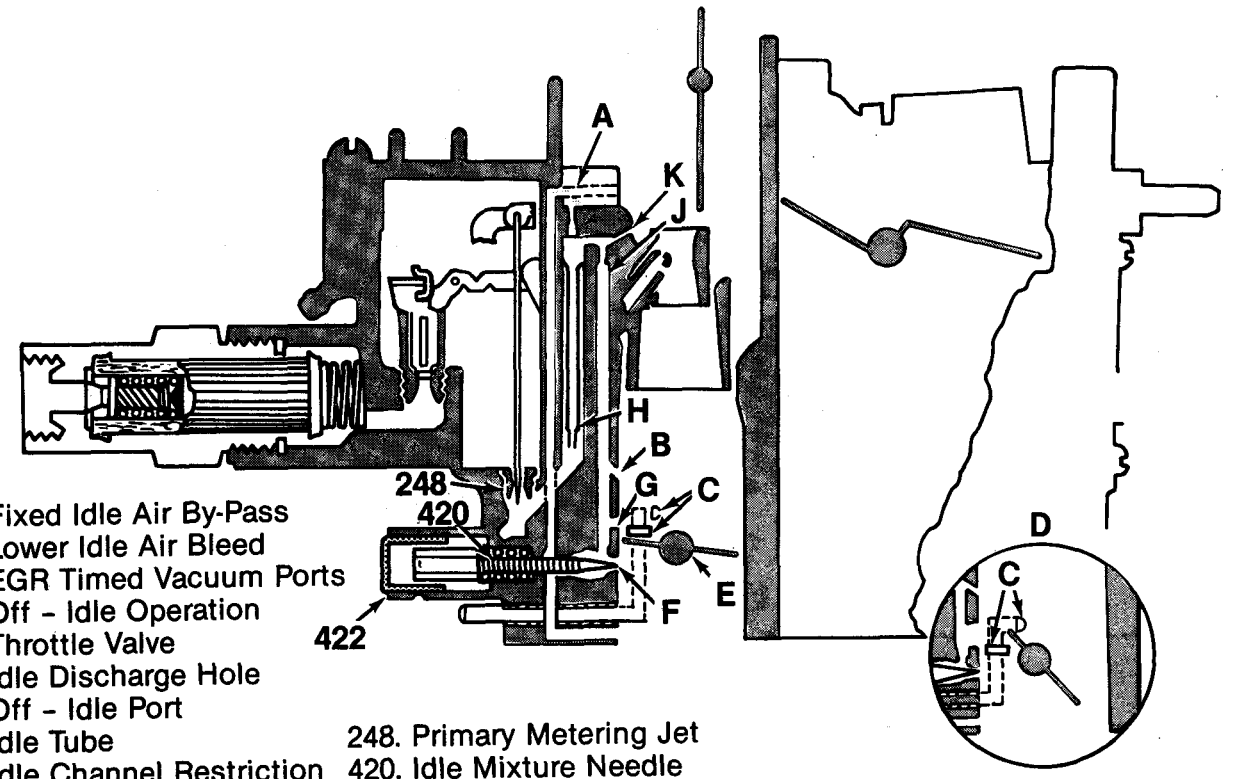
SECTION 6C1

CARBURETORS

CONTENTS

CARBURETOR MODELS M4ME, M4MED AND M4MEF



A. Fixed Idle Air By-Pass
B. Lower Idle Air Bleed
C. EGR Timed Vacuum Ports
D. Off - Idle Operation
E. Throttle Valve
F. Idle Discharge Hole
G. Off - Idle Port
H. Idle Tube
J. Idle Channel Restriction
K. Idle Air Bleed

248. Primary Metering Jet
420. Idle Mixture Needle
422. Idle Mixture Needle Plug

Figure 21—Idle System M4ME, And M4MED

DESCRIPTION

All these models are four barrel, two stage carburetors with three major assemblies: the air horn, float bowl, and throttle body. They have six basic operating systems (figures 21 through 33).

- Float
- Idle
- Main Metering
- Power
- Pump
- Choke

The first "M" indicates this carburetor is of a Modified primary metering "open loop" design.

The "4M" is the model designation, indicating it is a four barrel carburetor. The remaining letters designate specific features.

E — uses an electric choke.

D — has a dual capacity pump.

F — has an adjustable wide open throttle mixture control.

METERING SYSTEMS

A single float chamber supplies fuel to all carburetor bores. A float, float needle with pull clip, and a float needle seat, are used to control the level of fuel in the float chamber. A vacuum-operated power piston and metering rods control the air/fuel metering in the primary bores of the carburetor. Tapered metering rods are attached to the power valve piston assembly, and move in fixed metering jets, to provide the fuel flow for varying engine demands. A factory-set adjustable part throttle screw, used on all models, precisely positions the tapered portion of the metering rods in the jets. (On M4MEF models, the factory-set rich stop adjusting

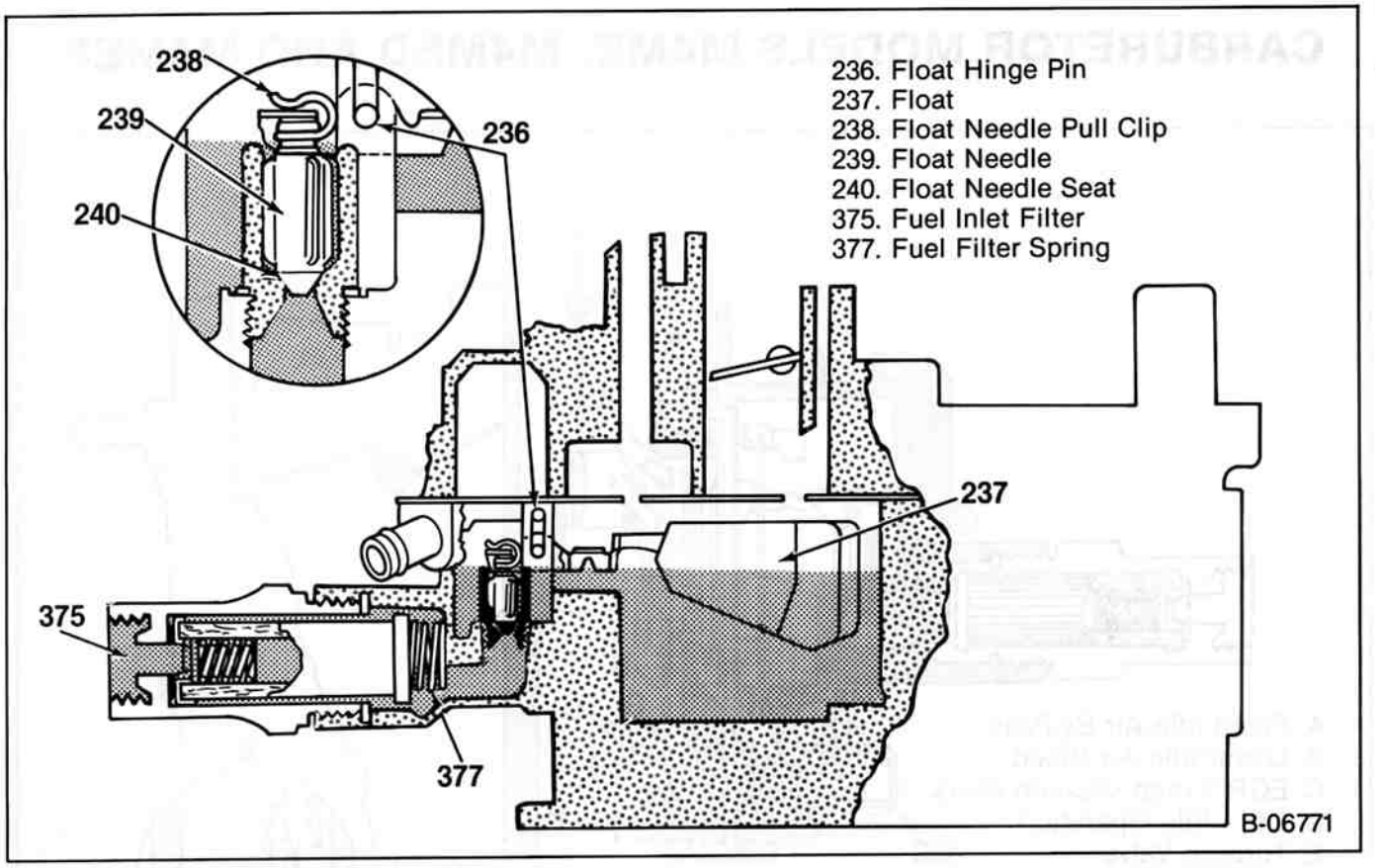


Figure 22—Float System

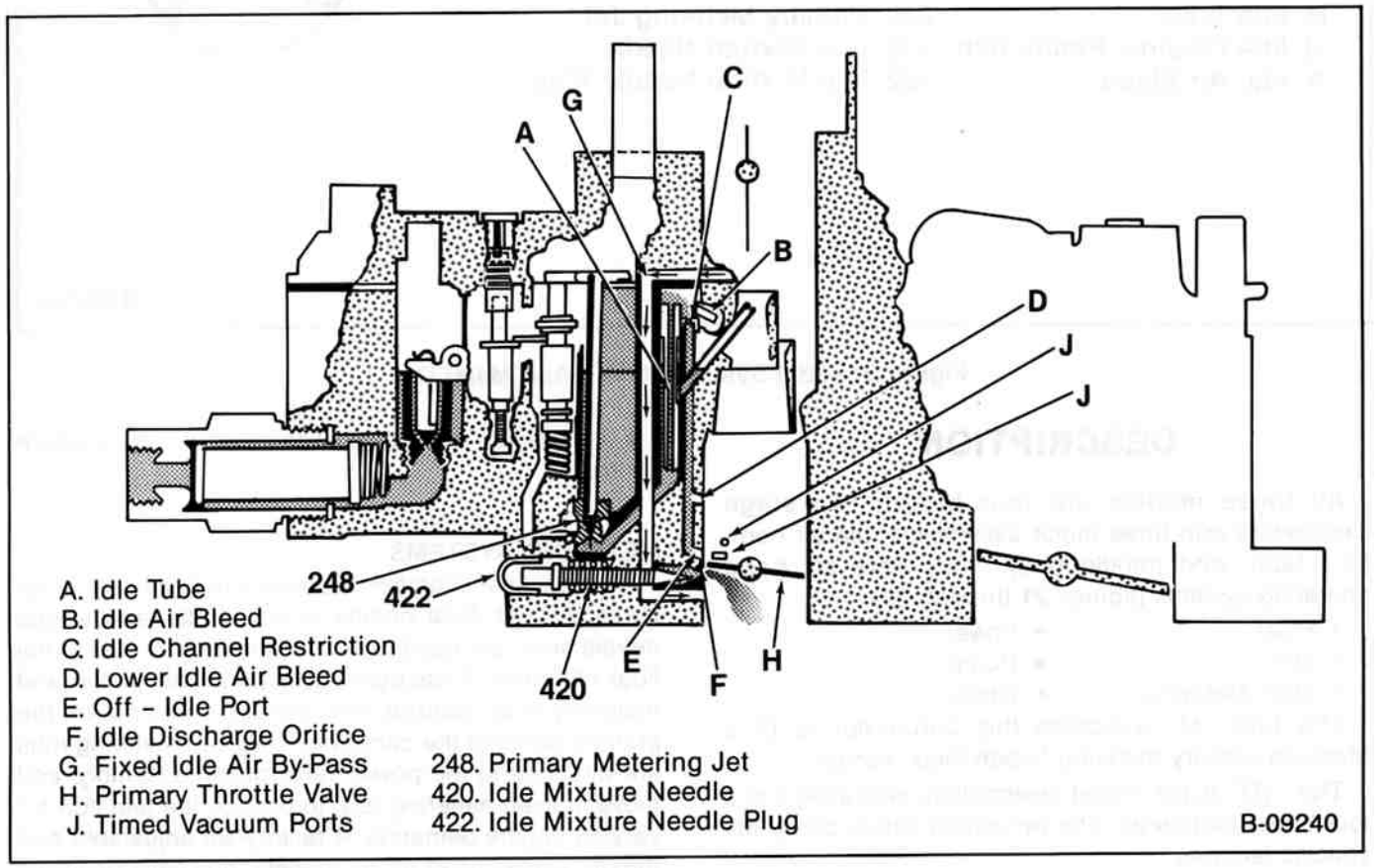


Figure 23—Idle System M4MEF

A. Air Valves (Open)
B. Eccentric Cam
C. Secondary Throttle Valves
D. Main Discharge Nozzles
E. Metering Discs
F. Throttle Valves
G. Vacuum Passage
31. Secondary Metering Rod Holder
32. Secondary Metering Rods
212. Power Valve Piston Assembly
213. Primary Metering Rod
218. Power Piston Spring
248. Primary Metering Jet

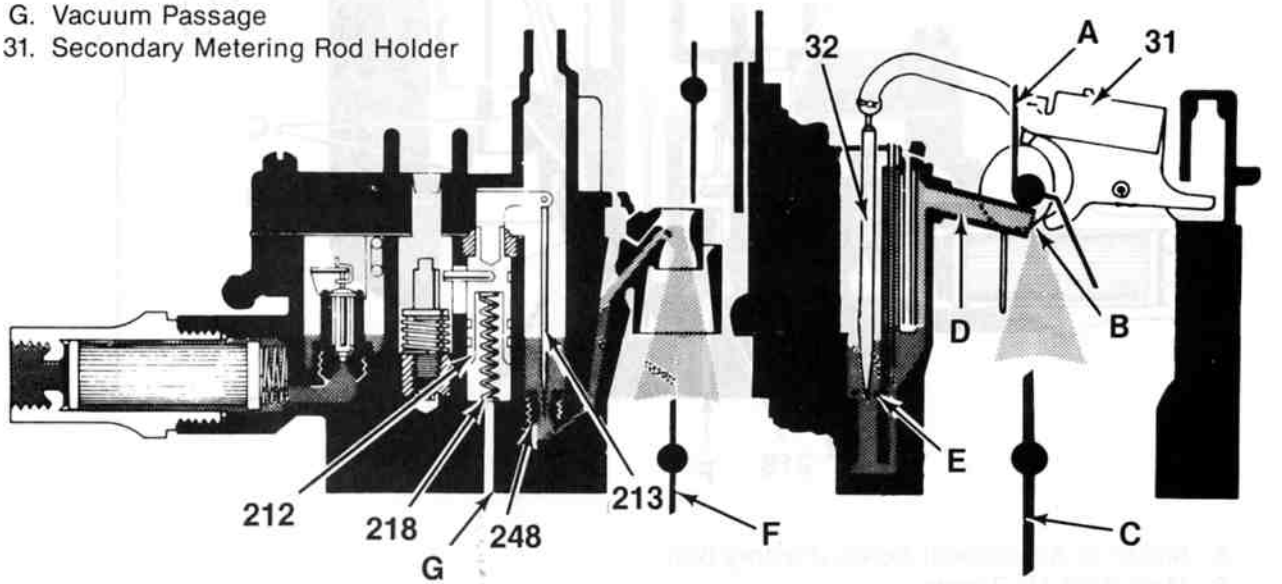


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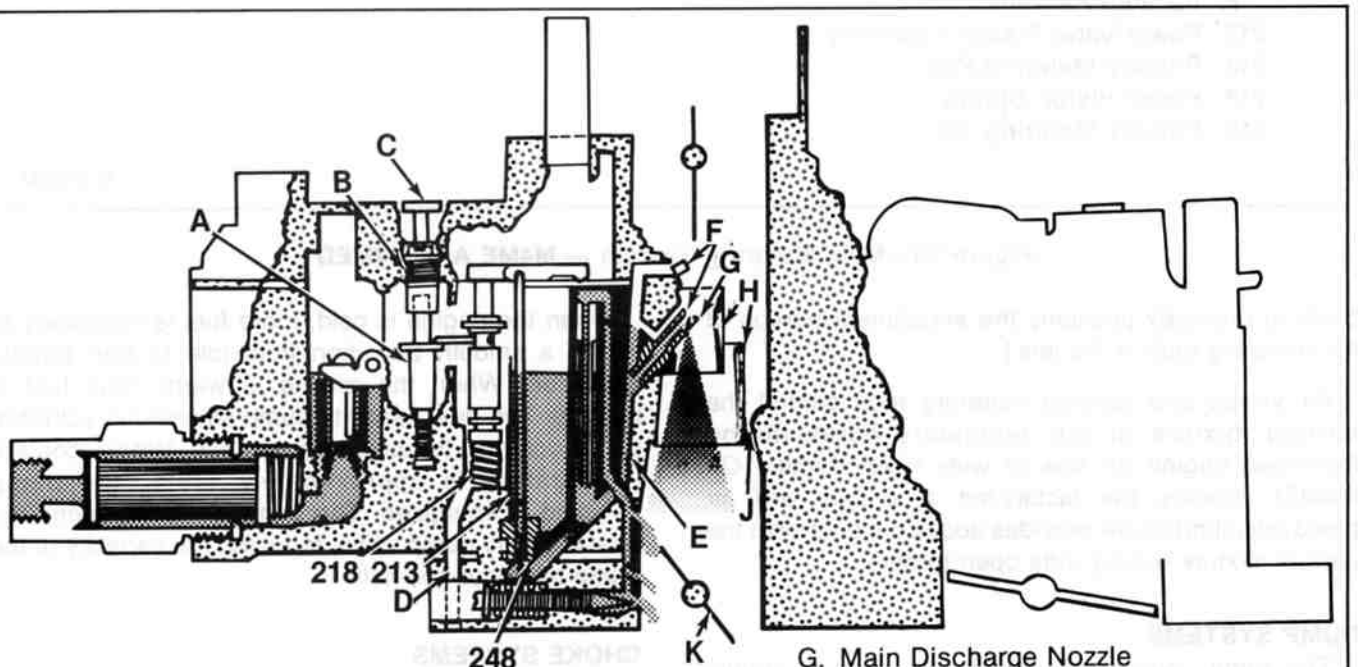
Figure 24—Power System M4ME And M4MED



A. Part Throttle Adjusting Screw (Do Not Turn Or Remove)
B. Rich Stop Adjusting Bushing
C. Rich Stop Adjust Plug
D. Vacuum Channel
E. Main Well
F. Main Well Air Bleeds
G. Main Discharge Nozzle
H. Boost Venturi
J. Main Venturi
K. Primary Throttle Valve
213. Primary Metering Rod
218. Power Piston Spring
248. Primary Metering Jet

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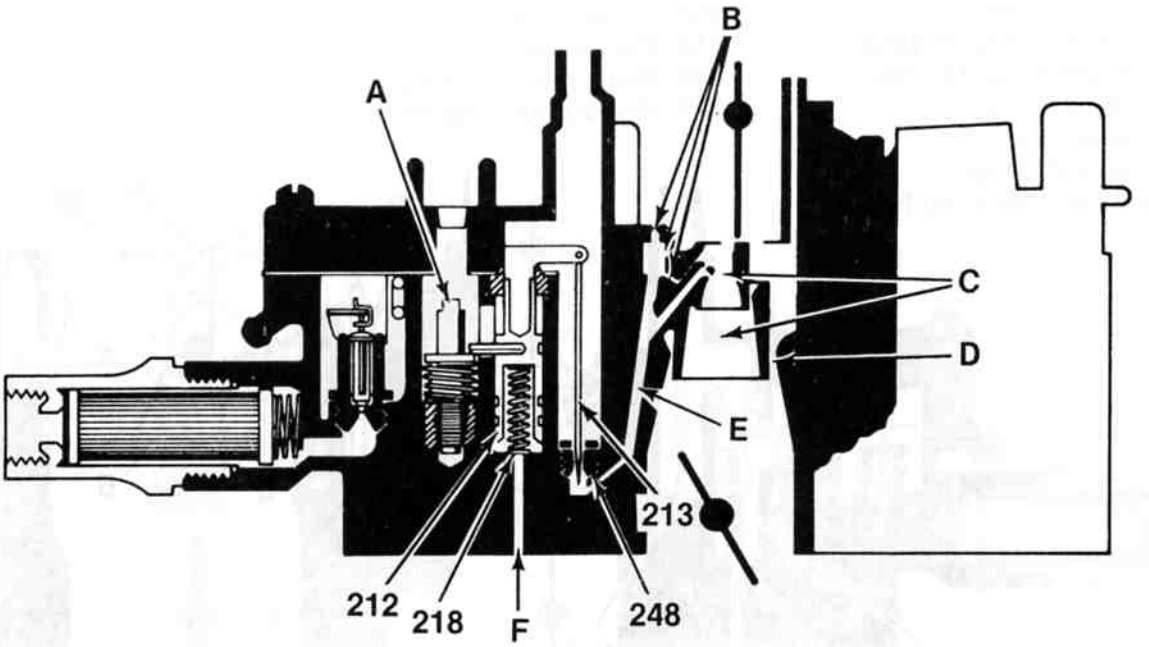
Figure 25—Main Metering System — M4MEF



A. Metering Adjustment Screw (Factory Set)
B. Main Well Air Bleeds
C. Boost Venturi
D. Main Venturi
E. Main Fuel Wells
F. Vacuum Passage
212. Power Valve Piston Assembly
213. Primary Metering Rod
218. Power Piston Spring
248. Primary Metering Jet

B-09241

Figure 26—Main Metering System — M4ME And M4MED

bushing precisely positions the enrichment portion of the metering rods in the jets.)

Air valves and tapered metering rods control the air/fuel mixture in the secondary bores during increased engine air flow at wide open throttle. On M4MEF models, the factory-set secondary well air bleed adjusting screw provides additional control of the air/fuel mixture during wide open throttle.

PUMP SYSTEMS

The pump system on all models uses a throttle actuated pump plunger, operating in the pump well. The pump provides extra fuel during quick throttle openings.

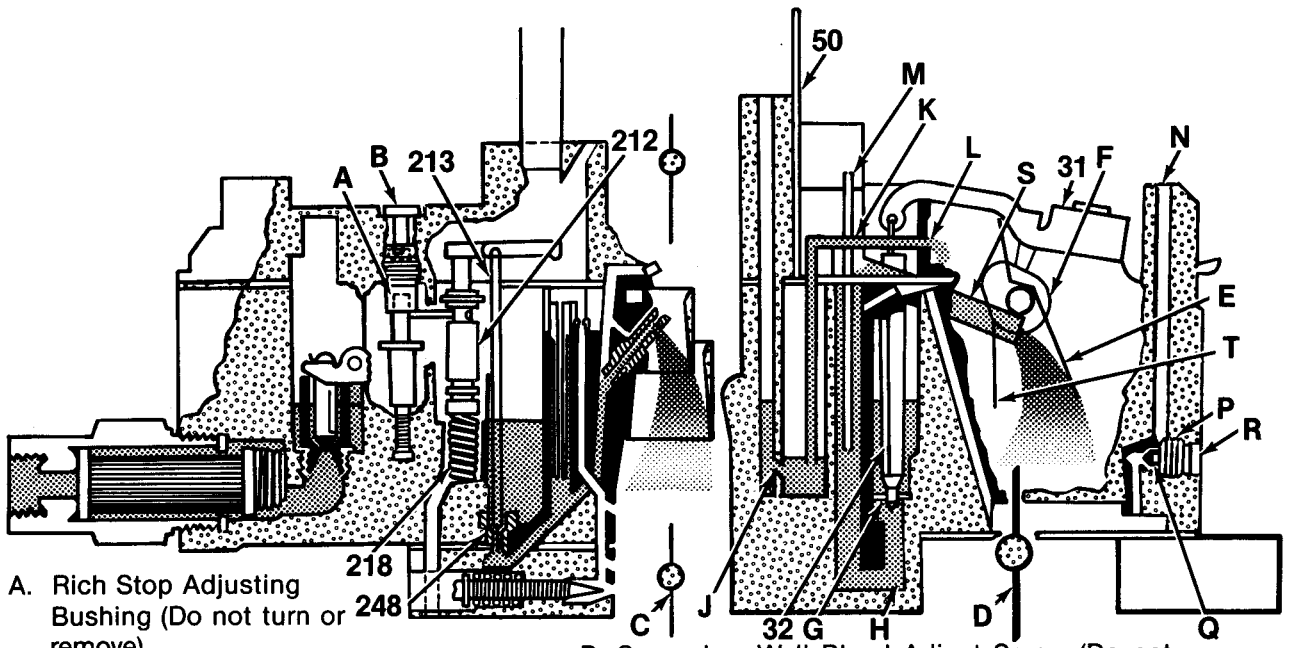
DUAL CAPACITY PUMP (M4MED ONLY)

M4MED carburetors have a float bowl-mounted dual capacity pump valve assembly and a dual capacity pump solenoid assembly.

When the engine is cold, more fuel is necessary to insure a smooth transition from idle to part throttle operation. When the engine is warm, less fuel is needed. The dual capacity pump solenoid is activated by a coolant temperature sensor. When coolant temperature is approximately 170°F, the pump solenoid is energized. The pump solenoid opens the dual capacity pump valve, reducing the capacity of the pump by about one-half.

CHOKE SYSTEMS

A choke coil is used to provide the choke valve closing force for cold startup and for correct opening timing during warmup. Vacuum break assemblies control initial choke valve openings at startup and during warmup. An unloader tang on the throttle lever forces the choke valve open to purge a flooded engine when the accelerator is pressed to the floor. The fast idle cam, following choke valve movement, acts as a



A. Rich Stop Adjusting Bushing (Do not turn or remove)
B. Rich Stop Adjusting Plug
C. Primary Throttle Valve
D. Secondary Throttle Valve
E. Air Valve
F. Eccentric Cam
G. Metering Disc
H. Secondary Fuel Well
J. Accelerator Well Inlet Orifice
K. Accelerator Well and Tube
L. Accelerator Well Discharge Orifice
M. Secondary Well Bleed Tube
N. Clean Air Inlet
P. Secondary Well Bleed Adjust Screw (Do not turn or remove)
Q. Secondary Well Bleed Adjust Spring
R. Secondary Well Bleed Adjust Plug
S. Secondary Discharge Nozzle
T. Baffle
31. Secondary Metering Rod Holder
32. Secondary Metering Rod
50. Air Horn Baffle
212. Power Valve Piston Assembly
213. Primary Metering Rod
218. Power Piston Spring
248. Primary Metering Jet

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Figure 27—Power System — M4MEF

graduated throttle stop to provide increased idle speed during warmup.

THROTTLE KICKER AND IDLE SPEED SOLENOID

Depending on engine displacement and vehicle application, a throttle kicker assembly or an idle speed solenoid may be used.

On vehicles without air conditioning, the idle speed solenoid provides desired engine speed and prevents dieseling when the ignition is turned off. On vehicles with air conditioning, the idle speed solenoid maintains engine idle speed when the air conditioning compressor clutch is engaged. The solenoid is energized by the air conditioning switch.

The vacuum-operated throttle kicker holds the throttle open during deceleration, to reduce emissions. On the 4.3 liter engine, it is also used to increase engine idle speed based on accessory load.

CARBURETOR IDENTIFICATION

Refer to the carburetor identification before servicing the carburetor. The number is stamped vertically on the float bowl near the secondary throttle lever (figure 34). Follow the instructions in the service package when replacing the float bowl assembly. Stamp or engrave the identification number on the new float bowl.

