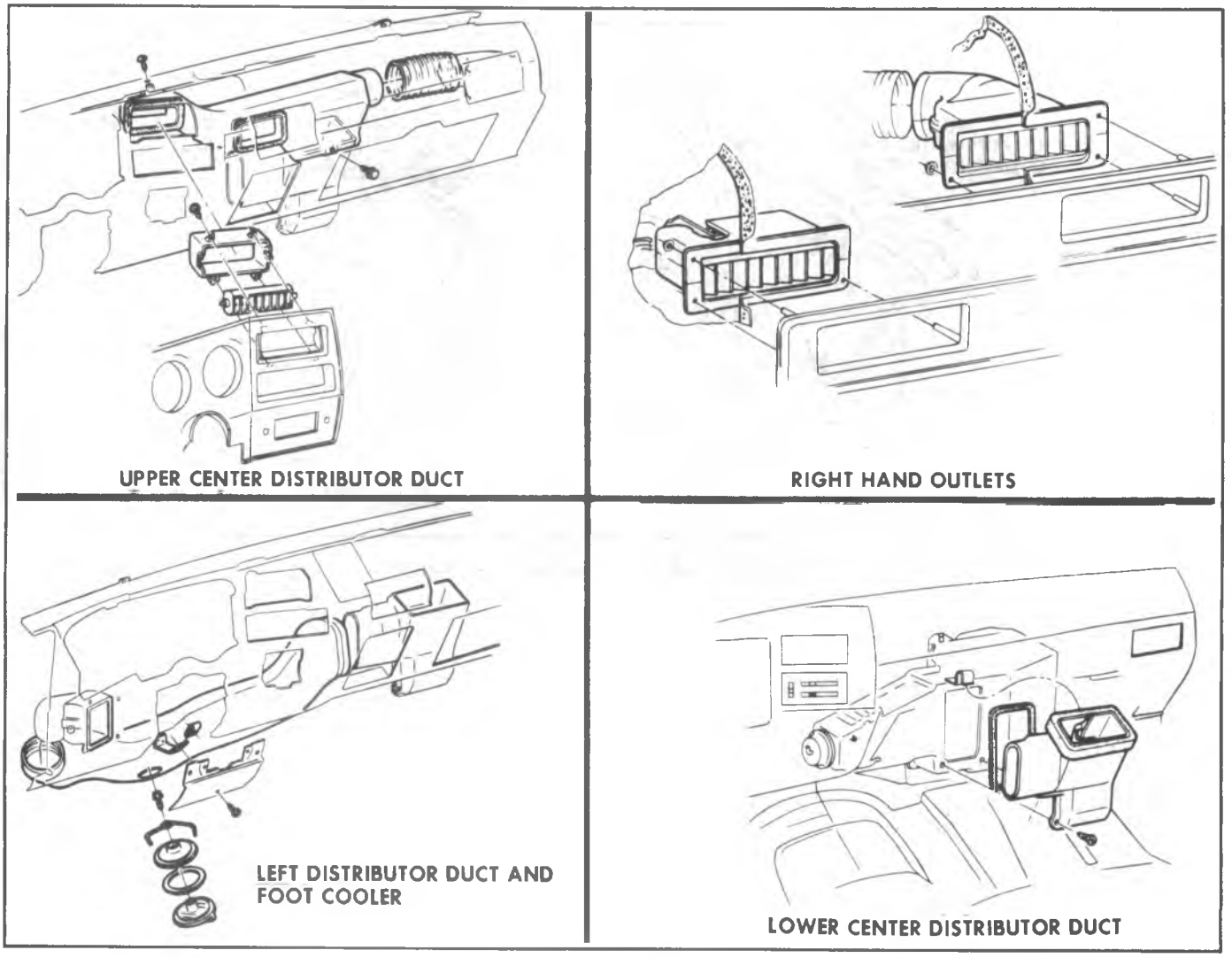


Fig. 1B-30--Air Selector and Ducts (C-K Series)

SELECTOR DUCT AND HEATER CORE ASSEMBLY-C-K

Replacement (Fig. 1B-30)

1. Disconnect the battery ground cable.
2. Drain the radiator and remove the heater hoses from the core tubes. Plug the core tubes to prevent coolant spillage during removal.
3. Remove the glove box and door as an assembly.
4. Remove the center duct to selector duct and instrument panel screws and remove the center lower and center upper ducts.
5. Disconnect the bowden cable at the temperature door.
6. Remove the nuts from the three selector duct studs projecting through the dash panel.
7. Remove the selector duct to dash panel screw (inside vehicle).
8. Pull the selector duct assembly rearward until the core tubes clear the dash panel. Lower the selector assembly far enough to gain access to all vacuum and electrical harnesses.
9. Disconnect the vacuum and electrical harness and remove the selector duct assembly.
10. Remove the core mounting strap screws and remove the core.
11. To install, reverse Steps 1 thru 10 above.
12. Refill coolant system and connect the battery ground strap. Check temperature door cable adjustment.

KICK PAD VALVE - C-K SERIES

Replacement (Fig. 1B-31)

1. Disconnect the vacuum hose at the actuator.
2. Unhook the valve return spring at the actuator end.
3. Remove the actuator bracket mounting screws.
4. Remove the cam to actuator arm screw and separate the actuator and bracket from the cam.
5. Remove the actuator to bracket nuts and separate the actuator and bracket.
6. To install reverse Steps 1 thru 5 above.

PLENUM VALVE - C-K SERIES

Replacement (Fig. 1B-31)

1. Raise the hood.
2. Remove the cowl plastic grille.
3. Remove the three cowl to valve assembly screws and remove the valve assembly from the vehicle.
4. Remove the actuator arm pushnut.

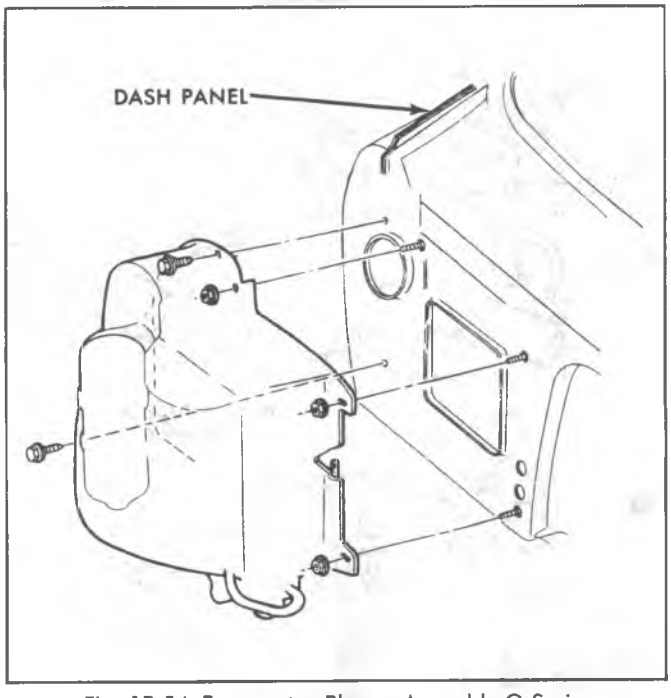
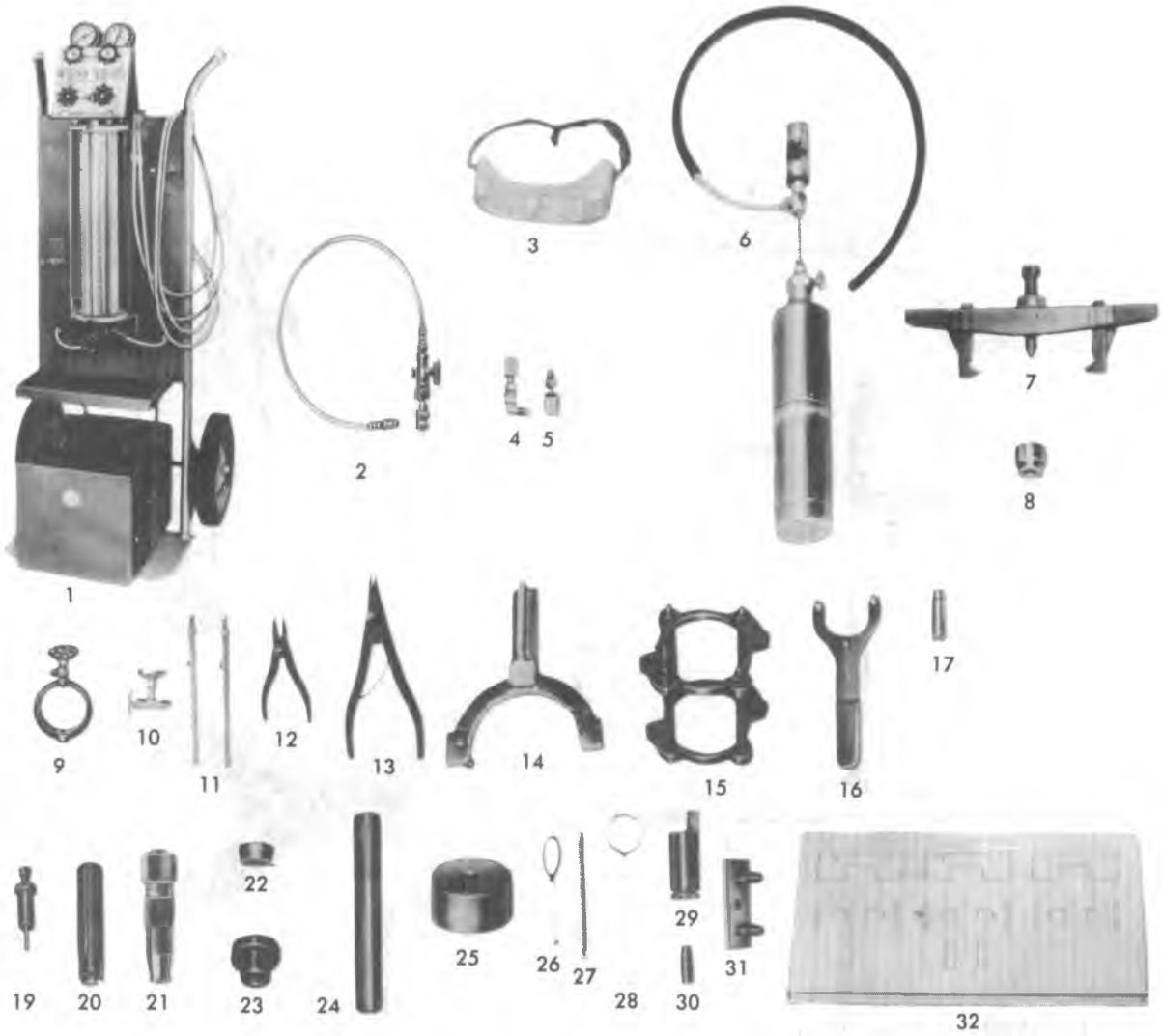


Fig. 1B-54--Evaporator Blower Assembly-G Series

SPECIAL TOOLS



1. J-8393	Charging Station	11. J-5421-02	Pocket Thermometers (2)	22. J-9398	Pulley Bearing Remover
2. J-24095	Oil Inducer	12. J-5403	No. 21 Snap Ring Pliers	23. J-9481	Pulley and Bearing Installer
3. J-5453	Goggles	13. J-6435	No. 26 Snap Ring Pliers	24. J-8092	Handle
4. J-9459	7/16"-20 90° Gauge Line	14. J-9396	Compressor Holding Fixture	25. J-21352	Internal Assembly Support Block
J-25499	3/8"-24 Adapter				
5. J-5420	7/16"-20 Straight Gauge Line	15. J-25030	Compressing Fixture	26. J-5139	Oil Pickup Tube Remover
J-25498	3/8" Adapter	16. J-9403	Clutch Hub Holding Tool	27. J-9432	Needle Bearing Installer
6. J-6084	Leak Detector	17. J-9399	9/16" Thin Wall Socket	28. J-9553-01	Seal Seat "O" Ring Remover
7. J-8433	Puller	18. J-9401	Hub and Drive Plate Assembly Remover		
8. J-9395	Puller Pilot			29. J-21508	Seal Seat "O" Ring Installer
9. J-23595	Refrigerant Can Valve (Side-Tap)	19. J-9480-01	Hub and Drive Plate Assembly Installer	30. J-22974	Shaft Seal Protector
				31. J-9625	Pressure Test Connector
10. J-6271-01	Refrigerant Can Valve (Top-Tap)	20. J-9392	Seal Remover	32. J-9402	Parts Tray
		21. J-23128	Seal Seat Remover		

Fig. 1B-75--Air Conditioning Special Tools

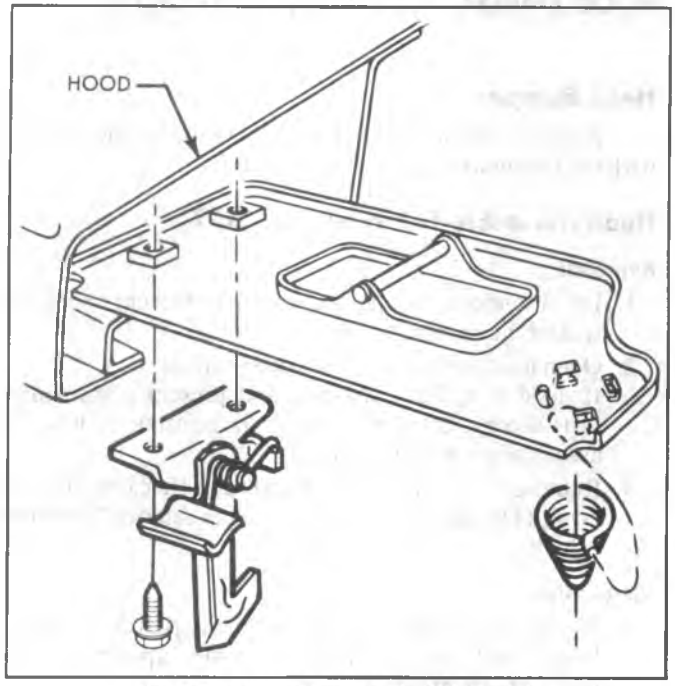


Fig. 2C-4--Secondary Latch -CK Models

2. Remove two (2) cap screws which attach each hinge and link to hood; then with a helper remove hood from vehicle.

Installation

1. If original hood is to be installed, position hood to hinges and links and install four cap screws snug which attach hinges and links to hood.
   If a new hood is to be installed, perform procedures as outlined under Alignment, directly below.
2. Shift hood on hinges to location marks made before removal of hood, then tighten attaching cap screws at hinges firmly. Close hood and check fit. If necessary to align hood perform procedure as outlined under "Alignment" which follows.

Alignment

1. Loosen hood hinge bolts.
   Note that the rear most bolt holes in hinge are slotted to allow hood to move back and forth.
2. Adjust bracket at hood latch, as necessary. Slotted hole in the bracket allow movement up or down at the latch, and right or left at the radiator support.
3. Adjust hood bumper as necessary in proportion to the latch.

Hood Assembly - G Model

The alignment of the hood is controlled by the position of the hood hinges and the height of the two bumpers located one at each side of the radiator support. The adjustment at the hood lock must be made after the hinges and bumpers are properly adjusted (Refer to Hood Lock Adjustment Fig. 2C-7). To align the hood and lock proceed as follows:

Hood Hinge (Fig. 2C-5)

Hood Lock Assembly - G Model

A bolt-type hood lock is used as shown in Fig. 2C-7. The lock bolt, located on the hood, dovetails with the mounted striker plate, preventing upward or downward movement of the hood while the vehicle is in motion. Integral with the striker plate is the combination lock release lever and safety catch.

1. Scribe a line around the entire hinge plate to be repositioned.
2. Loosen the appropriate screws and shift the position of the hood into correct alignment using the scribe marks to check amount of movement. Check alignment by tightening screws and closing the hood.

Replacement

1. Open hood and remove the four bolts holding the combination lock catch and lock bolt.
   If original hood lock assembly is to be replaced, scribe a line around lock for alignment on installation.
2. Place hood lock assembly in position.
3. Adjust as outlined under Adjustments.

Adjustment

Hood lock assembly to be adjusted fore and aft until hood lock bolt enters center of elongated guide. Bending bolt to accomplish this adjustment may seriously effect lock operation and safety catch engagement and is, therefore not recommended.

1. Adjust lock bolt as shown in Fig. 2C-7.
2. Open hood and adjust tightness of catch assembly so that it is just "snug" enough to hold lock bolt in position.
3. Close hood in a normal manner.
4. Raise hood again; lock bolt assembly will have shifted to operating position. Tighten bolts fully. Further adjustment may be made at lock bolt support, if necessary.
5. Adjust lock bolt to obtain a secure hood closure and reasonable lock release effort.

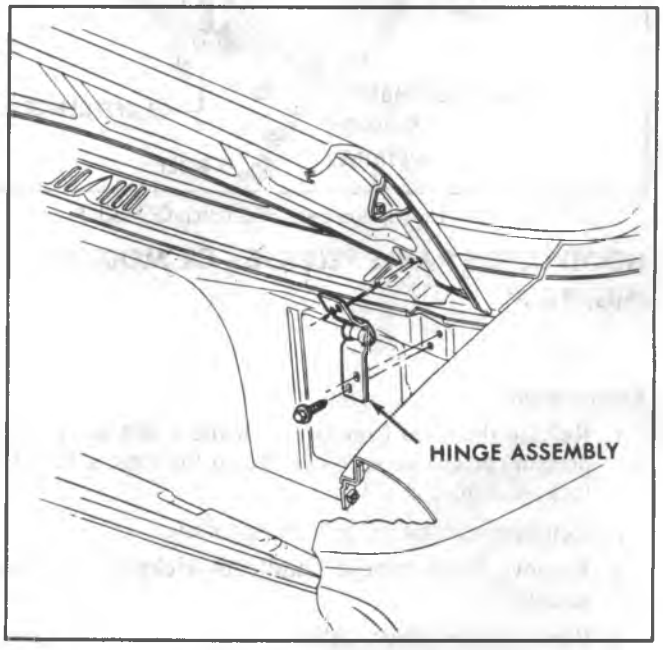


Fig. 2C-5--Hood Hinge-G Model

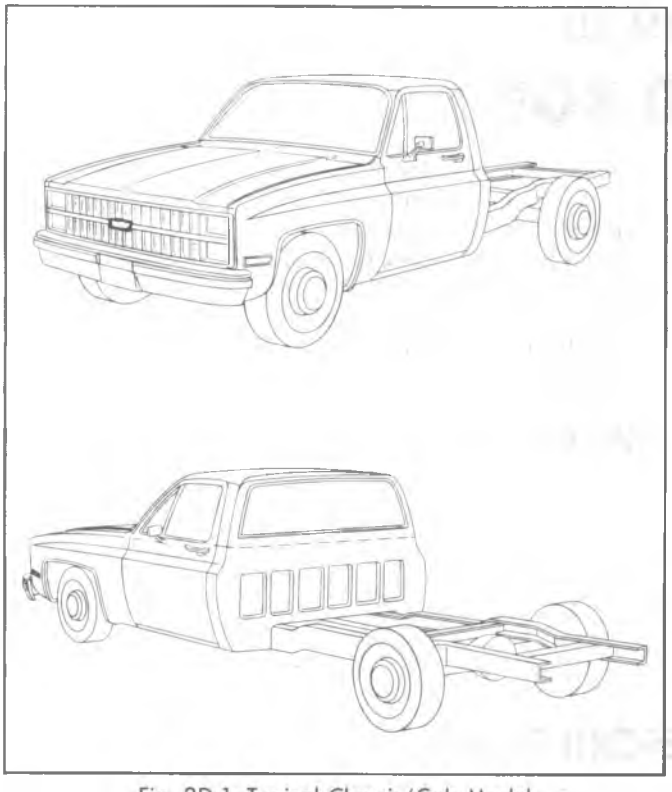


Fig. 2D-1--Typical Chassis/Cab Model

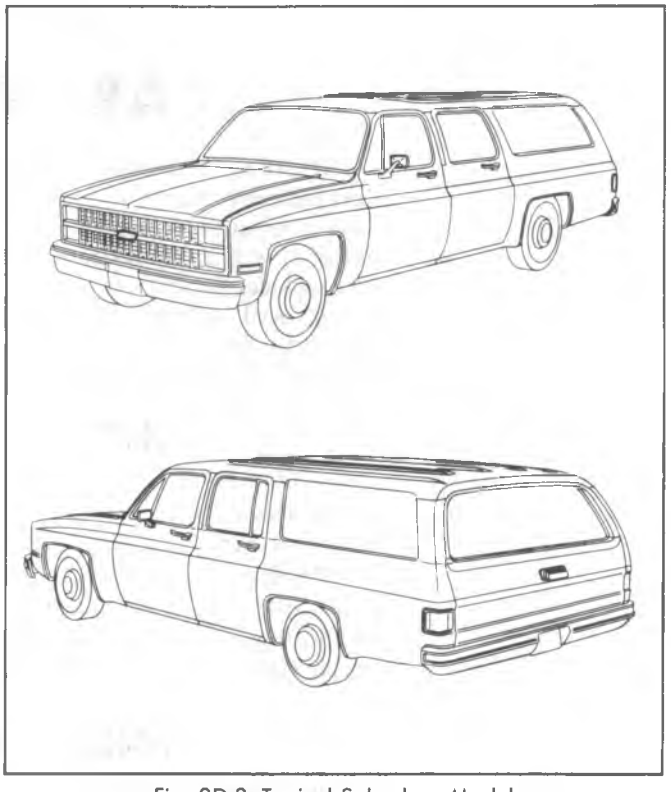


Fig. 2D-3--Typical Suburban Model

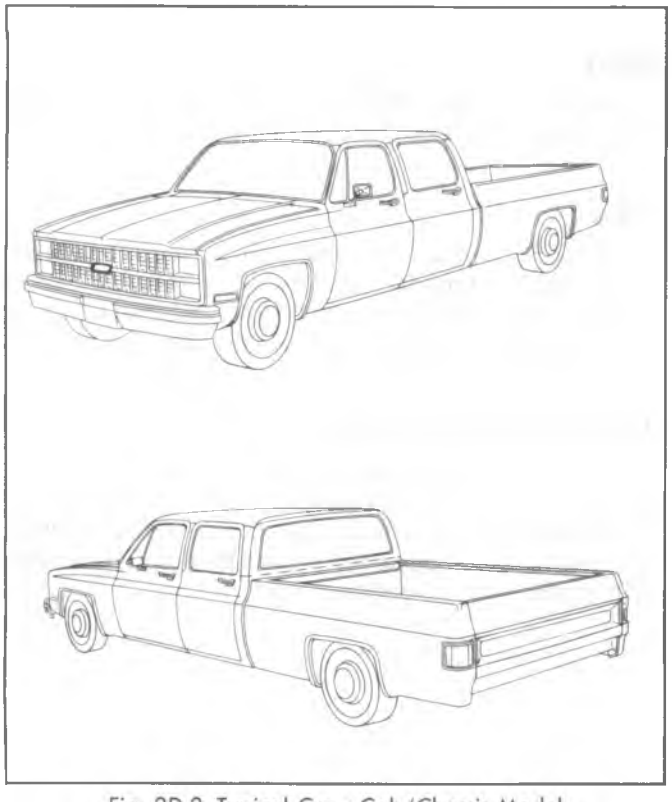


Fig. 2D-2--Typical Crew Cab/Chassis Model

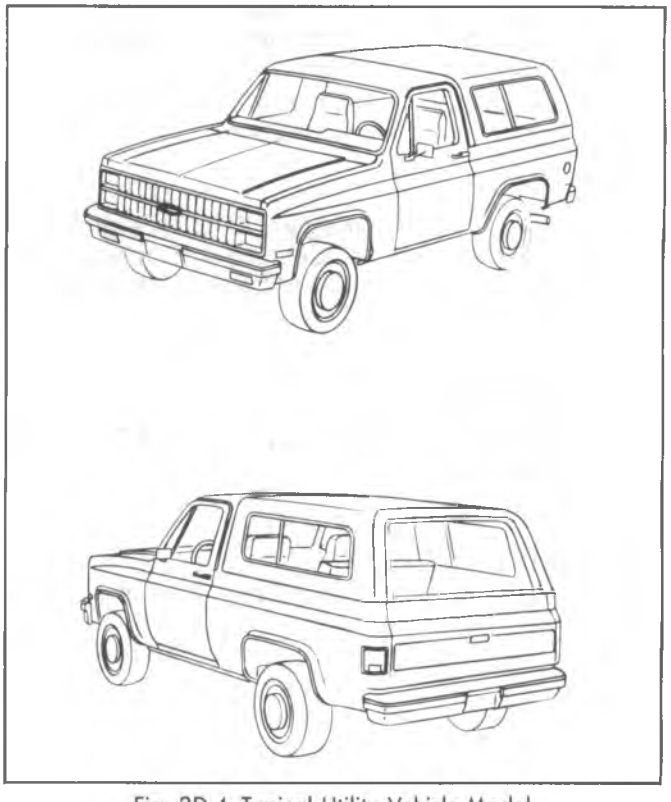


Fig. 2D-4--Typical Utility Vehicle Model

Fig. 2D-29--Removing Ventilator Assembly

which will fit in the channel. The extra filler extending beyond the rear edge of the glass should be pinched together to hold it in place during glass installation.
One side of this filler (the outside of the roll) is soapstoned. This is the side which goes into the metal channel.

4. Brush the inside of the metal glass channel freely with ordinary engine oil. This will enable the glass and filler to slide freely into the channel. Push the glass with the filler around it into the channel until it is firmly seated. After the glass is firmly in place, the oil softens the filler, causing it to swell, thereby making a watertight seal. Trim off the excess filler material around the channel and at the ends of the channel.
Glass should be installed so that rear edge is parallel to the division post. Allow full cure before water testing.

Installation

1. Lower the ventilator assembly into the door frame.
2. Make certain the rubber lip is positioned inside the inner and outer panel before tightening screws.
3. Reinstall all screws and tighten.
4. Install and tighten the three screws at the upper front of the door.

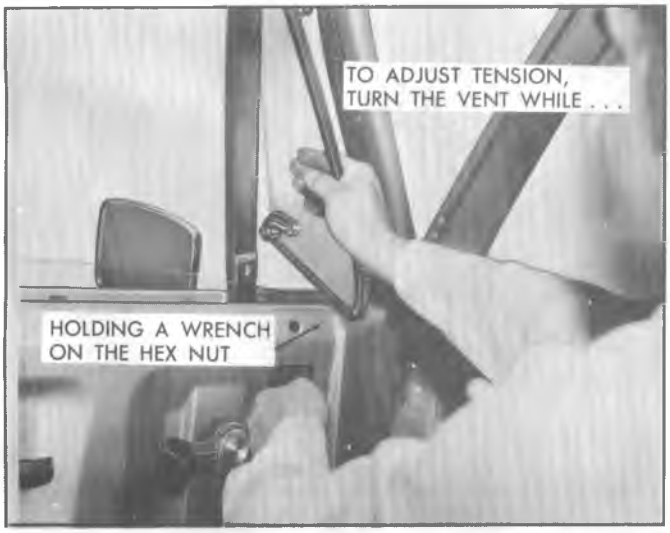


Fig. 2D-30--Adjusting Tension

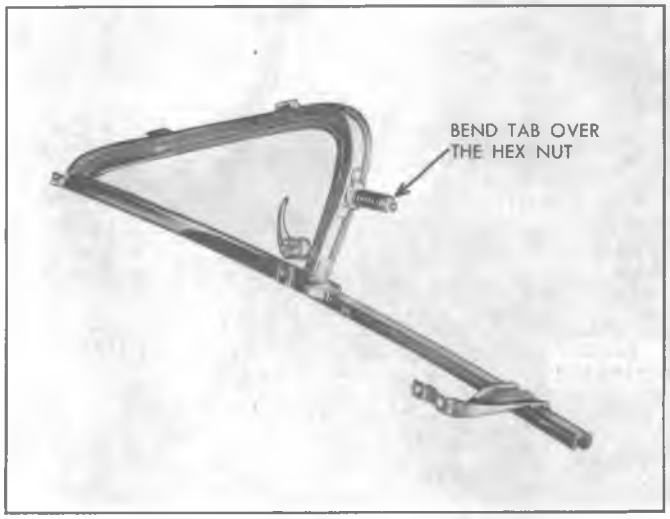


Fig. 2D-31--Bend Tabs Over Hex Nut

Adjustment

1. Adjust the ventilator by placing wrench on adjusting nut thru access hole and **turning vent window** to the desired tension. See figure 2D-30.
2. After making adjustment bend tabs over the hex nut on base of assembly. See figure 2D-31.
3. Install arm rest screws and trim panel.
4. Install window regulator handle.

DOOR WINDOW ASSEMBLY--FIG. 2D-32

Replacement

1. Completely lower glass to bottom of door.
2. Remove door arm rest and trim pad as outlined in this section.
3. Mask or cover upper portion of door window frame. Remove ventilator assembly as previously outlined.
4. Slide glass forward until front roller is in line with notch in sash channel. Disengage roller from channel.
5. Push window forward and tilt front portion of window up until rear roller is disengaged. See figure 2D-33.
6. Put window assembly in normal position (level) and raise straight up and out.
7. Reverse above procedure for installation.

WINDOW REGULATOR-MANUAL--FIG. 2D-32

Replacement

1. Raise window and tape glass in full up position using cloth body tape.
2. Remove trim panel as outlined previously.
3. Remove screws attaching regulator to door inner panel.
4. Remove regulator by sliding regulator rearward, disengaging rollers from sash channel.
A notch is provided in the sash channel to allow disengagement of the forward roller on the window regulator (Fig. 2D-32).
5. Install regulator by reversing above steps. Lubricate regulator gear with lubriplate or equivalent.

Fig. 2D-65--Removing Access Cover (Utility)

TORQUE ROD

Replacement

1. Lower endgate and remove access cover, as shown in figure 2D-65.
2. Disconnect torque rod anchor plate. It is necessary to remove the lower bolt only, then let plate swing down. See figure 2D-66.
3. Loosen four bolts retaining endgate hinge to body.
4. Move endgate slightly away from body.
5. Remove torque rod retaining bracket on lower edge of endgate. See figure 2D-66.
6. Remove torque rod retaining clip on side edge of endgate.
7. Lift torque rod up and slide from endgate as shown in figure 2D-67.
8. Reverse the procedure above for installation.

ENDGATE DISASSEMBLY-UTILITY MODELS ONLY

Manual Window

1. Lower endgate and remove acess cover.

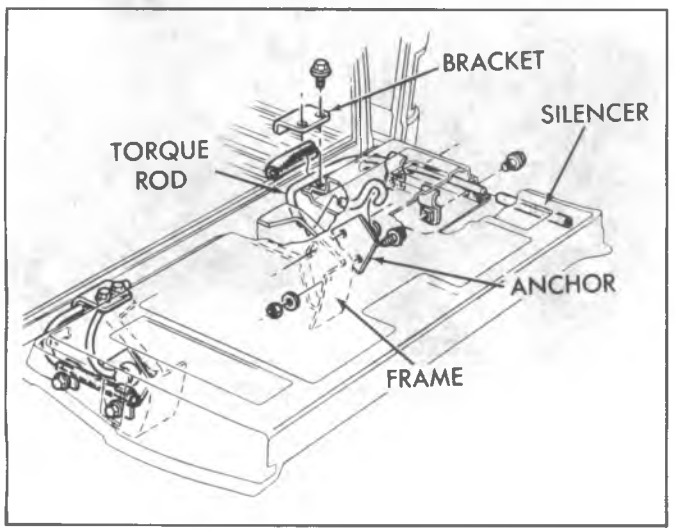


Fig. 2D-66--Torque Rod (Utility)

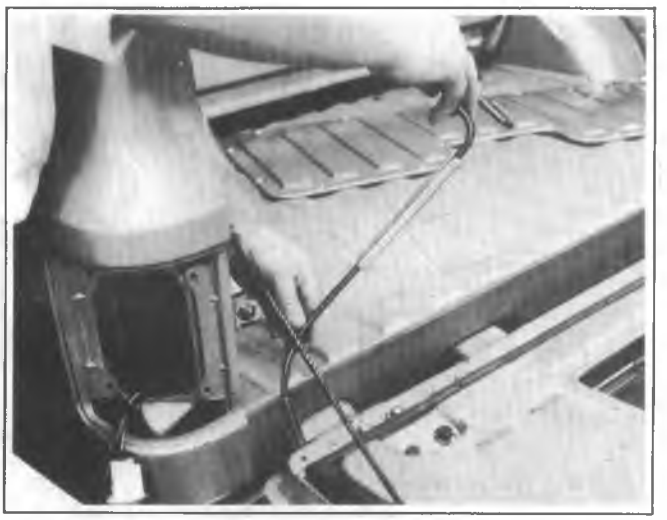


Fig. 2D-67--Removing Torque Rod (Utility)

2. Disconnect side latch remote control rods from center control by removing retaining clips. See figure 2D-68.
3. Remove four screws from each side latch, and withdraw latch and control rod from endgate, as sown in figure 2D-69.
4. Disconnect control rod from latch.
5. Refer to figure 2D-70 for installation of latch control and blockout rod.
6. Disconnect blockout rod from control assembly by detaching spring and removing two screws retaining rod to inner panel.
7. Disconnect inside handle control rod from control assembly, then remove screws which secure inside handle to inner panel.
8. Remove three screws which retain remote control assembly to inner panel.
9. Remove control assembly and inside handle as shown in figure 2D-71.
10. Refer to figure 2D-72 for window and regulator installation.
11. Roll window to up position.
12. Disconnect sash from regulator as shown in figure 2D-73.

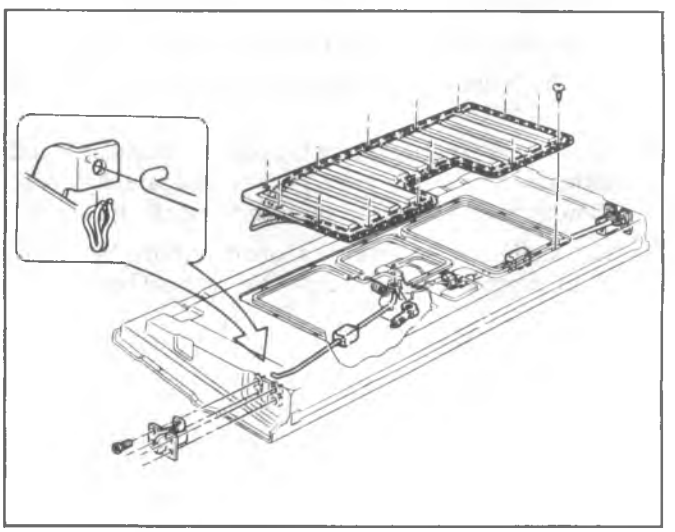


Fig. 2D-68--Latches and Rods

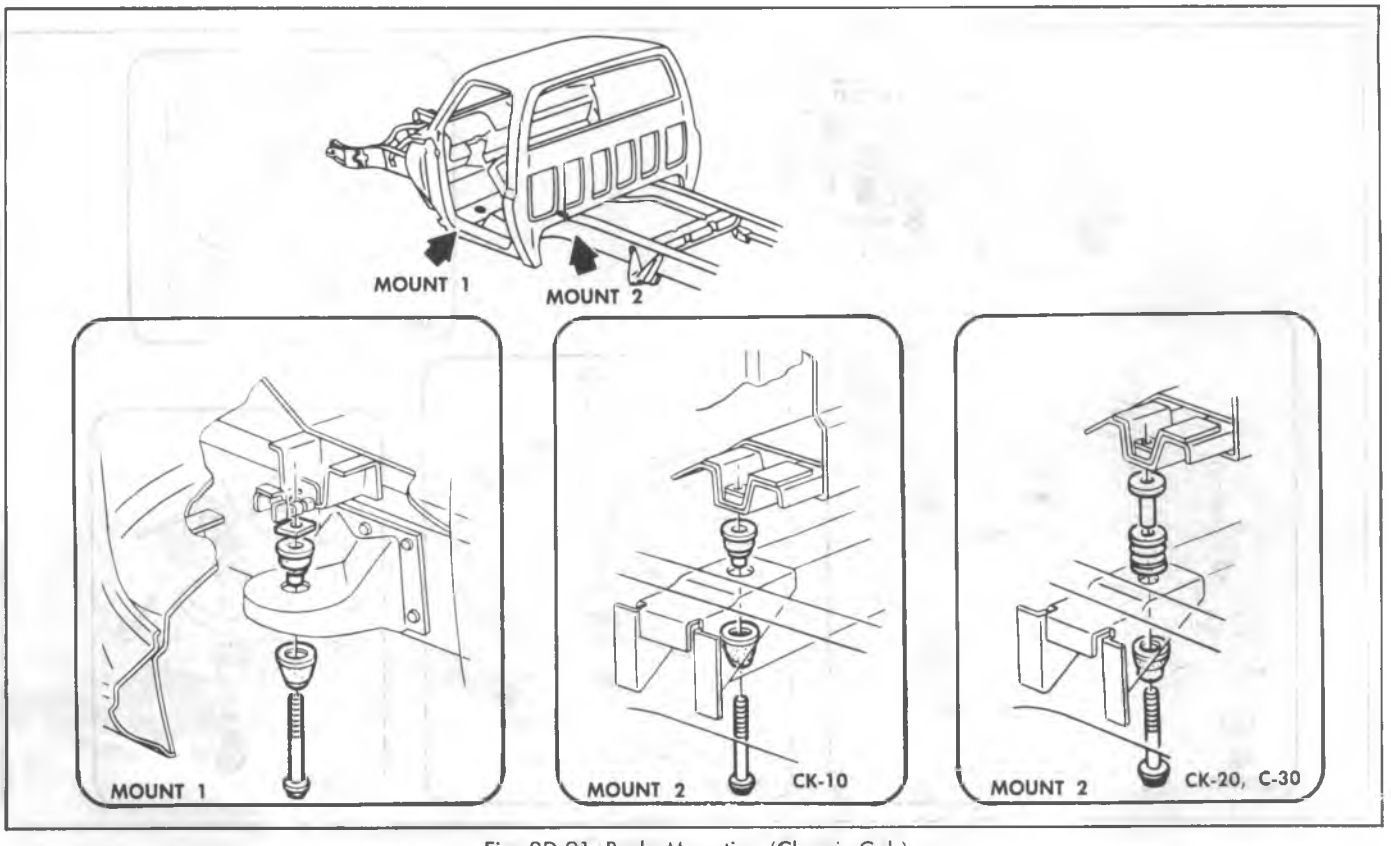


Fig. 2D-91--Body Mounting (Chassis Cab)

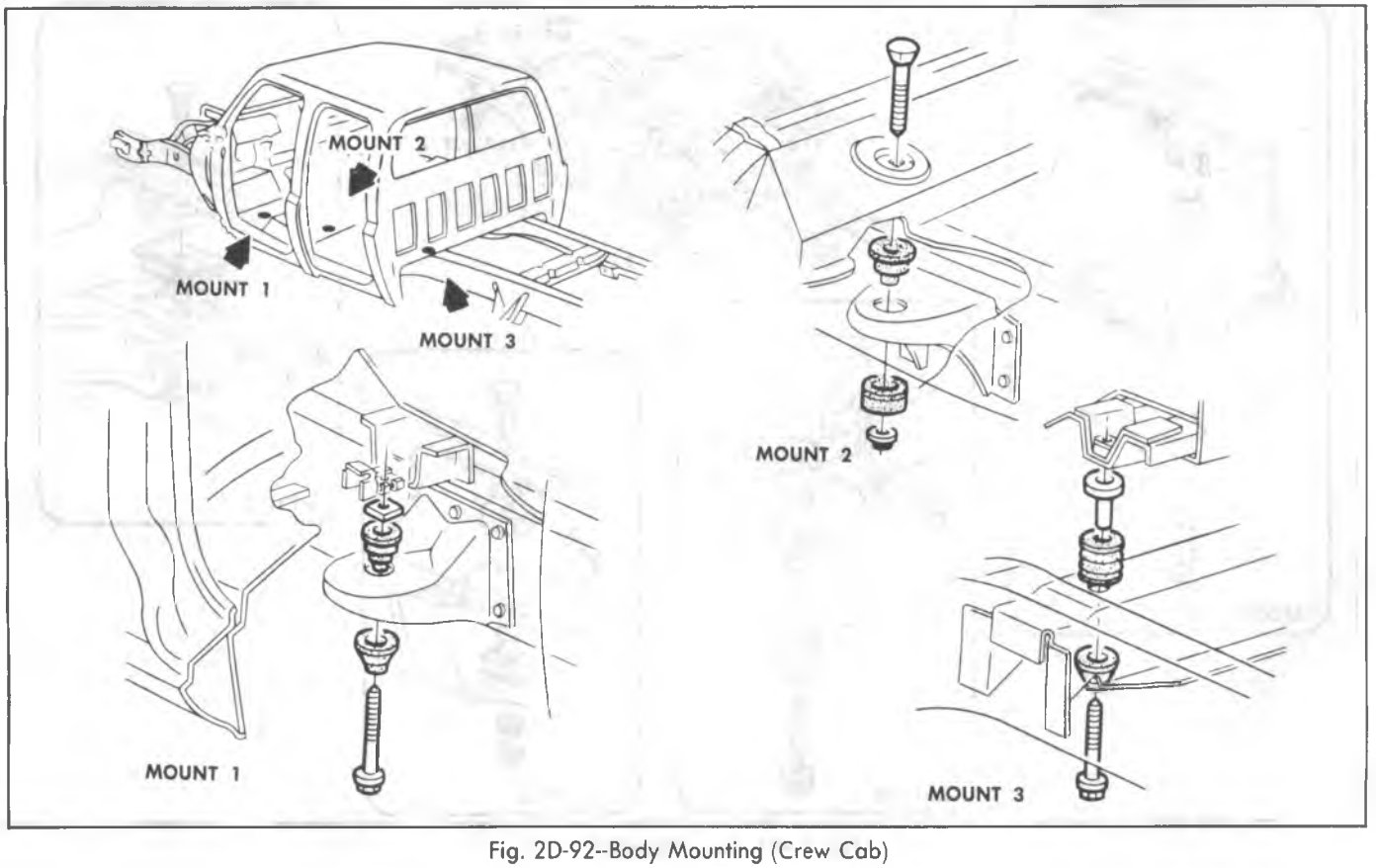


Fig. 2D-92--Body Mounting (Crew Cab)

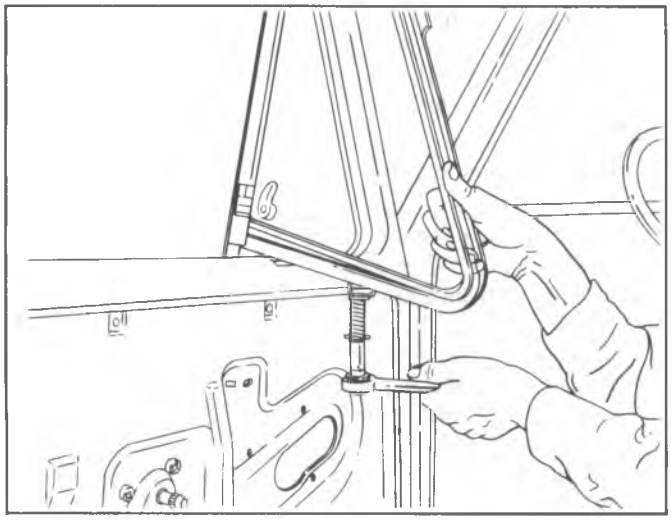


Fig. 2D-115--Adjusting Ventilator Tension

9. Reverse above procedure for installation.

DOOR WINDOW ADJUSTMENT

To perform the adjustments listed, the door trim panels must be removed.

Glass Height (Fig. 2D-116)

Loosen the bolt and adjust the stop assembly located above the regulator sprocket so that the glass height in the lowered position is flush with the top of the sill, then tighten stop assembly bolt.

Regulator Raising and Lowering Effort (Fig. 2D-109)

The lower bolt on the run channel assembly provides fore and aft movement to ease regulator effort.

WINDOW REGULATOR - MANUAL

Replacement

1. Wind window all the way up.
2. Remove inside door handles with Tool J-7797.
3. Remove door trim pad.
4. Remove screws securing regulator to inner panel.

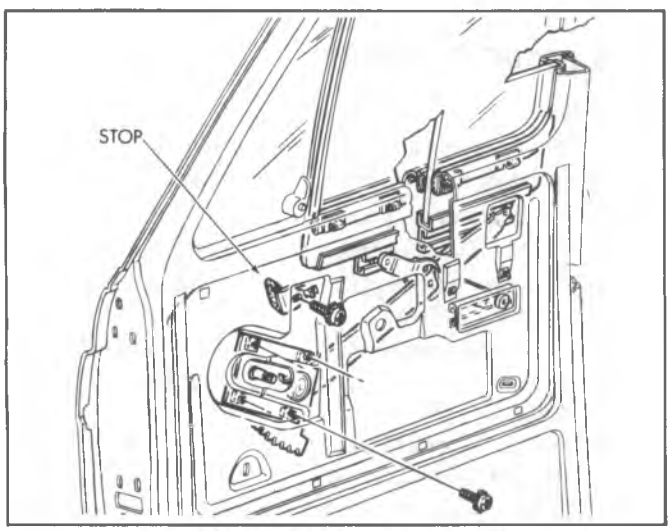


Fig. 2D-116--Window and Regulator

5. Push regulator out of door opening while holding rear of assembly, then slide assembly to the notches in the carrier channel and out through the door access hole.
6. Install regulator in reverse order of removal, lubricate regulator gears with lubriplate or equivalent.

WINDOW REGULATOR - POWER

In the case that window will not operate, check electrical connections first. Figure 2D-118 illustrates location of junctions, switch, relay and circuit breaker.

Replacement

CAUTION:Electrical connectors must be removed from window lift motor before performing any operation on the regulator, or personal injury could occur.

1. Disconnect battery ground cable.
2. Remove door trim panel.
3. Disconnect harness from regulator.
4. Remove screws securing regulator to inner panel.
5. Push regulator out of door opening while holding rear of assembly, then slide assembly to the notches in the carrier channel and out through the door access hole.

CAUTION:Step 6 must be performed when regulator is removed from door. The regulator lift arms are under tension from the counterbalance spring and can cause serious injury if the motor is removed without locking the sector gear in position.

6. Drill a hole through the regulator sector gear and back plate. DO NOT drill hole closer than 1/2" (12.7mm) to edge of sector gear or back plate. Install a pan head sheet metal tapping screw (No. 10 - 12 x 3/4) in drilled hole to lock sector gear in position.
7. Remove motor to regulator attaching screws.
8. Remove motor from regulator.
9. Prior to installation, lubricate the motor drive gear and regulator sector teeth.
   The lubrication used must be cold weather approved to a minimum of minus 20° fahrenheit (-29°C).
10. Install regulator motor to regulator. Make sure the motor pinion gear teeth mesh properly with the sector gear teeth before installing the three motor attaching screws.
11. Remove screw locking sector gear in a fixed position.
12. Install regulator in reverse order of removal, lubricate regulator gears and rollers with lubriplate or equivalent.

DOOR LOCK-FIGURE 2D-118

Removal

1. Raise window.
2. Remove inside handles with Tool J-9886-01.
3. Remove trim panel.
4. Remove door lock knob.
5. From outside the door remove screws retaining lock to door edge and lower the lock assembly.
6. Remove screws retaining remote control.
7. Remove screws securing glass run guide channel.

