# FUEL SYSTEM

## BASIC FUEL SYSTEM DIAGNOSIS

When there is a problem starting or driving a vehicle, two of the most important checks involve the ignition and the fuel systems. The questions most mechanics attempt to answer first, "is there spark?" and "is there fuel?" will often lead to solving most basic problems. For ignition system diagnosis and testing, please refer to the information on engine electrical components and ignition systems found earlier in this repair guide. If the ignition system checks out (there is spark), then you must determine if the fuel system is operating properly (is there fuel?).

## CARBURETED FUEL SYSTEM

## MECHANICAL FUEL PUMP

All fuel pumps used on carbureted V6 and V8 engines are of the diaphragm type and are serviced by replacement only. No adjustments or repairs are possible. The fuel pump is mounted on the left front (V6) and right front (V8) of the engine.

The fuel pumps are also equipped with vapor return lines for purposes of emission control and to reduce vapor lock. All pumps are operated by an eccentric on the camshaft. On V6 and V8 engines, a pushrod between the camshaft eccentric and the fuel pump operates the pump.

## REMOVAL & INSTALLATION

*When disconnecting the fuel pump outlet fitting, always use two wrenches to avoid twisting the line.*

1. Disconnect the fuel intake and outlet lines at the pump, then plug the pump intake line.
2. Remove the two pump mounting bolts and lockwashers; remove the pump and its gasket.
3. If the pump pushrod is to be removed from the V8, remove the two adapter bolts and lockwashers, then remove the adapter and its gasket.
4. Install the fuel pump with a new gasket reversing the removal procedure. Coat the mating surfaces with sealer.
5. Connect the fuel lines and check for leaks.

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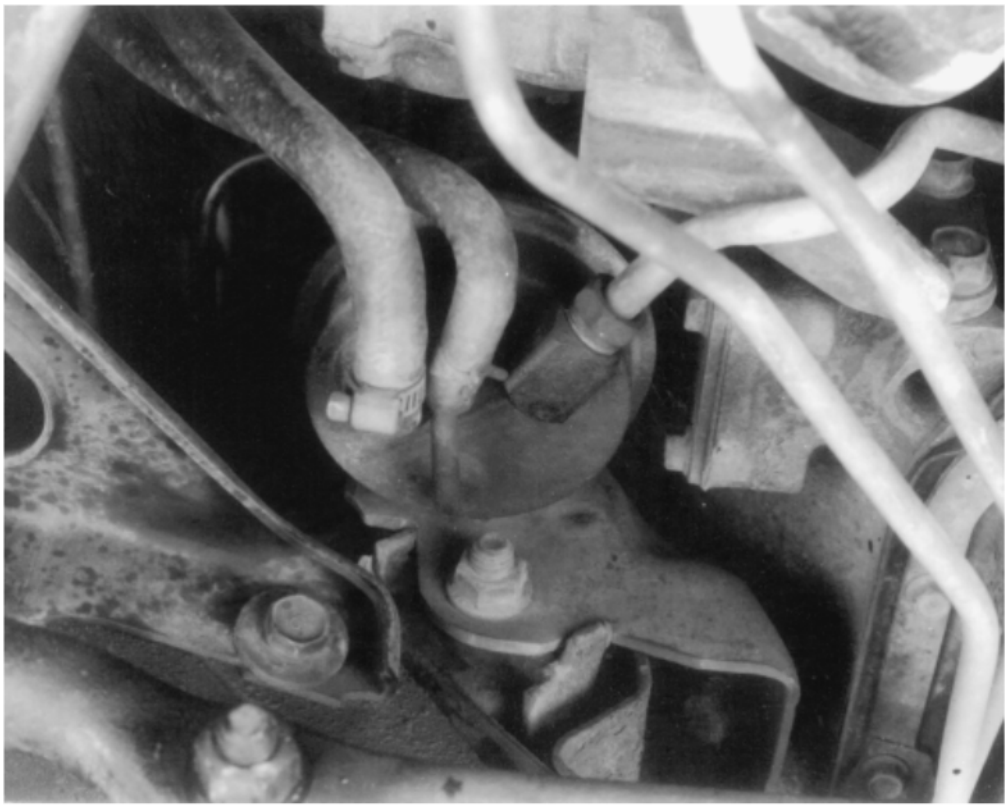


Fig. 1: Most fuel pumps are more easily accessed from underneath the car

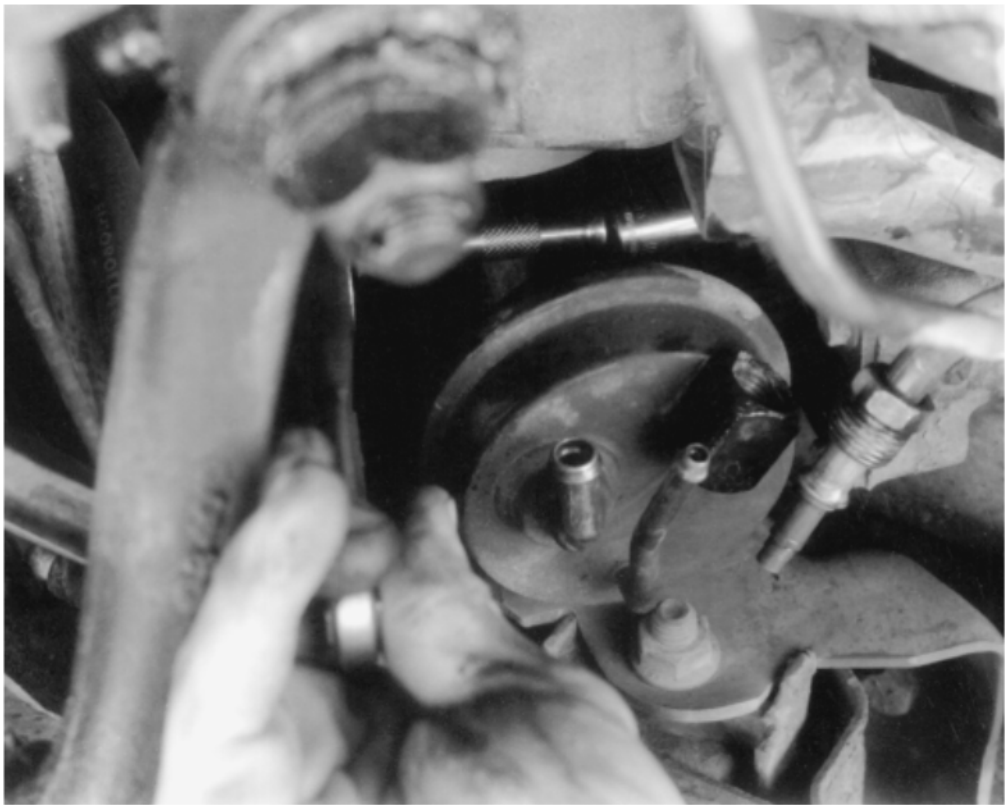


Fig. 2: Removing the fuel pump attaching bolts

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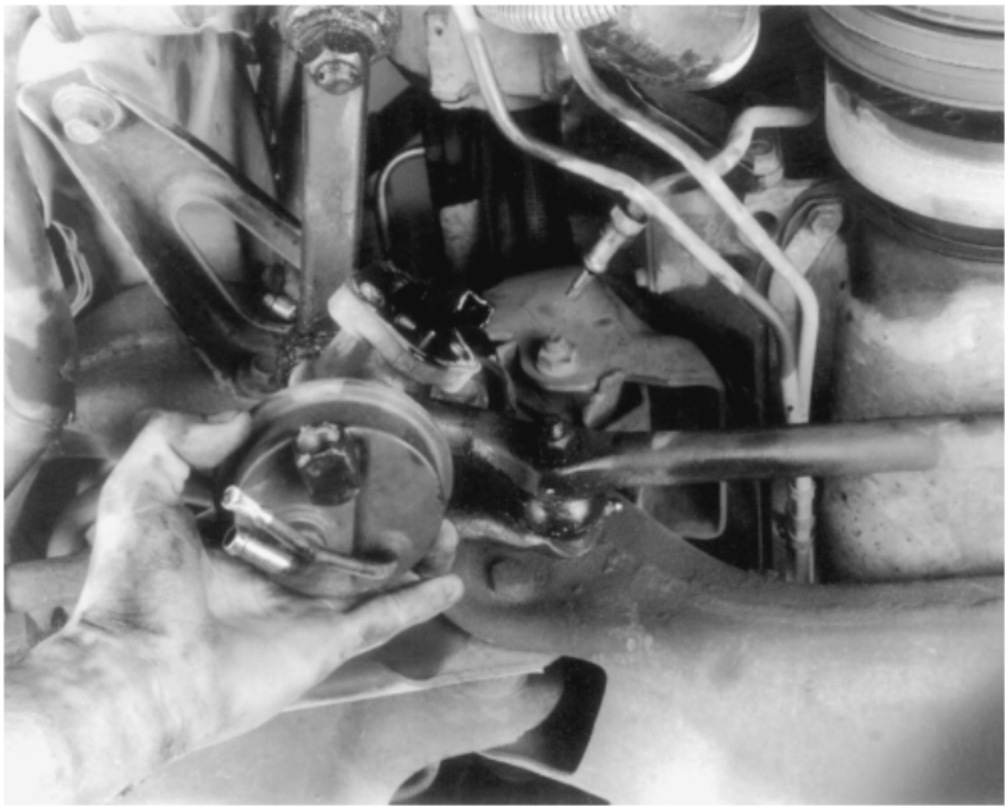


Fig. 3: Be careful not to spill fuel when removing the pump from the engine

**TESTING**

To determine if the pump is in good condition, tests for both volume and pressure should be performed. The tests are made with the pump installed, the engine at normal operating temperature and operating at idle speed. Never replace a fuel pump without first performing these simple tests.

Ensure the fuel filter has been changed at the specified interval. If in doubt, install a new filter first. Always check for broken or deteriorated fuel hoses. If a line has a crack or split, the pump may be operating properly, but the pump will only draw air, not fuel.

**PRESSURE TEST**

1. Disconnect the fuel line at the carburetor, then connect a fuel pump pressure gauge. Ensure the carburetor float bowl has a sufficient amount of gasoline.
2. Start the engine and check the pressure with the engine at idle. If the pump has a vapor return hose, squeeze it off so that an accurate reading can be obtained. Pressure should be $5^1/_2$-$6^1/_2$ psi.
3. If the pressure is incorrect, replace the pump. If it is within specifications, go on to the volume test.

**VOLUME TEST**

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1. Disconnect the pressure gauge. Run the fuel line into a graduated container.
2. Run the engine at idle until one pint of gasoline has been pumped. One pint should be delivered in 30 seconds or less. There is normally enough fuel in the carburetor float bowl to perform this test, but refill it if necessary.
3. If the delivery rate is below the minimum, check the lines for restrictions or leaks, then replace the pump.

## CARBURETORS

The V6 engine is equipped with the Rochester E2SE carburetor, V8 engines use the E4ME and E4MC. These carburetors are of the downdraft design and are used in conjunction with the CCC system for fuel control. They have special design features for optimum air/fuel mixture control during all ranges of engine operation.

An electric solenoid in the carburetor controls the air/fuel ratio. The solenoid is connected to an Electronic Control Module (ECM) which is an on-board computer. The ECM provides a controlling signal to the solenoid. The solenoid controls the metering rod(s) and an idle air bleed valve, thereby closely controlling the air/fuel ratio throughout the operating range of the engine.

## MODEL IDENTIFICATION

General Motors Rochester carburetors are identified by their model code. The first number indicates the number of barrels, while one of the last letters indicates the type of choke used. These are V for the manifold mounted choke coil, C for the choke coil mounted in the carburetor body, and E for electric choke, also mounted on the carburetor. Model codes ending in A indicate an altitude-compensating carburetor.

*Because of their intricate nature and computer controls, the E2SE, E4ME and E4MC carburetors should only be serviced by a qualified technician.*

## PRELIMINARY CHECKS

The following should be observed before attempting any adjustments.

1. Thoroughly warm the engine. If the engine is cold, be sure that it reaches operating temperature.
2. Check the torque of all carburetor mounting nuts and assembly screws. Also check the intake manifold-to-cylinder head bolts. If air is leaking at any of these points, any attempts at adjustment will inevitably lead to frustration.
3. Check the manifold heat control valve (if used) to be sure that it is free.
4. Check and adjust the choke as necessary.
5. Adjust the idle speed and mixture. If the mixture screws are capped, don't adjust them unless all other causes of rough idle have been eliminated. If any adjustments are performed that might possibly change

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the idle speed or mixture, adjust the idle and mixture again when you are finished.

*Before you make any carburetor adjustments make sure that the engine is in tune. Many problems which are thought to be carburetor related can be traced to an engine which is simply out-of-tune. Any trouble in these areas will have symptoms like those of carburetor problems.*

## ADJUSTMENTS

### FAST IDLE

#### ROCHESTER E2SE

1. Refer to the emission label and prepare the vehicle for adjustment.
2. Place the fast idle screw on the highest step of the fast idle cam.
3. Turn the fast idle screw to obtain the fast idle speed.

#### ROCHESTER E4ME AND E4MC

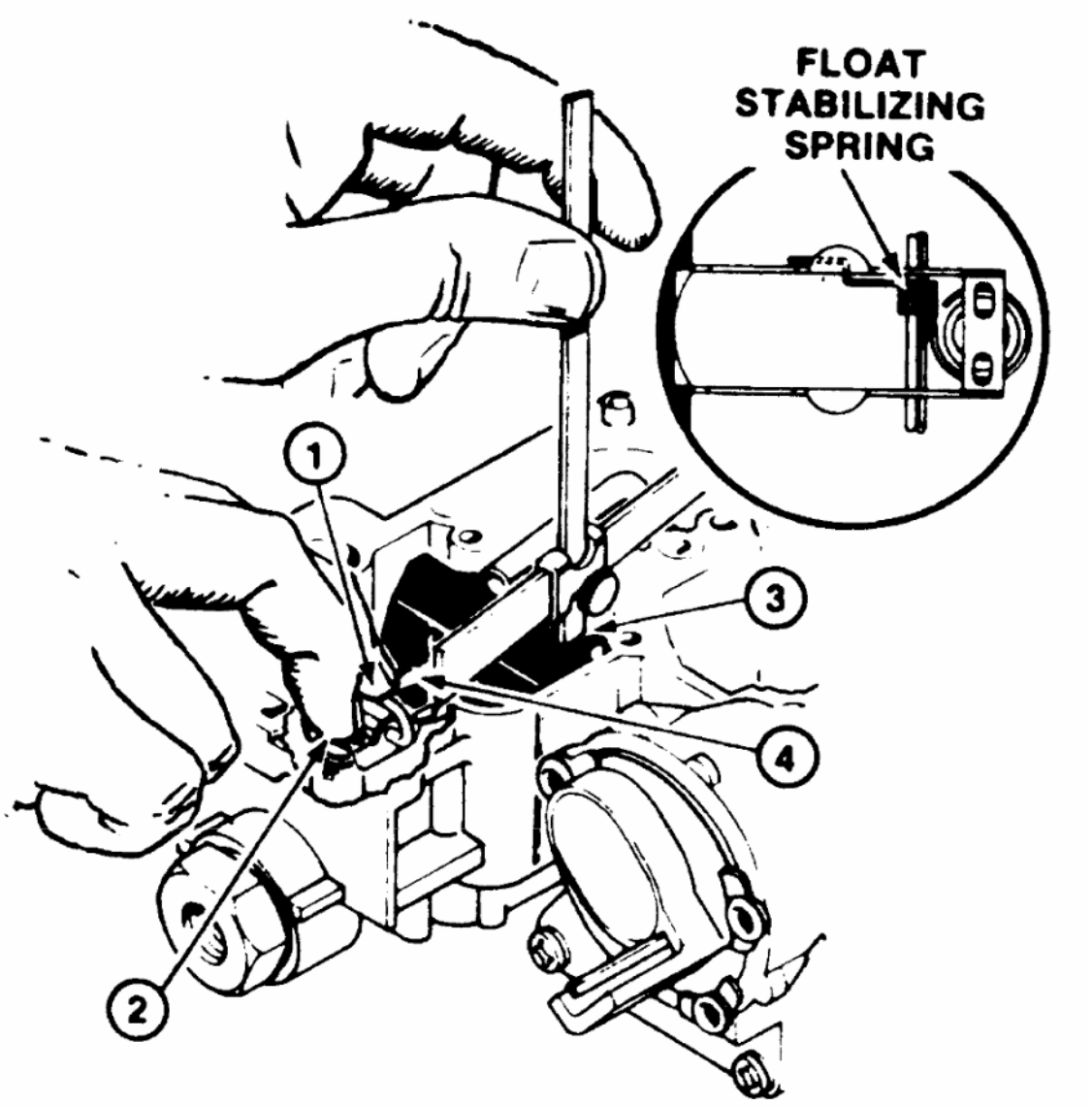
The fast idle adjustment must be performed according to the directions of the emissions label.

### FLOAT AND FUEL LEVEL

#### ROCHESTER E2SE

1. Remove the air horn and gasket.
2. While holding the retainer in place, push the float down lightly against the needle.
3. Place a measuring gauge on the float at the farthest point from the float hinge.
4. To adjust, remove the float and bend the arm up or down. Also check the float alignment.
5. Install the air horn and gasket.

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1. Hold retainer in place
2. Push float down lightly against needle
3. Gauge at large toe of float, at point farthest from float hinge
4. Remove float and bend float arm up or down to adjust (Some models have float stabilizer spring; use care in removing.)
5. Visually check float alignment

Fig. 1: Float adjustment on E2SE carburetors

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## ROCHESTER E4ME AND E4MC

1. Remove the air horn and gasket from the float bowl. Hold the float retainer down firmly. Push the float down (lightly) against the needle.
2. Position a T-scale over the toe of the float $^{1}/_{16}$ in. (1.6mm) from the end of the float toe.
3. If the float level varies more than $^{1}/_{16}$ in. (1.6mm) from the specified setting, it must be reset.

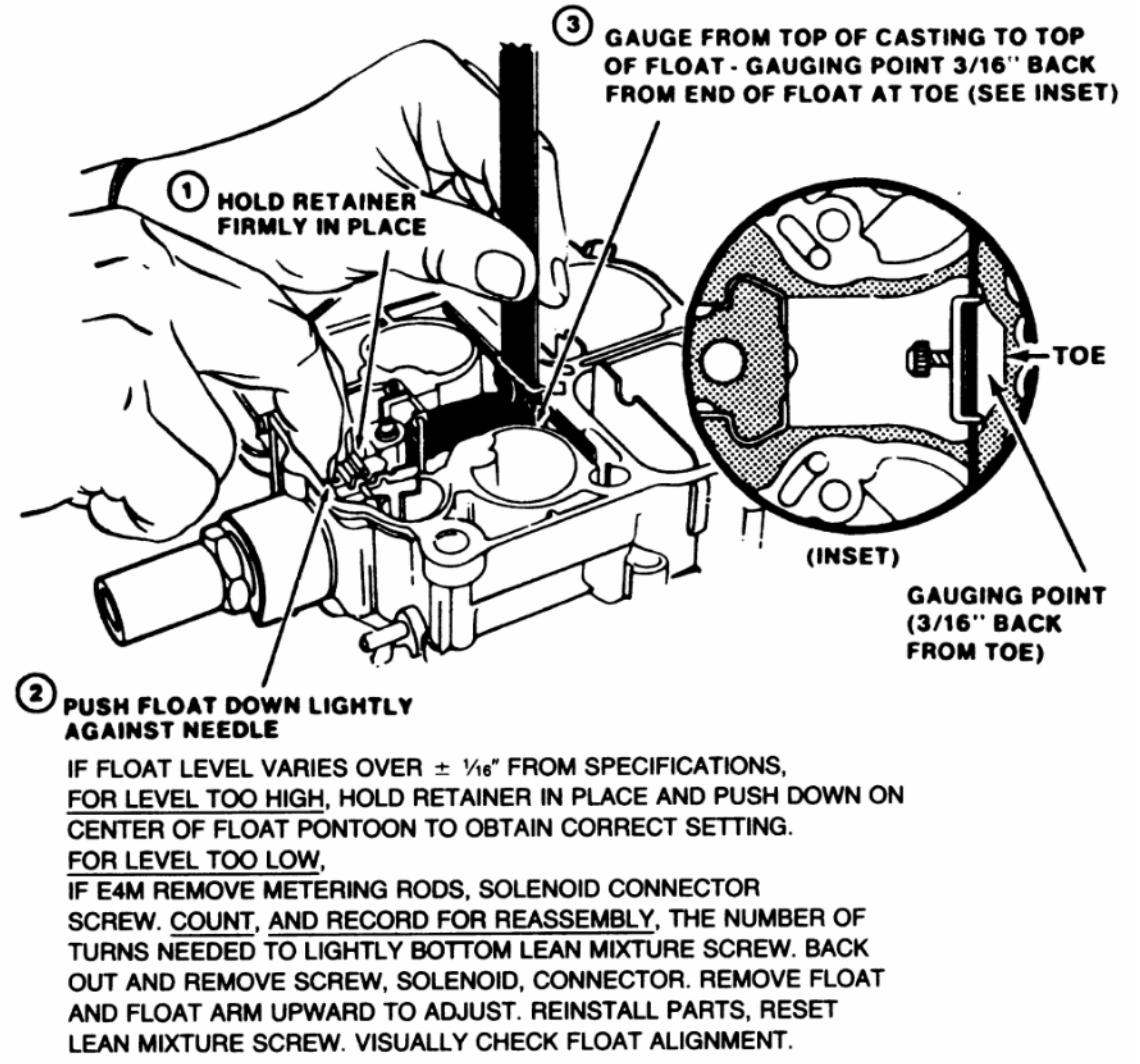



Fig. 2: E4ME/E4MC float level adjustment

## FLOAT LEVEL TOO HIGH

1. Hold the float retainer in place.
2. Push down on the center of the float until the correct level is obtained.

## FLOAT LEVEL TOO LOW

1. Lift out the metering rods and remove the solenoid connector screws.
2. Turn the lean mixture solenoid screw clockwise, counting and recording the number of turns required to seat the screw in the float bowl.

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3. Turn the screw counterclockwise and remove it. Lift the solenoid and the connector from the float bowl.
4. Remove the float and bend the arm up to adjust. The float must be correctly aligned after adjustment.
5. To install the components, reverse the order of removal. Back out the solenoid mixture screw the number of turns that was recorded earlier.

## THROTTLE LINKAGE

### ROCHESTER E2SE

No adjustment of the throttle cable can be made.

### ROCHESTER E4ME AND E4MC

Due to the design of the throttle cable, no adjustments of the throttle linkage can be made.

## CHOKE UNLOADER (PRIMARY)

### ROCHESTER E2SE

1. Connect a rubber band to the intermediate choke lever and open the throttle to allow the choke valve to close.
2. Set up the angle gauge and set the gauge to specifications.
3. Using a vacuum source, retract the vacuum break plunger. Make sure that the air valve rod does not interfere with the retraction of the vacuum break plunger.
4. Support the vacuum break rod and make the adjustment by bending the rod.

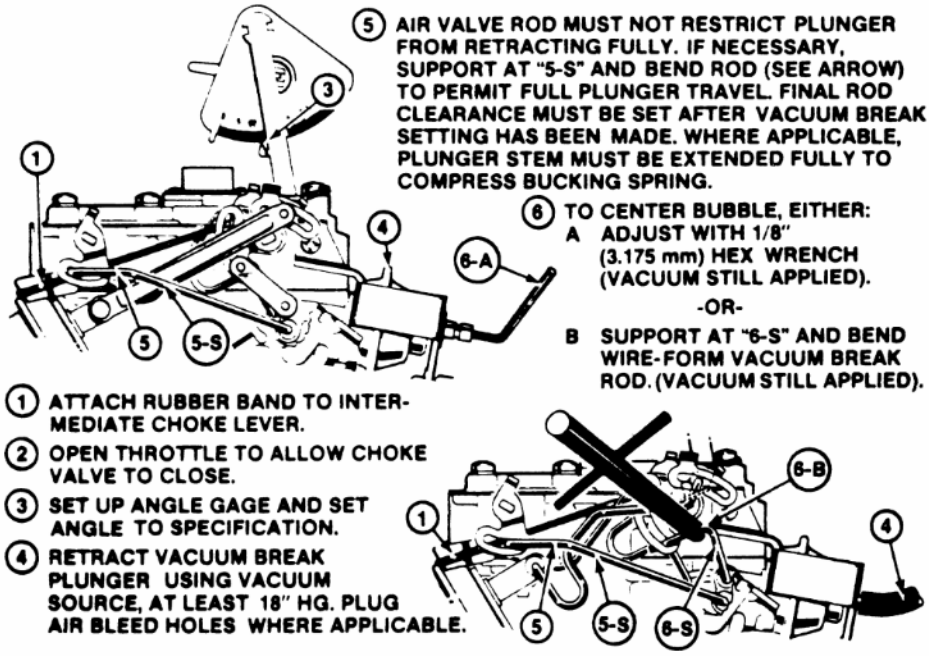



Fig. 3: Primary vacuum break adjustment on E2SE carburetors

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## ROCHESTER E4ME AND E4MC

1. Connect 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 the angle gauge and set to specifications.
4. Using a vacuum source, retract the vacuum break plunger. The air valve rod must not restrict the breaker plunger from fully retracting.
5. With the vacuum applied, turn the adjusting screw until the centering bubble of the angle gauge is level.