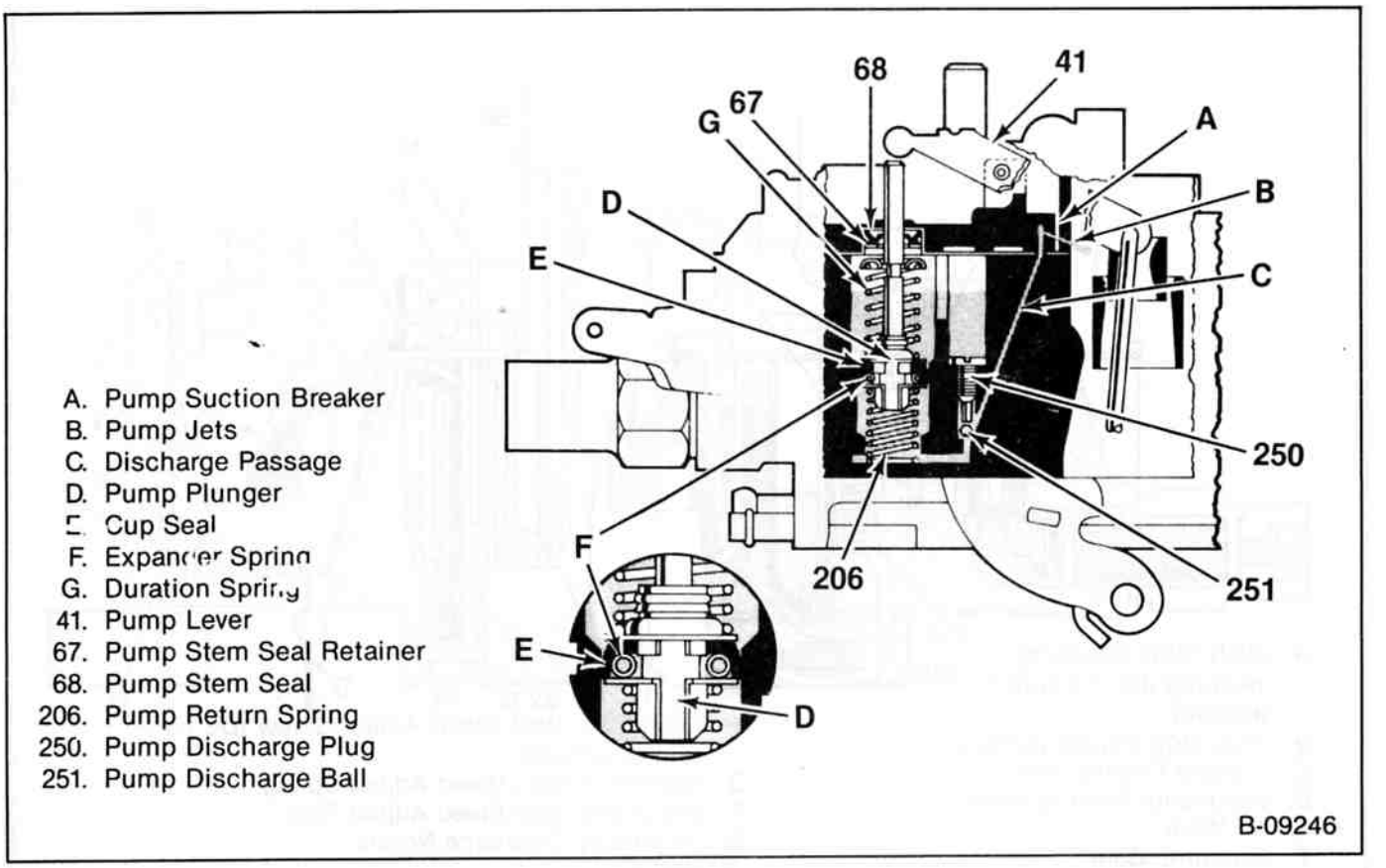


Figure 28—Pump System — M4ME And M4MEF

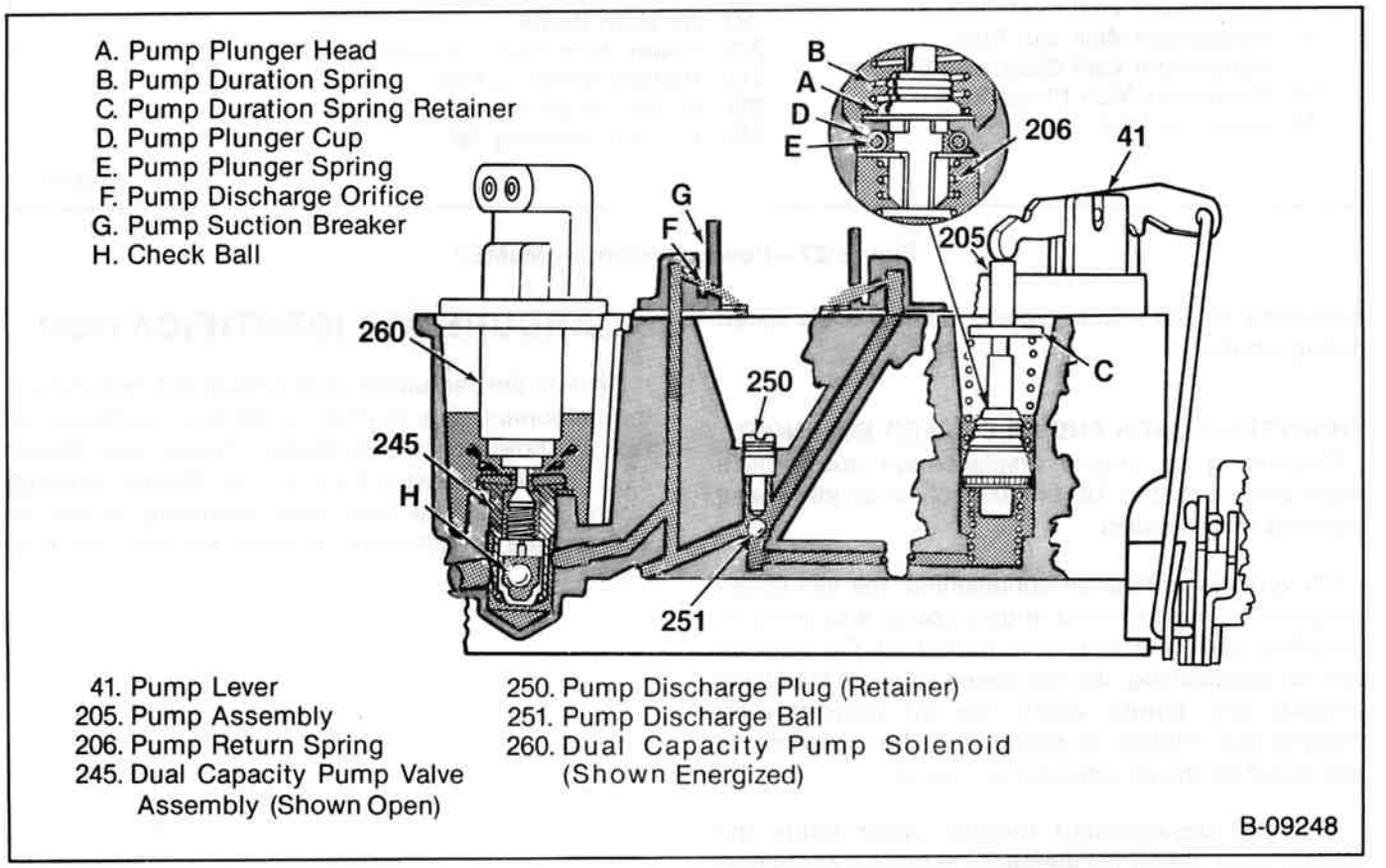
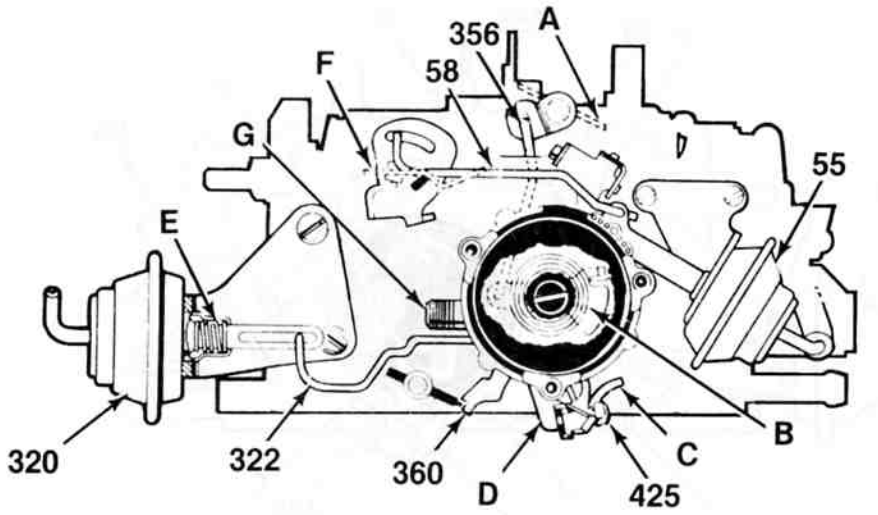


Figure 29—Dual Capacity Pump System — M4MED



A. Choke Valve
B. Thermostatic Coil
C. Unloader Tang
D. Fast Idle Cam Follower
E. Plunger Bucking Spring (Not Used On All Models)
F. Air Valve
G. Hot Air Inlet
55. Primary Side Vacuum Break Assembly
58. Primary Side Vacuum Break To Air Valve Link
320. Secondary Side Vacuum Break Assembly
322. Secondary Side Vacuum Break to Choke Link
356. Choke Link
360. Secondary Throttle Lockout Lever
425. Fast Idle Adjusting Screw

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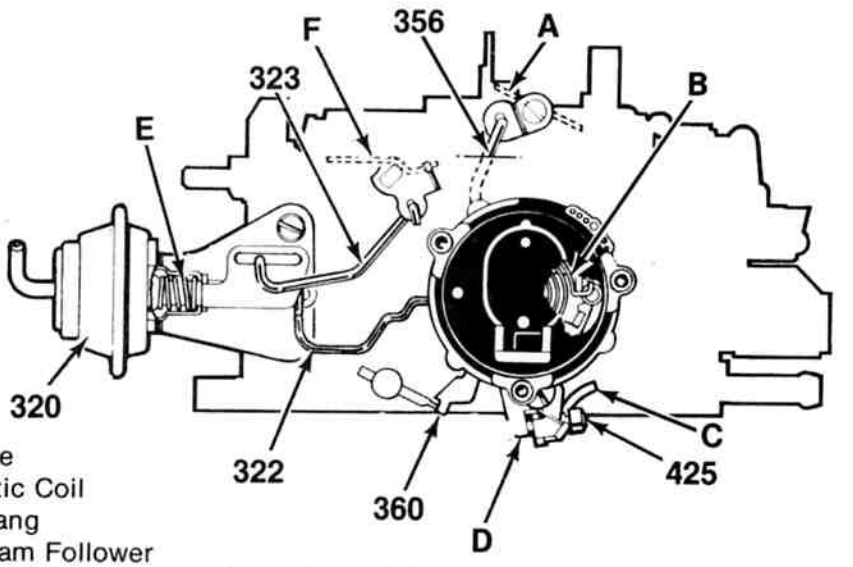
Figure 30—Hot Air Choke System With Front And Rear Vacuum Breaks



A. Choke Valve
B. Thermostatic Coil
C. Unloader Tang
D. Fast Idle Cam Follower
E. Plunger Bucking Spring (Not Used On All Models)
F. Air Valve
320. Secondary Side Vacuum Break Assembly
322. Secondary Side Vacuum Break To Choke Link
323. Secondary Side Vacuum Break to Air Valve Lever Link
360. Secondary Throttle Lockout Lever
425. Fast Idle Adjusting Screw

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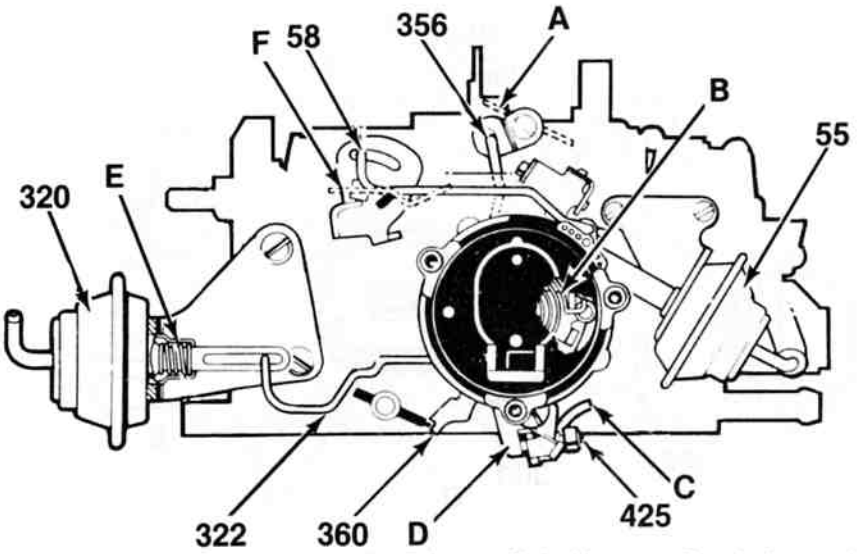
Figure 31—Electric Choke With Rear Vacuum Break

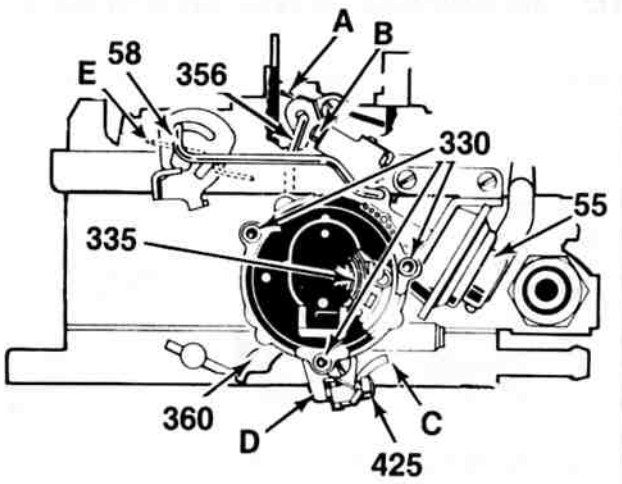


A. Choke Valve
B. Thermostatic Coil
C. Unloader Tang
D. Fast Idle Cam Follower
E. Plunger Bucking Spring (Not Used On All Models)
F. Air Valve

55. Primary Side Vacuum Break Assembly
58. Primary Side Vacuum Break To Air Valve Lever
320. Secondary Side Vacuum Break Assembly
322. Secondary Side Vacuum Break To Choke Link
356. Choke Link
360. Secondary Throttle Lockout Lever
425. Fast Idle Adjusting Screw

B-09252

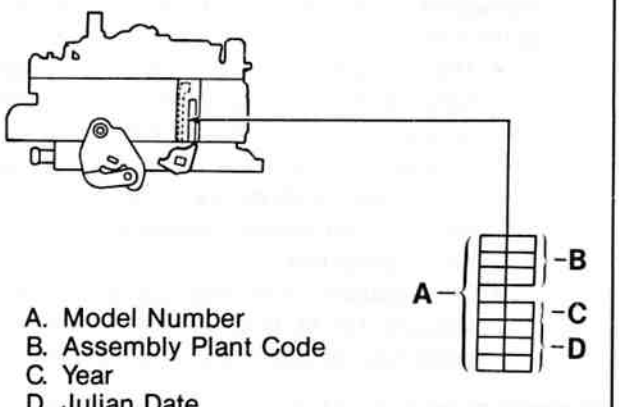
Figure 32—Electric Choke With Front And Rear Vacuum Breaks



A. Choke Valve
B. Adjustment Screw
C. Unloader Tang
D. Fast Idle Cam Follower
E. Air Valve
55. Primary Side Vacuum Break Assembly
58. Air Valve Link Rod
330. Choke Cover Attaching Rivet
335. Electric Choke Cover and Stat Assembly
356. Choke Link
360. Secondary Throttle Lockout Lever
425. Fast Idle Adjusting Screw

B-09250

Figure 33—Electric Choke System With Front Vacuum Break



A. Model Number
B. Assembly Plant Code
C. Year
D. Julian Date

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Figure 34—Carburetor Identification

ON-VEHICLE SERVICE (M4ME, M4MED AND M4MEF)

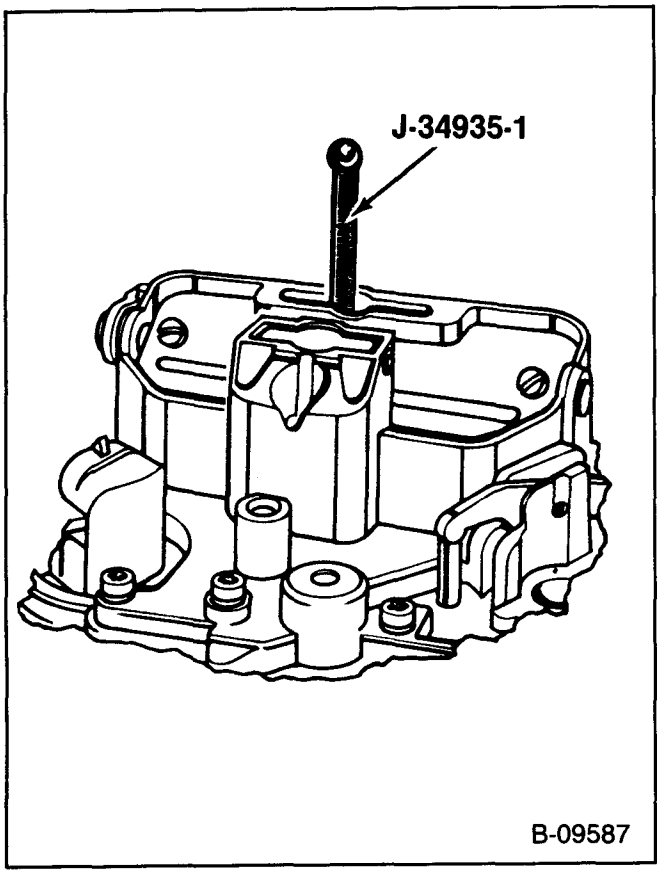


Figure 35—Checking The Float Level

FLOAT LEVEL CHECK

1. With the engine idling and the choke wide open, insert J-34935-1 in the vent slot or vent hole (figure 35).
   - Allow the gage to float freely.

NOTICE: Do not press down on the gage. Flooding or float damage could result.

2. Observe the mark on the gage that lines up with the top of the casting. The setting should be within 1.588 mm (2/32-inch) of the specified float level setting.
   - Incorrect fuel pressure will adversely affect the fuel level.
3. If not within specification, remove the air horn and adjust the float.

CHOKE AND HOSES

Check the choke mechanism and vacuum break(s) for proper operation at recommended maintenance intervals.

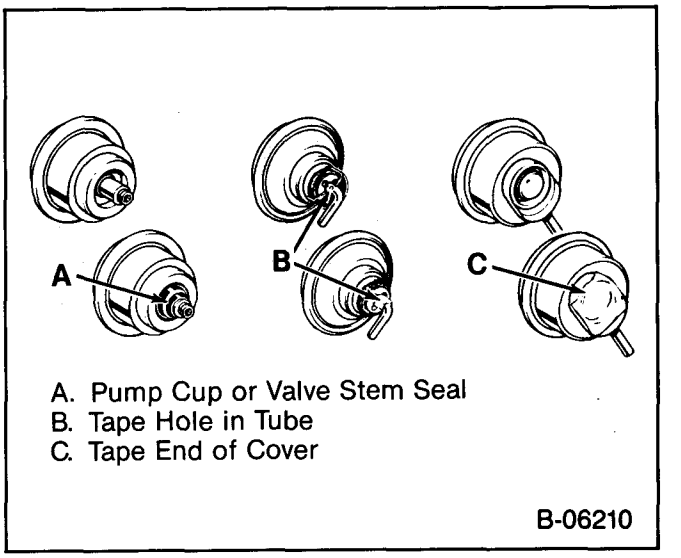


Figure 36—Plugging The Vacuum Break Air Bleed Holes

1. Remove the air cleaner. With the engine off, hold the throttle half open. Open and close the choke several times. Be sure all links are connected, and are not damaged.
2. If choke or linkage binds or is sluggish, clean them with choke cleaner X-20-A or equivalent. Refer to the "Light Duty Truck" Unit Repair Manual if cleaning does not correct the problem.
3. Inspect all carburetor vacuum hoses for proper connections, cracks, cuts, hardness, or other signs of deterioration. Replace or correct as necessary.

VACUUM BREAK CHECKING PROCEDURE

1. If the vacuum break has an air bleed hole, plug it during this checking procedure (figure 36).
2. Use hand held vacuum pump J-23738-A or equivalent, to apply -51 kPa (15 in. Hg.) vacuum to the vacuum break.
   - The vacuum break plunger should retract fully within ten seconds. Apply finger pressure to see if the plunger has moved through its' full travel. If it fails to retract within ten seconds, or if it fails to move through full travel, replace the vacuum break assembly.
   - The vacuum break diaphragm should hold vacuum for at least twenty seconds. If it does not, replace the vacuum break.

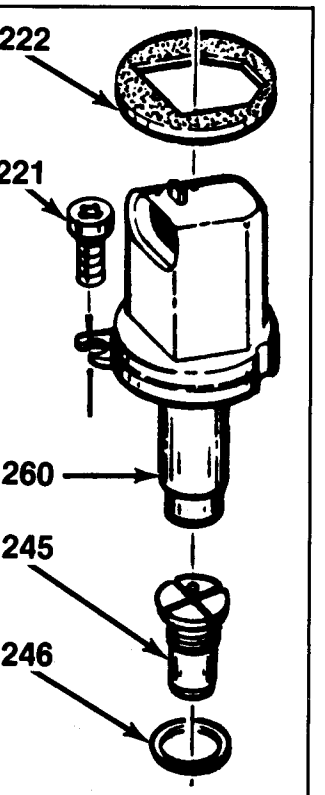
ELECTRIC CHOKE CHECKING PROCEDURE

1. Allow the choke to cool so that when the throttle is opened slightly, the choke valve closes fully.
   - Ambient temperature should be 15°-27°C (60°-80°F).

2. Start the engine and find the time that the choke valve takes to open fully.
   - Start timing when the engine starts.
3. If the choke fails to open fully within five minutes, check the voltage at the choke heater connection with the engine running.
   - If approximately 12-15 volts, replace the electric choke assembly.
   - If low or zero, check all connections and wires. Repair wires or replace fuses as required.

DUAL CAPACITY PUMP CHECK (M4MED ONLY)

1. Bring the engine to normal operating tempearture.
2. With the ignition off, actuate the throttle lever several times and observe the fuel stream. The stream should be strong and consistent.
3. Run the engine to refill the float bowl.
4. With the ignition on, actuate the throttle lever several times and observe the fuel stream. Less fuel should be coming from the pump because the solenoid is energized.
5. If the pump stream does not change and appears to be strong and consistent, fuel is not being bypassed by the pump circuit.
   - Disconnect the solenoid (260) (figure 37) coolant temperature switch connector and jump it to ground.
   - Repeat step 4.
     - — If less fuel comes from the pump, check cooling system operation and the coolant temperature switch for opens.
     - — If the pump stream remains the same, check wiring for opens or shorts.
   - Disconnect the dual capacity pump solenoid connector.
   - Remove the air horn assembly and gasket.
   - Remove the dual capacity solenoid from the float bowl and connect the solenoid connector.
   - With the ignition on and the coolant switch lead grounded, the solenoid should be energized and the solenoid plunger should extend. Replace the solenoid if it does not extend.
   - Check the pump valve (245) and passages for dirt or obstructions.
   - Check pump system operation.
6. If the pump stream does not change and appears to be weak or irregular, fuel is leaking in the pump circuit.
   - Disconnect the dual capacity pump solenoid (260) (figure 37) connector.



221. Screw
222. Gasket
245. Dual Capacity Pump Valve Assembly
246. Gasket
260. Dual Capacity Pump Solenoid

F-00861

Figure 37—Dual Capacity Pump

   - Remove the air horn assembly and the gasket.
   - Fill the float bowl and the pump well with clean fuel.
   - Seal the two pump discharge passages on the top surfaces of the float bowl with two fingers while pushing the pump assembly slowly into the pump well.
     - — The pump assembly should not travel to the bottom of the well. The only movement should be the compressing of the duration spring.
     - — If the pump assembly moves down in the well, the pump cup may be worn, hardened or damaged, the pump well may be worn or scored, the pump discharge plug may be leaking, the dual capacity pump solenoid plunger may be stuck, the pump valve may not be seating correctly, or the valve gasket may be leaking.
   - Connect the dual capacity pump solenoid connector.
   - Disconnect the dual pump solenoid coolant temperature switch connector and jump it to ground.
   - With the ignition on and the engine off, slowly move the pump assembly into the

pump well until fuel is visible at the top of the passages.
- Remove the pump assembly and continue to watch fuel in the passages. The fuel level should not go down.
  - — If the level begins to drop, the discharge ball may be missing or not seating correctly, damaged, or needs to be restaked. It may also indicate that the check ball in the pump valve is not seating properly.
- Check dual capacity pump system operation.

IDLE STOP SOLENOID CHECK

A non-functioning idle stop solenoid (if equipped) could cause stalling or rough idle when the air conditioning (if equipped) is turned on.

1. Turn the ignition on but do not start the engine. Turn the air conditioning switch on.
2. Open the throttle momentarily to allow the solenoid plunger to extend.
3. Disconnect the wire at the solenoid. The plunger should pull back from the throttle lever.
4. Connect the solenoid wire. The plunger should move out and contact the throttle lever.
5. If the plunger does not move in and out, check for voltage across the feed wire.
   - If the voltage is 12 to 15 volts, replace the solenoid.
   - If the voltage is low, locate the cause of the open circuit in the solenoid feed wire.

THROTTLE KICKER CHECK

Tool Required:
J-23738-A, Hand Held Vacuum Pump.

1. Hold the throttle half way open to allow the plunger to extend fully.
2. Apply 68 kPa (20-inches Hg) vacuum to the throttle kicker.
3. Apply finger pressure to the plunger to see if it is fully extended. If not, replace the throttle kicker.
4. Observe the vacuum gage. The vacuum should hold for at least 20 seconds. If not, replace the throttle kicker.
5. Release the vacuum to the throttle kicker.
6. Apply finger pressure to the plunger to see if it has returned to its retracted position. If not, replace the throttle kicker.

CARBURETOR REPLACEMENT

Flooding, stumble on acceleration and other performance complaints are, in many instances, caused by the presence of dirt, water or other foreign matter in carburetor. To aid in diagnosing the cause, the carburetor should be removed carefully from the engine without draining fuel from the bowl. Contents of the fuel bowl may then be examined for foreign materials as carburetor is disassembled.

Remove or Disconnect

1. Air cleaner and gasket.
2. Electrical connectors at the idle speed solenoid and dual capacity pump solenoid (if equipped).
3. Fuel line and vacuum hoses.
4. Choke system.
5. Accelerator linkage.
6. Downshift cable (automatic transmission only).
7. Cruise control linkage (if equipped).
8. Carburetor attaching bolts.
9. Carburetor and insulator.

Install or Connect

- Clean the sealing surfaces on the intake manifold and carburetor.

CAUTION: Extinguish all open flames while filling and testing carburetor with gasoline to avoid personal injury.

1. Carburetor and insulator.
   - It is good shop practice to fill the carburetor float bowl before installing the carburetor. This reduces the strain on starting motor and battery and reduces the possibility of backfiring while attempting to start the engine. Operate the throttle several times and check the discharge from pump jets before installing the carburetor.
2. Carburetor attaching bolts.

   Tighten

   - Bolts to 16 N·m (144 in. lbs.) in a criss-cross pattern.
3. Downshift cable (automatic transmission only).
4. Cruise control cable (if equipped).
5. Accelerator linkage.
6. Choke system.
7. Fuel line and vacuum hoses.
8. Electrical connectors at the idle speed solenoid and/or the dual capacity pump solenoid (if equipped).
9. Air cleaner.

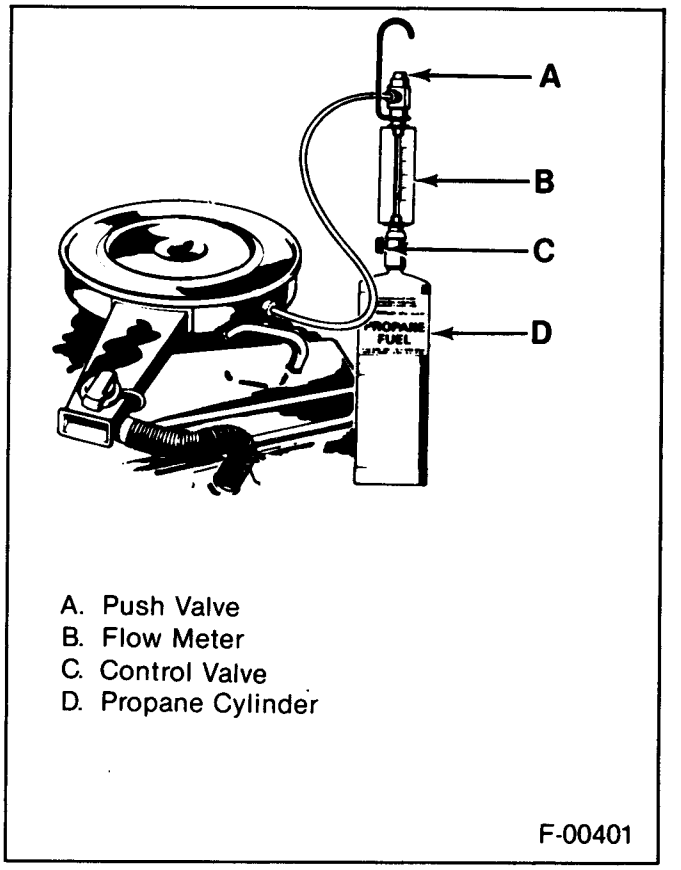
- Check and adjust the idle speed.

IDLE MIXTURE ADJUSTMENT (LIGHT-DUTY EMISSION VEHICLES ONLY)

Idle mixture needles were preset and sealed at the factory. Idle mixture should only be adjusted during major carburetor overhaul, throttle body replacement, or if high emissions are determined by official inspection.

Because of the sealed idle mixture needles, the idle mixture checking procedure requires artificial enrichment by adding propane. Adjusting mixture by other than the following method may violate government regulations.

1. Set the parking brake and block the drive wheels. Engine must be at normal operating temperature with the air conditioning off.
2. Disconnect and plug hoses as directed on the Emission Control Information label under the hood.
3. Connect an accurate tachometer to the engine.
4. Disconnect the vacuum advance and set timing to the specification shown on the Vehicle Emission Control Information label. Reconnect the vacuum advance.
5. Set carburetor idle speed to the specification shown on the Vehicle Emission Control Information label.
6. Disconnect the crankcase ventilation tube from the air cleaner.
7. Insert the hose with the rubber stopper into the crankcase ventilation tube opening in the air cleaner using tool J-26911 or equivalent (figure 38).
   - The propane cartridge must be vertical.
8. With the engine idling in Drive (Neutral for manual transmissions), slowly open the propane control valve while pressing the button. Continue to add propane until the engine speed drops, due to over-richness. Note the maximum engine speed (enriched speed). If rich speed drop cannot be obtained, check for an empty propane cartridge or propane system leaks.
9. If the enriched idle speed is within the enriched idle specification, the mixture is correct. Go to Step 18.
10. If the enriched idle speed is not within specifications, remove the idle mixture needles:
    - Remove the carburetor from the engine using normal service procedures.
    - Invert the carburetor and drain the fuel into an approved container.
    - Place the carburetor on a holding fixture with the manifold side up.
      — Use care to avoid damaging the linkage, tubes, and parts protruding from the air horn.