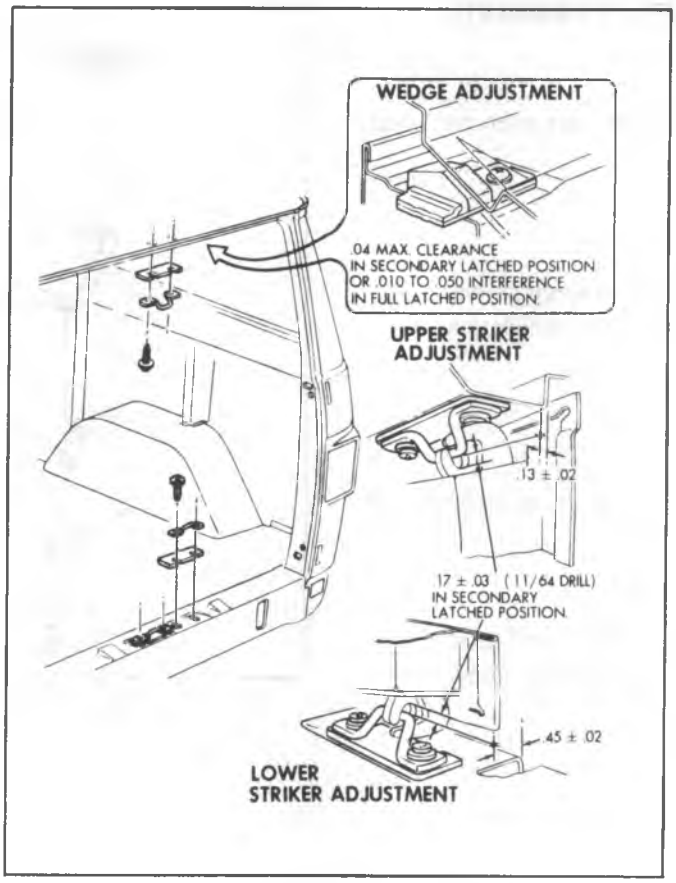


Fig. 2D-133--Reor Door Striker and Wedge Adjustment

SEATS

NOTICE: See NOTICE on page 1 of this section regarding fasteners used on seats and seat belts.

DRIVERS SEAT

Seat Adjuster

Replacement

1. Remove seat by removing nuts securing seat adjuster to seat riser.
2. Remove adjuster from seat. See figure 2D-134.
3. Install seat adjuster to seat. Torque bolts to specifications.
4. Install seat onto seat riser, and torque nuts to specifications.

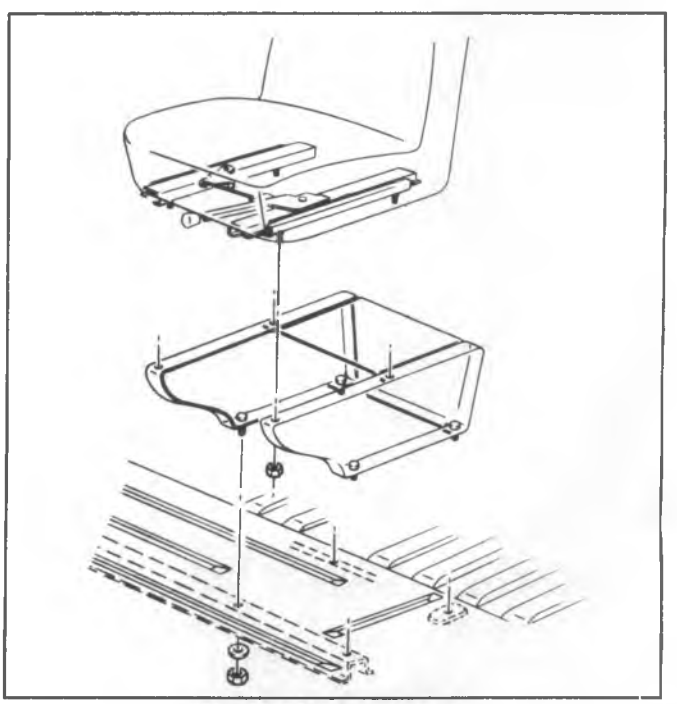


Fig. 2D-134--Driver's Seat

SEAT RISER

Replacement

1. Remove seat and adjusters as an assembly by removing nuts securing seat to riser.
2. Remove nuts securing seat riser to floor.
3. Install seat riser to floor. Torque nuts to specifications.
4. Install seat and torque nuts to specifications.

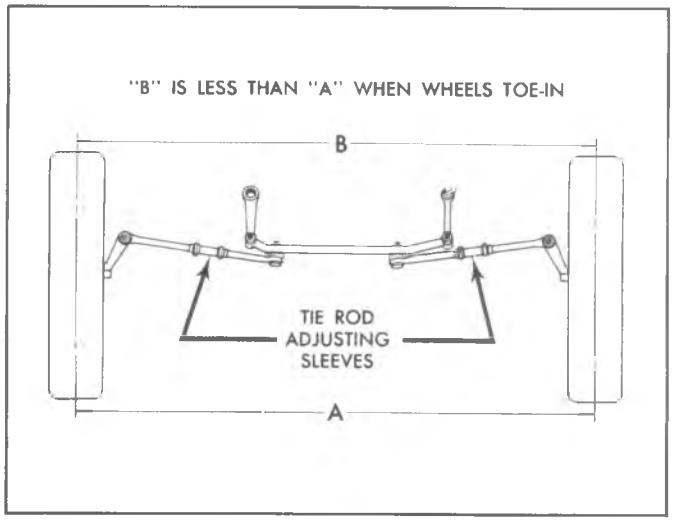


Fig. 3A-3--Toe-In Adjustment

Toe-In

1. Determine the wheel toe-in from the alignment equipment.
2. Change the length of both tie rod sleeves to affect a toe change.

Toe-in can be increased or decreased by changing the length of the tie rods. A threaded sleeve is provided for this purpose.

When the tie rods are mounted ahead of the steering knuckle they must be decreased in length in order to increase toe-in. When the tie rods are mounted behind the steering knuckle they must be lengthened in order to increase toe-in.

See Section 3B for proper tie rod clamp orientation and positioning.

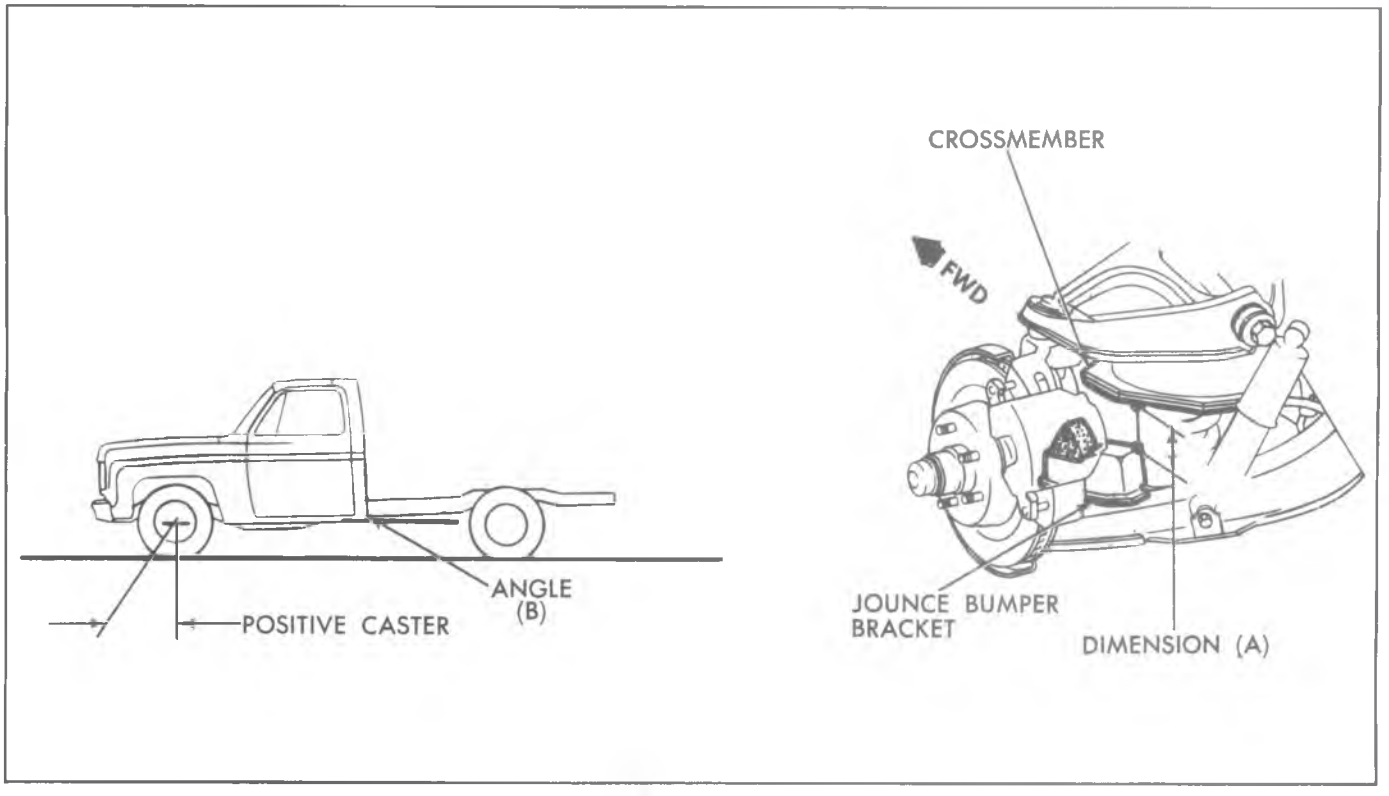


Fig. 3A-4--Determining Caster

It is also necessary that a scale or ruler be rested against the frame and used to determine the amount of movement since observers tend to over-estimate the actual movement when a scale is not used. The idler arm should always be replaced if it fails this test.

Jerking the right front wheel and tire assembly back and forth, thus causing an up and down movement in the idler arm is not an acceptable method of checking since there is no control on the amount of force being applied.

Caution should be used in assuming shimmy complaints are caused by loose idler arms. Before suspecting suspension or steering components, technicians should eliminate shimmy excitation factors, such as dynamic imbalance, run-out or force variation of wheel and tire assemblies and road surface irregularities.

Removal

1. Raise vehicle on a hoist.
2. Remove the nut from ball stud at the relay rod. Remove the ball stud from the relay rod by tapping on the relay rod boss with a hammer, while using a heavy hammer as a backing (Fig. 3B1-7).
3. Remove the idler arm to frame bolt and remove the idler arm assembly.

Installation

NOTICE: See the NOTICE on page 1 of this section regarding the fasteners referred to in steps 1 and 3.

1. Position the idler arm on the frame and install the mounting bolts (special plain washers under bolt heads); torque the nuts to specifications.
2. Make sure that the threads on the ball stud and in the ball stud nut are clean and smooth. If threads are not clean and smooth, ball stud may turn in the socket when attempting to tighten nut. Check condition of ball stud seal; replace if necessary.
3. Install the idler arm ball stud in the relay rod, making certain the seal is positioned properly. Use a 5/8-18 free-spinning nut to seat the tapers, per Fig. 3B1-6.
4. Lower the vehicle to the floor.

IDLER ARM — P SERIES MOTORHOME

The frame mounted idler support assembly is adjustable for support shaft end play. Check for idler arm movement at the relay rod end as indicated above. If the movement at the end of the arm exceeds ± 1/16 inch (1/8 inch total movement), readjust the support shaft end-play as follows:

1. Loosen the support assembly jam nut.
2. Tighten the adjusting plug to metal-to-metal contact.
3. Back off the adjusting plug 1/8 of a turn (1/2 of a flat on the square nut, or 45°).
4. Retorque the jam nut to 25-35 ft. lbs., while taking care that the adjusting plug does not rotate.

PITMAN ARM

Removal

1. Raise vehicle on hoist.
2. Remove nut from pitman arm ball stud.
3. Remove pitman arm or relay rod from ball stud by tapping on side of rod or arm (in which the stud mounts) with a hammer while using a heavy hammer or similar tool as a backing. Pull on linkage to remove from stud.
4. Remove pitman arm nut from pitman shaft or clamp bolt from pitman arm, and mark relation of arm position to shaft.
5. Remove pitman arm, using Tool J-6632 or J-5504.

Installation

NOTICE: See the NOTICE on page 1 of this section regarding the fasteners referred to in steps 3 and 4.

1. Install pitman arm on pitman shaft, lining up the marks made upon removal.

   NOTICE: If a clamp type pitman arm is used, spread the pitman arm just enough, with a wedge, to slip arm onto pitman shaft. Do not spread pitman arm more than required to slip over pitman shaft with hand pressure. Do not hammer or damage to steering gear may result. Be sure to install the hardened steel washer before installing the nut.
2. Make sure that threads on ball studs and in ball stud nuts are clean and smooth. If threads are not clean and smooth, ball studs may turn in sockets when attempting to tighten nut. Check condition of ball stud seals; replace if necessary.
3. Install pitman shaft nut or pitman arm clamp bolt and torque to specifications.
4. Position ball stud onto pitman arm or relay rod. Use a 5/8-18 free-spinning nut to seat the tapers, per Fig. 3B1-6.
5. Lubricate ball studs.
6. Lower the vehicle to the floor.

STEERING CONNECTING ROD (K MODELS ONLY)

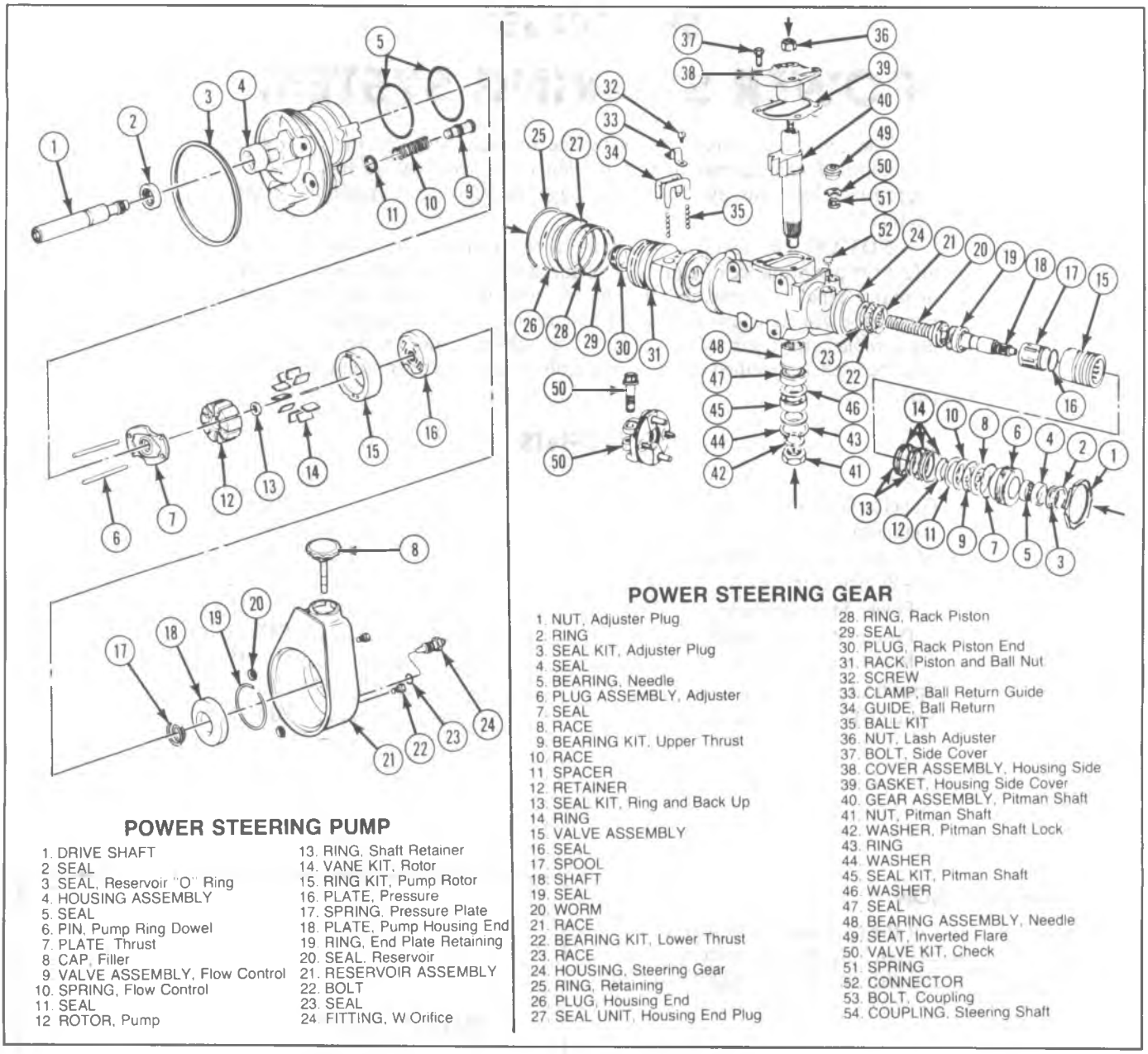
Removal

1. Remove cotter pins from ball studs, and then remove the castellated nuts.
2. Remove ball studs from steering arm and pitman arm boss with a heavy hammer and striking other side of boss with lighter hammer (similar to method shown in (Fig. 3B1-7).

Installation

NOTICE: See the NOTICE on page 1 of this section regarding the fasteners referred to in step 3.

1. Make sure that threads on ball studs and in ball stud nuts are clean and smooth. If threads are not clean and smooth, ball studs may turn in connecting rod when attempting to tighten nut. Check condition of ball stud seals-replace if necessary.
2. Install ball studs in steering arm and pitman arm. (Be sure to install the long end of the connecting rod assembly to the pitman arm, as shown in Fig. 3B1-5).
3. Install ball stud nuts and torque to specifications. Never back off nut to align cotter pin, always tighten nut to next slot that lines up with hole in stud.
4. Install cotter pins and lubricate ball studs. For proper alignment and orientation of connecting rod clamps see Figure 3B1-11.



POWER STEERING PUMP

1. DRIVE SHAFT
2. SEAL
3. SEAL, Reservoir "O" Ring
4. HOUSING ASSEMBLY
5. SEAL
6. PIN, Pump Ring Dowel
7. PLATE, Thrust
8. CAP, Filler
9. VALVE ASSEMBLY, Flow Control
10. SPRING, Flow Control
11. SEAL
12. ROTOR, Pump
13. RING, Shaft Retainer
14. VANE KIT, Rotor
15. RING KIT, Pump Rotor
16. PLATE, Pressure
17. SPRING, Pressure Plate
18. PLATE, Pump Housing End
19. RING, End Plate Retaining
20. SEAL, Reservoir
21. RESERVOIR ASSEMBLY
22. BOLT
23. SEAL
24. FITTING, W Orifice

POWER STEERING GEAR

1. NUT, Adjuster Plug
2. RING
3. SEAL KIT, Adjuster Plug
4. SEAL
5. BEARING, Needle
6. PLUG ASSEMBLY, Adjuster
7. SEAL
8. RACE
9. BEARING KIT, Upper Thrust
10. RACE
11. SPACER
12. RETAINER
13. SEAL KIT, Ring and Back Up
14. RING
15. VALVE ASSEMBLY
16. SEAL
17. SPOOL
18. SHAFT
19. SEAL
20. WORM
21. RACE
22. BEARING KIT, Lower Thrust
23. RACE
24. HOUSING, Steering Gear
25. RING, Retaining
26. PLUG, Housing End
27. SEAL UNIT, Housing End Plug
28. RING, Rack Piston
29. SEAL
30. PLUG, Rack Piston End
31. RACK, Piston and Ball Nut
32. SCREW
33. CLAMP, Ball Return Guide
34. GUIDE, Ball Return
35. BALL KIT
36. NUT, Lash Adjuster
37. BOLT, Side Cover
38. COVER ASSEMBLY, Housing Side
39. GASKET, Housing Side Cover
40. GEAR ASSEMBLY, Pitman Shaft
41. NUT, Pitman Shaft
42. WASHER, Pitman Shaft Lock
43. RING
44. WASHER
45. SEAL KIT, Pitman Shaft
46. WASHER
47. SEAL
48. BEARING ASSEMBLY, Needle
49. SEAT, Inverted Flare
50. VALVE KIT, Check
51. SPRING
52. CONNECTOR
53. BOLT, Coupling
54. COUPLING, Steering Shaft

Fig. 3B3-2 -- Pump and Gear Cross-Section

DIAGNOSIS (FIGS. 3B3-3 THROUGH 3B3-8)

Complaints of faulty steering are frequently the result of problems other than the steering gear or pump. Those areas of the steering system which can be easily checked and quickly corrected without disassembly and overhaul of any major components should be attempted first.

Conditions such as hard or loose steering, road shock or vibrations are not always due to the steering gear or pump, but are often related instead to such factors low tire pressure and front end alignment. These factors should be checked and corrected before any adjustment or disassembly of the power steering gear or pump is attempted.

System Checks

Many factors affect power operation of the steering system, of which the most common are:

1. Fluid level and condition.
2. Drive belt tension.
3. Loose component mountings.
4. Loose pump pulley.

These factors must be checked and corrected before making any further diagnosis of the steering system. The need for proper diagnosis cannot be over-emphasized.

After the source of the problem has been found, determine the cause. For example, if the oil level in the reservoir is found to be low, refill and check the entire hydraulic system for oil leaks. Refilling the reservoir will not necessarily correct the problem.

P Models

a. Place the steering gear in position, guiding the stub shaft into the universal joint assembly and lining up the marks made at removal. If a new gear was installed, line up the mark on the stub shaft with the mark on the universal yoke.

b. Install the steering gear to frame bolts and torque to specifications.

c. Install the universal joint pinch bolt and torque to specification. The pinch bolt must pass through the shaft undercut.

All Models

6. Install the pitman arm onto the pitman shaft, lining up the marks made at removal. Install the pitman shaft nut or pitman arm pinch bolt and torque to specifications.
7. Remove the plugs and caps from the steering gear and hoses and connect the hoses to the gear. Tighten the hose fittings to specified torque.

POWER STEERING PUMP (3B3-15 THROUGH 3B3-26)

Removal

1. Disconnect hoses at pump. When hoses are disconnected, secure ends in raised position to prevent drainage of oil. Cap or tape the ends of the hoses to prevent entrance of dirt.
   On Models with remote reservoir, disconnect reservoir hose at pump and secure in raised position. Cap hose pump fittings.
2. Install two caps at pump fittings to prevent drainage of oil from pump.
3. Loosen bracket-to-pump mounting nuts.
4. Remove pump belt.
5. Remove pump from attaching parts and remove pump from vehicle.

Installation

1. Postion pump assembly on vehicle and install attaching parts loosely.
2. Connect and tighten hose fittings.
3. Fill reservoir. Bleed pump by turning pulley backward (counter-clockwise as viewed from front) until air bubbles cease to appear.
4. Install pump belt over pulley.
5. Tension belt as outlined under "Pump Belt Tension-Adjustment" in this section.
6. Bleed as outlined under "Bleeding Power Steering System."

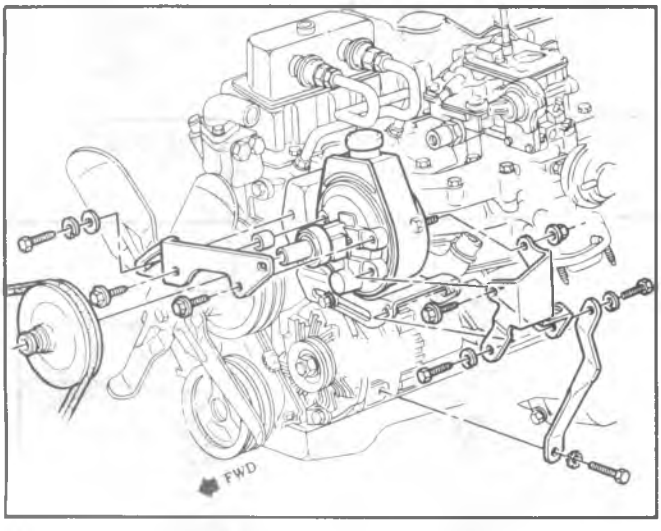


Fig. 3B3-15--P/S Pump Mounting; CK100, CK200 (03) with LE3 Engine

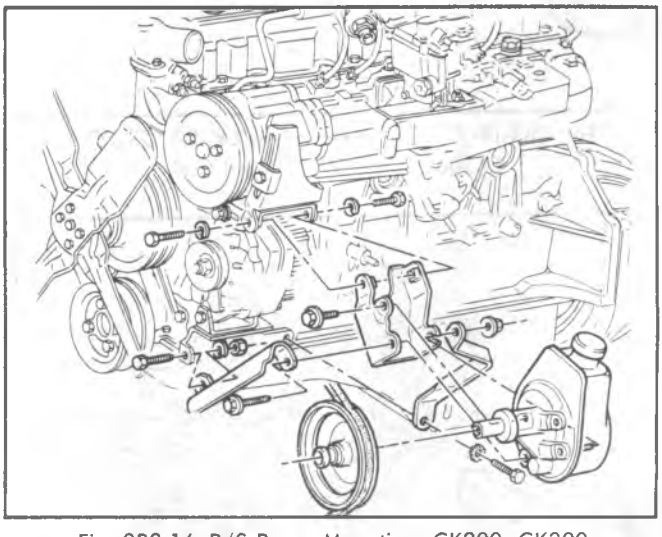


Fig. 3B3-16--P/S Pump Mounting; CK200, CK300 with L25 Engine

IGNITION SYSTEM – ELECTRICAL SYSTEM – WILL NOT FUNCTION (CONT'D.)

Cause	Solution
D. Defective ignition switch.	D. Replace ignition switch.
E. Ignition switch not adjusted properly.	E. Readjust ignition switch.

SWITCH WILL NOT ACTUATE MECHANICALLY

Cause	Solution
A. Defective ignition switch.	A. Replace igntion switch.

SWITCH CAN NOT BE SET CORRECTLY

Cause	Solution
A. Switch actuator rod deformed.	A. Repair or replace switch actuator rod.
B. Sector to rack engaged in wrong tooth (tilt).	B. Engage sector to rack correctly.

NOISE IN COLUMN

Cause	Solution
A. Coupling bolts loose.	A. Tighten pinch bolts to specified torque.
B. Column not correctly aligned.	B. Realign column.
C. Coupling pulled apart.	C. Replace coupling and realign column.
D. Sheared intermediate shaft plastic joint.	D. Replace or repair steering shaft and realign column.
E. Horn contact ring not lubricated.	E. Lubricate with lubriplate.
F. Lack of grease on bearings or bearing surfaces.	F. Lubricate bearings.
G. Lower shaft bearing tight or frozen.	G. Replace bearing. Check shaft and replace if scored.
H. Upper shaft tight or frozen.	H. Replace housing assembly.
I. Shaft lock plate cover loose.	I. Tighten three screws or, if missing, replace. CAUTION: Use specified screws. (15 in. lbs.)
J. Lock plate snap ring not seated.	J. Replace snap ring. Check for proper seating in groove.
K. Defective buzzer dog cam on lock cylinder.	K. Replace lock cylinder.
L. One click when in "off-lock" position and the steering wheel is moved.	L. Normal condition - lock bolt is seating.

Fig. 3B4-5–Automatic Transmission Column Diagnosis Chart C

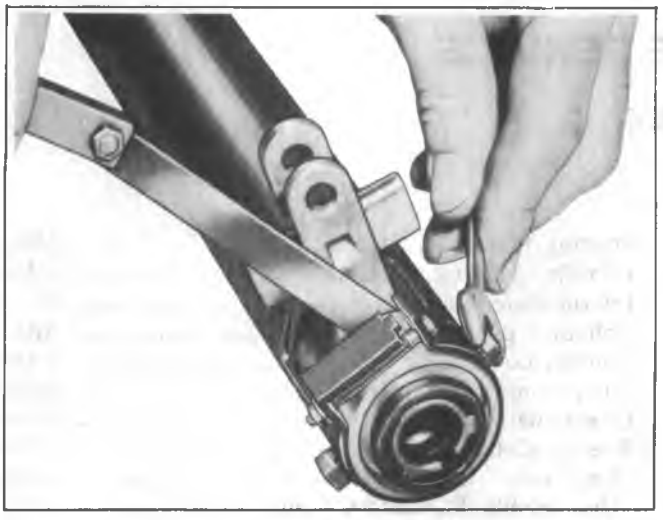


Fig. 3B4-19–Shift Tube Adjustment-3 Speed Manual Transmission

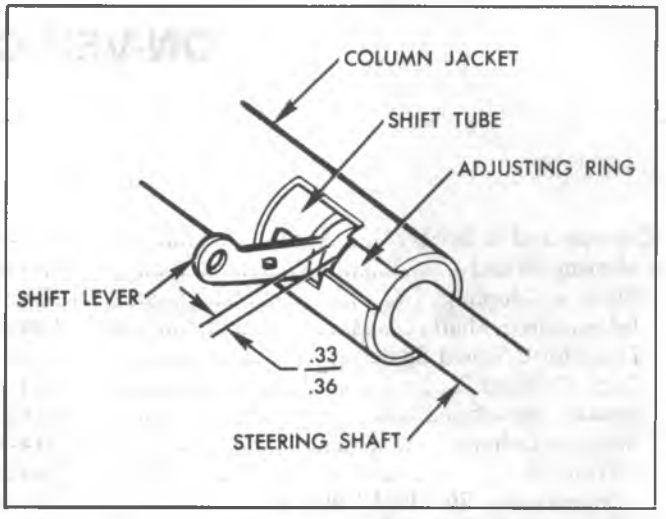


Fig. 3B4-20–Shift Tube Adjustment-Automatic Transmission

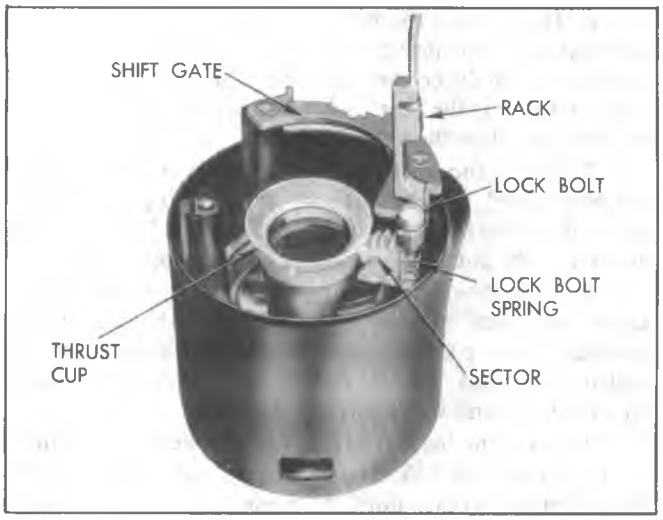


Fig. 3B4-43–Turn Signal Housing Assembly

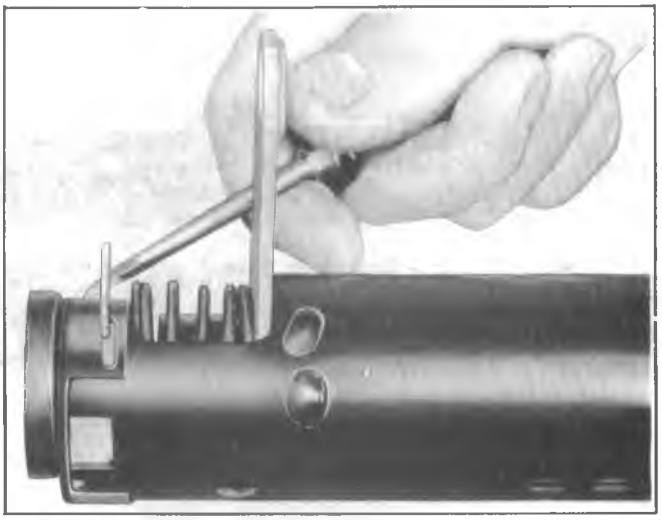


Fig. 3B4-45–Removing Lower Bearing Retainer

Fig. 3B4-44–Removing Ignition Switch Actuator Sector

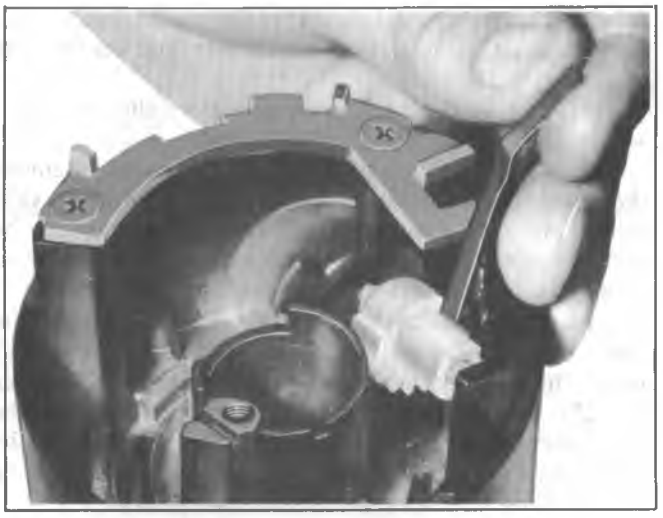


Fig. 3B4-46–Installing Rack Preload Spring

13. Install the neutral-safety or back-up switch as outlined in Section 8 of this manual.

14. Slide the steering shaft into the column and install the upper bearing thrust washer.

15. Install the turn signal switch, lock cylinder assembly and ignition switch as previously outlined in this section.

16. Install the shift lever and shift lever pivot pin.

17. Remove the column from the vise.

18. Install the dash bracket to the column; torque the screws to specifications.

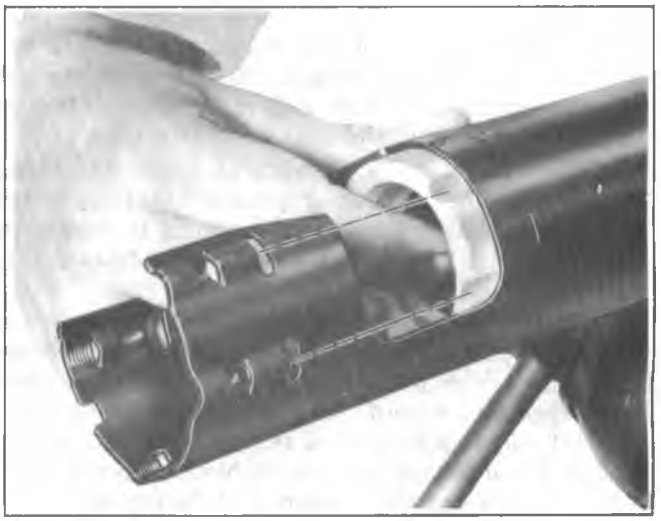


Fig. 3B4-47–Installing Gearshift Housing Lower Bearing

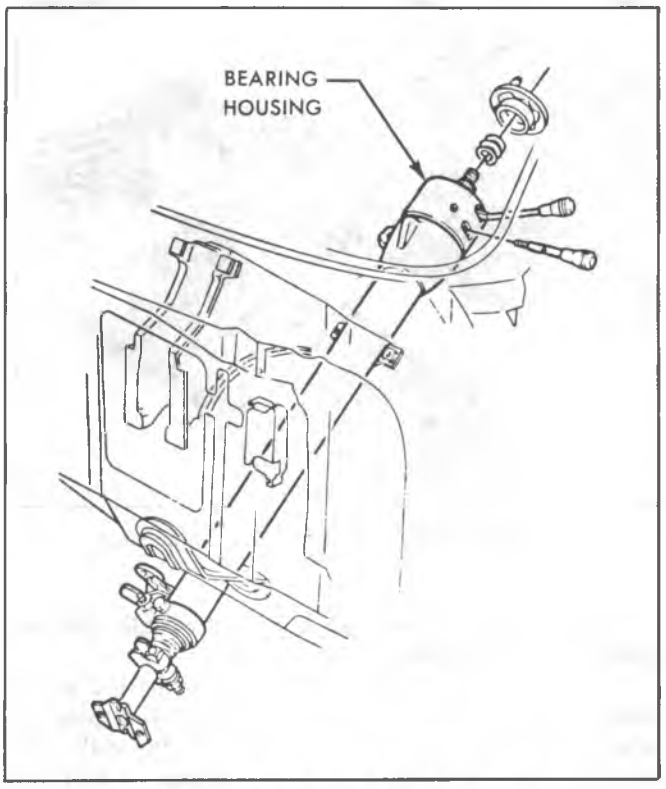


Fig. 3B4-66–Tilt Column Bearing Housing

6. Remove the steering shaft bearing locknut using Socket J-22599. Remove the upper bearing race seat and race.

7. Remove the two bearing housing pivot pins using Tool J-21854.

8. Pull up on the tilt release lever (to disengage the lock shoes) and remove the bearing housing.

If the bearing housing is being replaced or it is necessary to disassemble the bearing housing, proceed as follows:

a. Press the upper and lower bearings out of the housing.

b. Using Puller J-5822 and Slide Hammer J-2619, pull the bearing races from the housing.

c. Remove the tilt release lever.

d. Drive out the shoe release pivot pin using Tool J-22635 or a suitable punch. Remove the lever spring and remove the wedge.

e. Using a suitable size punch, drive out the lock shoe retaining pin. Remove the shoes and shoe springs.

If the upper steering shaft, lower steering shaft, or centering spheres are being removed, proceed as follows:

9. To remove the steering shaft assembly through the upper end of the column. If it is necessary to disassemble the shaft, proceed as follows:

a. To remove the lower steering shaft first disconnect the shaft at the pot joint coupling clamp.

b. Turn the upper shaft 90° to the lower shaft and slide the upper shaft and centering spheres from the lower shaft.

c. Rotate the centering spheres 90° and remove the centering spheres and preload spring from the upper shaft.

If the bearing housing support is being replaced, proceed as follows:

10. Remove the four bearing housing support screws and remove the support.

Assembly

NOTICE: See NOTICE on page 1 of this section regarding the fasteners referred to in steps 3, 9 and 11.

1. Assemble the steering shaft as follows:

a. Lubricate and assemble the centering spheres and preload spring.

b. Install the spheres into the upper (short) shaft and rotate 90°.

c. Install the lower shaft 90° to the upper shaft and over the centering spheres. Slowly straighten the shafts while compressing the preload spring.

2. Install the shaft assembly into the housing from the upper end.

3. Install the lower shaft to the pot joint coupling clamp. Install the coupling clamp bolt and torque to specifications.

NOTICE: The coupling bolt must pass through the shaft undercut, or damage may occur to the components.

4. Assemble the bearing housing as follows:

a. Press the new upper and lower bearing races into the bearing housing.

b. Lubricate and install the bearings into the bearing races.

c. Place the lock shoe springs in position in the housing. Install each shoe in place and compress the spring until a suitable size straight punch can be used to hold the shoe in position (it may be necessary to acquire assistance to install the shoes). Once the shoes are in place, drive in the shoe retaining pin.

d. Install the shoe release lever and drive in the pivot pin.

e. Install the tilt release lever.

f. Lubricate the shoes and release lever.

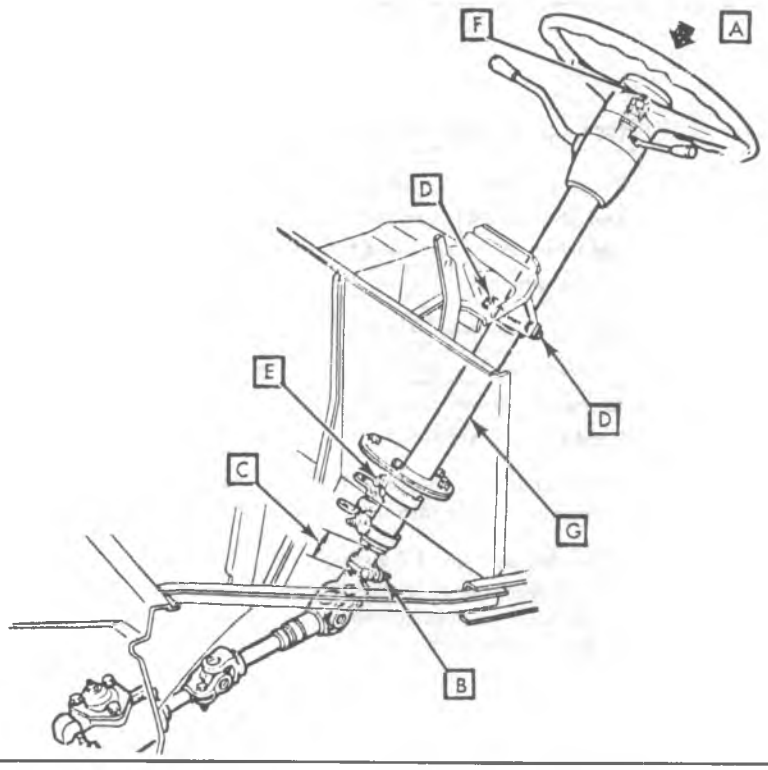
5. Install the bearing housing assembly to the support. Hold the tilt release lever in the "up" position until the shoes have fully engaged the support. Lubricate and install the bearing housing pivot pins. Press the pins in flush with the housing.

6. Place the housing in the full "up" position and then install tilt spring and retainer (tapered end of spring first). Push into the housing approximately 3/16" and rotate counterclockwise 1/8 turn.

7. Lubricate and install the upper bearing race, race seat and locknut. Tighten the locknut (using Socket J-22599) to remove the lash and then carefully further tighten 1/16 to 1/8 of a turn (column must be in straight ahead position).

8. Remove the tilt release lever.

9. Install the directional signal switch as outlined under "Directional Signal Switch - Installation".



STEERING SYSTEM MANDATORY REQUIREMENTS

1. Using a 50 lb. force applied to the steering wheel end of Shaft [A], Lower Clamp Nut [B] must be tightened to the specified torque to give a compressed spring dimension [C] of 1.26 ±.02 after assembly.
2. All Mast Jacket attachments [D] & [E] must be tightened to recommended torque.
3. Threaded portion of Steering Shaft [F] must be completely free of lubricant after Mast Jacket [G] assembly to maintain steering wheel clamping load and hub clearance.

Fig. 3B4-88–Mandatory Sequence For Installation of P Series Column

Probable Cause	Probable Remedy
NOISE IN FRONT END	
a. Ball joints and steering linkage need lubrication	a. Lubricate at recommended intervals
b. Shock absorber loose or bushings worn	b. Tighten bolts and/or replace bushings
c. Worn control arm bushings	c. Replace bushings
d. Worn tie rod ends	d. Replace tie rod ends
e. Worn or loose wheel bearings	e. Adjust or replace wheel bearings
f. Loose stabilizer bar	f. Tighten all stabilizer bar attachments
g. Loose wheel nuts	g. Tighten the wheel nuts to proper torque
h. Spring improperly positioned	h. Reposition
i. Loose suspension bolts	i. Torque to specifications or replace
WHEEL TRAMP	
a. Tire and wheel out of balance	a. Balance wheels
b. Tire and wheel out of round	b. Replace tire
c. Blister or bump on tire	c. Replace tire
d. Improper shock absorber action	d. Replace shock absorber
EXCESSIVE OR UNEVEN TIRE WEAR	
a. Underinflated or overinflated tires	a. Inflate tire to proper recommended pressure
b. Improper toe-in	b. Adjust toe-in
c. Wheels out of balance	c. Balance wheels
d. Hard Driving	d. Instruct driver
e. Over loaded vehicle	e. Instruct driver
SCUFFED TIRES	
a. Toe-in incorrect	a. Adjust toe-in to specifications
b. Excessive speed on turns	b. Advise driver
c. Tires improperly inflated	c. Inflate tires to proper recommended pressure
d. Suspension arm bent or twisted	d. Replace arm
CUPPED TIRES	
a. Front shock absorbers defective	a. Replace shock absorbers
b. Worn ball joints	b. Replace ball joints
c. Wheel bearings incorrectly adjusted or worn	c. Adjust or replace wheel bearings
d. Wheel and tire out of balance	d. Balance wheel and tire
e. Excessive tire or wheel runout	e. Compensate for runout

Fig. 3C-6--Front Suspension Diagnosis Chart C

Inspecting Shock Mountings

If noisy and/or loose shock mountings are suspected, place vehicle on hoist that supports wheels and check all mountings for the following conditions:

(1) Worn or defective grommets

(2) Loose mounting nuts

(3) Possible interference condition

(4) Bump stops missing

If no apparent defects are noted in this step but noise condition still exists when vehicle is bounced up and down, proceed.

Inspecting Shocks for Leaks and Manually Operating Shocks

This procedure is sub-divided into two general areas, (1) Inspecting Shocks for Loss of Hydraulic Fluid and (2)

5. Remove nuts securing control arm shaft to frame. Withdraw control arm assembly. Tape shims together and tag for proper relocation when control arm is reinstalled.

Upper Control Arm Inner Pivot Shaft and/or Bushing Replacement

C10, G10-20, P10 (Rubber Bushings)

Removal (Fig. 3C-22)

1. Remove the upper control arm using the preceding procedure and mount the control arm in a vise.
2. Install remover J-24435-1, receiver J-24435-3 and "C" clamps J-24435-7 as shown in Figure 3C-22.
3. Tighten the clamp to draw out the old bushing. Discard old bushing.
4. The pivot shaft may now be removed from the control arm assembly.
5. Reposition the control arm in the vise and repeat the removal procedure on the remaining bushing.

Bushing Installation

1. Again using "C" clamp J-24435-7 and installers J-24435-4 (outer) and J-24435-5 (inner) tighten clamp to install bushing onto control arm.
2. Install pivot shaft into inside diameter of first installed bushing.
3. Install remaining bushing as shown in Figure 3C-23 and described in step 1.
4. Remove tools and install control arm on vehicle following procedure described below. Torque all fasteners to proper specifications.

Upper Control Arm Installation

NOTICE: See NOTICE on page 1 of this section regarding the fasteners referred to in steps 1, 2 and 3.

When installing the upper control arm be sure to position the special aligning washers to the pivot shaft with concave and convex sides together.

1. Place control arm in position on bracket and install nuts. Before tightening nuts, insert caster and camber shims in the same order as when removed. Torque the nuts to specifications.
   A normal shim pack will leave at least two (2) threads of the bolt exposed beyond the nut. If two (2) threads cannot be obtained: Check for damaged control arms and related parts. Difference between front and rear shim packs must not exceed 7.62 mm (.30 inches). Front shim pack must be at least 6.09 mm (.24 inches). Always tighten the thinner shim packs' nut first for improved shaft to frame clamping force and torque retention.
2. Insert ball joint stud into steering knuckle and install nut. Torque stud nut to specifications and install cotter pin.
3. Install brake caliper assembly if removed (see section 5).
4. Remove adjustable support from under lower control arm. Install wheel and tire assembly.
5. Lower the vehicle to the floor.

LOWER CONTROL ARM ASSEMBLY

Removal

1. Raise vehicle on hoist and remove spring as outlined under spring removal. Support the inboard end of the control arm after spring removal.
2. Remove cotter pin from lower ball stud and loosen stud nut one turn.
3. Install Ball Stud Remover J-23742, position large cup end of the tool over the upper ball stud nut and piloting the threaded end of tool on end of the lower ball stud. Extend bolt from Tool J-23742 to loosen lower ball stud in steering knuckle. When stud is loosened, remove tool and nut from lower stud.
   It is necessary to remove the brake caliper assembly and wire it to the frame to gain clearance for tool J-23742. See section 5 for proper procedure.
4. Remove the lower control arm.