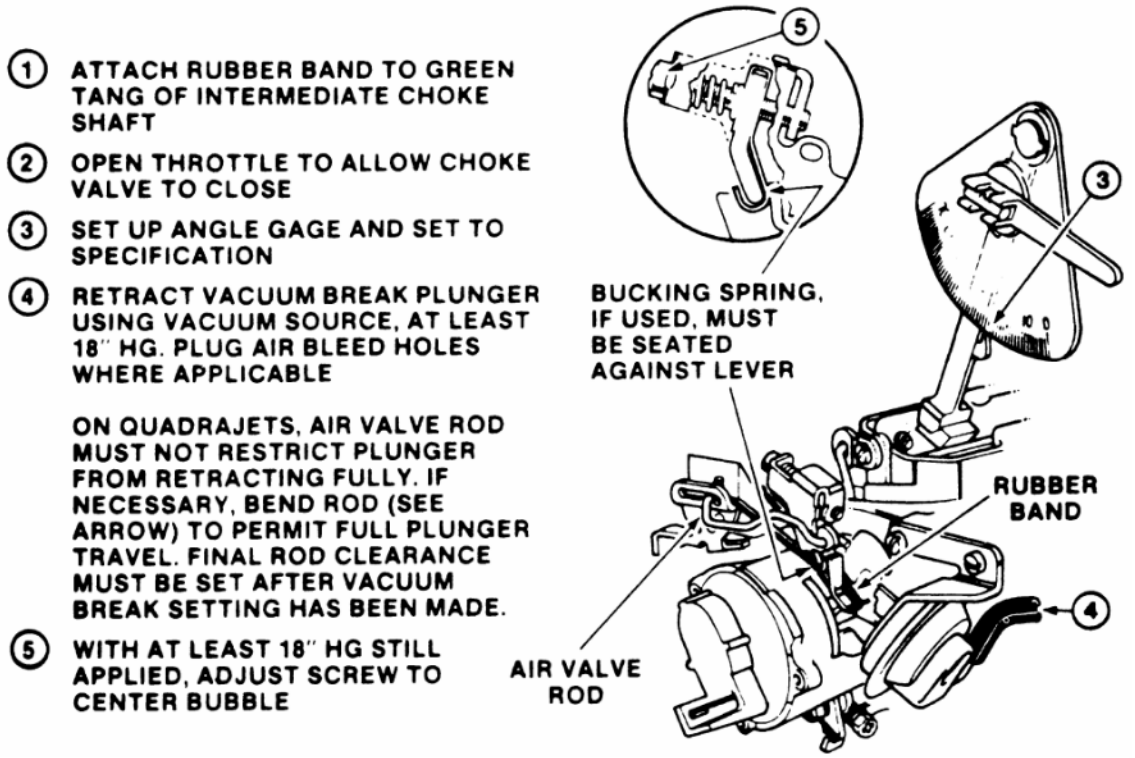


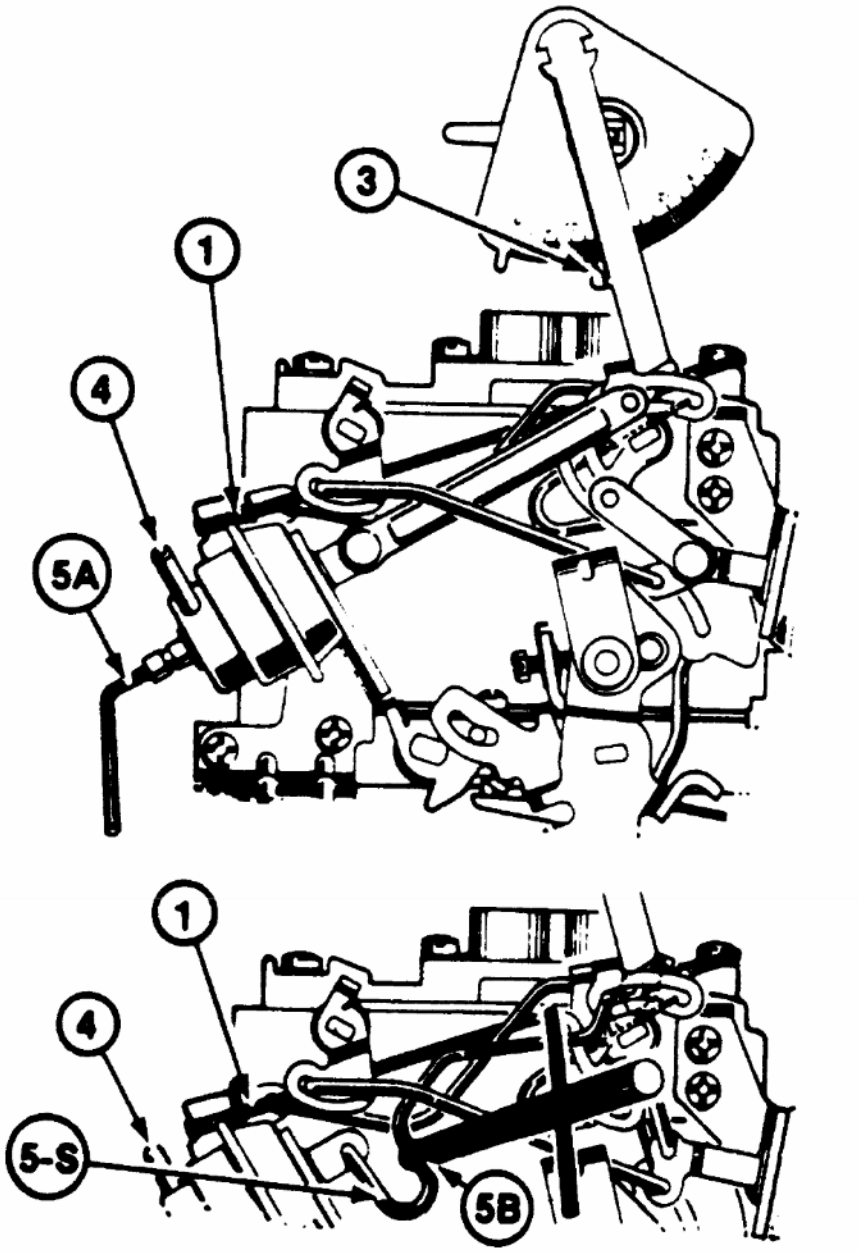

Fig. 4: Primary vacuum break adjustment on E4ME/E4MC carburetors

## CHOKE UNLOADER (SECONDARY)

## ROCHESTER E2SE

1. Connect a rubber band to the intermediate choke lever and open the throttle to allow the choke to close.
2. Set up the angle gauge and set the angle to specifications.
3. Using a vacuum source, retract the vacuum break plunger and retain the vacuum pressure.
4. Refer to the accompanying illustration to perform this procedure. Center the angle gauge bubble by turning an $^{1}/_{8}$ in. (3mm) Allen wrench or bending vacuum break rod.

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1. Attach rubber band to intermediate choke lever
2. Open throttle to allow choke valve to close
3. Set up angle gage and set angle to specification
4. Retract vacuum break plunger using vacuum source, at least 18 in. Hg. Plug air bleed holes where applicable. Where applicable, plunger stem must be extended fully to compress plunger bucking spring.
5. To center bubble, either:
   A.Adjust with 1/8 in. hex wrench (vacuums till applied) – or –B.Support at "5-S", bend side from vacuum break rod (vacuum still applied)

Fig. 5: Secondary vacuum break adjustment on E2SE carburetors

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## ROCHESTER E4ME AND E4MC

1. Connect 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 the angle gauge and set the angle to specification.
4. Using a vacuum source, retract the vacuum break plunger.

*The air valve rod must not restrict the vacuum break plunger from fully retracting.*

5. With the vacuum applied, turn the adjusting screw or bend the vacuum break rod until the bubble of the angle gauge is centered.

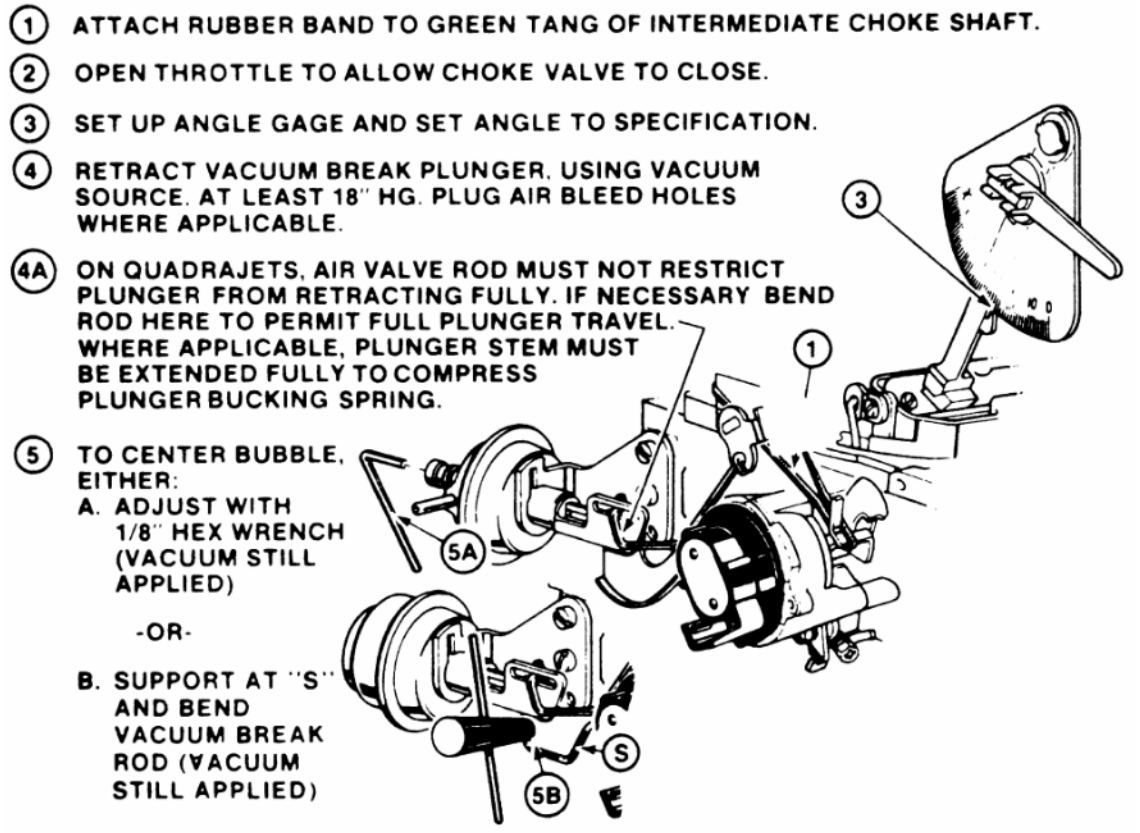


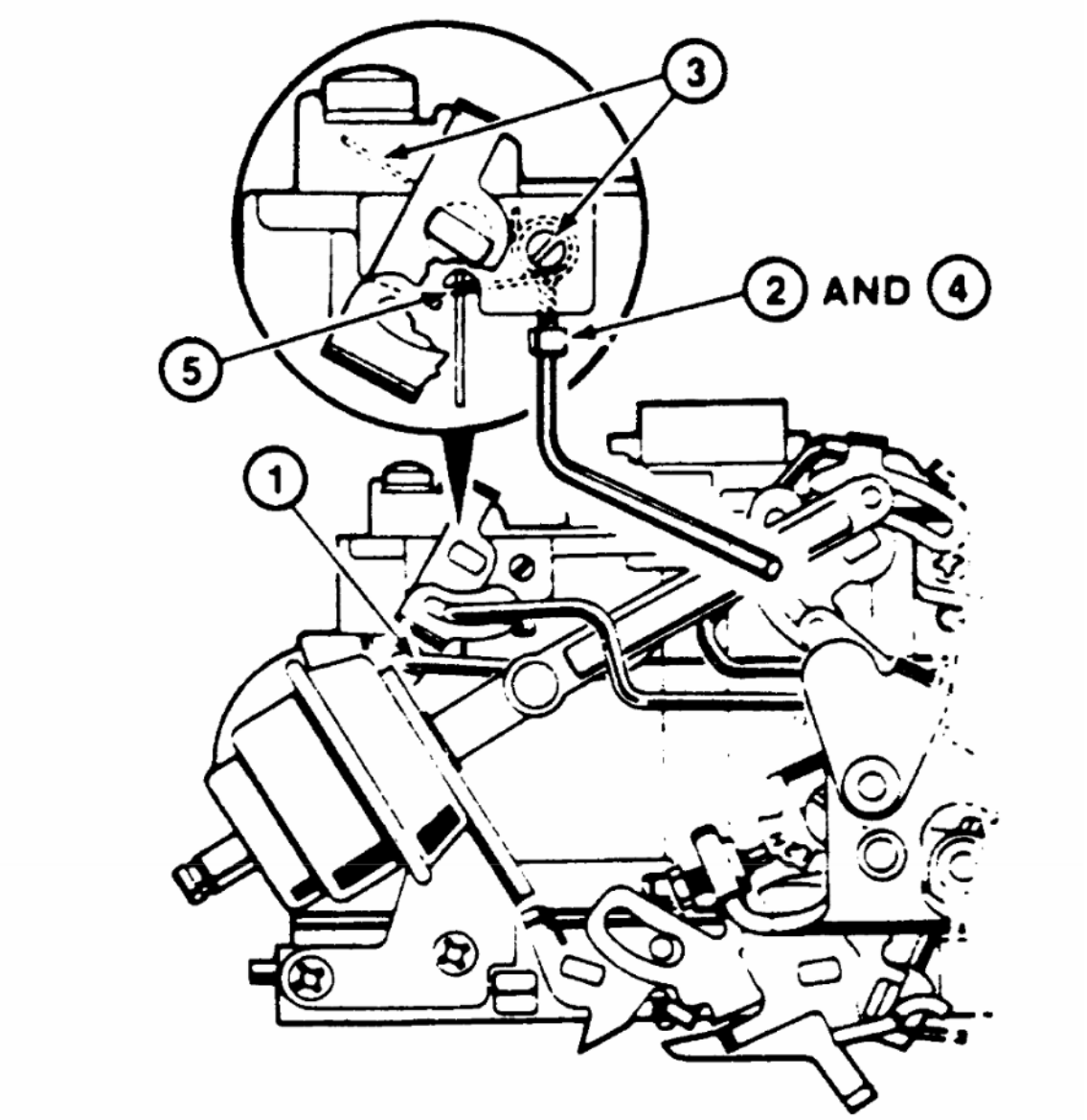

Fig. 6: Secondary vacuum break adjustment on E4ME/E4MC carburetors

## AIR VALVE SPRING ADJUSTMENT

## ROCHESTER E2SE

1. If necessary, remove the intermediate choke rod to gain access to the lock screw.
2. Loosen the lock screw and turn the tension adjusting screw clockwise until the air valve opens slightly.
3. Turn the adjusting screw counterclockwise until the air valve just closes; continue turning the screw counterclockwise according to specifications.
4. Tighten the lock screw. Apply lithium grease to the spring and pin.

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1. If necessary, remove intermediate choke rod, to gain access to lock screw
2. Loosen lock screw using $^{3}/_{32}$ in. hex wrench
3. Turn tension-adjusting screw clockwise until air valve opens slightly. Turn adjusting screw counterclockwise until air valve just closes. Continue counterclockwise specified number of turns
4. Tighten lock screw
5. Apply lithium base grease to lubricate pin and spring contact area

Fig. 7: Air valve spring adjustment on E2SE carburetors

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## ROCHESTER E4ME AND E4MC

1. Loosen the lock screw and turn the tension adjusting screw counterclockwise until the air valve partly opens.
2. Turn the tension adjusting screw clockwise until the air valve just closes, then turn the screw clockwise a specified number of turns.
3. Tighten the lock screw and apply lithium grease to the spring contact area.

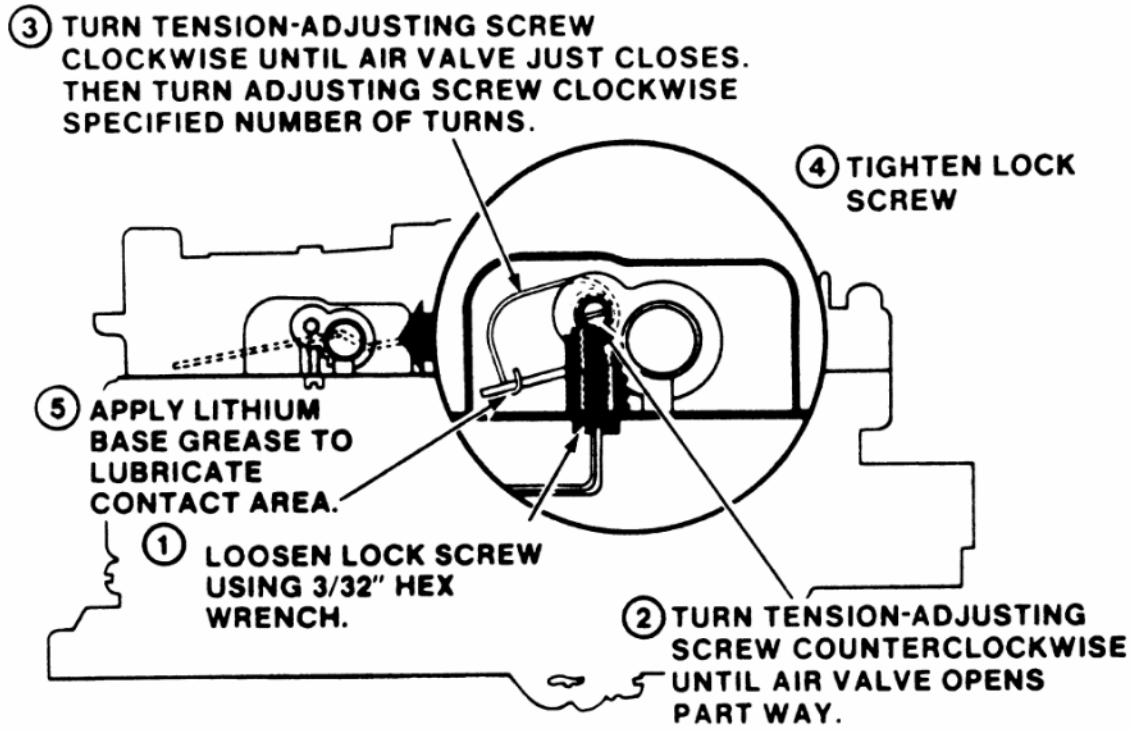


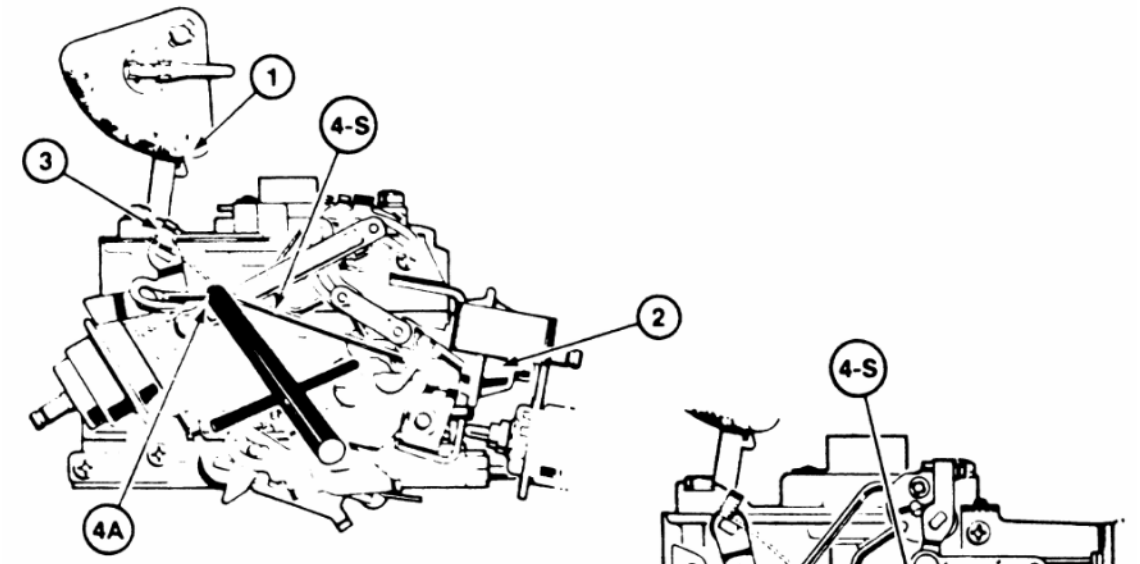

Fig. 8: Air valve spring adjustment on E4ME/E4MC carburetors

## AIR VALVE ROD ADJUSTMENT

## ROCHESTER E2SE

1. Set up the angle gauge on the air valve and set the angle to specification.
2. Use a vacuum source to seat the vacuum break plunger.
3. By applying light pressure to the air valve lever, rotate it in the opening direction.
4. Support the air valve rod and bend it to make the adjustment.

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1. Set up angle gage on air valve and set angle to specifications
2. Use vacuum source, at least 18 in. Hg, to seat vacuum break plunger
3. Rotate air valve in the direction of open air valve by applying light pressure to air valve lever
4. To adjust, support at "4-S" and bend air valve rod ("A" or "B") until bubble is centered

Fig. 9: Air valve rod adjustment on E2SE carburetors

## ROCHESTER E4ME AND E4MC

1. Using a vacuum source, seat the vacuum break plunger. The air valve must be closed.
2. Insert a 0.025 in. (0.635mm) plug gauge between the rod and the end of the slot.
3. To adjust, bend the air valve rod.