A. Push Valve
B. Flow Meter
C. Control Valve
D. Propane Cylinder

F-00401

Figure 38—Idle Mixture Check With Propane Enrichment

- Use a hacksaw to make two parallel cuts in the throttle body, one on each side of the locator point by each idle mixture needle plug. Cut down to the steel plug but not more than 3.1 mm (1/8-inch) beyond the locator point.
- Place a flat punch at a point near the ends of the saw marks. Hold the punch at a 45 degree angle and drive it into the throttle body until the casting breaks away, exposing the steel plug.
- Hold a center punch vertically and drive it into the steel plug.
- Hold the punch at a 45 degree angle and drive the plug out of the casting.
- Remove all loose pieces.
- Repeat the procedure for the other plug.

11. Install the carburetor on the engine.
12. Use J-29030-B or equivalent to lightly seat the mixture needles, then back out equally, just enough so the engine will run.
13. Place the transmission in Drive (automatic) or Neutral (manual).
14. Back each needle out (richen 1/8 turn at a time), until the maximum idle speed is obtained. Set the idle speed to the enriched idle specification.

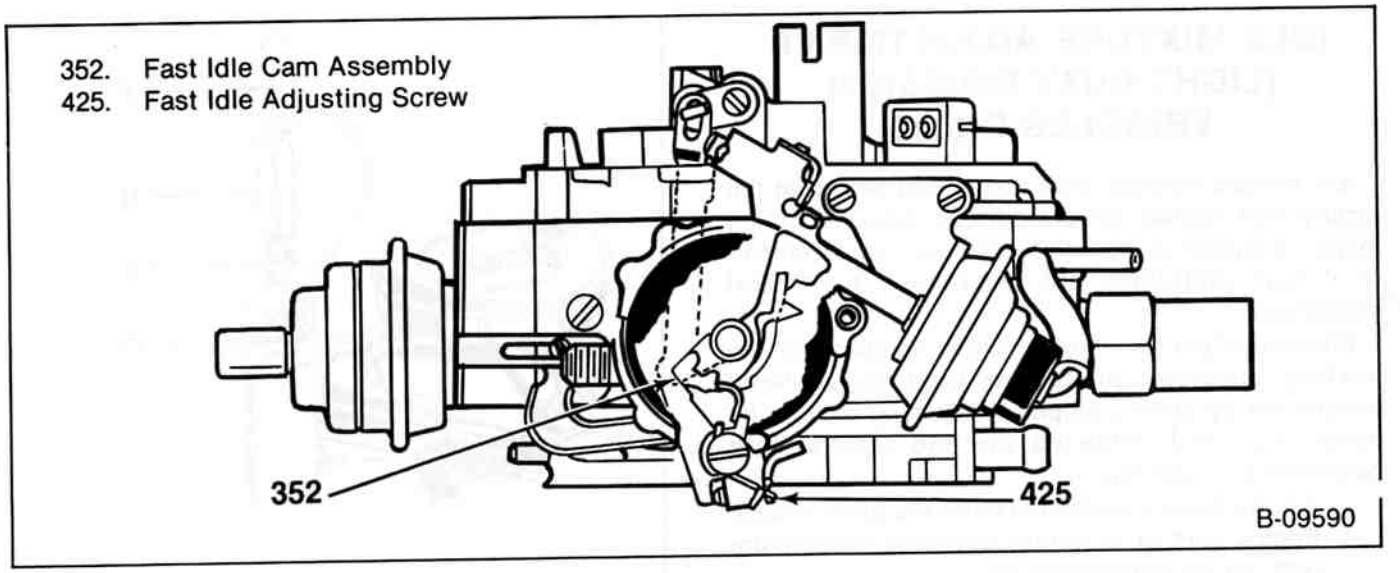


Figure 39—Fast Idle Adjustment

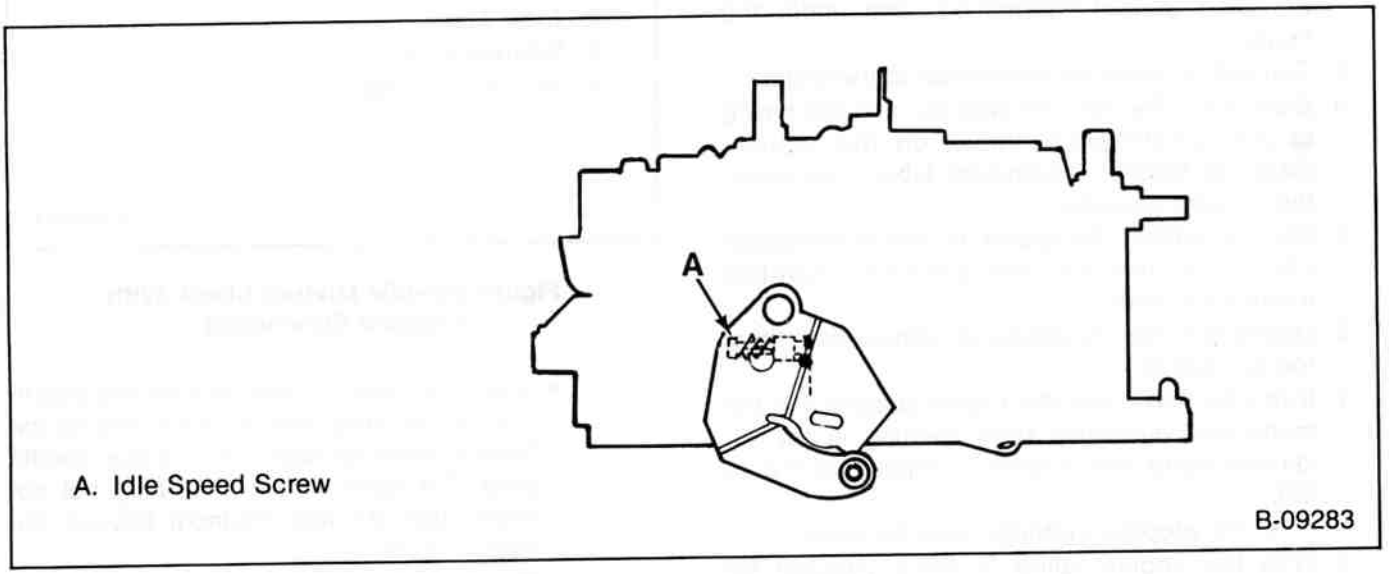


Figure 40—Idle Speed Adjustment — Without Idle Speed Solenoid

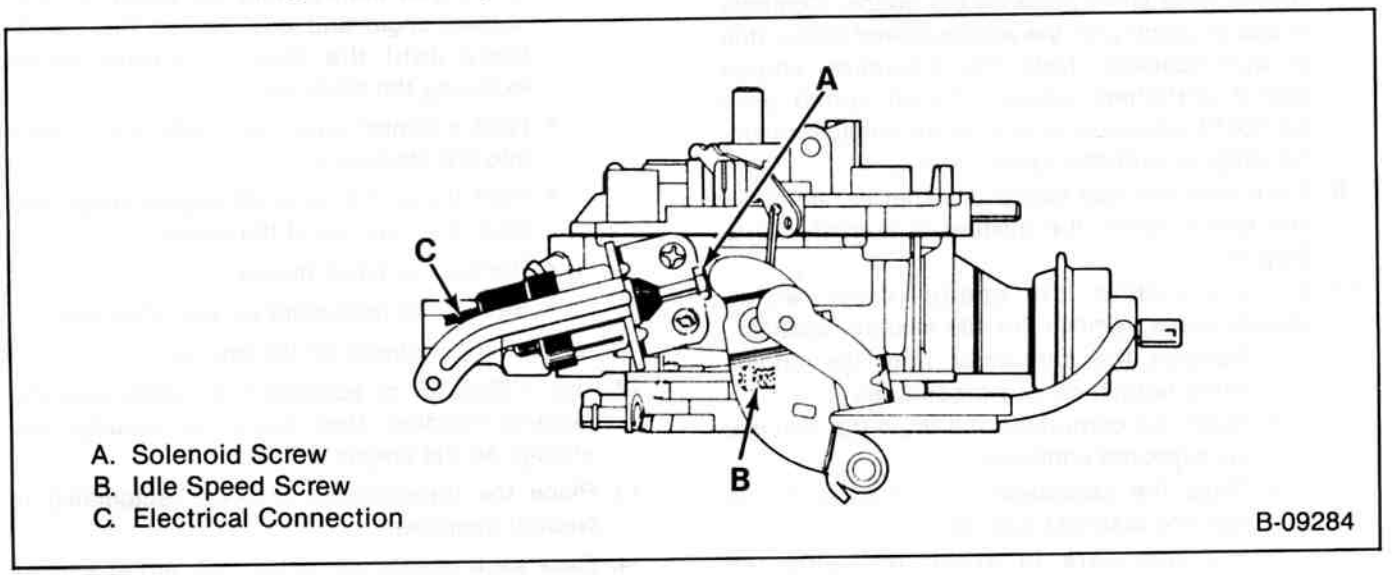


Figure 41—Idle Speed Adjustment — With Idle Speed Solenoid

15. Turn each mixture needle in (1/8 turn at a time), until the idle speed reaches the value given on the Emission Control Information label.
16. Re-check the enriched speed with propane. If not within specification, repeat the adjustment, starting at step 12.
17. After adjustments are made, seal the idle mixture needles with RTV rubber or equivalent. Sealing is required to retain the setting and to prevent loss of fuel vapors.
18. Check, and if necessary, adjust the fast idle as described on the Emission Control Information label.
19. Turn the engine off. Remove the propane tool and connect the crankcase ventilation tube. Unplug and reconnect the vacuum hoses. Install the air cleaner.
20. Remove the wheel blocks.

IDLE MIXTURE ADJUSTMENT (HEAVY DUTY EMISSION VEHICLES ONLY)

Idle mixture needles were preset at the factory and sealed. Idle mixture should be adjusted only during major carburetor overhaul, throttle body replacement, or if high emissions are determined by official inspection.

Perform this adjustment with the engine at operating temperature, parking brake applied, drive wheels blocked, and the transmission in Park or Neutral.

1. Remove the air cleaner.
2. Remove the idle mixture needle plugs (if equipped).
   - Remove the carburetor from the engine using normal service procedures.
   - Invert the carburetor and drain the fuel into an approved container.
   - Place the carburetor on a holding fixture with the manifold side up.
     — Use care to avoid damaging the linkage, tubes, and parts protruding from the air horn.
   - Use a hacksaw to make two parallel cuts in the throttle body, one on each side of the locator point by each idle mixture needle plug. Cut down to the steel plug but not more than 3.1 mm (1/8-inch) beyond the locator point.
   - Place a flat punch at a point near the ends of the saw marks. Hold the punch at a 45 degree angle and drive it into the throttle body until the casting breaks away, exposing the steel plug.
   - Hold a center punch vertically and drive it into the steel plug.
   - Hold the punch at a 45 degree angle and drive the plug out of the casting.
   - Remove all loose pieces.
   - Repeat the procedure for the other plug.
   - Replace the carburetor on the engine.
3. Connect a tachometer and a vacuum gage to the engine.
4. As a preliminary adjustment, lightly seat each mixture needle and back it out two turns.
5. Adjust the idle speed screw to the idle speed specified on the Vehicle Emission Control Information label.
   - Engine should be running with the choke wide open and the transmission in neutral.
6. Adjust each idle mixture needle to obtain the highest RPM.
7. Repeat steps 4 and 5 until "best" idle is obtained.
8. Reset the curb idle speed to specifications on the Vehicle Emission Control Information label (if necessary).
9. After adjustments are made, seal idle mixture needles with RTV rubber or equivalent. Sealing is required to retain the setting and to prevent loss of fuel vapors.
10. Check, and if necessary, adjust the throttle lever actuator.
11. Check, and if necessary, adjust the fast idle speed as described on the Emission Control Infomation label.
12. Turn off the engine, remove gages, unplug and reconnect vacuum hoses. Install the air cleaner.
13. Remove block from the drive wheels.

IDLE SPEED ADJUSTMENT

Refer to the Emission Control Information label to adjust idle speed and fast idle.

THROTTLE KICKER ADJUSTMENT

Refer to DRIVEABILITY AND EMISSIONS - CARBURETED (SEC. 6E8) to adjust the throttle kicker.

FLOAT ADJUSTMENT

Tools Required:
J-9789-90, Float Level "T" Scale
J-34817, Float Positioning Tool Kit

1. Remove the air horn, gasket, power piston and metering rod assembly, and the float bowl insert.
2. Attach J-34817-1 to the float bowl (figure 42).
3. Place J-34817-3 in J-34817-1 with the contact pin resting on the outer edge of the float lever.
4. Measure the distance from the top of the casting to the top of the float at a point 3/16-inch from the large end of the float.

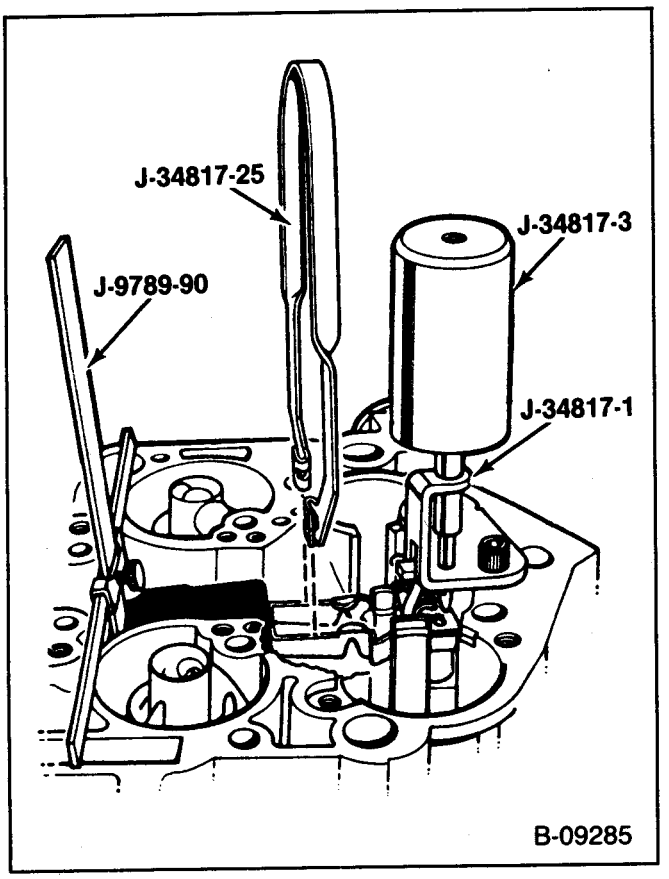


Figure 42—Float Adjustment

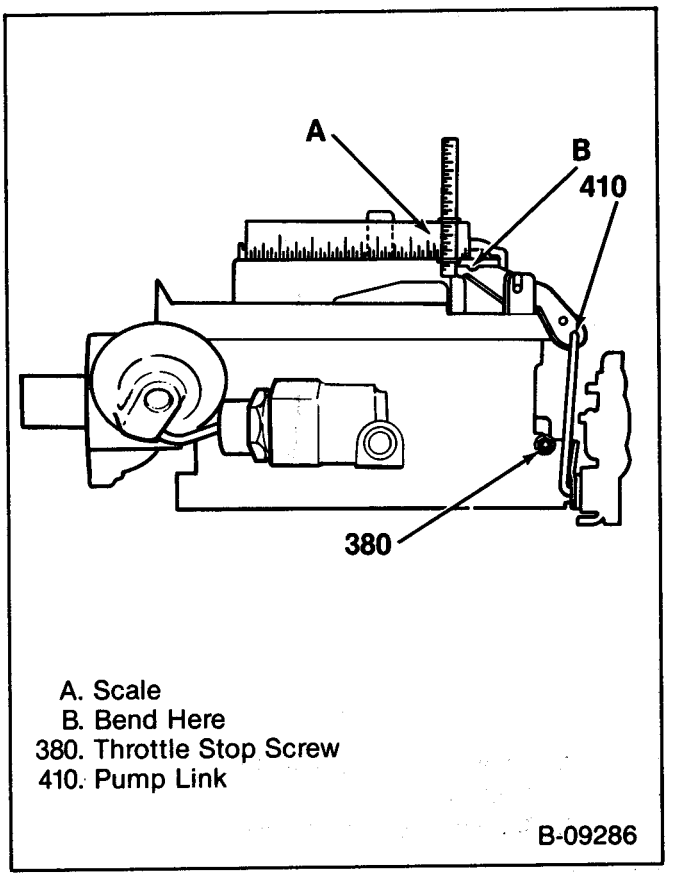


Figure 43—Pump Adjustment

- Use J-9789-90.

5. If more than ± 2/32-inch from specification, use J-34817-25 to bend the lever up or down.
6. Remove J-34817-25 and measure, repeating until within specification.
7. Check the float alignment.
8. Reassemble the carburetor.

PUMP ADJUSTMENT

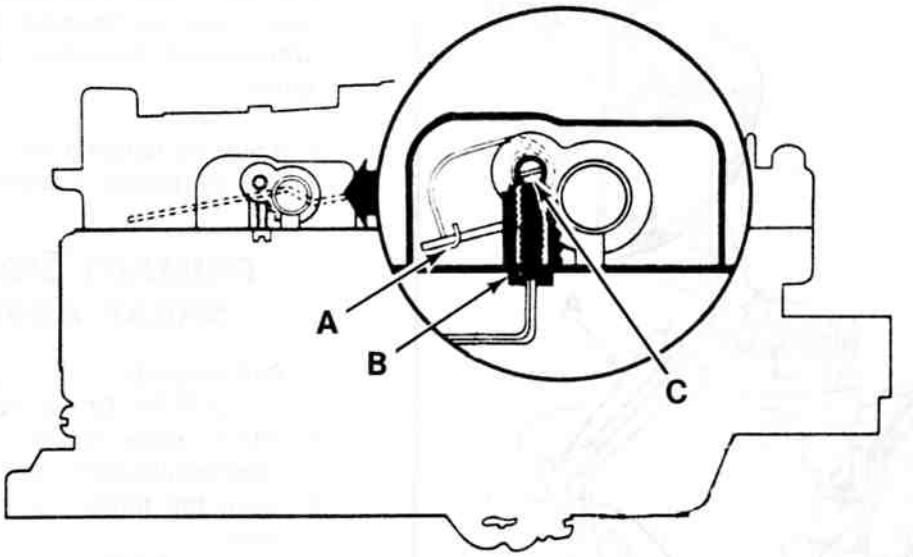
1. The pump link (410) must be in the specified hole (figure 43).
2. Be sure the fast idle cam follower lever is off the steps of the fast idle cam. Back off the throttle stop screw (380) from contact with the throttle lever.
3. Gage from the top of the choke valve wall next to the vent stack, to the top of the pump stem as specified.
4. Bend the pump lever (41) at the notch to adjust.
   - Support the lever with a screwdriver while bending it.

AIR VALVE SPRING ADJUSTMENT

1. Loosen the lock screw using a 3/32-inch hex wrench (figure 44).
2. Turn the tension adjusting screw counterclockwise until the air valve opens part way.
3. Turn the tension adjusting screw clockwise until the air valve just closes. Then turn the adjusting screw clockwise the specified number of turns.
4. Tighten the lock screw.
5. Apply lithium base grease to lubricate the contact area.
6. Bend the choke rod to adjust.

CHOKE COIL LEVER ADJUSTMENT

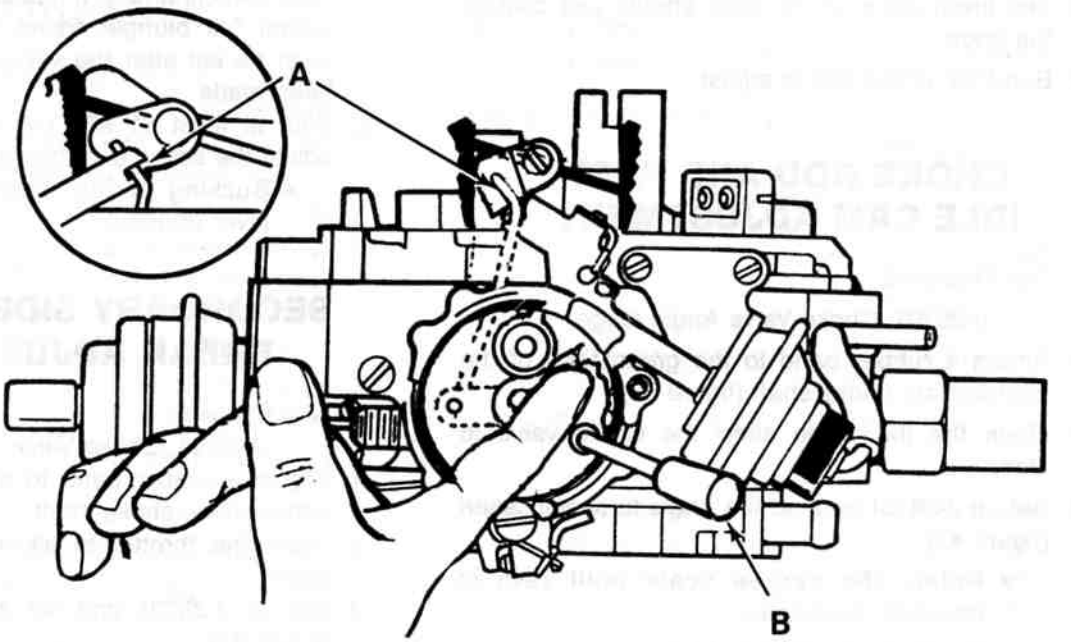
1. Drill out and remove rivets (if riveted). Remove the electric choke cover and stat assembly.
2. Place the fast idle cam follower on the high step of the fast idle cam.
3. Push up on the choke coil lever to close the choke valve.
4. Insert a 0.120-inch plug gage (figure 45).



A. Apply Lithium Base Grease Here
B. Lock Screw
C. Tension Adjusting Screw

B-09287

Figure 44—Air Valve Spring Adjustment



A. Bend Here to Adjust
B. 0.120 - Inch Plug Gage

B-09573

Figure 45—Choke Coil Lever Adjustment

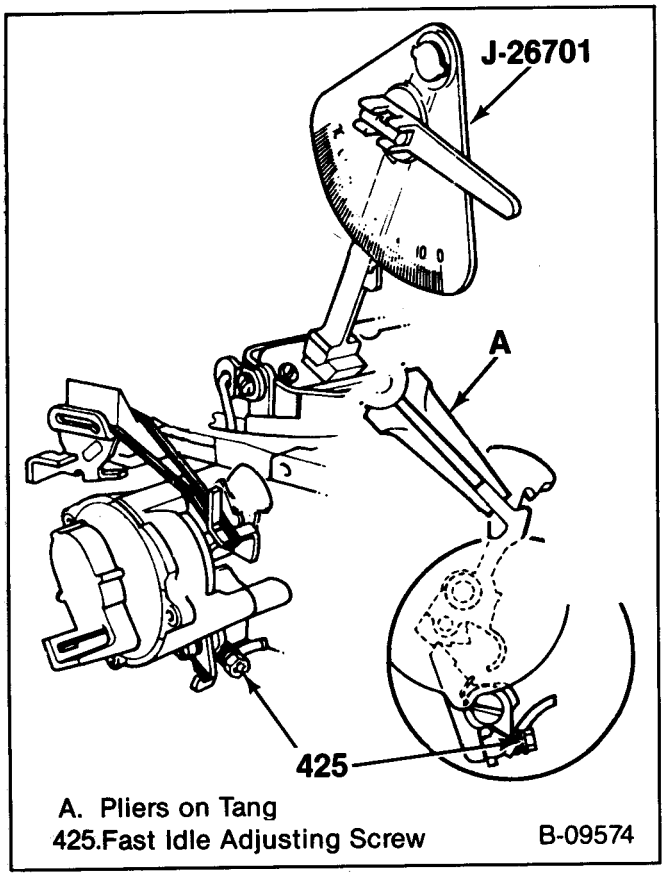


Figure 46—Choke Rod And Fast Idle Cam Adjustment

5. The lower edge of the lever should just contact the gage.
6. Bend the choke rod to adjust.

CHOKE ROD AND FAST IDLE CAM ADJUSTMENT

Tool Required:

J-26701, Choke Valve Angle Gage

1. Attach a rubber band to the green tang of the intermediate choke shaft (figure 46).
2. Open the throttle to allow the choke valve to close.
3. Set up J-26701 and set the angle to specification (figure 47).
   - Rotate the degree scale until zero is opposite the pointer.
   - Center the leveling bubble.
   - Rotate the scale to the specified angle.
     — Refer to "Specifications."
4. Place the cam follower on the second step of the cam against the high step. If the cam follower does not contact the cam, turn in the fast idle speed screw additional turn(s).

NOTICE: Final Fast Idle Speed Adjustment must be performed according to the Underhood Emission Control Information Label.

5. Adjust by bending the tang of the fast idle cam until the bubble is centered.

PRIMARY SIDE VACUUM BREAK ADJUSTMENT

Tool Required:

J-26701, Choke Valve Angle Gage

1. Attach rubber band to the green tang of the intermediate choke saft.
2. Open the throttle to allow the choke valve to close.
3. Set up J-26701 and set angle to specifications (figure 47).
   - Rotate the degree scale until zero is opposite the pointer.
   - Center the leveling bubble.
   - Rotate the scale to the specified angle.
     — Refer to "Specifications."
4. Retract the vacuum break plunger using a vacuum source of at least 61 kPa (18 in. Hg.). Plug the air bleed holes where applicable (figure 36).
   - The air valve rod must not restrict the plunger from retracting fully. If necessary, bend the rod to permit full plunger travel. Final rod clearance must be set after the vacuum break setting has been made.
5. With at least 61 kPa (18 in. Hg.) still applied, adjust the screw to center the bubble (figure 48).
   - Bucking spring must be seated against lever (if used).

SECONDARY SIDE VACUUM BREAK ADJUSTMENT

Tool Required:

J-26701, Choke Valve Angle Gage

1. Attach a rubber band to the green tang of the intermediate choke shaft.
2. Open the throttle to allow the choke valve to close.
3. Set up J-26701 and set angle to specification (figure 47).
   - Rotate the degree scale until zero is opposite the pointer.
   - Center the leveling bubble.
   - Rotate the scale to the specified angle.
     — Refer to "Specifications."
4. Retract the vacuum break plunger using a vacuum source of at least 61 kPa (18 in. Hg.).

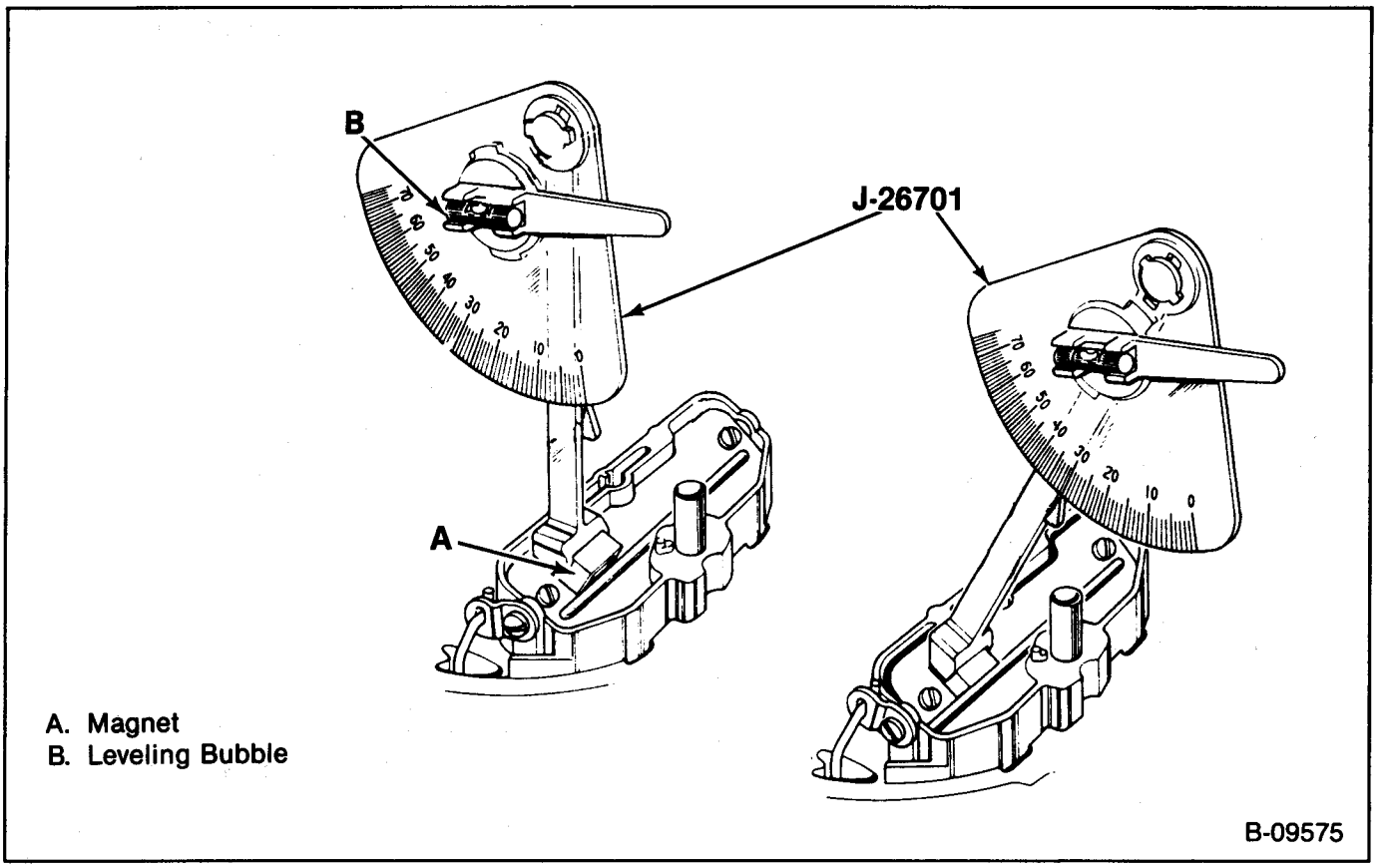


Figure 47—Choke Valve Angle Gage

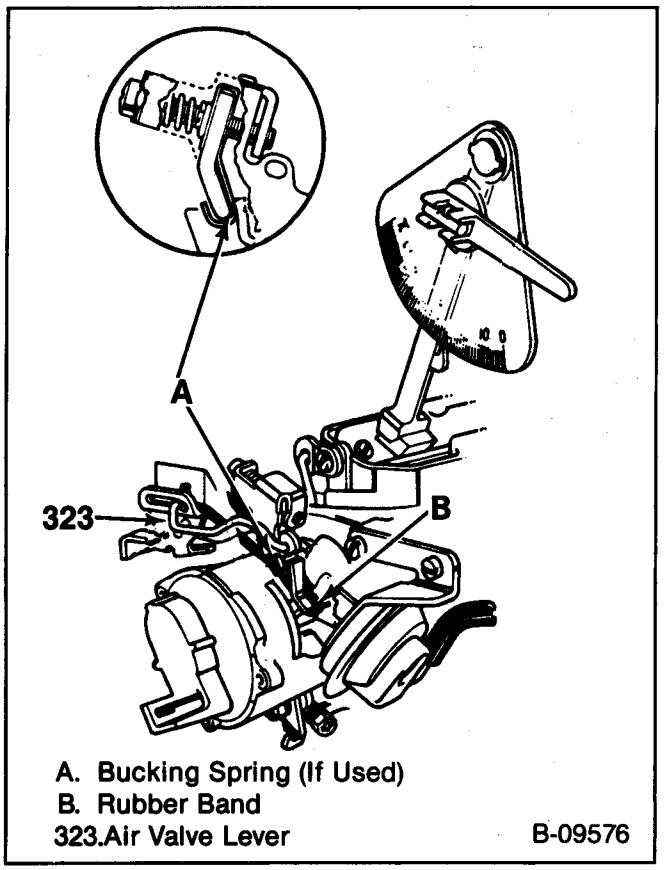


Figure 48—Primary Side Vacuum Break Adjustment

Plug the air bleed holes where applicable (figure 36).