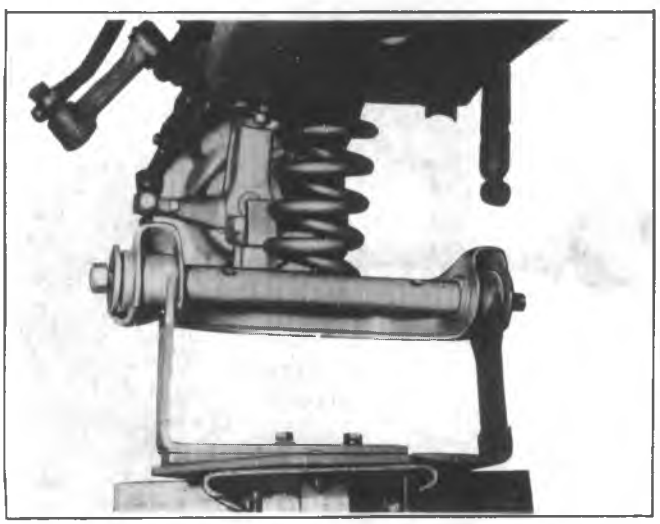


Fig. 3C-24--Lowering Control Arm for Bushing Replacement

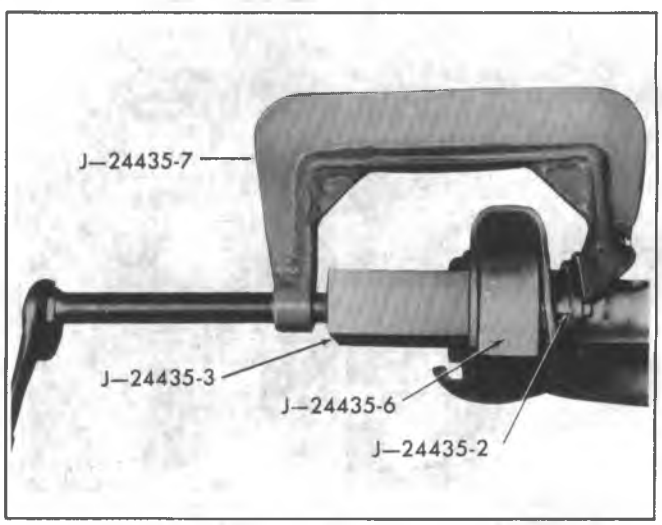


Fig. 3C-25--L.C.A. Rubber Bushing Removal

4. Use a small screwdriver to pry the plastic outer cage (#22) free from the inner cage (#23) while the inner cage is being removed.
5. Use a small screwdriver to pry the plastic outer cage tabs free from the groove in the outer clutch housing. Remove outer cage.
6. Remove the clutch sleeve (#18) and attached components from the outer clutch housing.
7. Compress the return spring (#15) and hold the spring in the compressed condition with fabricated clamps as shown in Fig. 3C-4K. After the clamps are installed, position the entire assembly in a bench vise so that the vise holds both ends of the clutch sleeve. Remove the retaining ring (#12).
8. With the clutch sleeve assembly still in the vise, remove the clamps holding the return spring. Slowly open the vise to permit releasing of the return spring in a controlled manner. Remove the retainer seat, spring and spring support washers (#13, 14) from the hub sleeve.
9. Remove the C-type retaining ring (#19) from the clutch sleeve. It is necessary to position the sleeve assembly so that the C-ring ends are aligned with the legs of the cam follower, allowing removal between the two legs.
10. Remove the conical spring (#20) from between the cam follower and the clutch gear.
11. Separate the cam follower (#21) from the clutch gear (#17).

REASSEMBLE HUB

1. Snap the tangs of the cam follower (#21) over the flats of the clutch gear (#17).
2. Compress the conical spring (#20) and slide it into position with the large diameter of the spring located against the clutch gear.
3. Position the clutch gear assembly over the splines of the hub sleeve ((#18). The teeth of the cam follower should be located at the end of the hub sleeve which has no splines. The clutch gear and spring should slide freely over the splines of the hub sleeve.
4. Assemble the "C" shaped retainer ring (#19) in the groove of the hub sleeve.
5. Assemble a spring retainer (#14, 16) over each end of the return spring (#15).
6. Position one end of the return spring with retainer (#16) against the shoulder of the clutch gear.
7. Place the spring support washer (#13) against the retainer on the end of the return spring. Compress the return spring and assemble the retainer ring (#12) in the groove of the hub sleeve. Two "C" shaped clamps may be used to retain the return spring while the retainer ring is being assembled. Refer to Fig. 3C-3K.
8. The two "C" shaped clamps may be fabricated from 3/8" (9.5mm) wide by 3/32" or 1/8" (2.4-3.2mm) thick stock. The distance between the two legs of the clamps should be approximately 1-1/4" (31.8mm).
9. Place the components assembled in steps 1 through 7 into the outer housing (#10). The cam follower should be positioned with the two legs directed outboard.
10. Screw three of the cover screws (#1) into three holes of the outer clutch housing. These screws will support the component to permit the clutch hub to drop down so that the tangs of brake band (#25) may be assembled.
11. Carefully work the plastic outer cage (#22) into the outer clutch housing with the ramps facing toward the cam follower. The small external tabs of the plastic cage should be located in the wide groove of the outer clutch housing.
12. Assemble the steel inner cage (#23) into the outer cage, aligning the tab of the outer cage with the "window" of the inner cage.

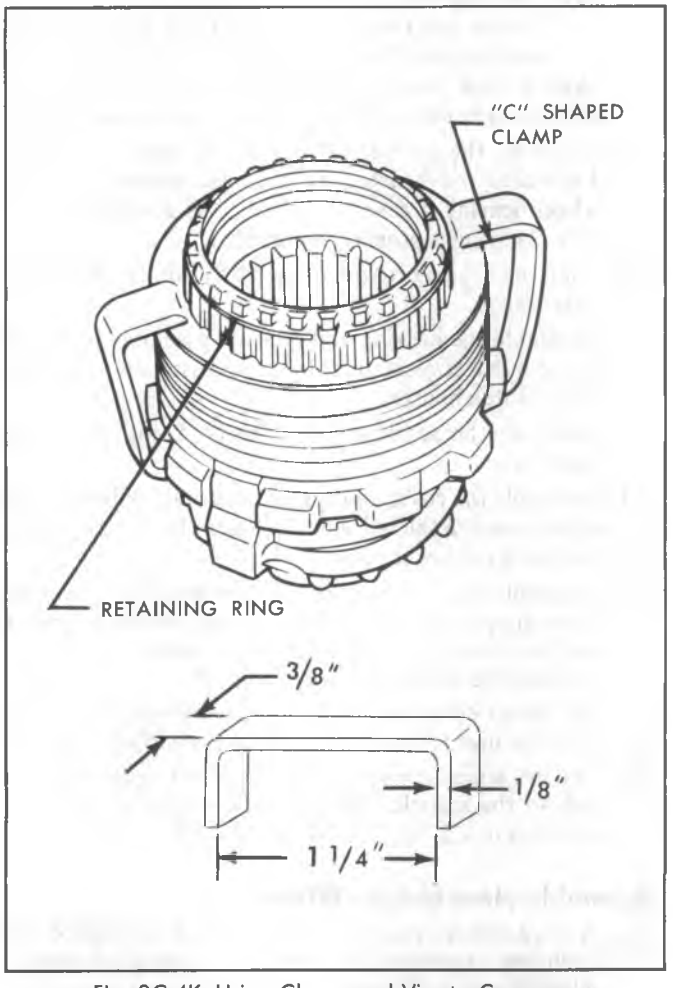


Fig. 3C-4K--Using Clamp and Vise to Compress Return Spring

SPECIFICATIONS

FRONT SUSPENSION BOLT TORQUE (ft. lbs.) * †

	CP-10	CP-20-30	K-All	G-10-20	G-30
Lower Control Arm Shaft U-Bolt	85	85	—	65	85
Upper Control Arm Shaft Nuts	70	105	—	70	105
Control Arm Rubber Bushings	115	—	—	115	—
Upper Control Arm Bushing Steel ††		New 190 Used 115	—	—	New 190 Used 115
Lower Control Arm Bushing Steel ††		New 280 Used 130	—	—	New 280 Used 130
Upper Ball Joint Nut	* 50	**90	**100	* 50	**90
Lower Ball Joint Nut	**90	**90	***80	**90	**90
Nut, Spindle-to-Knuckle	—	—	65	—	—
Crossmember to Side Rail •	65	65	—	65	65
Crossmember to Bottom Rail ••	90	90	—	90	90
Crossmember Brake Support Struts	60	60		60	60
Stabilizer Bar to Control Arm	25	25	Anchor Plate —130	25	
Stabilizer Bar to Frame	25	25	.55	25	
Shock Absorber Upper End	140	140	65	75	
Shock Absorber Lower End	60	60	65	75	
Brake Splash Shield to Knuckle	120 in. lbs.	120 in. lbs.	120 in. lbs.	120 in. lbs.	
Wheel Bearing Adjustment	—	—	Inner 35 Outer •••	—	
Wheel Bearing End Movement	.001-.005"	.001-.005"	.001-.010"	.001-.005"	
Caliper Mounting Bolt	35	35	—	35	
Spring — Front Eye Bolt	—	—	90	—	
Spring — Rear Eye Bolt	—	—	50	—	
Spring — To Rear Shackle Bolt	—	—	50	—	
Spring — To Axle U-Bolt	—	—	150	—	
Spring — Front Support to Frame	—	—	25	—	
Suspension Bumper	15	15	25	15	
Stabilizer to Spring Plate	—	—	130	—	

* Plus additional torque to align cotter pin. Not to exceed 90 ft. lbs. maximum.
** Plus additional torque to align cotter pin. Not to exceed 130 ft. lbs. maximum.
*** Plus additional torque to align cotter pin.
† All specifications are given in foot pounds of Torque unless indicated otherwise.
†† C10, G10-20 Rubber Bushings; C20-30, P10-30 Steel Bushings.
• P300 (32), P300 (42) and JF9 — 100 ft. lbs.
•• P300 (32) — 215 ft. lbs., P300 (42) and JF9 — 130 ft. lbs.
••• (K10-20) 205 ft. lbs., (K30) 65 ft. lbs.

Specs Page

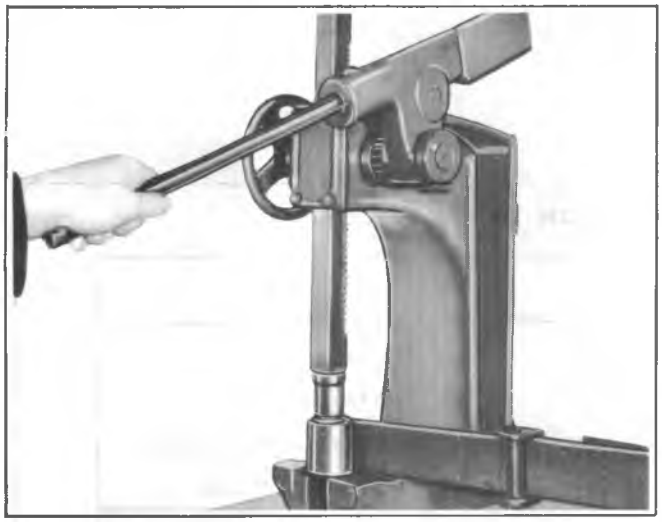


Fig. 3D-22--Pressing Out Bushing

1. Install all four nuts to uniform engagement on 'U' Bolts to retain and position anchor plate in design position (perpendicular to axis of 'U' Bolts).
2. Torque all nuts in a diagonal sequence (e.g. 1-3-2-4) to 14-35 N•m.
3. Torque all nuts to full torque using a diagonal sequence.

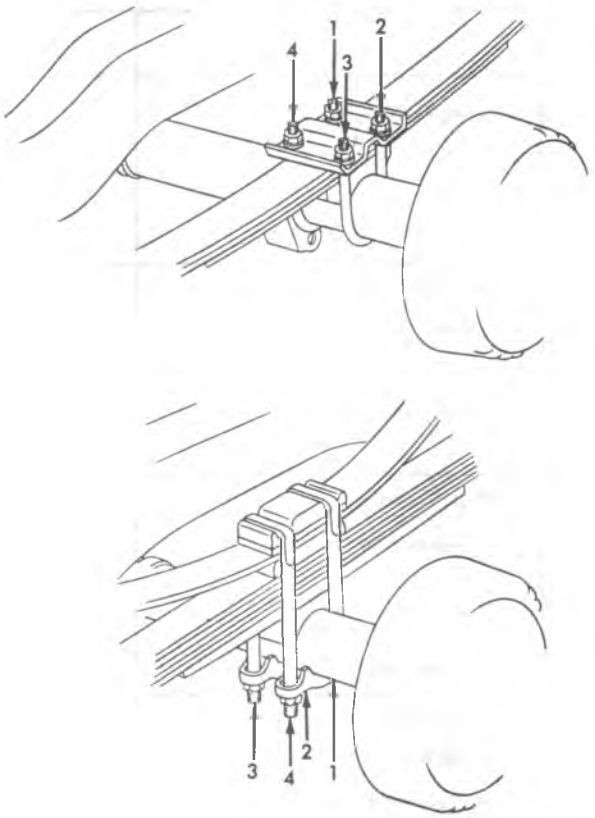


Fig. 3D-23--U-Bolt Installation

three lower sidewall rim line rings while the tire is laying flat (measurements should be taken each 90° around the circumference of the rim flange. If spacing is uneven around the bead from side to side, repeat Steps 1 through 3, and recheck.

It's important that this procedure be followed to insure proper bead seating in order to prevent bead deformation.

Radial tires, as well as the bias tires, must be mounted and inflated in accordance with safety precautions noted in RMA Radial and Bias Truck Tire Service Manuals.

TIRE REPAIR

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from the tire manufacturer.

Series	Description	Torque
K	7/16" Bolts (6)	70-90 Ft. Lbs.
C10,P10,G10,G20	1/2" Bolts (5)	75-100 Ft. Lbs.
C20, P20 C30, P30 and K20, G30 Single Wheels	9/16" Bolts (8)	90-120 Ft. Lbs.
CKPG30 Dual Wheels	9/16" Bolts (8)	110-140 Ft. Lbs.
	Heavy Duty Wheels 5/8" Bolts (10)	130-180 Ft. Lbs.

Fig. 3E-12--Wheel Nut Torque

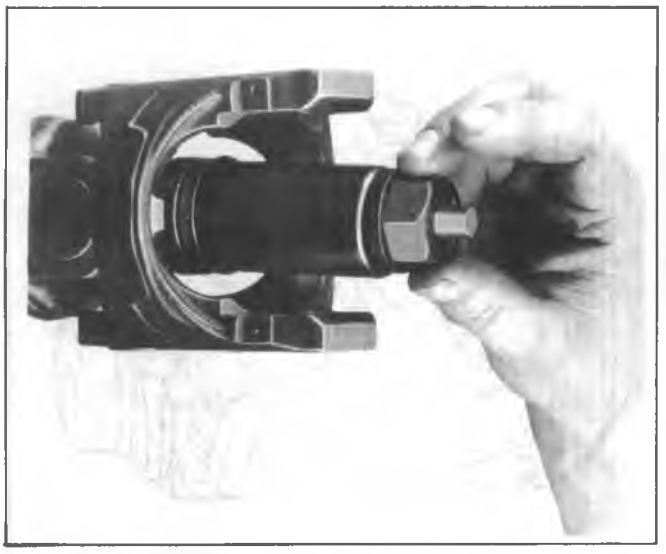


Fig. 4A-25--Installing Outer Cylinder of Tool J-23996 Over Ball

Centering Ball Replacement

1. Place fingers of inner part of Tool J-23996 under ball as shown in figure 4A-24.
2. Place outer cylinder of Tool J-23996 over outside of ball as shown in figure 4A-25.
3. Thread nut on Tool J-23996 and draw ball off stud, using wrench as shown in figure 4A-27.
4. Place the replacement ball on stud.
5. Using Tool J-23996, drive ball onto stud as in figure 4A-27, until the ball can be seen to seat firmly against the shoulder at the base of the stud. This is important as the center of the double Cardan joint is determined by the ball seating tightly in the proper location.
6. Using grease provided in the ball seat kit, lubricate all parts and insert them into the clean ball seat cavity in the following order: spring, washer (smallest OD), three ball seats (with largest opening outward to receive ball), washer (largest OD) and seal.

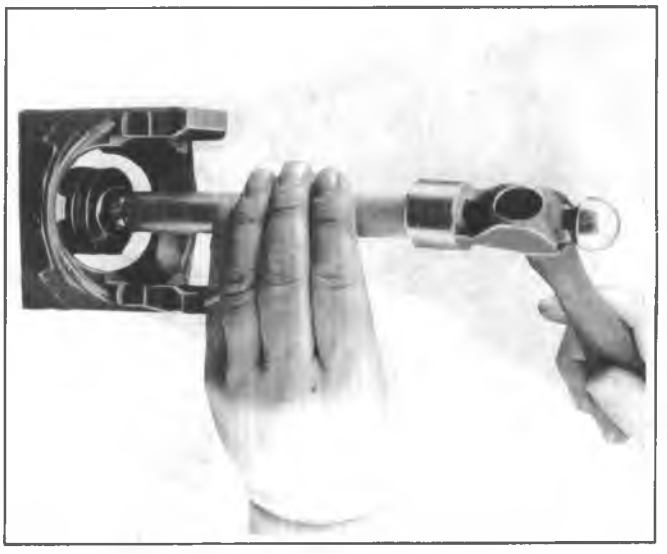


Fig. 4A-27--Installing Centering Ball

7. Lubricate seal lip and press seal flush with Tool J-23694, as shown in figure 4A-28. Sealing lip should tip inward.
8. Fill cavity with grease provided in kit.
9. Install flange yoke to centering ball as shown in figure 4A-29, making sure alignment marks are correctly positioned. Install trunnion and bearing caps as previously outlined.

LUBRICATION

The front axle propshaft found on all four-wheel drive trucks requires special lubrication procedures at two locations: The C/V joint, and the slip yoke.

Constant Velocity Joints (C/V)

The constant velocity (C/V) joint, located at the transfer case end of the front propshaft, must be lubricated periodically (see Section 0) with special lubricant, #1050679, or equivalent. If the fitting cannot be seen from beneath the vehicle Figure 4A-30 shows how the fitting may be lubricated from above the C/V joint, with a special adapter J-25512-2 on the end of a flex hose.

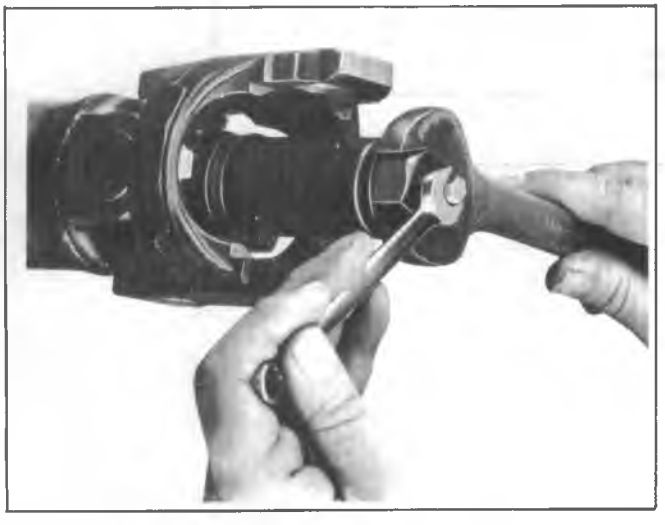


Fig. 4A-26--Removing Centering Ball

Fig. 4A-28--Installing Centering Ball Seal

Noise produced by these gears will be most pronounced on turns.

Pinion Bearing failures can be distinguished because they rotate at higher speeds than differential side bearings and axle shaft bearings. Rough or brinelled pinion bearings produce a continuous low pitched whirring or scraping noise starting at relatively low speed.

Side Bearings produce a constant rough noise of a lower pitch than pinion bearings. Side bearing noise may also fluctuate in the above wheel bearing test. Bearing Diagnosis Charts appear later in this section.

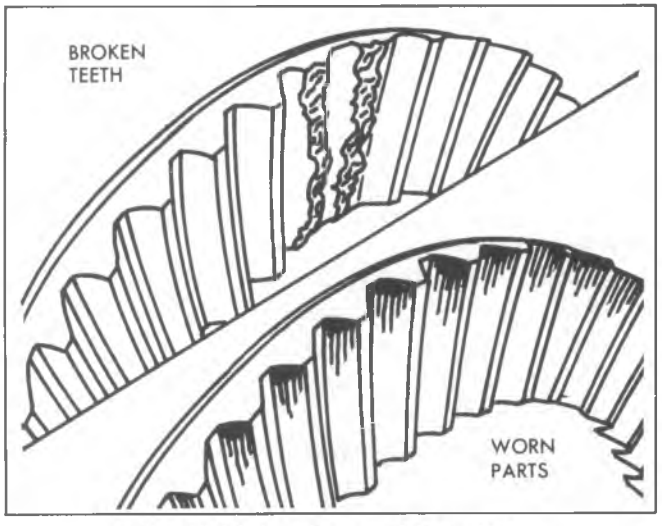


Fig. 4B-10--Two Causes of Gear Noise

Gear Noise

There are two basic types of gear noise. The first type is produced by broken, bent, or forcibly damaged gear teeth and is usually quite audible over the entire speed range and presents no particular problem in diagnosis.

For example, hypoid gear tooth scoring as seen in figure 4B-10 generally results from the following: insufficient lubricant improper breakin, improper lubricant, insufficient gear backlash, improper ring and pinion gear alignment, or loss of drive pinion nut torque. The scoring will progressively lead to complete erosion of the gear tooth, or gear tooth pitting and eventual fracture if the initial scoring condition is not corrected. Another cause of hypoid tooth fracture is extended overloading of the gear set which will produce fatigue fracture, or shock loading which will result in sudden failure.

Differential pinion and side gears rarely give trouble. Common causes of differential failure are shock loading, extended overloading, and seizure of the differential pinions to the cross shaft resulting from excessive wheel spin and consequent lubrication breakdown.

The second type of gear noise pertains to the mesh pattern of the gear teeth. This form of abnormal gear noise can be recognized as it produces a cycling pitch (whine) and will be very pronounced in the speed range at which it occurs, appearing under either "drive", "float" or "coast" conditions. "Drive" is acceleration or heavy pull. "Coast" is with a closed throttle and vehicle in gear and "float" is using just enough throttle to keep the car from driving the engine-the vehicle slows down gradually but engine still pulls slightly. Gear noise tends to peak in a narrow speed range or ranges, and will tend to remain constant in pitch. Bearing noise will vary in pitch with vehicle speeds. See figure 4B-11.

3. Install hub and drum assembly on axle housing, exercising care so as not to damage oil seal or dislocate other internal components.
4. Install thrust washer so that tang on I.D. of washer is in keyway on axle housing.
5. Install adjusting nut and complete the installation as directed under "Bearing Adjustment."

BEARING ADJUSTMENT

Before checking bearing adjustment, make sure brakes are fully released and do not drag.

Check bearing play by grasping tire at top and pulling back and forth, or by using a pry bar under tire. If bearings are properly adjusted, movement of brake drum in relation to brake flange plate will be barely noticeable and wheel will turn freely. If movement is excessive, adjust bearing as follows:

1. Remove axle shaft and raise vehicle until wheel is free to rotate.
2. Keyways and threads on tube and nut must be clean and free from chips, burrs and shavings.
3. Disengage tang of retainer and remove retainer from axle housing tube.
4. Torque adjusting nut to 50 ft. lbs., at the same time rotating the hub assembly and making sure bearing cones are seated and in contact with the spindle shoulder.

   Proper wheel bearing adjustment can be made using tool J-2222-02 with some modification or tool J-2222-L (Fig. 4B-36).
5. Back off nut until loose.
6. If adjusting nut slot is in alignment with keyway in axle spindle, insert square key into slot. If adjusting nut slot is not aligned, back off nut a slight amount and insert square key into slot. Do not back off nut more than one slot to align key.
7. Assemble snap ring at end of spindle to retain key in position.

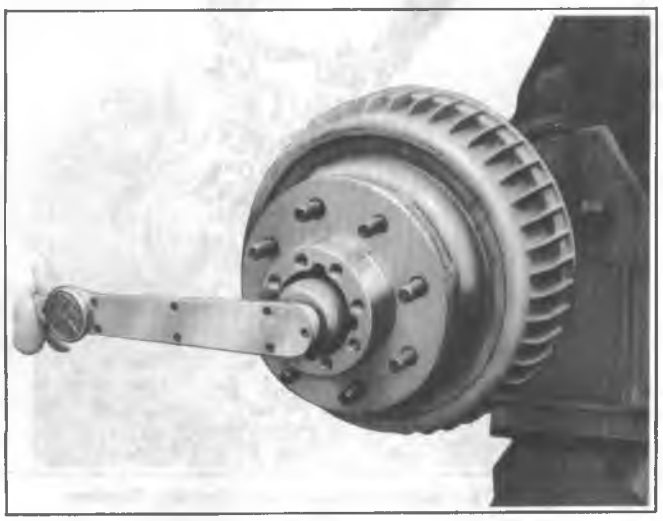


Fig. 4B-35--Tightening Adjusting Nut-Typical

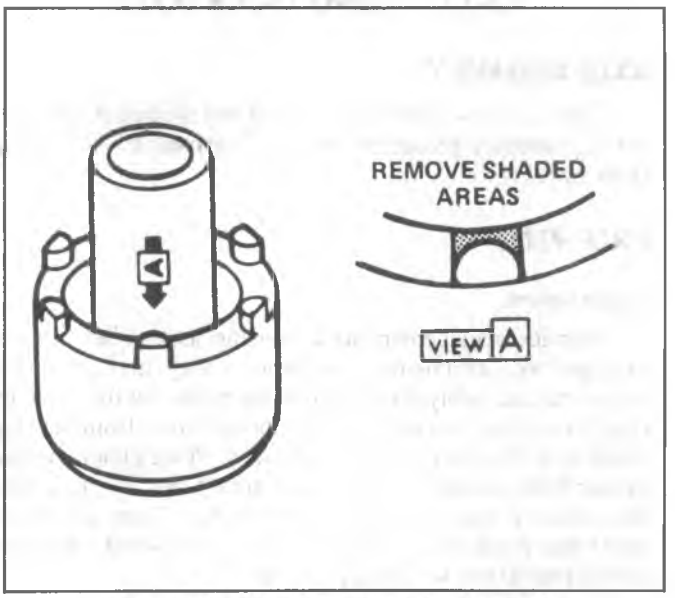


Fig. 4B-36--Wheel Bearing Adjusting Tool

DRIVE PINION OIL SEAL

Replacement

The pinion oil seal may be replaced with the carrier assembly installed in the vehicle.

1. Disconnect propeller shaft.
2. Scribe a line down the pinion stem, pinion nut and companion flange.
3. Use J-8614-11 to remove the pinion nut and the companion flange.
4. Pry the oil seal from the bore, using care not to damage the machined surfaces. Thoroughly clean all foreign material from contact area.
5. Lubricate the cavity between the seal lips with a high melting point bearing lubricant.
6. Install a new pinion oil seal into the bore, using J-24434.
7. Reinstall the companion flange, pinion nut and propeller shaft.

NOTICE: See NOTICE on page 1 of this section, regarding the above fasteners.

DANA 10-1/2" RING GEAR AXLE

DANA 9-3/4" RING GEAR AXLE

Procedures for service to axle assembly, axle shafts, hub and drum components and bearing adjustments are identical to those listed for "Chevrolet 10-1/2 Ring Gear Axle".

Drive pinion oil seal replacement requires different special tools for the Dana axles. Follow the same procedure listed for "Chevrolet 10-1/2" Ring Gear Axle"; use J-24384 for seal replacement on Dana 10-1/2" Ring Gear Axles, and use J-22281 for pinion oil seal replacement on Dana 9-3/4" Ring Gear Axles.

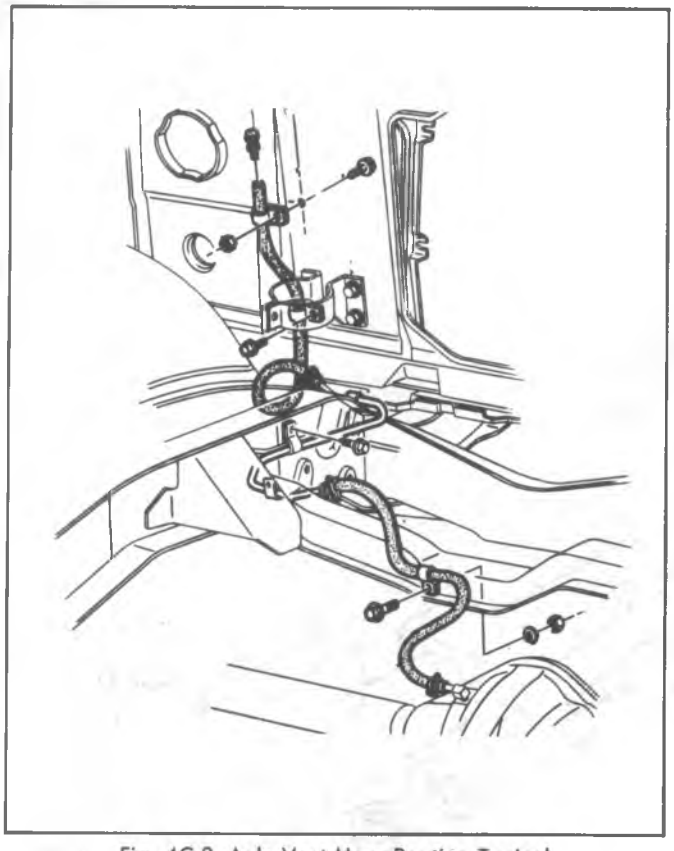


Fig. 4C-3--Axle Vent Hose Routing Typical

SPECIFICATIONS

CHEVROLET

Axle	Bolt Torques (Ft.-Lbs.)	Axle	Bolt Torques (Ft.-Lbs.)
Gear and Backlash Preferred	.005-.008	Carrier Cover	20
Min. and Max.	.003-.010	Ring Gear	80
New Pinion Bearing Preload	15-30 in.-lbs.	Differential Bearing Caps	55
Used Pinion Bearing Preload	5-10 in.-lbs.	Filler Plugs	25

DANA

Axle	Bolt Torques (Ft.-Lbs.)	Axle	Bolt Torques (Ft.-Lbs.)
Gear Backlash Preferred	.004"-.009"	Carrier Cover	35
Min. and Max.	.004"-.009"	Ring Gear* — K-30	110
New Pinion Bearing Preload	20-40 in.-lbs.	Differential Bearing Caps	85
Used Pinion Bearing Preload	10-20 in.-lbs.	Filler Plugs	10
		Drive Pinion Nut** — K-30	270

Specification Chart 4C-1

1. Fill the master cylinder reservoirs with brake fluid and keep at least one-half full of fluid during the bleeding operation.
2. If the master cylinder is known or suspected to have air in the bore, then it must be bled before any wheel cylinder or caliper in the following manner:
   a. Disconnect the forward (blind end) brake pipe connection at the master cylinder.
   b. Allow brake fluid to fill the master cylinder bore until it begins to flow from the forward pipe connector port.
   c. Connect the forward brake pipe to the master cylinder and tighten.
   d. Depress the brake pedal slowly one time and hold. Loosen the forward brake pipe connection at the master cylinder to purge air from the bore. Tighten the connection and then release the brake pedal slowly. Wait 15 seconds. Repeat the sequence, including the 15 second wait, until all air is removed from the bore. Care must be taken to prevent brake fluid from contacting any painted surface.
   e. After all air has been removed at the forward connection, bleed the master cylinder at the rear (cowl) connection in the same manner as the front in step "d" above.
   f. If it is known that the calipers and wheel cylinders do not contain any air, then it will not be necessary to bleed them.
3. Individual wheel cylinder or calipers are bled only after all air is removed from master cylinder.
   a. Place a proper size box end wrench or Tool J-21472 over the bleeder valve. Attach transparent tube over valve and allow tube to be hand submerged in brake fluid in a transparent container. Depress the brake pedal slowly one time and hold. Loosen the bleeder valve to purge the air from the cylinder. Tighten bleeder screw and slowly release pedal. Wait 15 seconds. Repeat the sequence, including the 15 second wait until all air is removed. It may be necessary to repeat the sequence 10 or more times to remove all the air.

JB1 thru JB6 gas engine vehicles -- Rapid pumping of the brake pedal pushes the master cylinder secondary piston down the bore in a manner that makes it difficult to bleed the rear side of the system..

4. If it is necessary to bleed all of the wheel cylinders and calipers, the following sequence should be followed: 1) Right rear wheel cylinder; 2) Left rear wheel cylinder; 3) Right front caliper; 4) Left front caliper.
5. Check the brake pedal for "sponginess" and the brake warning light for indication of unbalanced pressure. Repeat entire bleeding procedure to correct either of these two conditions.

Pressure Bleeding

Pressure bleeding equipment must be of the diaphragm type. That is, it must have a rubber diaphragm between the air supply and the brake fluid to prevent air, moisture, oil and other contaiminants from entering the hydraulic system.

1. Install the correct pressure bleeding adapter to the master cylinder. Brake Systems JB1 throught JB6 gas engine vehicles require adapter J-26819, extension J-26819-30 and clamp J-26819-25. All other systems use J-23518. Refer to Fig. 5-4, special tool illustration and brake system description chart.

   NOTICE: It is very important that the correct master cylinder bleeder adapter be used to avoid possible damage to the master cylinder reservoir (fig. 5-4).
2. Make sure the pressure tank is at least 1/3 full of Supreme #11 brake fluid or its equivalent.
   The bleeder ball must be re-bled each time fluid is added.
3. Charge the bleeder ball to between 140-170 kPa (20 and 25 psi)
4. When ready to begin bleeding, connect hose to master cylinder bleeder adapter and open the tank valve.
5. Disc brakes require a manual override of the front brake metering or combination valve to permit flow to the front wheels. Therefore, it will be necessary to hold the valve stem open manually pressure bleeding.
   To hold the metering valve open to bleed the front brakes, the valve stem must be either pushed in or pulled out. Install metering valve actuator J-23709.
6. Bleed the brakes in the following sequence: right rear, left front, left rear and right front.
7. With the proper size wrench over the bleeder valve attach bleeder tube. The discharge end must hang submerged in a clean container partially filled with brake fluid.
8. Open the bleeder valve at least 3/4 turn and allow flow to continue until no air is seen in the fluid.
9. Close the bleed valve; Be sure it seals.
10. Repeat Steps 7-9 for the remaining bleeder valves (see Step 6 for sequence).
11. Check the pedal feel for "sponginess" and repeat the entire procedure if necessary.
12. Dispose of all removed brake fluid.
13. Remove Tool J-23709 from the combination valve and tighten the mounting bolt.
14. Disconnect bleeder equipment from the brake bleeder adapter.
15. Remove bleeder adapter. Wipe all areas dry if fluid was spilled during adapter removal.
16. Fill master cylinder reservoir(s) to proper level and install master cylinder diaphragm and cover.

Flushing Brake Hydraulic System

It is recommended that the entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in the hydraulic system.

Flushing is also recommended if there is any doubt as to the grade of fluid in the system. If fluid has been used which contains the slightest trace of mineral oil, all rubber parts that have been subjected to the contaminated fluid should be replaced.

2. Turn the tool to the opposite side and fit over brake shoes by turning the star wheel until the gauge just slides over the linings.
3. Rotate the gauge around the brake shoe lining surface to insure proper clearance.
4. Install propeller shaft flange at mainshaft as outlined in transmission section.
5. Lower rear wheels. Remove jack and wheel blocks.

PARKING BRAKE CABLES (Fig. 5-10)

Front Cable Replacement

1. Raise vehicle on hoist.
2. Remove adjusting nut from equalizer.
3. Remove retainer clip from rear portion of front cable at frame and from lever arm.
4. Disconnect front brake cable from parking brake pedal or lever assemblies. Remove front brake cable. On some models it may assist installation of new cable if a heavy cord is tied to other end of cable in order to guide new cable through proper routing.
5. Install cable by reversing removal procedure.
6. Adjust parking brake.

Center Cable Replacement

1. Raise vehicle on hoist.
2. Remove adjusting nut from equalizer.
3. Unhook connector at each end and disengage hooks and guides.
4. Install new cable by reversing removal procedure.
5. Adjust parking brake.
6. Apply parking brake 3 times with heavy pressure and repeat adjustment.

Rear Parking Brake Cable Replacement

1. Raise vehicle on hoist.
2. Remove rear wheel and brake drum.
3. Loosen adjusting nut at equalizer.
4. Disengage rear cable at connector.
5. Bend retainer fingers.
6. Disengage cable at brake shoe operating lever.
7. Install new cable by reversing removal procedure.
8. Adjust parking brake.

COMBINATION VALVE

Electrical Circuit Test

1. Disconnect wire from switch terminal and use a jumper to connect wire to a good ground.
2. Turn ignition key on "On" - warning lamp should light. If lamp does not light, bulb is burned out or electrical circuit is defective. Replace bulb or repair electrical circuit as necessary.
3. When warning lamp lights, turn ignition switch off. Disconnect jumper and reconnect wire to switch terminal.

Warning Light Switch Test

1. Raise vehicle on hoist. Attach a bleeder hose to a rear brake bleed screw and immerse the other end of the hose in a container partially filled with clean brake fluid. Be sure master cylinder reservoir is full.
2. Turn ignition switch to "On"; open bleeder screw while a helper applies moderate pressure to the brake pedal; warning lamp should light. Close bleeder screw before helper releases brake pedal. Reapply brake pedal with moderate-to-heavy pressure; light should go out.
3. Attach the bleeder hose to a front brake bleeder screw and repeat above test. Warning lamp action should be the same as in Step No. 2. Turn ignition switch off.
4. If warning lamp does not light during Steps 2 and 3 but does light when a jumper is connected to ground, the warning light switch portion of the combination valve is defective. Do not attempt to disassemble the combination valve. If any portion of the combination valve is defective, it must be replaced with a new combination valve.
5. Lower vehicle to floor. Check and refill master cylinder to proper level.

Replacement

The combination valve is not repairable and must be serviced as a complete assembly.

1. Disconnect hydraulic lines at combination valve. Plug lines to prevent loss of fluid and entrance of dirt. Disconnect warning switch wiring harness from valve switch terminal.
2. Remove combination valve.
3. Install combination valve by reversing removal steps.
4. Bleed entire brake system. Do not move vehicle until a firm brake pedal is obtained.

BRAKE PEDAL

The brake pedal mounting is an integral design with the cluth pedal (except automatic transmission), necessitating the removal of the clutch pedal before removing the brake pedal.

Removal (Fig. 5-12)

1. Remove the pull back spring from the body or brake pedal support bracket.
2. **Manual Transmission Vehicles--** Remove the clutch pedal as outlined under "Clutch Pedal" in Section 7C. **Automatic Transmission Vehicles--** Remove pedal pivot bolt nut or pivot pin retainer and remove bolts or pin and bushings.
3. **P Models--** Remove the sleeve assembly screw attachment and remove sleeve.
4. Disengage the push rod from the master cylinder and remove the pedal.

Inspection

Clean all parts and inspect for wear, cracks or any other damage that might impair operation; replace if required.

Installation

Reverse the above procedure and make certain the brake pedal is secure and adjusted properly before operating the vehicle. Lubricate pedal pivot bushings and pivot pin, bolt or sleeve with Delco Brake Lube (or equivalent). Adjust stoplamp switch.

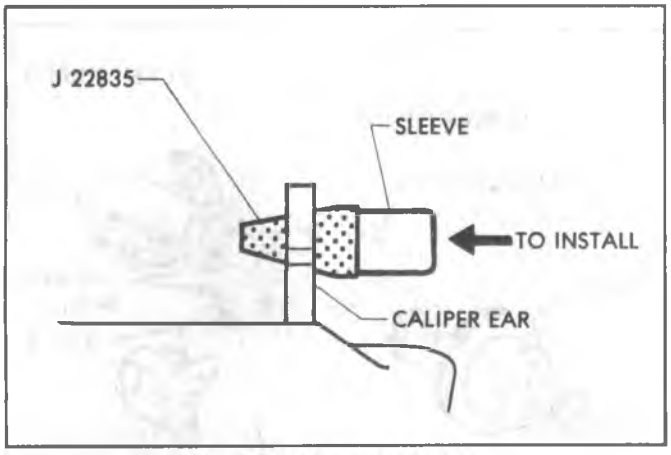


Fig. 5-25--Sleeve Installation

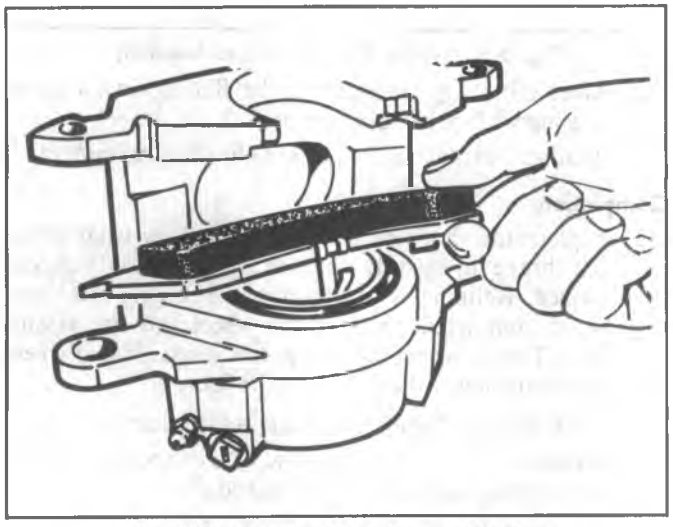


Fig. 5-26--Inserting Shoe Support Spring

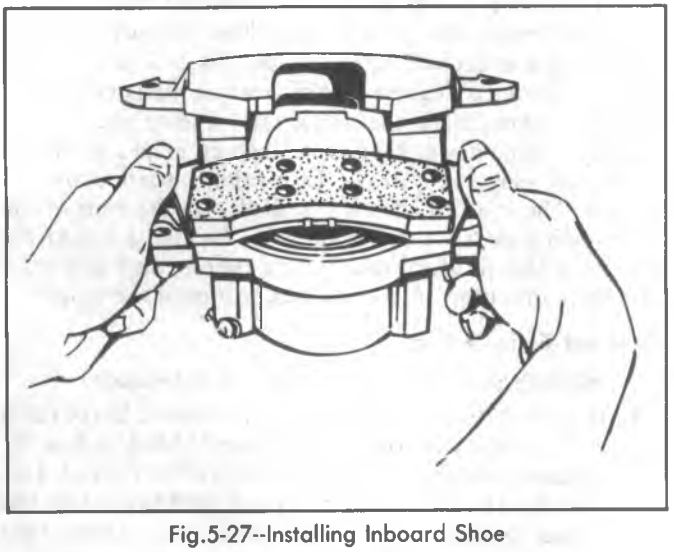


Fig.5-27--Installing Inboard Shoe

4. Position the inboard shoe and lining assembly (with spring attached) in the caliper so that the ear end of the shoe and lining is down and the bottom end up at an angle with the spring resting on the piston I.D. (fig. 5-27). Press down on both ends of the shoe until the shoe is in a flat position, resting on the piston. The spring end of the inboard shoe support spring should be resting on the I.D. of the piston.

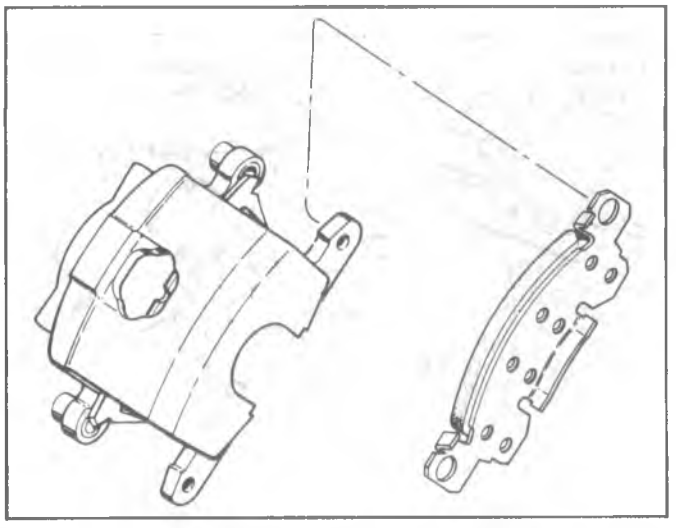


Fig. 5-28--Installing Outboard Shoe

NOTICE: On inboard shoes there is a specific left hand and right hand shoe. When properly installed the wear sensor will be toward rear of caliper.

5. Position the outboard shoe in the caliper, with the ears at the top of the shoe over the caliper ears and the tab at the bottom of the shoe engaged in the caliper cut-out (see fig. 5-28). Be sure to note right and left brake shoes.
6. Postion the caliper over the rotor, lining up the holes in the caliper ears with the holes in the mounting bracket.

NOTICE: When reinstalling caliper be sure you haven't turned it over, end over end. This would cause a severe twist in the brake hose. After positioning caliper on disc, observe brake hose being sure it is not twisted.

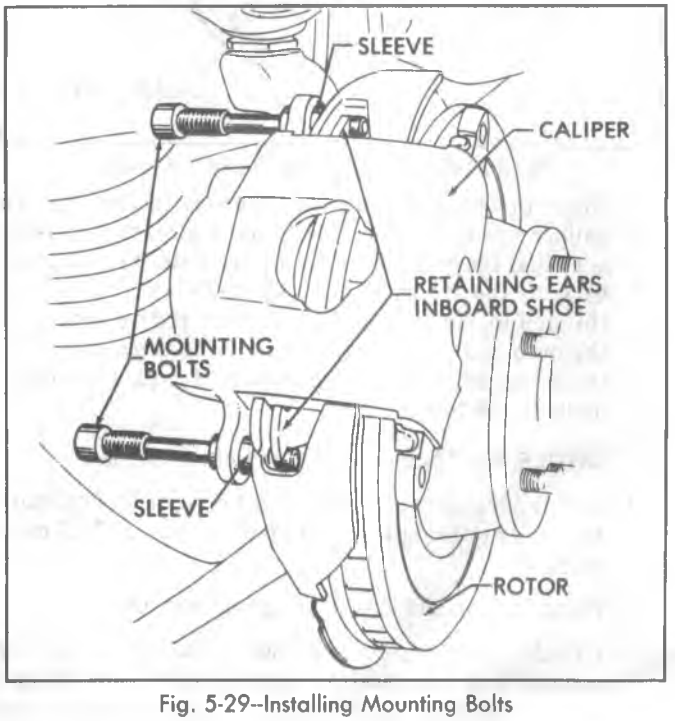


Fig. 5-29--Installing Mounting Bolts

4. Shake excessive rinsing fluid from cylinder. Do not use a rag to dry cylinder, as lint from the rag cannot be kept from cylinder bore surfaces.

Assembly

1. Lubricate cylinder bore and counterbore with clean brake fluid and insert spring-expander assembly.
2. Install new cups. (Be sure cups are lint and dirt free.) Do not lubricate cups prior to assembly.
3. Install new pistons.
4. Press new boots into cylinder counterbores by hand. Do not lubricate boots prior to assembly.

Installation

NOTICE: See "Notice" on page 1 of this section.

1. Install wheel cylinder on brake backing plate and connect brake pipe to hose. Torque rear wheel brake pipe to wheel cylinder to specifications.
2. Install brake shoes, drum and wheel; then flush and bleed hydraulic system.