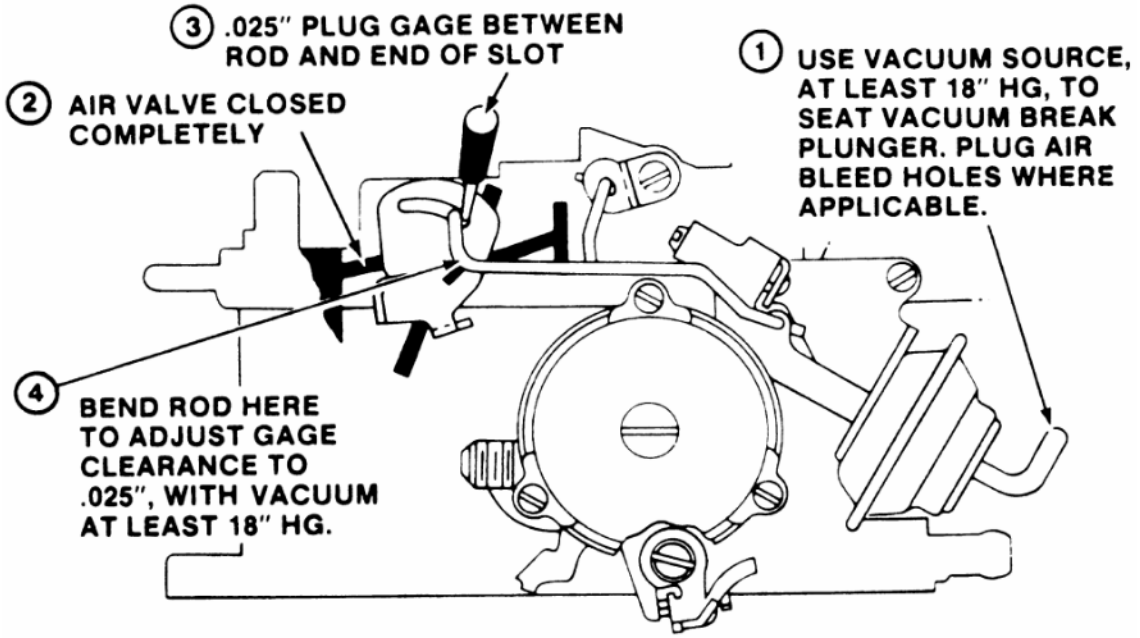



Fig. 10: Front air valve rod adjustment on E4ME/E4MC carburetors

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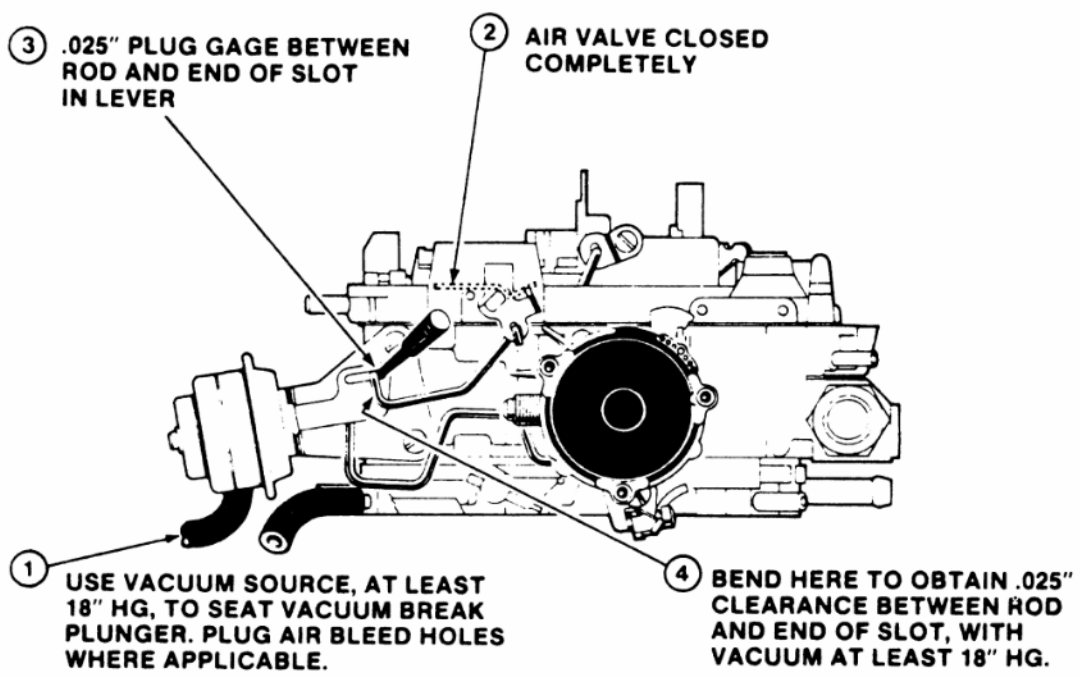
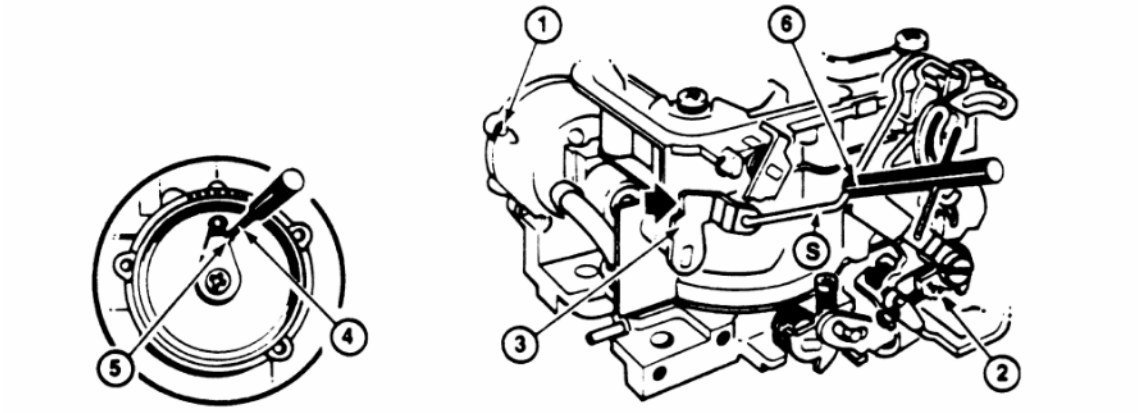



Fig. 11: Rear air valve rod adjustment on E4ME/E4MC carburetors

## CHOKE LEVER ADJUSTMENT

### ROCHESTER E2SE

1. If the choke cover is riveted, drill out the rivets and remove the choke cover with the spring assembly.
2. Place the fast idle screw on the high step of the fast idle cam. Push the intermediate choke lever until the choke valve is closed.
3. Place a 0.085 in. (2.16mm) plug gauge in the choke housing hole and move the choke lever to touch the plug gauge.
4. Support the intermediate choke rod and bend it to make adjustment.
5. To install choke cover, use pop rivets.




1. If riveted, drill out and remove rivets. Remove choke cover and coil assembly
2. Place fast idle screw on high step of fast idle cam
3. Push on intermediate choke lever until choke valve is closed
4. Insert 0.085 in. plug gage in hole
5. Edge of lever should just contact side of gage
6. Support at "S" and bend intermediate choke rod to adjust

Fig. 12: Choke lever adjustment on E2SE carburetors

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ROCHESTER E4ME AND E4MC

1. If the choke cover plate is riveted, drill out the rivets and remove the plate assembly.
2. Place the fast idle cam follower on the high step of the fast idle cam.
3. Lift up on the choke lever to close the choke valve and insert a 0.120 in. (3mm) plug gauge into the choke housing hole. The choke lever should just touch the gauge.
4. To adjust, bend the choke rod.
5. To replace the cover plate, rivet in place.

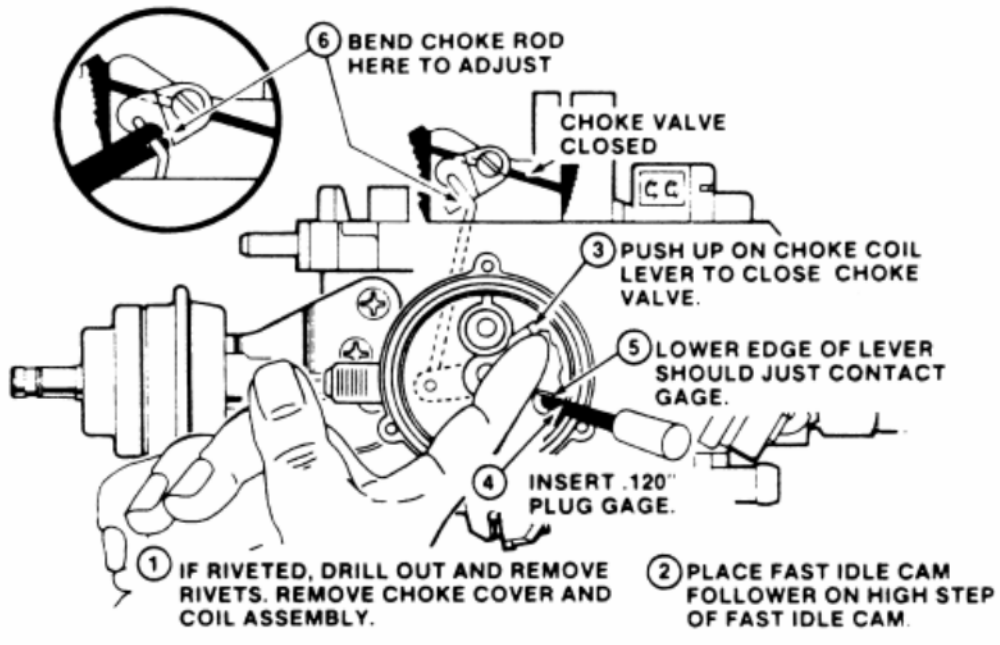


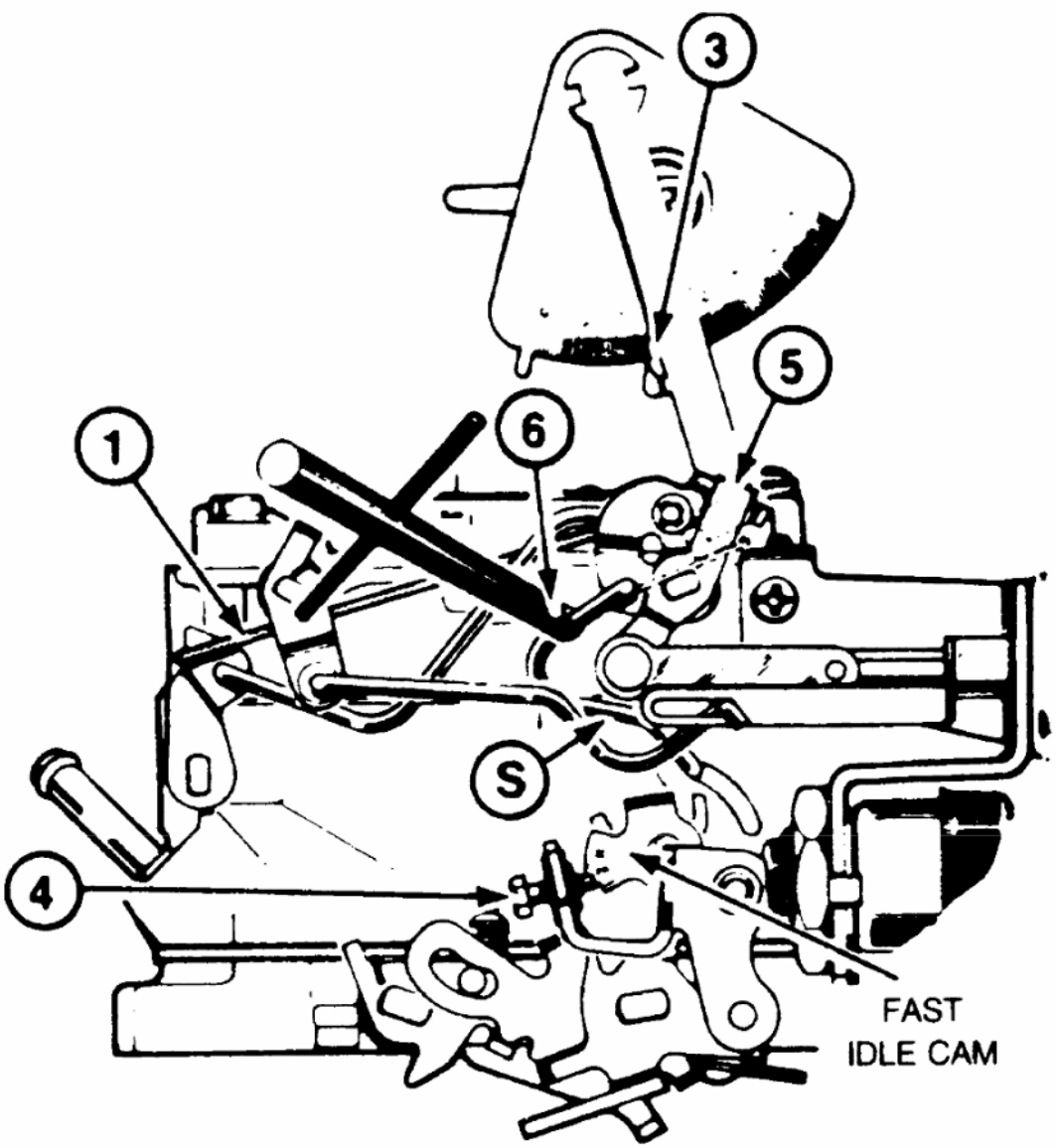

Fig. 13: Choke lever adjustment on E4ME/E4MC carburetors

## CHOKE ROD FAST IDLE CAM ADJUSTMENT

### ROCHESTER E2SE

1. Attach a rubber band to the intermediate choke lever and open the throttle to allow the choke plate to close.
2. Set up the angle gauge and set the angle to specifications.
3. Place the fast idle screw on the second step of the cam, against the high step.
4. Move the choke shaft lever, to open the choke valve, make contact with the black closing tang.
5. Support the fast idle cam rod and bend the rod to make the adjustment. Adjustment is completed when the bubble of the angle gauge is level.

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1. Attach rubber band to intermediate choke lever
2. Open throttle to allow choke valve to close
3. Set up angle gage and set angle to specifications
4. Place fast idle screw on second step of cam against rise of high step
5. Push on choke shaft lever to open choke valve and to make contact with black closing tang
6. Support at "S" and adjust by bending fast idle cam rod until bubble is centered

Fig. 14: Choke rod fast idle cam adjustment on E2SE carburetors

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## ROCHESTER E4ME AND E4MC

1. Connect 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 the angle gauge and set the angle to specifications.
4. Place the cam follower on the second step of the fast idle cam, against the rise of the first step. If the cam follower does not contact the cam, turn the fast idle screw additional turns.
5. To adjust, bend the tang of the fast idle cam until the gauge bubble is centered.

*The final fast idle speed adjustment must be performed according to the emission control label.*

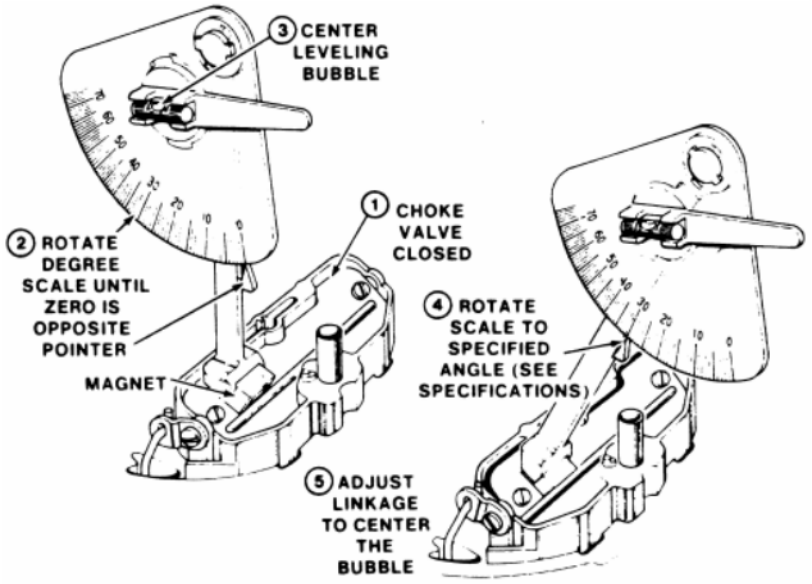



Fig. 15: Choke valve angle gauge

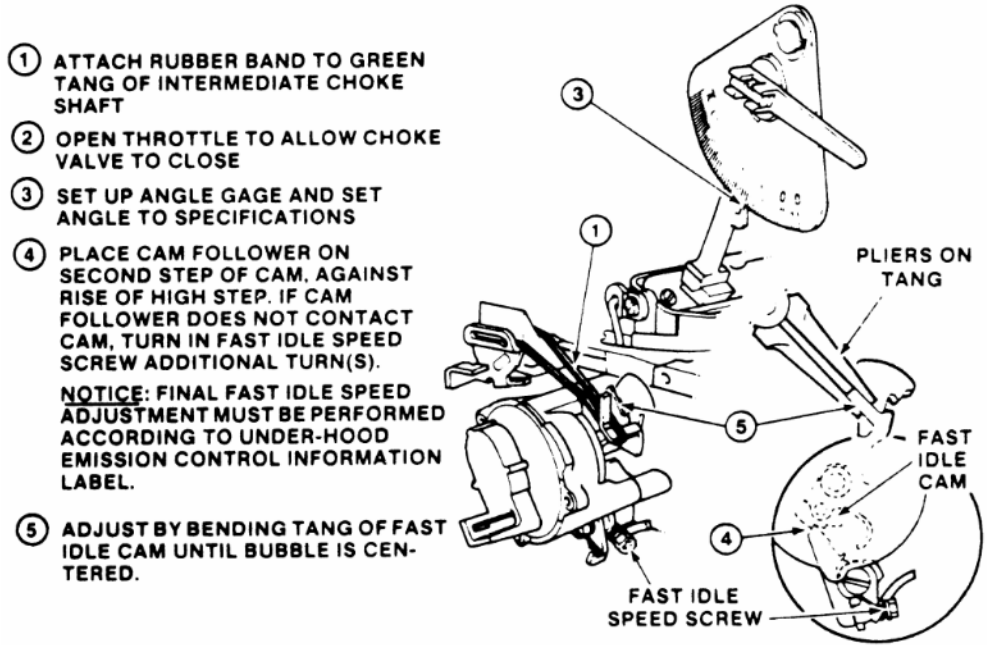


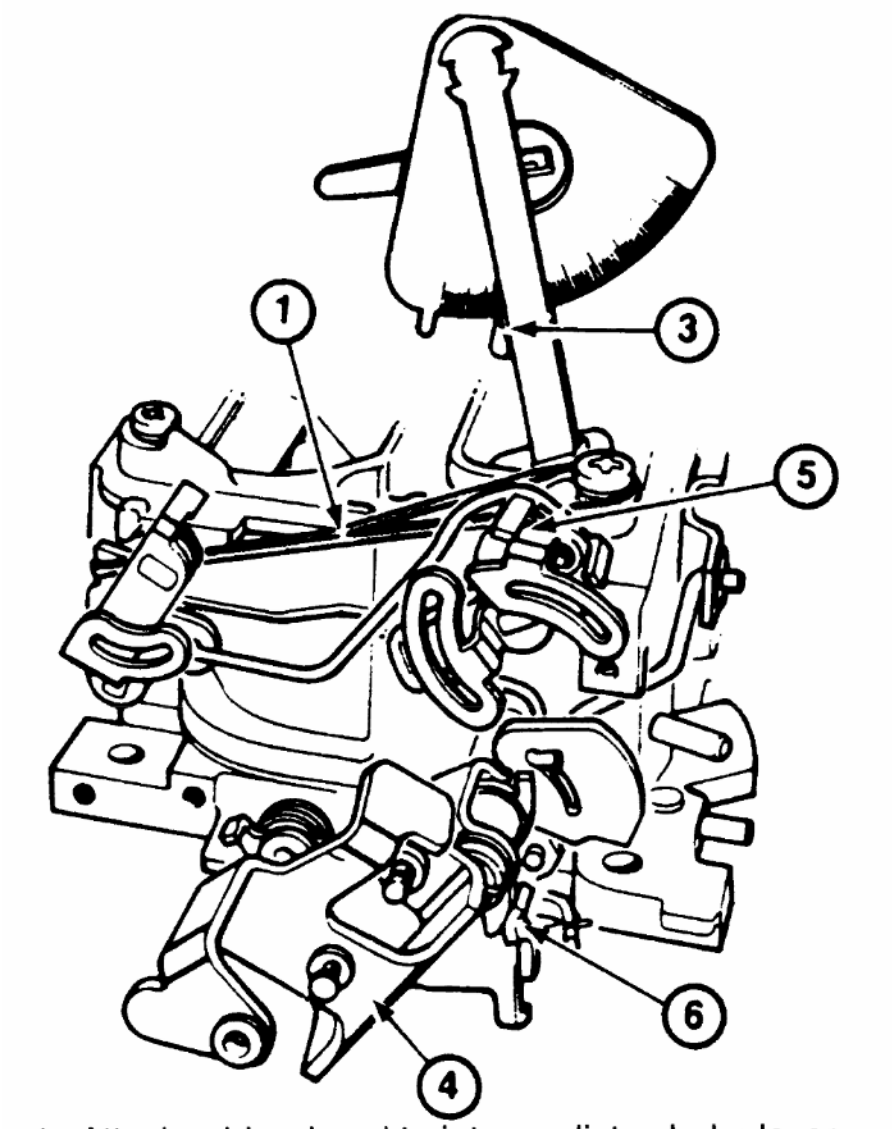

Fig. 16: Choke rod fast idle cam adjustment on E4ME/E4MC carburetors

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## UNLOADER ADJUSTMENT

## ROCHESTER E2SE

1. Connect a rubber band to the intermediate choke lever and open throttle to allow the choke to close.
2. Set up the angle gauge and set the angle to specifications.
3. Hold the throttle lever in wide-open position and push on the choke lever to open the choke, making contact with the black closing tang.
4. To adjust, bend the tang until the bubble of the angle gauge is centered.




1. Attach rubber band to intermediate choke lever
2. Open throttle to allow choke valve to close
3. Set up angle gage and set angle to specifications
4. Hold throttle lever in wide open position
5. Push on choke shaft lever to open choke valve and to make contact with black closing tang
6. Adjust by bending tang until bubble is centered

Fig. 17: Unloader adjustment on E2SE

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## ROCHESTER E4ME AND E4MC

1. Connect a rubber band to the green tang of the intermediate shaft.
2. Open the throttle to allow the choke valve to close.
3. Set up the angle gauge and set the angle to specification.
4. Hold the secondary lockout lever away from the pin.
5. Hold the throttle lever in the wide-open position.
6. To adjust, bend the tang of the fast idle lever until the bubble of the angle gauge is centered.