- The air valve rod must not restrict the plunger from retracting fully. If necessary, bend the rod to permit full plunger travel. The plunger stem must be extended fully to compress the plunger bucking spring.

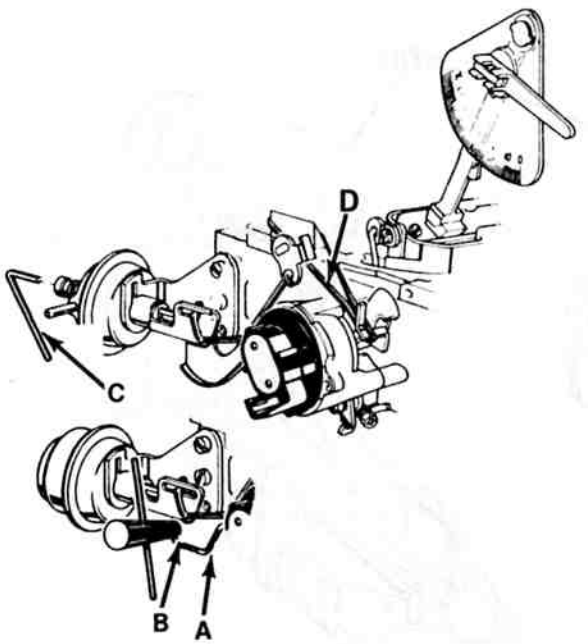
5. Center the bubble by adjusting with a 1/8 inch hex wrench (vacuum still applied) or support at point "A" and bend the vacuum break rod (vacuum still applied) (figure 49).

AIR VALVE ROD ADJUSTMENT

1. Use a vacuum source of at least 61 kPa (18 in. Hg.) to seat the vacuum break plunger.

   - Plug the air bleed holes where applicable (figure 36).

2. The air valve must be completely closed.
3. Use a 0.025-inch plug gage between the rod and the end of the slot (figures 50 and 51).
4. Bend the rod to adjust clearance to 0.025-inch.



A. Support Here
B. Bend Here
C. Hex Wrench
D. Rubber Band

B-09577

Figure 49—Secondary Side Vacuum Break Adjustment

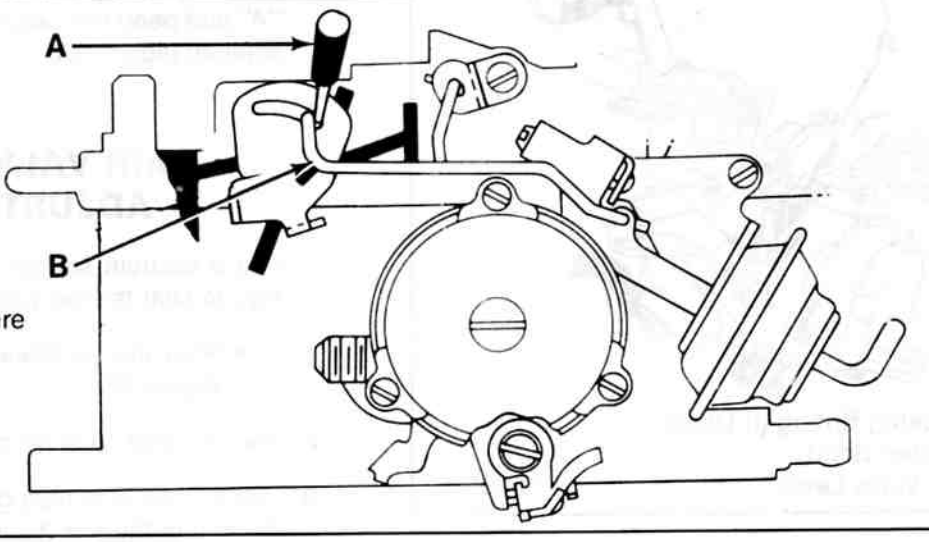
UNLOADER ADJUSTMENT

Tool Required:
J-26701, Choke Valve Angle Gage

1. Attach a rubber band to the green tang of the intermediate choke shaft (figure 52).
2. Open the throttle to allow the choke valve to close.
3. Set up J-26701 and set angle to specification (figure 47).
   - Rotate the degree scale until zero is opposite the pointer.
   - Center the leveling bubble.
   - Rotate the scale to the specified angle.
     — Refer to "Specifications."
4. Hold the secondary lockout lever away from the pin.
5. Hold the throttle lever wide open.
6. Adjust by bending the tang of the fast idle lever until the bubble is centered.

SECONDARY LOCKOUT ADJUSTMENT

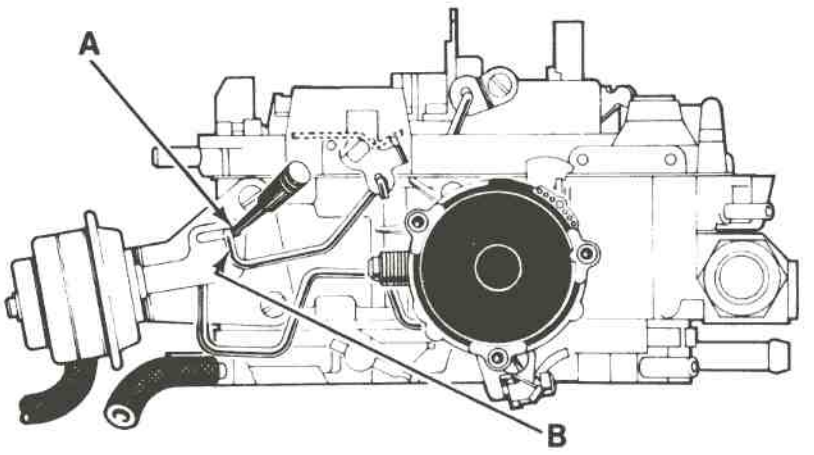
1. The choke valve and throttle valves must be closed.
2. Secondary lockout lever side clearance should be a maximum of 0.015-inch (figure 53).
3. Bend the pin to adjust.
4. Hold the choke valve wide open by pushing down on the tail of the fast idle cam.
5. Check the secondary lockout opening clearance with a 0.015-inch gage.
6. File the end of the pin for clearance.
   - Check for burrs after filing.



A. 0.025-inch Plug Gage
B. Bend Rod Here To Adjust

F-00402

Figure 50—Front Air Valve Adjustment

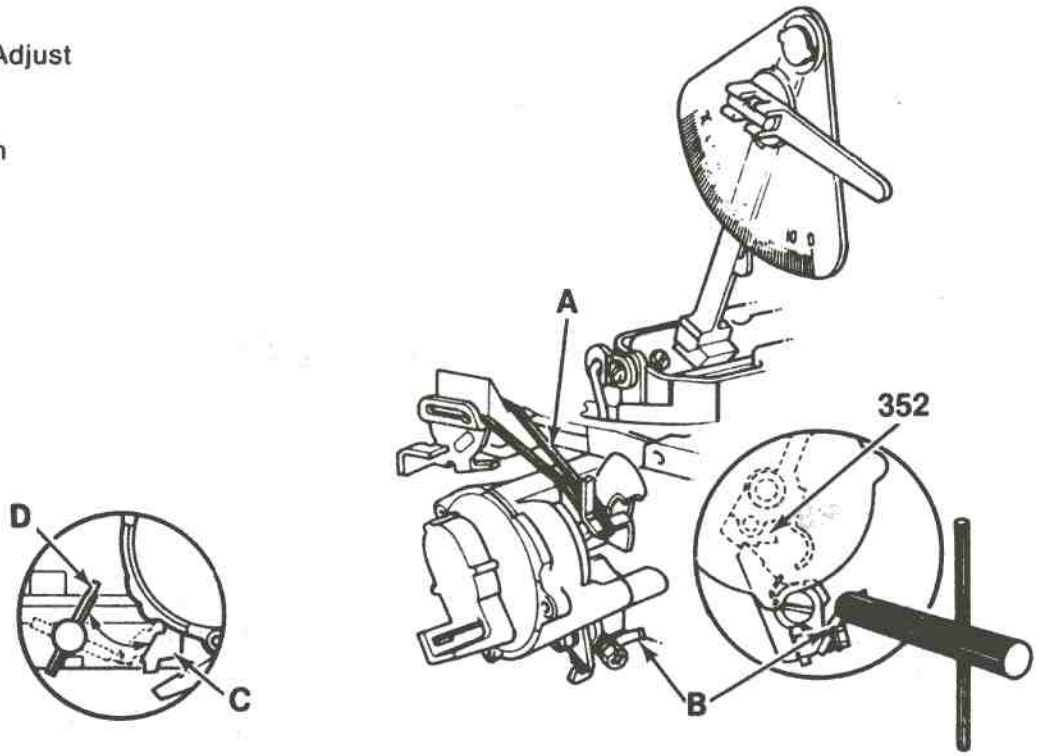


A. Plug Gage
B. Bend Here

F-00403

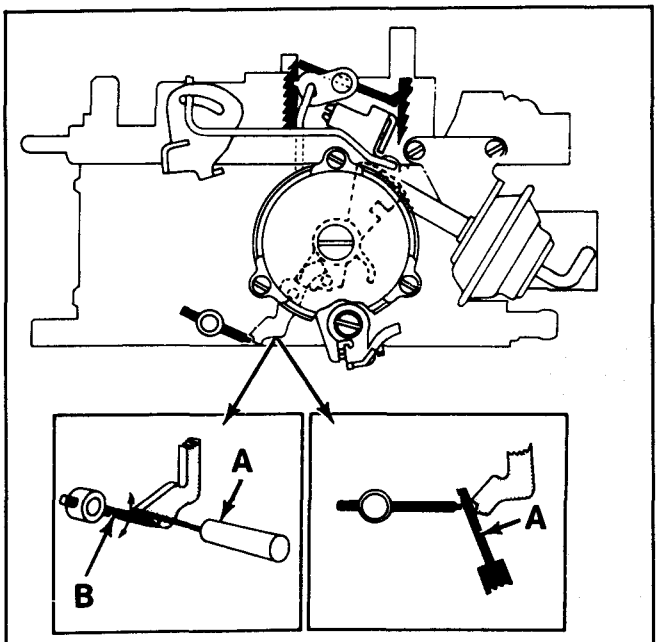
Figure 51—Rear Air Valve Adjustment

A. Rubber Band
B. Bend Tang to Adjust
C. Lockout Lever
D. Pin
352. Fast Idle Cam



B-09580

Figure 52—Unloader Adjustment



A. 0.015-inch Plug Gage
B. Bend Here

F-00404

Figure 53—Secondary Lockout Adjustment

CARBURETOR MODELS E4ME AND E4MED (CALIFORNIA ONLY)

DESCRIPTION

The Models E4ME and E4MED Quadrajet Carburetors are of the four barrel, two stage design. They are used with the Computer Command Control System of fuel control, which is further described in DRIVABILITY AND EMISSIONS — CARBURETED (SEC. 6E8).

The carburetor has three major assemblies: the air horn, the float bowl, and the throttle body. It has six basic operating systems (figures 54 through 60).

- Float
- Idle
- Main Metering
- Power
- Pump
- Choke

A single float chamber supplies fuel to the four carburetor bores. Fuel level is controlled by a closed cell rubber float, brass needle seat, and a rubber tipped float needle with pull clip.

Air/fuel mixture in the primary bores is controlled by an electrically operated mixture control solenoid. The solenoid is mounted in the float bowl. The plunger in the solenoid is controlled (or "pulsed") by electrical signals received frm the Electronic Control Module (ECM).

TWO POINT ADJUSTMENT

The two points of fuel control adjustment are:

1. The mixture control solenoid adjusting screw.
2. The idle mixture needles.

A single mixture control solenoid adjusting screw replaces the separate rich stop and lean stop screws. The solenoid adjusting screw positions the solenoid in the float bowl. A rich limit stop is assembled with the adjusting screw to hold the solenoid plunger travel to a fixed limit.

DUAL CAPACITY PUMP (E4MED MODELS ONLY)

E4MED model carburetors have a dual capacity pump valve and a combined mixture control/dual capacity pump solenoid assembly mounted on the float bowl (figure 59).

When the engine is cold, more fuel is necessary to insure a smooth transition from idle to part throttle. When the engine is warm, less fuel is required. The dual capacity pump is controlled by the coolant

SPECIFICATIONS (CONTINUED)

MODEL M4MC/M4ME CARBURETORS

CARBU-RETOR PART NO.	FLOAT LEVEL mm (Inches) ± 2/32"	PUMP ROD SETTING mm (Inches)	PUMP ROD LOCA-TION	AIR VALVE SPRING (Turns)	CHOKE COIL LEVER	FAST IDLE CAM (CHOKE ROD) ± 2.5°	VACUUM BREAK FRONT ± 2.5°	VACUUM BREAK REAR ± 3.5°	AIR VALVE ROD mm (Inches)	UN-LOAD-ER ± 4°	PROPANE ENRICH-MENT SPEED
17085000	9.5 (12/32)	7.0 (9/32)	INNER	7/8	.120	46°	24°	30°	0.6 (.025)	40°	
17085001	9.5 (12/32)	7.0 (9/32)	INNER	1	.120	46°	23°	30°	0.6 (.025)	40°	
17085003	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	23°	—	0.6 (.025)	35°	
17085004	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	23°	—	0.6 (.025)	35°	
17085206	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	26°	0.6 (.025)	39°	20
17085208	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	26°	38°	0.6 (.025)	39°	10
17085209	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	20°	26°	36°	0.6 (.025)	39°	50
17085210	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	26°	38°	0.6 (.025)	39°	10
17085211	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	20°	26°	36°	0.6 (.025)	39°	50
17085212	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	23°	—	0.6 (.025)	35°	
17085213	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	23°	—	0.6 (.025)	35°	
17085215	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	26°	0.6 (.025)	32°	
17085216	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	26°	38°	0.6 (.025)	39°	
17085217	10.0 (13/32)	7.0 (9/32)	INNER	1/2	.120	20°	26°	36°	0.6 (.025)	39°	
17085219	10.0 (13/32)	7.0 (9/32)	INNER	1/2	.120	20°	26°	36°	0.6 (.025)	39°	
17085220	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	20°	—	26°	0.6 (.025)	32°	75
17085221	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	20°	—	26°	0.6 (.025)	32°	75
17085222	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	26°	36°	0.6 (.025)	39°	20

SPECIFICATIONS (CONTINUED)

MODEL M4MC/M4ME CARBURETORS

CARBU-RETOR PART NO.	FLOAT LEVEL mm (Inches) ± 2/32"	PUMP ROD SETTING mm (Inches)	PUMP ROD LOCA-TION	AIR VALVE SPRING (Turns)	CHOKE COIL LEVER	FAST IDLE CAM (CHOKE ROD) ± 2.5°	VACUUM BREAK FRONT ± 2.5°	VACUUM BREAK REAR ± 3.5°	AIR VALVE ROD mm (Inches)	UN-LOAD-ER ± 4°	PROPANE ENRICH-MENT SPEED
17085223	10.0 (13/32)	9.5 (3/8)	OUTER	1/2	.120	20°	26°	36°	0.6 (.025)	39°	50
17085224	10.0 (13/32)	7.0 (9/32)	INNER	1/2	.120	20°	26°	36°	0.6 (.025)	39°	20
17085225	10.0 (13/32)	9.5 (3/8)	OUTER	1/2	.120	20°	26°	36°	0.6 (.025)	39°	50
17085226	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	—	24°	0.6 (.025)	32°	20
17085227	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	—	24°	0.6 (.025)	32°	20
17085228	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	24°	0.6 (.025)	39°	30
17085229	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	24°	0.6 (.025)	39°	30
17085230	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	—	26°	0.6 (.025)	32°	20
17085231	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	—	26°	0.6 (.025)	32°	40
17085235	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	26°	0.6 (.025)	39°	80
17085238	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	20°	—	26°	0.6 (.025)	32°	75
17085239	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	20°	—	26°	0.6 (.025)	32°	75
17085283	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	—	24°	0.6 (.025)	32°	20
17085284	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	—	26°	0.6 (.025)	32°	20
17085285	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	20°	—	24°	0.6 (.025)	32°	20
17085290	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	24°	0.6 (.025)	39°	30
17085291	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	46°	—	26°	0.6 (.025)	39°	100
17085292	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	24°	0.6 (.025)	39°	30
17085293	10.0 (13/32)	9.5 (3/8)	OUTER	7/8	.120	46°	—	26°	0.6 (.025)	39°	100
17085294	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	26°	0.6 (.025)	39°	
17085298	10.0 (13/32)	7.0 (9/32)	INNER	7/8	.120	46°	—	26°	0.6 (.025)	39°	

SPECIFICATIONS (CONTINUED)

MODEL E4ME CARBURETOR

CARBU-RETOR NUMBER	FLOAT LEVEL ± 2/32"	LEAN MIXTURE SCREW	IDLE MIXTURE NEEDLE (NO. OF TURNS)	IDLE AIR BLEED VALVE	AIR VALVE SPRING (NO. OF TURNS)	CHOKE STAT LEVER	CHOKE LINK CAM ± 2.5°	VACUUM BREAK FRONT ± 2.5°	VACUUM BREAK REAR ± 3.5°	AIR VALVE ROD	UN-LOADER ± 4°
17085502	14/32 (11.0 mm)	1.304 Gage	SEE NOTE	1.756 Gage	7/8	.120 Gage	20°	26°	36°	.025	39°
17085503	14/32 (11.0 mm)	1.304 Gage	SEE NOTE	1.756 Gage	7/8	.120 Gage	20°	26°	36°	.025	39°
17085506	14/32 (11.0 mm)	1.304 Gage	SEE NOTE	1.756 Gage	1	.120 Gage	20°	27°	36°	.025	36°
17085508	14/32 (11.0 mm)	1.304 Gage	SEE NOTE	1.756 Gage	1	.120 Gage	20°	27°	36°	.025	36°
17085524	14/32 (11.0 mm)	1.304 Gage	SEE NOTE	1.756 Gage	1	.120 Gage	20°	25°	36°	.025	36°
17085526	14/32 (11.0 mm)	1.304 Gage	SEE NOTE	1.756 Gage	1	.120 Gage	20°	25°	36°	.025	36°

NOTE: Preset 3 Turns, Final Adjustment On Vehicle

THROTTLE POSITION SENSOR (TPS)		
ENGINE	TPS VOLTAGE ± 0.1 VOLT	THROTTLE
F (LF3)	.41 Volts	Curb Idle
L (LS9)	.41 Volts	Curb Idle
N (LB1)	.25 Volts	Curb Idle

SPECIAL TOOLS

J-9789-D	Carburetor Gage Set
J-9789-90	Float Level "T" Scale
J-9789-111	Bending Tool
J-9789-118	Carburetor Stand
J-23738-A	Hand Held Vacuum Pump
J-26701-A	Carburetor Choke Angle Gage
J-26911	Propane Enrichment Device
J-29030-B	Idle Mixture Socket
J-34817	Float Positioning Tool Kit
J-34935-1	Float Level Gage

SECTION 6D

ENGINE ELECTRICAL

CONTENTS

CHARGING SYSTEM

DESCRIPTION

The charging system consists of the battery, the generator, the regulator, and the charging system indicator lamp circuitry. The generator supplies electrical power for charging the battery and operating accessories.

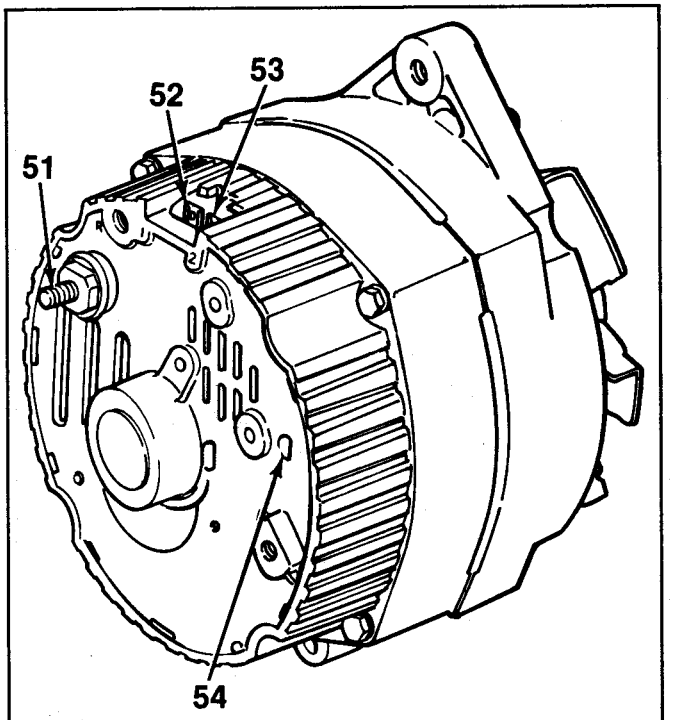
The generators shown in figures 6 through 11 are of the "System Intergral" series (generator with built-in regulator).

The generator features a solid state regulator that is mounted inside the generator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the slip ring end frame. The regulator voltage setting cannot be adjusted.

The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long periods of attention-free service.

The stator windings are assembled on the inside of a laminated core that forms part of the generator frame. A rectifier bridge connected to the stator windings contains six diodes, and electrically changes the stator AC voltages to a DC voltage which appears at the generator output (BAT) terminal. The output varies from 37 to 80 amperes, depending on the model. Refer to "Specifications" at the end of this section. Generator field current is supplied thorugh a diode trio which also is connected to the stator windings. A capacitor or condenser, mounted in the end frame, protects the rectifier bridge and diode trio from high voltages, and suppresses radio noise.

No periodic adjustments or maintenance of any kind are required on the entire generator assembly.



51. "BAT" Terminal
52. No. 1 Terminal
53. No. 2 Terminal
54. Field Ground Hole

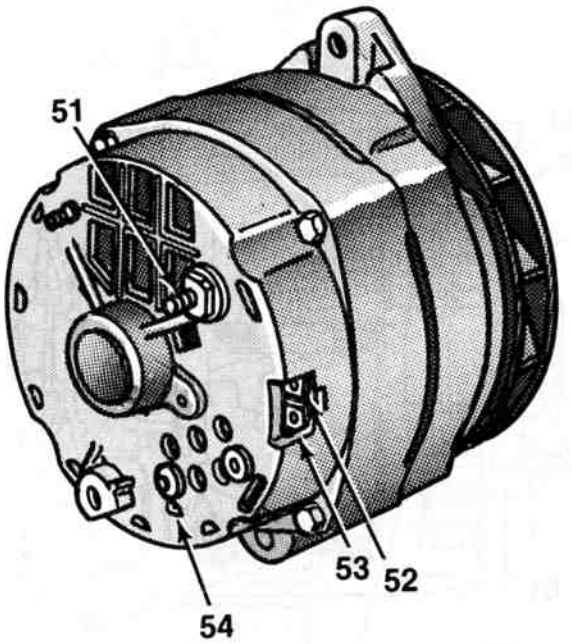
F-00020

Figure 6—10-SI Series 100 Generator

CIRCUIT OPERATION

When the engine control switch is turned to "Run" or "Start", the switch closes and current from the battery flows through the charging system indicator lamp, the number 1 terminal, the regulator, ground, and back to the battery. Current also flows through the generator field coil and back to the battery. The charge indicator lamp then turns on.

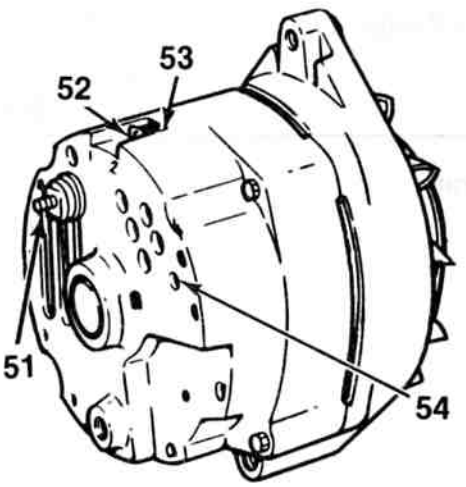
With the generator operating, direct current (DC) voltage is applied to the battery through the "BAT" terminal. Some of the output flows through the diode trio to the field coil, then through the brown wire at terminal number 1 to the charge indicator lamp. The lamp goes out since approximately the same voltage is present at both sides of the lamp. On vehicles with gages a voltmeter indicates voltage.



51. BAT Terminal
52. No. 1 Terminal
53. No. 2 Terminal
54. Field Ground Hole

F-00013

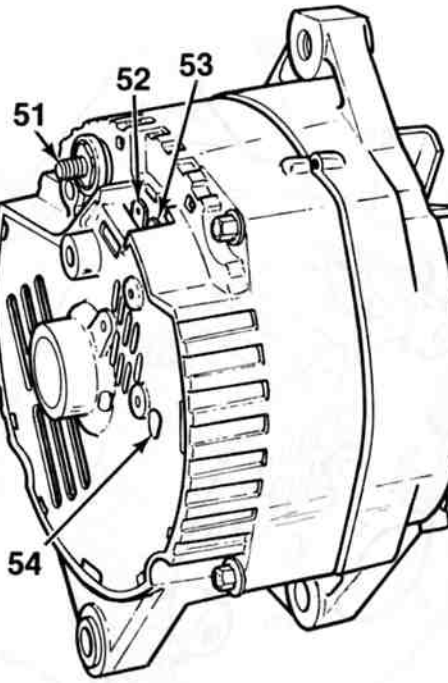
Figure 7—12-SI Series 100 Generator



51. "BAT" Terminal
52. No. 1 Terminal
53. No. 2 Terminal
54. Field Ground Hole

F-00014

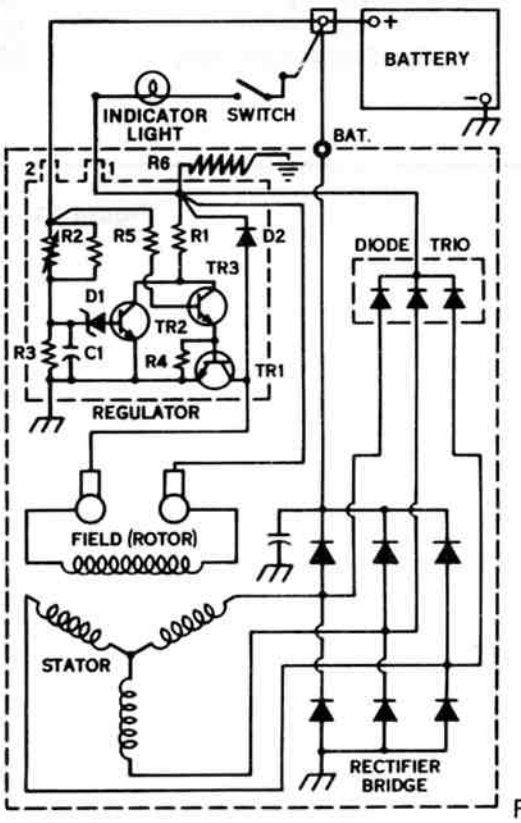
Figure 8—15-SI Series 100 Generator



51. BAT Terminal
52. No. 1 Terminal
53. No. 2 Terminal
54. Field Ground Hole

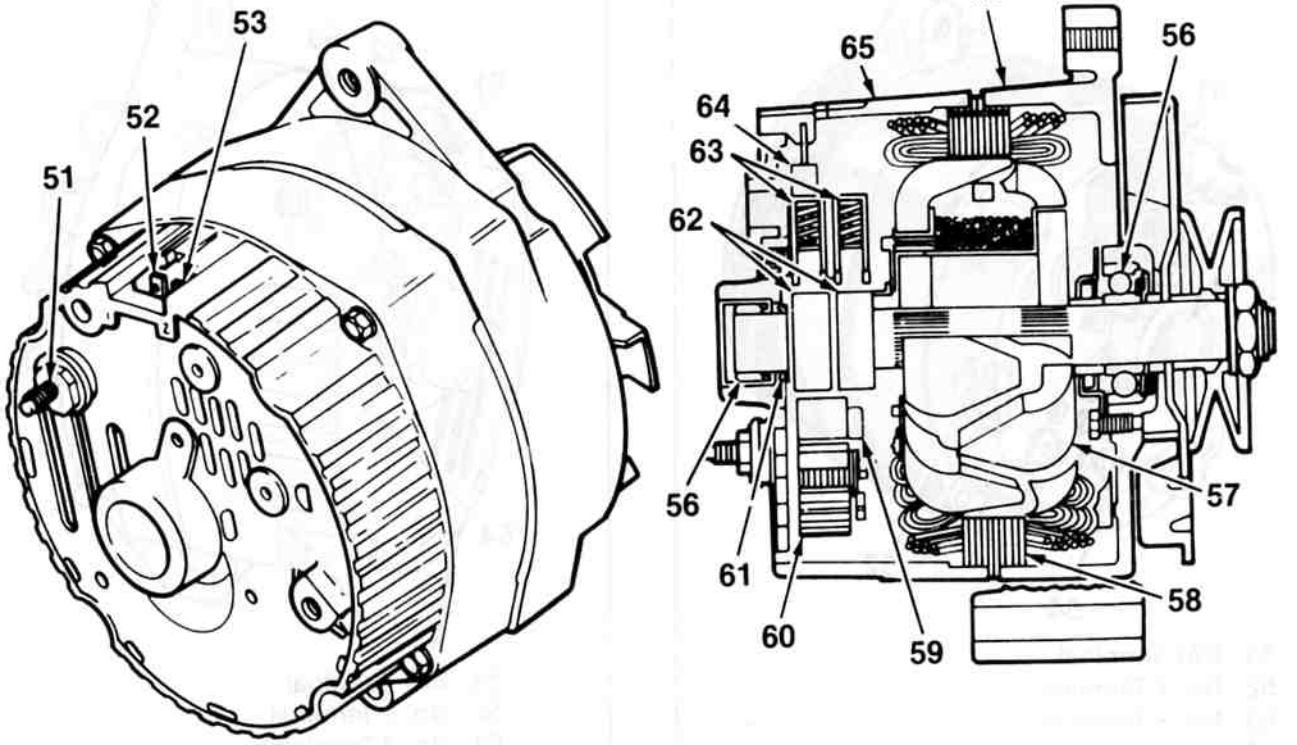
F-00015

Figure 9—27-SI Series 100 Generator



F-00660

Figure 10—Generator Schematic



51. "BAT" Terminal
52. No. 1 Terminal
53. No. 2 Terminal
55. Drive End Frame
56. Bearing
57. Rotor
58. Stator Assembly
59. Diode Trio
60. Rectifier Bridge
61. Seal
62. Slip Rings
63. Brushes
64. Regulator
65. Slip Ring End Frame

B-08205

Figure 11—SI Series Generator

DIAGNOSIS OF CHARGING SYSTEM

NOISY GENERATOR

Noise from a generator may be caused by a loose drive pulley, loose mounting bolts, worn or dirty bearings, worn diode or stator. If the pulley and mounting bolts are snug and the noise continues, remove the generator for inspection and repair. Refer to "Generator Replacement" later in this section.