POWER BRAKE VACUUM HOSE FILTER

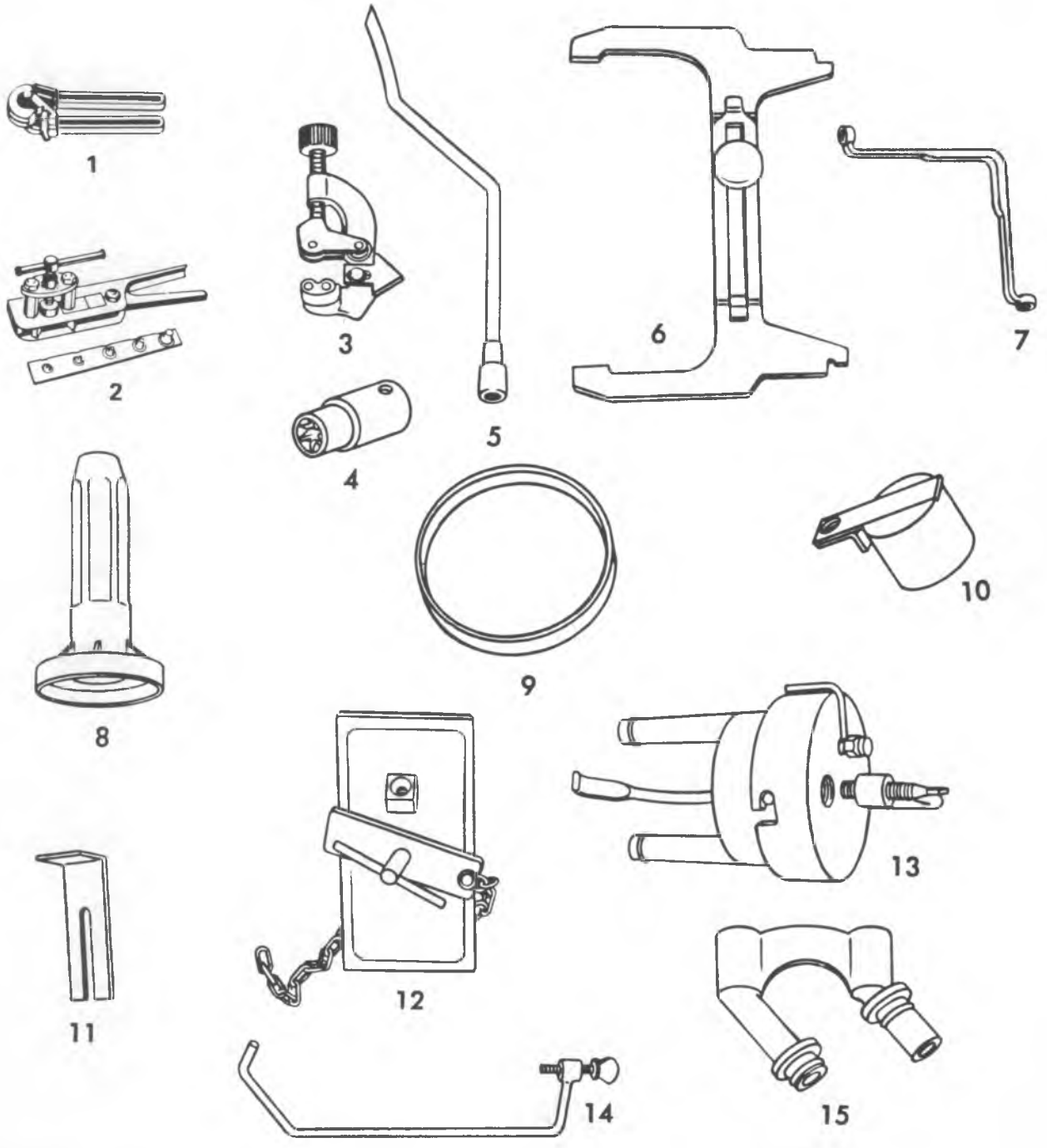
Removal

1. Use a pair of pliers to move the hose clamp approximately 2" (50 mm).
2. Twist the filter in the hose to break the seal and remove the filter.

Installation

1. Install the filter. Be sure the vacuum check valve on the power brake unit is positioned from vertical as shown in figure(s) 5-48 and 5-49.
2. Position hose clamp to retain filter.

SPECIAL TOOLS



1. J-25310 Tubing Bender
2. J23530 Flaring Tool
3. J-23533 Tubing Cutter
4. J-25085 Socket
5. J-8049 or J-22348 Spring Remover
6. J-21177 or J-22364 Drum/Shoe Gauge
7. J-21472 or J-22364 Bleeder Wrench
8. J-22904 Dust Boot Installer
   J-28735 Dust Boot Installer (JB7)
9. J-24548 Dust Boot Installer
10. J-26889 Accumulation Piston Compressor
11. J-23709 Combination Valve Pin Retainer
12. J-23518 Pressure Bleeder Adater
13. J-26819 Pressure Bleeder Adapter
14. J-26819-25 Bleeder Adapter Clamp (Long)
15. J-26819-30 Bleeder Adapter Extension

	until maximum vacuum is reached. If less than 12 inches, replace pump. If more than 12 inches, go to step 8. 8. Check fuel lines and hoses for splits, leaks or kinks by disconnecting each section of line and connect vacuum gage. Crank or run engine until vacuum gage peaks. Vacuum should be at least 12 inches. If less, repair or replace defective line or hose. 9. If fuel lines and pump check OK, remove tank unit, replace strainer and clean fuel tank, if necessary.
L. Hard Starting - Hot (Engine cranks OK)	1. Visually check the following: a. Vacuum hoses for splits, kinks and proper connections. See hose routing Schematic, Vehicle Emission Control Information Label. b. Air leaks at carburetor mounting and intake manifold. c. Ignition wires for cracking, hardness, proper connections, and carbon tracking. Repair or replace as necessary. 2. Check ignition timing per emission control information label. "Non EST" If timing is too early - speed up engine to see if timing mark moves If not, check for stuck mechanical advance. Refer to Section 6D. Repair as necessary and recheck timing. Check EST if applicable see Section 6D. 3. Check the following: a. Choke, throttle linkage and fast idle cam for sticking. b. Carburetor flooding. Clean and repair as necessary. If repairs are necessary, see carburetor, cleaning and inspection, Section 6C. 4. Check ignition system Section 6D. Check distributor for: a. Worn shaft b. Bare and shorted wires c. Faulty pick up coil, module, ignition coil, and shorted condenser. Repair or replace as necessary. 5. Remove spark plugs. Check for cracks, wear, improper gap, burned electrodes, heavy deposits. Repair or replace as necessary. 6. Also check steps 6, 7, 8, 9 - Hard Starting - Cold. Emission Non-Compliance, See Section 6E.

ENGINE MECHANICAL DIAGNOSIS

The following diagnostic information covers common problems and possible causes. When the proper diagnosis is made, the problem should be corrected by adjustment, repair or part replacement as required. Refer to the appropriate section of the manual for these procedures.

CONDITION	POSSIBLE CAUSE	CORRECTION
Excessive Oil Loss	a. External oil leaks.	1. Tighten bolts and/or replace gaskets and seals as necessary.
	b. Improper reading of dipstick.	1. Check oil with car on a level surface and allow adequate drain down time.

Section 6A1

Contents

4.1 L (D) L-6 - RPO LE3
4.8 L (T) L-6 - RPO L25

GENERAL DESCRIPTION

CYLINDER BLOCK

The cylinder block is made of cast iron and has 6 cylinders arranged "In-Line". Seven main bearings support the crankshaft which is retained by recessed bearing caps that are machined with the block for proper alignment and clearances. Cylinders are completely encircled by coolant jackets.

CYLINDER HEAD

The cast iron cylinder head has individual intake and exhaust ports for each cylinder. Valve guides are integral and rocker arms are retained on individual threaded studs pressed into head. The 4.1 L(D) heads have integrated inlet manifolds. The 4.8 L(T) uses separate inlet manifolds.

CRANKSHAFT AND BEARINGS

The crankshaft is cast nodular iron and is supported by seven main bearings. Number seven bearing is the end thrust bearing. Main bearings are lubricated from oil holes which intersect the main oil gallery located on the right side of the block. The cam bearings are also fed oil by intersecting holes with main oil gallery. The lifters are located in the main oil gallery.

A damper assembly, on the forward end of the crankshaft, dampens any engine torsional vibrations. The outer ring of the damper is grooved for the accessory drive belts.

CAMSHAFT AND DRIVE

The cast iron camshaft is supported by four bearings and is gear driven. A cast iron crankshaft gear drives the aluminum camshaft gear. Cam lobes are ground, hardened and tapered with the high side toward the rear. This, coupled with a spherical face on the lifters, causes the valve lifters to rotate.

PISTONS AND CONNECTING RODS

The pistons are made of a cast aluminum alloy using two compression rings and one oil control ring.

Piston pins in the 4.1 L (D) engine are offset .060" (1.5mm) toward the thrust side (right hand side) to provide a gradual change in thrust pressure against the cylinder wall as the piston travels its path. This also provides for quieter operation. 4.8 L (T) engine piston pins are on piston centerline for best durability and reduced friction. Pins are chromium steel and have a floating fit in the pistons. They are retained in the connecting rods by a press fit.

Connecting rods are made of forged steel. Full pressure lubrication is directed to the connecting rods by drilled oil passages from the adjacent main bearing journal. Oil holes at the connecting rod journals are located so that oil is supplied to give maximum lubrication just prior to full bearing load.

VALVE TRAIN

A very simple ball pivot-type train is used. Motion is transmitted from the camshaft through the hydraulic lifters and push rods to the rocker arms. The rocker arm pivots on its ball and transmits the camshaft motion to the valve. The rocker arm ball is retained by a self locking nut.

HYDRAULIC VALVE LIFTERS

Hydraulic Valve Lifters are used to keep all parts of the valve train in constant contact for quiet operation.

Fig. 6A1-10--Valve Adjustment

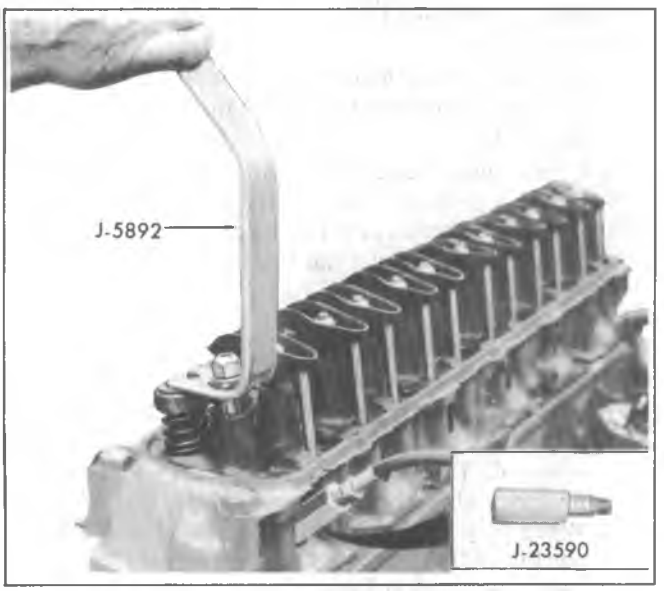


Fig. 6A1-11--Compressing Valve Spring

2. Remove spark plug, rocker arm and push rod on the cylinder(s) to be serviced.
3. Install air line adapter Tool J-23590 to spark plug port and apply compressed air to hold the valves in place.
4. Using Tool J-5892 to compress the valve spring, remove the valve locks, valve cap, valve shield and valve spring and damper (fig. 6A1-11).
5. Remove the valve stem oil seal.
6. To replace, set the valve spring, oil shedder and valve cap in place. Compress the spring with Tool J-5892 and install new oil seal in the lower groove of the stem, making sure the seal is flat and not twisted. A light coat of oil on the seal will help prevent twisting.
7. Install the valve locks and release the compressor tool, making sure the locks seat properly in the upper groove of the valve stem. Grease may be used to hold the locks in place while releasing the compressor tool.
8. Using Tool J-23994, apply vacuum to the valve assembly to make sure no air leaks past the seal.
9. Install spark plug, and torque to 15 lb. ft. (20 N·m).
10. Install and adjust valve mechanism as previously outlined.

VALVE LIFTERS

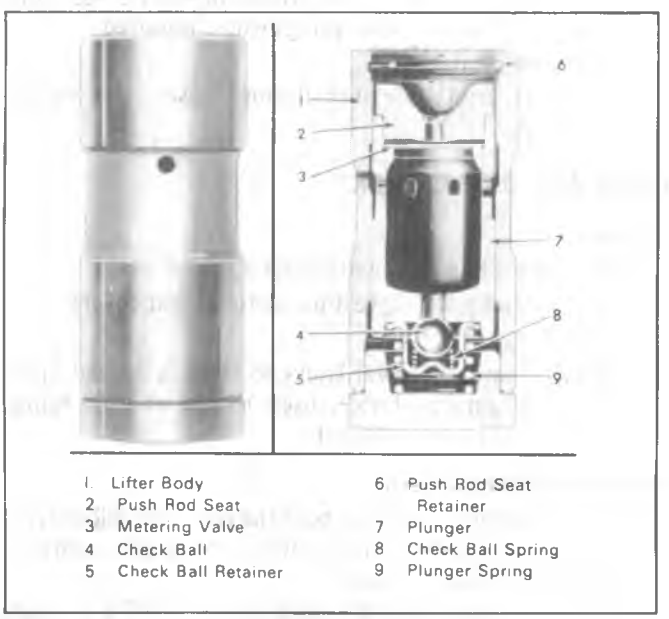
Hydraulic valve lifters very seldom require attention. The lifters are extremely simple in design. Readjustments are not necessary, and servicing of the lifters requires only that care and cleanliness be exercised in the handling of parts.

Removal

1. Remove rocker arm cover and loosen rocker arms sufficiently to remove the push rods. Place push rods in a rack so that they may be returned to their original location.
2. Mark distributor housing, with chalk, at #1 and #6 positions. Remove distributor cap and lay aside.
3. Remove push rod covers as outlined.
4. Remove valve lifters. Place valve lifters in a rack so that they may be installed in the same location.

Disassembly

1. Hold the plunger down with a push rod, and using the blade of a small screw driver, remove the push rod seat retainer.
2. Remove the push rod seat and metering valve (fig. 6A1-12).
3. Remove the plunger, ball check valve assembly and the plunger spring.
4. Remove the ball check valve and spring by prying the ball retainer loose from the plunger with the blade of a small screw driver (fig. 6A1-13).



1 Lifter Body
2 Push Rod Seat
3 Metering Valve
4 Check Ball
5 Check Ball Retainer
6 Push Rod Seat Retainer
7 Plunger
8 Check Ball Spring
9 Plunger Spring

Fig. 6A1-12--Hydraulic Valve Lifter

graduations on the gaging plastic envelope (fig. 6A1-31).

Normally, main bearing journals wear evenly and are not out-of-round. However, if a bearing is being fitted to an out-of-round journal (.001" max.), be sure to fit to the maximum diameter of the journal. If the bearing is fitted to the minimum diameter and the journal is out-of-round .001", interference between the bearing and journal will result in rapid bearing failure. If the flattened gaging plastic tapers toward the middle or ends, there is a difference in clearance indicating taper, low spot or other irregularity of the bearing or journal. Be sure to measure the journal with a micrometer if the flattened gaging plastic indicates more than .001" difference.

6. If the bearing clearance is within specifications, the bearing insert is satisfactory. If the clearance is not within specifications, replace the insert. Always replace both upper and lower insert as a unit.

   If a new bearing cap is being installed and clearance is less tha .001", inspect for burrs or nicks; if none are found then install shims as required.
7. A standard, .001" or .002" undersize bearing may produce the proper clearance. If not, it will be necessary to regrind the crankshaft journal for use with the next undersize bearing.

   After selecting new bearing, recheck clearance.
8. Proceed to the next bearing. After all bearings have been checked, rotate the crankshaft to see that there is no excessive drag.

   When checking #1 main bearing, loosen accessory drive belts so as to prevent tapered reading with plastic gage.
9. Measure crankshaft end play (see specifications) by forcing the crankshaft to the extreme front position. Measure at the front end of the rear main bearing with a feeler gage (fig. 6A1-32).
10. Install a new rear main bearing oil seal in the cylinder block and main bearing cap.

Replacement

Main bearings may be replaced with or without removing the crankshaft.

With Crankshaft Removed

1. Remove and inspect the crankshaft.
2. Remove the main bearings from the cylinder block and main bearing caps.
3. Coat bearing surfaces of new, correct size, main bearings with oil and install in the cylinder block and main bearing caps.
4. Install the crankshaft.

Without Crankshaft Removal

1. With oil pan, oil pump and spark plugs removed, remove cap on main bearing requiring replacement and remove bearing from cap.
2. The rear main journal has no oil hole. Replace the rear main bearing upper half as follows:
   a. Use a small drift punch and hammer to start the upper bearing half rotating out of block.

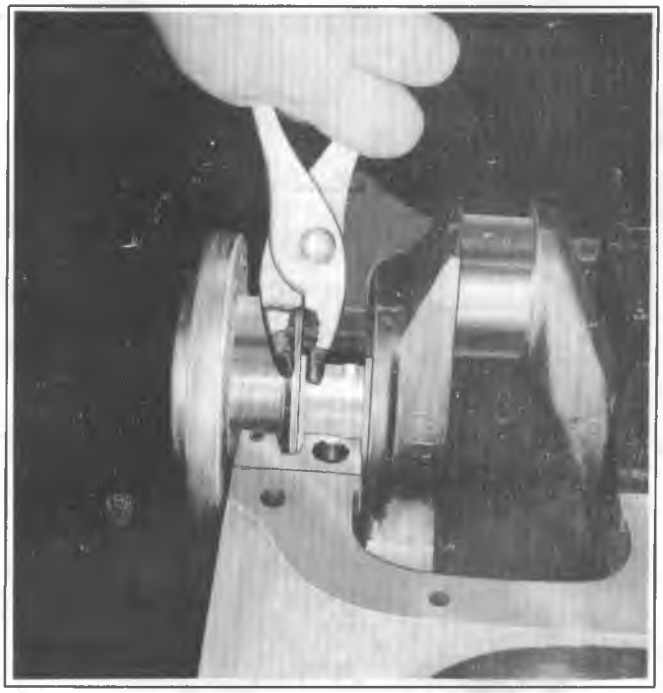


Fig. 6A1-33--Replacing Upper Main Bearing

   b. Use a pair of pliers (with taped jaws) to hold the bearing thrust surface to the oil slinger and rotate the crankshaft to remove bearing (fig. 6A1-33).
   c. Oil new selected size upper bearing and insert plain (unnotched) end between crankshaft and indented or notched side of block.
   d. Use pliers as in removing to rotate bearing into place. The last 1/4" (6.5mm) movement may be done by holding just the slinger with the pliers or tap in place with a drift punch.
3. All other crankshaft journals have oil holes. Replace the main bearing upper half as follows:
   a. Install a main bearing removing and installing tool, such as Tool J-8080, in oil hole in crankshaft journal. If such a tool is not available, a cotter pin may be bent as required to do the job.
   b. Rotate the crankshaft clockwise as viewed from the front of engine. This will roll upper bearing out of block.
   c. Oil new selected size upper bearing and insert plain (unnotched) end between crankshaft and indented or notched side of block. Rotate the bearing into place and remove tool from oil hole in crankshaft journal.
4. Oil new lower bearing and install in bearing cap.
5. Install main bearing caps with arrows pointing toward front of engine.
6. Torque all main bearing caps **except the rear main cap** to 65 lb. ft. (88N·m). Torque rear main bearing cap to 10-12 lb. ft. (14-16N·m) then tap end of crankshaft, first rearward then forward with a lead hammer. This will line up rear main bearing and crankshaft thrust surfaces. Retorque **all** main bearing caps to 65 lb. ft. (88N·m).

ON VEHICLE SERVICE

ENGINE MOUNTS

Engine mounts (fig. 6A4-3 - 6A4-8) are the non-adjustable type and seldom require service. Broken or deteriorated mounts should be replaced immediately, because of the added strain placed on other mounts and drive line components.

Checking Engine Mounts

Front Mount

Raise the engine to remove weight from the mounts and to place a slight tension in the rubber. Observe both mounts while raising engine. If an engine mount exhibits:

a. Hard rubber surface covered with heat check cracks;

b. Rubber separated from a metal plate of the mount;

c. Rubber split through center

replace the mount. If there is relative movement between a metal plate of the mount and its attaching points, lower the engine on the mounts and tighten the screws or nuts attaching the mount to the engine, frame, or bracket.

Rear Mount

Raise the vehicle on a hoist. Push up and pull down on the transmission tailshaft while observing the transmission mount. If the rubber separates from the metal plate of the mount or if the tailshaft moves up but not down (mount bottomed out) replace the mount. If there is relative movement between a metal plate of the mount and its attaching point, tighten the screws or nuts attaching the mount to the transmission or crossmember.

Front Mount Replacement

1. Remove mount retaining bolt from below frame mounting bracket.
2. Raise front of engine and remove mount-to-engine bolts and remove mount.

   NOTICE: Raise engine only enough for sufficient clearance. Check for interference between rear of engine and cowl panel which could cause distributor damage.
3. Replace mount to engine and lower engine into place.
4. Install retaining bolt and torque all bolts to specifications.

Rear Mount Replacement

1. Support engine weight to relieve rear mounts.
2. Remove crossmember-to-mount bolts.
3. On "P" Series with manual transmission and propeller shaft parking brake, remove mount attaching bolts from frame outrigger and clutch housing and remove rear mounting cushions.
4. Remove mount-to-transmission bolts, then remove mount.
5. On "P" Series with manual transmission and propeller shaft parking brake, install new mounting cushions and bolts.
6. Install new mount on transmission.
7. While lowering transmission, align and start crossmember-to-mount bolts.
8. Torque bolts to specifications then bend lock tabs to bolt head as applicable.

INTAKE MANIFOLD

Removal

1. Drain radiator and remove air cleaner.
2. Disconnect:
   - Battery negative cable at battery.
   - Radiator upper hose and heater hose at manifold.
   - Accelerator linkage at carburetor.
   - Fuel line at carburetor.
   - Crankcase ventilation lines.
   - Spark advance hose at distributor.
3. Remove distributor cap and mark rotor position with chalk, then remove distributor.
4. Remove air conditioning compressor and bracket (if equipped), accelerator return spring and bracket, and accelerator bellcrank.
5. Remove generator upper mounting bracket.
6. Remove manifold attaching bolts, then remove manifold and carburetor as an assembly. Discard gaskets.
7. Remove A.I.R. crossover.
8. If manifold is being replaced, transfer:
   - Carburetor and carburetor attaching bolts.
   - Temperature sending unit.
   - Thermostat with housing (use new gasket).
   - Heater hose adapter.
   - EGR Valve (use new gasket).
   - TVS switch.
   - Vacuum fitting(s).
   - Choke spring assembly (where applicable).

Installation

1. Clean gasket and seal surfaces on manifold, block, and cylinder heads with degreaser. Remove all RTV that is loose or will cause installation interference.
2. Install gaskets on cylinder heads and place a 3/16" (5mm) bead of RTV, #1052366 or equivalent, on the front and rear ridges of the cylinder case. Extend the bead 1/2" (13mm) up each cylinder head to seal and retain the manifold side gaskets.
3. Install manifold and torque bolts to specifications in the sequence outlined in fig. 6A4-9.
4. Install (if removed) air compressor and bracket, accelerator bellcrank.
5. Install distributor, positioning rotor at chalk mark, then install distributor cap.
6. Connect:
   - Spark advance hose at distributor.
   - Crankcase ventilation lines.
   - Fuel line at carburetor.
   - Accelerator linkage at carburetor.
   - Battery negative cable at battery.
7. Install air cleaner.
8. Fill with coolant (refer to section 6B for proper procedure), start engine, adjust ignition timing and carburetor idle speed (if necessary) and check for leaks.

connecting rods against sides of engine so they will not be in the way while replacing camshaft bearings.

1. With camshaft and crankshaft removed, drive camshaft rear plug from cylinder block.
2. Using Tool J-6098, with nut and thrust washer installed to end of threads, index pilot in camshaft front bearing and install puller screw through pilot.
3. Install remover and installer tool with shoulder toward bearing, making sure a sufficient amount of threads are engaged.
4. Using two wrenches, hold puller screw while turning nut. When bearing has been pulled from bore, remove remover and installer tool and bearing from puller screw (fig. 6A4-36).
5. Remove remaining bearings (except front and rear) in the same manner. It will be necessary to index pilot in camshaft rear bearing to remove the rear intermediate bearing.
6. Assemble remover and installer tool on driver handle and remove camshaft front and rear bearings by driving towards center of cylinder block (fig. 6A4-37).

Installation

The camshaft front and rear bearings should be installed first. These bearings will act as guides for the pilot and center the remaining bearings being pulled into place.

1. Assemble remover and installer tool on driver handle and install camshaft front and rear bearings by driving towards center of cylinder block (fig. 6A4-37).
2. Using Tool Set J-6098, with nut then thrust washer installed to end of threads, index pilot in camshaft front bearing and install puller screw through pilot.
3. Index camshaft bearing in bore (with oil hole aligned as outlined below), then install remover and installer tool on puller screw with shoulder toward bearing.
   - Number one cam bearing oil hole must be positioned so that oil holes are equidistant from 6 o'clock position.

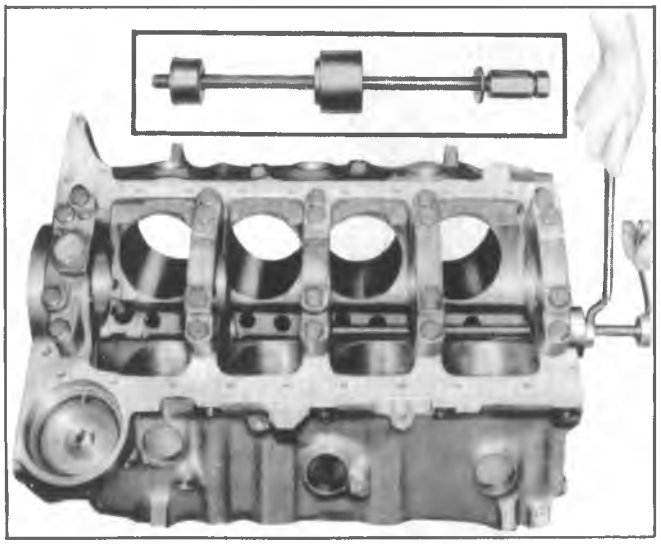


Fig. 6A4-36--Removing Camshaft Bearings

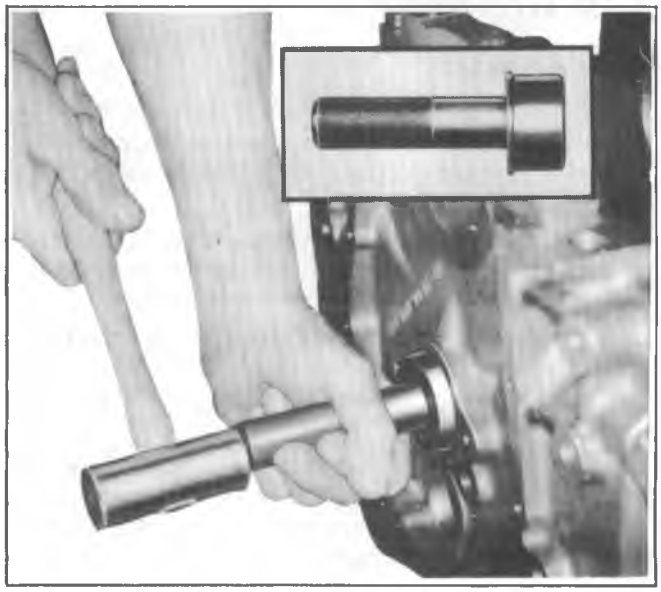


Fig. 6A4-37--Replacing Camshaft Front Bearing

   - Number two through number four bearing oil holes must be positioned at 5 o'clock position (toward left side of engine, and at a position even with bottom of cylinder bore).
   - Number five bearing oil hole must be in 12 o'clock position.
4. Using two wrenches, hold puller screw while turning nut. After bearing has been pulled into bore, remove the remover and installer tool from puller screw, and check alignment of oil hole in camshaft bearing.
5. Install remaining bearings in the same manner. It will be necessary to index pilot in the camshaft rear bearing to install the rear intermediate bearing.
6. Coat new camshaft rear plug O.D. with #1052080 sealant, or equivalent, and install flush to 1/32" (.80mm) deep.

OIL PAN

Removal

1. Drain engine oil.
2. Remove exhaust crossover pipe.
3. On vehicles equipped with automatic transmission, remove converter housing under pan.
4. On 'K' models with automatic transmission, remove strut rods at motor mounts.
5. Remove oil pan and discard gaskets and seals.

Installation

1. Thoroughly clean all gasket and seal surfaces on oil pan, cylinder block, crankcase front cover and rear main bearing cap.
2. Install new oil pan side gaskets on cylinder block using gasket sealant as a retainer. Install new oil pan rear seal in rear main bearing cap groove, with ends butting side gaskets. Install new oil pan front seal in groove in crankcase front cover with ends butting side gaskets.
3. Install oil pan and torque bolts to specifications.
4. If 'K' model, replace strut rods.
5. Install converter housing under pan.

17. Disconnect exhaust pipe from exhaust manifold flanges.
    - 'K' models with automatic transmission, remove strut rods at motor mounts.
18. Remove flywheel or convertor splash shield, as applicable.
19. Disconnect wiring along right pan rail.
20. Disconnect wiring at starter and remove starter.
21. Disconnect wiring for gas gage.
22. If equipped with automatic transmission, remove convertor to flex plate attaching bolts.
23. Support transmission.
24. Remove bell housing to engine retaining bolts.
25. Remove lower engine mount bracket to frame bolts.
26. Lower vehicle.
27. Remove vehicle hood.
28. Attach engine lifting device.
29. Remove engine.

Installation (CK Series)

1. Place engine in vehicle.
2. Raise vehicle.
3. Install engine mount bracket to frame bolts.
4. Install bell housing to engine retaining bolts. Remove transmission support.
5. If equipped with automatic transmission, install convertor to flex plate attaching bolts.
6. Install flywheel or convertor splash shield, as applicable.
7. Connect wiring for gas gage.
8. Install starter. Connect wiring.
9. Install engine wiring harness along right pan rail.
10. Connect exhaust pipe to exhaust manifold flanges.
11. Lower vehicle.
12. Connect all vacuum lines to intake manifold.
13. Connect fuel line at fuel pump.
14. Install engine wiring harness to engine.
15. If power steering equipped, install pump on engine.
16. If A/C equipped, install compressor on engine.
17. Connect accelerator linkage and detent linkage, if so equipped, to carburetor.
18. Install radiator.
    - If equipped with automatic transmission, connect cooler lines to radiator.
19. Connect heater hoses to engine.
20. Connect radiator hoses to engine.
21. Install water pump pulley and fan to water pump.
22. Install accessory drive belts. Adjust to specifications.
23. Fill cooling system.
24. Fill crankcase.
25. Connect battery cables and start engine. Check timing and carburetor adjustment and adjust if necessary.
26. Install air cleaner and vehicle hood.

CRANKSHAFT

The crankshaft can be removed while the engine is disassembled for overhaul, as previously outlined, or without complete disassembly as outlined below.

Removal

1. With the engine removed from the vehicle and the transmission and/or clutch housing removed from the engine, mount engine in stand and clamp securely.
2. Remove the oil dip stick and oil dip stick tube, (if applicable).
3. Remove the starting motor, clutch assembly (if equipped) and flywheel.
4. Remove the spark plugs.
5. Remove crankshaft pulley and torsional damper.
6. Remove oil pan and oil pump.
7. Remove crankcase front cover, and if so equipped, remove timing chain and camshaft sprocket.
8. Check the connecting rod caps for cylinder number identification. If necessary, mark them.
9. Remove the connecting rod caps and push the pistons to top of bores.
10. Remove main bearing caps and lift crankshaft out of cylinder block.
11. Remove rear main bearing oil seal and main bearings from cylinder block and main bearing caps.

Cleaning and Inspection

1. Wash crankshaft in solvent and dry with compressed air.
2. Measure dimensions of main bearing journals and crankpins with a micrometer for out-of-round, taper or undersize. (See Specifications.)
3. Check crankshaft for run-out by supporting at the front and rear main bearings journals in "V" blocks and check at the front and rear intermediate journals with a dial indicator. (See Specifications.)
4. Replace or recondition the crankshaft if out of specifications.

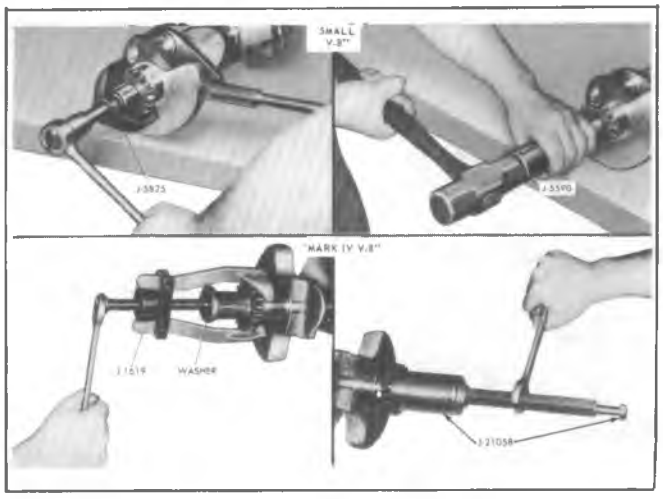


Fig. 6A4-59--Sprocket or Gear Replacement

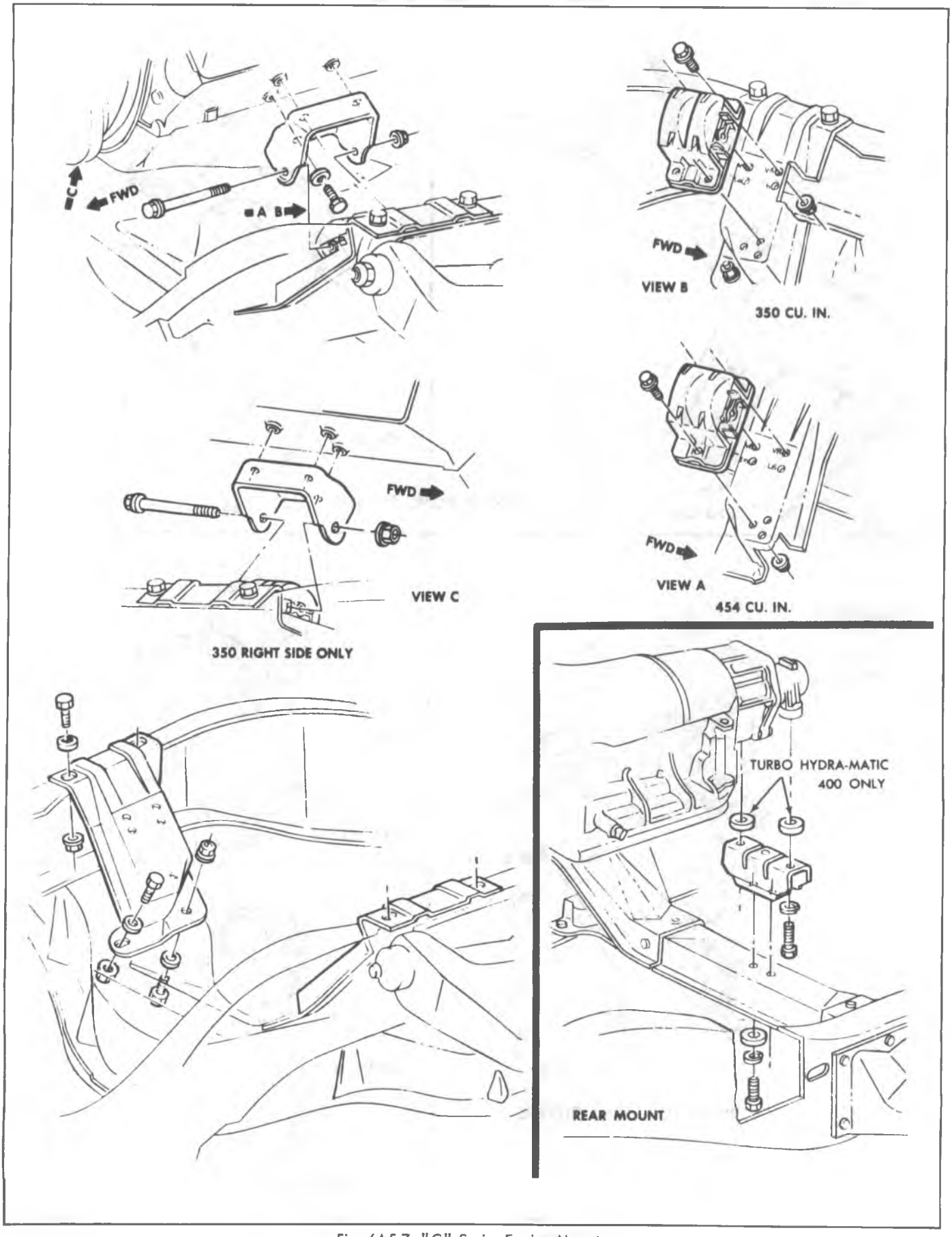


Fig. 6A5-7--"C" Series Engine Mounts

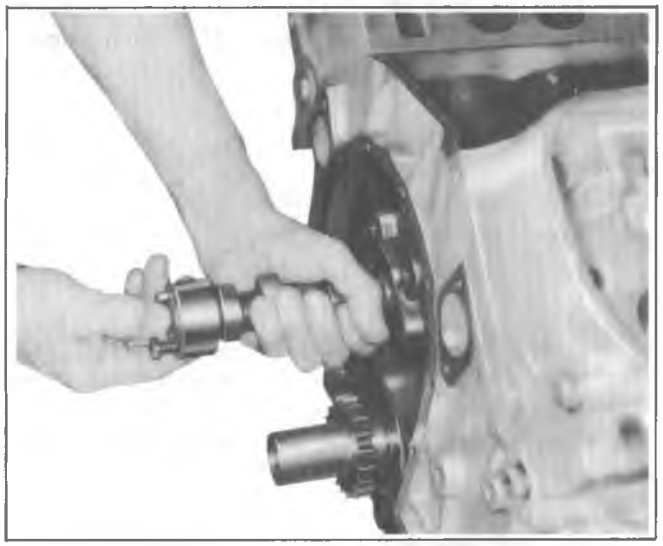


Fig. 6A5-36--Removing Camshaft

5. Complete camshaft removal as follows:
   - Sprocket is a light fit on camshaft. If sprocket does not come off easily a light blow on the lower edge of the sprocket (with a plastic mallet) should dislodge the sprocket.
6. Install two 5/16" - 18 x 4" bolts in camshaft bolt holes then remove camshaft (fig. 6A5-36).

   NOTICE: All camshaft journals are the same diameter and care must be used in removing camshaft to avoid damage to bearings.

Inspection

The camshaft bearing journals should be measured with a micrometer for an out-of-round condition. If the journals exceed .001" out-of-round, the camshaft should be replaced.

Installation

Whenever a new camshaft is installed coat camshaft lobes with "Molykote" or its equivalent.

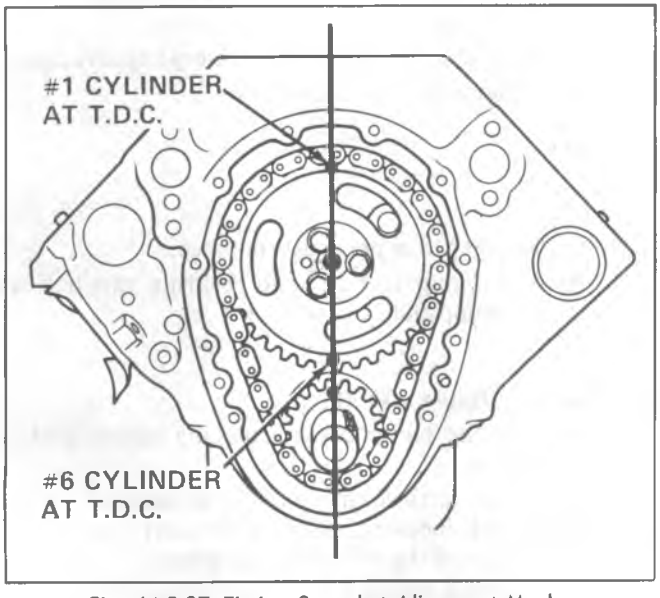


Fig. 6A5-37--Timing Sprocket Alignment Marks

Whenever a new camshaft is installed, replacement of all valve lifters oil filter and engine oil is recommended to insure durability of the camshaft lobes and lifter feet.

1. Lubricate camshaft journals with engine oil and install camshaft.
2. Install timing chain on camshaft sprocket. Hold the sprocket vertically with the chain hanging down and align marks on camshaft and crankshaft sprockets. (Refer to fig. 6A5-37).
3. Align dowel in camshaft with dowel hole in camshaft sprocket then install sprocket on camshaft.
4. Draw the camshaft sprocket onto camshaft using the mounting bolts. Torque to specifications.
5. Lubricate timing chain with engine oil.
6. Install fuel pump push rod as outlined in Section 6C.
7. Install grille.
8. Install crankcase front cover as previously outlined.
9. Install valve lifters as previously outlined.

CAMSHAFT BEARINGS

Removal

Camshaft bearings can be replaced while engine is disassembled for overhaul or without complete disassembly of the engine. To replace bearings without complete disassembly remove the camshaft and crankshaft leaving cylinder heads attached and pistons in place. Before removing crankshaft, tape threads of connecting rod bolts to prevent damage to crankshaft. Fasten connecting rods against sides of engine so they will not be in the way while replacing camshaft bearings.

1. With camshaft and crankshaft removed, drive camshaft rear plug from cylinder block.
2. Using Tool J-6098 with nut and thrust washer installed to end of threads, index pilot in camshaft front bearing and install puller screw through pilot.
3. Install remover and installer tool with shoulder toward bearing, making sure a sufficient amount of threads are engaged.

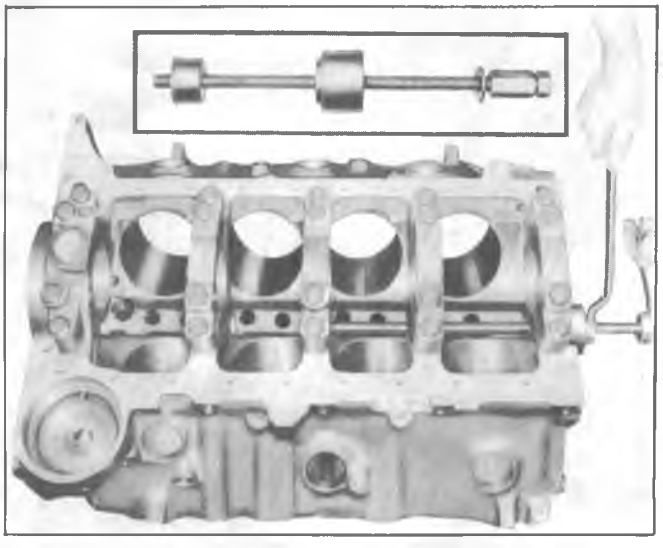


Fig. 6A5-38--Removing Camshaft Bearings

22. Start engine, check for leaks and check timing.

CRANKSAHFT

The crankshaft can be removed while the engine is disassembled for overhaul, as previously outlined or without complete disassembly as outlined below.

Removal

1. With the engine removed from the vehicle and the transmission and/or clutch housing removed from the engine, mount engine in stand and clamp securely.
2. Remove the oil dip stick and oil dip stick tube, (if applicable).
3. Remove the starting motor, clutch assembly (if equipped) and flywheel.
4. Remove the spark plugs.
5. Remove crankshaft pulley and torsional damper.
6. Remove oil pan and oil pump.
7. Remove crankcase front cover, and if so equipped, remove timing chain and camshaft sprocket.
8. Check the connecting rod caps for cylinder number identification. If necessary, mark them.
9. Remove the connecting rod caps and push the pistons to top of bores.
10. Remove main bearing caps and lift crankshaft out of cylinder block.
11. Remove rear main bearing oil seal and main bearings from cylinder block and main bearing caps.

Cleaning and Inspection

1. Wash crankshaft in solvent and dry with compressed air.
2. Measure dimensions of main bearing journals and crankpins with a micrometer for out-of-round, taper or undersize. (See Specifications.)
3. Check crankshaft for run-out by supporting at the front and rear main bearings journals in "V" blocks and check at the front and rear intermediate journals with a dial indicator. (See Specifications.)
4. Replace or recondition the crankshaft if out of specifications.

SPROCKET OR GEAR REPLACEMENT

Remove crankshaft sprocket using Tool J1619, install using Tool J-21058.

Installation

1. Install rear main bearing oil seal in cylinder block and rear main bearing cap grooves. Install with lip of seal toward front of engine. Where seal has two lips install lip with helix towards front of engine.
2. Lubricate lips of seal with engine oil. Keep oil off parting line surface.
3. Install main bearings in cylinder block and main bearing caps then lubricate bearing surface with engine oil.
4. Install crankshaft, being careful not to damage bearing surfaces.
5. Apply a thin coat of brush-on type oil sealing compound to block mating surface and corresponding surface of cap only (fig. 6A5-58). Do not allow sealant on crankshaft or seal.
6. Install main bearing caps with arrows pointing toward front of engine.
7. Torque all except rear main bearing cap bolts to specifications. Torque rear main bearing cap bolts to 10-12 lbs. ft. (14-16 N·m) then tap end of crankshaft, first rearward then forward with a lead hammer. This will line up rear main bearing and crankshaft thrust surfaces. Retorque all main bearing cap bolts to specifications.
8. Measure crankshaft end play with a feeler gage. Force crankshaft forward and measure clearance between the front of the rear main bearing and the crankshaft thrust surface.
9. Install flywheel and torque to specifications. A wood block placed between the crankshaft and cylinder block will prevent crankshaft from rotating.
   - Align dowel hole in flywheel with dowel hole in crankshaft. On vehicles equipped with automatic transmissions, install flywheel with the converter attaching pads towards transmission.

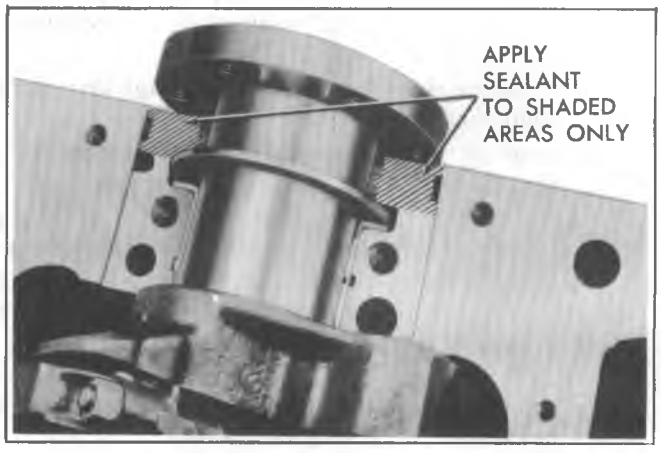


Fig. 6A5-58--Sealing Bearing Cap

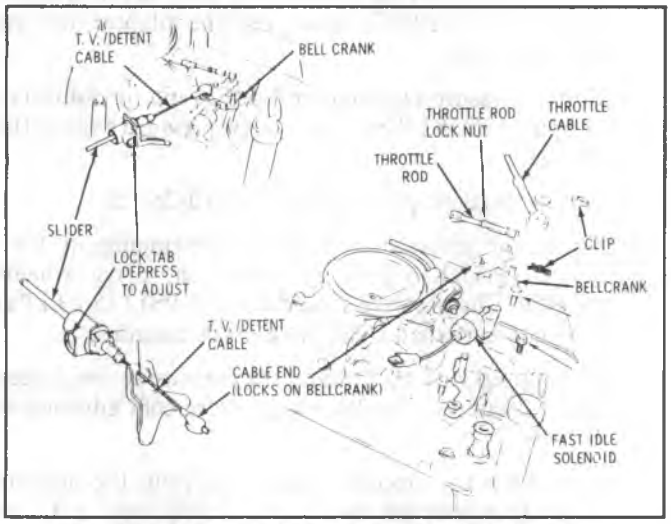


Fig. 6A6-16--Transmission Detent Cable Adjustment

5. Rotate the lever assembly to the full throttle position and hold in that position.
6. Lengthen the pump rod until the injection pump lever just contacts the full throttle stop.
7. Release the lever assembly and tighten the pump rod lock nut.
8. Remove the pump rod from the lever assembly.
9. Reconnect the transmission T.V. (or detent) cable.
10. Depress and hold the medal lock tab on the cable upper end. Move the slider through the fitting in the direction away from the lever assembly until the slider stops against the metal fitting.
11. Release the metal tab, rotate the lever assembly to the full throttle stop and release the lever assembly.
12. Reconnect the pump rod (and cruise control throttle rod, if so equipped).
13. Remove the connector from the fast idle switch and bridge the harness connector with a jumper. Do not allow the jumper to touch ground.
14. With the driving wheels blocked and the parking brake on, start the engine and adjust the solenoid (energized) to the specification listed on the Emission Control Information Label.
15. Check and adjust the slow idle speed with the engine at operating temperature.
    To check idle speeds, it will be necessary to insert the probe of the magnetic pickup tach, J-26925, in the timing indicator hole.
16. With the driving wheels blocked and the parking brake on, adjust the slow idle screw on the injection pump to the specification shown on the emission control label.
17. If equipped with cruise control, adjust the servo throttle rod to minimum slack (engine off) then put clip in first free hole closest to the bellcrank, but within the servo bail.