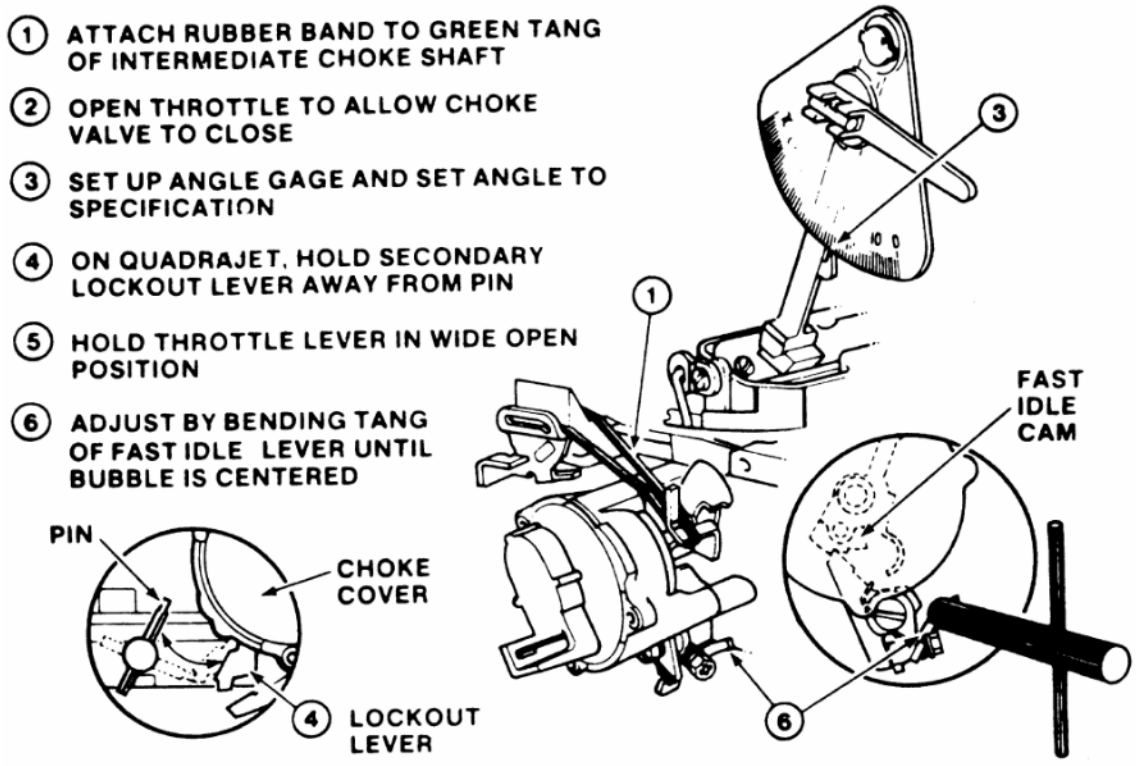


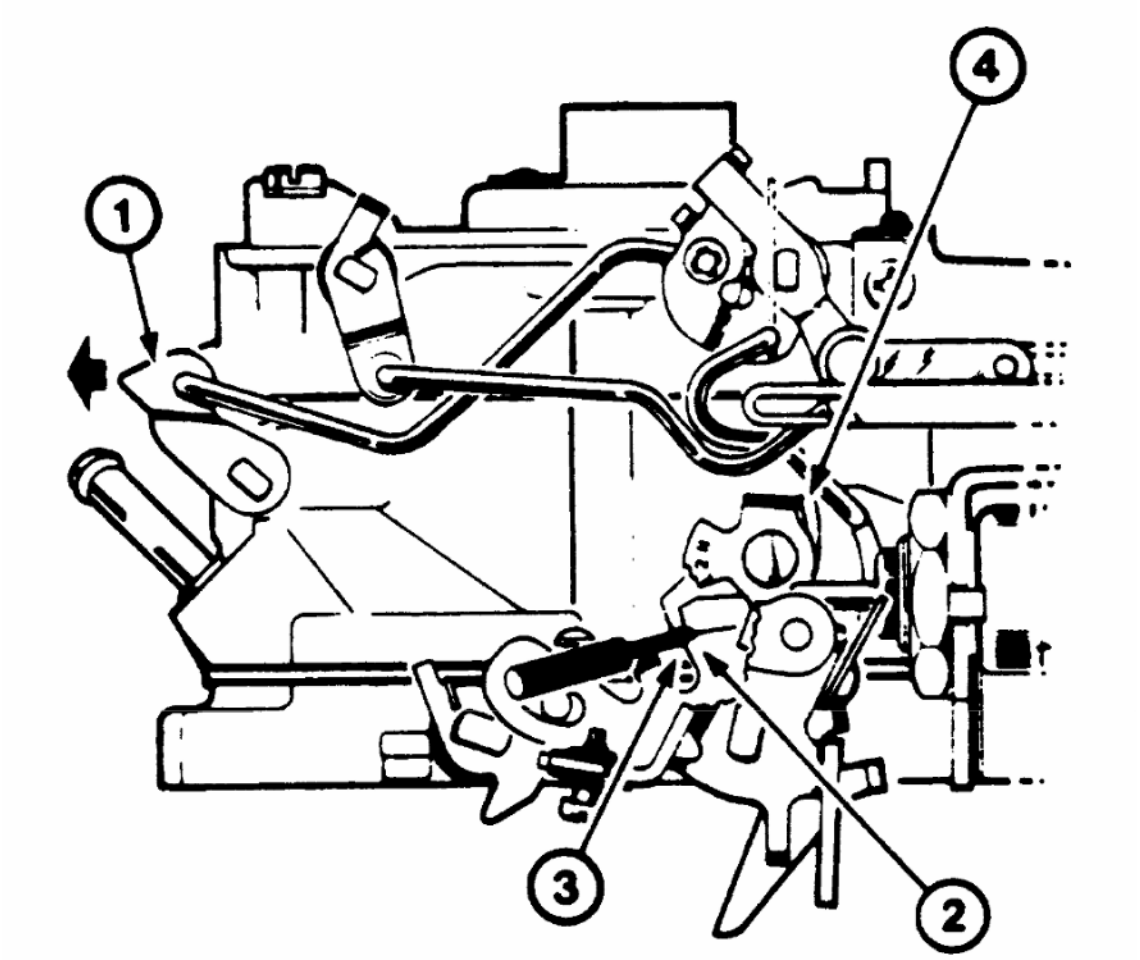

Fig. 18: Unloader adjustment on E4ME/E4MC

## SECONDARY LOCKOUT ADJUSTMENT

## ROCHESTER E2SE

1. Push down on the intermediate choke lever to hold the choke valve wide-open.
2. Open the throttle lever until the end of the secondary actuating lever is opposite the toe of the lockout lever.
3. Insert a 0.025 in. (0.635mm) plug gauge.
4. To adjust, bend the lockout lever tang into contact with the fast idle cam.

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1. Hold choke valve wide open by pushing down on intermediate choke lever
2. Open throttle lever until end of secondary actuating lever is opposite toe of lockout lever
3. Gage clearance — dimension should be 0.025 in.
4. If necessary to adjust, bend lockout lever gag contacting fast idle cam

Fig. 19: Secondary lockout adjustment on E2SE carburetors

**ROCHESTER E4ME AND E4MC**

1. With the choke and the throttle valves closed, insert a 0.015 in. (0.38mm) plug gauge between the lockout lever and the pin. To establish clearance, bend the pin.
2. Push down on the fast idle cam and hold the choke valve wide open.
3. Insert a 0.015 in. (0.38mm) plug gauge sideways between the lockout lever and the pin. To adjust, file the end of the pin.

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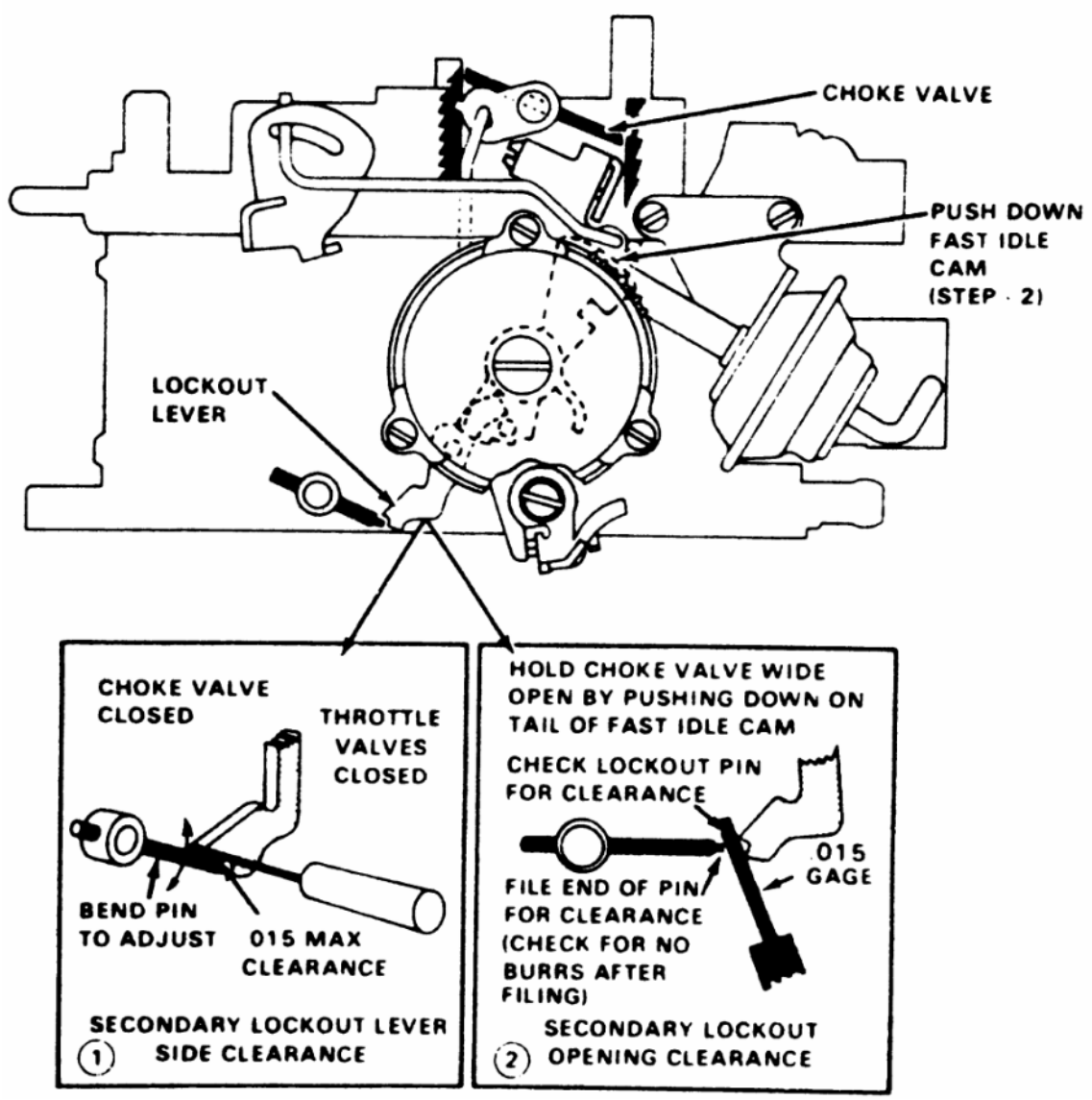


Fig. 20: Secondary lockout adjustment on E4ME/E4MC carburetors

## MIXTURE CONTROL (M/C) SOLENOID

### TRAVEL TEST

These procedures are performed on four barrel models only. Before checking the mixture control solenoid travel, it may be necessary to modify the float gauge J-9789-130 or equivalent (used to externally check the float level).

This should be done by filing or grinding sufficient material off the gauge to allow for insertion down the vertical D-shaped hole in the air horn casting (located next to the idle air bleed valve cover).

Check that the gauge freely enters the D-shaped vent hole and does not bind. The gauge will also be used to determine the total mixture control solenoid travel.

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With the engine OFF and the air cleaner removed, measure the control solenoid travel as follows:

1. Insert a modified float gauge J-9789-130 or equivalent down the D-shaped vent hole. Press down on the gauge and release it.
2. Observe that the gauge moves freely and does not bind. With the gauge released (solenoid in the up position), be sure to read it at eye level and record the mark on the gauge (in inches/millimeters) that lines up with the top of the air horn casting (upper edge).
3. Lightly press down on the gauge until bottomed (solenoid in the down position). Record (in inches/millimeters) the mark on the gauge that lines up with the top of the air horn casting.
4. Subtract the gauge up dimension from gauge dimension. Record the difference (in inches/millimeters). This difference is total solenoid travel.
5. If total solenoid travel is not within $^{3}/_{32}$-$^{5}/_{32}$ in. (2.4-3.9mm), perform the mixture control solenoid adjustments. If the difference is within specifications, proceed to the idle air bleed valve adjustment.

*If adjustment is required, it will be necessary to remove the air horn and drive out the mixture control solenoid screw plug from the under side of the air horn.*

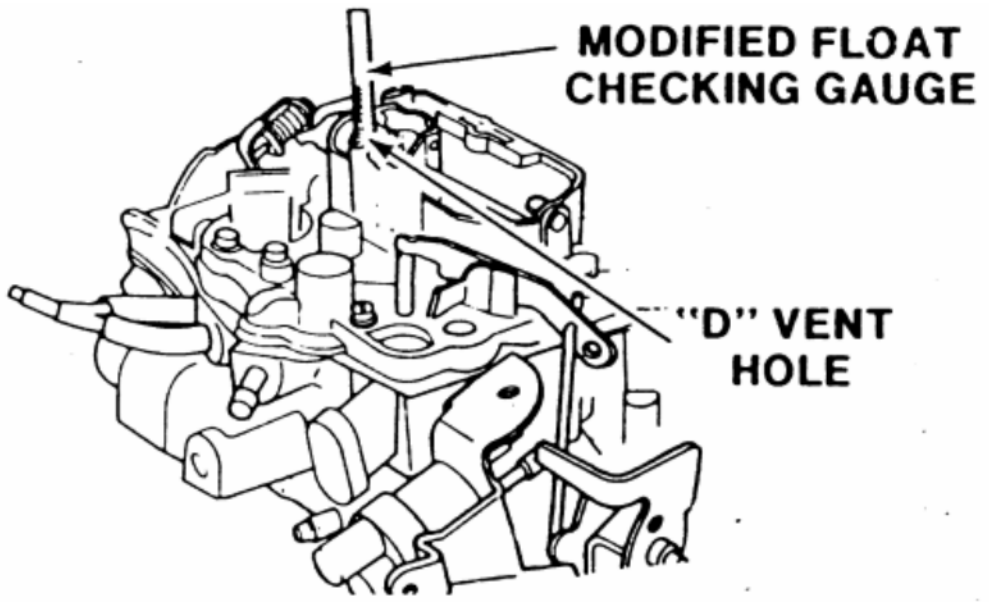



Fig. 21: Checking the solenoid plunger travel

**ADJUSTMENTS**

Before making adjustment to mixture control solenoid, verify that the plunger travel is not correct.

1. Remove air horn, mixture control solenoid plunger, air horn gasket and plastic filler block, using normal service procedures.
2. Check carburetor for cause of incorrect mixture:
    a. M/C solenoid bore or plunger worn or sticking
    b. Metering rods for incorrect part number, sticking or rods or springs not installed properly

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c. Foreign material in jets

3. Remove throttle side metering rod. Install mixture control solenoid gauging tool, J-33815-1, BT-8253-A, or equivalent, over the throttle side metering jet rod guide and temporarily reinstall the solenoid plunger into the solenoid body.
4. Holding the solenoid plunger in the *DOWN* position, use tool J-28696-10, BT-7928, or equivalent, to turn lean mixture solenoid screw counterclockwise until the plunger breaks contact with the gauging tool. Turn slowly clockwise until the plunger makes contact with the gauging tool. The adjustment is correct when the solenoid plunger is contacting both the solenoid stop and the gauging tool.

*If the total difference in adjustment required less than $^{3}/_{4}$ turn of the lean mixture solenoid screw, the original setting was within the manufacturer's specifications.*

5. Remove solenoid plunger and gauging tool and reinstall metering rod and plastic filler block.
6. Invert air horn and remove rich mixture stop screw from bottom side of air horn, using tool J-28696-4, BT-7967-A, or equivalent.
7. Remove lean mixture screw plug and the rich mixture stop screw plug from air horn, using a punch.
8. Reinstall rich mixture stop screw in air horn and bottom lightly, then back screw out $^{1}/_{4}$ turn.
9. Reinstall air horn gasket, mixture control solenoid plunger and air horn to carburetor.
10. Adjust the M/C solenoid plunger travel as follows:
    a. Insert float gauge down D-shaped vent hole. Press down on gauge and release, observing that the gauge moves freely and does not bind. With gauge released, (plunger UP position), read at eye level and record the reading of the gauge mark (in inches/millimeters) that lines up with the top of air horn casting, (upper edge).
    b. Lightly press down on gauge until bottomed, (plunger DOWN position). Read and record (in inches/millimeters) the reading of the gauge mark that lines up with top of air horn casting.
    c. Subtract gauge *UP* position from the gauge *DOWN* position and record the difference. This difference is the total plunger travel. Insert external float gauge in vent hole and, with tool J-28696-10, BT-7928, or equivalent, adjust rich mixture stop screw to obtain $^{5}/_{32}$ in. (3.9mm) total plunger travel.
11. With solenoid plunger travel correctly set, install plugs (supplied in service kits) in the air horn, as follows:

    a. Install plug, hollow end down, into the access hole for the lean mixture (solenoid) screw. Use suitably sized punch to drive plug into the air horn until the top of plug is even with the lower. Plug must be installed to retain the screw setting and to prevent fuel vapor loss.

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b. Install plug, with hollow end down, over the rich mixture stop screw access hole and drive plug into place so that the top of the plug is $^{3}/_{16}$ in. (4.7mm) below the surface of the air horn casting.

*Plug must be installed to retain screw setting.*

12. To check the M/C solenoid dwell, first disconnect vacuum line to the canister purge valve and plug it. Ground diagnostic TEST terminal and run engine until it is at normal operation temperature (upper radiator hose hot) and in closed loop.
13. Check M/C dwell at 3000 rpm. If within 10-50 degrees, calibration is complete. If higher than 50 degrees, check the carburetor for a cause of rich condition. If below 10 degrees, look for a cause of lean engine condition such as vacuum leaks. If none are found, check for the cause of a lean carburetor.

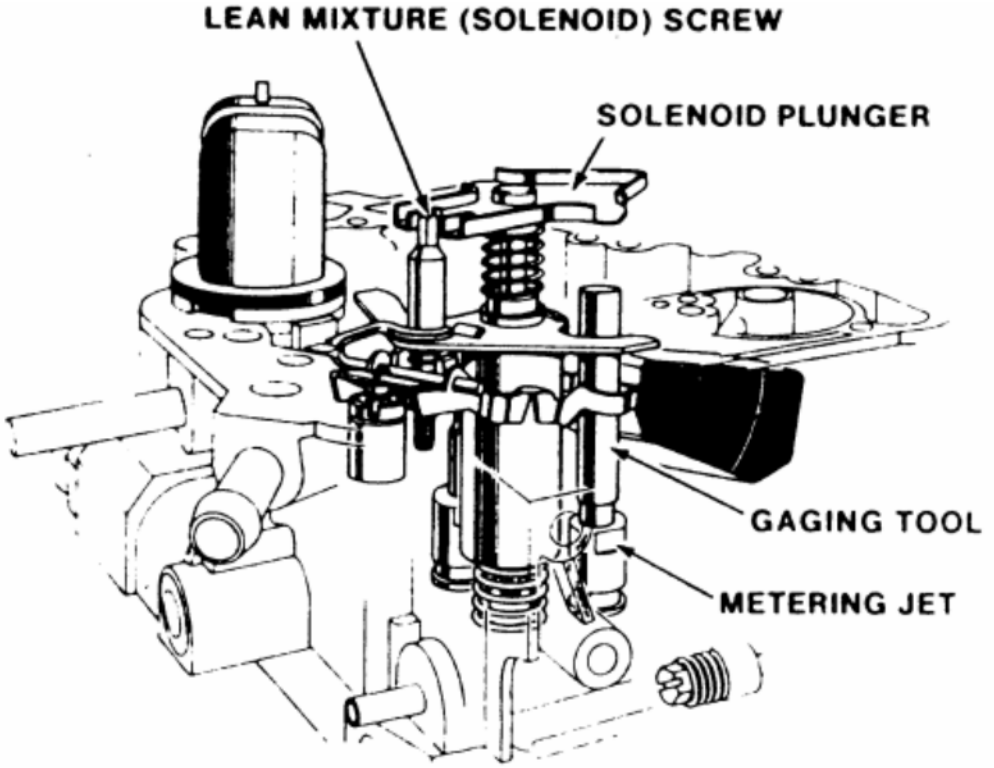



Fig. 22: Installing the mixture control solenoid gauging tool

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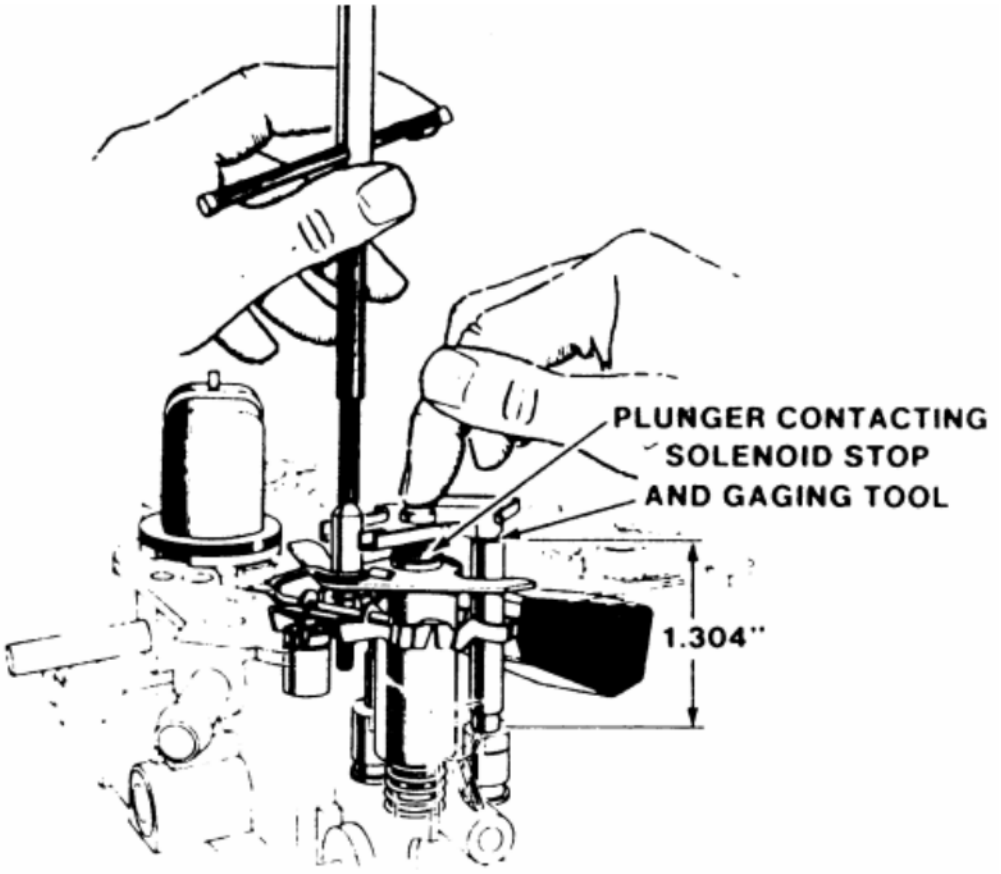



Fig. 23: Adjusting the lean mixture solenoid screw

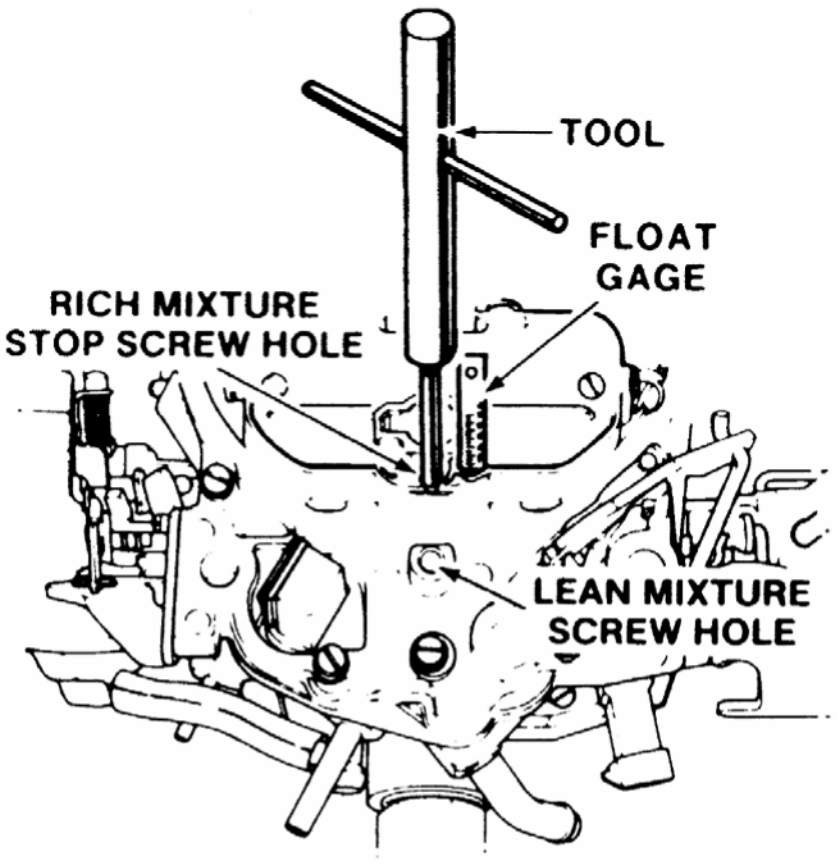



Fig. 24: Adjusting the rich mixture stop screw

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## IDLE AIR VALVE

A cover is in place over the idle air bleed valve. Also, the access holes to the idle mixture needles are sealed with hardened plugs. This is done to seal the factory settings, during original equipment production. These items are NOT to be removed unless required for cleaning, part replacement, improper dwell readings or if the System Performance Check indicates the carburetor is the cause of the trouble.

## ROCHESTER E4ME AND E4MC

1. With engine *OFF*, cover the internal bowl vents and inlet to bleed valve and the carburetor air intakes with masking tape. This is done to prevent metal chips from entering.
2. Carefully drill rivet head of idle air bleed cover, with 0.110 in. (2.8mm) drill bit.
3. Remove rivet head and all pieces of rivet.
4. Lift cover off air bleed valve and blow out any metal shavings, or use a magnet to remove excess metal.

**CAUTION** - Always wear eye protection when using compressed air.

5. Remove masking tape.
6. Start engine and allow it to reach normal operating temperature.
7. Disconnect the vacuum hose from the canister purge valve and plug it.
8. While idling in *D* for automatic transmission or *N* for manual transmission, slowly turn the valve counterclockwise or clockwise, until the dwell reading varies within the 25-35 degree range, attempting to be as close to 30 degrees as possible.