ELECTRICAL TESTS

Before performing the diagnosis procedures on the vehicle, be certain that the system wiring is good and generator belts are not slipping. Also, the battery must be fully charged for a valid test of the charging system.

NOTICE: To avoid damage to the vehicle electrical system, 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 herein.***
- ***NEVER operate the generator with the output terminal open-circuited.***
- ***Make sure the generator and battery have the same ground polarity.***
- ***When connecting a charger or booster battery to the vehicle battery, connect negative to negative and positive to positive.***

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

1. On vehicles without gages, unusual operation of the charging indicator lamp.
2. An undercharged battery, indicated by slow cranking or a dark battery hydrometer.
3. An overcharged battery, indicated by spewing of electrolyte from the vents.

CHARGING SYSTEM INDICATOR LAMP OPERATION

Check the indicator lamp for normal operation (figure 12). If normal, proceed to "Undercharged Battery".

UNDERCHARGED BATTERY

Slow cranking or a dark battery hydrometer can be caused by one or more of the following conditions even though the indicator lamp may be operating normally. The following procedures also apply to vehicles equipped with a voltmeter.

1. Check that the undercharged condition has not been caused by accessories having been left on for extended periods.
2. Check the drive belt for proper tension. Refer to ENGINE COOLING (SEC. 6B) for belt specifications.
3. If the battery is suspected as defective, refer to "Battery" covered previously in this section.
4. Inspect the wiring for cracks or breaks. Check all circuit connections, cable clamps and battery terminals for tightness and cleanliness.
5. With the engine control switch on and all wiring harness leads connected, use a voltmeter for the following checks:

Install or Connect (Figures 6 through 11)

1. Voltmeter from the generator battery terminal to ground.
   - Should read 12 volts.
2. Voltmeter from the number 1 terminal to ground.
   - Should read one volt or more.
3. Voltmeter from the number 2 terminal to ground.
   - Should read 12 volts.

A zero reading on any of the above indicates an open between the voltmeter connection and the battery. If checks 1 through 5 are normal perform the generator output test.

OVERCHARGED BATTERY

If the battery feels hot, is spewing electrolyte, or lamps seem too bright when turned on, an overcharged condition may exist.

To check the voltage, install a voltmeter across the battery. Run the engine at moderate speed with all accessories off. If the voltage reads 15.5 or more, remove the generator for repair.

GENERATOR OUTPUT TEST

1. Disconnect the battery ground cable.
2. Connect an ammeter in the circuit at the battery terminal of the generator.
3. Reconnect battery ground cable.
4. Turn on the radio, windshield wipers, headlamps (high beam) and blower motor high speed.
5. Connect a carbon pile across the battery.
6. Run the engine at moderate speed (about 2,000 rpm) and adjust the carbon pile to obtain maximum current output.
7. If the ampere output is within 10 amperes of the rated ouput as stamped on the generator frame, the generator is probably all right.

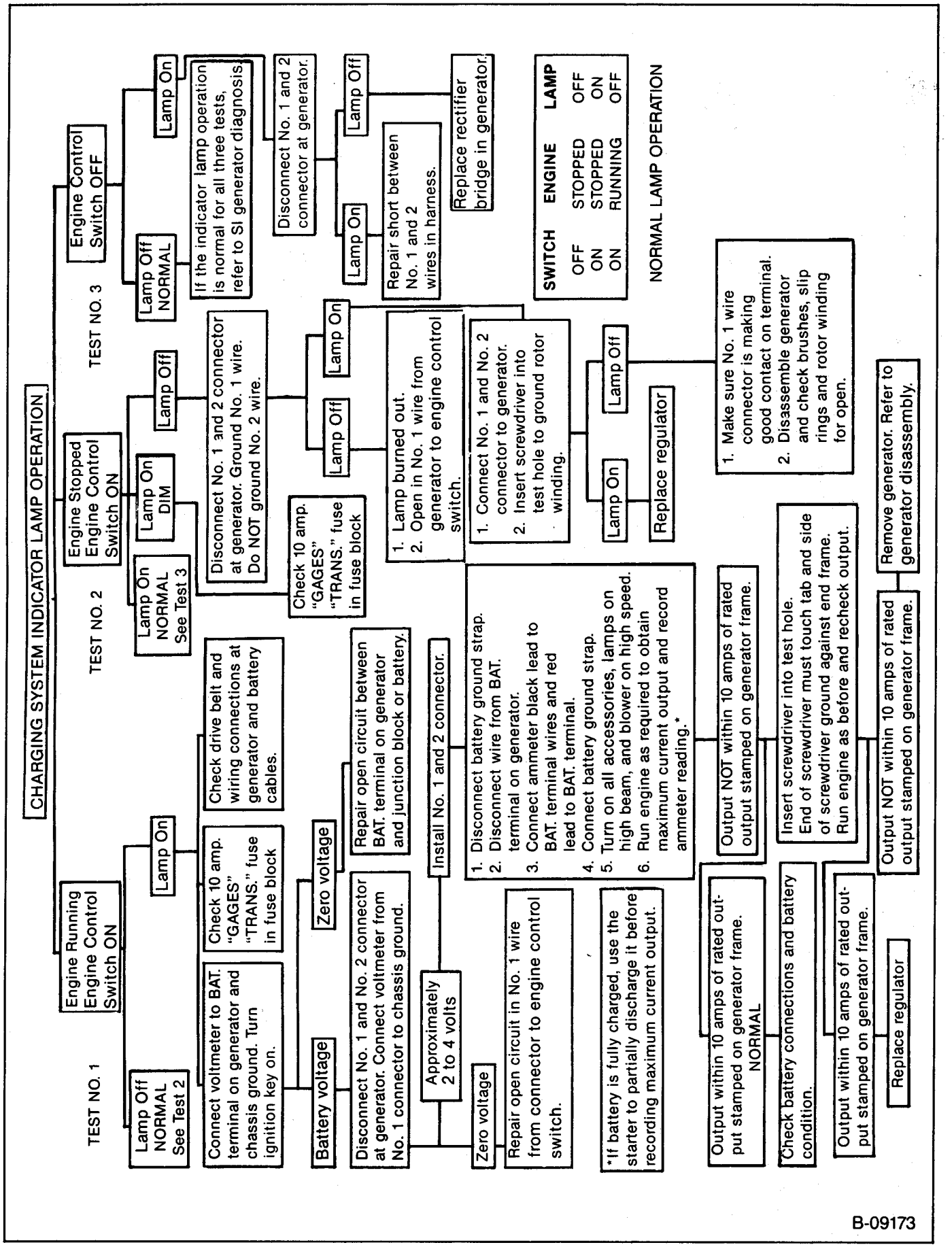
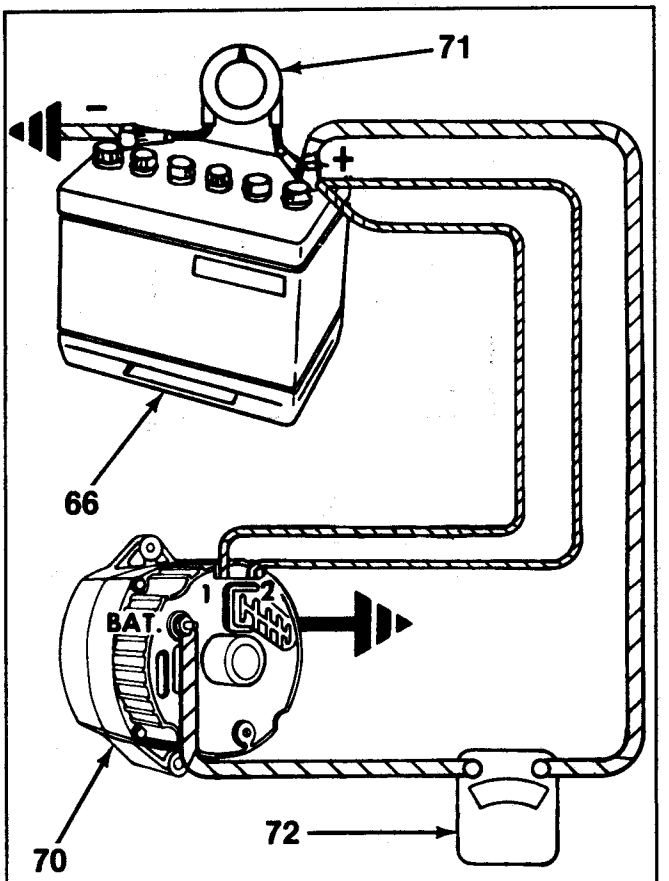


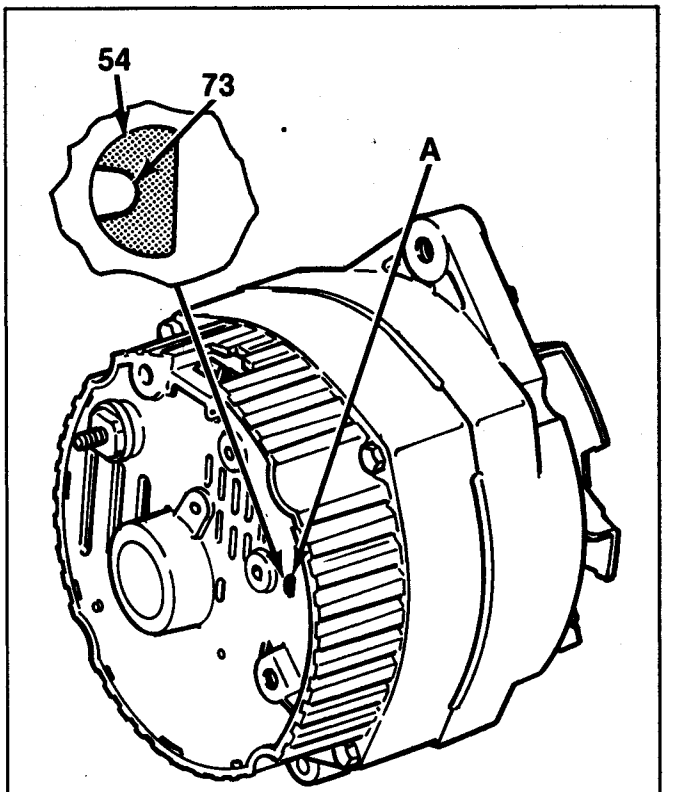
Figure 12—Charging System Diagnosis



66. Battery
70. Generator
71. Carbon Pile
72. Ammeter

F-00010

Figure 13—Connections For Generator Output Test



54. Field Ground
73. Tab
A. Insert screwdriver, ground tab to end frame.

F-00011

Figure 14—Generator Field Ground Tab

8. If the vehicle is equipped with a charging system indicator lamp, and the lamp remains on while the engine runs, and ampere output is normal, remove the generator for repair. Check the diode trio and rectifier bridge.
9. If the ampere output is not within 10 percent of the rated ouput in amperes, see if the test hole is accessible (figure 14). If it is not accessible go to step 14.
10. Ground the field winding by inserting a screwdriver into the test hole.

NOTICE: The tab is within 19 mm (3/4 inch) of the casting surface. Do not force the screwdriver deeper than 25 mm (1 inch) into the end frame or the generator may be damaged.

11. Run the engine at moderate speed and adjust the carbon pile to get maximum current ouput.
12. If the output is within 10 amperes of the rated ouput, remove the generator for repair. Refer to the Light Duty Truck Unit Repair Manual to check the field winding and regulator.
13. If the output is not within 10 amperes of rated output, remove the generator and check the field winding, diode trio, rectifier bridge and stator.
14. If the test hole is not accessible, remove the generator for repair.

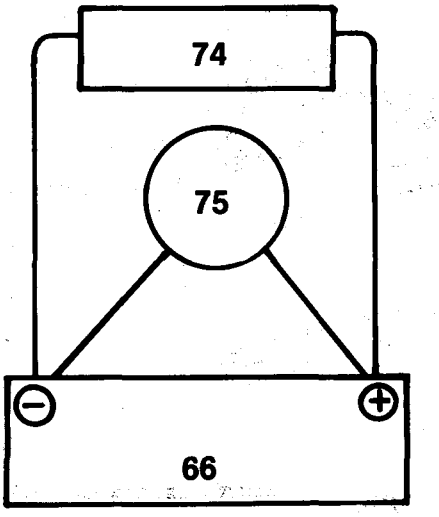
GENERATOR DIAGNOSTIC TESTER INDICATIONS

If a tester is available, check the generator following the tester manufacturer's instructions. It will indicate about 98 percent of the charging system problems.

TRANSISTORIZED VOLTAGE REGULATOR TEST

Connect a fast charger and a voltmeter to the battery as shown in figure 15. With the engine control switch on "run" and the engine off, slowly increase the charge rate. The charging system indicator lamp (on vehicles without gages) will dim at the voltage regulator setting. The setting should be at a minimum of 13.5 volts and a maximum of 16.0 volts.

This test works if the rotor circuit is good, even if the stator, rectifier bridge or diode trio is bad.



74. Fast Charger
75. Voltmeter
66. Battery

F-00012

Figure 15—On-Vehicle Regulator Test

GENERATOR ON-VEHICLE SERVICE

GENERATOR REPLACEMENT

The removal and installation instructions serve only as a guide. Additional operations may be required on some vehicles to remove other equipment to gain access to the generator, drive belts and brackets. However, specific instructions are given below for G vans equipped with air conditioning.

CAUTION: Failure to observe step 1 in this procedure may result in an injury from the *hot battery lead at the generator.*

Remove or Disconnect

All Models

1. Negative battery cable at the battery.

G Van:

2. Air intake hoses on the bulkhead side.
3. Air intake and hoses.
4. *Transmission fluid dipstick from the tube.*

Important

- Cover the tube opening to prevent dirt particles form entering the tube.

5. Engine oil dipstick.
6. Bolt through the bracket holding the dipstick tube to the engine oil fill tube.
7. Engine oil dipstick tube.
   - Cover the opening.
8. Bolt holding the oil fill tube to the generator bracket.
9. *Oil fill tube from the rubber grommet in the valve* cover.
   - Cover the opening.

All Models:

10. Terminal plug and battery lead from the back of the generator.
    - Loosen the adjusting bolt on the generator mounting.
11. Generator drive belt.
12. Lower mounting through-bolt from the generator flange.
13. *Adjusting bolt and the generator.*

Install or Connect

All Models

1. Generator to the mounting bracket with the bolt.
   - Do not tighten.
2. Lower mounting bolt through the generator flange, flange extension, emission hose bracket and into the cylinder head.
3. Generator drive belt.

Tighten

- Belt. Refer to ENGINE COOLING (SEC. 6B) for belt specifications.
- Adjusting bolt.

4. Terminal plug and battery lead to the back of the generator.

G Van:

5. Oil fill tube to the rubber grommet after removing the cover.
6. Oil fill tube to the generator bracket with the bolt.
7. Engine oil dispatch tube bracket to the oil fill tube with a bolt after removing the cover.
8. Dipstick.
9. Air intake hoses.
10. Air intake and bolt to core support.

All Models:

11. Negative battery cable to the battery.

Refer to the Light Duty Truck Unit Repair Manual for off-vehicle service.

DIESEL GLOW PLUG ELECTRICAL SYSTEM

DESCRIPTION

In the diesel engine, air alone is compressed in the cylinder; then after the air has been compressed a charge of fuel is sprayed into the cylinder and ignition occurs due to the heat of compression. Eight glow plugs are used to preheat the chamber as an aid to starting (figure 16).

The diesel glow plug system consists of an intergral-electronic control/glow plug relay assembly, 6-volt glow plugs, a glow plug inhibit temperature switch and a glow plug lamp.

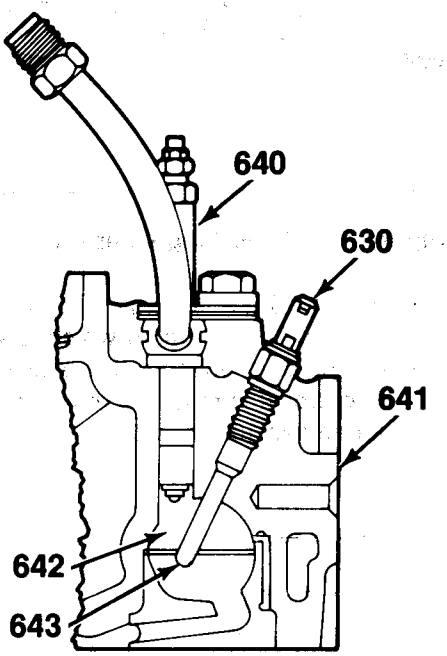
GLOW PLUGS

These are 6-volt heaters (operated at 12 volts) that turn on when the engine control switch is turned to the run position prior to starting the engine. They remain pulsing a short time after starting, then automatically turn off.

INSTRUMENTATION

Vehicles with the diesel engine have special instrumentation indicators to permit the operator to properly apply the starting procedure. A glow plug lamp on the instrument panel provides this information on engine starting conditions.

Vehicles equipped with diesel engines have a water in fuel lamp and low engine coolant lamp. Refer to the engine fuel and engine cooling sections for information on these systems.



630. Glow Plug
640. Fuel Injector
641. Cylinder Head
642. Pre Combustion Chamber
643. Heated Sheath

F-00228

Figure 16—Diesel Engine Glow Plug Location

ELECTRONIC CONTROLLER/GLOW PLUG RELAY ASSEMBLY (FIGURES 17 AND 18)

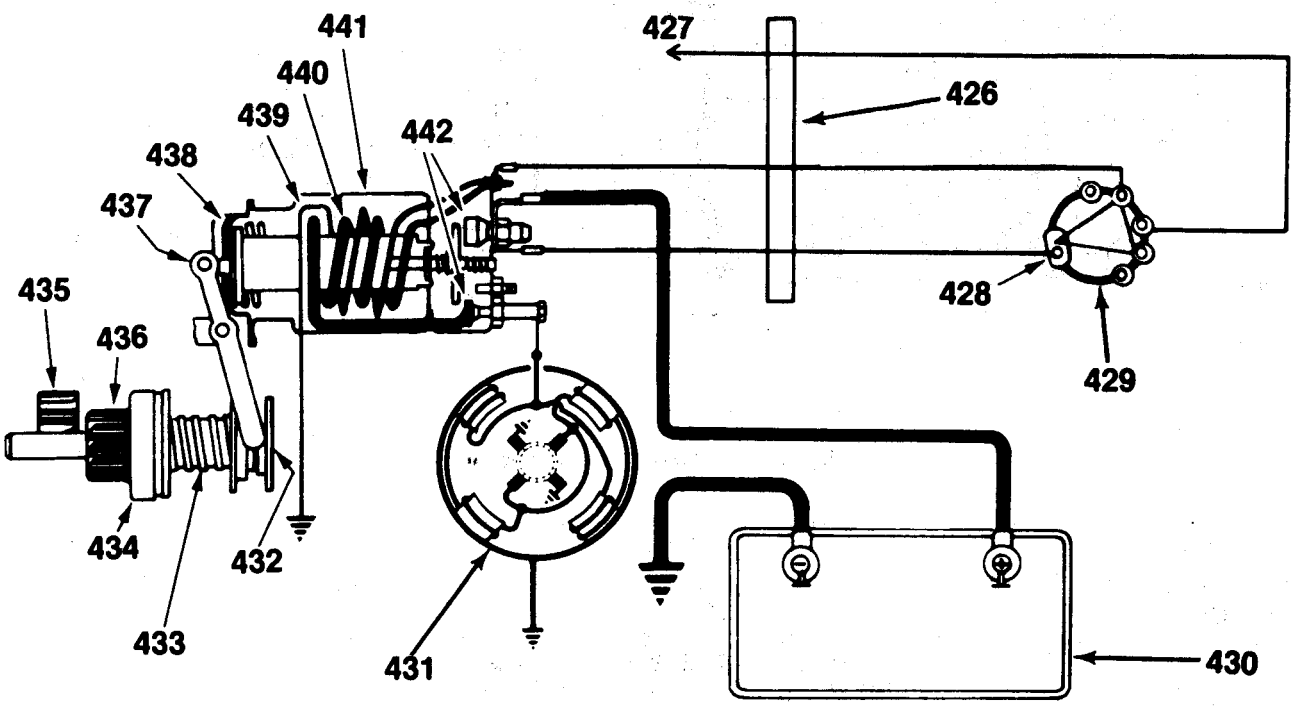
The assembly contains the circuitry which monitors and controls glow plug relay operation. Information is received at pins B and C which is used by the controller to determine glow plug operating requirements. Pin B senses voltage at the starting

GLOW PLUG ON-VEHICLE SERVICE

Check the system and its components on the vehicle.

None of the components are serviceable. When installing new components and making connections, be sure that connections are tight and torque values are used. Torque the glow plugs to 17 N·m (12 ft. lbs.) when installed.

CRANKING SYSTEM



426. Bulkhead Connector
427. To Distributor "BAT" Terminal
428. BAT.
429. Engine Control Switch
430. Battery
431. Starter Motor
432. Shift Collar
433. Pinion Compression Spring
434. Clutch
435. Flywheel
436. Pinion
437. Shift Lever
438. Plunger
439. Hold In Coil
440. Pull In Coil
441. Solenoid
442. Solenoid Switch Contacts

B-08263

Figure 21—Cranking Circuit

DESCRIPTION

CRANKING CIRCUIT

The basic cranking circuit consists of the battery, starter motor, engine control switch, and related electrical wiring (figure 21).

STARTER MOTOR

Two types of starter motors are used in the vehicles covered in this manual (figures 22 and 23). Both have the shift lever mechanism and the solenoid plunger enclosed in the drive housing to protect them from exposure to dirt, icing conditions and splash.

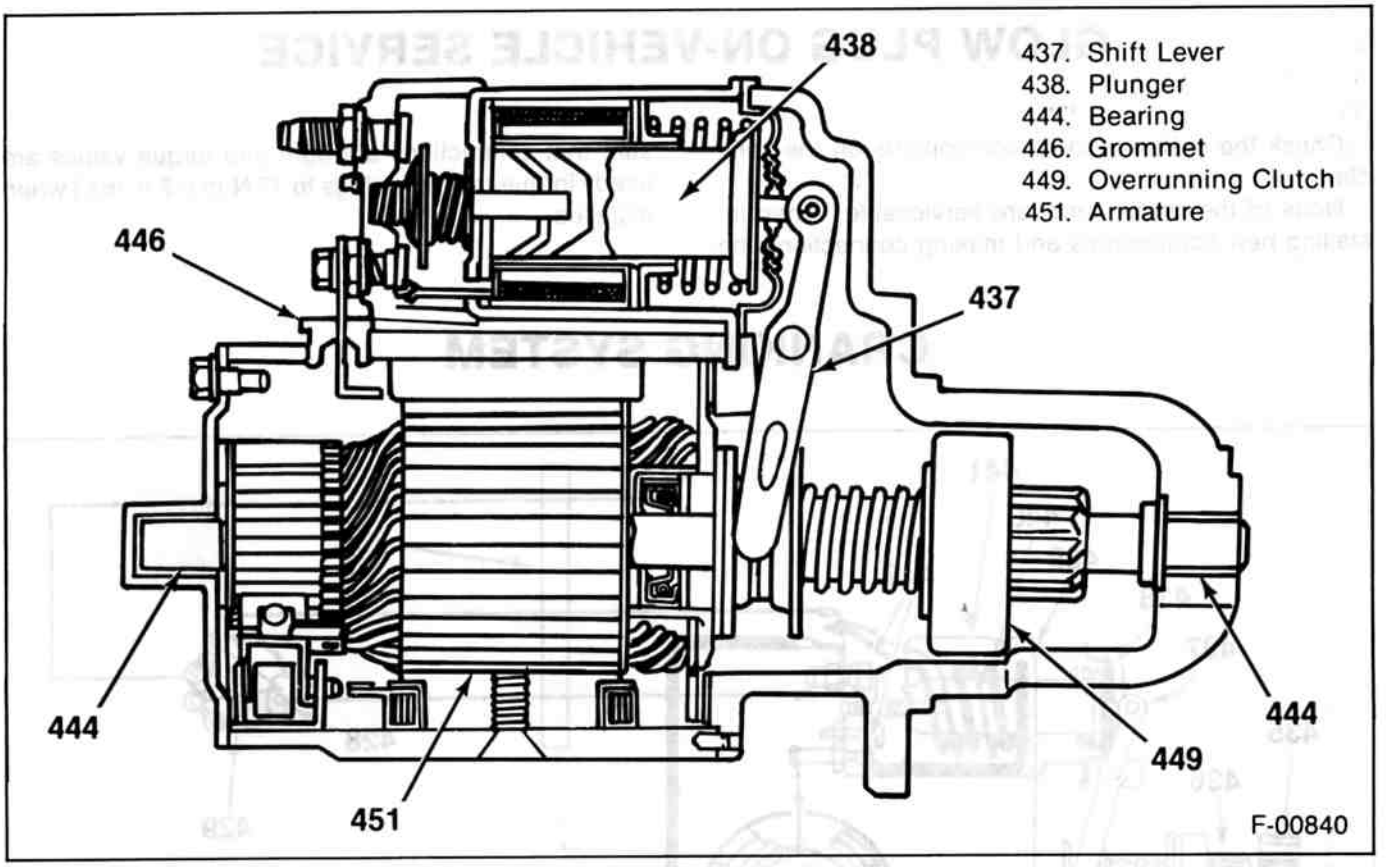


Figure 22—10MT Starting Motor

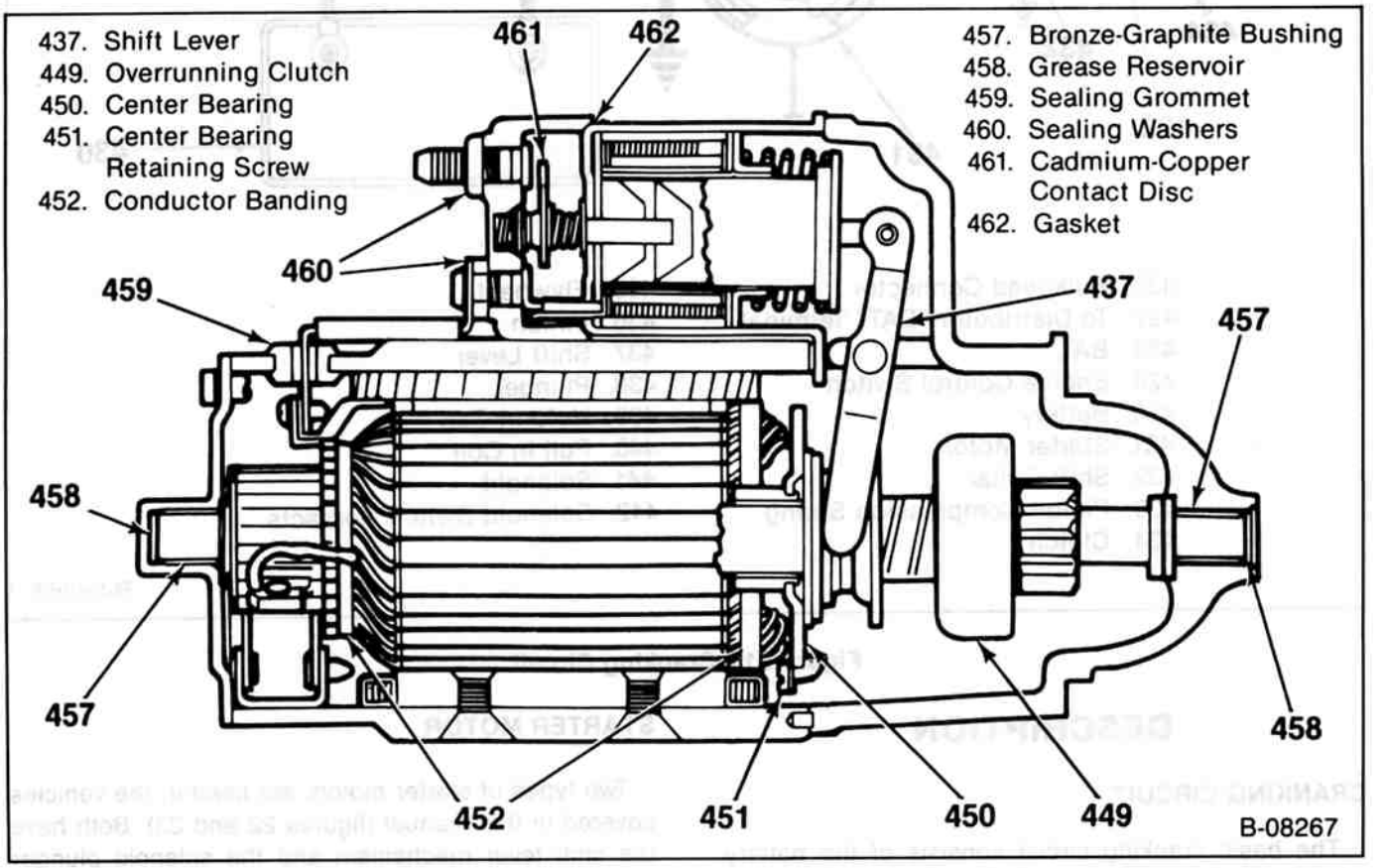


Figure 23—27MT Starting Motor

In the basic circuit (figure 21), the solenoid windings are energized when the switch is closed (in the "Start" position). The resulting plunger and shift lever movement causes the pinion to mesh with the engine flywheel ring gear and the solenoid main contacts to close, and engine cranking takes place. When the engine starts, pinion overrun protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage. To prevent excessive overrun, open the engine control switch (release from the "Start" position) immediately when the engine starts.