Vacuum Regulator Valve Adjustment

1. Remove air crossover and install screened covers J-26996-2 (Calif.) or J-26996-10 (Exc. Calif.) on intake manifold.
2. Remove throttle rod from throttle lever.
3. Loosen the vacuum regulator valve injection pump bolts.
4. Install J-26701-15 carburetor angle gage adapter to the injection pump throttle lever. Place angle gage J-26701 on adapter.
5. Rotate throttle lever to the wide open throttle position and set angle gage to zero degrees. (Fig. 6A6-17).
6. Center bubble in level.
7. Set angle gage to 58 degrees.
8. Rotate throttle lever so level bubble is centered (Fig. 6A6-18).
9. Attach vacuum source such as J-23738 vacuum pump to Port A. Install vacuum gage to Port B. Apply 18-22 inches of vacuum to Port A, Fig. 6A6-19.
10. Rotate vacuum valve clockwise to obtain 8.5 to 9.0 inches of vacuum.
11. Tighten vacuum valve bolts. Remove vacuum source and vacuum gage.
12. Install throttle rod to bellcrank.
13. Remove screened covers, then install air crossover.

Vacuum Regulator Valve

Removal

1. Remove the two vacuum hoses from the valve noting the location of the vacuum hoses.
2. Remove the two (2) attaching bolts.

Installation:

1. Install the valve following the "Vacuum Regulator Valve Adjustment Procedure."
2. Attach the two vacuum hoses to the valve. Put the hose from the vacuum pump to the inboard port and the hose to the transmission on the outboard port.

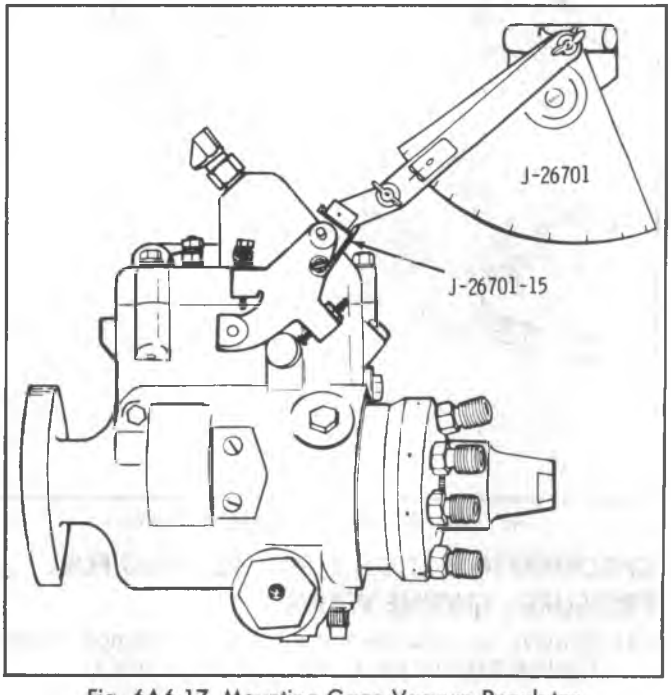


Fig. 6A6-17--Mounting Gage Vacuum Regulator Vacuum Adjustment

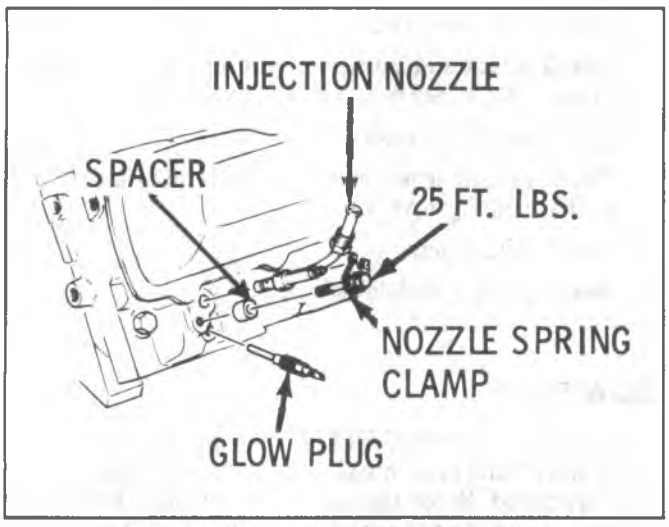


Fig. 6A6-48--Injection Nozzle Installation

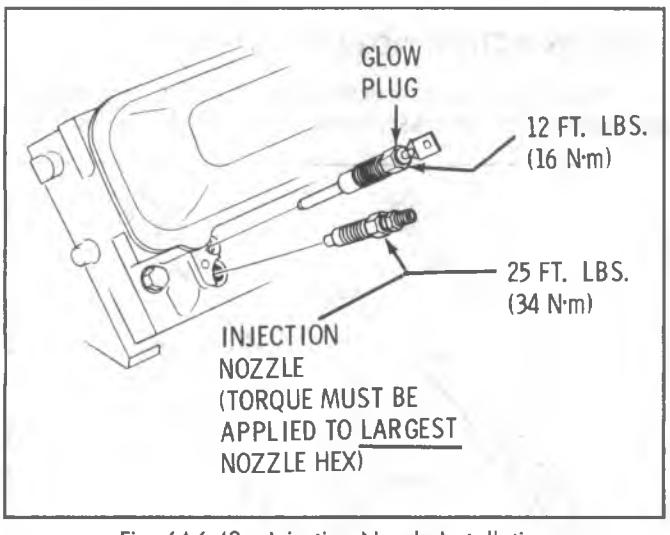


Fig. 6A6-48a--Injection Nozzle Installation

Injection Nozzle Removal (With Lines Removed)

Roosa-Master

Removal

1. Remove the fuel return line clamps from all nozzles on the bank where a nozzle is to be removed then remove that fuel return line.
2. Remove nozzle spring clamp and spacer; then remove nozzle using tool J-29082.
3. Cap the nozzle inlet line and the tip of the nozzle.

Installation

1. If a nozzle is to be reinstalled after removal, a new compression seal and carbon stop seal must be installed after removal of the used seals. See Figure 6A6-47 for seal installation.
2. Remove protective caps then install injection nozzle and spring clamp and spacer. Torque bolt to 25 lb. ft. (34 N·m) (Fig. 6A6-48).
3. Install fuel return line.
4. Start engine and check for leaks.

Test Preparation

To ensure correct preparation of the nozzle for testing, the following procedure should be performed.

1. Clean the carbon from the tip of the nozzles with a brass wire brush. Do not use motorzed brush or a steel wire brush as they could damage the nozzle tip.
   Diesel fuel should never be used as a test fluid. It is recommended that SAE J967D or equivalent be used. Make sure that the tester reservoir has a sufficient amount of fluid to complete test.
   At this point the proper connecting adapter to be used from the nozzle to the tester should be selected (adapters are available from the tester manufacturer).
   Connect the nozzle to the tester (available tool) with the tip pointing down.

Testing Procedure

CAUTION:When testing nozzles, do not place your hands or arms near the tip of the nozzle. The high pressure atomized fuel spray from a nozzle has sufficient penetrating power to puncture flesh and may result in blood poisonging and/or damaged tissue. The nozzle tip should always be enclosed in a receptacle, preferably transparent, to contain the spray.

To test the performance of the nozzle, the following items should be checked as described.

1. Opening pressure test
   Close the pressure gage valve and flush the nozzle by operating the test pump rapidly. Open the gage valve and raise the pressure slowly until the nozzle opens. (The gage reading will drop sharply at this point.) The nozzle opening pressure will be the maximum gage pressure observed and should be within the following limit: 1750 PSI to 1900 PSI.
2. Spray pattern test
   Close the pressure gage valve. Operate the tester at approximately 30 strokes per minute (one strke every two seconds) and observe spray pattern.

   CAUTION:Test fuel spray is flammable. Keep vapor away from open flames or personal injury could result.

   When testing nozzles, do not place your hands or arms near the tip of the nozzle. The high pressure atomized fuel spray from a nozzle has sufficient penetrating power to puncture flesh and destroy tissue and may result in blood poisoning. The nozzle tip should always be enclosed in a receptacle, preferably transparent, to contain the spray.
   The nozzle should have a finely atomized cloud-like pattern. The pattern should not be streaky with tester fluid. Refer to Figure 6A6-49.
3. Seat tightness test
   With the nozzle top pointed downward and the gage valve closed, operate the tester rapidly to firmly seat the valve. Dry the nozzle tip thoroughly. Open the gage valve and raise the pressure to 1300-1400 PSI/ While holding this pressure, a drop of tester fluid should not form on the tip within ten seconds.
   Slight dampness, however, is permissable with a used nozzle.

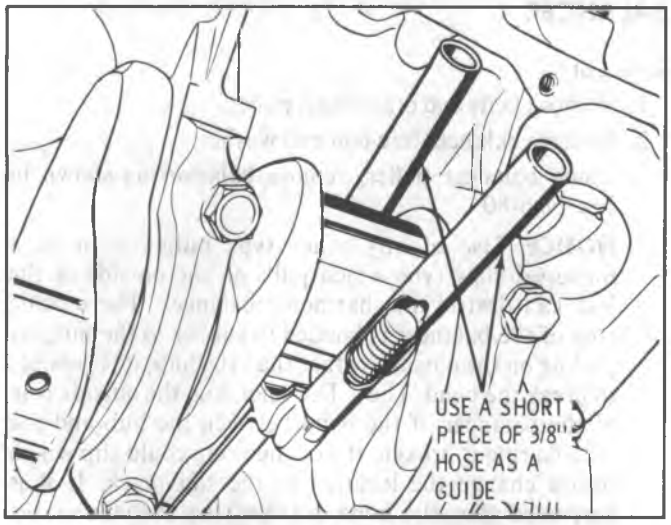


Fig. 6A6-76--Connecting Rod Bolt Guide

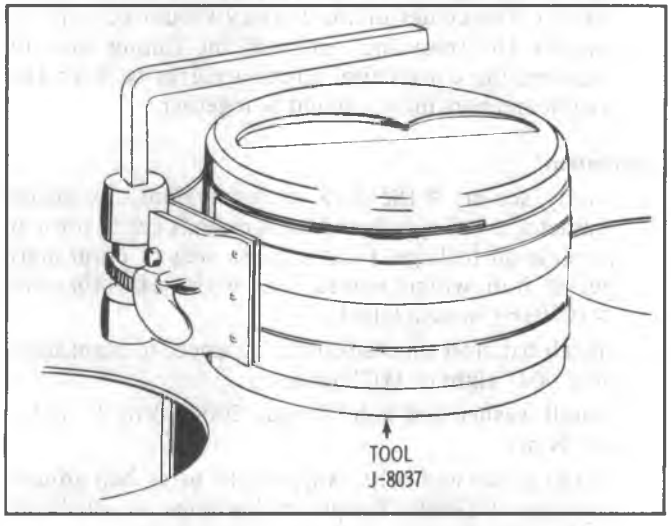


Fig. 6A6-77--Piston Ring Compressor

2. Apply engine oil to rings and piston, then install piston ring compressing tool on piston. (Fig. 6A6-77).
3. Install each piston and rod in its respective cylinder bore so valve depression in top of piston is towards the inner side of engine. (Fig. 6A6-78).
   - On the forward half of the engine, cylinders 1, 2, 3 and 4, the large valve depression goes to the front.
   - On the rear half of the engine, cylinders 5, 6, 7 and 8, the large valve depression goes to the rear of engine.
4. Lubricate the crankpin with engine oil and install connecting rod bearing and cap, with bearing index tang in rod and cap on same side.

When more than one rod and piston is being installed, the connecting rod cap attaching nuts should only be tightened enough to keep each rod in position until all have been installed. This will facilitate installation of remaining piston assemblies.

The clearance between the adjacent rods, when checked with a feeler gage on each crankpin, should be from .006" to .020". (Fig. 6A6-79).

5. Torque rod bolt nuts to 42 lbs. ft. (57 N·m).

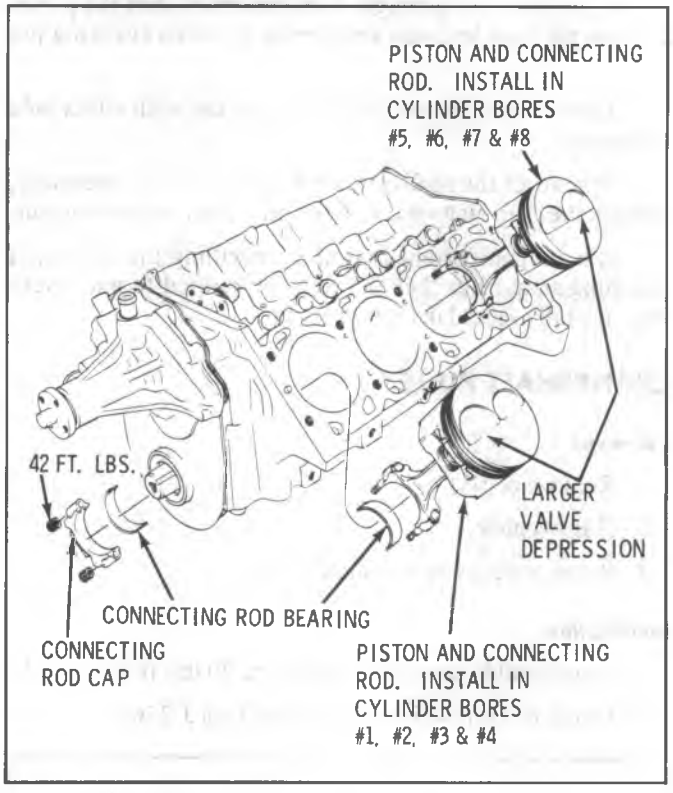


Fig. 6A6-78--Piston Locations in Block

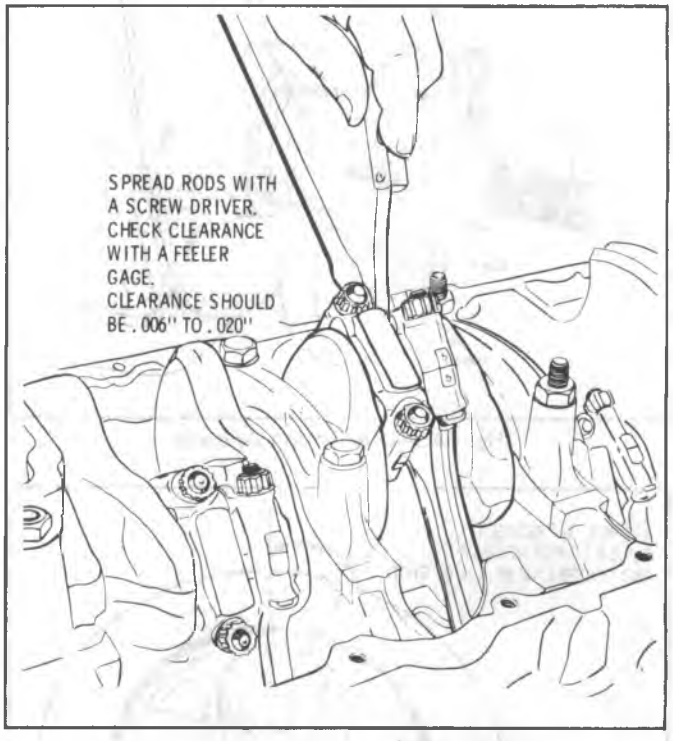


Fig. 6A6-79--Connecting Rod Side Clearance

PISTON PINS

The piston pin is free floating and the correct fit in the piston is .0003" to .0005" and rod is .0003" to .0013" loose. If the pin to piston clearance is to the high limit (.0005" piston or .0013" rod)., the pin can be inserted in the piston or rod with very little hand pressure and will fall through the piston or rod by its own weight. If the clearance is .0003",

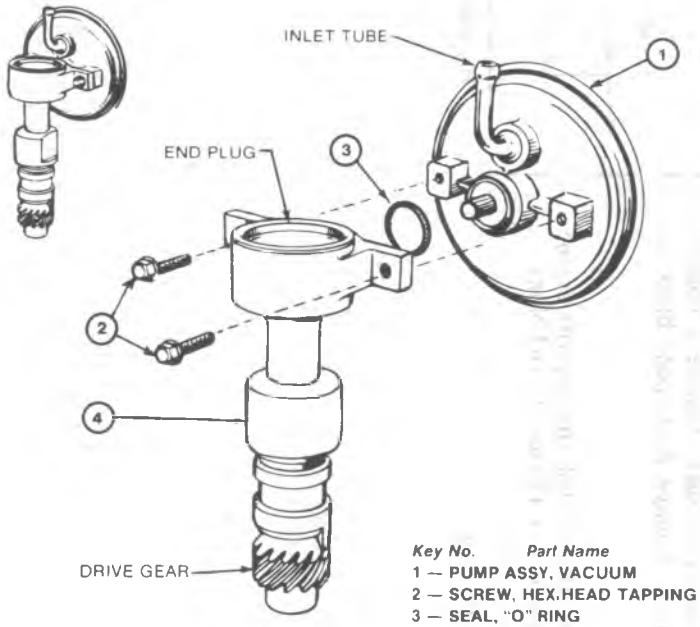
DRIVE AND VACUUM PUMPS

GENERAL DESCRIPTION

The vacuum pump is used to provide vacuum required for some accessories. It is a diaphragm pump which needs no periodic maintenance. It is driven by a cam inside the drive assembly to which it mounts. The pump's diaphragm moves back and forth causing air to flow into the inlet tube, through the pump, and exhaust out the rear port.

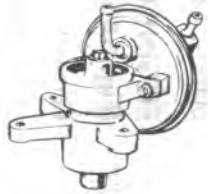
The vacuum pump is driven two ways, gear driven and belt driven. The gear driven pump has a drive gear on the lower end which meshes with the cam shaft gear in the engine. This drive gear causes the cam in the drive housing to rotate. The drive gear also powers the engine oil lubricating pump. The belt driven pump has a pulley attached to the shaft at the lower end of the housing assembly. The pump pulley is driven off the belt cluster at the front of the engine.

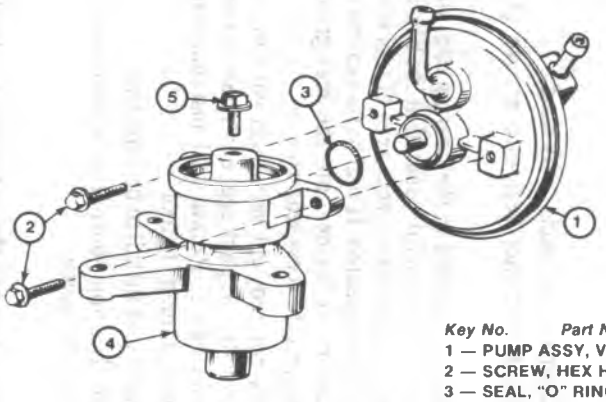
CAUTION: *Do not operate engine without drive and vacuum pump assembly as this is also the drive for the engine oil pump (gear driven pump only)*



Key No.	Part Name
1	PUMP ASSY, VACUUM
2	SCREW, HEX.HEAD TAPPING
3	SEAL, "O" RING
4	DRIVE ASSY, VACUUM PUMP

(GEAR DRIVEN) - SERVICE COMPONENTS





Key No.	Part Name
1	PUMP ASSY, VACUUM
2	SCREW, HEX HEAD TAPPING
3	SEAL, "O" RING
4	DRIVE ASSY, VACUUM PUMP
5	BOLT ASSY, SEAL &

(BELT DRIVEN) - SERVICE COMPONENTS

1JL80

Fig. 6A6-104-Vacuum Pump

DRIVE BELTS

Frayed or cracked belts should be replaced and tensioned to specifications using a strand tension gage, such as tool J-23600-B or equivalent.

Loose belts may place an extremely high impact load on driven component bearings due to the whipping action of the belt.

An over tightened belt places unnecessary loads on the component bearings.

In figure 6B-2, the minimum reading is the lowest allowable setting before the belt must be reset. When readjusting, the adjustment specification should be met. When adjusting a drive belt, it is important that the proper adjustment specification be used. Refer to figures 6B-3 thru 6B-5 for adjustment.

- A 'Used' belt is one that has been rotated at least one complete revolution on engine pulleys. This begins the 'seating' of the belt and it should never be reset to 'New' belt specifications.

DIAGNOSIS

If the cooling system requires frequent addition of coolant in order to maintain the proper level, check all units and connections in the cooling system for evidence of leakage. Inspection should be made with cooling system cold. Small leaks which may show dampness or dripping can easily escape detection when the engine is hot, due to the rapid evaporation of coolant. Tell-tale stains of grayish white or rusty color, or dye stains from anti-freeze, at joints in cooling system are almost always sure signs of small leaks even though there appears to be no damage.

Air may be drawn into the cooling system through leakage at the water pump seal or through leaks in the coolant recovery system. Gas may be forced into the cooling system through leakage at the cylinder head gasket(s) even though the leakage is not sufficient to allow coolant to enter the combustion chamber.

SYSTEM CHECKS

Exhaust Leaks

To check for exhaust leaks into the cooling system, drain the system until the coolant level stands just above the top of the cylinder head(s), then disconnect the radiator upper hose and remove the thermostat and fan belt(s). Start the engine and quickly accelerate several times. At the same time note any appreciable coolant rise or the appearance of bubbles which are indicative of exhaust gases leaking into the cooling system.

NOTICE: A defective head gasket may allow exhaust gases to leak into the cooling system. This is particularly damaging to the cooling system as the gases combine with the water to form acids which are harmful to the radiator and engine.

Water Pump

Water pump operation may be checked by running the engine while squeezing the radiator upper hose (engine warm). A pressure surge should be felt. Check for a plugged venthole in pump.

Radiator

Test for restriction in the radiator, by warming the engine up and then turning the engine off and feeling the radiator. The radiator should be hot along the left side and warm along the right side, with an even temperature rise from right to left. Cold spots in the radiator indicate clogged sections.

Thermostat

An operational check of the thermostat can be made by hanging the thermostat on a hook in a 33% glycol solution 25°F (4°C) above the temperature stamped on the thermostat valve. Submerge the valve completely and agitate the solution thoroughly. Under this condition the valve should open. Remove the thermostat and place in a 33% glycol solution 10°F (-12°C) below temperature indicated on the valve. With valve completely submerged and coolant agitated thoroughly, the valve should close completely.

Overheat and/or Noise

Engine overheat and/or cooling system noise may be caused by restrictions in the cooling system.

Components which may be prone to this condition are cylinder head, water pump, block, thermostat housing and inlet manifold. Symptoms of this condition are as follows:

- Engine may make snapping/cracking noises.
- Heater core may gurgle or surge.
- Radiator hoses may collapse and expand.
- Heater hoses may vibrate and thump.
- Overheat light may or may not come on.

Symptoms are the result of coolant boiling at some localized area and may be noticed after extending idling and/or while being driven. Determine which side of the engine is involved and whether it is more at the front or rear of engine.

Diagnosis & Inspection

1. Isolate area of engine the localized boiling is originating from. This can be done by probing engine with a sounding bar (large screw driver).
2. With radiator cap removed, observe water being circulated in radiator. Feel the front area of radiator for cold spots which indicate blockage. Blocked radiators generally occur on units that have accrued miles and not on new vehicles.

   CAUTION:The radiator cap should be removed from a cool engine only. If the radiator cap is removed from a hot cooling system, serious personal injury may result.
3. Inspect thermostat to see if it opens completely.
4. Inspect thermostat housing to make sure it is completely free of obstructions.
5. Remove water pump from vehicle and remove the back cover on the pump. All internal passages can be inspected using a flash light.

DIAGNOSIS
FUEL TANK

CONDITION	POSSIBLE CAUSE	CORRECTION
Gasoline Odor	1. Tank overfilled.	Do not "pack" tank. Fill to automatic shut-off.
	2. Fuel feed line leaking.	Correct as required.
	3. Leak in fuel tank.	Purge tank and repair or replace tank as required.
	4. Disconnected fuel vapor pipe or hoses.	Connect pipe or hoses as required.
	6. Faulty fill cap or tank neck.	Install new cap or tank neck as required.
Collapsed Fuel Tank	1. Plugged or pinched vapor pipe or hoses, & defective cap.	Check all lines from tank to canister and replace cap.
	2. Canister filter plugged & defective cap.	Replace filter in canister & cap.
Fuel Tank Rattles	1. Mounting straps loose.	Tighten straps to specifications.
	2. Baffle loose.	Replace fuel tank.
	3. Foreign material in tank.	Remove tank and clean.
Fuel Starvation	1. Tank gage unit filter plugged.	Replace filter.
	2. Fuel line pinched, plugged or mis-routed.	Check open or re-route as required.

Fig. 6C-10--Fuel Tank Diagnosis

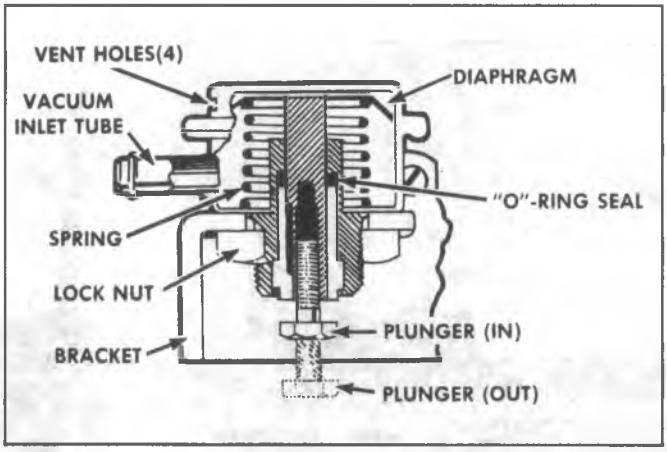


Fig. 6C1-12d--TRC

UNIT REPAIR

DISASSEMBLY

Place carburetor on a holding fixture to prevent damage to throttle valve.

Air Horn

Removal

1. Remove choke vacuum break diaphragm hose.
2. Remove vacuum break diaphragm assembly from air horn by removing two attaching screws. These screws have a tapered head and do not use lockwashers. Remove diaphragm plunger stem from diaphragm to choke lever link. (Fig. 6C1-13).

   NOTICE: Screw that retains vacuum break lever to choke shaft is installed with thread torque retaining compound. It is not necessary to remove this screw and lever unless choke shaft replacement is required.
3. Remove fast idle cam attaching screw; then remove fast idle cam (Fig. 6C1-14).

   Remove choke rod from choke coil lever on end of choke shaft.
4. Remove choke coil assembly as follows: Align a#21 drill (.159 ") on rivet head and drill only enough to remove rivet head. Drill the two remaining rivet heads and then use a drift and small hammer to drive the remainder of the rivets out of the choke housing. Remove the three retainers and choke cover assembly from choke housing.
5. Choke coil housing need not be removed from float bowl unless replacement is necessary. To remove choke housing, remove three attaching screws from float bowl. Two screws have lockwashers and the one facing the choke housing has a tapered head for locating choke housing.
6. Remove four remaining air horn to bowl attaching screws and lockwashers (three long and one short screw).
7. Remove air horn by lifting and twisting back towards choke housing so that the choke coil lever link will disengage from the choke coil lever at the choke

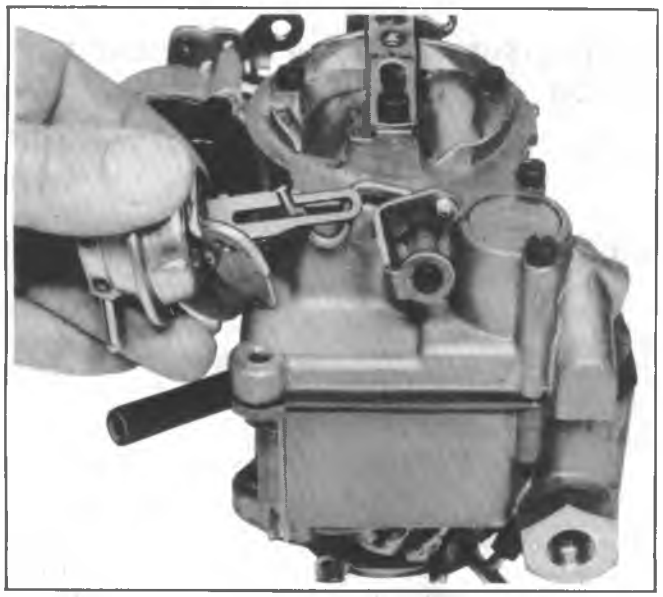


Fig. 6C1-13--Vacuum Break Diaphragm

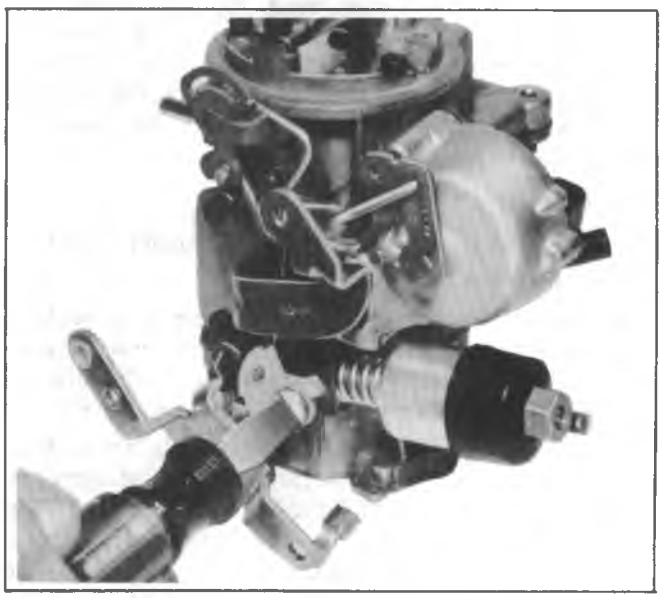
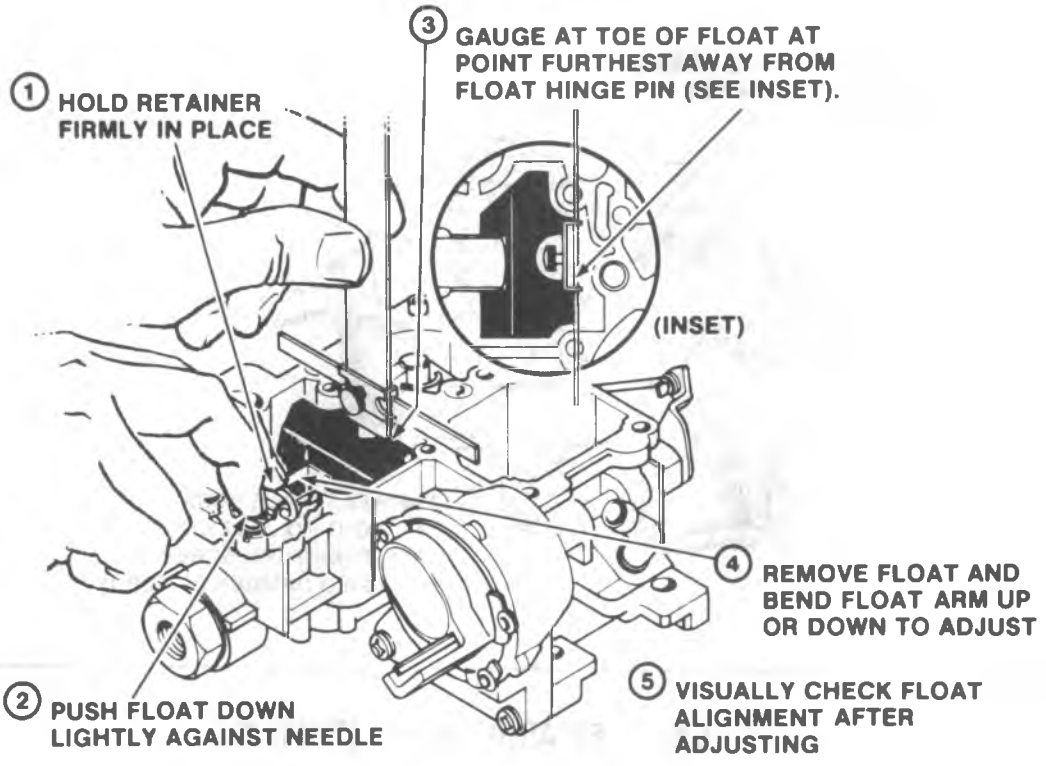


Fig. 6C1-14--Fast Idle Cam

2SE CARBURETOR ADJUSTMENTS

FLOAT ADJUSTMENT



PUMP ADJUSTMENT

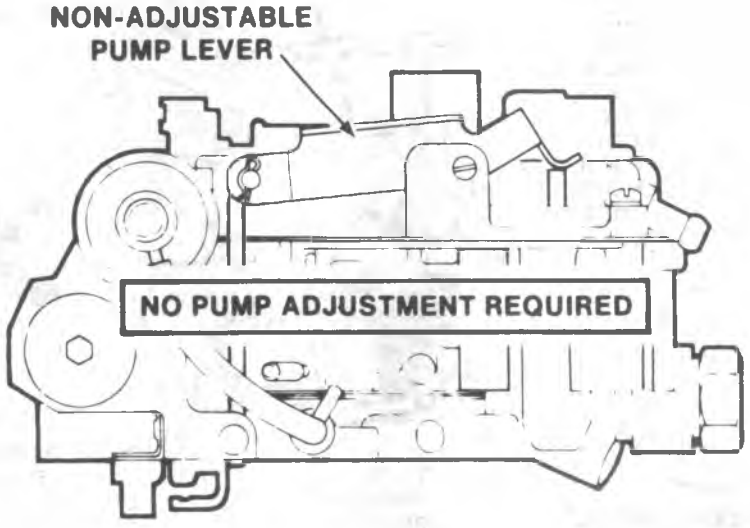


Fig. 6C2-A--2SE Carburetor Adjustments

worn or damaged parts, and service adjustment of individual systems.

CARBURETOR DISASSEMBLY

Before performing any service on the carburetor, it is essential that the carburetor be placed on a holding fixture such as tool J-9789-118 or equivalent. Without the use of the holding fixture, it is possible to damage throttle valves.

Idle Speed Solenoid

Removal

1. Bend back retaining tabs on lockwasher; then remove large solenoid retaining nut using suitable wrench. Use care in removing nut with wrench to avoid bending or damaging choke linkage, solenoid bracket, vacuum break unit or throttle lever.
2. Remove lockwasher and solenoid unit from bracket.

   NOTICE: The solenoid should not be immersed in any type of carburetor cleaner and should always be removed before complete carburetor overhaul. Immersion in cleaner will damage solenoid.

Air Horn

1. Remove clip from hole in pump lever. Do not remove pump lever retaining screw or pump lever from air horn assembly.
2. Remove hose from primary side vacuum break assembly.
3. Remove (2) screws securing primary side vacuum break bracket to air horn (Fig. 6C2-3b); then, rotate vacuum break and bracket assembly to disengage vacuum break link from slot in vacuum break and choke lever and air valve rod from slot in air valve lever.

   NOTICE: Do not place vacuum break assembly in carburetor cleaner. Immersion in cleaner will damage vacuum break diaphragm.
4. If necessary to replace the vacuum break rod or air valve rod, remove and discard retaining clips from end of air valve rods. New retaining clip is required for reassembly. Remove plastic bushing used on rods and retain for later re-use.
5. Remove secondary side idle speed solenoid-vacuum break bracket attaching screws from throttle body (Fig. 6C2-3b). Then, rotate bracket to remove secondary side vacuum break link from slot in break and choke lever.
6. Remove and discard retaining clip from intermediate choke rod at choke lever (Fig. 6C2-4). A new retaining clip is required for reassembly. Remove choke rod and plastic bushing from choke lever. and save the bushing for later re-use.
7. Remove (2) small screws that retain the hot idle compensator valve (Fig. 6C2-5). Remove valve and seal from air horn. Discard seal. Hot idle compensator valve must be removed to gain access to short air horn to bowl attaching screw.
8. Remove the seven (7) air horn to bowl attaching screws and lockwashers (Fig. 6C2-6). Remove vent and screen assembly.
9. Rotate fast idle cam to the full UP position and remove air horn assembly by tilting to disengage fast idle cam and pump rod from hole in pump lever (Fig. 6C2-7). If pump plunger came out of float bowl with air horn removal, remove pump plunger from air horn. The air horn gasket should remain on the float bowl for removal later.

   Do not remove fast idle cam screw and cam from float bowl. These parts are not serviced separately and are to remain permanently in place as installed by the factory. The new service replacement float bowl will include the secondary lock-out lever, fast idle cam and screw installed as required.
10. Remove fast idle cam rod from choke lever by rotating rod to align squirt on rod with small slot in lever.

Air Horn Disassembly

1. Remove pump plunger stem seal by inverting air horn and use a small screwdriver to remove staking holding the seal retainer in place. Remove and discard retainer and seal.

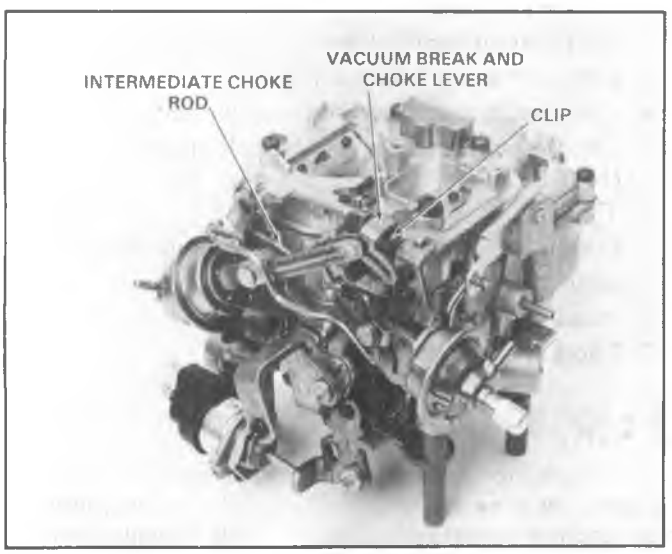


Fig. 6C2-3b--Vacuum Break and Idle Speed Solenoid

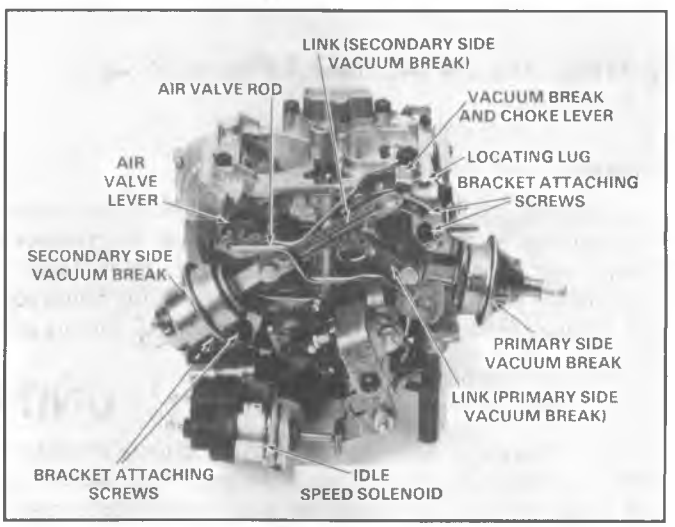


Fig. 6C2-4--Choke Rod and Choke Lever

SECTION 6C3

CARBURETOR MODEL M2ME

CONTENTS

GENERAL DESCRIPTION

The M2ME carburetors (Fig. 6C3-2) for light duty emission vehicles are basically carryover for the 1981 model except a new electric choke carburetor is used replacing the hot air choke model (M2MC) previously used. All models include tamper-resistant features such as rivets, plugs, covers, etc. to discourage readjustment of facotory settings which could affect either or both emission control and driveability. For example, as a carryover feature, blind rivets are installed at the factory to retain the setting of the thermostatic coil in the housing.

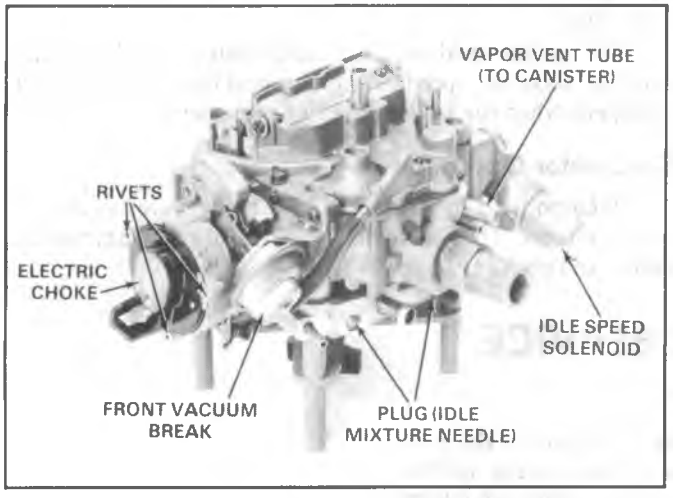


Fig. 6C3-1--Model M2ME

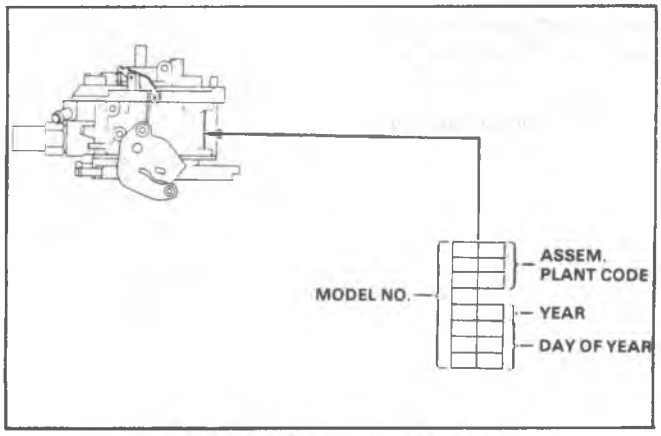


Fig. 6C3-2--Model Identification

A special cut-out is notched in the choke cover which must be aligned with an extended tab on one of the choke retainers which is located in the 2 o'clock position. The other two retainers are of the conventional design (no tab).

The choke thermostatic cover and coil assembly must not be removed unless required during major carburetor overhaul, or replacement of the cover and coil assembly or choke housing in which case special service procedures are necessary. An integral 2" pleated paper fuel filter, with check valve, is mounted in the front of the float bowl behind the fuel inlet nut to give maximum filtration of incoming fuel. The check valve is used to shut off fuel flow to the carburetor and prevent fuel leaks if a vehicle roll-over should occur.

A single pontoon float, brass needle seat, and a rubber tipped float valve with pull clip are used to control fuel level in the float chamber. The aneroid cavity insert, used on past models, is deleted. This change was made to improve fuel handling during vehicle maneuvers. A plastic filler block is used above the float chamber to reduce fuel slosh in the float bowl.

To reduce the possibility of fuel vapor losses, the following carburetor changes have been made to meet evaporative emission requirements.

- Pump plunger stem seal and retainer added to the air horn on all models.
- Raised beads added to the air horn and float bowl gasket mating surfaces, and air horn gasket, for good air horn to bowl sealing.
- The new model M2ME carburetor uses two (2) additional air horn to bowl attaching screws and lockwashers.
- Four (4) throttle body to bowl screws used for improved sealing as a carryover feature.
- Idle mixture needle plugs vapor sealed.

The carburetor has internally balanced venting through a vent tube, pressed into the air horn casting, located adjacent to the air intake, and by a vent slot located directly over the float chamber. In addition, vent baffles located strategically in the float bowl provide efficient fuel

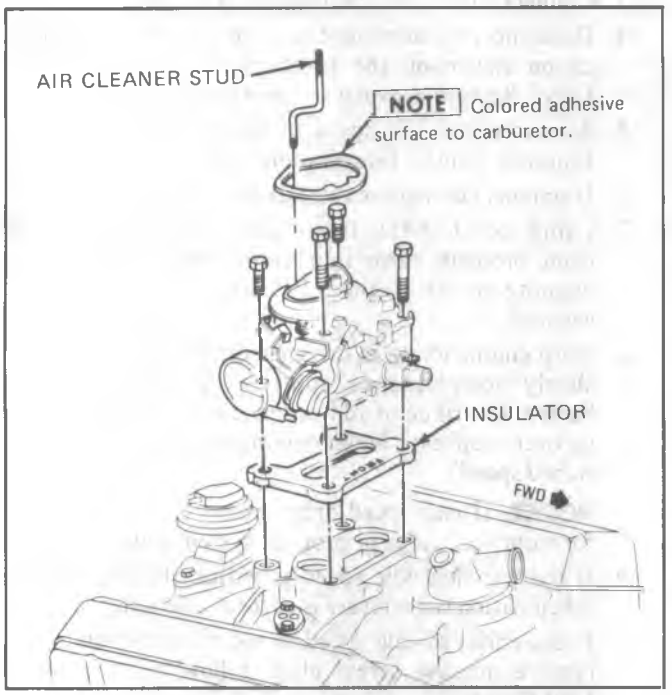


Fig. 6C3-5--Carburetor Replacement

1. Remove air cleaner and gasket.
2. Disconnect solenoid wire if equipped.
3. Disconnect fuel and vacuum lines from carburetor.
4. Disconnect electrical connections.
5. Disconnect accelerator linkage.
6. If equipped with automatic transmission, disconnect downshift cable.
7. If equipped with cruise control, disconnect linkage.
8. Remove carburetor attaching bolts and remove carburetor and insulator.

Installation

1. Fill carburetor bowl before installing carburetor.
2. With clean sealing surfaces on carburetor and intake manifold, install new insulator.
3. Position carburetor over insulator and install bolts. Torque bolts to correct torque (See Carburetor Mounting Torque).
4. Connect downshift cable as required.
5. Connect cruise control cable as required.
6. Connect accelerator linkage.
7. Connect electrical connections.
8. Connect fuel pipe and vacuum hoses.
9. Connect solenoid wire as required.
10. Install air cleaner.
11. Check and adjust idle speed.

UNIT REPAIR

DISASSEMBLY

Before doing any service on the carburetor place it on a holding fixture. Without the use of the holding fixture, it is possible damage to throttle valves.

Solenoid (If Equipped)

Removal

Remove screws holding the solenoid and bracket to float bowl and remove solenoid and bracket assembly. The solenoid should not be immersed in any type of carburetor cleaner and should always be removed before complete carburetor overhaul.

Air Horn

Removal

1. Remove upper choke lever trom the end of choke shaft by removing retaining screw (Fig. 6C3-6). Then rotate upper choke lever to remove choke rod from slot in lever.
2. Remove choke rod from lower lever inside the float bowl casting. Remove rod by holding lower lever outward with small screwdriver and twisting rod counterclockwise.
3. With Tool J-25322 drive roll pin (pump lever pivot pin) inward just until pump lever can be removed from air horn. Then remove pump lever from pump rod (Fig. 6C3-7). Note location of accelerator pump rod for reassembly.
4. Remove seven air horn to bowl attaching screws; then remove the two countersunk screws located next to the venture (Fig. 6C3-8).
5. Remove air horn from float bowl by lifting straight up. The air horn gasket should remain on the float bowl for removal later (Fig. 6C3-9).

Air Horn - Disasembly

1. Remove front vacuum break hose. Then remove two attaching screws and remove vacuum break and

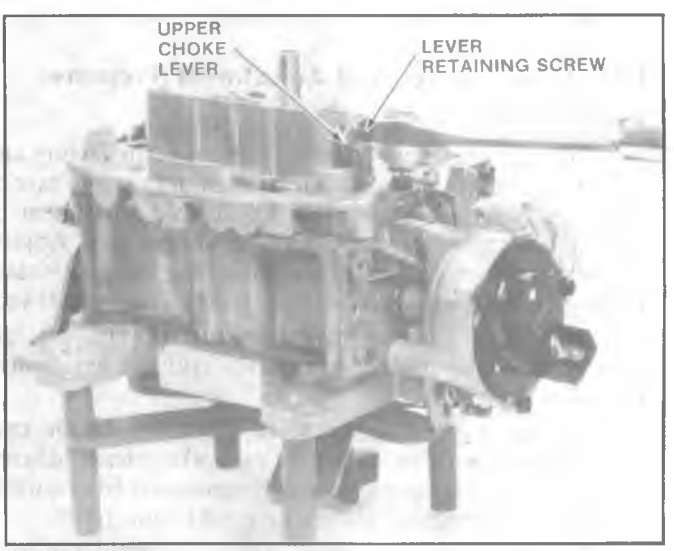


Fig. 6C3-6--Removing Upper Choke Lever

SECTION 6C4

CARBURETOR MODEL M4M

CONTENTS

GENERAL DESCRIPTION

The model M4MC carburetor is used on Heavy Duty Emissions vehicles. In addition, a new electric choke model M4ME carburetor is used on Light Duty Emissions vehicles replacing the hot air choke model previously used. All models (Fig. 6C4-1,2 and 3) tamper - resistant features such as rivets, plugs, covers, etc., to discourage readjustment of factory settings which could affect either or both emission control and driveability. For example, as a carryover feature, blind rivets are installed at the factory to retain the setting of the thermostatic coil in the housing.