*Perform this step carefully. The air bleed valve is very sensitive and should be turned in $^{1}/_{8}$ turn increments only.*

9. If the dwell reading does not vary and is not within the 25-35 degree range, it will be necessary to remove the plugs and to adjust the idle mixture needles.

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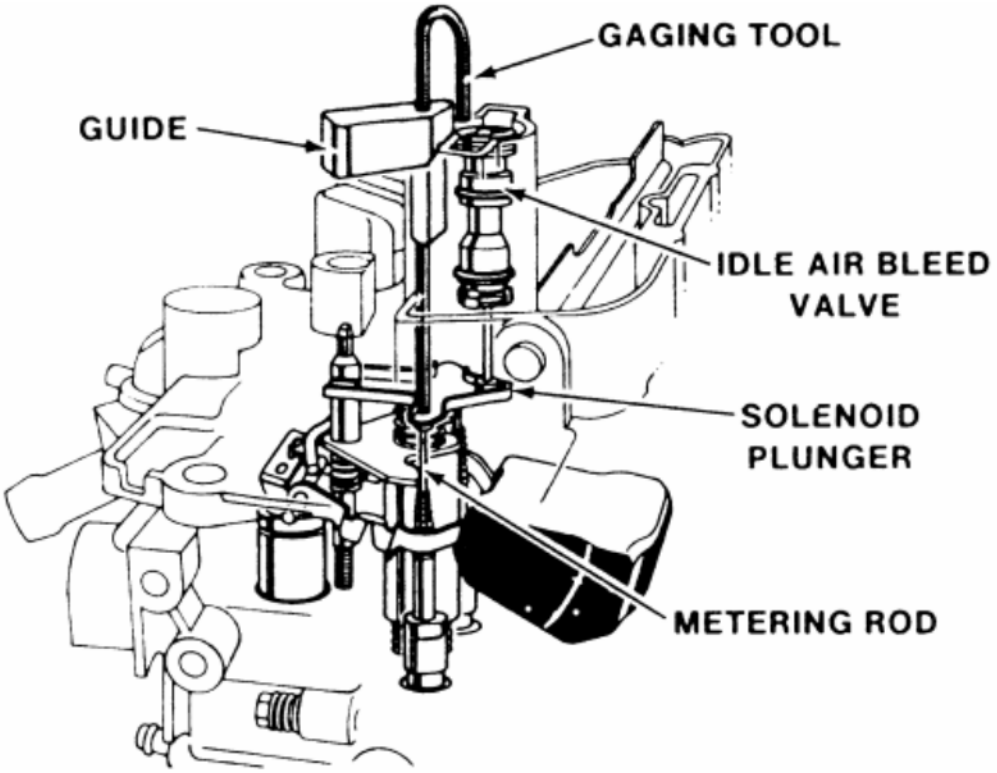



Fig. 25: Installing the idle air bleed valve gauging tool

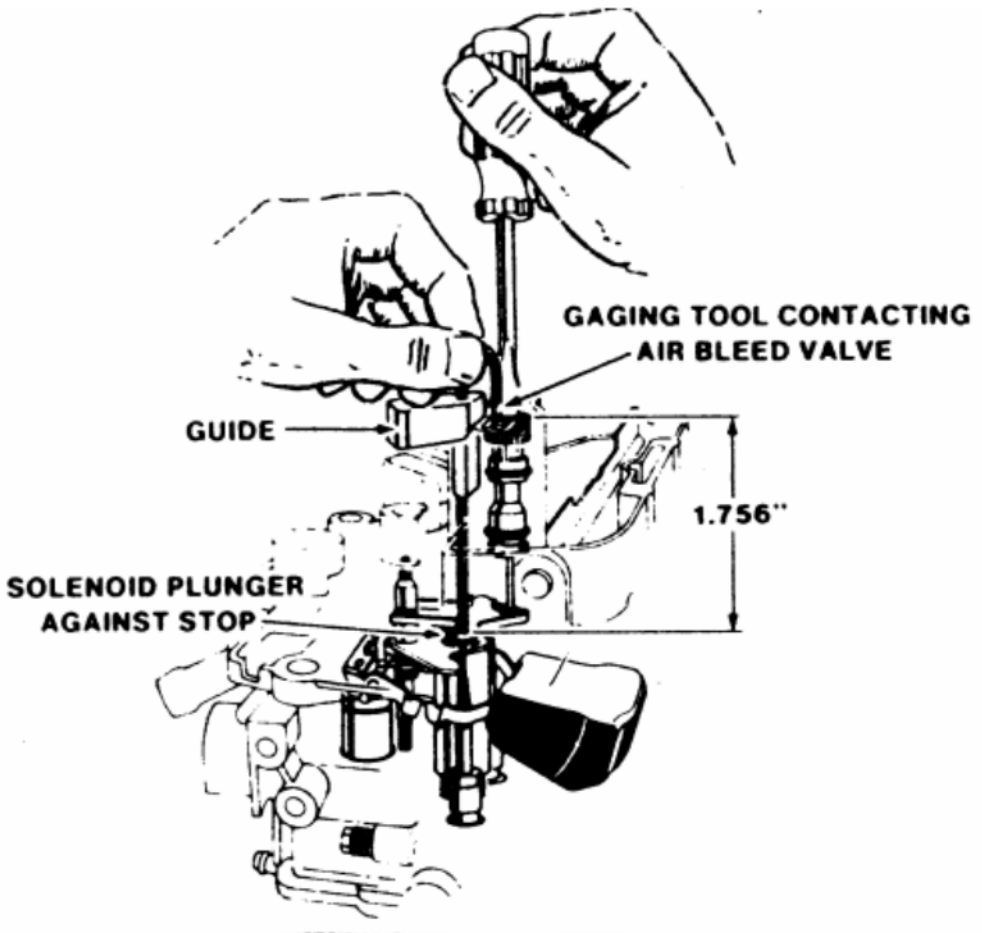



Fig. 26: Adjusting the idle air bleed valve

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## IDLE MIXTURE

### E2SE CARBURETORS

1. Remove the carburetor from the engine.
2. Remove the plugs covering the idle mixture needles.
3. Turn the mixture needle in until slightly seated, then back it out 4 turns.
4. If the plug in the air horn covering the idle air bleed has been removed, replace the air horn. If the plug is still in place, do not remove it.
5. Remove the vent stack screen assembly to gain access to the lean mixture screw.
6. Using tool J-28696-10 or equivalent, turn the lean mixture screw in until lightly seated, then back out $2^{1}/_{2}$ turns.
7. Install the carburetor on the engine.
8. Disconnect the bowl vent line at the carburetor.
9. Disconnect the EGR hose and canister purge hose at the carburetor. Cap the ports on the carburetor.
10. Find the hose from port D of the carburetor to the temperature sensor and secondary vacuum break thermal vacuum switch. Disconnect and plug the vacuum hose going to the air cleaner.
11. Connect the positive lead of a dwell meter to the mixture control solenoid test lead (green connector). Connect the other lead to ground. Set the meter to the 6 cylinder position.
12. Run the engine on the high step of the fast idle cam until the cooling fan starts to cycle.
13. Run the engine at 3,000 rpm and adjust the lean mixture screw slowly. Allow the reading to stabilize, obtain an average dwell of 35 degrees. It is normal for the dwell to vary in a narrow range.
14. Return to idle.
15. Adjust the idle mixture screw to obtain an average dwell of 25 degrees. Allow time for the reading to stabilize.
16. Run the engine at 3,000 rpm and note the dwell reading. It should be varying with an average reading of 35 degrees. If it does not, repeat the earlier steps.

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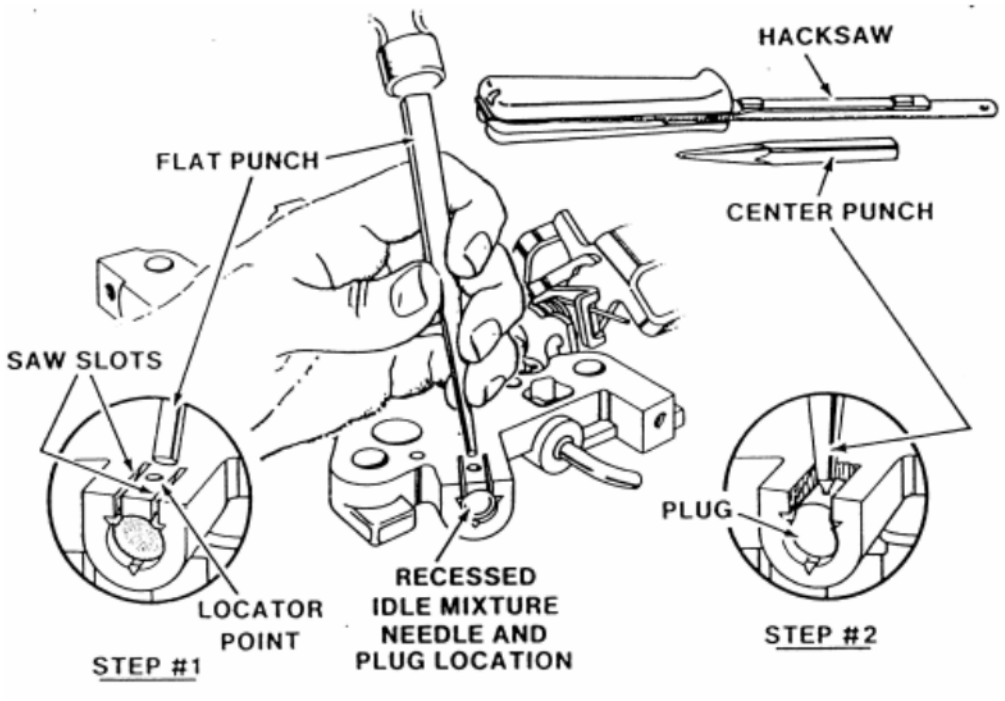



Fig. 27: Idle mixture needle plug removal

## E4ME CARBURETORS (ELECTRIC CHOKE)

1. Using tool J-29030, BT-7610-B, or equivalent, turn both idle mixture needles clockwise until they are lightly seated, then turn each mixture needle counterclockwise 3 turns.
2. Reinstall carburetor on engine using a new flange mounting gasket, but do not install air cleaner and gasket at this time.
3. Disconnect the vacuum hose to canister purge valve and plug it. Readjust the idle air bleed valve to finalize correct dwell reading.
4. Connect the positive lead of a dwell meter to the mixture control solenoid test lead (green connector). Connect the other lead to ground. Set the meter to the 6 cylinder position.
5. Start engine and run until fully warm, then repeat the idle air bleed valve adjustment.
6. If unable to set dwell to 25-35 degrees and the dwell is below 25 degrees, turn both mixture needles counterclockwise an additional turn. If dwell is above 35 degrees, turn both mixture needles clockwise an additional turn. Readjust idle air bleed valve to obtain dwell limits. Repeat as needed.
7. After adjustments are complete, seal the idle mixture needle openings in the throttle body, using silicone sealant, RTV rubber, or equivalent. The sealer is required to discourage unnecessary adjustment of the setting and to prevent fuel vapor loss in that area. Reconnect canister vacuum hose.
8. On vehicles without an Idle Load Compensator (ILC), adjust curb idle speed if necessary.
9. Check, and if necessary, adjust fast idle speed as described on Vehicle Emission Control Information (VECI) label.

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THESE ADJUSTMENTS SHOULD BE PERFORMED ONLY IF INDICATED BY SYSTEM PERFORMANCE CHECK.

LEAN MIXTURE SCREW:

1. WITH VENT SCREEN (OR ENTIRE AIR HORN) OFF, USE TOOL J-28696-10 OR BT-7928 OR EQUIVALENT, TO LIGHTLY BOTTOM LEAN MIXTURE SCREW.
2. BACK OUT NUMBER OF TURNS INDICATED IN SPECIFICATIONS.

IDLE MIXTURE SCREW:

4. WITH IDLE MIXTURE SCREW PLUG REMOVED, USE TOOL J-29030 OR BT-7610B OR EQUIVALENT TO LIGHTLY BOTTOM SCREW.
5. BACK OUT NUMBER OF TURNS INDICATED IN SPECIFICATIONS.

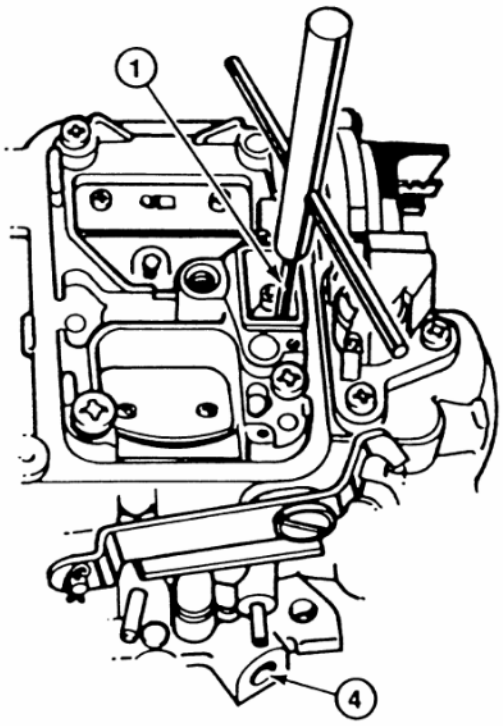



Fig. 28: Lean mixture and idle mixture screw adjustment

## E4MC CARBURETOR (HOT AIR CHOKE)

1. Using tool J-29030-B, BT-7610-B, or equivalent, turn each idle mixture needle clockwise until lightly seated, then turn each mixture needle counterclockwise 3 turns.
2. Reinstall carburetor on engine, using a new flange mounting gasket, but do not install air cleaner or gasket at this time.
3. Disconnect vacuum hose to canister purge valve and plug it.
4. Connect the positive lead of a dwell meter to the mixture control solenoid test lead (green connector). Connect the other lead to ground. Set the meter to the 6 cylinder position.
5. Start engine and allow it to reach normal operating temperature.
6. While idling in *D* (*N* for manual transmission), adjust both mixture needles equally, in $^{1}/_{8}$ turn increments, until dwell reading varies within the 25-35 degree range, attempting to be as close to 30 degrees as possible.
7. If reading is too low, turn mixture needles counterclockwise. If reading is too high, turn mixture needles clockwise. Allow time for dwell reading to stabilize after each adjustment.

*After adjustments are complete, seal the idle mixture needle openings in the throttle body, using silicone sealant, RTV rubber, or equivalent. The sealer is required to discourage unnecessary readjustment of the setting and prevent fuel vapor loss in that area.*

8. On vehicles without a carburetor-mounted Idle Load Compensator (ILC) , adjust curb idle speed if necessary.

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9. Check, and if necessary, adjust fast idle speed, as described on the Vehicle Emission Control Information (VECI) label.

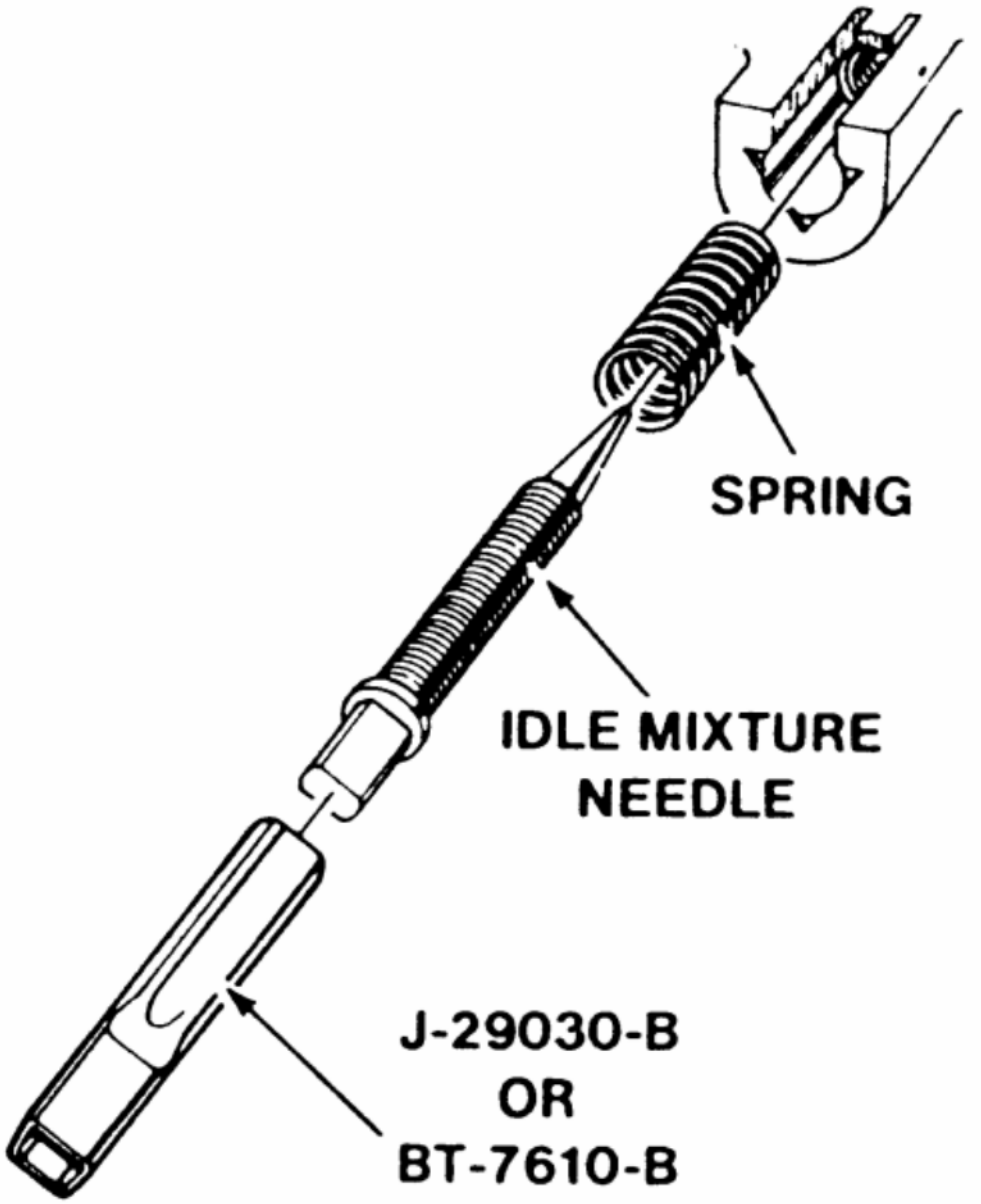



Fig. 29: Mixture needle and spring

**IDLE LOAD COMPENSATOR**

The idle load compensator is adjusted at the factory. Do not make any adjustments unless diagnosis leads to it, or curb idle speed is not to specification.

1. Make certain ignition timing, mixture adjustment, vacuum hoses, fuel pressure and CCC system meets specifications.
2. Remove air cleaner and plug hose to thermal vacuum valve.
3. Connect a tachometer.
4. Disconnect and plug hose to EGR valve.

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5. Disconnect and plug hose to canister purge port.
6. Disconnect and plug hose to idle load compensator.
7. Back out idle stop screw on carburetor 3 turns.
8. Turn air conditioning OFF.
9. Block drive wheels, set parking brake, place transmission in *P*, start and warm engine to normal operating temperature. Make certain choke is *OPEN*.
10. With engine *RUNNING* place transmission in *D* and idle load compensator fully extended (no vacuum applied). Using tool J-29607, or equivalent, adjust plunger to obtain 650-750 rpm. Locknut on plunger must be held with a wrench to prevent damage to guide tabs.
11. Measure distance from the locknut to tip of the plunger. This distance must not exceed 1 in. (25mm). If it does check for low idle condition.
12. Reconnect vacuum hose to idle load compensator and observe idle speed.
13. Idle speed should be between 425-475 rpm in *D*.
14. If idle speed is correct no further adjustment is necessary, proceed to the next step. If idle speed is still incorrect continue as follows:

*It may be necessary to remove the idle load compensator from the engine unless a hex key wrench is modified to clear obstructions.*

a. Stop engine, remove rubber cap from the center outlet tube.
b. Using a 0.90 in. (23mm) hex wrench, insert through open center tube to engage idle speed adjusting screw.
c. If idle speed was low, turn the adjusting screw counterclockwise approximately 1 turn for every 85 rpm low. If idle speed was high turn screw 1 turn for every 85 rpm high.

15. Disconnect and plug vacuum hose to the idle load compensator.
16. Using a hand pump, apply vacuum to the idle load compensator until fully retracted.
17. Adjust the idle stop screw on carburetor float bowl to obtain 450 rpm in *D*.
18. Place transmission in *P* and stop engine.
19. Reconnect the idle load compensator.
20. Reconnect all vacuum hoses.
21. Install air cleaner and gasket. Remove wheel blocks.

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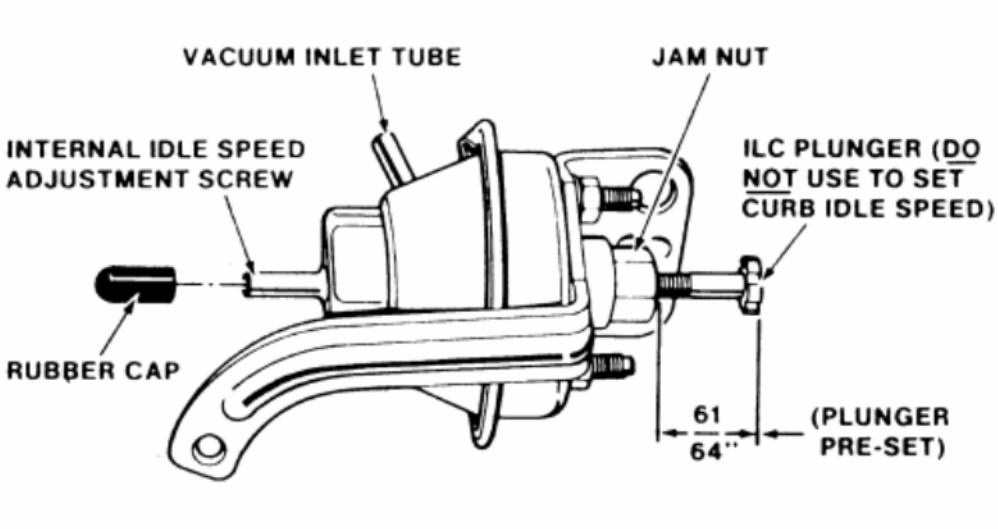



Fig. 30: Idle load compensator components

## THROTTLE POSITION SENSOR (TPS)

Before the throttle position sensor voltage output setting can be accurately checked or adjusted the idle rpm must be within specifications. The plug covering the TPS adjustment screw is used to provide a tamper-resistant design and retain the factory setting during vehicle operation. Do not remove the plug unless diagnosis indicates the TPS is not adjusted correctly, or it is necessary to replace the air horn assembly, float bowl, TPS, or TPS adjustment screw. This is a critical adjustment that must be performed accurately to ensure proper vehicle performance and control of exhaust emissions. Remove TPS plug if not already removed.

*Adjustment is required only if voltage is above the following readings, as the ECM automatically zeros below 0.70 Volts.*

1. Using a $^{5}/_{64}$ in. (2mm) drill bit, carefully drill a hole in the steel or aluminum plug. Be sure to drill only far enough to start a self tapping screw, the approximate drilling depth is $^{1}/_{16}$-$^{1}/_{8}$ in. (1.6-3mm).

*Use care in drilling so as not to damage the TPS adjustment screw head.*

2. Start a long self tapping screw (No. 8 x $^{1}/_{2}$ in.) into the drilled pilot hole in the plug. Turn the screw in only enough to ensure a good thread engagement in the drilled hole.
3. Place a suitable tool between the screw head and the air horn casting. Then pry against the screw head to remove the plug. A small slide hammer may also be used in this procedure. Be sure to discard the plug when it has been removed.
4. Connect a suitable digital voltmeter (J-29125 or equivalent) from the TPS connector center terminal (B) to the bottom terminal (C).