DIAGNOSIS OF CRANKING SYSTEM

Refer to figures 24, 25 and 26 for a diagnosis of the cranking system. Before removing any unit in the system for repair, make the following checks.

CRANKING CIRCUIT

BATTERY

Determine the condition of the battery. Refer to "Battery" earlier in this section for battery diagnosis and testing.

WIRING

Inspect the circuit wiring for damage. Inspect all connections to the starter motor, solenoid, engine control switch, and battery, including all ground connections. Clean and tighten all connections as required.

SOLENOID AND CONTROL SWITCHES

Check all switches to determine their condition. A vehicle equipped with an automatic transmission and a computerized ignition system (Electronic Control Module) has a neutral start switch which allows the vehicle to be started in Park or Neutral. It is located on the steering column near the floor. A vehicle with a manual transmission has a neutral start switch attached to the clutch.

STARTER MOTOR NOISE

Refer to the starter noise diagnostic chart.

PINION CLEARANCE

1. Remove the lower flywheel housing cover.
2. Inspect the flywheel for signs of unusual wear such as chipped or missing gear teeth or the flywheel being bent. If the flywheel needs replacing, refer to "Engine Mechanical" earlier in this manual.
3. Start the engine and gently touch the outside diameter of the rotating flywheel ring gear with chalk or crayon to show the high point of tooth runout after the engine is turned off. Turn the engine off and rotate the flywheel so that the marked teeth are in the area of the starter pinion gear.
4. Disconnect the negative battery cable to prevent accidental cranking of the engine.
5. Insert a screwdriver in the small hole in the bottom of the starter (shown by the arrow in figure 27) and move the starter pinion and clutch assembly so that the pinion teeth and flywheel teeth are meshed. If necessary, rotate the flywheel so that a pinion tooth is directly in the center of two flywheel teeth and on the centerline of the two gears (figure 28).
6. Measure the clearance between the top of the pinion tooth and the bottom of the flywheel tooth using the width of the wire gage (figure 28). Normal clearance is 0.5 to 1.5 mm (0.02 to 0.06 inch).
7. If the clearance is less than 0.5 mm (0.02 inch) and the starter whines after firing, shim the starter away from the flywheel.
   - Gas engines (figure 29):
     Add 1.0 mm (0.04 inch) shims, one at a time, to both long bolts between starter mounting pads and engine until noise problem is corrected. Do not use more than 2 shims total.
   - Diesel engine (figure 30):
     Add shims as required. Total shim stack must not exceed 4.0 mm (0.016 inch). If starter shims are not available, washers made of shim stock can be used.
8. If the pinion clearance is more than 1.5 mm (0.06 inch) and the starter whines during cranking, shim the starter towards the flywheel.
   - Gas engines (figure 29):
     Add 0.38 mm (0.015 inch) shims between the outboard starter mounting pad and engine mount until the noise stops. Do not add more than 4 shims total.

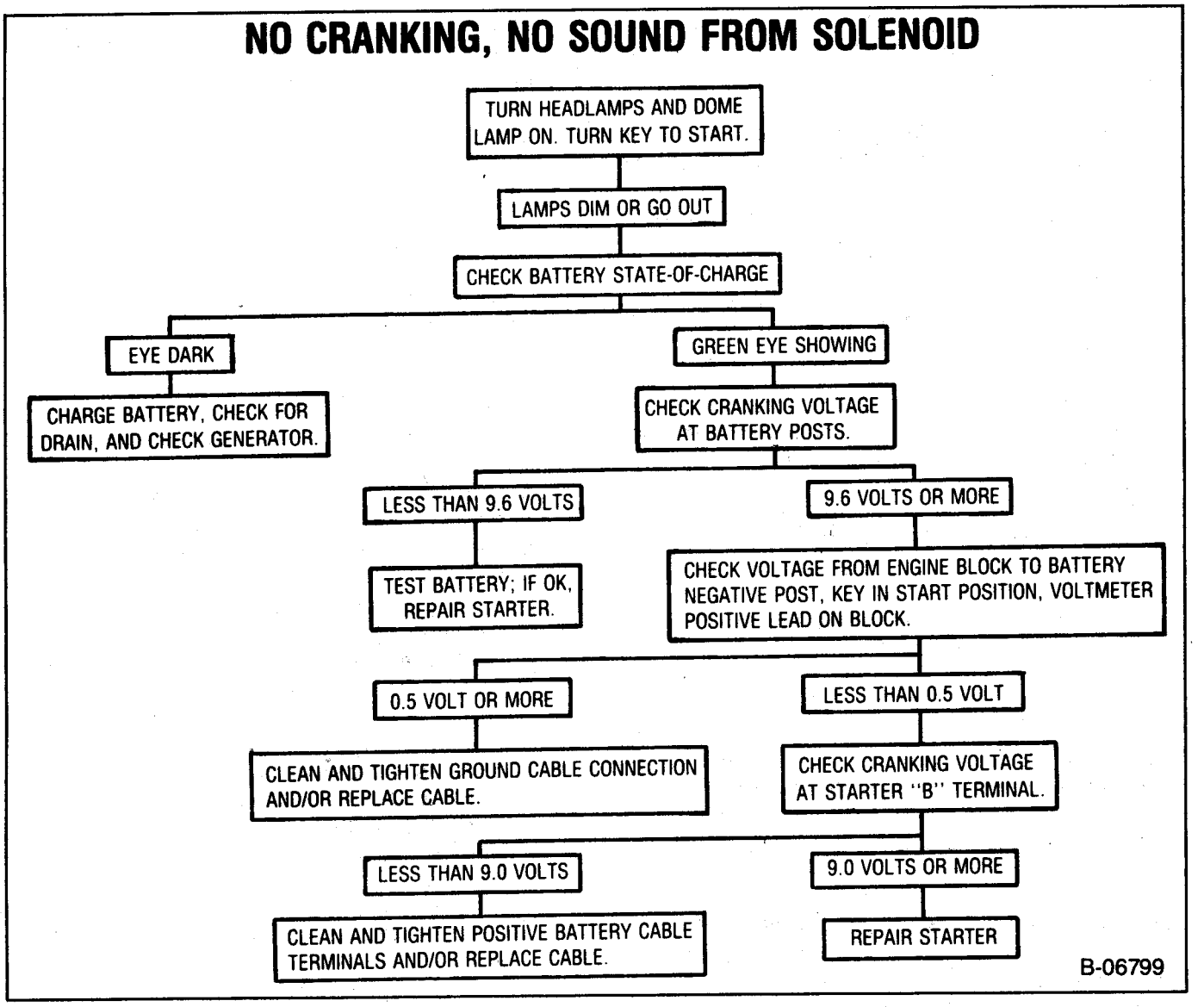


Figure 24—Cranking System Diagnosis

- Diesel engine (figure 30):
  Add a 1.0 mm (0.014 inch) shim at "A" between the starter motor mounting pad and the engine. If a starter shim is not available, a washer made of shim stock can be used.

9. When shimming is done, torque the mounting bolts.

Tighten

1. Gas engine starter motor mounting bolts to 38 N·m (28 ft. lbs.) (figure 29).
2. Diesel engine starter motor:
   - Through bolt to 38 N·m (28 ft. lbs.) (figure 30).
   - Nut to 10 N·m (7.4 ft. lbs.).
   - Bolt to 32 N·m (24 ft. lbs.).

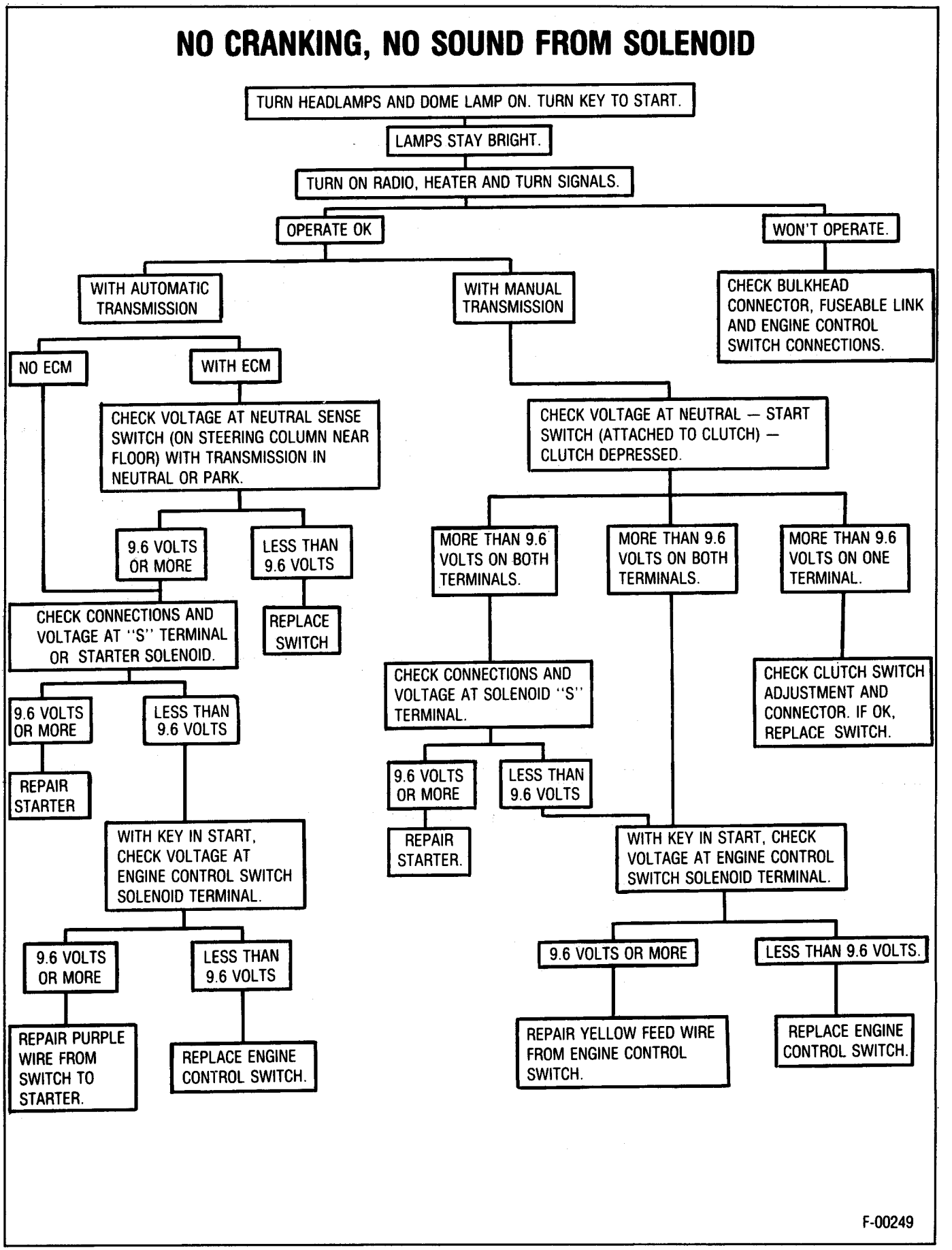


Figure 25—Cranking System Diagnosis

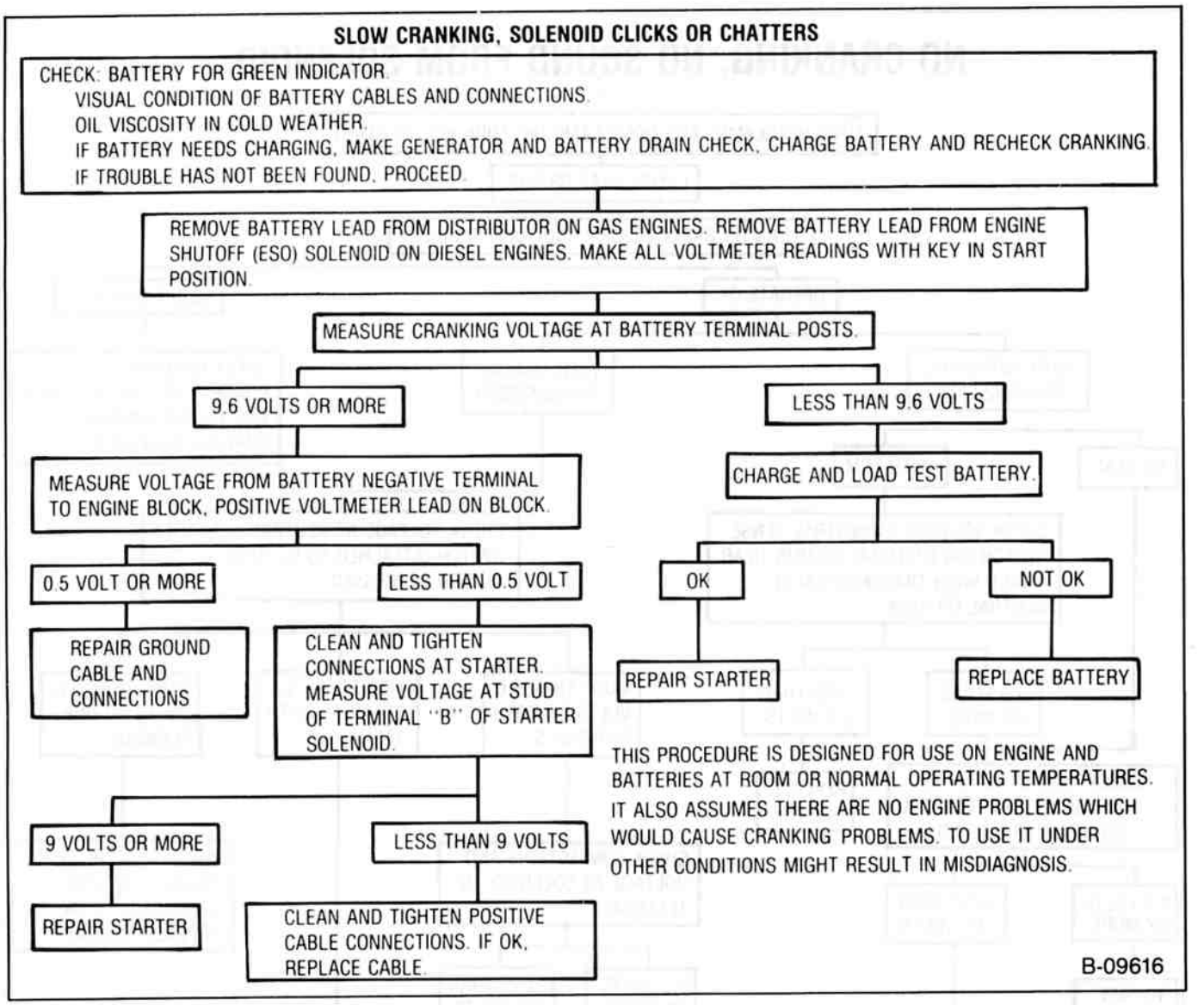
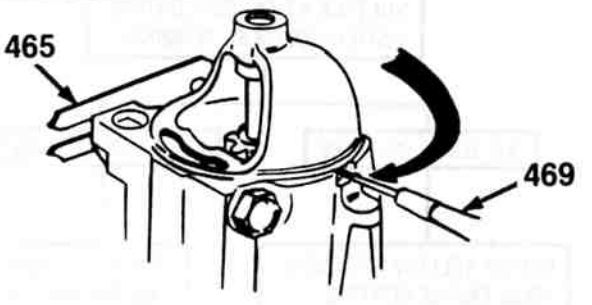


Figure 26—Cranking System Diagnosis



465. Shim
469. Screwdriver F-00247

Figure 27—Meshing Starter and Flywheel Teeth

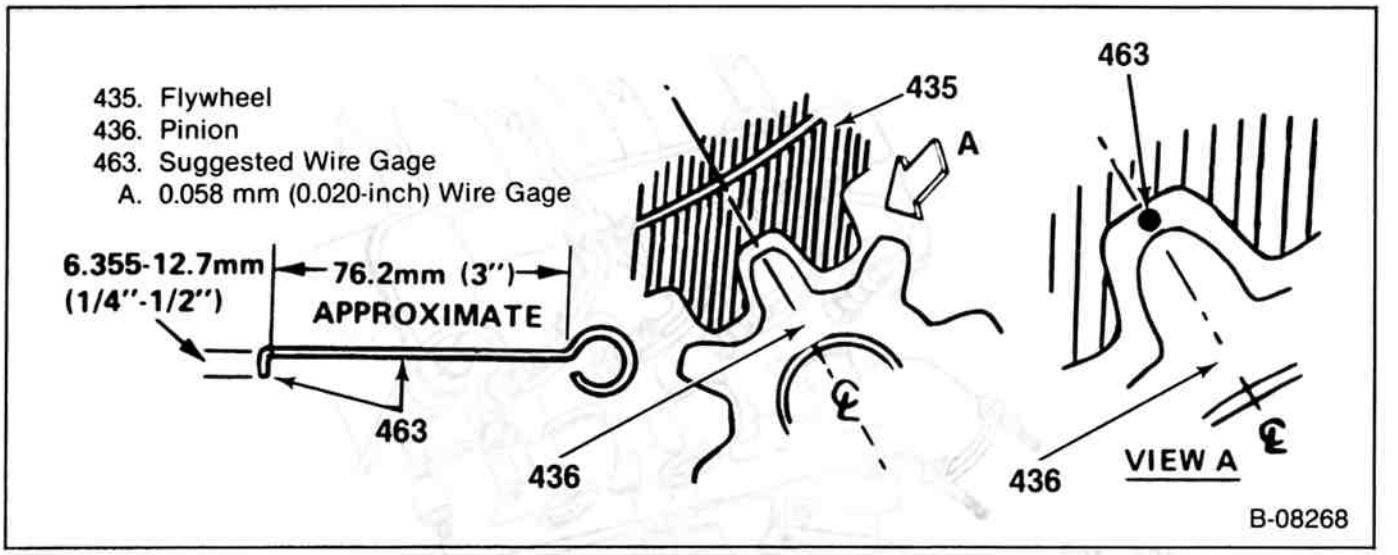


Figure 28—Flywheel To Pinion Clearance

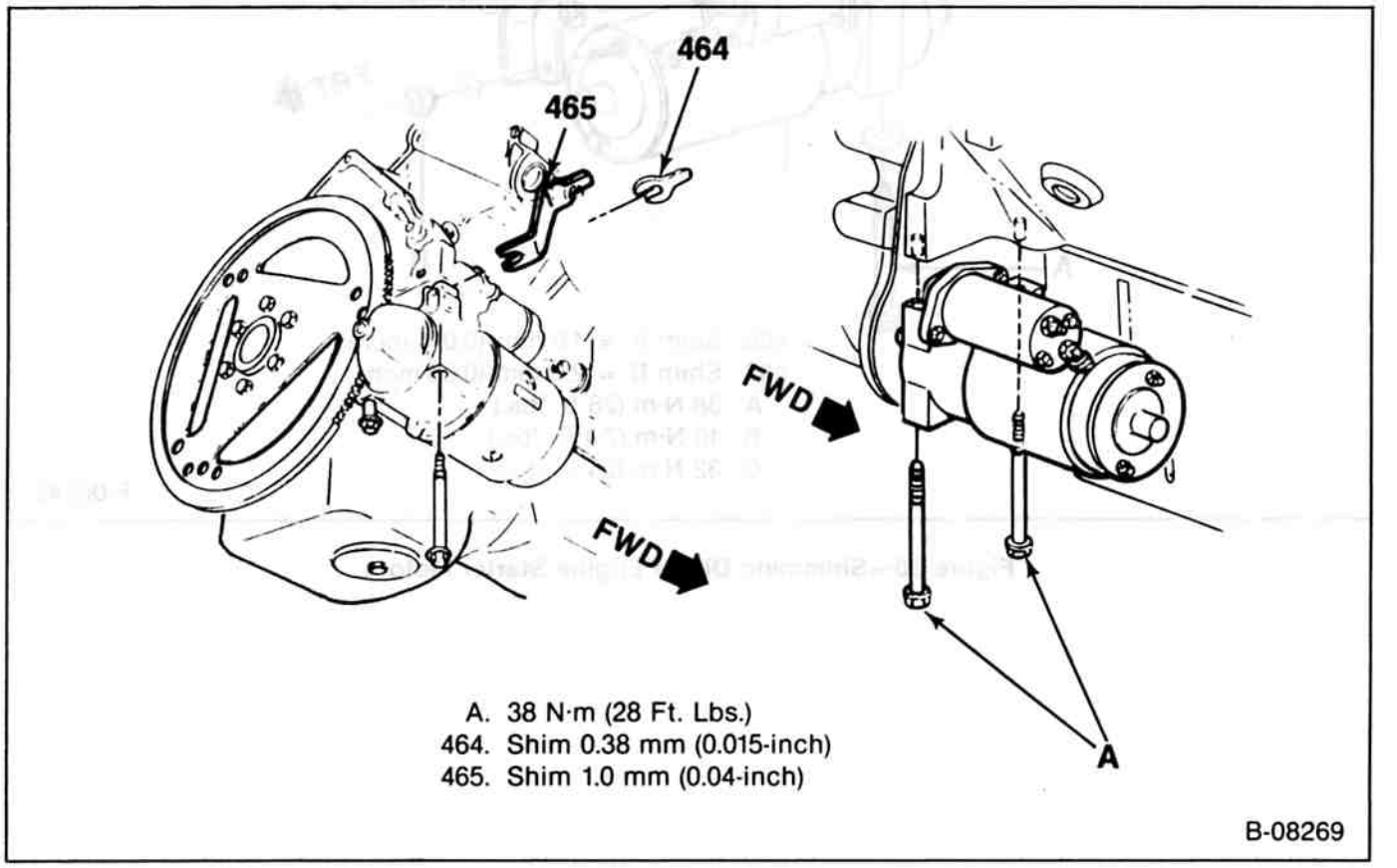


Figure 29—Shimming Gas Engine Starter Motors

CRANKING SYSTEM ON-VEHICLE SERVICE

MAINTENANCE

Keep starter terminals and all other terminals in the electrical system clean and tight. A loose or corroded connection or terminal will cause excessive resistance in the system which will result in hard starting.

At regular intervals, inspect the starting system to locate and correct potential causes of trouble before the system performance is affected.

Starting motors do not require lubrication except during overhaul.

STARTER MOTOR

If the battery, wiring and switches are in satisfactory condition, and the engine is functioning properly, remove the motor and refer to the Light Duty Truck Unit Repair Manual.

Never operate the starter motor more than 15 seconds at a time without pausing to allow it to cool for at least two minutes. Overheating, caused by excessive cranking, will damage the motor.

STARTER MOTOR REPLACEMENT

Remove or Disconnect

1. Negative battery cable.
2. Starter braces or shields if equipped.
3. Wires from the starter solenoid.
   - Raise the vehicle.
4. Two bolts, nuts, washers and shims holding the starter to the engine.
5. Starter from the engine.

Install or Connect

1. Two bolts, nuts, washer and shims through the starter to the engine.

   Tighten

   - Bolts to 38 N·m (28 ft. lbs.).
   - Lower the vehicle.
2. Wires to the solenoid terminals.
3. Negative battery terminal.

IGNITION SYSTEM

DESCRIPTION

All ignition systems include a battery, a distributor, an engine control switch, spark plugs, and the primary and secondary wiring. Information on the battery is located earlier in this section. Refer to CAB ELECTRICAL (SEC. 8A) for information on the engine control switch.

There are three ignition systems used on light duty vehicles: the High Energy Ignition (HEI) system, the HEI/ESC system, and the HEI/EST system.

HEI SYSTEM

The High Energy Ignition distributor used on these gasoline engines combines all ignition components in one unit (figures 31 and 32). The external electrical connections are the engine control switch feed wire, the tachometer pickup, and the six or eight spark plug leads. The engine control switch feed connector to the distributor has full battery voltage when the engine control switch is in the "RUN" and "START" positions. There is NO RESISTOR WIRE FROM THE ENGINE CONTROL SWITCH TO THE DISTRIBUTOR. The ignition coil is in the distributor cap and connects through a resistance brush to the rotor. The High Energy Ignition system is basically identical in operation to conventional ignition except the module and pick-up coil replace the contact points.

The High Energy Ignition is a magnetic pulse triggered, transistor controlled, inductive discharge ignition system. The magnetic pick-up assembly located inside the distributor contains a permanent magnet, a pole piece with internal teeth, and a pick-up coil. When the teeth of the timer core rotating inside the pole piece line up with the teeth of the pole piece, an induced voltage in the pick-up coil signals the electronic module to trigger the coil primary circuit. The primary current decreases and a high voltage of up to 35,000 volts is induced in the ignition coil secondary winding which is directed through the rotor and secondary leads to fire the spark plugs. The capacitor in the distributor is for radio noise suppression.

The magnetic pick-up assembly is mounted over the main bearing on the distributor housing, and is made to rotate by the vacuum control unit, thus providing vacuum advance. The distributor shaft is mounted on the camshaft at the rear of the engine, and rotates at one-half the rpm of the engine. The force of rotation moves the advance weights against the springs, and provides cetrifugal advance to the timer core.

The module automatically controls the dwell period, stretching it with increasing engine speed.

The HEI system also features a longer spark duration, made possible by the higher amount of energy stored in the coil primary. This is desirable for firing lean mixtures.

When making compression checks, disconnect the engine control switch connector (pink wire) from HEI system.

No periodic lubrication is required. Engine oil lubricates the lower bushing and an oil-filled reservoir provides lubrication for the upper bushing.

ELECTRONIC SPARK CONTROL (HEI/ESC) SYSTEM (Figures 33, 34 and 35)

ESC is a closed loop system that controls engine knock by retarding spark timing. In addition to the components of the HEI system, it includes an electronic controller, a sensor, and switches. This system is used with LBI (4.3 L V6) and LE9 (5.0 L) engine equipped trucks.

Controller (Figures 36 and 37)

The controller is contained in a plastic box mounted behind the instrument panel compartment on the passenger side on CK models and under the driver's seat in the G van. It contains micro-electronic circuits which process signals from the sensor and switches and send a voltage signal to the distributor module to retard spark timing. The retard command is in proportion to the number and intensity of "knock" signals. It does not have memory storage.

Sensor (Figure 38)

The piezoelectric device is mounted in the engine block. It detects the presence and intensity of detonation by the vibration characteristics of the engine and sends a voltage signal to the controller.