A special cut-out is notched in the choke cover which must be aligned with an extended tab on one of the choke retainers which is located in the 2 o'clock position. The other two retainers are of the conventional design (no tab).

The choke thermostatic cover and coil assembly must not be removed unless required during major carburetor overhaul, or replacement of the cover and coil assembly or choke housing in which case special service procedures are necessary.

An integral 2" pleated paper fuel filter, with check valve on light duty vehicles, is mounted in the front of the float bowl behind the fuel inlet nut to give maximum filtration of incoming fuel. The check valve is used to shut off fuel flow to the carburetor and prevent fuel leaks if a vehicle roll-over should occur.

A single pontoon float, brass needle seat, and a rubber tipped float valve with pull clip are used to control fuel level in the float chamber. On M4MC models, the aneroid cavity insert is revised; on M4ME models, the aneriod cavity insert is deleted. These changes were made to improve fuel handling during vehicle maneuvers.

To reduce the possibility of fuel vapor losses, the following carburetor changes have been made to meet evaporative emission requirements:

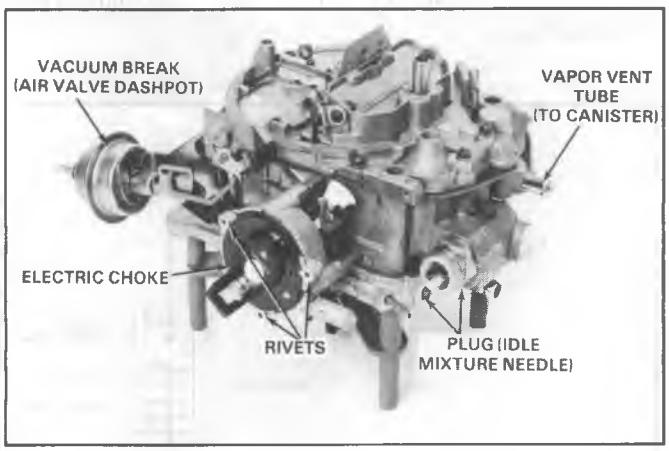


Fig. 6C4-1--Model M4ME with L.D. Emissions

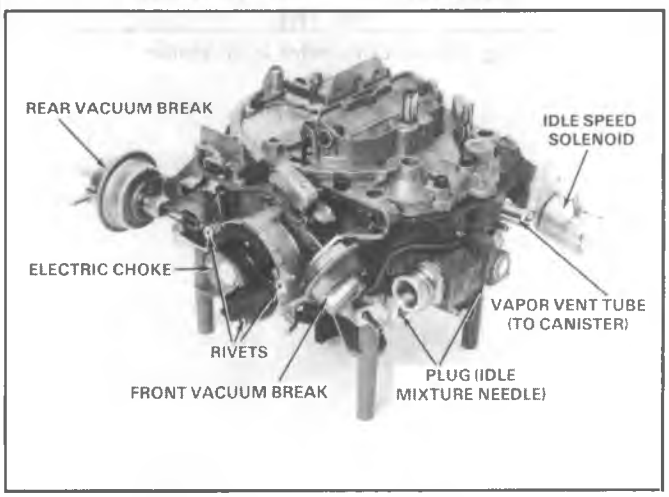


Fig. 6C4-2--M4ME W/Calif. Emissions

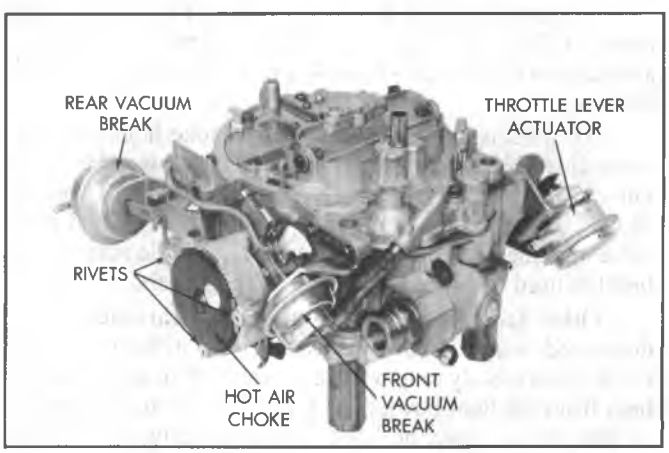


Fig. 6C4-3--Model M4MC With H.D. Emissions

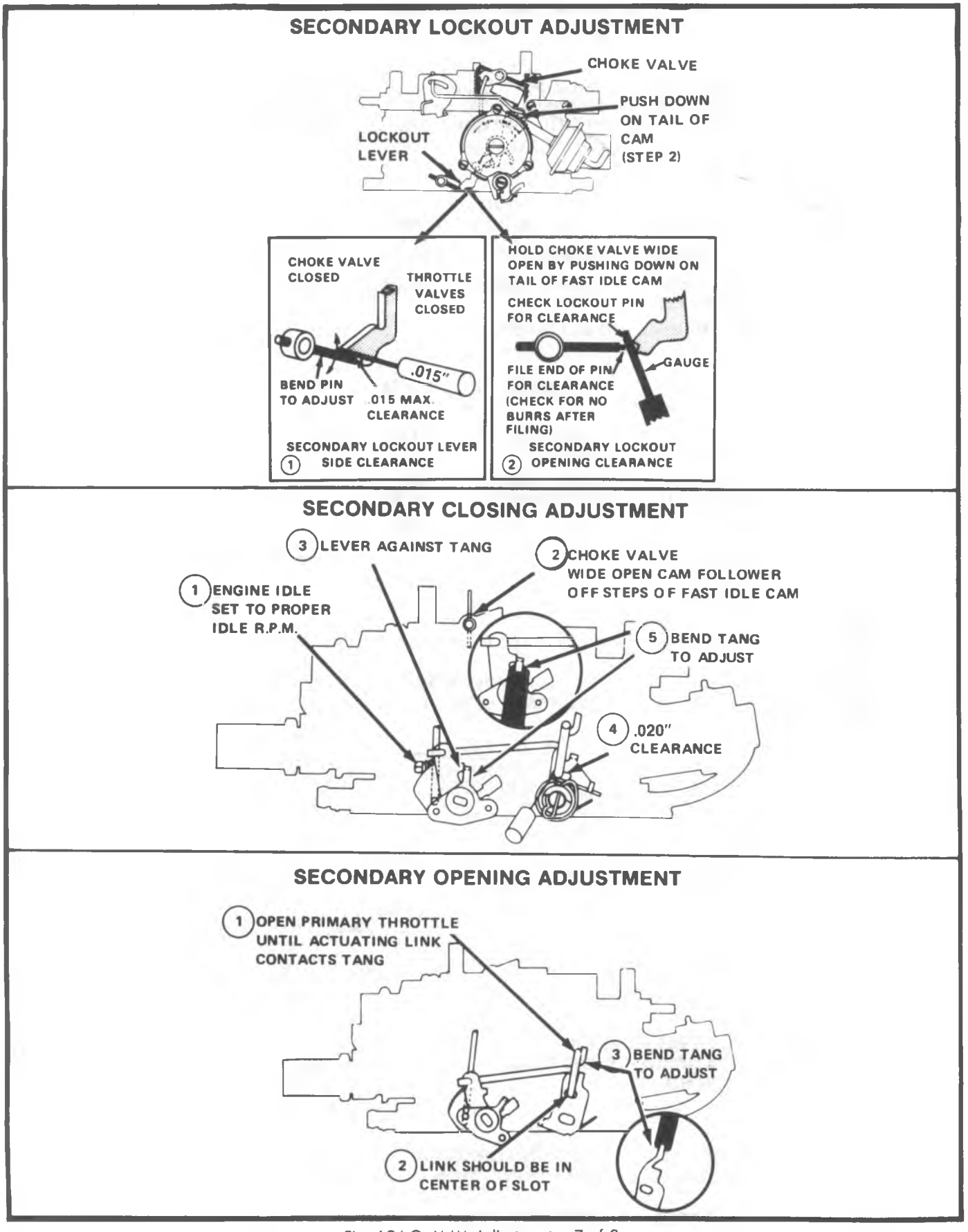


Fig. 6C4-G--M4M Adjustments - 7 of 9

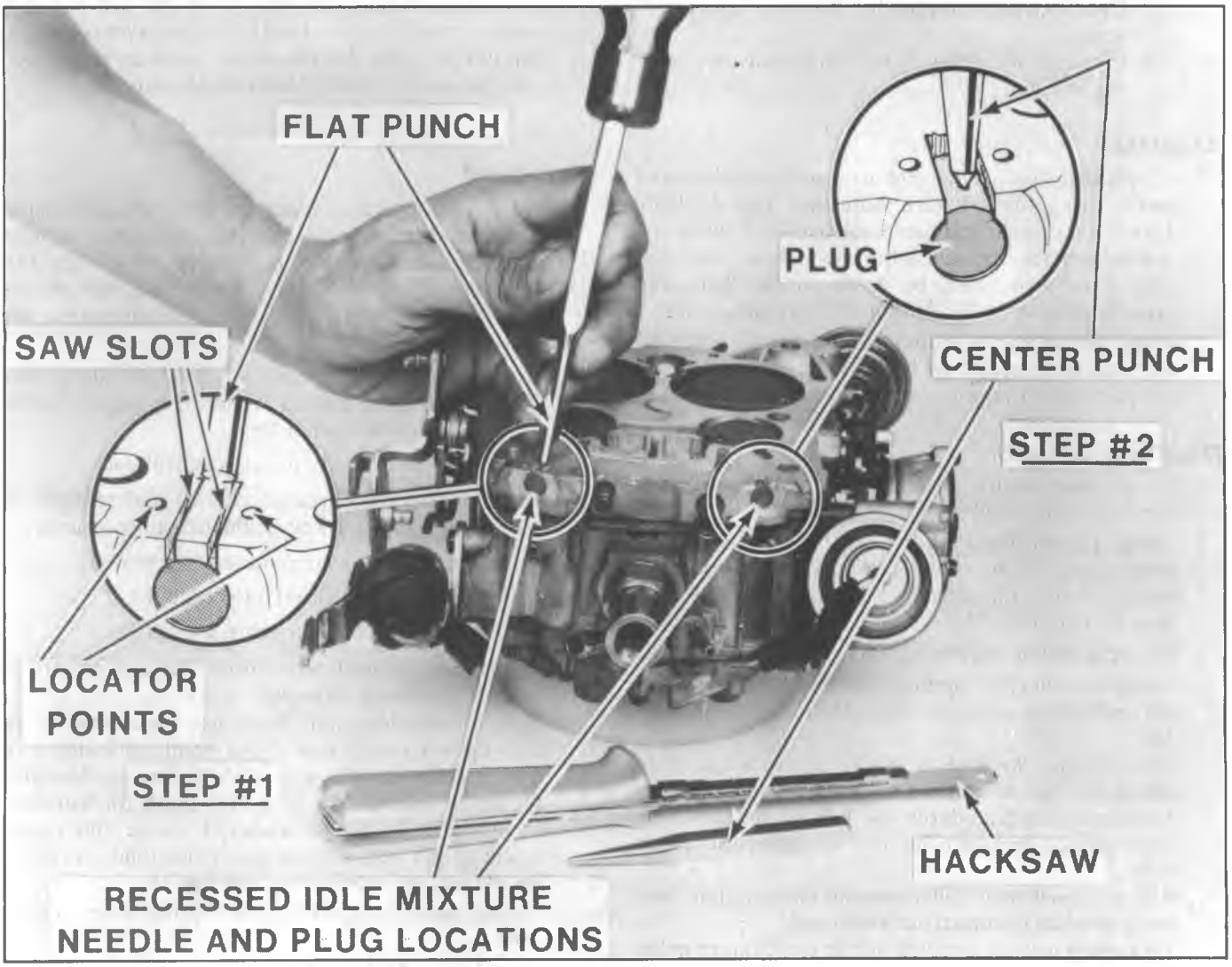


Fig. 6C4-26a--Idle Mixture Needle

1. Thoroughly clean all metal parts and blow dry with compressed air. Make sure all fuel passages and metering parts are free of burrs and dirt.
2. Check, repair or replace the following parts if the following problems were encountered.
   a. Flooding
      1. Inspect float needle seat for dirt, deep wear grooves, scores and proper seating.
      2. Inspect float, float arm and hinge pin for distortion, binds and burrs. Check float for leaks and/or being loaded (heavier than normal).
   b. Hesitation
      1. Inspect pump plunger for cracks, scores or cup, excessive wear. A used pump cup will shrink when dry. Soak in fuel for 8 hours before testing if dried out.
      2. Inspect pump duration and return spring for being weak or distorted.
      3. Check all pump passages and jets for dirt, improper seating inlet or discharge balls, scores in pump well.
      4. Check pump linkage for excessive wear, repair or replace as necessary.
   c. Hard Starting - Poor Cold Operation
      1. Check choke valve and linkage for excessive wear, binds or distortion.
      2. Inspect choke vacuum diaphragm for leaks.
      3. Clean or replace carburetor filter.
      4. Inspect needle for sticking, dirt etc.
      5. Examine fast idle cam for wear or damage.
      6. Also check items under "flooding".
   d. Poor Performance - Poor Gas Mileage
      1. Power Piston, power valve, metering rods for dirt, sticking, binding, damaged parts or excessive wear.
      2. Check air valve for binds and damage. If air valve is damaged, the air horn assembly must be replaced. A torsion spring kit is available for repairs to air valve closing spring. A new plastic secondary metering rod cam is included in the kit.
   e. Rough Idle
      1. Inspect gasket and gasket mating surfaces on castings for damage to sealing beads, nicks, burrs and other damage.
      2. Clean all idle fuel passages.
      3. If removed, inspect idle mixture meedles for ridges, burrs, or being bent.
      4. Check throttle lever and valves for binds, nicks, and other damage.

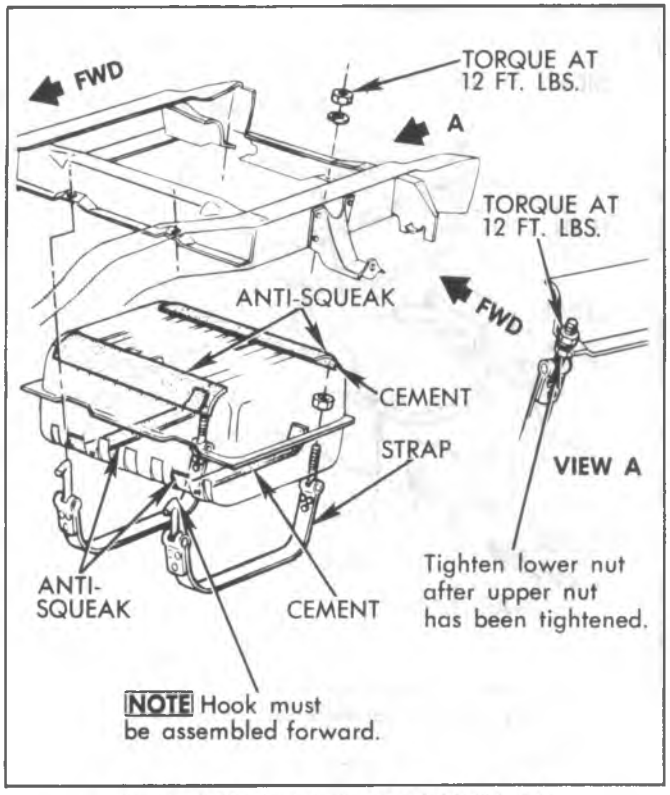


Fig. 6C5-11--Fuel Tank, CK 10-20 (06, 16)

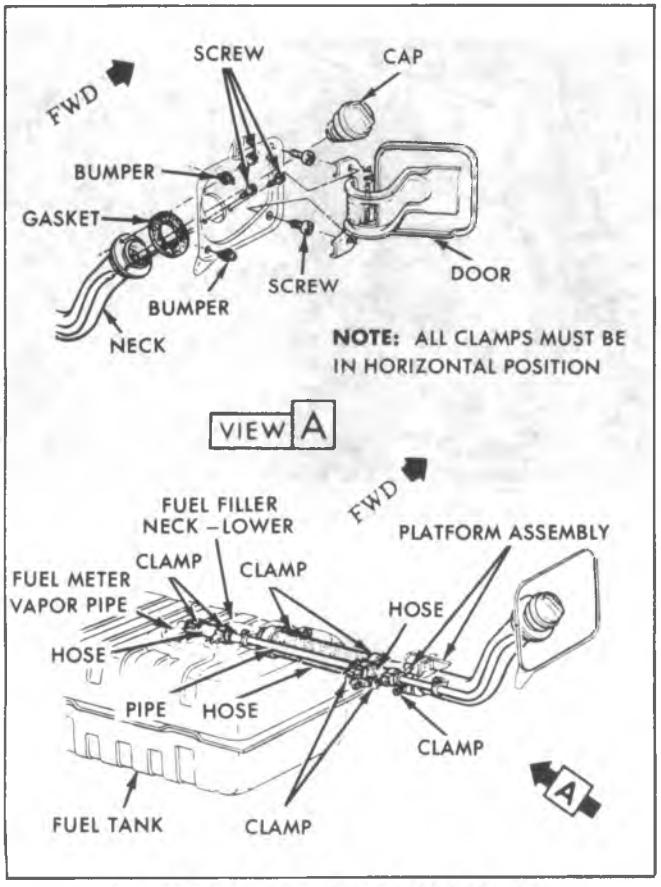


Fig. 6C5-12--Fuel Tank, CK 10-20 (06, 16)

Center and Auxiliary Fuel Tank

CK 10 and 20 (06, 16) (Figs. 6C5-11, 12) G Van (Fig. 6C5-13).

1. Drain tank.
2. Raise vehicle on hoist.
3. Unclamp upper filler neck and vent tube hose (Fig. 6C5-8 and 9).
4. Unclamp gage unit hoses at frame end.
5. Support tank and remove support straps.
6. Lower tank and disconnect meter wire.
7. Remove tank.
8. Install in the reverse order, using new antisqueak material.
9. Lower vehicle and remove from hoist.

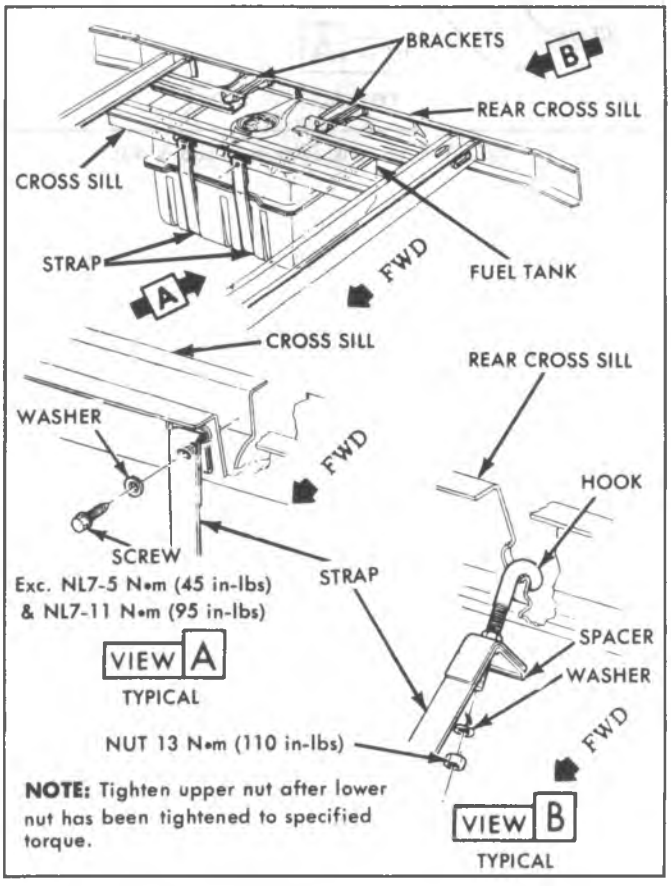


Fig. 6C5-13--Fuel Tank Installation G Van

SPECIAL TOOLS

Idle Mixture Socket	J-29030-B
Adjustable Float Gage	J-9789-90
Bending Tool	J-9789-111
Needle Valve Seat Remover	J-22769
Carburetor Stand	J-9789-118
Float Level Gage	J-9789-130
Float Level Gage	J-9789-135
Carburetor Choke Angle Gage	J-26701-4
Hand Vacuum Device	J-23738
Thermac Thermometer	J-22973
Carburetor Gage Set	J-9789-C
Fuel Tank Sending Unit Remover	J-24187

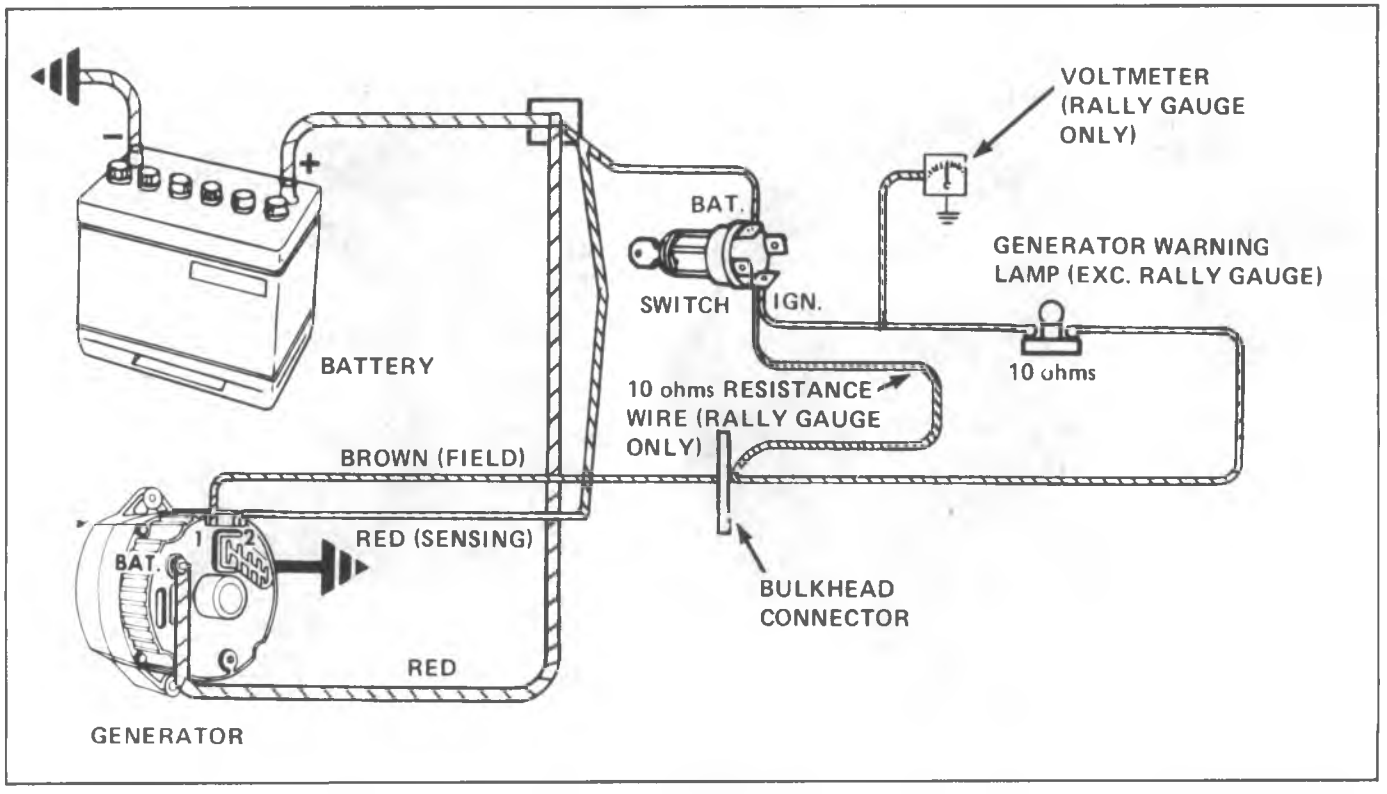


Fig. 6D-3C--Charging Circuit - SI System

DIAGNOSIS

Most charging system troubles show up as a faulty indicator lamp, an undercharged or an overcharged battery. Since the battery itself may be defective, it should be checked first to determine its condition. Also, in the case of an undercharged battery, check for battery drain caused by grounds or by accessories being left on.

A basic wiring diagram showing lead connections is shown in Figure 6D-3C. To avoid damage to the electrical equipment, always observe the following precautions:

- Do not polarize the generator.
- Do not short across or ground any of the terminals in the charging circuit except as specifically instructed.
- Never operate the generator with the output terminal open circuited.
- Make sure the generator and battery are of the same ground polarity.
- When connecting a charger or a booster battery to the vehicle battery, see Battery Charging Section.
- In some circuits (Gage option), a voltmeter may be used instead of an indicator lamp. In this case, Section "A" pertaining to faulty indicator lamp operation should be omitted from the troubleshooting procedure.

Trouble in the charging system will show up as one or more of the following conditions:

A. Faulty indicator lamp operation.

B. An undercharged battery as evidenced by slow cranking or test indicator dark.

C. An overcharged battery as evidenced by excessive spewing of electrolyte from the vent holes.

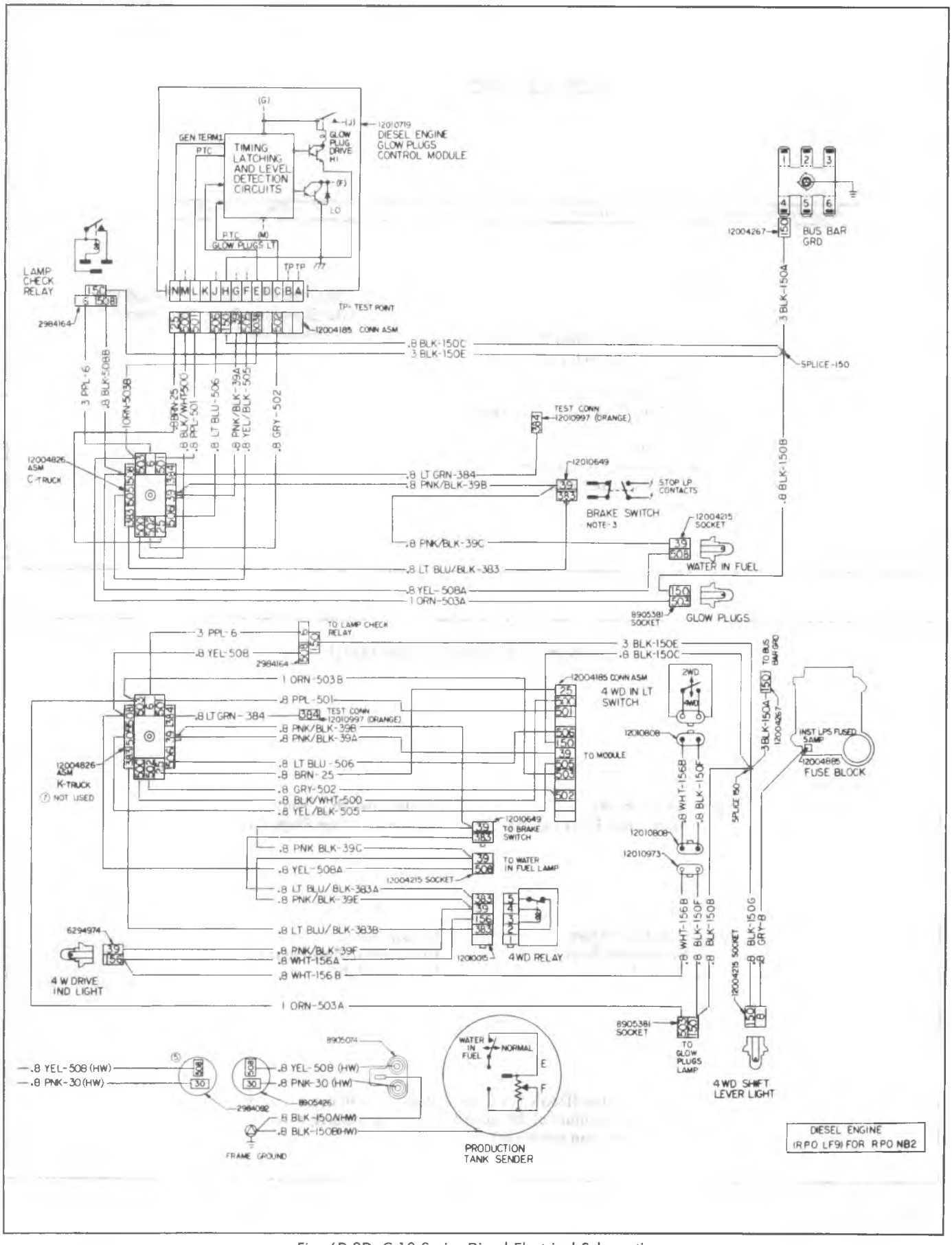


Fig. 6D-2D--C-10 Series Diesel Electrical Schematic

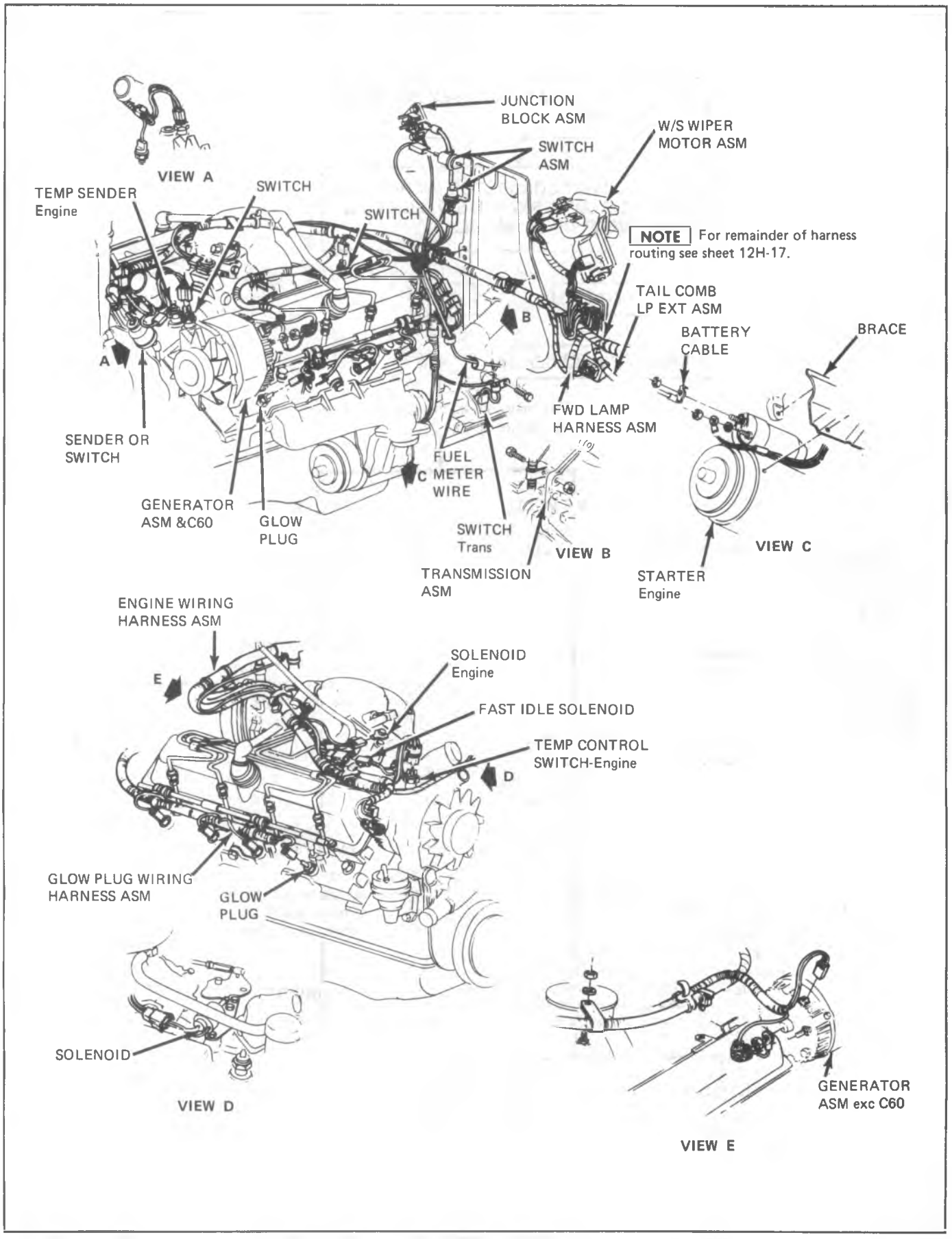


Fig. 6D-16D--Engine Compartment Wiring

SET IGNITION TIMING

1. Refer to the Vehicle Emissions Control Information label located on the radiator support panel. Follow all instructions on the label.
2. With ignition off, connect the pick-up lead of timing light to the number one spark plug. Use a jumper lead between the wire and plug or an inductive type pick-up. DO NOT pierce the wire or attempt to insert a wire between the boot and the wire. Connect the timing light power leads according to manufacturer's instructions.
3. Start the engine, and aim the timing light at the timing mark (see Fig. 6D-29D). The line on the balancer or pulley will line up at the timing mark. If a change is necessary, loosen the distributor hold-down clamp bolt at the base of the distributor. While observing the mark with the timing light, slightly rotate the distributor until the line indicates the correct timing. Tighten the hold-down bolt, and re-check the timing.
4. Turn off the engine and remove the timing light. Reconnect the number one spark plug wire, if removed.

Fig. 6D-29D--Timing Mark - Typical

SPARK PLUG WIRES

Use care when removing spark plug wire boots from spark plugs. Twist the boot 1/2 turn before removing, and pull on the boot only to remove the wire.

It is extremely important when replacing plug wires to route the wires correctly and through the proper retainers. Failure to route the wires properly can lead to radio ignition noise and crossfiring of the plugs, or shorting of the leads to ground.

Refer to Figure 6D-30D for proper spark plug wire routing.

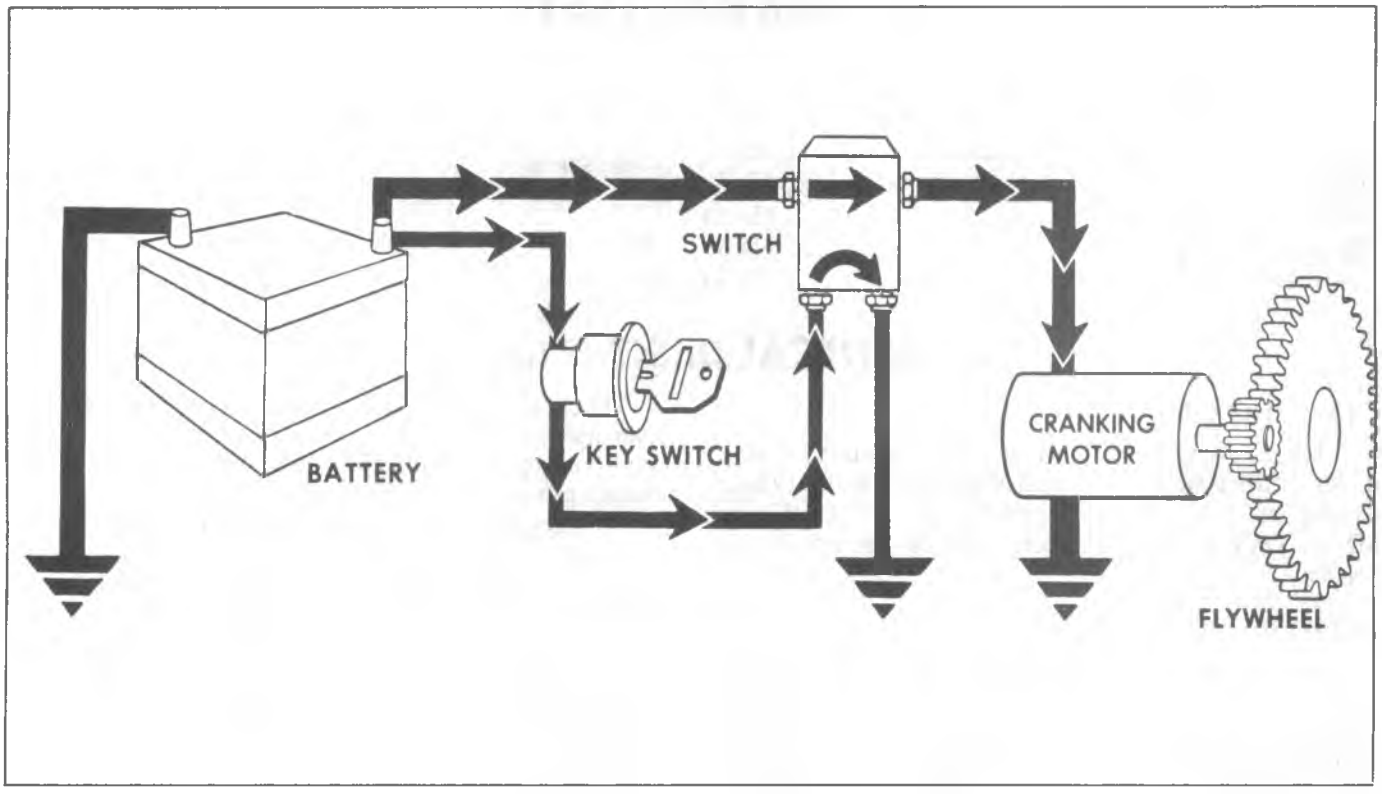


Fig. 6D-1E--Cranking Circuit - All

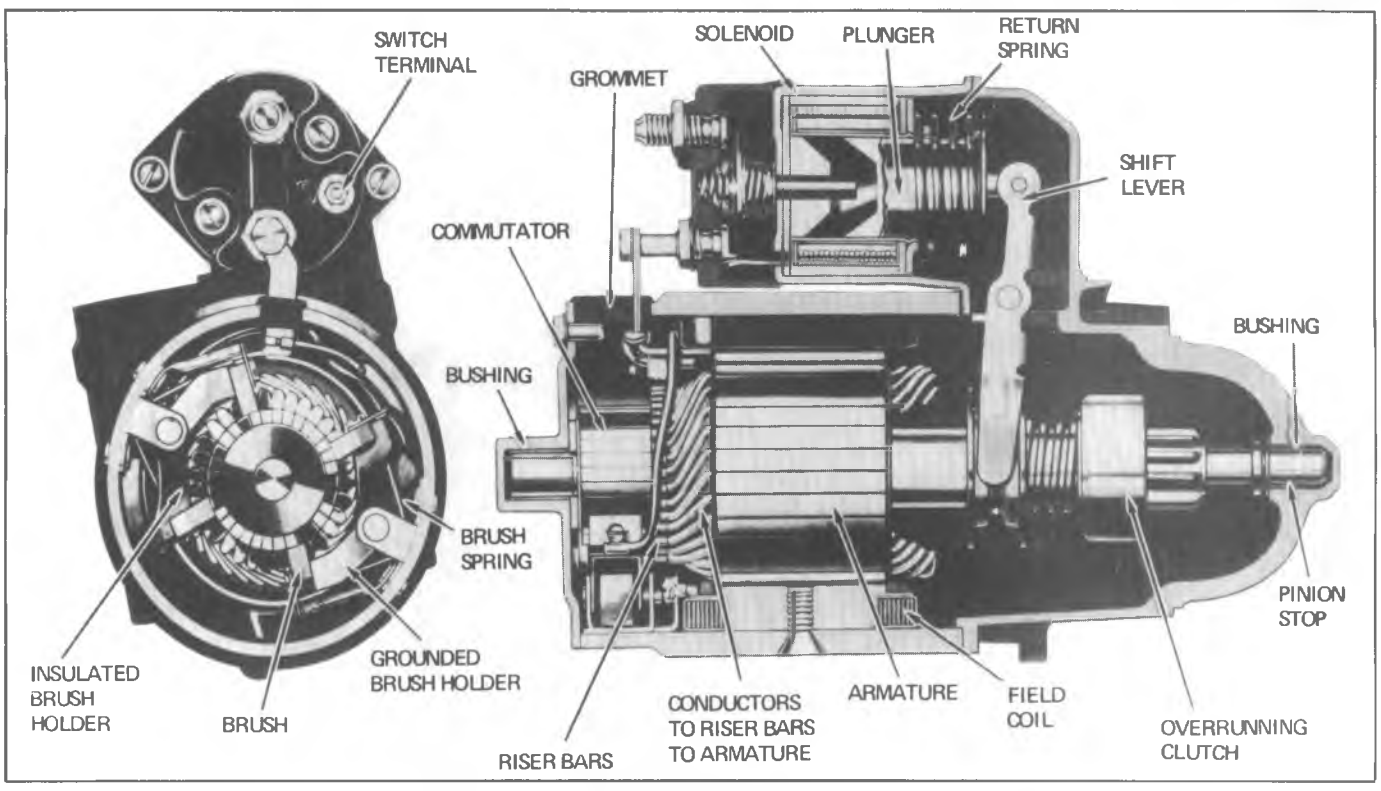
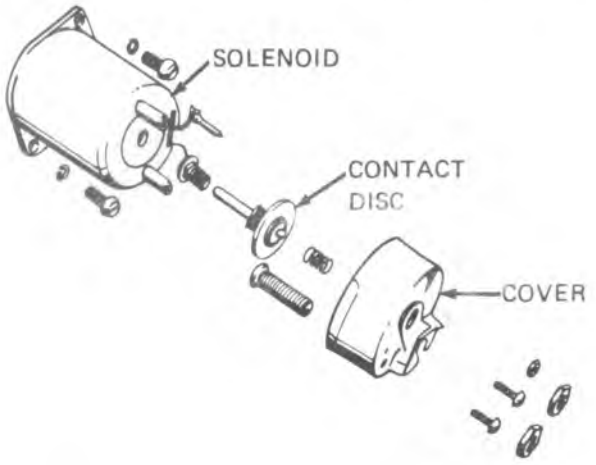


Fig. 6D-2E--Cross Section of 10MT Starting Motor

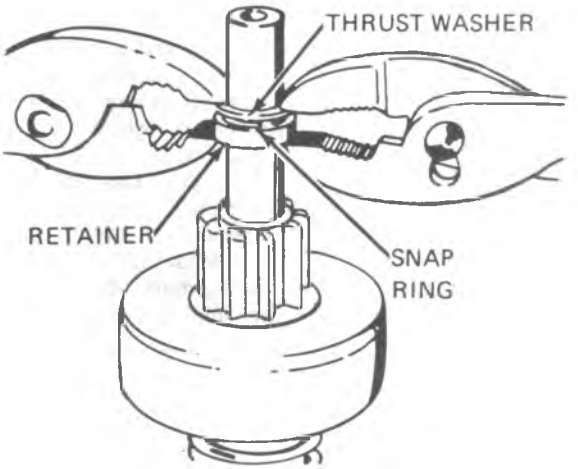
SOLENOID SWITCH DISASSEMBLY



f. The starter solenoid switch is serviced as an assembly. The cover can be removed to inspect the contacts and contact disc if necessary.

STARTER ASSEMBLY

INSTALLING RETAINER, WASHER AND RING



20. Assemble the armature and clutch as follows:
a. Lubricate drive end of armature shaft with lubricant 1960954 or equivalent.
b. Install center bearing (diesel starters) with bearing toward the armature winding. Then install the fiber washer on the armature shaft.
c. Slide clutch assembly onto armature shaft with pinion away from armature.
d. Slide retainer onto shaft with cupped side facing the end of shaft.
e. Install snap ring into groove on armature shaft.
f. Install thrust washer on shaft.
g. Position retainer and thrust washer with snap ring in between. Using two pliers, grip retainer and thrust washer or collar and squeeze until snap ring is forced into retainer and is held securely in groove in armature shaft.

21. Lubricate drive gear housing bushing with lubricant 1960954 or equivalent.

22. Engage shift lever yoke with clutch and slide complete assembly into drive gear housing.

On non-diesel starters the shift lever may be installed in drive gear housing first.

23. Install the center bearing screws (25 MT diesel only) and the shift lever pivot bolt. Tighten securely.

24. Install solenoid assembly.

25. Apply sealer, No. 1050026 or equivalent to solenoid flange where field frame contacts it.

26. Position field frame against drive gear housing on alignment pin using care to prevent damage to brushes.

27. Lubricate commutator end-frame bushing with lubricant 1960954 or equivalent.

28. Install washer on armature shaft and slide end frame onto shaft, then install and tighten through-bolts. On diesel starter, install insulator and then end frame onto shaft. Then install through bolts, making sure they pass through bolt holes in insulator.

29. Connect the field coil connector to the solenoid terminal.

30. Check pinion clearance as outlined under PINION CLEARANCE.

Fig. 6D-13E--Starter Unit Repair 5 of 6

POSSIBLE CAUSES OF EMISSIONS TEST FAILURES

EXCESSIVE EMISSIONS	EXPLANATION	POSSIBLE CAUSES
Hydrocarbons (HC) *	Excessive hydrocarbons are caused by an air fuel mixture that is not burning completely.	• Engine not at normal operating temperature. • Disconnected, obstructed, leaking, or misrouted vacuum hoses. • Vacuum leaks. • Maladjusted idle speed. • Maladjusted idle mixture - if plugs are removed. • Maladjusted initial spark timing. • Spark plugs, wires or distributor cap. • Improper operation of AIR or Pulsair system. • Lead contamination of catalytic converter (check for absence of filler neck restrictor).
Carbon monoxide (CO) *	Excessive carbon monoxide emissions are due to a mixture that is rich.	• Engine not at normal operating temperature. • Maladjusted idle mixture if plugs are removed. • Improperly adjusted/sticking choke. • Stuck PCV valve or obstructed PCV hose. • Lead contamination of catalytic converter (check for absence of filler neck restrictor). • Improper operation of AIR or Pulsair system. • Leaking carburetor fuel passages or gaskets. • Carburetor float level. • Stuck carburetor power piston. • Restricted air cleaner element.
Oxides of nitrogen (NO_x)	Excessive oxides of nitrogen are generally due to high temperatures in the combustion chamber.	• Obstructed/leaking/misrouted vacuum lines. • Faulty EGR temperature sensor controls. • Improper operation of the EGR system. • Incorrect EGR valve for engine type. • Plugged EGR passages. • Inoperative Thermac. • Maladjusted initial spark timing. • Improper operation of distributor centrifugal or vacuum spark advance.

* Excessive emissions of both hydrocarbons and carbon monoxide are related to an extremely rich air/fuel mixture. A rich air/fuel mixture increases CO emissions, but if the mixture is too rich, it will not burn completely. This unburned fuel contributes to high hydrocarbon emissions. Check for possible causes as stated in the HC and CO section. Check co-related causes first.