*Jumper wires for access can be made using terminals 12014836 and 12014837 or equivalent. Make jumper wires up with 16 gauge (1.0mm), 18 gauge (0.8mm) or 20 gauge (0.5mm) wire approximately 6 in. (152mm) long.*

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5. With the ignition *ON* and the engine stopped, install the TPS adjustment screw and turn the screw with a suitable tool to obtain the specified voltage at the specified throttle position with the A/C controls in the *OFF* position.
    a. 2.8L - 0.30 volts at curb idle position
    b. 5.0L - 0.40 volts at curb idle position
6. After the adjustment has been made, install a new plug kit (supplied in the service kits), into the air horn. Drive the plug into place until it is flush with the raised pump lever boss on the casting. Clear trouble code memory after adjustment.

*The plug must be installed to retain the TPS adjustment screw setting. If a plug kit is not available, remove the TPS adjusting screw and apply thread sealer adhesive X-10 or equivalent to the screw threads. Now repeat the TPS adjustment procedure to obtain the correct TPS voltage.*

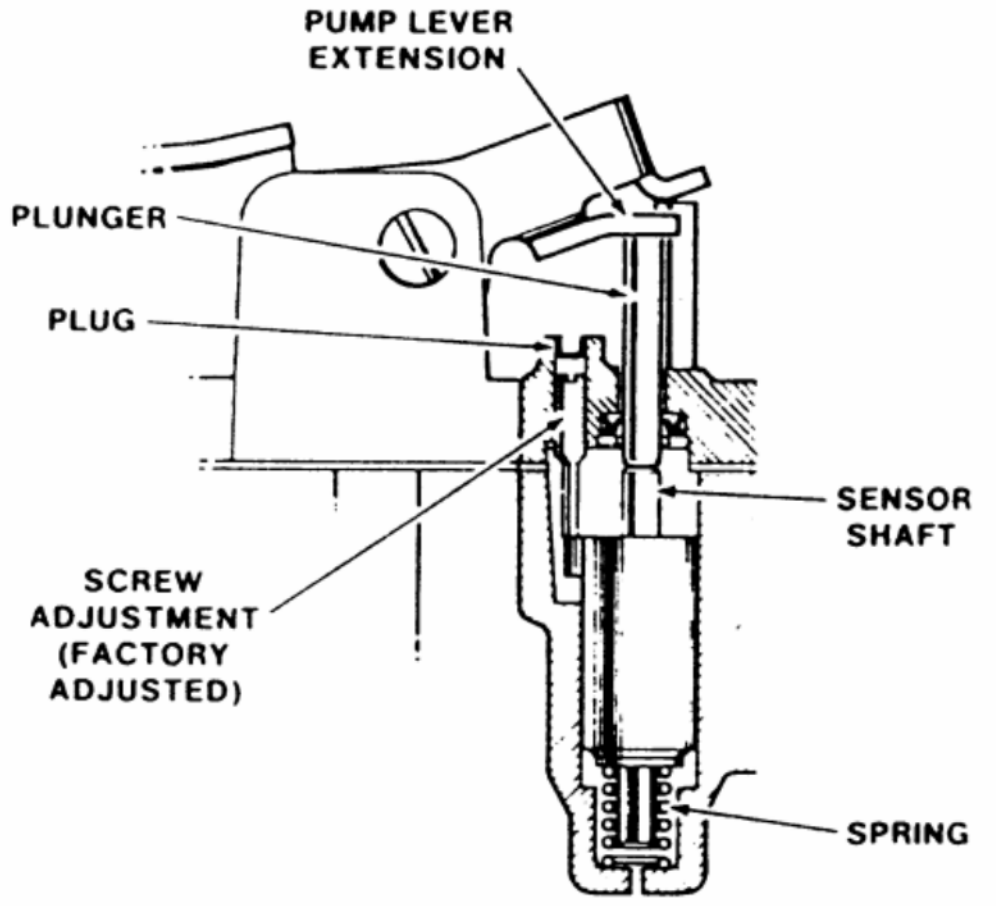



Fig. 31: Throttle position sensor adjusting screw location on E2SE carburetors

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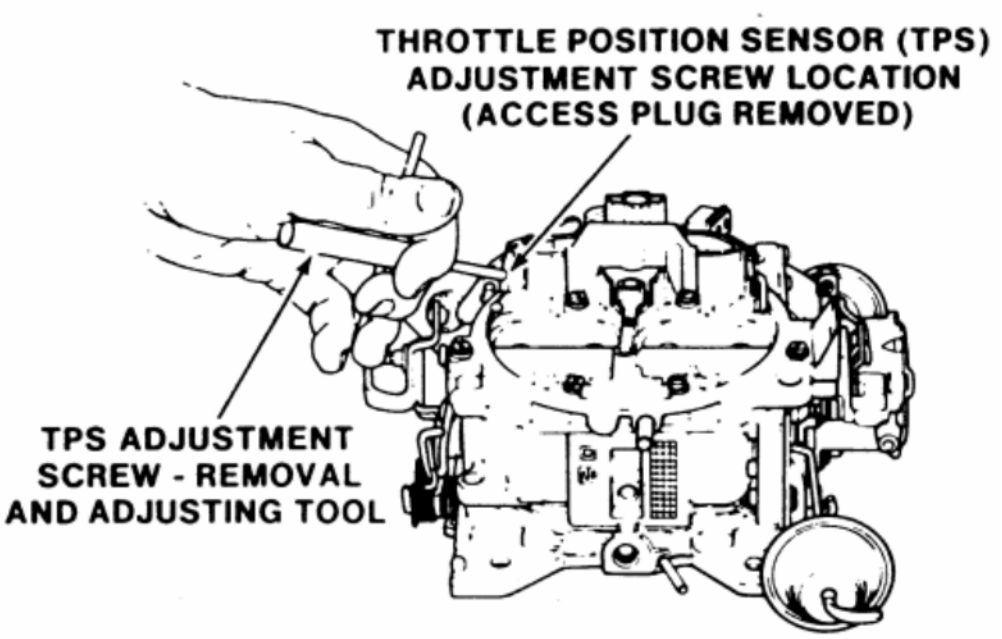



Fig. 32: Throttle position sensor adjusting screw location on E4ME/E4MC carburetors

## REMOVAL & INSTALLATION

Always replace all internal gaskets that are removed. Flooding, stumble on acceleration and other performance complaints are in many instances, caused by presence of dirt, water, or other foreign matter in carburetor. To aid in diagnosis, carburetor should be carefully removed from engine without draining fuel from bowl. Contents of fuel bowl may then be examined for contamination as carburetor is disassembled. Check the fuel filter.

## ROCHESTER E2SE

1. Remove air cleaner and gasket.
2. Disconnect fuel pipe and vacuum lines.
3. Disconnect electrical connectors.
4. Disconnect accelerator linkage.
5. If equipped with automatic transmission, disconnect downshift cable.
6. If equipped with cruise control, disconnect linkage.
7. Remove carburetor attaching bolts.
8. Remove carburetor and EFE heater/insulator (if used).
9. Inspect EFE heater/insulator for damage. Be certain throttle body and EFE heater/insulator surfaces are clean.

To install:

10. Install EFE heater/insulator.
11. Install carburetor and tighten nuts alternately to the correct torque.
12. Connect downshift cable, as required.
13. Attach the cruise control cable, as required.
14. Connect accelerator linkage.
15. Connect electrical connections.

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16. Connect fuel pipe sand vacuum hoses.
17. Check base (slow) and fast idle.
18. Install the air cleaner.

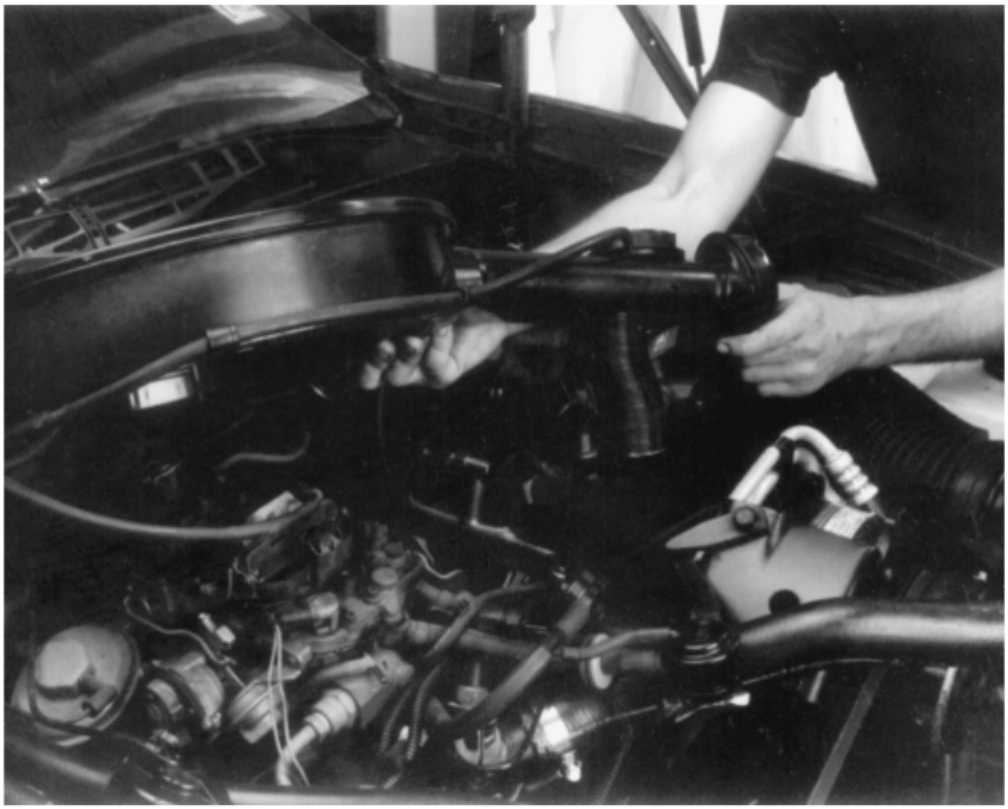


Fig. 33: Remove the air cleaner for access to the carburetor

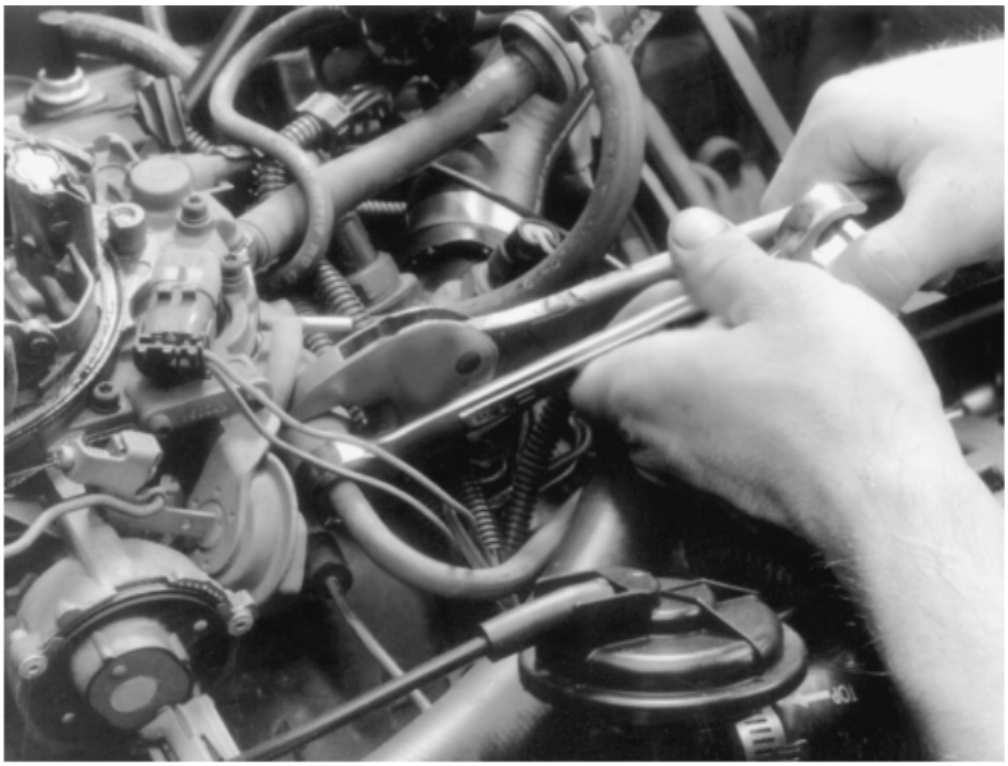


Fig. 34: Use a back-up wrench when disconnecting fuel lines

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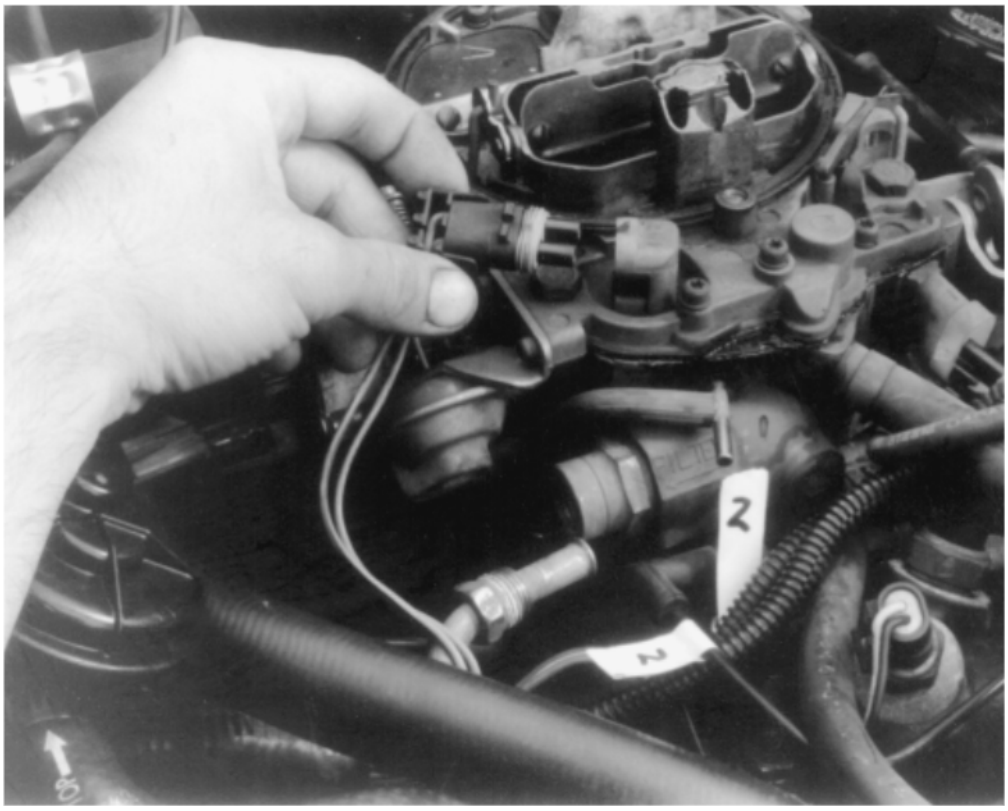


Fig. 35: If the retaining clip on the connector is broken off like this one, it should be replaced

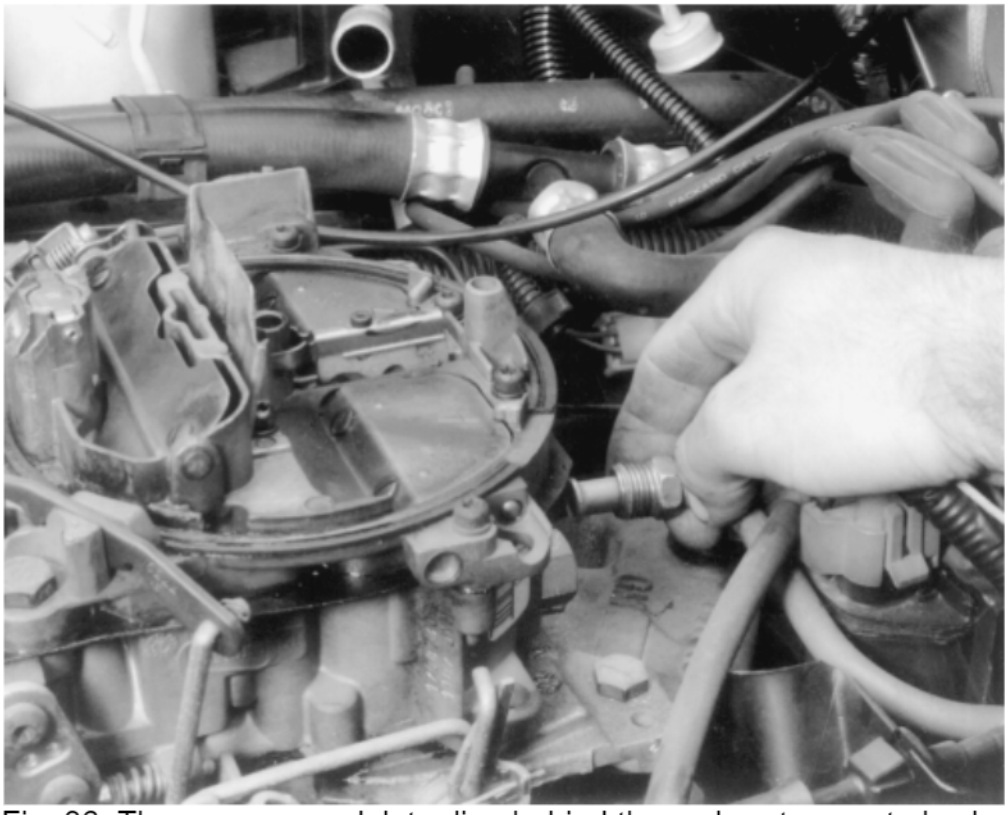


Fig. 36: The vacuum modulator line behind the carburetor must also be disconnected, if equipped

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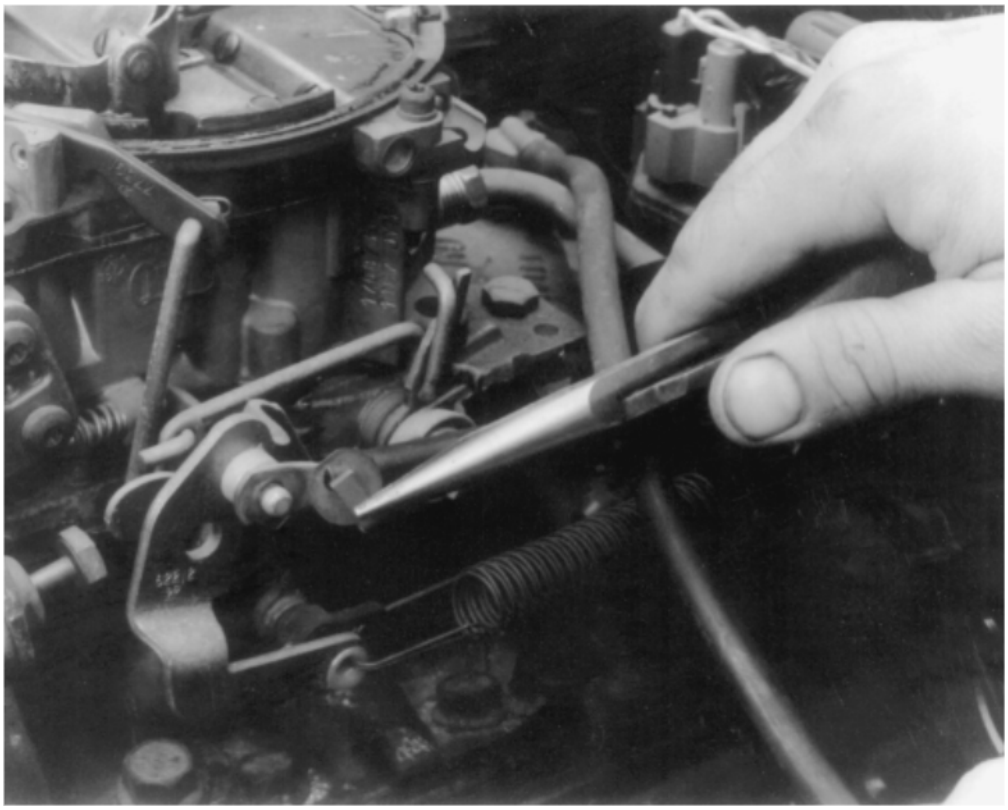


Fig. 37: The accelerator cable retaining clip can be removed using a pair of needle nose pliers

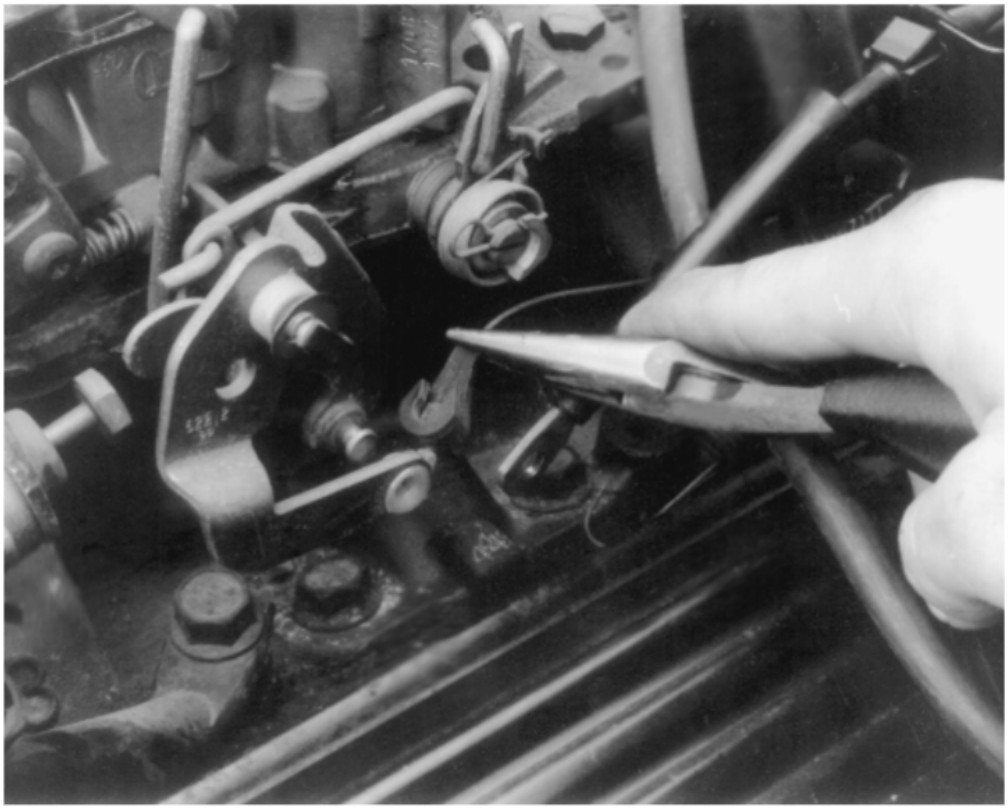


Fig. 38: The return spring and throttle valve cable must also be disconnected from the linkage

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Fig. 39: Removing the rear carburetor attaching bolts (note: a long extension is helpful here)