ESC Vacuum Switch

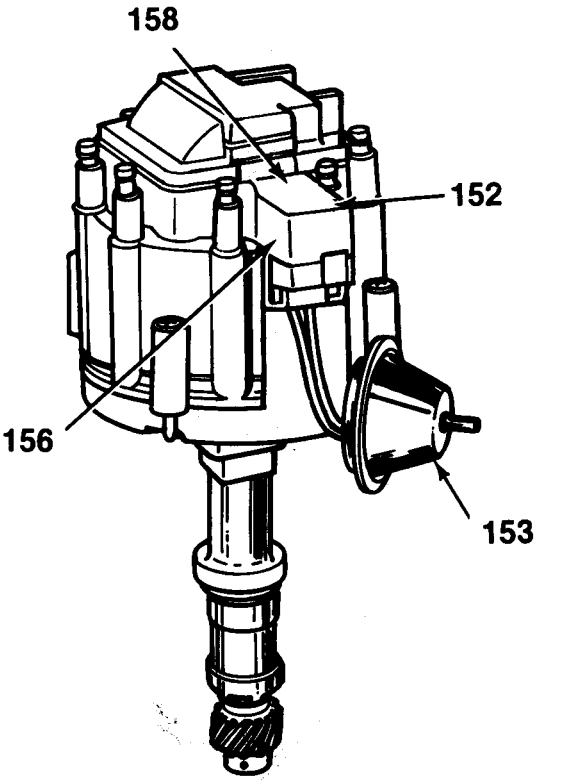
On LE9 and LB1 engine-equipped vehicles with automatic transmissions a "tip in" vacuum switch is used. It provides a brief contact closure (signal) to the controller to retard spark timing to minimize knock during a throttle "tip in" condition.

The switch contacts are normally open under steady engine vacuum conditions including no vacuum, and all brief increasing vacuum conditions. The switch closes during rapidly decreasing vacuum conditions such as those encountered on rapid throttle operation.

The switch is mounted on the right side of the cowl in the engine compartment (figure 39).

CARL Switch

HEI/ESC-equipped vehicles with manual transmissions (except the M20) use a Clutch Activated Retarded Limiting (CARL) switch (figures 40 and 41). It sends a signal to the controller to limit the retard command sent to the distributor in response to the "knock" sensor. Some detonation is then permitted during first gear acceleration to gain power.



152. Battery Terminal (Connected to Ignition Switch)
153. Vacuum Unit
156. Tach Terminal
158. Ground Terminal

B-09832

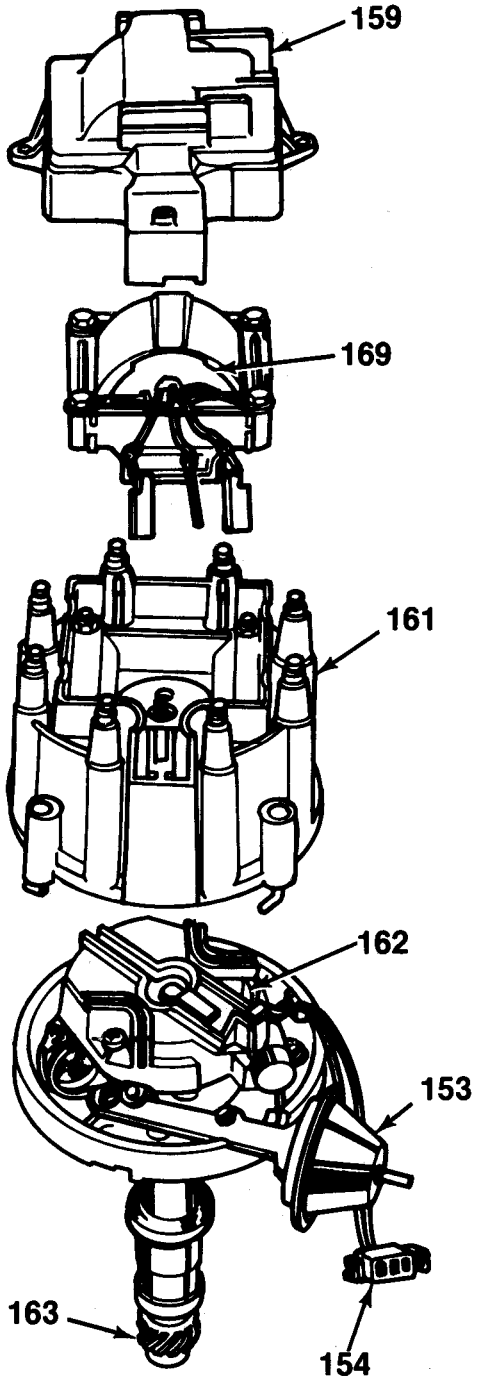
Figure 31—High Energy Ignition

ELECTRONIC SPARK TIMING (HEI/EST) SYSTEM

California vehicles use an HEI/EST distributor. All spark timing changes in the distributor are done electronically by the Electronic Control Module (ECM) which monitors information from various engine sensors, computes the desired spark timing and signals the distributor to change the timing accordingly. No vacuum or mechanical advance is used. Further EST information is found in DRIVABILITY AND EMISSIONS (SEC. 6E).

IGNITION TIMING

Timing specifications for each engine are listed on the Vehicle Emissions Control Information label on the radiator support. When using a timing light, connect an adapter between the number 1 spark plug and the



153. Vacuum Unit
154. Connector
159. Cover
160. Coil
161. Cap
162. Rotor
163. Gear

B-09833

Figure 32—HEI System Components

number 1 spark plug wire, or use an inductive type pick-up. Do not pierce the plug lead. Once the insulation of the spark plug cable has been broken, voltage will jump to the nearest ground, and the spark plug will not fire properly. The timing procedure remains the same as the conventional ignition system. Always follow Vehicle Emissions Control Information label procedures when adjusting timing.

SECONDARY WIRING

The spark plug wiring used with the HEI system is a carbon impregnated cord conductor encased in an 8 mm or 7 mm diameter silicone rubber jacket. The silicone wiring withstands high temperatures and provides an insulator for the higher voltage of the HEI system. The silicone spark plug boots form a tight seal on the plug and the boot should be twisted ½ turn before removing. Be cafeful when connecting a timing light or other pick-up equipment. Do not force contacts between the boot and wiring or through the silicone jacket. Make connections in parallel using an adapter. DO NOT pull on the wire to remove. Pull on the boot, or use a tool designed for this purpose.

SPARK PLUGS

Resistor type, tapered seat spark plugs are used on all gasoline engines. No gasket is used on these tapered seat plugs. Refer to figure 42 for an explanation of letter coding on spark plugs. Refer to the Vehicle Emissions Control Information label on the radiator support for correct gap information.

Normal or average service is assumed to be a mixture of idling, slow speed, and high speed operation with some of each making up the daily total driving. Occasional or intermittent high-speed driving is essential to good spark plug performance as it provides increased and sustained combustion heat that burns away any excess deposits of carbon or oxide that may have accumulated from frequent idling or continual stop-and-go or slow-speed driving. Spark plugs are protected by an insulating nipple made of special heat-resistant material which covers the spark plug terminal and extends downward over a portion of the plug insulator. These nipples prevent flash-over with resultant missing of engine, even though a film is allowed to accumulate on exposed portion of plug porcelains.

Do not mistake corona discharge for flash-over or a shorted insulator. Corona is a steady blue light appearing around the insulator, just above the shell crimp. It is the visible evidence of a high-tension field, and has no effect on ignition performance. Usually it can be detected only in darkness. This discharge may repel dust particles, leaving a clear ring on the insulator just above the shell. This ring is sometimes mistakenly regarded as evidence that combustion gases have blown out between shell and insulator.

DIAGNOSIS OF SPARK PLUGS (CONT.)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Broken or cracked insulator tips.	Heat shock from sudden rise in tip temperature under severe operating conditons. Improper gapping of plugs.	Replace plugs. Gap correctly.

IGNITION SYSTEM ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

Some service tachometers and electronic diagnostic equipment may NOT be compatible with the High Energy Ignition system. Consult your representative of such equipment to update your equipment for compatibility with the HEI system.

1. When making compression checks, disconnect the engine control switch feed wire at the distributor. When disconnecting this connector release the locking tab while pulling downward on the connector body; do not use a screwdriver or tool to release the locking tab as it may break the tab.
2. No periodic lubrication is required. Engine oil lubricates the lower bushing and an oil-filled reservoir provides lubrication for the upper bushing.
3. The tachometer (TACH) terminal is next to the engine control switch (BAT) connector on the distributor cap.

NOTICE: the tachometer terminal must NEVER be allowed to touch ground, as damage to the module and/or ignition coil can result.

4. There is no dwell adjustment since this is controlled by the module.
5. The centrifugal advance and vacuum advance are similar to the conventional ignition.
6. The material used to construct the spark plug wires is very pliable and soft. This wire will withstand more heat and carry a higher voltage. Due to the more pliable wire, scuffing and cutting become easier. Route the spark plug wires correctly to prevent chaffing or cutting. When removing a spark plug wire from a spark plug, twist the boot on the spark plug and pull on the boot to remove the wire.

DISTRIBUTOR REPLACEMENT

Remove or Disconnect

1. Engine cover (G-Van only).
2. Engine control switch battery feed wire from the distributor cap.
3. Tachometer lead (if equipped) from the cap.
4. Ignition coil connector from the cap.
   - Do not use a screwdriver or tool to release the locking tabs.
5. Distributor cap by pressing down on the four spring-loaded screws and turning the latches to the left.
6. Vacuum hose from the vacuum advance unit (if equipped).
7. Distributor clamp bolt and hold-down clamp from the engine.
   - Note the position of the rotor, then pull the distributor up until the rotor just stops turning to the left and again note the position of the rotor.
8. Distributor.

Install or Connect

To ensure correct timing of the distributor it must be installed with the rotor correctly positioned as noted in Step 7 of the removal procedure.

If the engine was accidentally cranked after the distributor was removed, the following procedure can be used for installation:

- Remove the number 1 spark plug.
- Place finger over the number 1 spark plug hole and crank the engine slowly until compression is felt.
- Align the timing mark on the pulley to "0" on the engine timing indicator.

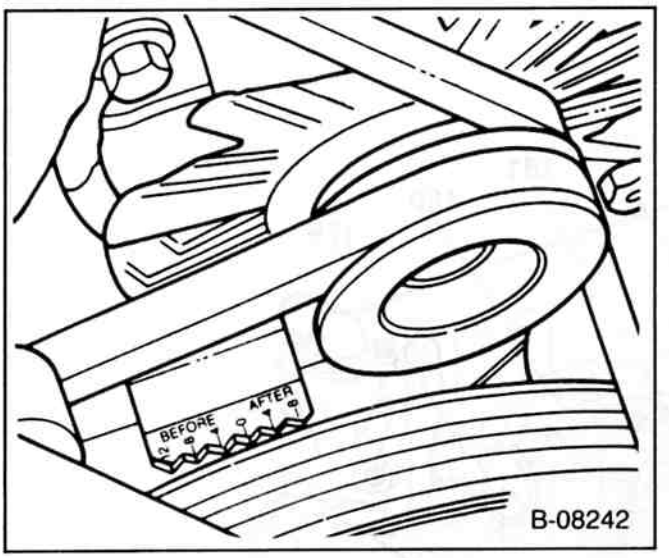


Figure 51—Typical Timing Mark

- Turn the rotor to point between number 1 and number 8 spark plug towers on the distributor cap.

1. Distributor.
   - If the distributor shaft won't drop into the engine, first insert a screwdriver into the hole for the distributor and turn the oil pump drive shaft.
2. Distributor hold-down clamp and clamp bolt.
3. Vacuum hose to the vacuum unit (if equipped).
4. Cap on the distributor.
   - The aligning tab on the cap should engage with the notch in the housing.
5. Four hold-down spring latches.
6. Ignition coil connector to the cap.
7. Engine control switch battery feed wire.
8. Tachometer lead (if so equipped).
   - Set ignition timing as described later in this section.

IGNITION TIMING

1. Refer to the Vehicle Emissions Control Information label located on the radiator support. Follow all instructions on the label.
2. With the engine control switch off, connect the pick-up lead of a timing light to the number 1 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. Disconnect the vacuum hose from the distributor if so equipped.
4. Start the engine and aim the timing light at the timing mark (figure 51). 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, slowly rotate the distributor until the line indicates the correct timing. Tighten the hold-down bolt, and re-check the timing.
5. Turn off the engine and remove the timing light. Reconnect the number 1 spark plug wire, if removed.
6. Connect the vacuum hose to the distributor if so equipped.

SPARK PLUG WIRES

Use care when removing spark plug wire boots from spark plugs. Twist the boot ½ turn before removing, and pull on the boot only to remove the wire.

When replacing plug wires, 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.

SPARK PLUG WIRE REPLACEMENT

Wire routings must be kept intact during service, and followed exactly when wires have been disconnected, or when replacement of the wires is necessary. For the correct wiring routing for each engine, refer to figures 52 through 57.

Some distributors have spark plug wire retainer harness assemblies with the engine firing order marked on them. If the firing order is not indicated, install the plug wires according to the firing order as shown in figures 58, 59 and 60. When the wiring is completed, the plug wire from cylinder number 1 should lead to the distributor tower at the front and on the same side of the engine as cylinder number 1. The plug wire from cylinder number 6 (in 6 cylinder engines) or from cylinder number 8 (in V8 engines) should lead to the distributor tower at the front of the engine next to the number 1 tower.

On the LE8 (7.4 L V8) engine, the spark plug harness assembly and a dielectric paper insulator are fitted to a shield which is installed over the spark plug (figure 61). The insulator grounds the shield to the engine block. If the assembly is removed from the shield, make sure that the insulator is present and undamaged before reinstallation.

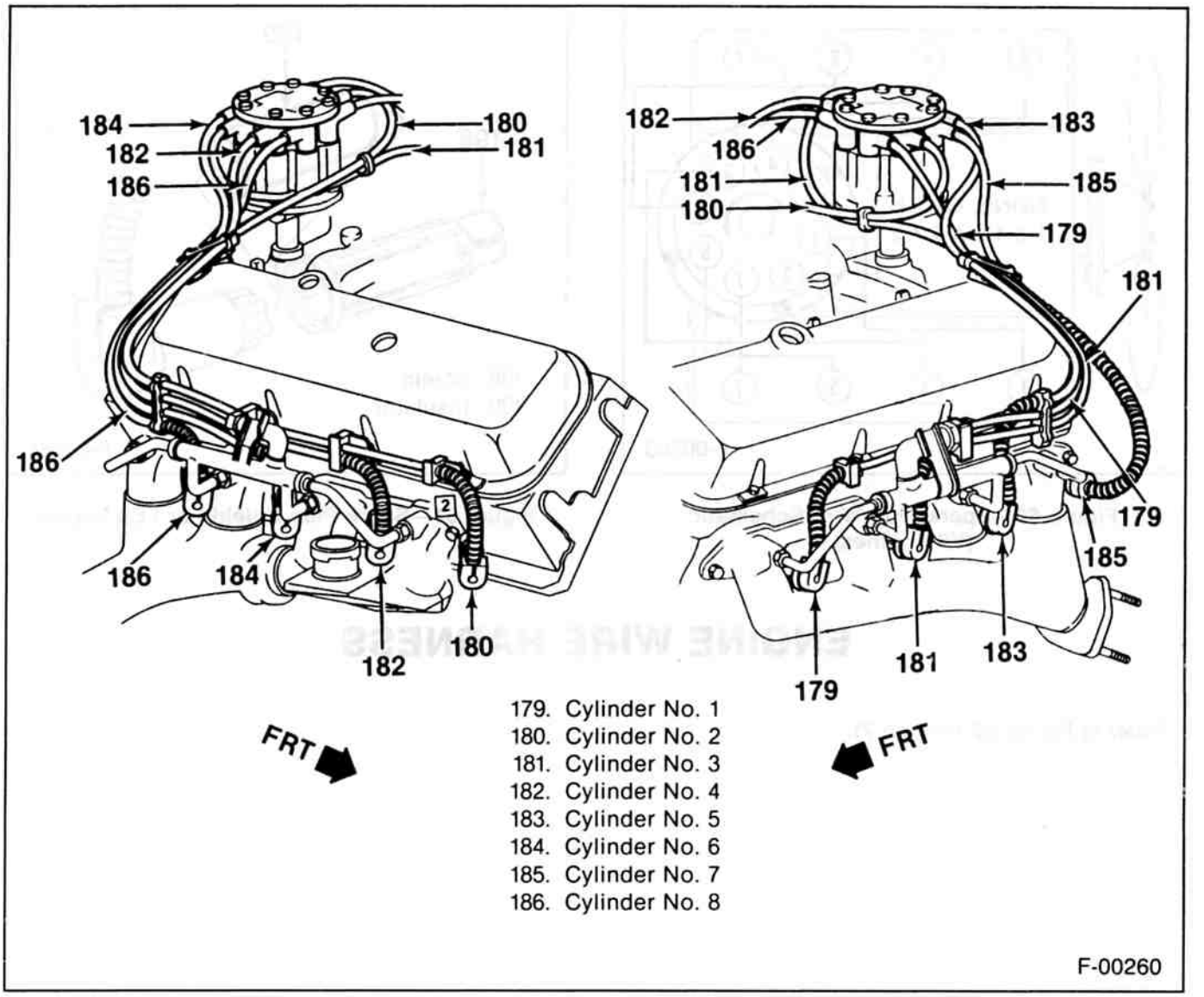


Figure 57—Spark Plug Wire Routing For Engine LE8

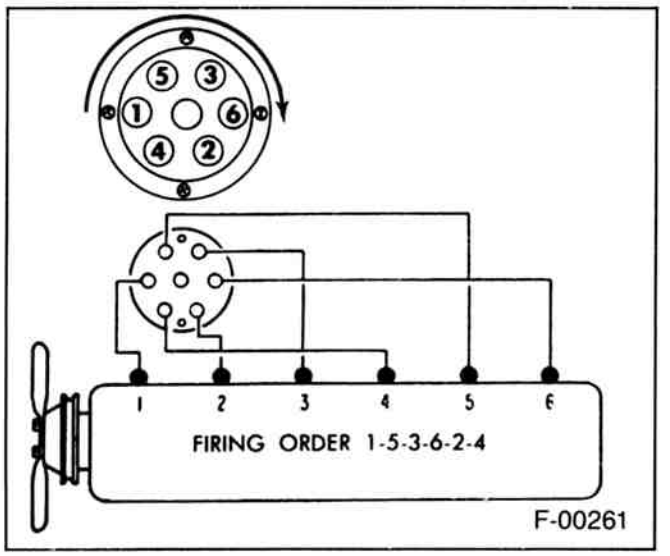


Figure 58—Spark Plug Wire Schematic (L6 Engines)

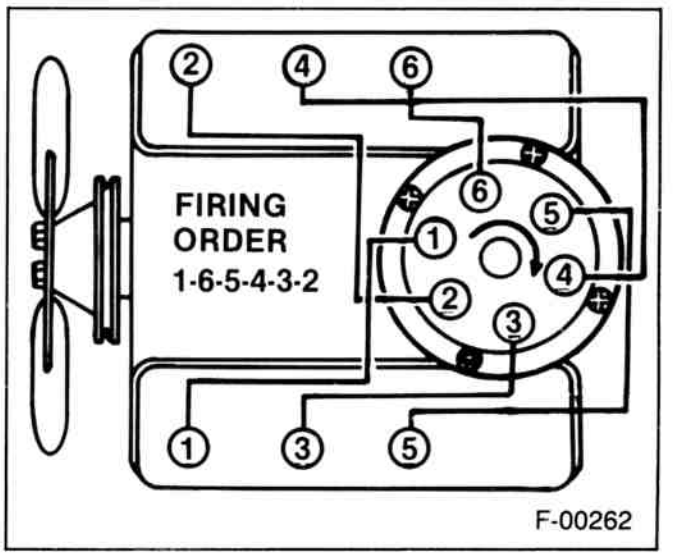


Figure 59—Spark Plug Wire Schematic (V6 Engines)

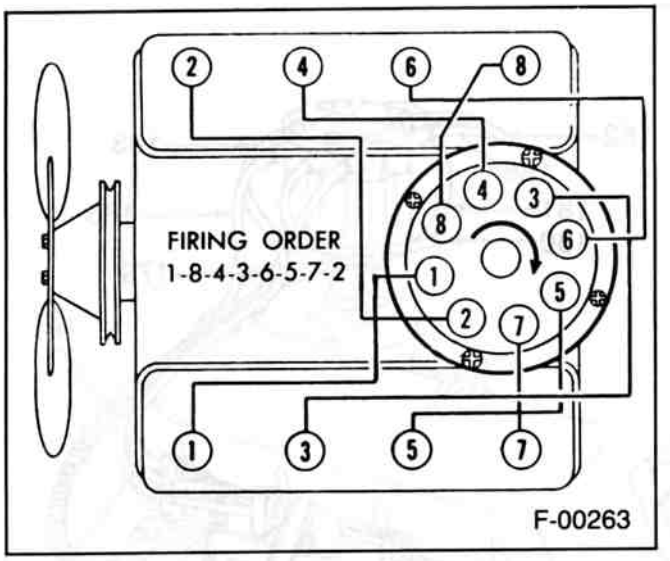


Figure 60—Spark Plug Wire Schematic (V8 Engines)

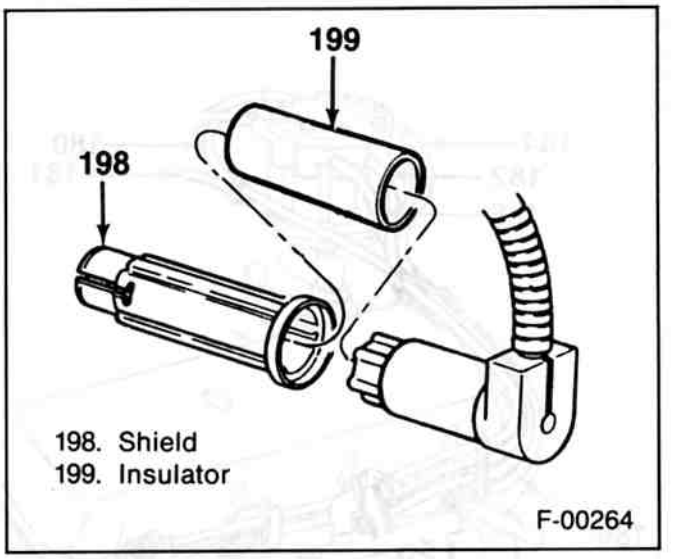


Figure 61—Spark Plug Shield For LE8 Engine

ENGINE WIRE HARNESS

Refer to figures 62 through 71.

GENERATOR APPLICATIONS (CONT.)

Engine	Generator	Part Number	Mounting Torque			
			Top Bracket Bolt		Bottom Bracket Bolt	
			N·m	Ft. Lbs.	N·m	Ft. Lbs.
P Truck (Cont.)						
LT9 5.7 L (350 cu. in.)	K79	1101159	25	18	47	35
	K81	1105707	25	18	47	35
	K81	1101156	25	18	47	35
	K97	1105709	26	19	47	35
LE8 7.4 L (454 cu. in.)	K81	1105692	25	18	47	35
	K97	1105693	64	47	50	37
LL4 6.2 L (379 cu. in.)	K81	1105632	27	20	43	32
	K09	1101215	27	20	43	32

GENERATOR SPECIFICATIONS

Part No.	Series (Type 100)	Rotation Viewing Dr. End	Field Current @ 12 Volts (27° C, 80° F) AMPS	Cold Ouput			Hot Output
				AMPS @ 2000 RPM	AMPS	RPM	AMPS
1100203	10SI	CW	4.0 - 5.0	22	33	5000	37
1100207	12SI	CW	4.5 - 5.0	38	70	7000	66
1100225	10SI	CW	4.0 - 5.0	22	33	5000	37
1100229	10SI	CW	4.0 - 5.0	25	38	5000	42
1100242	12SI	CW	4.5 - 5.0	38	70	7000	66
1101064	27SI	CW	4.4 - 4.9	55	76	5000	80
1101155	10SI	CW	4.0 - 5.0	22	33	5000	37
1101156	12SI	CW	4.5 - 5.0	38	70	7000	66
1101157	12SI	CW	4.5 - 5.0	51	81	7000	78
1101159	10SI	CW	4.0 - 5.0	25	38	5000	42
1105628	12SI	CW	4.5 - 5.0	51	81	7000	78
1105629	12SI	CW	4.5 - 5.0	56	103	7000	94
1105632	12SI	CW	4.5 - 5.0	38	70	7000	66
1105691	10SI	CW	4.0 - 5.0	22	33	5000	37
1105692	12SI	CW	4.5 - 5.0	38	70	7000	66
1105693	27SI	CW	4.4 - 4.9	55	76	5000	80
1105703	10SI	CW	4.0 - 5.0	22	33	5000	37
1105704	10SI	CW	4.0 - 5.0	22	33	5000	37
1105706	12SI	CW	4.5 - 5.0	38	70	7000	66
1105707	12SI	CW	4.5 - 5.0	38	70	7000	66
1105708	12SI	CW	4.5 - 5.0	51	81	7000	78
1105709	27SI	CW	4.4. - 4.9	55	76	5000	80

STARTER SPECIFICATIONS

					No Load Test @ 10 Volts			
Truck Model	Engine Application	Starter			AMPS		RPM	
		Part No.	Series	Type	Minimum	Maximum	Minimum	Maximum
C, G, P	LH6,LL4	1113589	27MT	136	120	210	9000	13400
K	LH6,LL4	1113590	27MT	136	120	210	9000	13400
C	L25	1998559	10MT	101	60	90	6500	10500
K	L25							
P	L25							
K	LE9, LS9,LT9, L25	1998560	10MT	101	70	110	6500	10700
C, G	LE9, LF3, LS9, LT9	1998561	10MT	101	70	110	6500	10700
K	LE9, LS9, LT9							
G	LE9, LF3							
P	LT9							
C	LB1, LE8	1998562	10MT	101	70	110	6500	11070
K	LB1, LE8							
G	LB1, L59, LT9							
P	LT9, LE8							
P	LT9	1998563	10MT	100	70	110	6500	10700
K	LB1, LE8	1998565	10MT	101	70	110	6500	10700

STARTER SHIMS

Gas Engines		Diesel Engines	
Shim	Part No.	Shim	Part No.
0.38 mm (0.015")	1246249	1.0 mm (0.014")	23500396
1.0 mm (0.04")	14036090	2.0 mm (0.08")	23500397

DISTRIBUTOR SPECIFICATIONS

The values given in these data are distributor rpm and distributor degrees of advance. The centrifugal automatic advance should be checked at each of the distributor speeds listed. NOTE: Distributor rpm and degrees of advance are one-half engine rpm and degrees of advance.

Advance curve information for the HEI/EST distributor is not given. The advance is provided by a separate electronic control device.

CENTRIFUGAL ADVANCE

Model No.	Ignition System	Start Distributor RPM	Start Distributor Degree	Intermediate Distributor RPM	Intermediate Distributor Degree	Intermediate Distributor RPM	Intermediate Distributor Degree	Maximum Distributor RPM	Maximum Distributor Degree	Vacuum Model
CK										
1103436	HEI	650	0-4			1200	7-9	2300	10-12	1973691
1103460	HEI/EST									
1103456	HEI/ESC	700	0-2			1000	3-5	2100	9-11	1973691
1103572	HEI	800	0-2	1200	4-6	1600	5-7	200	8-10	1973691
1103573	HEI/EST									
1103604	HEI	700	0-2			1000	3-5	2100	9-11	1973591
1103631	HEI/ESC	800	0-2	1200	4-6	1600	5-7	2000	8-10	1973644
1103641	HEI/ESC	700	0-2			1000	3-5	2100	9-11	1973644
G Van										
1103436	HEI	650	0-4			1200	7-9	2300	10-12	1973691
1103460	HEI/EST									
1103465	HEI/ESC	700	0-2			1000	3-5	2100	9-11	1973691
1103572	HEI	800	0-2	1200	4-6	1600	5-7	2000	8-10	1973626
1103573	HEI/EST									1973691
1103604	HEI	700	0-2	1000	3-5			2100	9-11	1973591
1103631	HEI/ESC	800	0-2	1200	4-6	1600	5-7	2000	8-10	1973644
1103641	HEI/ESC	700	0-2			1000	3-5	2100	9-11	1973644
P Truck										
1103376	HEI	700	0-3			1400	6-8	2100	9-11	1973682
1103384	HEI	500	0-4			800	5-8	2000	9-11	1973620
1103420	HEI	1000	0-3			800	5-8	2000	11-13	1973681
1103606	HEI	600	0-3			1850	4-6	1900	9-11	1973626
1103636	HEI	700	0-2			1000	3-5	2100	9-11	1973682

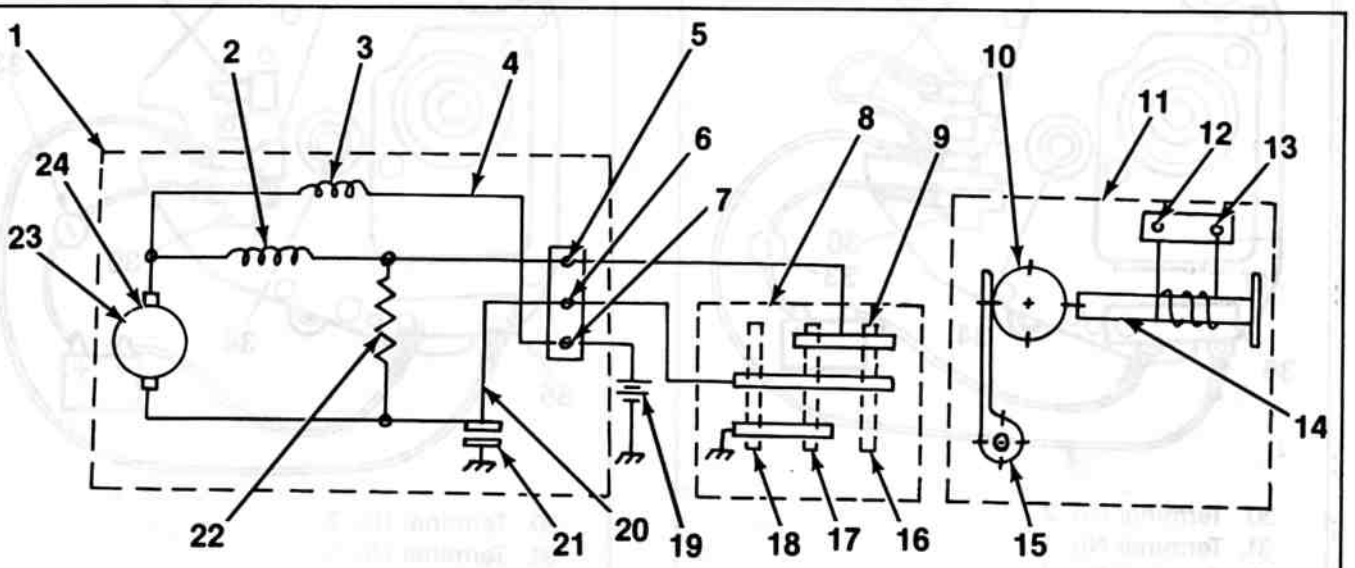
VACUUM ADVANCE SPECIFICATIONS

	Start		Maximum		Max. Dist.
Vacuum Model	Inches Hg.	-kPa	Inches Hg.	-kPa	(Deg.)
1973591	3-4	10-14	11-13	37-44	10
1973620	3-6	10-21	10-13	33-44	12
1973626	3-6	10-21	7-9	23-31	5
1973644	3-4	7-14	6-7	18-25	8
1978681	9-11	30-38	12-13	40-48	5
1973682	7-9	24-32	13-14	42-46	5
1973691	3-4	8-14	6-9	20-30	10

SPECIAL TOOLS

AC Delco ST 1201 Battery Terminal Adapters
AC ST-125 Spark Plug Tester
J 29125-A Multimeter

WINDSHIELD WIPER AND WASHER P MODELS



1. Motor
2. Shunt Resistor
3. Series Resistor
4. GRA Wire
5. Terminal No. 3
6. Terminal No. 1
7. Terminal No. 2
8. Instrument Panel Switch
9. Moving Contact
10. Rachet
11. Washer
12. Terminal #1
13. Terminal #2
14. Solenoid
15. Pawl
16. OFF Position
17. LOW Position
18. HIGH Position
19. Power
20. RED Wire
21. PARK Switch
22. Resistor
23. Armature
24. Brush

F-00814

Figure 48—P-Model Wiper Diagram

DESCRIPTION

The system consists of a compound wound rectangular-shaped motor attached to a gear box containing a parking switch in addition to the gear train. The gear train consists of a motor armature helical gearshaft which drives an intermediate gear and pinion assembly. The pinion gear of the intermediate gear and pinion drives an output gear and shaft assembly.