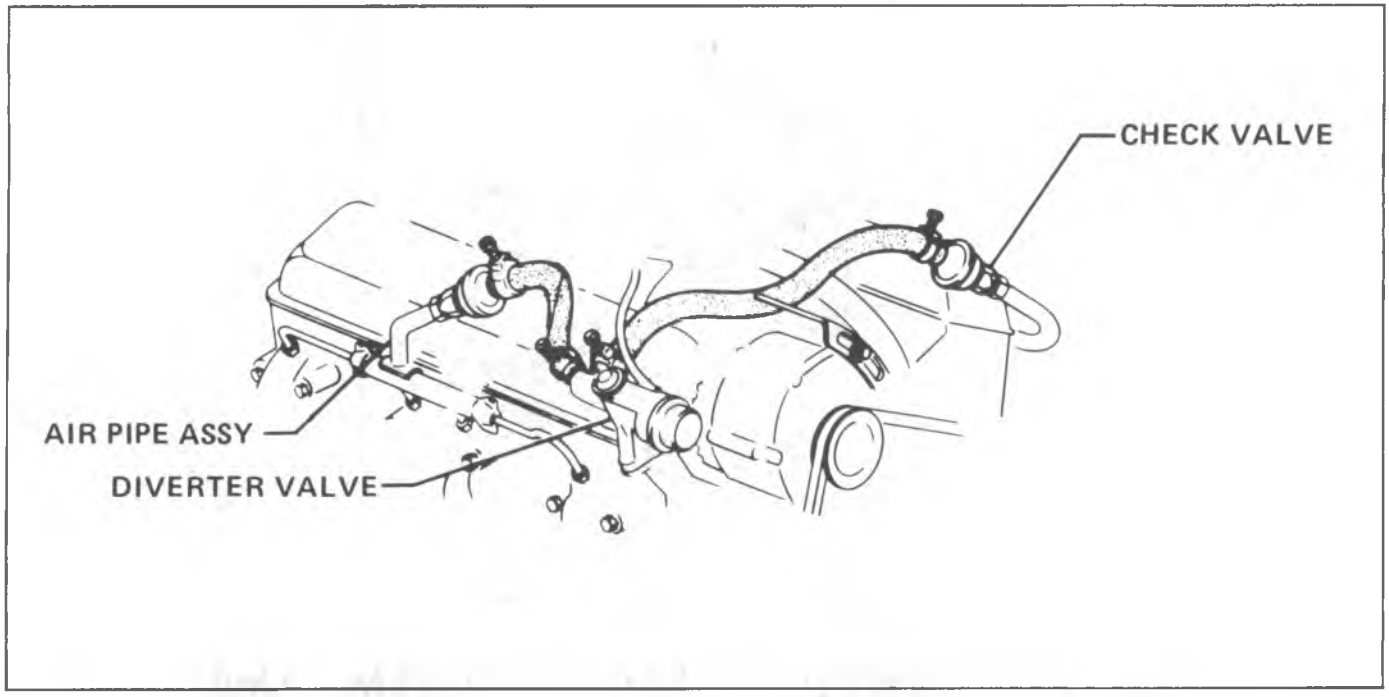


Fig. 6E-26--Air Injection Pipes-V8

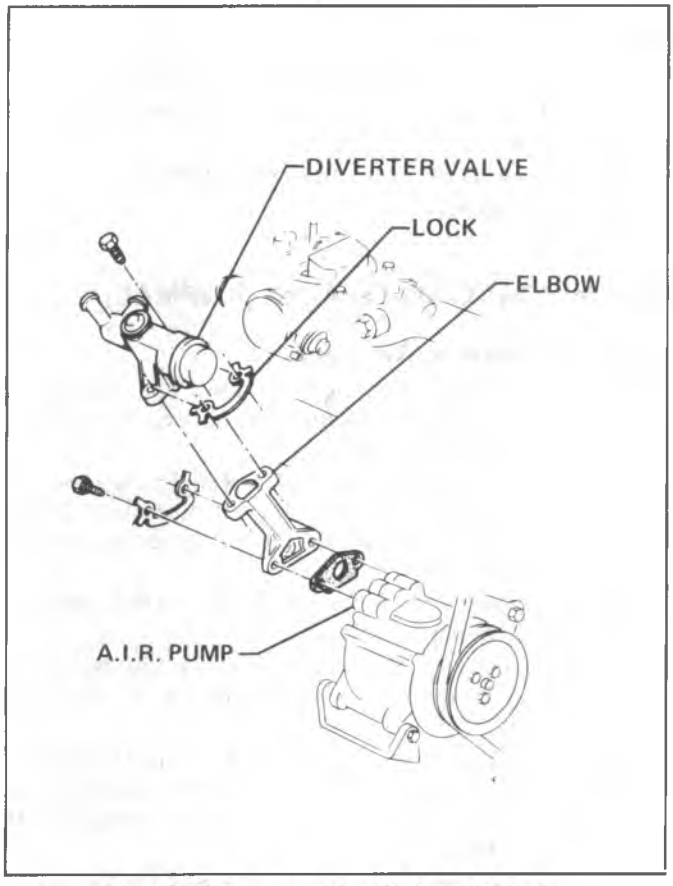


Fig. 6E-27--Diverter Valve-V8 C and K Series

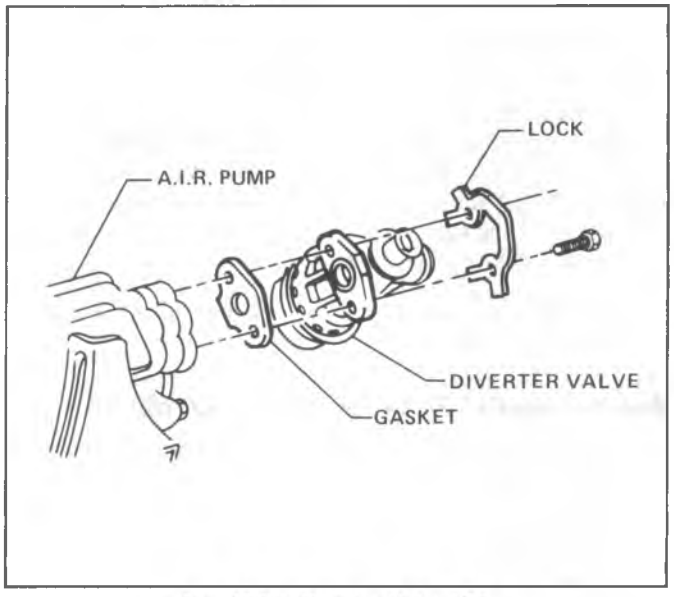


Fig. 6E-28--Diverter Valve-L25

CONDITION	POSSIBLE CAUSE	CORRECTION
Leaking Exhaust Gases	Leaks at pipe joints.	Tighten U-bolt nuts at leaking joints to 30 lb. ft. (40 N·m).
	Damaged or improperly installed seals or packing.	Replace seals or packing as necessary.
	Loose exhaust pipe heat tube extension connections.	Replace seals or packing as required. Tighten stud nuts or bolts to specifications.
	Burned or rusted out exhaust pipe heat tube extensions.	Replace heat tube extensions as required.
Exhaust Noises	Leaks at manifold or pipe connections.	Tighten clamps at leaking connections to specified torque. Replace gasket or packing as required.
	Burned or blown out muffler.	Replace muffler assembly.
	Burned or rusted out exhaust pipe.	Replace exhaust pipe.
	Exhaust pipe leaking at manifold flange.	Tighten attaching bolts nuts to 17 lb. ft. (23 N·m)
	Exhaust manifold cracked or broken.	Replace manifold.
	Leak between manifold and cylinder head.	Tighten manifold to cylinder head stud nuts or bolts to specifications.
Loss of engine power and/or internal rattles in muffler.	Dislodged turning tubes and or baffles in muffler.	Replace muffler.
Loss of engine power.	Imploding (inner wall collapse) of exhaust pipe (except "P" Truck)	Replace exhaust pipe.

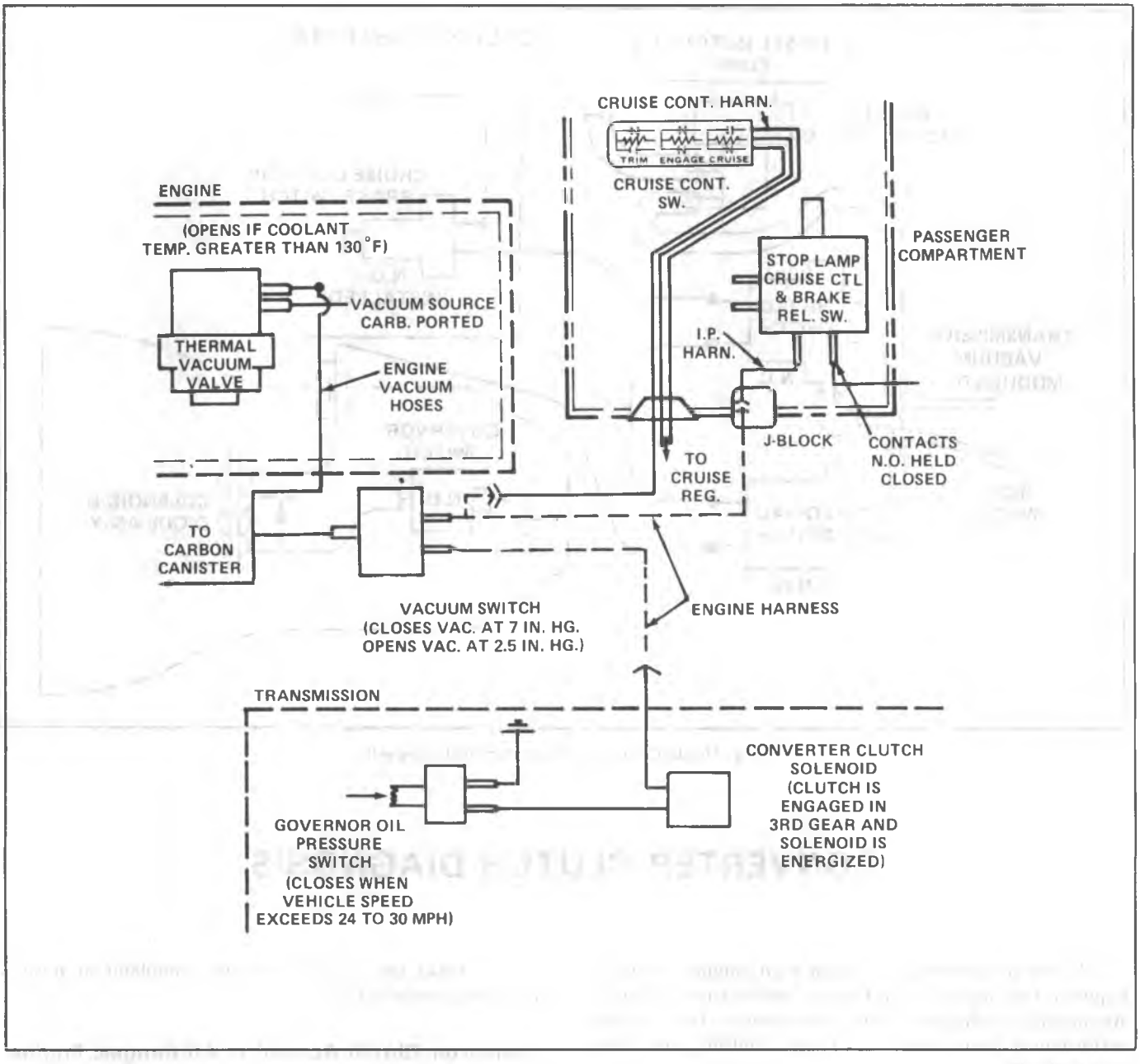
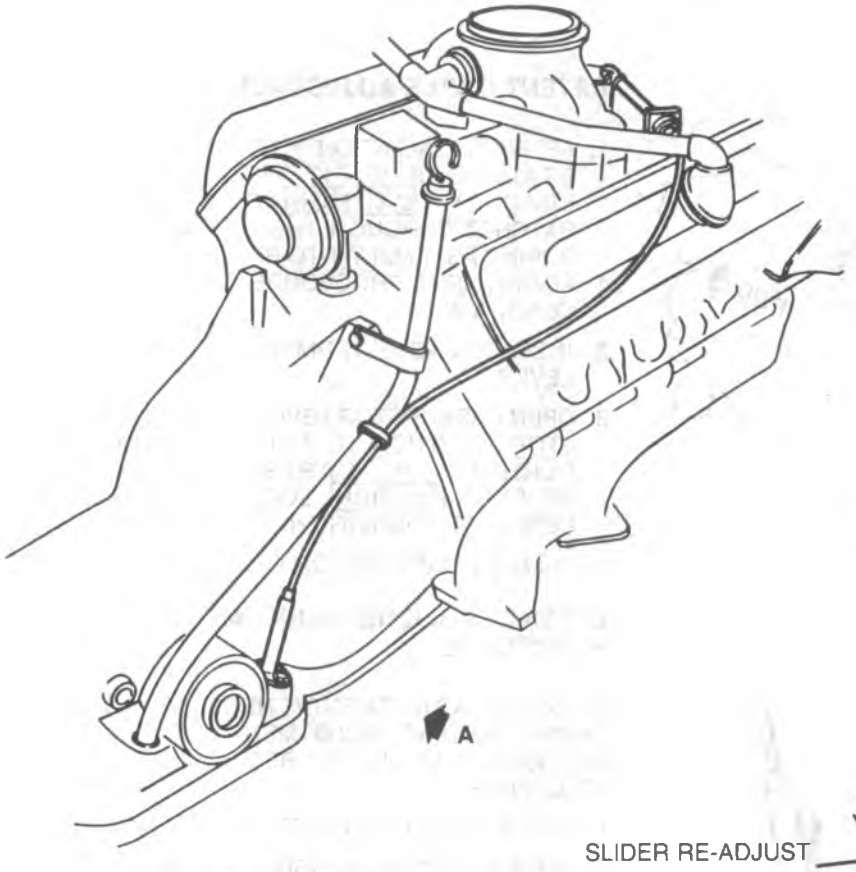
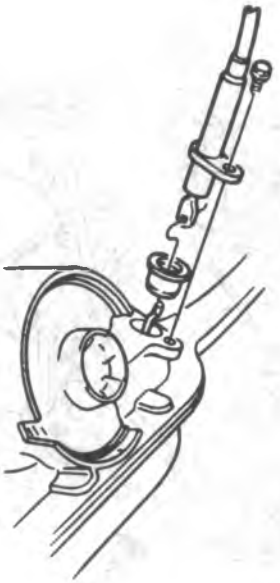
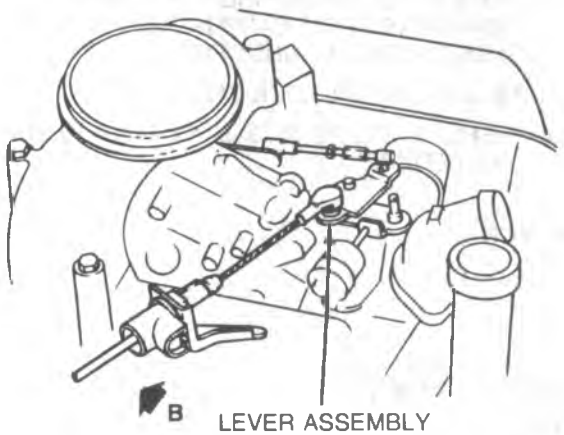


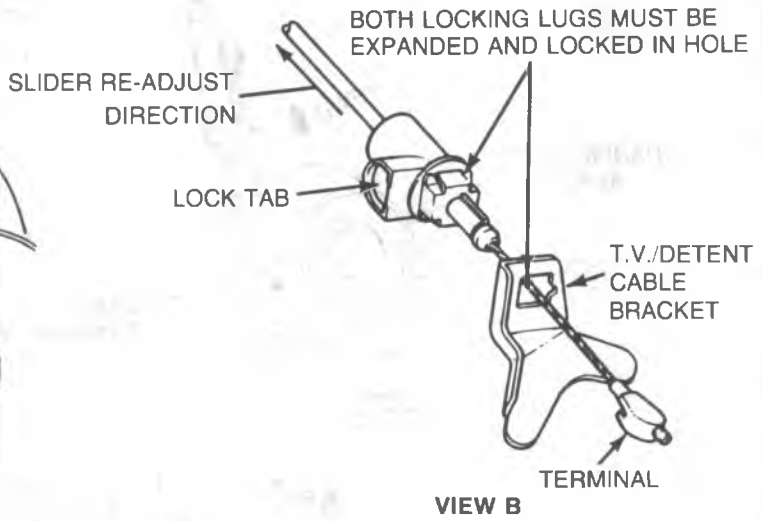
Fig. 7A-2a–Converter Clutch Controls (Gas)





VIEW A





VIEW B

CABLE ADJUSTMENT PROCEDURE

1. Remove pump rod from lever assembly.
2. After installation to transmission, install cable fitting into cable bracket. **CAUTION** Slider must not be adjusted before or during assembly to bracket.
3. Install cable terminal to lever assembly.
4. Rotate the lever assembly to its full throttle stop position to automatically adjust slider on cable to correct setting.
5. Release lever assembly & reconnect the pump rod to lever assembly.

CABLE RE-ADJUSTMENT PROCEDURE

In case re-adjustment is necessary because of inadvertent adjustment before or during assembly, perform the following.

1. Remove pump rod from lever assembly, depress and hold metal lock tab.
2. Move slider through fitting in direction away from lever assembly until slider stops against fitting.
3. Release metal lock tab.
4. Repeat steps 4 & 5 of adjustment procedure.

Fig. 7A-6a—Detent Cable Adjustment - Diesel

ON VEHICLE SERVICE

TRANSMISSION REPLACEMENT

(All Except K Model)

If necessary, the catalytic converter may have to be disconnected to provide adequate clearance for transmission removal. This procedure will include removal of the converter support bracket.

1. Before raising the vehicle, disconnect the negative battery cable detent downshift cable at carburetor and release the parking brake.
2. Raise vehicle on hoist.
3. Remove propeller shaft.
4. Disconnect speedometer cable, detent downshift cable, modulator vacuum line and oil cooler pipes at transmission.
5. Disconnect shift control linkage.
6. Support transmission with suitable transmission jack.
7. Disconnect rear mount from frame crossmember.
8. Remove two bolts at each end of frame crossmember. Remove crossmember.
9. Remove converter under pan.
10. Remove converter-to-flexplate bolts, as shown in Fig. 7A-14.
11. Lower transmission until jack is barely supporting it.
12. Remove transmission to engine mounting bolts and remove oil filler tube at transmission.
13. Raise transmission to its normal position, support engine with jack and slide transmission rearward from engine and lower it away from vehicle.

Use suitable converter holding tool when lowering transmission or keep rear of transmission lower than front so as not to lose converter.

The installation of the transmission is the reverse of the removal with the following added step. Before installing the flexplate-to-converter bolts, make certain that the attaching lugs on the converter are flush with the flex plate and the converter rotates freely by hand in this position. Refer to Fig. 7A-14 for instructions on attaching the converter-to-flexplate. This will insure proper converter alignment.

After installation of transmission, lower vehicle and remove vehicle from hoist. Check linkage for proper adjustment.

Check transmission fluid level.

TRANSMISSION REPLACEMENT (K MODEL)

1. Disconnect battery cable.
2. Remove transmission dipstick.
3. Disconnect detent downshift cable at carburetor.
4. Remove transfer case shift lever knob and boot.
5. Raise vehicle on hoist.

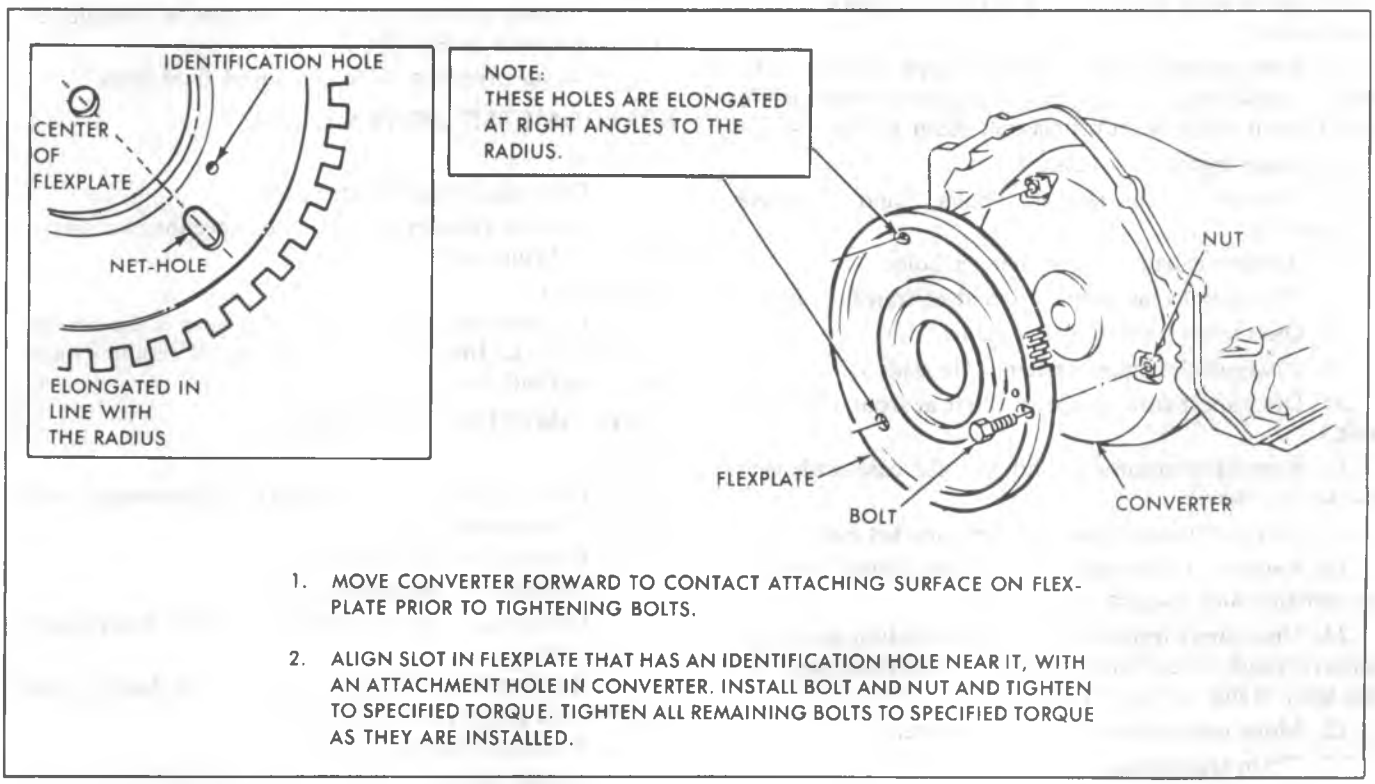


Fig. 7A-14–Typical Transmission Mounting, Net-Hole Design

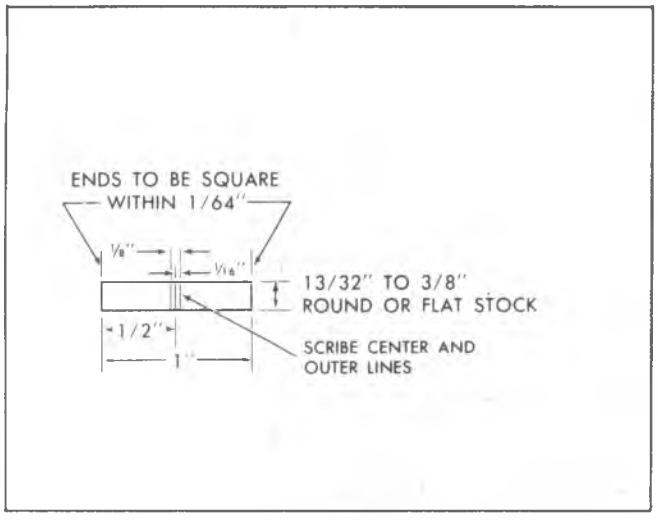


Fig. 7A-38--Vacuum Modulator

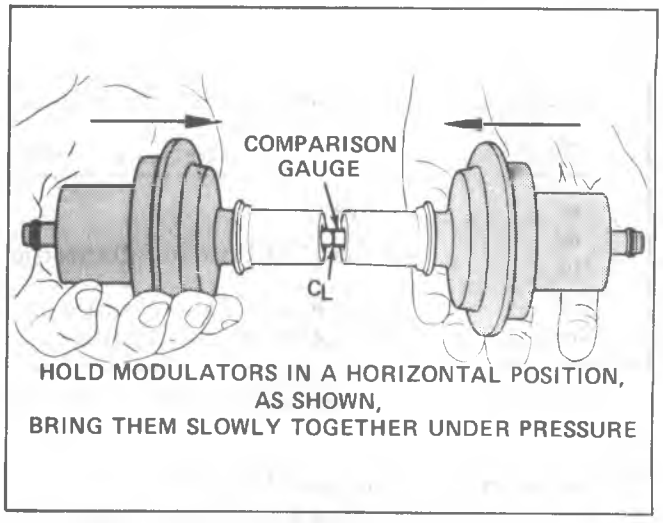


Fig. 7A-40--Holding Modulators in Horizontal Position

Sleeve Alignment Check

Roll the main body of the modulator on a flat surface and observe the sleeve for concentricity to the can. If the sleeve is concentric and the plunger is free, the modulator is acceptable.

Once the modulator assembly passes all of the above tests, it is an acceptable part and should be reused.

400 Trans. With Diesel Engine

If erratic or poor quality shifting occurs due to incorrect vacuum supply to the modulator, check the vacuum regulator valve and the vacuum pump as described in Section 6A-6 of this manual.

MANUAL LINKAGE

Manual linkage adjustment and the associated neutral safety switch are important from a safety standpoint. The neutral safety switch should be adjusted so that the engine will start in the Park (P) and Neutral (N) positions only.

With the selector lever in the Park position, the parking pawl should freely engage and prevent the vehicle from rolling. The pointer on the indicator quadrant should line up properly with the range indicators in all ranges.

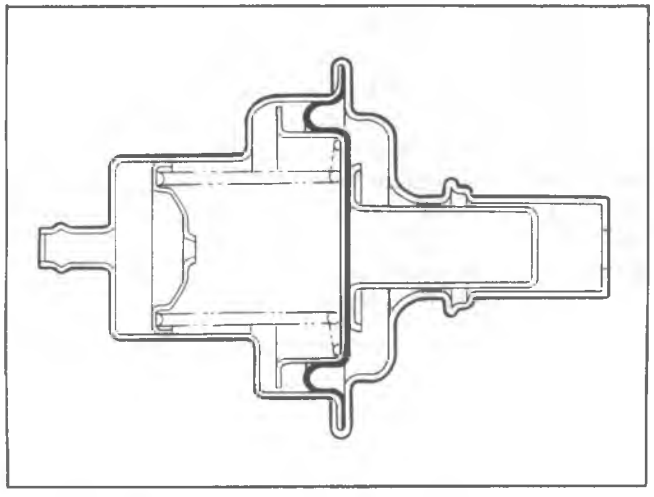


Fig. 7A-39--Bellows Comparison Gage

TROUBLE DIAGNOSIS, BY CONDITION

NOTICE: On vehicles with diesel engine, the vacuum source for the vacuum modulator is the Vacuum Regulator Valve. When diagnosing shift complaints on these vehicles, it is important to assure that the vacuum pump is providing 22 in. (28 kPa) of vacuum to this valve. Also check the throttle linkage adjustment as outlined in Section 6A-3 of this manual.

No Drive in Drive Range

(Install pressure gage)

- Low oil level - check for external leaks or defective vacuum modulator (leaking diaphragm will evacuate oil from unit).
- Manual linkage maladjusted (correct alignment in manual lever shift quadrant is essential); manual valve disconnected from manual lever pin.
- Low oil pressure - refer to LOW LINE PRESSURE below.

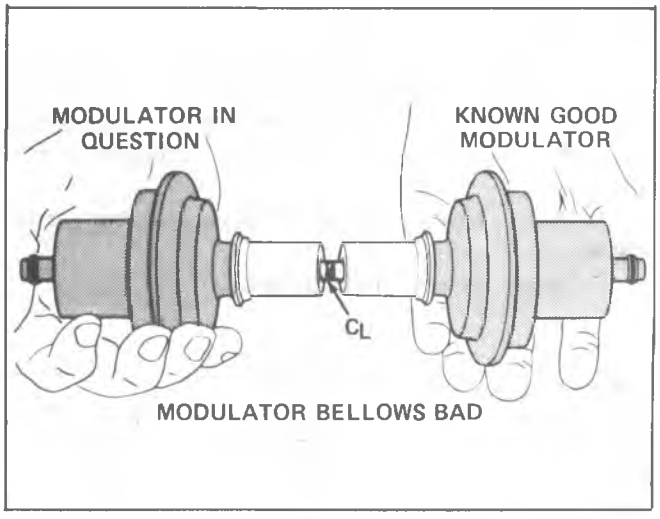


Fig. 7A-41--Modulator Bellows - Bad

SPECIFICATIONS

350 C (MV4)

Pump Cover to Pump Body	23 N·m	17 ft. lb.
Pump Assembly to Case	24 N·m	18.5 ft. lb.
Valve Body and Auxiliary Valve Body	14 N·m	130 in. lb.
Parking Lock Bracket	39 N·m	29 ft. lb.
Oil Suction Screen	4 N·m	40 in. lb.
Oil Pan to Case	14 N·m	130 in. lb.
Extension to Case	33 N·m	25 ft. lb.
Modulator Retainer to Case	14 N·m	30 in. lb.
Inner Selector Lever to Shaft	33 N·m	25 ft. lb.
Detent Valve Actuating Bracket	6 N·m	52 in. lb.
Converter to Flywheel Bolts	47 N·m	35 ft. lb.
Under Pan to Transmission Case	12 N·m	110 in. lb.
Transmission Case to Engine	47 N·m	35 ft. lb.
Oil Cooler Pipe Connectors to Transmission Case or Radiator	14 N·m	125 in. lb.
Oil Cooler Pipe to Connectors	13 N·m	10 ft. lb.
Detent Cable to Transmission	8 N·m	75 in. lb.
Detent Cable to Carb	12 N·m	112 in. lb.
Solenoid Assembly	4 N·m	3 ft. lb.
Governor Pressure Switch	10 N·m	8 ft. lb.

400 (M40)

Pump Cover Bolts	24 N·m	18 ft. lb.
Parking Pawl Bracket Bolts	24 N·m	18 ft. lb.
Center Support Bolt	29 N·m	23 ft. lb.
Pump to Case Attaching Bolts	24 N·m	18 ft. lb.
Extension Housing to Case Attaching Bolts		23 ft. lb.
Rear Servo Cover Bolts	24 N·m	18 ft. lb.
Detent Solenoid Bolts	9 N·m	7 ft. lb.
Control Valve Body Bolts	10 N·m	8 ft. lb.
Bottom Pan Attaching Screws	14 N·m	12 ft. lb.
Modulator Retainer Bolt	24 N·m	18 ft. lb.
Governor Cover Bolts	24 N·m	18 ft. lb.
Manual Lever to Manual Shaft Nut	10 N·m	8 ft. lb.
Manual Shaft to Inside Detent Lever	24 N·m	18 ft. lb.
Linkage Swivel Clamp Nut	57 N·m	43 ft. lb.
Converter Dust Shield Screws	124 N·m	93 ft. lb.
Transmission to Engine Mounting Bolts	47 N·m	35 ft. lb.
Converter to Flywheel Bolts	47 N·m	35 ft. lb.
Rear Mount to Transmission Bolts	54 N·m	40 ft. lb.
Rear Mount to Crossmember Bolt	54 N·m	40 ft. lb.
Crossmember Mounting Bolts	32 N·m	25 ft. lb.
Oil Cooler Line	13 N·m	10 ft. lb.
Line Pressure Take-Off Plug	17 N·m	13 ft. lb.
Strainer Retainer Bolt	13 N·m	10 ft. lb.
Oil Cooler Pipe Connectors to Transmission Case or Radiator	14 N·m	125 in. lb.
Oil Cooler Pipe to Connector	1 N·m	10 in. lb.
Downshift Switch to Bracket	2 N·m	22 in. lb.

1. Drive Gear Bearing Retainer
2. Retainer Gasket
3. Lip Seal
4. Snap Ring
5. Drive Gear Bearing
6. Oil Slinger
7. Drive Gear and Pilot Bearings
8. Power Take-Off Cover Gasket
9. Power Take-Off Cover
10. Retaining Screws
11. 1st-2nd Speed Blocker Ring
12. Synchronizer Spring
13. 1st-2nd Speed Synchronizer Hub
14. Synchronizer Keys
15. Synchronizer Spring
16. Reverse Driven Gear
17. 1st Gear Bushing
18. 1st Gear
19. Thrust Washer
20. Rear Main Bearing
21. Bearing Snap Ring
22. Speedometer Gear
23. Rear Mainshaft Lock Nut
24. 2nd Speed Bushing (On Shaft)
25. Mainshaft
26. 2nd Speed Gear
27. 3rd Gear Bushing
28. Thrust Washer
29. 3rd Speed Gear
30. 3rd Speed Blocker Ring
31. Synchronizer Spring
32. Synchronizer Keys
33. 3rd-4th Synchronizer Hub
34 Synchronizer Spring
35. 3rd-4th Speed Blocker Ring
36. 3rd-4th Speed Synchronizer Sleeve
37. **Snap Ring**
38. **Snap Ring**
39. **Thrust Washer**
40. **Clutch Countergear**
41. **Spacer**
42. **3rd Speed Countergear**
43. **Countergear Shaft**
44. **Countergear Rear Bearing**
45. **Snap Ring**
46. **Bearing Outer Snap Ring**
47. **Rear Retainer Gasket**
48. **Rear Retainer**
49. **Retainer Bolts**
50. **Retainer Lip Seal**
51. **Reverse Idler Shaft**
52. **Drain Plug**
53. **Reverse Idler Gear**
54. **Case**
55. **Fill Plug**
56. **Countergear Front Bearing**
57. **Gasket**
58. **Front Cover**
59. **Cover Screws**

Fig. 7B-6--4-Speed 117mm, Exploded View

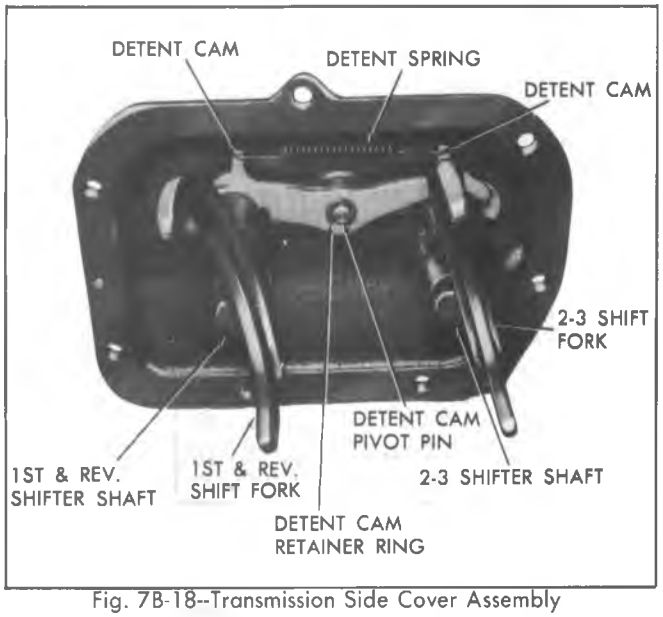


Fig. 7B-18--Transmission Side Cover Assembly

housing until lock plate can be inserted in groove and attached to housing.

TRANSMISSION SIDE COVER

Replacement / Repair (Fig. 7B-17)

1. Disconnect control rods from levers and back-up lamp wiring.
2. Shift transmission into neutral detent positions before removing cover. Remove cover assembly from transmission case carefully and allow oil to drain.
3. Remove the outer shifter levers.
4. Remove both shift forks from shifter shaft assemblies. Remove both shifter shaft assemblies from cover. Seals around shifter shaft may now be pried out if replacement is required because of damage.
5. Remove detent cam spring and pivot retainer "C" ring. Remove both detent cams.
6. With detent spring tang projecting up over the 2nd and 3rd shifter shaft cover opening, install the first and reverse detent cam onto the detent cam pivot pin. With the detent spring tang projecting up over the first and reverse shifter shaft cover hole install the 2nd and 3rd detent cam.
7. Install detent cam retaining "C" ring to pivot shaft, and hook spring into detent cam notches.
8. Install both shifter shaft assemblies in cover being careful not to damage seals. Install both shift forks to shifter shaft assemblies, lifting up on detent cam to allow forks to fully seat into position.
9. Install outer shifter levers, flat washers, lock washers and bolts.
10. Shift shifter levers into neutral detent (center) position and slide cover into place making sure the shift forks are aligned with their respective mainshaft clutch sliding sleeves.
11. Install cover attaching bolts and tighten evenly to specified torque, then connect wiring.
12. Remove filler plug and add lubricant specified in Section 0B to level of filler plug hole.

TRANSMISSION FLOOR SHIFT CONTROL LEVER REPLACEMENT (4 SPEED) 117mm

1. On K-Series models, remove transfer case shift lever boot retainer attaching screws and retainer from compartment floor.
2. Remove floor covering from vehicle.
3. Remove transmission shift lever boot retainer attaching screws.
4. Slide boot and retainer up on shift lever and remove the transmission shift lever using Tool J-8109 as shown in Fig. 7B-14.
5. To install, reverse removal procedure Steps 1-4.

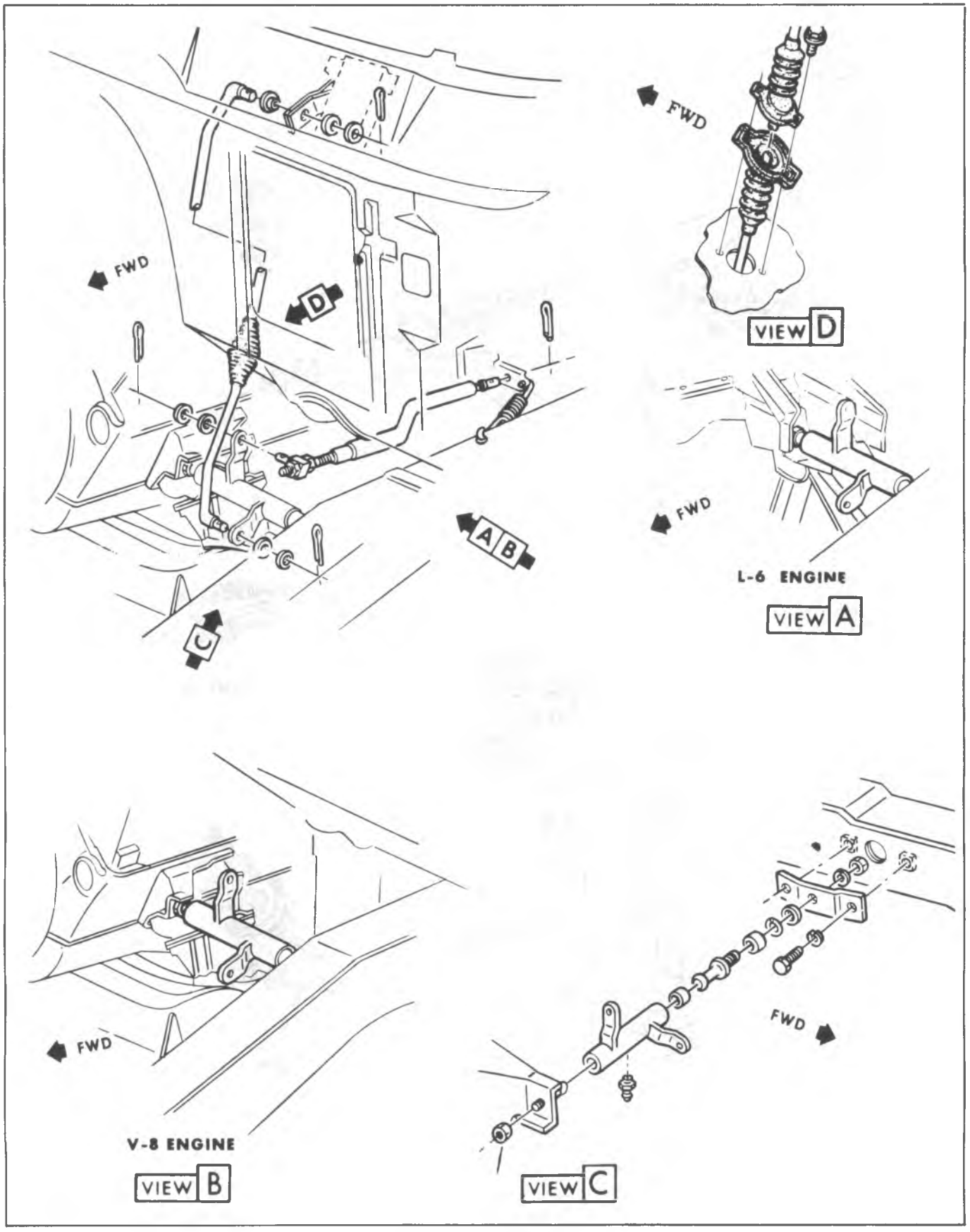


Fig. 7C-7–G-Truck Clutch Controls

Shift Pattern

A floor mounted shift lever is used to select the various operating ranges on the 208 model. The shift lever is located on the floorpan transmission tunnel adjacent to the transmission gearshift lever. Furthermore, the transfer case shift pattern is not in a straight line for 208 models, the range positions are shown in Fig. 7E-2.

Four-Wheel Drive Indicator Lamp

An indicator lamp is mounted in the instrument panel to alert the driver whenever the vehicle is being operated in four-wheel range. The lamp is controlled by an indicator switch in the transfer case (Fig. 7E-3). The switch is a ball and plunger unit that is activated by the transfer case range sector when four-wheel range is selected.

Identification

An identification tag is attached to the rear half of the transfer case (Fig. 7E-3). This tag provides the transfer case model number, low range reduction ratio, and assembly number. The information on this tag is necessary for servicing information. If the tag is removed or becomes dislodged during service operations, it should be reattached using an adhesive sealant such as Loctite 312, or equivalent.

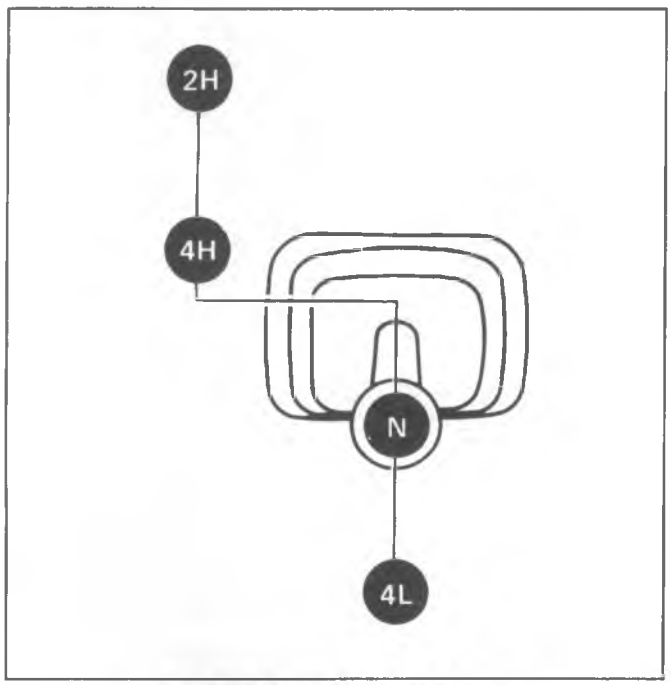


Fig. 7E-2 Model 208 Shift Pattern

Lubrication

The Model 208 transfer case lubricant should be changed at the intervals specified in the Maintenance Schedule. When adding lubricant to or refilling the transfer case after service, use Dexron® II. Refer to the maintenance and adjustments section for lubricant change procedures and fill level.

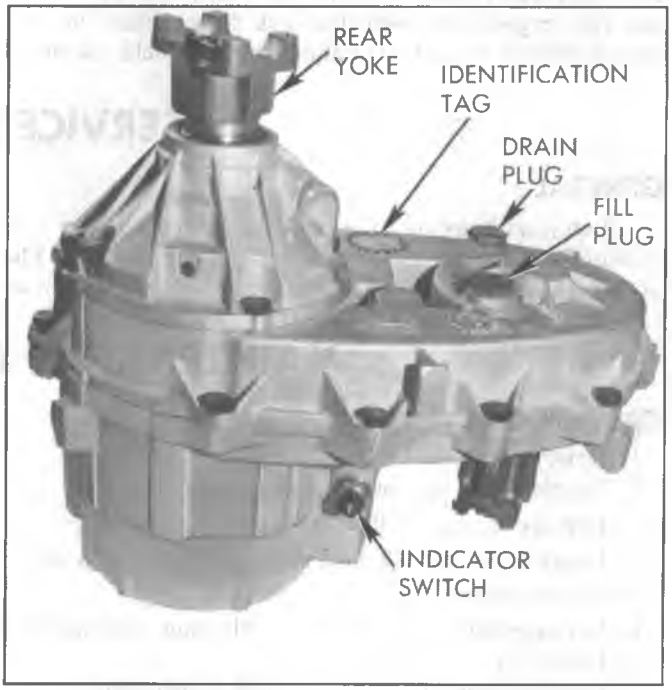


Fig. 7E-3 Model 208 Indicator Switch, Identification Tag, and Drain and Fill Plug Location

Power Flow

In all drive range positions input torque is transmitted to the transfer case gear train through the transfer case input gear.

In 2H range, torque flows from the input gear to the planetary assembly and annulus gear which rotate as a unit. Torque is transferred to the mainshaft through the planetary carrier which is splined to the mainshaft. Torque flow continues through the mainshaft and rear yoke which is splined to the mainshaft, and finally to the rear propeller shaft and axle. In 2H range, the sliding clutch remains in a neutral position and does not lock the drive sprocket to the mainshaft. As a result, torque is not transferred to the driven sprocket.

In 4H range, input torque from the input gear is transmitted through the planetary and annulus gear and through the mainshaft in exactly the same fashion as in 2H range. However, in 4H position, the sliding clutch is shifted forward and into engagement with the mainshaft clutch gear. This locks the drive sprocket to the mainshaft through the sliding clutch. Torque is now transmitted through the drive sprocket to the driven sprocket by the connecting drived chain. Since the front output shaft is splined to the driven sprocket, torque now flows through the front output shaft to the front propeller shaft and axle resulting in high range four-wheel drive.