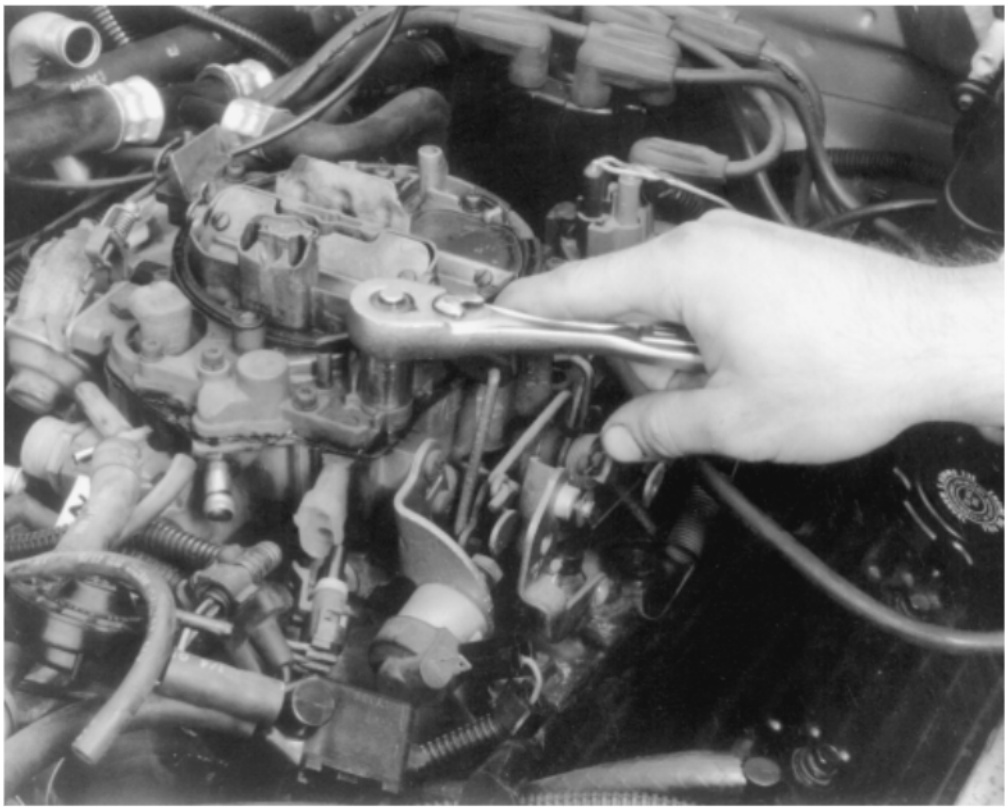


Fig. 40: Removing the front carburetor attaching bolts

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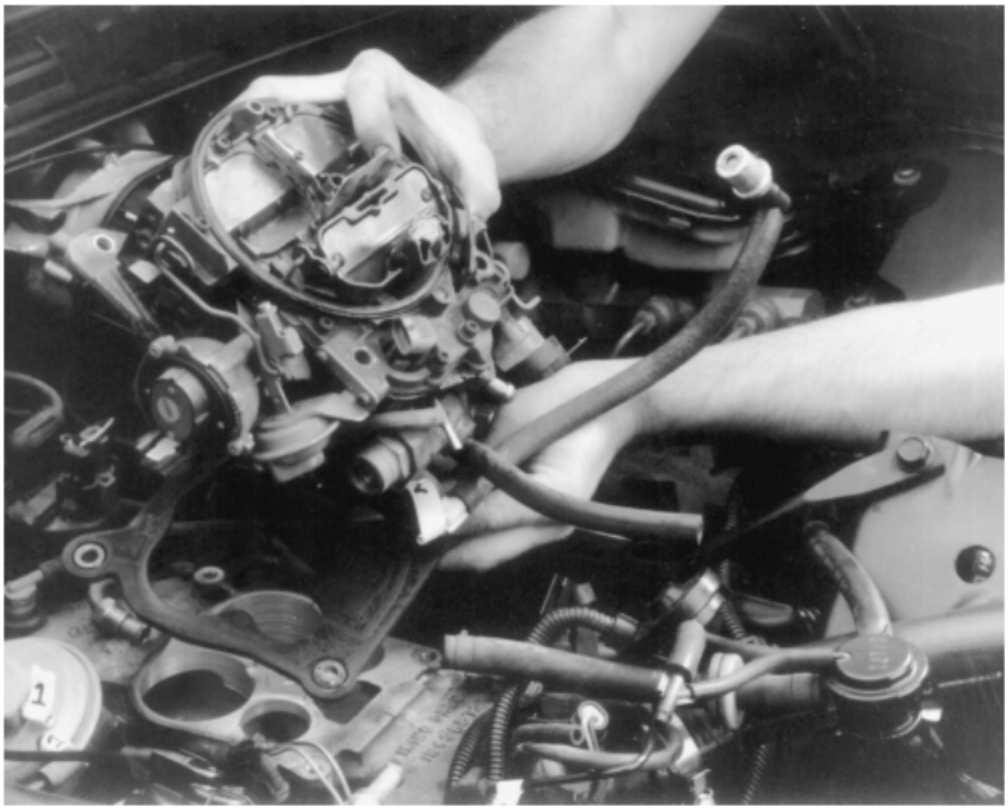


Fig. 41: Always replace this gasket anytime the carburetor is removed

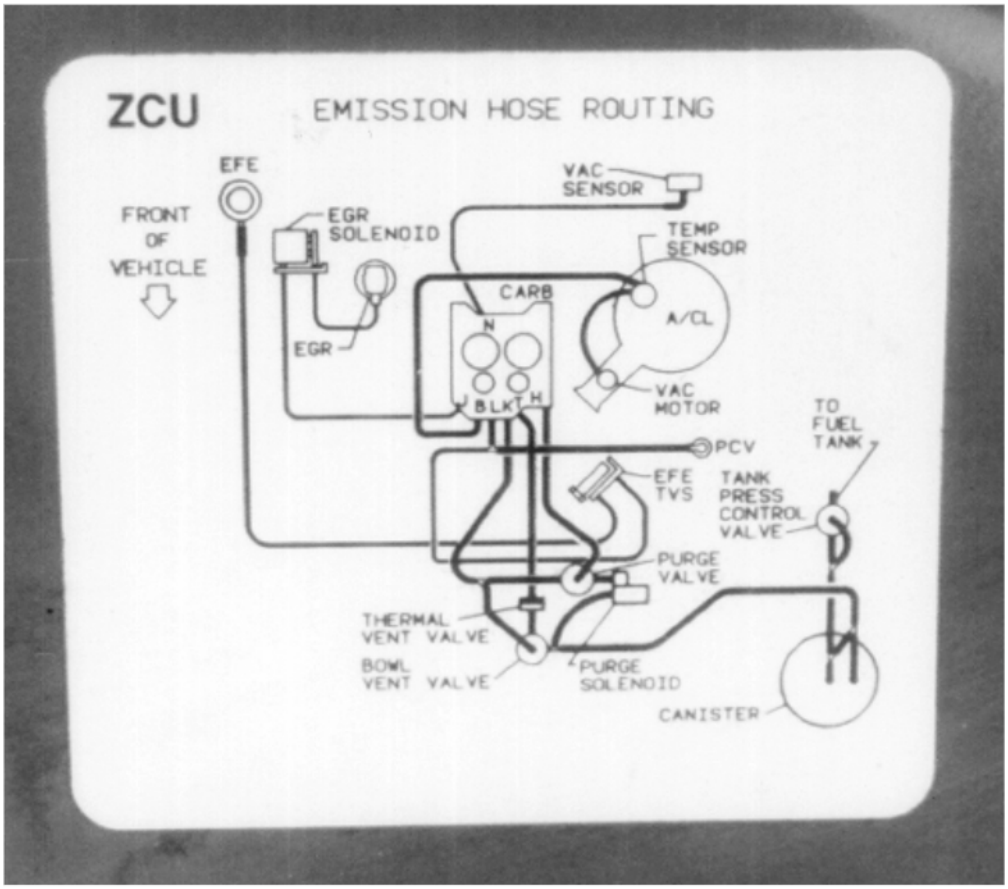



Fig. 42: The emission hose routing sticker under the hood is helpful when installing the carburetor

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Fig. 43: The adjustment specifications on the emission control information label must always be followed

**ROCHESTER E4ME AND E4MC**

1. Disconnect the battery and remove the air cleaner.
2. Disconnect the accelerator linkage.
3. Disconnect the transmission detent cable.
4. If equipped, remove the cruise control cable.
5. Tag and detach all of the necessary vacuum lines and electrical connections.
6. Disconnect the fuel line at the carburetor inlet.
7. Remove the attaching bolts and remove the carburetor.

To install:

8. Position the carburetor onto the manifold and install the attaching bolts.
9. Connect the fuel line at the carburetor inlet.
10. Attach all of the vacuum lines and electrical connections, as tagged during removal.
11. If equipped, install the cruise control.
12. Connect the transmission detent cable.
13. Connect the accelerator linkage.
14. Install the air cleaner and connect the battery.

**OVERHAUL**

Carburetor overhaul kits are recommended for each overhaul. These kits contain all gaskets and new parts to replace those which deteriorate most

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rapidly. Failure to replace all parts supplied with the kit (especially gaskets) can result in poor performance later.

Some carburetor manufacturers supply overhaul kits for three basic types: minor repair; major repair; and gasket kits. Certain parts may be expected in most kits based on the desired degree of overhaul.

**MINOR REPAIR KITS**

- All gaskets
- Float needle valve
- All diaphragms
- Spring for the pump diaphragm

**MAJOR REPAIR KITS**

- All jets and gaskets
- All diaphragms
- Float needle valve
- Pump ball valve
- Float
- Complete intermediate rod
- Intermediate pump lever
- Some cover hold-down screws and washers

**GASKET KITS**

- All gaskets

Efficient carburetion depends greatly on careful cleaning and inspection during overhaul, since dirt, gum, water, or varnish in or on the carburetor parts are often responsible for poor performance.

Overhaul your carburetor in a clean, dust-free area. Carefully disassemble the carburetor, referring often to the exploded views and directions packaged with the rebuilding kit. Keep all similar and look-alike parts separated during disassembly and cleaning to avoid accidental interchange during assembly. Make a note of all jet sizes.

When the carburetor is disassembled, wash all parts (except diaphragms, electric components, pump plunger, and any other plastic, leather, fiber, or rubber parts) in clean carburetor solvent. Do not leave parts in the solvent any longer than is necessary to sufficiently loosen the deposits. Excessive cleaning may remove the special finish from the float bowl and choke valve bodies, leaving these parts unfit for service. Rinse all parts in clean solvent and blow them dry with compressed air or allow them to air dry. Wipe clean all cork, plastic, leather, and fiber parts with a clean, lint-free cloth.

Blow out all passages and jets with compressed air and be sure that there are no restrictions or blockages. Never use wire or similar tools to clean jets, fuel

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passages, or air bleeds. Clean all jets and valves separately to avoid accidental interchange.

Check all parts for wear or damage. If wear or damage is found, replace the defective parts. Especially check the following:

1. Check the float needle and seat for wear.
2. Check the float hinge pin for wear and the float(s) for dents or distortion. Replace the float if fuel has leaked into it.
3. Check the throttle and choke shaft bores for wear or an out-of-round condition. Damage or wear to the throttle arm, shaft, or shaft bore will often require replacement of the throttle body. These parts require a close tolerance of fit; wear may allow air leakage, which could affect starting and idling.

*Throttle shafts and bushings are not included in overhaul kits. They can be purchased separately or repaired by a qualified carburetor overhaul shop.*

4. Inspect the idle mixture adjusting needles for burrs or grooves. Any such condition requires replacement of the needle, since you will not be able to obtain a satisfactory idle.
5. Test the accelerator pump check valves. They should pass air one way but not the other. Test for proper seating by blowing and sucking on the valve. Replace the valve check ball and spring as necessary. If the valve is satisfactory, wash the valve parts again to remove breath moisture.
6. Check the bowl cover for warped surfaces with a straightedge.
7. Closely inspect the accelerator pump plunger for wear and damage, replacing as necessary.
8. After the carburetor is assembled, check the choke valve for freedom of operation.
9. Check, repair or replace parts, if the following problems are encountered:

**FLOODING**

- Inspect the float valve and seat for dirt, deep wear grooves, scores and improper sealing
- Inspect the float valve pull clip for proper installation; be careful not to bend the pull clip
- Inspect the float, the float arms and the hinge pin for distortion, binds, and burrs. Check the density of the material in the float; if heavier than normal, replace the float
- Clean or replace the fuel inlet filter and check the valve assembly

**HESITATION**

- Inspect the pump plunger for cracks, scores or cup excessive wear. A used pump cup will shrink when dry. If dried out, soak in fuel for 8 hours before testing
- Inspect the pump duration and return springs for weakness or distortion

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- Check the pump passages and the jet(s) for dirt, improper seating of the discharge checkball or the temperature bypass disc and/or scores in the pumpwell. Check the condition of the pump discharge check ball spring, replace as necessary
- Check the pump linkage for excessive wear; repair or replace as necessary

**HARD STARTING-POOR COLD OPERATION**

- Check the choke valve and linkage for excessive wear, binds or distortion
- Test the vacuum break diaphragm(s) for leaks
- Clean or replace the fuel filter
- Inspect the float valve for sticking, dirt, etc.
- Also check the items under "Flooding"

**POOR PERFORMANCE-POOR GAS MILEAGE**

- Clean all fuel and vacuum passages in the castings
- Check the choke valve for freedom of movement
- Check the Mixture Control (M/C) solenoid for sticking, binding or leaking
- Check the air valve and secondary metering rod for binding conditions. If the air valve or metering rod is damaged or the metering rod adjustment is changed from the factory setting, the air horn assembly must be replaced. Also check the air valve lever spring for proper installation

**ROUGH IDLE**

- Inspect the gasket and gasket mating surfaces on the casting for nicks, burrs or damage to the sealing beads
- Check the operation and sealing of the mixture control solenoid
- Clean all of the idle field passages
- If removed, inspect the idle mixture needle for ridges, burrs or being bent
- Check the throttle lever and valves for binds, nicks. or other damage
- Check all of the diaphragms for possible ruptures or leaks

After cleaning and checking all components, reassemble the carburetor, using new parts and referring to the exploded view. When reassembling, make sure that all screws and jets are tight in their seats, but do not overtighten as the tips will be distorted. Tighten all screws gradually, in rotation. Do not tighten needle valves into their seats; uneven jetting will result. Always use new gaskets. Be sure to follow all assembly and adjustment procedures.

*Before performing any service on the carburetor, it is essential that it be placed on a suitable holding fixture, such as tool J-9789-118, BY-30-15 or equivalent. Without the use of the holding fixture, it is possible to damage throttle valves or other parts of the carburetor.*

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## THROTTLE BODY INJECTION SYSTEM

### SYSTEM DESCRIPTION

The throttle body injection (TBI) system used on 2.5L (VIN 2) and 5.0L (VIN E) engines is centrally located on the intake manifold. Its function is to supply the correct air/fuel mixture to the engine, as directed by the Engine Control Module (ECM).

The TBI unit consists of two relatively simple casting assemblies: a throttle body and a fuel metering assembly. Components include, a pressure regulator, idle air control valve, fuel injector(s), throttle position sensor, fuel inlet and a fuel return fitting.

The Throttle Body Injection identification number is stamped on the lower mounting flange located near the TPS. The number is in alphabetical code and should be noted before servicing the unit.

An oxygen sensor in the exhaust system functions to provide feedback information to the ECM as to oxygen content in the exhaust. The ECM then uses this information to modify fuel delivery to achieve as near as possible an ideal air/fuel ratio of 14.7:1. This ratio permits the catalytic converter to become more effective in reducing emissions while providing acceptable driveability.

Should you encounter any type of engine performance problem, have a complete CCC system test performed by a qualified, professional technician. If the fault lies in the injection system, you can use the following procedures to remove the TBI unit and replace the defective component(s).

### RELIEVING FUEL SYSTEM PRESSURE

1. Disconnect the negative battery cable to prevent fuel discharge if the key is accidentally turned to the RUN position.
2. Loosen the fuel filler cap to relieve fuel tank pressure and do not tighten until service has been completed.
3. Fuel system pressure is automatically relieved when the engine is turned OFF. No further action is necessary.

*When disconnecting fuel lines, there may still be a small amount of fuel released. Cover the fuel line connection with a shop cloth to collect the fuel, then place the cloth in an approved container.*

## ELECTRIC FUEL PUMP

### REMOVAL & INSTALLATION

The fuel pump is part of the fuel sender assembly located inside the fuel tank.

1. Release the fuel system pressure and disconnect the negative battery cable.

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2. Drain the fuel tank, then raise and safely support the vehicle.
3. Remove the fuel tank from the vehicle.
4. Clean the area surrounding the sender assembly to prevent contamination of the fuel system.
5. Remove the fuel sender from the tank as follows:
    a. Use tool J-24187 or equivalent to remove the sending unit retaining cam. Remove the fuel sender and O-rings from the tank. Discard the O-rings.
6. If necessary, separate the fuel pump from the sending unit assembly.

To install:

7. If removed, install the fuel pump to the sending unit. If the strainer was removed, it must be replaced with a new one.
8. Inspect and clean the O-ring mating surfaces.
9. Install a new O-ring in the groove around the tank opening. If applicable, install a new O-ring on the fuel sender feed tube.
10. Install the fuel sender assembly as follows:
    a. The fuel pump strainer must be in a horizontal position, and when installed, must not block the travel of the float arm. Gently fold the strainer over itself and slowly position the sending assembly in the tank so the strainer is not damaged or trapped by the sump walls.
11. Install the retaining cam using tool J-24187 or equivalent.
12. Install the fuel tank assembly.
13. Lower the vehicle.
14. Fill the fuel tank, tighten the fuel filler cap and connect the negative battery cable.

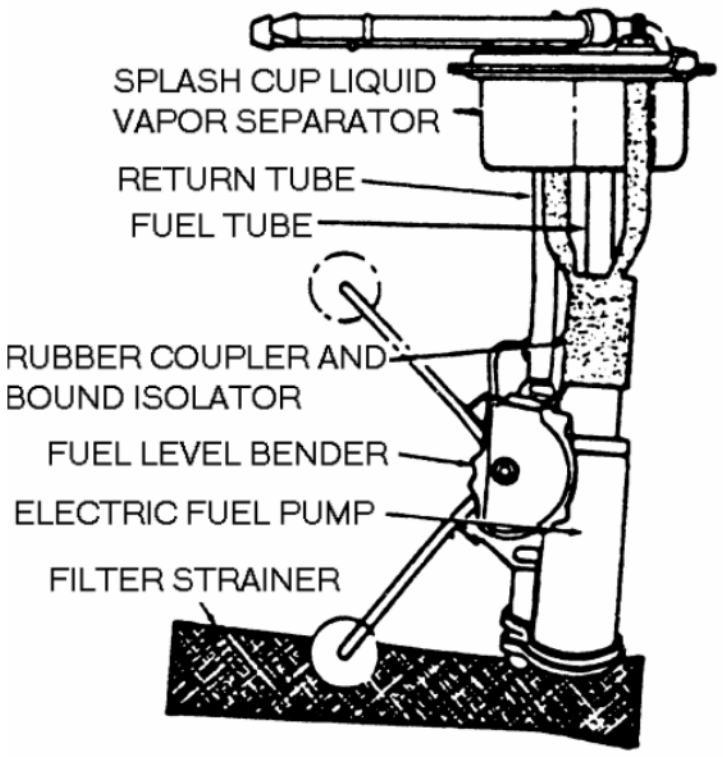



Fig. 1: Fuel pump and sending unit assembly

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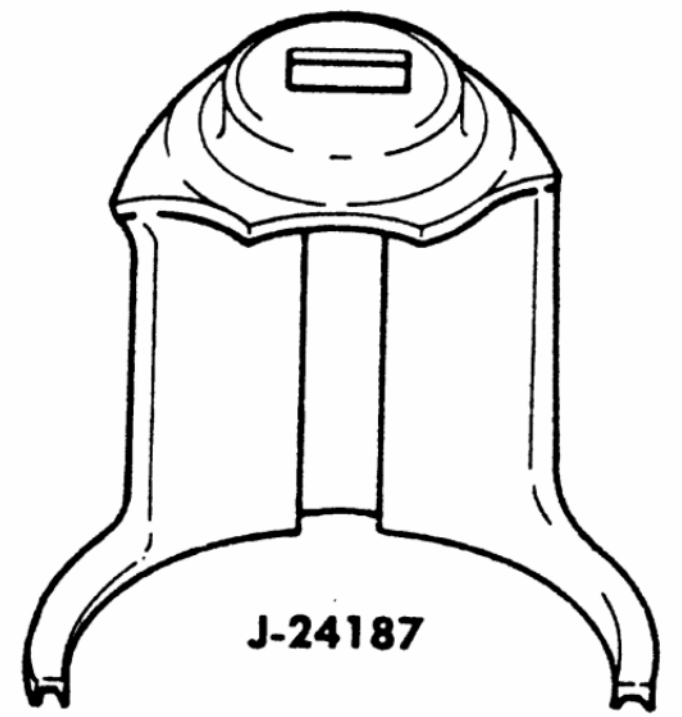
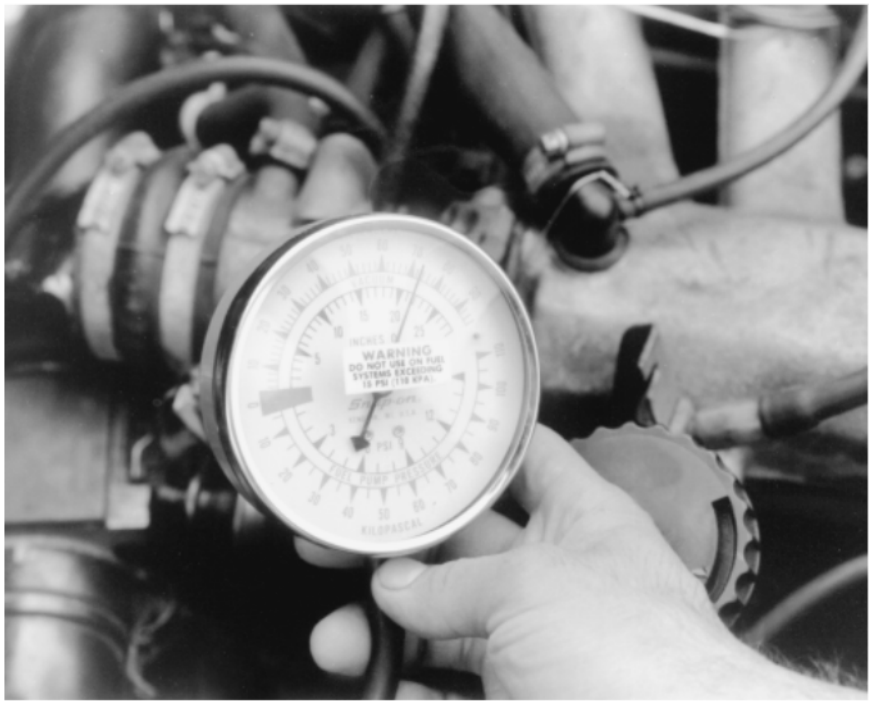


Fig. 2: Fuel pump locking cam tool

**TESTING**

1. Turn the engine OFF and relieve the fuel pressure.
2. Remove the air cleaner and plug the THERMAC vacuum port on TBI.
3. Install a fuel pressure gauge between the throttle body unit and the fuel line. Use a back-up wrench to hold fuel nut on the TBI when removing the fuel line.


Fig. 3: Fuel pressure can be checked using an inexpensive pressure/vacuum gauge

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4. Start the car and observe the fuel pressure reading. It should be 9-13 psi (62-90 kPa).
5. Relieve the fuel pressure.
6. Remove the fuel pressure gauge.
7. Reinstall the fuel line.
8. Start the car and check for fuel leaks.
9. Remove plug covering THERMAC vacuum port on the TBI and install the air cleaner.

## THROTTLE BODY

### REMOVAL & INSTALLATION

1. Relieve the fuel system pressure.
2. Disconnect the THERMAC hose from the engine fitting and remove the air cleaner.
3. Detach the electrical connectors at the idle air control, throttle position sensor, and the injector.
4. Disconnect the throttle linkage, return spring, and cruise control (if equipped).
5. Disconnect the throttle body vacuum hoses, fuel supply and fuel return lines.
6. Disconnect the 3 bolts securing the throttle body and remove the throttle body.
7. To install, reverse the removal procedures. Replace the manifold gasket and O-rings.
8. Perform the minimum idle speed adjustment, if necessary.