Turning the wiper switch to the LO speed position completes the circuits from the wiper terminals 1 and 3 to ground (Figure 48). Current then flows from the battery via wiper terminal No. 2 through the series field and divides; (1) part passes through the armature to ground via wiper terminal No. 1 to the wiper switch and (2) the second part passes through the shunt field to ground through wiper terminal No. 3 to the wiper switch. The wiper switch must be securely grounded to body metal.

Moving the wiper switch to the HI speed position opens the shunt field circuit to ground at the switch. However, the shunt field is connected to a 20 ohm resistor which is connected across wiper terminals 1 and 3. The shunt field current then flows via terminal No. 3 through the resistor to terminal No. 1 to the switch, to ground.

The parking circuit covers that portion of wiper operation when the wiper switch is turned "off" and the wiper blades have not reached the park position.

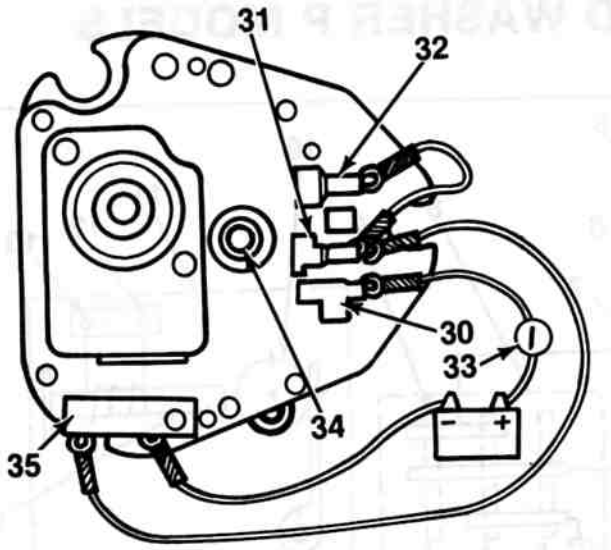
When the wiper blades are not in the normal park position, the parking switch contacts are still closed. The wiper will continue to operate until the wiper output gear is turned to a position where its cam opens the park switch. The wiper motor circuits are completed to ground through the parking switch.

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.

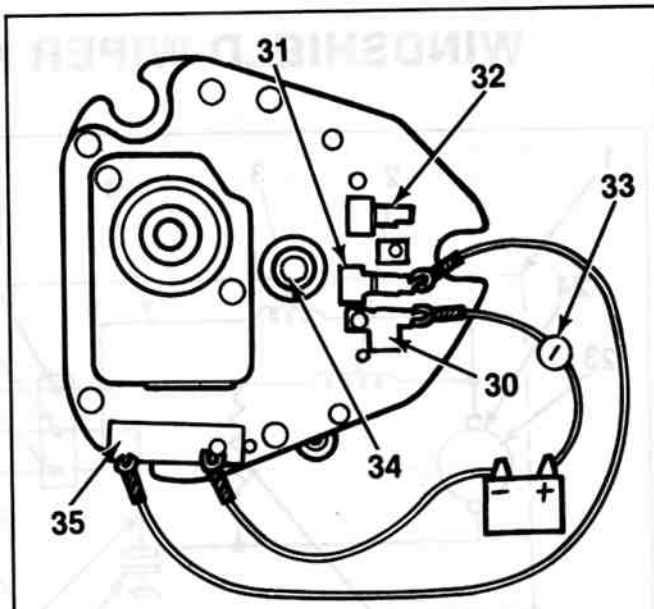
When the output gear cam opens the park switch contacts, the wiper is OFF.



30. Terminal No. 2
31. Terminal No. 1
32. Terminal No. 3
33. Ammeter; 0-30 Ampere Range
34. Gear Shaft In The Park Position
35. Wiper Ground Strap

F-00808

Figure 49—Wiper Motor Jumper Connections—Low Speed



30. Terminal No. 2
31. Terminal No. 1
32. Terminal No. 3
33. Ammeter; 0-30 Ampere Range
34. Gear Shaft In The Park Position
35. Wiper Ground Strap

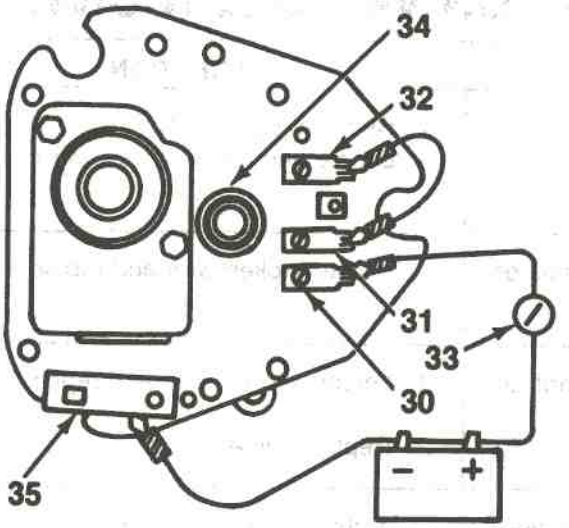
F-00809

Figure 50—Wiper Motor Jumper Connections—High Speed

DIAGNOSIS

WIPER SYSTEM CHECKS

1. Inspect for the following items:
   a. Wiring harness is securely connected to wiper and switch.
   b. Wiper motor is securely grounded to body.
   c. Wiper switch is securely mounted and grounded.
   d. Check fuse.
2. If items in Step 1 check out, try operating wiper in both "LO" and "HI" speeds, then turn wiper off (blades should return to park position). If wiper fails to operate correctly, proceed to Step 3.
3. Disconnect wiring harness from wiper and try operating wiper as shown in Figures 49, 50, and 51.
4. If wiper operates correctly independently of switch and vehicle wiring, refer to DIAGNOSIS CHART—WIPER ON VEHICLE.
5. If wiper still fails to operate correctly in Step 3, disconnect wiper linkage from motor crank arm and try operating wiper again. If wiper operates correctly independently of linkage, check linkage for cause of wiper malfunction.
6. If wiper fails to operate correctly independently of linkage, remove wiper motor from vehicle and refer to DIAGNOSIS CHART—WIPER OFF VEHICLE.



30. Terminal No. 2
31. Terminal No. 1
32. Terminal No. 3
33. Ammeter; 0-30 Ampere Range
34. Gear Shaft In The Park Position
35. Wiper Ground Strap

F-00810

Figure 51—Wiper Motor Jumper Connections—Off

DIAGNOSIS OF THE WIPER—ON VEHICLE

PROBLEM	POSSIBLE CAUSE	CORRECTION
Wiper Not Working Or Intermittent	1. Blown fuse 2. Open circuit in feed wire (No. 2 terminal on wiper motor) 3. Loose mounting of wiper switch. 4. Faulty wiper switch. 5. Open circuit in wire to wiper switch (No. 1 terminal on wiper motor)	1. Locate short circuit and repair. Replace fuse. 2. Locate broken wire and repair. 3. Tighten switch mounting. 4. Replace switch. 5. Locate broken wire and repair.
Wiper Will Not Shut Off. Wiper has Both "Lo" And "Hi" Speeds	1. Grounded wire (No. 1 terminal on wiper motor) to wiper switch.	1. Locate short circuit and repair.
Wiper Will Not Shut Off. Wiper Has "Lo" Speed Only.	1. Defective wiper switch. 2. Grounded wire (No. 3 terminal on wiper motor) to wiper switch.	1. Replace wiper switch. 2. Locate and repair short circuit.

DIAGNOSIS OF THE WIPER—ON VEHICLE (CONT.)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Wiper Will Not Shut Off. Wiper has "Hi" Speed Only	1. Defective wiper switch. 2. Open circuit in wire (No. 3 terminal on wiper motor) to wiper switch.	1. Replace wiper switch. 2. Locate and repair broken wire.
Wiper Has "Hi" Speed Only	Open circuit in wire (No. 3 terminal on wiper motor) to wiper switch.	Locate broken wire and repair.
Wiper Has "Lo" Speed Only	1. Grounded wire (No. 3 terminal on wiper motor) to wiper switch. 2. Defective wiper switch.	1. Locate short circuit and repair. 2. Replace wiper switch.
Blades Do Not Return To Full Park Position	Loose wiper ground strap connection.	Tighten strap connection.

DIAGNOSIS OF THE WIPER—OFF VEHICLE

PROBLEM	POSSIBLE CAUSE	CORRECTION
Wiper Not Working or Intermittent	1. Broken or damaged gear train (only if not working). 2. Poor solder connections at terminal board. 3. Loose splice joints at brush plate. 4. Brushes binding in brush holder. 5. Open circuit in armature.	1. Replace gears as required. 2. Resolder wires at terminals. 3. Recrimp or solder splice joints. 4. Clean holder or replace brush, spring or brush plate assembly. 5. Replace armature.
Wiper Will Not Shut-Off. Wiper Has Normal "Hi" and "Lo" Speed	1. Faulty part switch. 2. Grounded red lead wire.	1. Replace terminal board assembly. 2. Repair short circuit in red wire.
Wiper Will Not Shut Off. Wiper Has "Lo" Speed Only	1. Grounded shunt field coil. 2. Grounded black wire.	1. Replace frame and field assembly. 2. Repair short circuit in black wire.
Wiper Will Not Shut Off. Wiper Has "Hi" Speed Only	1. Open circuit in shunt field coil. 2. Open circuit in black wire.	1. Replace frame and field assembly. 2. Repair broken wire or poor solder connection.
Wiper Shuts Off—But Not In Park Position	Park switch faulty or contacts dirty.	Replace terminal board assembly or clean contacts.
"Hi" Speed Too Fast	Resistor faulty.	Replace terminal board assembly.

DIAGNOSIS OF THE WASHER SYSTEM

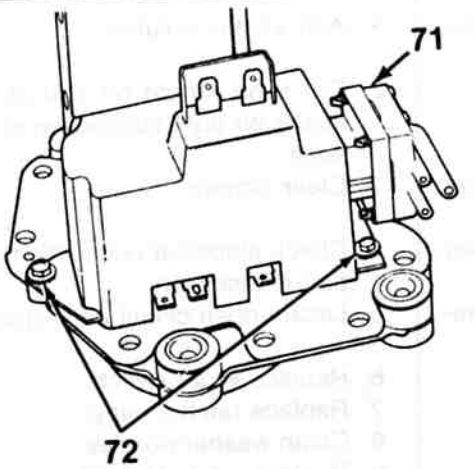
PROBLEM	POSSIBLE CAUSE	CORRECTION
Washers Inoperative	1 Inadequate quantity of washer solution. 2. Hoses damaged or loose. 3. Plugged screen at end of jar cover hose. 4. Loose electrical connection to washer pump or wiper switch. 5. Open circuit in feed wire to ratchet relay coil. 6. Wiper switch faulty. 7. Ratchet relay coil defective. 8. Washer nozzles plugged. 9. Ratchet wheel tooth missing. 10. Ratchet pawl spring missing. 11. Faulty pump valve assembly.	1. Add washer solution. 2. Cut short length off end of hose to insure air tight connection or replace hose. 3. Clean screen. 4. Check electrical connections and repair if necessary. 5. Locate open circuit and repair. 6. Replace wiper switch. 7. Replace ratchet relay. 8. Clean washer nozzles. 9. Replace ratchet wheel. 10. Replace ratchet pawl spring. 11. Replace pump valve assembly.
Washer Pumps Continuously When Wipers Are Operating	1. Grounded wire from ratchet relay to switch. 2. Wiper switch faulty. 3. Ratchet wheel tooth missing. 4. Ratchet wheel dog broken or not contacting ratchet wheel teeth. 5. Lock-out tang broken or bent on piston actuating plate.	1. Locate grounded wire and repair. 2. Replace wiper switch. 3. Replace ratchet wheel. 4. Replace of repair ratchet wheel dog. 5. Replace piston actuating plate.

ON-VEHICLE SERVICE

WIPER MOTOR

Wiper motor replacement procedures are not included here since installation is performed by the individual body manufacturers; however, disassembly of the unit will be covered in "Unit Repair."

UNIT REPAIR



71. Pump
72. Pump Mounting Screws F-00832

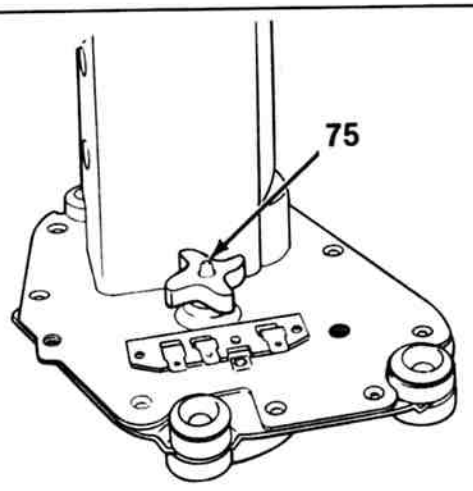
Figure 52—Washer Pump Mounting Screws

WIPER MOTOR DISASSEMBLY

GEAR BOX AND MOTOR

Remove or Disconnect (Figure 52, 53, and 54)

1. Two washer pump mounting screws (72).
2. Pump (71) from the gear box cover.
3. Washer pump drive cam (75).
   - Wedge off the cam and the plate using two screwdrivers.
4. Crank arm retaining nut (58).
   - Clamp the crank arm (57) in a vise before removing the nut (58).
5. Crank arm (57).



75. Cam (Press Fit On Shaft) F-00833

Figure 53—Washer Pump Drive Cam

6. Seal cap (56).
7. Retaining ring (55).
8. Spacer (54).
9. Gear box cover retaining rivets.
   - Drill out the rivets.
10. Gear box cover (53).
11. Output gear and shaft assembly (52).
12. Intermediate gear and pinion assembly off the shaft (51).
13. Terminal board and park switch assembly, if necessary.
    - Unsolder the motor leads from the terminals.
    - Label the motor leads.
    - Drill out the rivets securing the terminal board and the park switch ground strap to the mounting plate.
14. Motor through bolts (42).
15. Motor from the mounting plate.
    - Tap motor frame lightly.
16. Brush spring tension (61).
17. Armature (46) and end plate (43) from the motor frame (44).
18. End plate (43) from the armature (46).
    - There is a thrust plug (45) between the armature shaft and the end plate.
19. End play adjusting washers (47 and 41) from the armature.
    - Note the washers positions.

INSPECTION

Inspect all the parts for wear or damage. All the parts can be replaced individually except the motor frame and field, which is serviced as an assembly. Service kits provide screws, nuts and washers to replace the gear cover and terminal board rivets.

WIPER MOTOR ASSEMBLY

GEAR BOX AND MOTOR

Install or Connect (Figure 52, 53, 54, and 55)

1. End play adjusting washers (41 and 47) on the armature (46).
2. End plate (43) on the armature (46).
   - Make sure the thrust plug (45) is between the armature shaft and the endplate.
   - Lubricate the bearing with light machine oil.
3. Armature and the end plate assembly on the motor frame (44).
4. Brush spring tension (60).

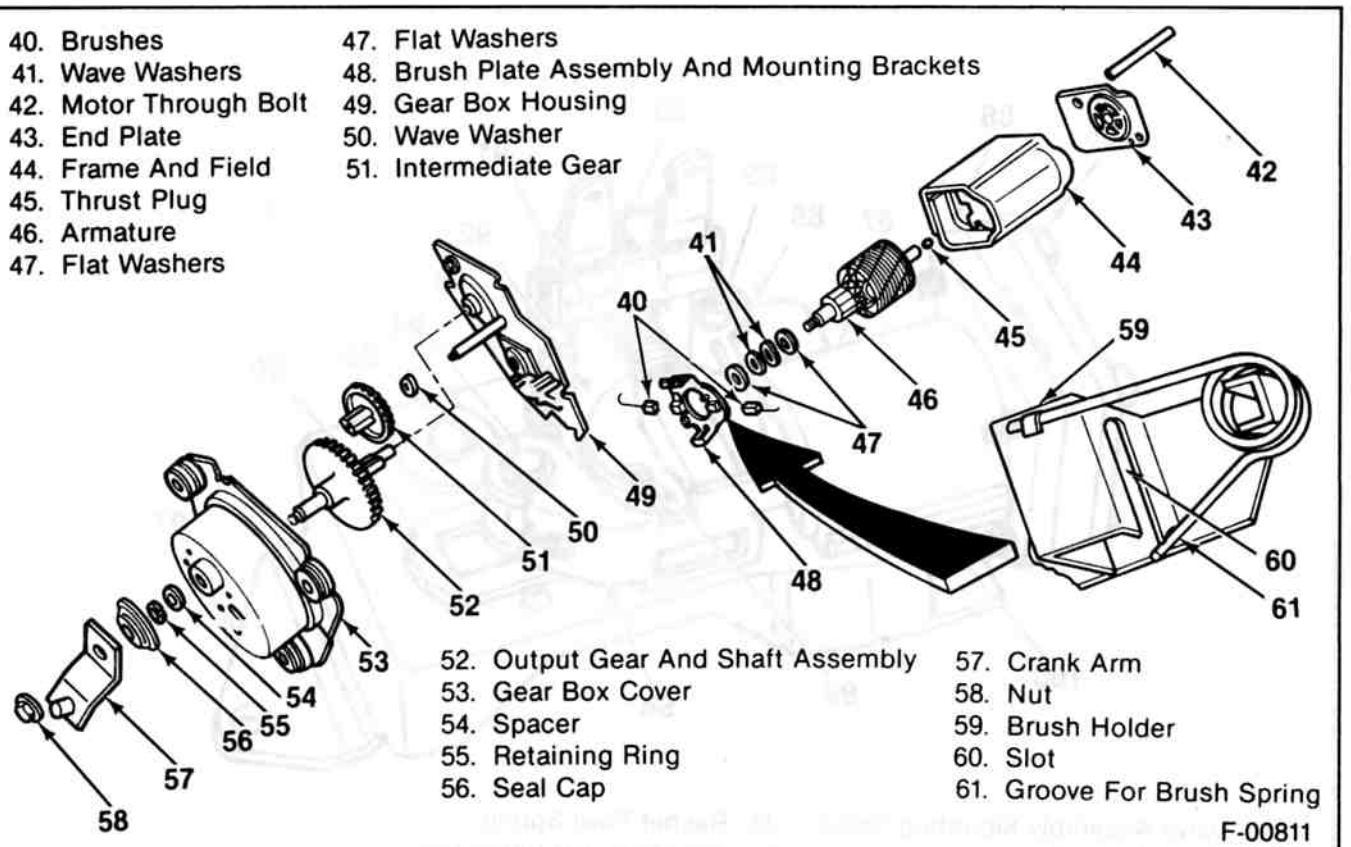


Figure 54—Wiper Motor And Gear Box Assembly

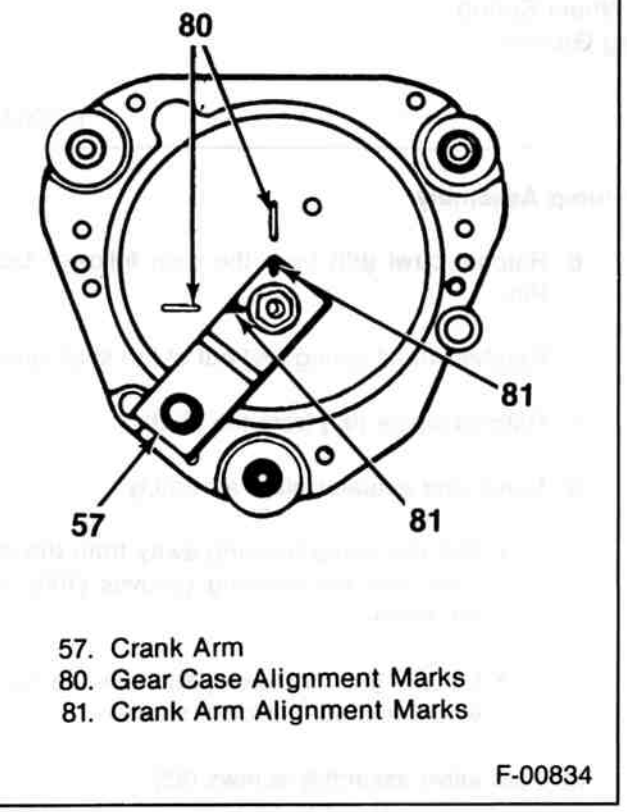
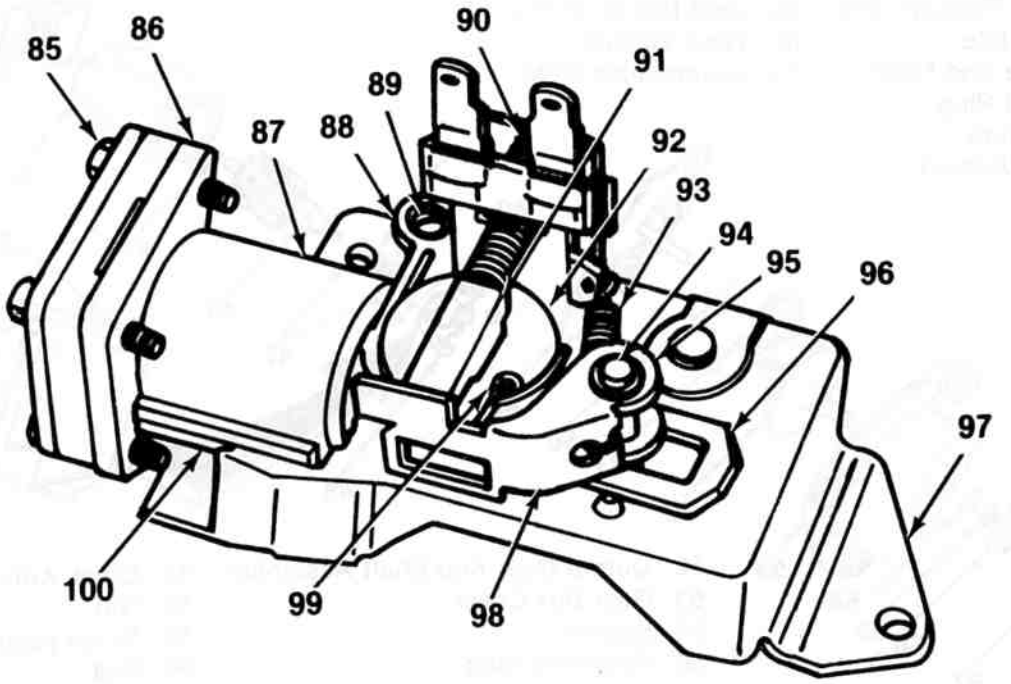


Figure 55—Crank Arm Park Alignment

5. Motor to the mounting plate (49).
6. Motor through bolts (42).
7. Terminal board and park switch assembly, if removed.
   - Secure the terminal board and park switch with the screws, washers and nuts supplied in the rebuild kits.
   - Solder the motor leads to the terminals.
8. Intermediate gear and pinion assembly on the shaft (51).
   - Lubricate the gear teeth with Delco Cam and Ball Bearing Grease (or equivalent).
9. Output gear and shaft assembly (52).
10. Gear box cover (53).
11. Gear box cover screw, washers, and nuts.
12. Spacer (54).
13. Retaining ring (55).
14. Seal cap (56).
15. Crank arm (57).
    - Place the wiper in the park position.
    - Install the crank arm on the output shaft.
    - Rotate the crank so that the alignment marks line up with those on the cover (80 and 81).
16. Crank arm retaining nut (58).
    - Clamp the crank arm in a vise before tightening the retaining nut.
17. Washer pump drive cam (75).
    - Press the cam on the shaft.



85. Valve Assembly Mounting Screw
86. Valve Assembly
87. Pump
88. Rachet Dog
89. Rachet Dog Retaining Screw
90. Solenoid Coil
91. Solenoid Plunger
92. Rachet Wheel
93. Rachet Pawl Spring
94. Cam Follower Upper Pin
95. "E" Ring
96. Cam Follower
97. Frame
98. Rachet Pawl
99. Rachet Wheel Spring
100. Retaining Groove

F-00835

Figure 56—Washer Pump Assembly

18. Pump on the gear box cover.
19. Two pump mounting screws (72).

WINDSHIELD WASHER DISASSEMBLY

Remove or Disconnect (Figure 56)

1. Washer pump cover
2. Ratchet dog retaining screw (89).
3. Solenoid assembly (90) and ratchet dog (88) off the pump frame (97).
   - Hold the spring loaded solenoid plunger (91) in position while lifting the solenoid assembly.
4. Ratchet pawl spring (93).
5. Ratchet pawl retaining ring (94).
6. Ratchet pawl (98) from the cam follower Upper Pin.
7. Ratchet wheel spring (99) out of the shaft groove.
8. Ratchet wheel (92) from the shaft.
9. Pump and actuator plate assembly.
   - Pull the pump housing away from the drive cam until the housing grooves (100) clear the frame.
   - Lift the cam follower (96) from the ratchet wheel and cam follower shafts.
10. Four valve assembly screws (85).
11. Valve assembly (86) from the pump housing.

WINDSHIELD WASHER ASSEMBLY

Install or Connect (Figure 56)

1. Valve assembly (86). To the pump housing (87).
   - Be sure that the seal between the pump housing and the valve plate is properly positioned in the pump housing and valve plate grooves.
   - Be sure that the triple seal is properly installed between the valve body and the pipe assembly.
2. Four valve assembly screws (85).
3. Pump (87) and cam follower (96) assembly to the frame (97).
4. Ratchet wheel (92) to the shaft.
5. Ratchet wheel spring (99) into the shaft groove.
6. Ratchet pawl (98) onto the cam follower upper pin (94).
7. Ratchet pawl retaining "E" ring (95).
8. Ratchet pawl spring (93).
9. Solenoid assembly (90) and ratchet dog (88) on the pump frame (97).
   - Hold the spring loaded solenoid plunger (91) in position while installing the solenoid assembly.
10. Ratchet dog retaining screw (89).
11. Washer pump cover.

HEATER SYSTEM CIRCUITS

DESCRIPTION

The heater blower motor is controlled by the blower switch. The blower switch is a four position switch; off, low, medium, and high. This switch controls the speed of the blower motor by connecting different resistances into the motor circuit, thereby dropping the voltage available to the motor.

The blower switch is located on the control assembly. The harness from the switch goes to the dash panel connector and into the engine compartment. The harness is then routed to the resistor block, which is located on the blower housing. From the resistor block, the harness then goes to the blower motor. The wire colors can be found in the wiring diagrams which are at the back of this manual.

DIAGNOSIS

For diagnosis of the heater blower circuit, refer to HEATER (SEC. 1A).

ON-VEHICLE SERVICE

For on-vehicle service of the heater blower circuit, refer to HEATER (SEC. 1A).

AIR CONDITIONING ELECTRICAL SYSTEM

DESCRIPTION

The compressor electro-magnetic clutch is turned on and off by the pressure sensing switch. When refrigerant pressure drops below a certain predetermined level, the switch opens the compressor clutch circuit, which causes the refrigeration system to stop working. The pressure sensing switch is located near the top of the accumulator.

DIAGNOSIS

For diagnosis of the A/C electrical system, refer to AIR CONDITIONING (SEC. 1B).

ON-VEHICLE SERVICE

For on-vehicle service of the air conditioning, refer to AIR CONDITIONING (SEC. 1B).