In 4L range, the path of torque through the transfer case is exactly the same as in 4H range but with one major

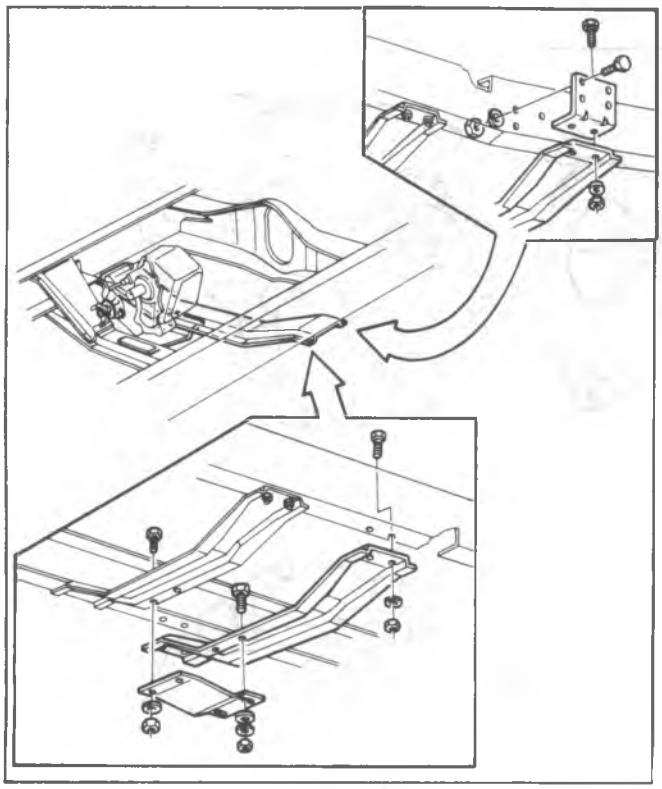


Fig. 7E-11--Skid Plates

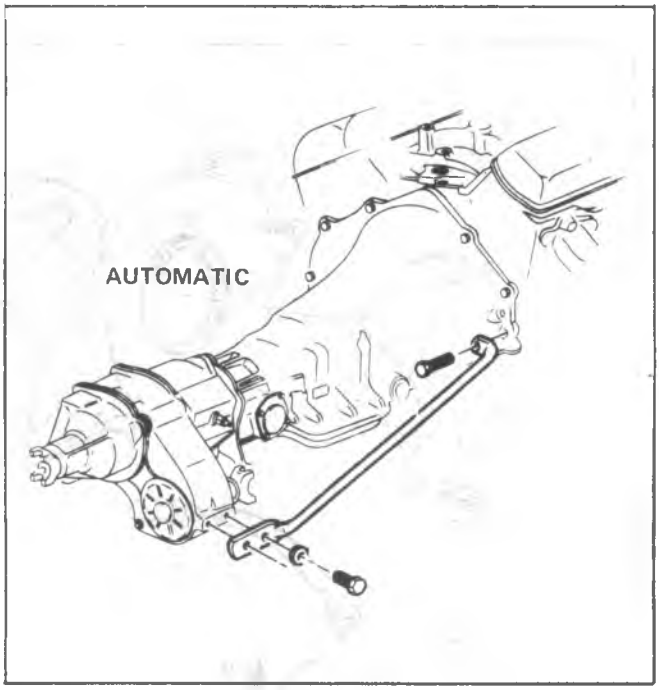


Fig. 7E-12--Strut Rods

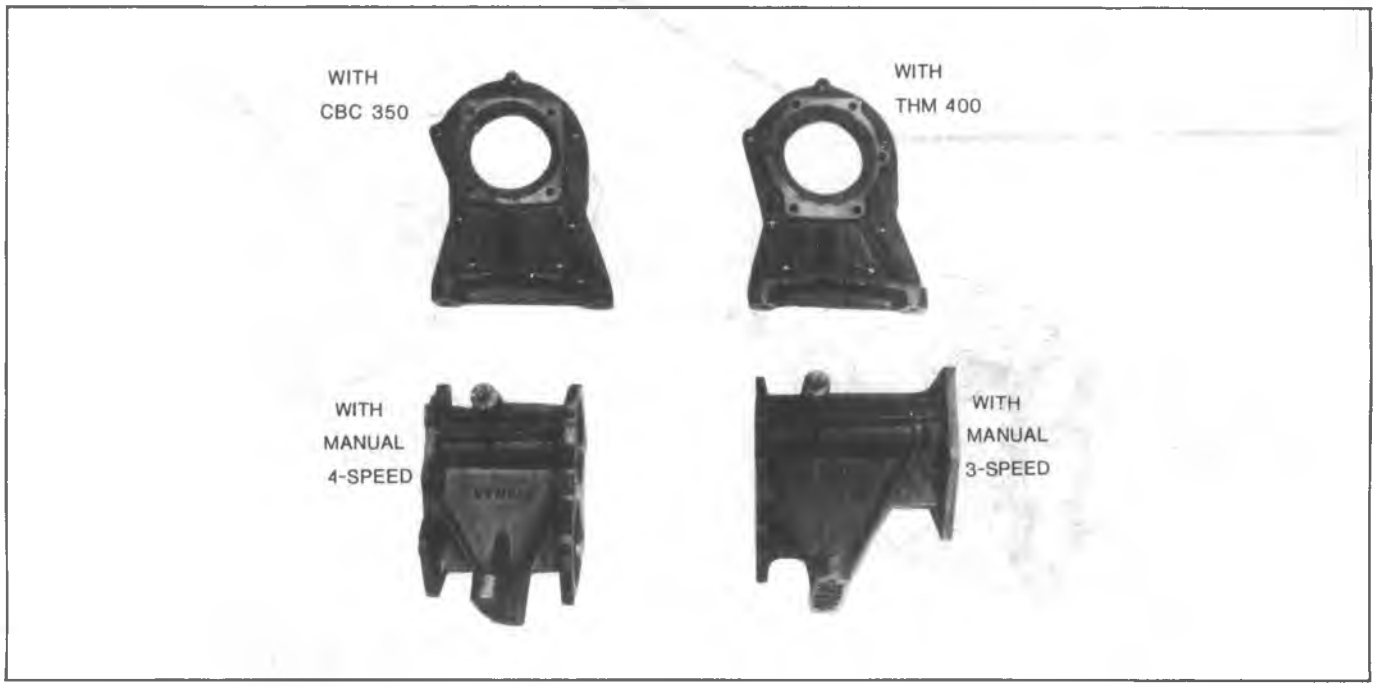


Fig. 7E-13--Adapter Assembles

Hazard warning lamps inoperative	1. Blown stop-hazard fuse	1. Switch turn signals on. If lamps operate, replace stop-hazard fuse if blown. If new fuse blows, repair short to ground. (Could be in stop light circuit).
	2. Defective hazard warning flasher. (Located on fuse panel).	2. If stop-hazard fuse is OK, switch turn signals on. If lamps operate, replace defective hazard flasher.
	3. Open in wiring or defective turn signal switch.	3. Using test lamp, check brown wire in turn signal steering column connector. If lamp does not light on either side of connector, repair open circuit between flasher and connector. If lamp lights only on feed side of connector, clean connector contacts, If lamp lights on both sides of connector, replace defective turn signal switch assembly.

BACK-UP LAMP

Condition	Possible Cause	Correction
One lamp inoperative or intermittent	1. Loose or burnt out bulb	1. Secure or replace bulb.
	2. Loose connection	2. Tighten connectors.
	3. Open ground connections	3. Repair bulb ground circuit.
Both lamps inoperative or intermittent.	1. Neutral start switch misadjusted (Open when shift lever is in reverse position)	1. Readjust neutral start switch.
	2. Loose connection or open circuit	2. Secure all connectors. If OK, check continuity of circuit from fuse to lamps with test lamp. If lamp does not light on either side of fuse, correct open circuit from battery to fuse.
	3. Blown fuse	3. Replace fuse. If new fuse blows, repair short to ground in circuit from fuse through neutral start switch to back-up lamps.
	4. Defective neutral start switch	4. With ignition on, check switch terminals in back-up position with test lamp. If lamp lights at pink wire terminal but not at light green wire terminal, replace neutral start switch.
	5. Defective ignition switch	5. If test lamp lights at ignition switch battery terminal but not at output terminal, replace ignition switch.

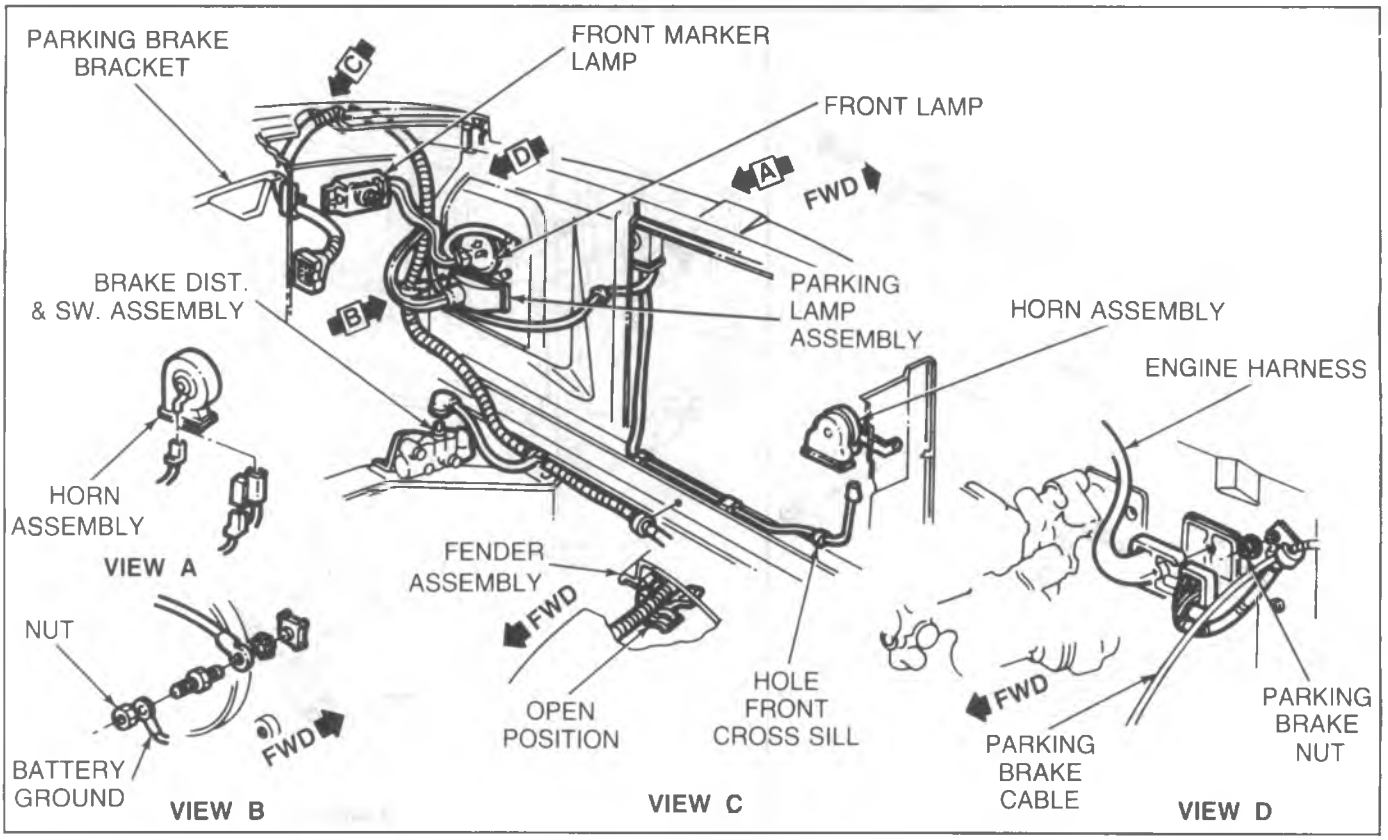


Fig. 8A-13--G Series Forward Lamp Wiring

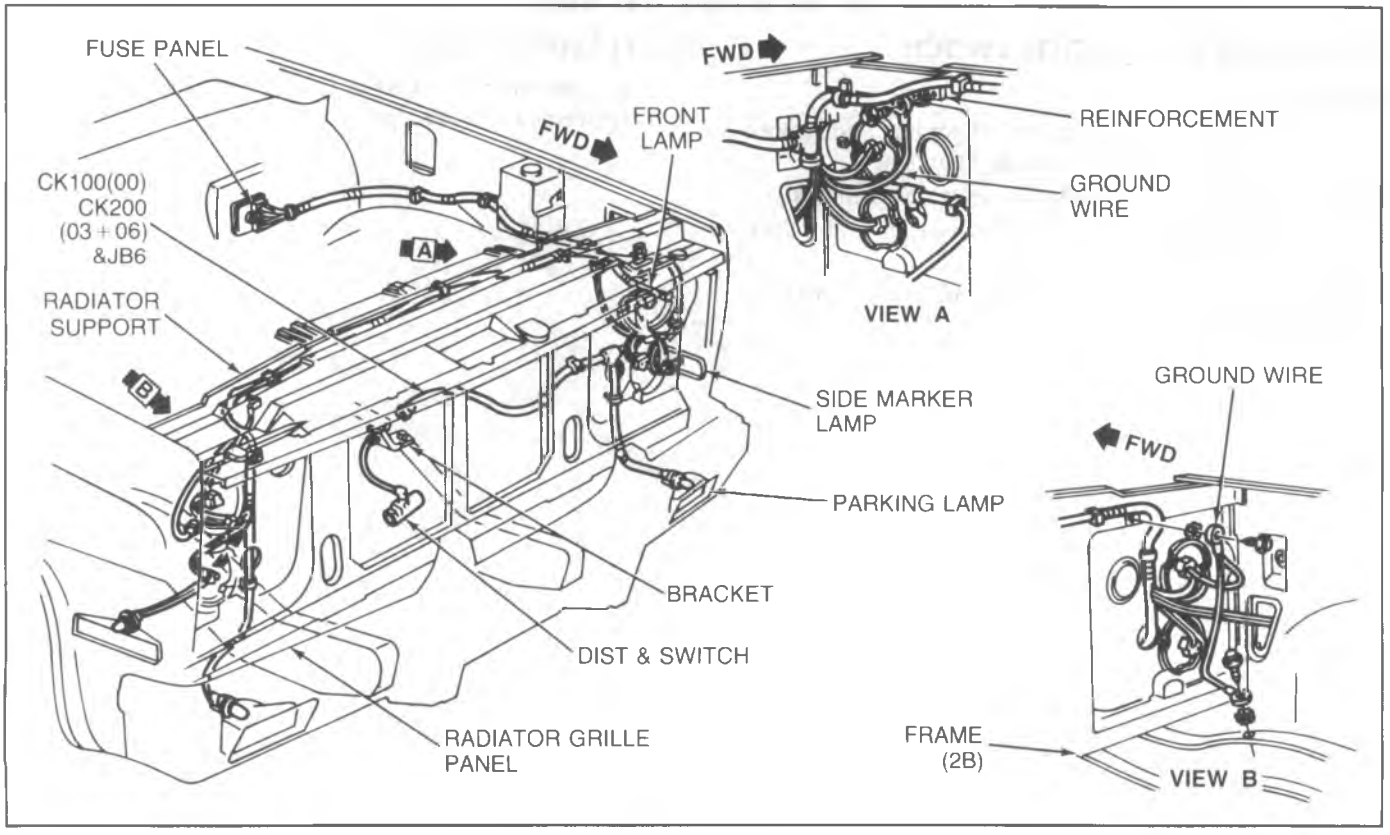


Fig. 8A-14--CK Series Forward Lamp Wiring

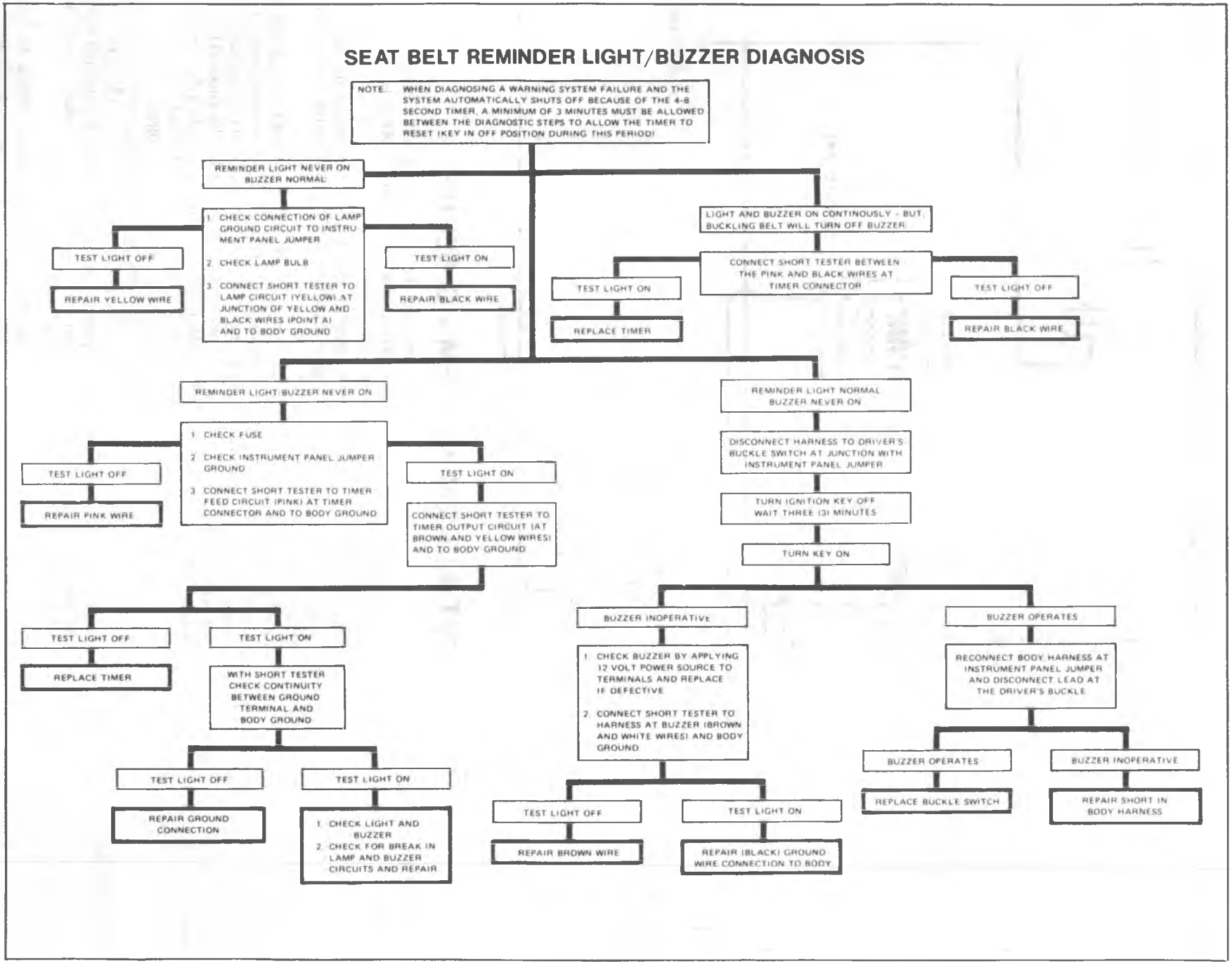


Fig. 8B-12--Seat Belt Reminder System Diagnosis

CHARGING SYSTEM INDICATOR

Condition	Possible Cause	Correction
Light on, ignition off.	1. Shorted positive diode.	1. Locate and replace shorted diode.
Light not on, ignition on and engine not running.	1. Bulb burned out.	1. Replace bulb.
	2. Open in light circuit.	2. Locate and correct open.
	3. Open in field.	3. Replace rotor.
Light on, engine running above idle speed.	1. No generator output.	1. Check and correct cause of no output.
	2. Shorted negative diode.	2. Locate and replace shorted diode.
	3. Loose or broken generator belt.	3. Tighten or replace and tighten generator belt.

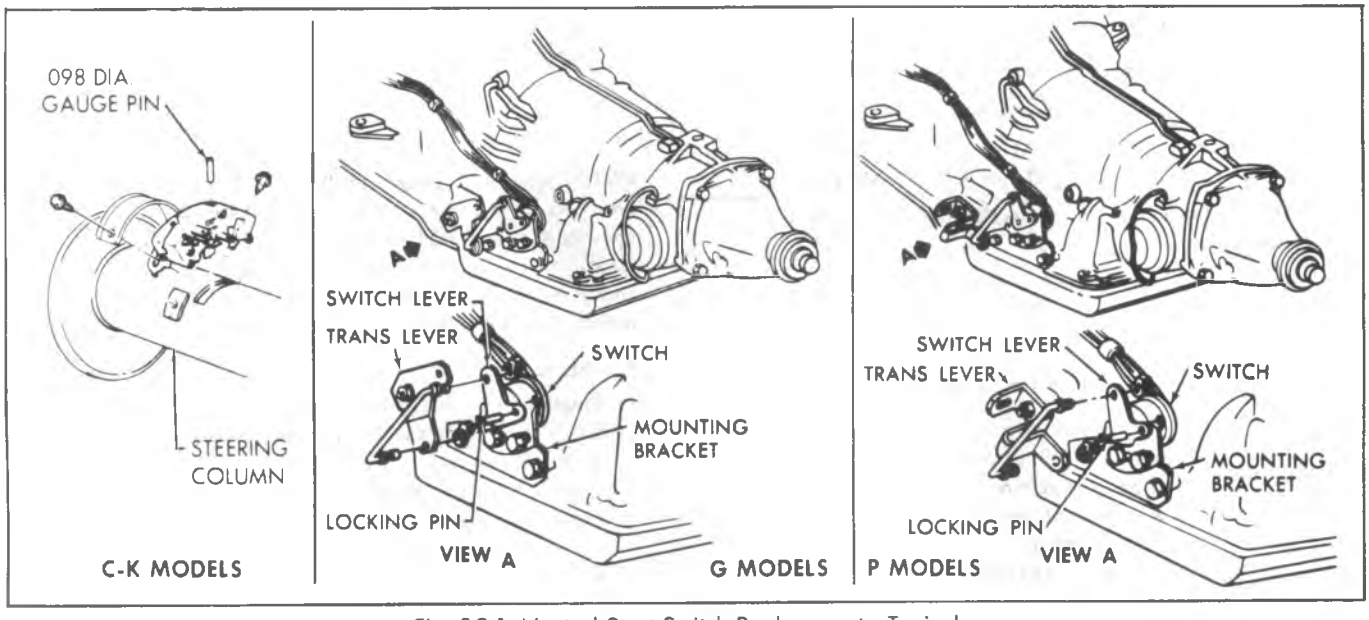


Fig. 8C-1--Neutral Start Switch Replacement - Typical

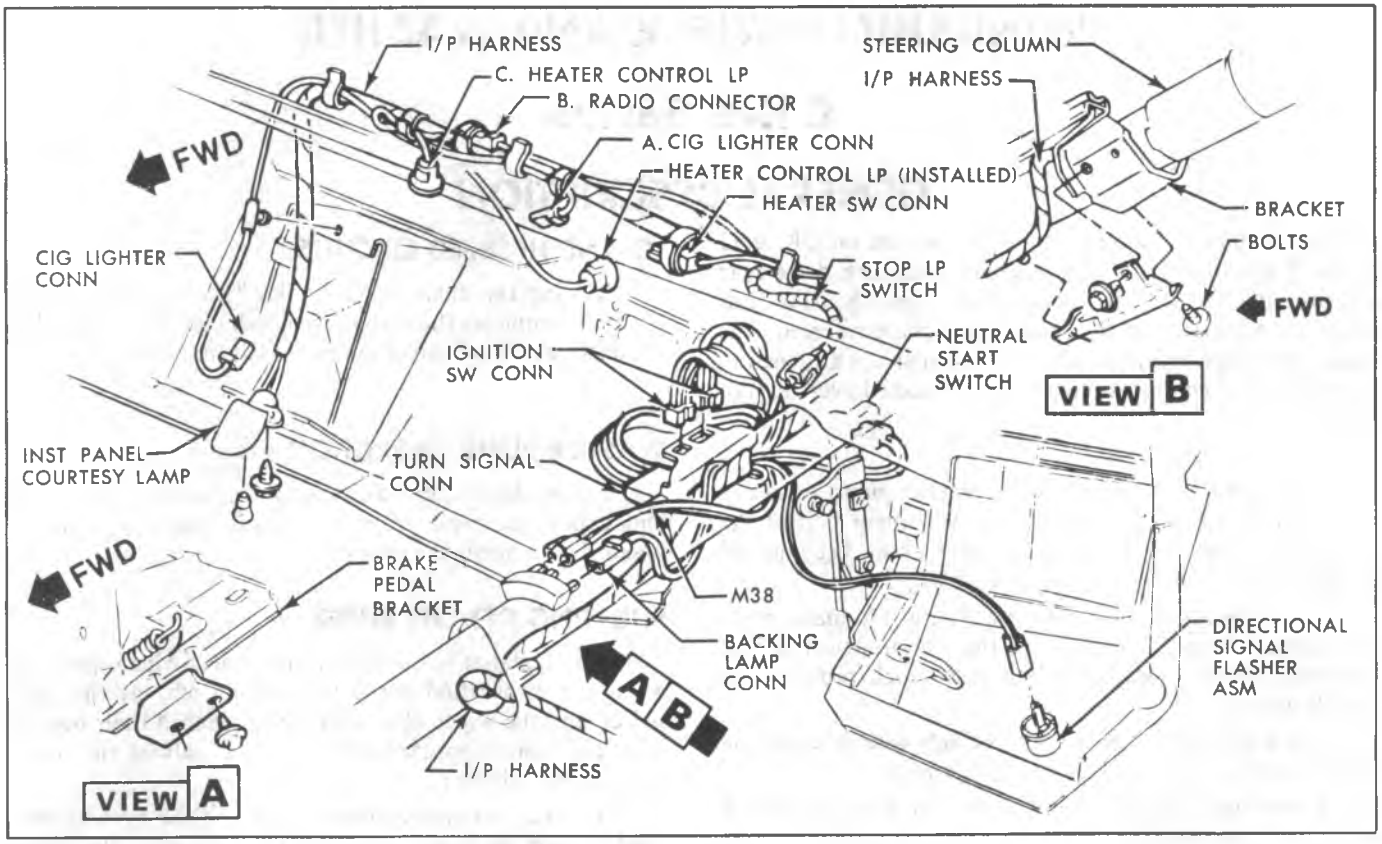


Fig. 8C-7--Instrument Panel Wiring R.H. - CK Models

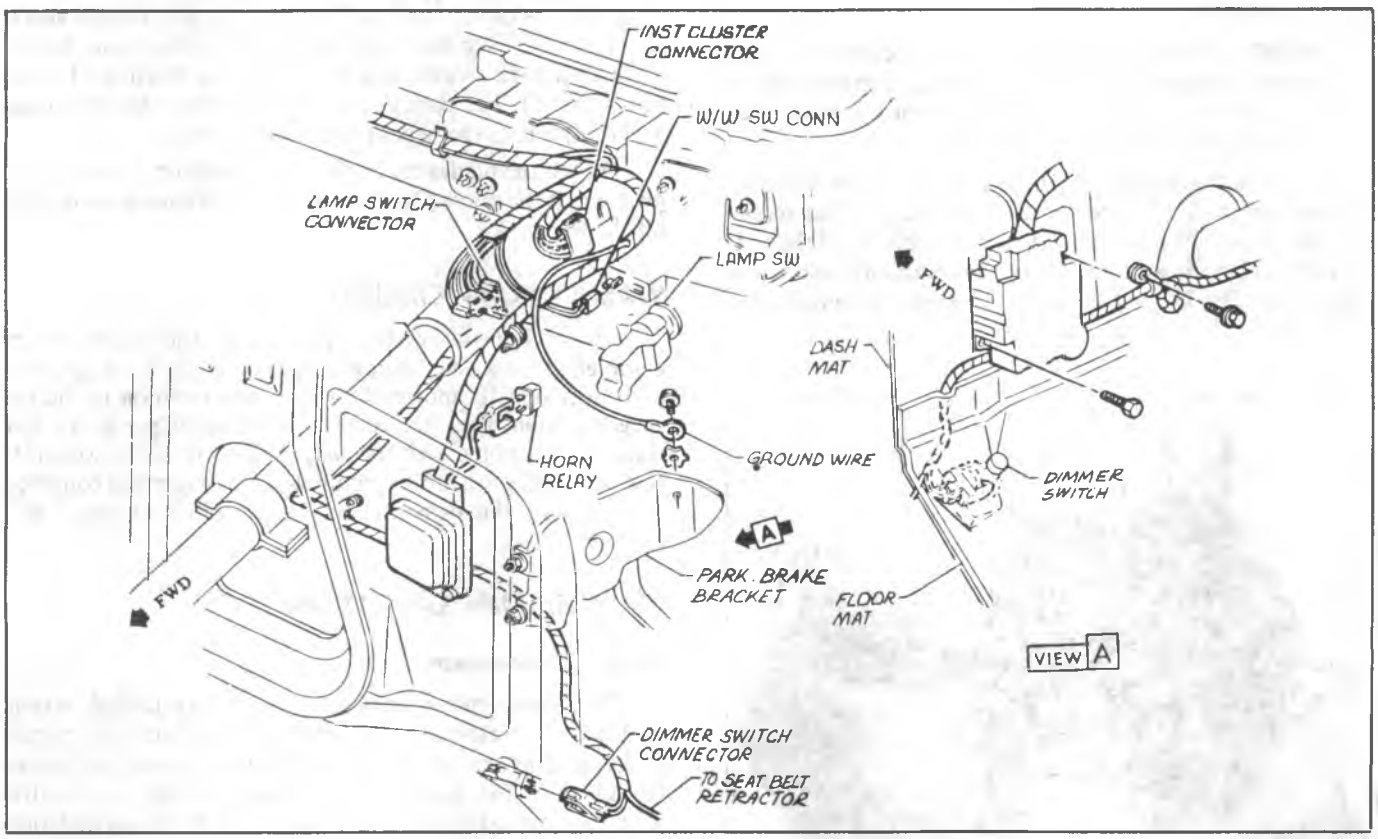


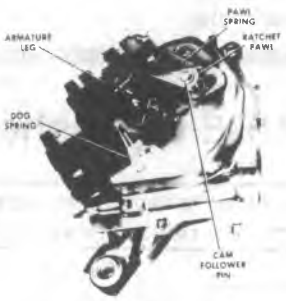
Fig. 8C-8--Instrument Panel Wiring - L.H. - CK Models

STEP 4

Remove washer pump cover and re-connect wiring to wiper motor terminals 1, 2 and 3. Turn on wiper motor and observe if ratchet pawl is moving back and forth.

Not moving

Check the following:
1) Pawl spring properly connected.
2) Cam-follower not binding.



Moves back and forth

Leave wiper running and Go To STEP 5

STEP 5

Connect 12(+) volts to one of washer pump terminals (6 or 7) and ground the other for approx. 2 seconds. Observe it relay armature is pulled toward the relay coil; armature leg drops down on gear ramp and ratchet pawl starts rotating ratchet gear. Refer to view in STEP 4.

Operates OK

Go To STEP 6

Relay armature operates correctly but ratchet gear doesn't rotate.

Check ratchet gear teeth and/or ratchet gear dog spring engages gear teeth. Refer to above Illustration.

Armature Leg doesn't clear rim on ratchet gear. Drops back in slot area on edge of rim.

Check the following:
a) Relay coil-sw. assy. correctly assembled to washer frame

b) Burr on end of armature leg. File off as required.

c) Loose coil on pole piece.

STEP 6

Observe if piston actuator plate move back and forth with the cam follower pin. Refer to view in STEP 4.

Piston Moves back and forth

Replace valve assembly and recheck pump. If washer pump still fails to pump solution, replace piston and housing assembly.

Piston Not Moving.

Replace piston and housing assembly.

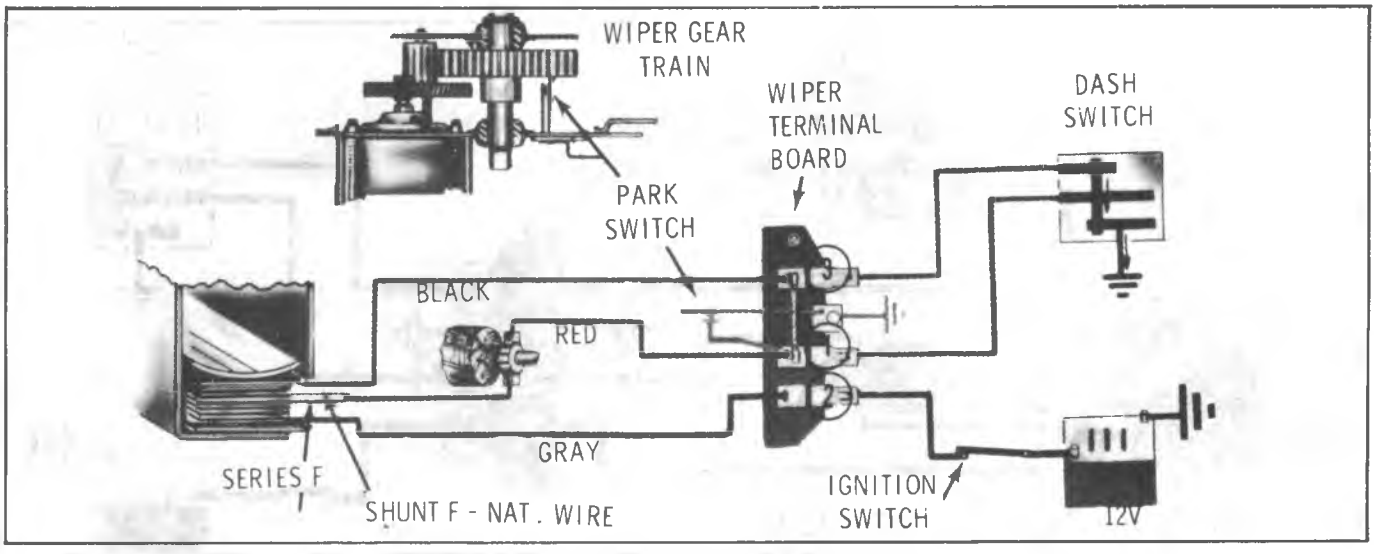


Fig. 8C-28--LO Speed Circuit

wiper will continue to operate until the wiper output gear is turned to a position where its cam opens the park switch. Referring to Figure 8C-30, it can be seen that the wiper motor circuits are completed to ground through the parking switch.

The wiper motor must be securely grounded to body metal.

The shunt field circuit is completed from terminal No. 3 via the switch to terminal No. 1 through the parking switch to ground. The series field and armature circuit is also completed from terminal No. 1 through the parking switch to ground.

The shunt field is connected direct to ground, by-passing the resistor. This results in LO speed operation during the parking operation.

When the output gear cam opens the park switch contacts, the wiper is OFF.

ELECTRICAL CIRCUIT IDENTIFICATION

Circuit Number	Circuit Color	Circuit Name
2	Red	Feed, Battery - Unfused
3	Pink	Feed, Ign. Sw. "On & Crank" Controlled, Unfused
4	Brown	Feed, Ign. Sw. "Accsy & On" Controlled, Unfused
5	Yellow	Neutral Safety Start Sw. or Start Relay Feed
6	Purple	Starter Solenoid Feed
7	Yellow	Primary Ignition Resistance By-Pass
8	Gray	Instrument and Panel Lights (Fused No. 44 Cir.)
9	Brown	Tail, License, Park and Side Marker Lamp Feed
10	Yellow	Dimmer Sw. Feed
11	Light Green	Headlamp Feed, Hi-Beam
12	Tan	Headlamp Feed, Lo-Beam
13	Purple	Front Parking Lamps
14	Light Blue	L.H. Indicator and Front Directional Lamps
15	Dark Blue	R.H. Indicator and Front Directional Lamps
16	Purple	Directional Signal Sw., Feed From Flasher
17	White	Directional Signal Sw., Feed From Stop Sw.
18	Yellow	Stop and Directional Lamp or Directional Lamp Only - Rear L.H.
19	Dark Green	Stop and Directional Lamp or Directional Lamp Only - Rear R.H.
20	Light Blue	Stop Lamp (Only)
21	Pink	Spot Light
22	White	Direct Ground - Trailer
24	Light Green	Back Up Lamp Feed
25	Brown	Feed, Voltage Regulator Controlled
26	Dark Blue	Field Circuit (F) (Gen/Reg.)
27	Brown	Traffic Hazard Sw., Feed From Hazard Flasher
28	Black	Ground, Horn Sw. Controlled
29	Dark Green	Horn Feed
30	Pink	Fuel Gauge to Tank Unit
31	Tan	Oil Pressure, Engine
32	Yellow	Map Light Feed
33	Tan-White	Warning Light - Brake
34	Purple	Fog or Drive Lamp
35	Dark Green	Ground, Eng. Coolant Temp. Sw. or ECM Controlled (Hot)
36	Light Green	Ground, Eng. Temp. Sw. Controlled (Cold)
37	Light Green	Ground, Eng. Metal Temp. Sw. Controlled (Hot)
38	Dark Blue	Flasher Fused Feed
39	Pink-Black	Feed, Ign. Sw. "On and Crank" Controlled - Fused
40	Orange	Feed, Battery - Fused
41	Brown-White	Feed, Ign. Sw. "Accsy and On" Controlled - Fused
42	Yellow	Feed, A/C Auto Relay Controlled
43	Yellow	Radio Feed
44	Dark Green	I.P. and Lights Feed (Usually Light Sw. to Fuse)
45	Black	Marker and Clearance Lamps (Trailers)
46	Dark Blue	Rear Seat Speaker Feed From Single Radio or Right Stereo
47	Dark Blue	Auxiliary Circuit (Trailer)
48	Gray	Tail Lp. - Headlamp Sw. "On" - or Dir. Signal and Stop - Headlamp Sw. "Off" Rear L.H.
49	Dark Blue	Tail Lp. - Headlamp Sw. "On" - or Dir. Signal and Stop - Headlamp Sw. "Off" Rear R.H.
50	Brown	Feed, Ign. Sw. "On" Controlled - Fused
51	Yellow	Blower Resistor Feed - Low
52	Orange	Feed, Blow Sw. "Hi" or Selector Sw. "Max Cold" Controlled
53	Light Green	Valve Release Solenoid to Control Box
54	Dark Green	Control to Shield
55	Orange	Kick Down Solenoid Feed
56	Tan	Amplifier to Transducer
57	Orange	L.H. Cornering Lamp Feed
58	Black	R.H. Cornering Lamp Feed
59	Dark Green	Compressor Feed
60	Orange-Black	Feed, Battery, Circuit Breaker Protected
61	Yellow	Ground, Resistive, Auto A/C Amb. Sensor Controlled
62	Light Green	Ground, Resistive, Auto A/C Feed Back Pot Controlled
63	Tan	Feed, Blower Sw. "Medium 1" Controlled
64	Brown	Blower Sw. Feed From A/C Selector Sw.
65	Purple	Blower Motor Feed
66	Light Green	Feed, A/C Selector Sw. Controlled (Comp. Ct.)
67	Light Blue	Feed, A/C Freon Press, Cut-Out Sw. Controlled
68	Yellow-Black	Ground, Resistive, Low Coolant Probe Controlled
69	Gray	Ground Low Coolant Module Controlled
70	Pink	Feed, Relay Controlled, Ign. Sw. Controlled

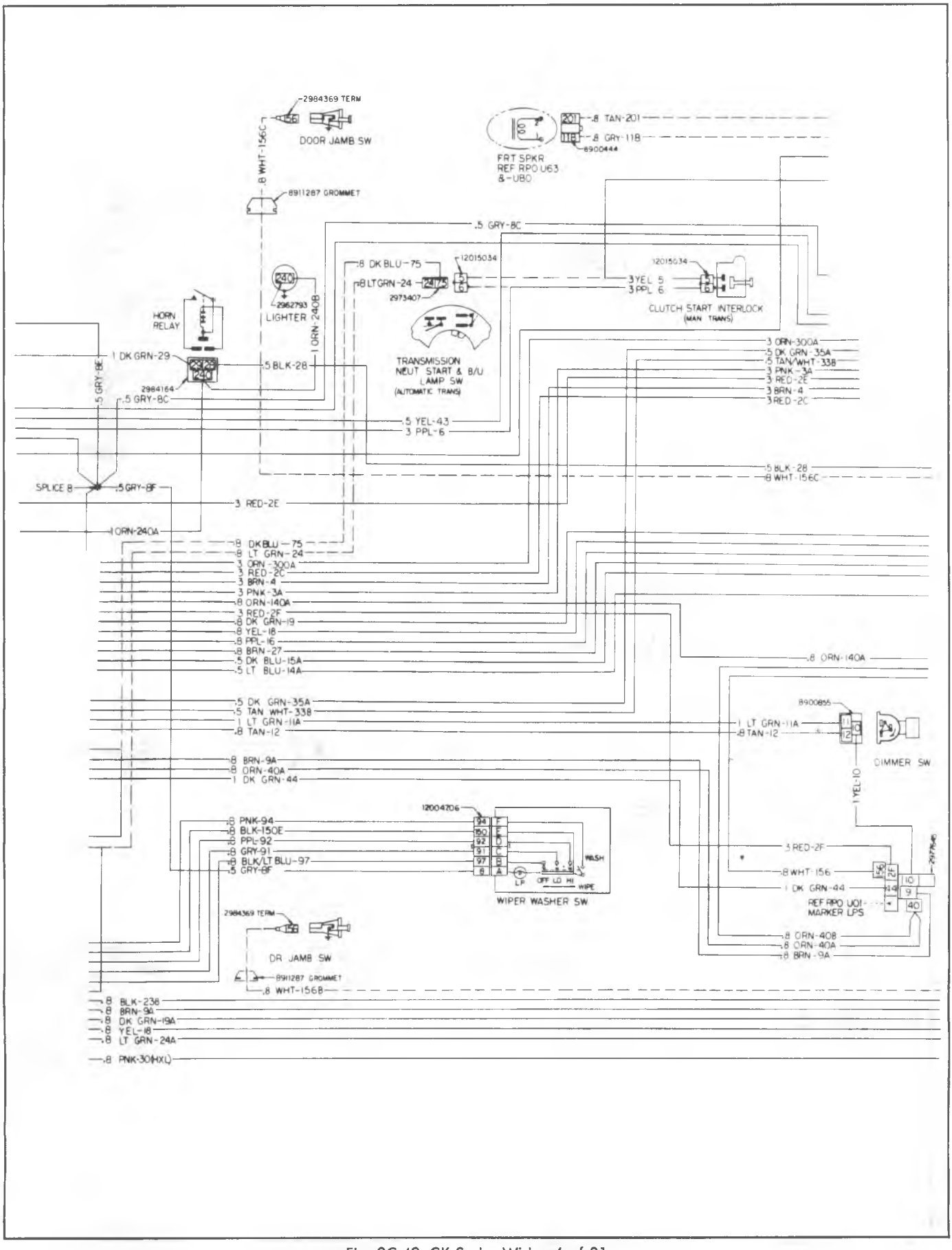


Fig. 8C-49--CK Series Wiring 6 of 31

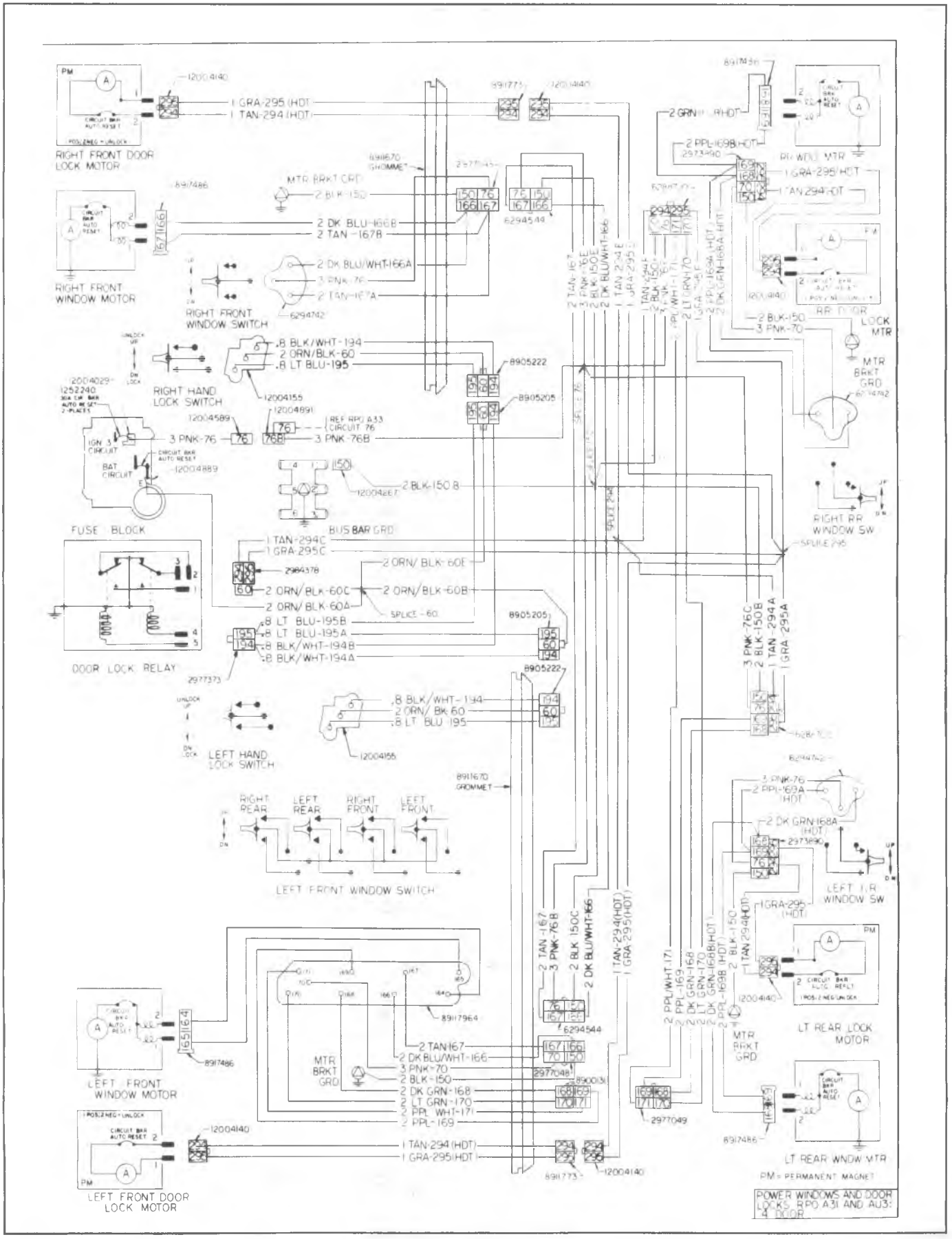


Fig. 8C-60--CK Series Wiring 17 of 31

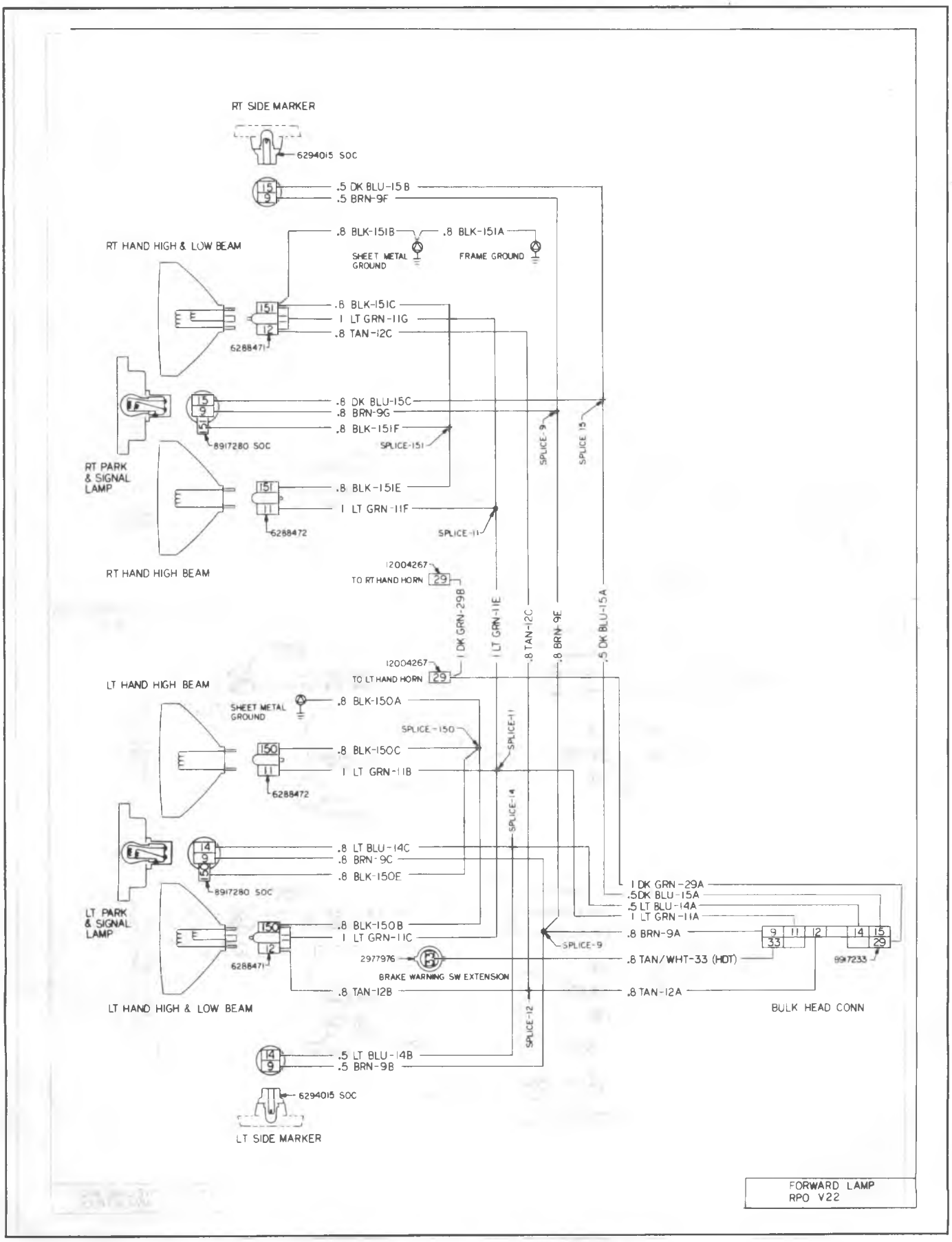


Fig. 8C-71--CK Series Wiring 28 of 31