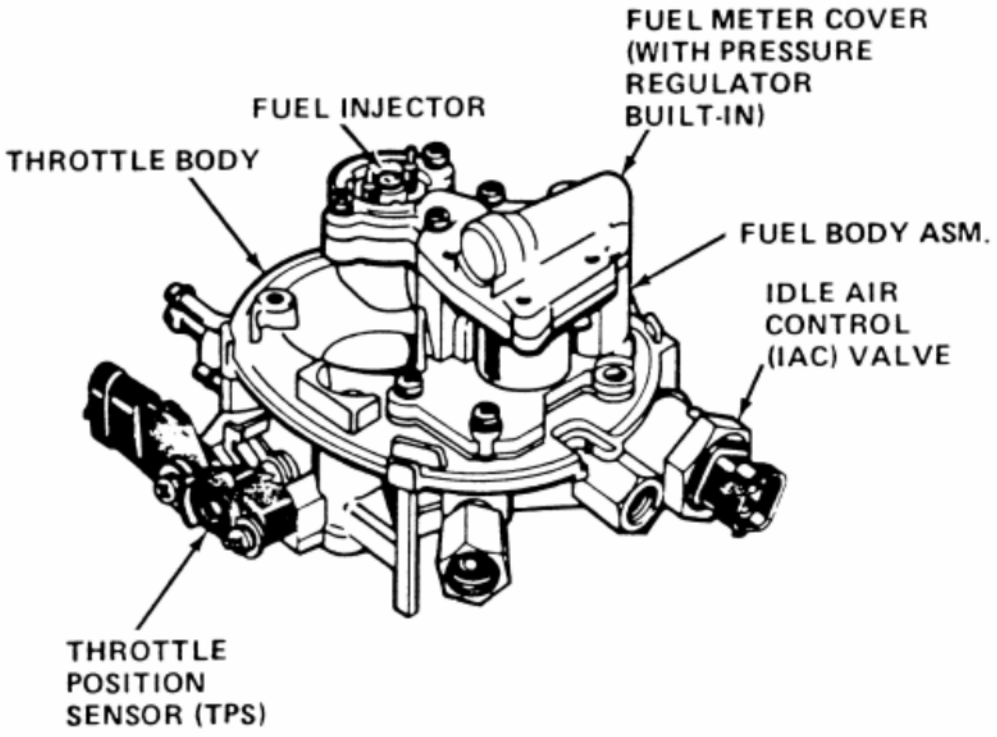



Fig. 1: Single injector TBI unit

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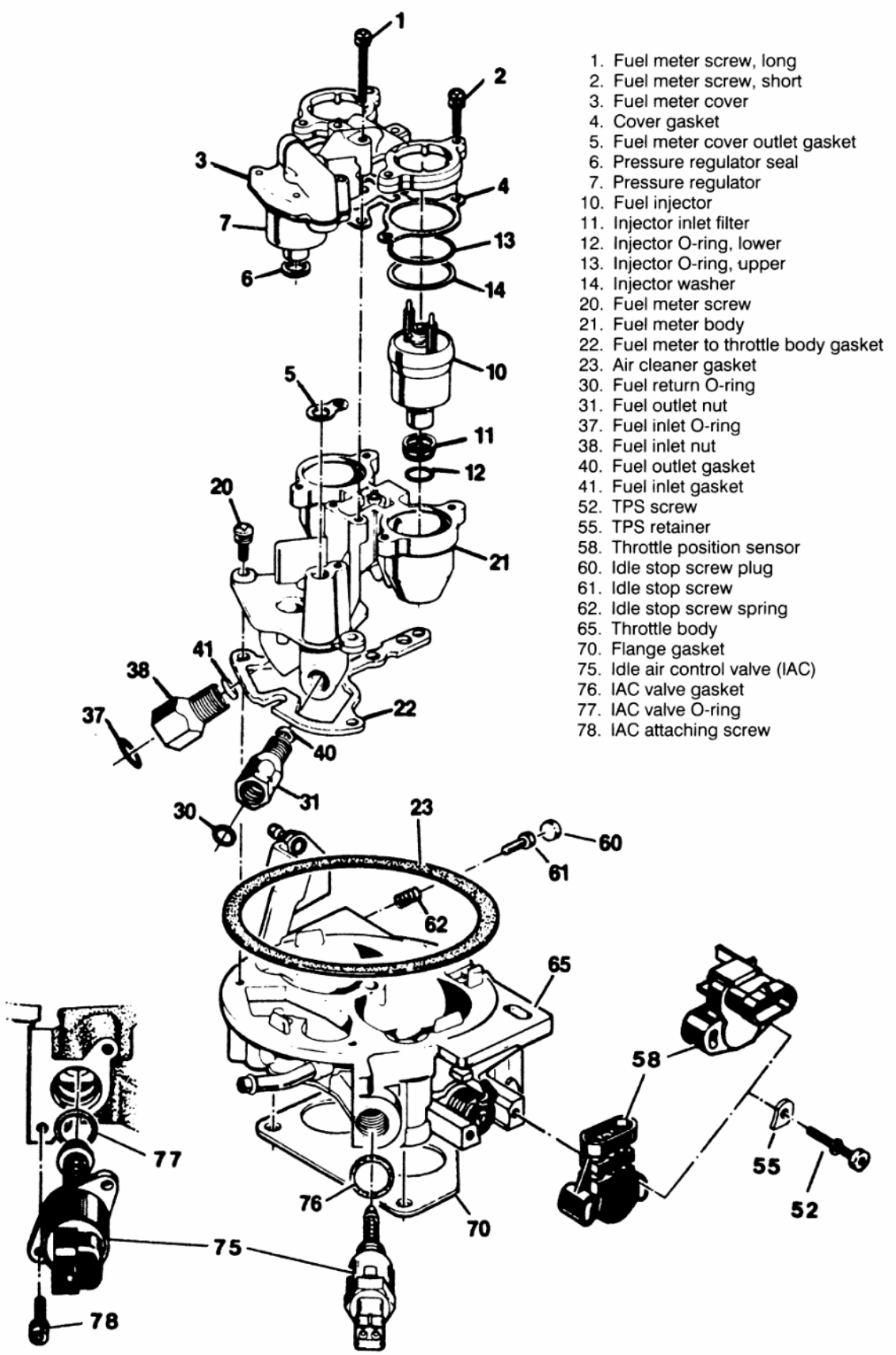



Fig. 2: Dual injector TBI unit

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## INJECTOR REPLACEMENT

*Use care in removing injectors to prevent damage to the electrical connector pins on top of the injector, the fuel injector fuel filter and nozzle. The fuel injector is serviced as a complete assembly only and should never be immersed in any type of cleaner.*

## SINGLE INJECTOR UNITS

1. Relieve the fuel system pressure.
2. Remove the air cleaner.
3. Detach the injector connector by squeezing the two tabs together and pulling straight up.
4. Remove the screws securing the fuel meter cover. Note the location of any short screws for correct placement during reassembly.

**CAUTION** - DO NOT remove the four screws securing the pressure regulator to the fuel meter cover. The fuel pressure regulator includes a large spring under heavy tension which could cause personal injury if released.

5. With the old fuel meter gasket in place to prevent damage to the casting, use a prytool and fulcrum to pry the injector carefully until it is free from the fuel meter body.
6. Remove the injector.
7. Remove the large O-ring and steel back-up washer at the top of the injector cavity in the fuel meter body.
8. Remove the small O-ring located at the bottom of the injector cavity.

To Install:

9. Lubricate the new, small O-ring with automatic transmission fluid; then, push the new O-ring on the nozzle end of the injector up against the injector fuel filter.
10. Install the steel backup washer in the recess of the fuel meter body. Lubricate the new large O-ring with automatic transmission fluid, then install the O-ring directly above the backup washer, pressing the O-ring down into the cavity recess. The O-ring is properly installed when it is flush with the casting surface.

**WARNING** - Do not attempt to reverse this procedure and install the backup washer and O-ring after the injector is located in the cavity. To do so will prevent proper seating of the O-ring in the cavity recess which could result in a fuel leak and possible fire.

11. Install the injector by using a pushing/twisting motion to center the nozzle O-ring in the bottom of the injector cavity and aligning the raised lug on the injector base with the notch cast into the fuel meter body. Push down on the injector making sure it is fully seated in the cavity. Injector installation is correct when the lug is seated in the notch and the electrical terminals are parallel to the throttle shaft.

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12. Using new gaskets on the fuel meter cover and a new dust seal, install the cover to the fuel meter body. The two short screws are located adjacent to the injector.
13. Connect the injector electrical connector by pushing straight down until seated firmly in place.
14. Connect the negative battery cable.
15. With the engine OFF and the ignition ON, check for fuel leaks.
16. Install the air cleaner.

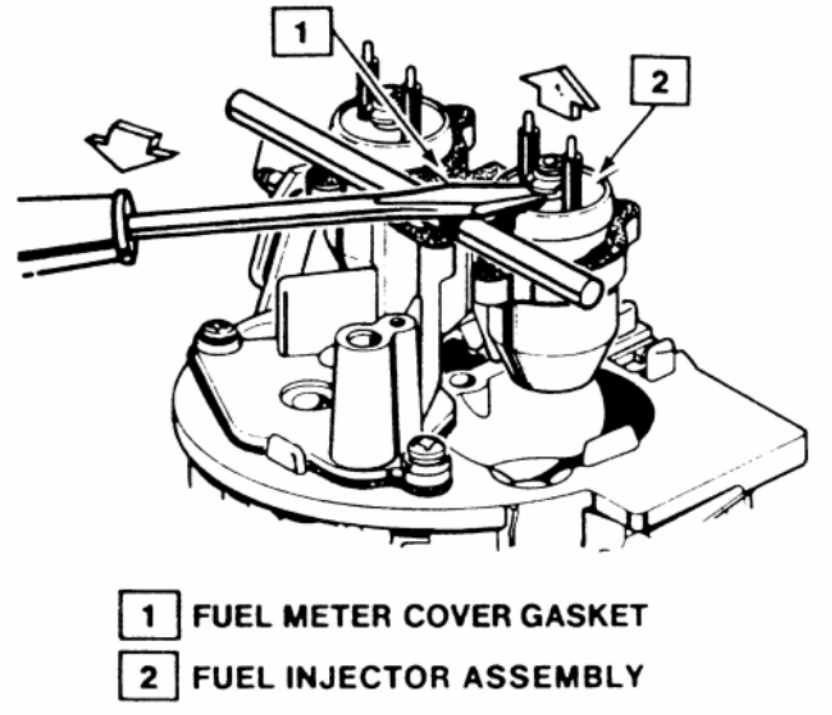



Fig. 3: Removing the fuel injectors

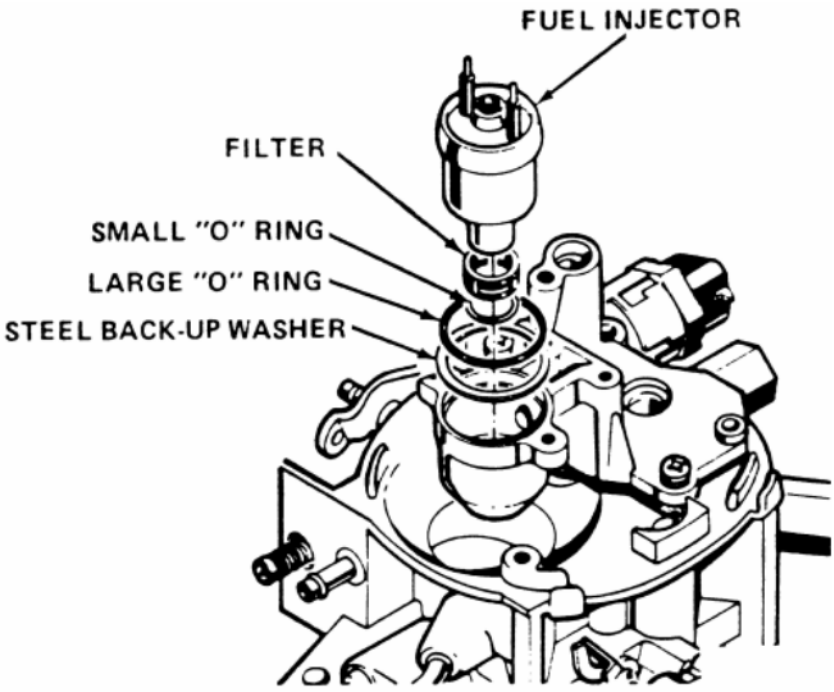



Fig. 4: Fuel injector components

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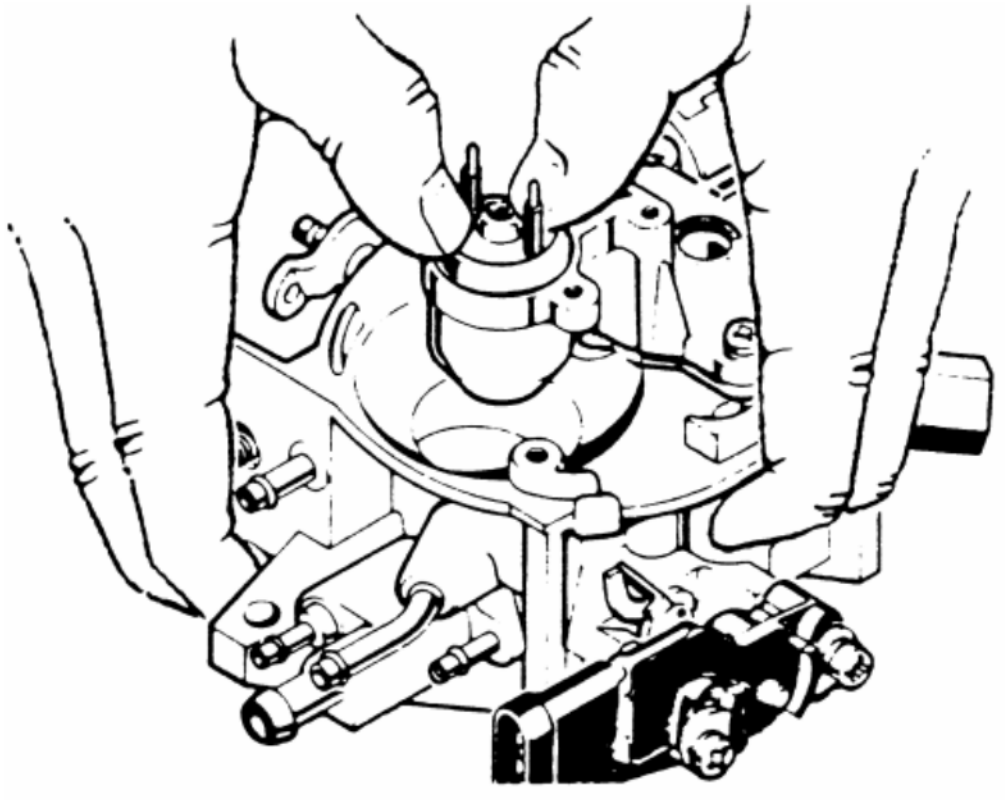


Fig. 5: Installing the fuel injectors

**DUAL INJECTOR UNITS**

1. Relieve the fuel system pressure.
2. Remove the air cleaner.
3. Disconnect the injector connector by squeezing the two tabs together and pulling straight up.
4. Remove the screws securing the fuel meter cover.

**CAUTION** - DO NOT remove the four screws securing the pressure regulator to the fuel meter cover. The fuel pressure regulator includes a large spring under heavy tension which could cause personal injury if released.

5. With the old fuel meter gasket in place to prevent damage to the casting, use a suitable prytool and fulcrum to pry the injector carefully until it is free from the fuel meter body.
6. Remove the injector.
7. Remove the small O-ring from the nozzle end of the injector and discard it.
8. Remove the old fuel meter cover gasket and discard it.
9. Remove the upper O-ring and steel backup washer from the top of the injector cavity. Discard the O-ring.

To install:

10. Install the steel backup washer in the counterbore of the fuel meter body.

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11. Lubricate the new large O-ring with clean engine oil and install it directly over the backup washer. Be sure the O-ring is seated properly and is flush with the top of the fuel meter body surface.
12. Lubricate the new small O-ring with clean engine oil and install it on the nozzle end of the injector. Push the O-ring on far enough to contact the filter.

**WARNING** - Do not attempt to reverse this procedure and install the backup washer and O-ring after the injector is located in the cavity. To do so will prevent proper seating of the O-ring in the cavity recess which could result in a fuel leak and possible fire.

13. Install the injector by aligning the raised lug on the injector base with the notch cast into the fuel meter body. Push down on the injector making sure it is fully seated in the cavity. Injector installation is correct when the lug is seated in the notch and the electrical terminals are parallel to the throttle shaft.
14. Using new gaskets on the fuel meter cover and a new dust seal, install the cover to the fuel meter body. Use an appropriate thread locking compound on the cover attaching screws.
15. Connect the injector electrical connector by pushing straight down until seated firmly in place.
16. Connect the negative battery cable.
17. With the engine OFF and the ignition ON, check for fuel leaks.
18. Install the air cleaner.

## ADJUSTMENTS

### MINIMUM IDLE SPEED

*Minimum idle speed should only be adjusted when installing a replacement throttle body. The idle stop screw is used to regulate the minimum idle speed of the engine. The throttle body is adjusted at the factory, then covered with a cap or plug to discourage unnecessary readjustment.*

### 2.5L ENGINES

1. Remove the air cleaner and plug the THERMAC vacuum port.
2. Disconnect the TV cable from the throttle control bracket to allow access to the idle adjustment screw.
3. Remove the throttle stop screw plug or cap.
4. Connect a tachometer to the engine.
5. Disconnect the Idle Air Control (IAC) valve connector.
6. Start the engine with the transmission in PARK (auto transmission) or NEUTRAL (manual transmission) and allow the engine speed to stabilize. All accessories (A/C, rear defogger, etc.) should be OFF.
7. Install tool J-33047 in the idle air passage of the throttle body. Be certain that the tool seats fully in the passage and no air leaks exist.

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8. Using a number 20 Torx® bit, turn the throttle stop screw until the engine speed is 475-525 rpm in PARK (auto transmission) or 450-500 rpm in NEUTRAL (manual transmission).
9. Stop the engine and remove tool J-33047 from the throttle body.
10. Reconnect the TV cable to the throttle control bracket.
11. Reconnect the IAC valve connector.
12. Use silicone sealant to cover the throttle stop screw.
13. Reinstall the air cleaner.

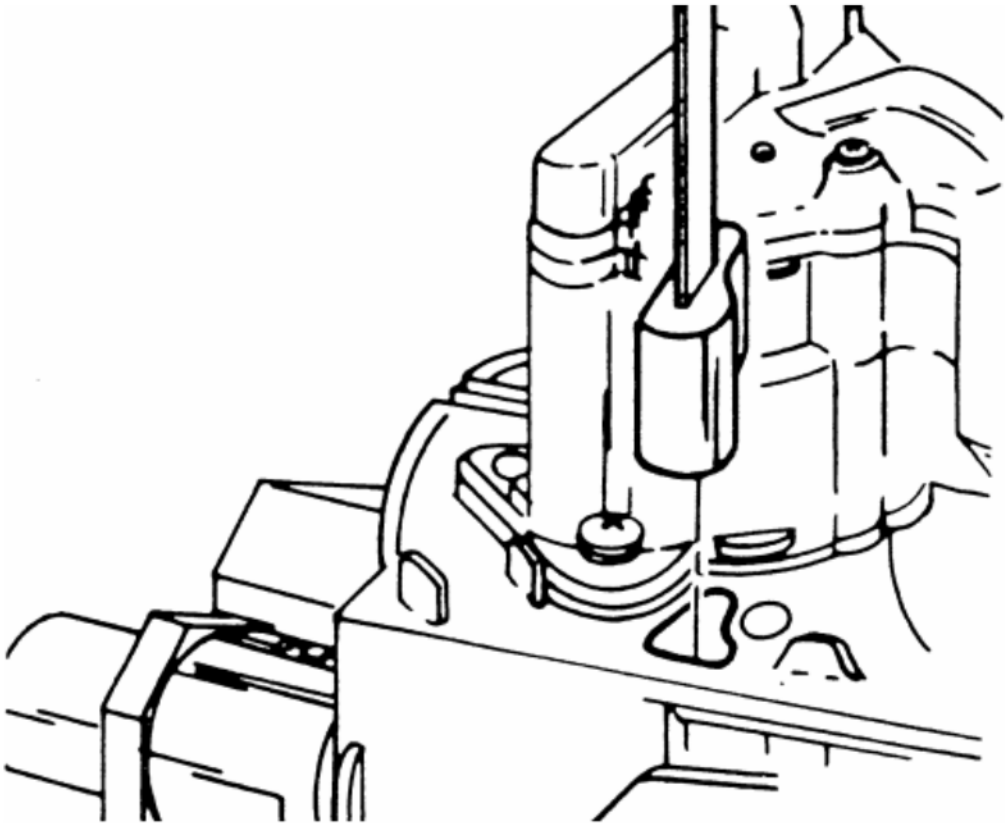


Fig. 6: Installing tool J-33047

**5.0L ENGINES**

1. Remove the idle stop screw plug or cap.
2. Ground the diagnostic connector (ALDL).
3. Turn the ignition *ON* and wait 45 seconds, DO NOT start the engine.
4. Disconnect the idle air control connector with the ignition *ON*.
5. Remove the ground from the diagnostic connector and disconnect the distributor set-timing connector.
6. Connect a tachometer to the engine.
7. Place the transmission in PARK (auto transmission) or NEUTRAL (manual transmission). Start and run the engine until it reaches normal operating temperature.

*It is important that the distributor set-timing connector be disconnected to fix the spark advance at base timing. This eliminates the possibility of changes in engine speed due to variations in timing.*

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8. The idle speed should be 450-500 rpm, adjust as necessary.

**WARNING** - Correct minimum idle speed adjustment is critical to vehicle performance and component durability. Incorrect minimum idle speed adjustment (too high) will cause the IAC valve pintle to constantly bottom in it's seat and result in early valve failure. If minimum idle speed is adjusted too low, the vehicle may not start in cold weather or may stall during warm-up.

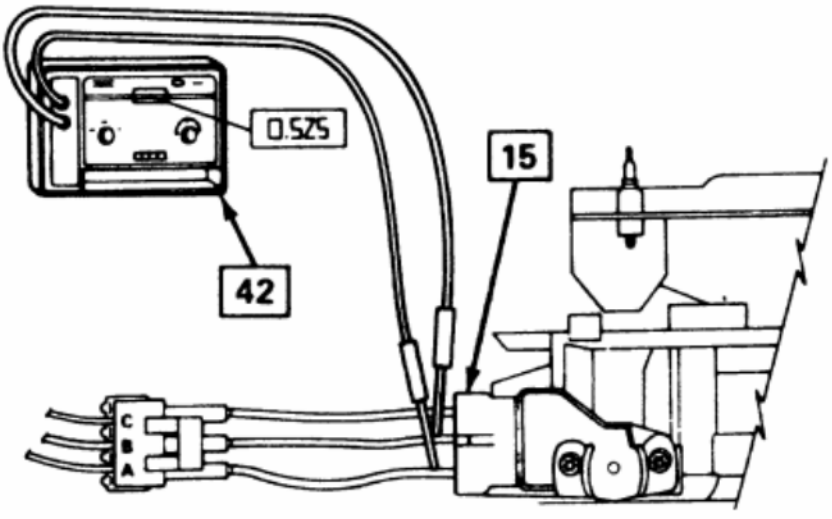
Turn the ignition *OFF* and reconnect the IAC motor connector.

9. Reconnect the distributor set-timing connector.
10. Use silicone sealant to cover the throttle stop screw.

## THROTTLE POSITION SENSOR (TPS)

*1982-1983 2.5L TBI engines are equipped with an adjustable throttle position sensor. This procedure should only be performed after replacing the TPS or diagnosis leads to incorrect TPS adjustment.*

1. Remove the throttle position sensor connector and install three jumper wires between the connector and the sensor. Connect a digital voltmeter to terminals *B* and *C*.
2. Turn the ignition *ON*. It should display between 0.45-0.60 volts.
3. Adjust the TPS, if necessary, by loosening the attaching screws and rotating the TPS.
4. Tighten the screws, remove the jumper wires with the ignition *OFF* and reconnect the harness connector.
5. Start the engine and check for proper idle operation.




15. TPS
42. Digital volt/ohmmeter

Fig. 7: TPS adjustment

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## FUEL PRESSURE REGULATOR

## REMOVAL & INSTALLATION

The fuel meter cover contains the pressure regulator and is only serviced as a complete preset assembly. The fuel pressure regulator is preset and plugged at the factory.

1. Relieve the fuel system pressure.
2. Remove the air cleaner.
3. Disconnect the electrical connector to the fuel injector(s).
4. Remove the fuel meter cover attaching screws and lockwashers.
5. Remove the fuel meter cover.

**CAUTION** - DO NOT remove the four screws securing the pressure regulator to the meter cover. The pressure regulator contains a large spring under heavy compression which could cause personal injury if released. Disassembly may also cause a fuel leak and result in a fire.

6. Discard the old gaskets and dust seal.

To install:

7. Install a new dust seal, fuel outlet passage gasket and fuel meter cover gasket.
8. Install the fuel meter cover.
9. Coat the attaching screws with a thread locking compound and tighten the screws to 27 inch lbs. (3 Nm). Install the short screws next to the injectors.
10. Reconnect the electrical connectors to the fuel injectors.
11. With the engine OFF and the ignition ON, check for fuel leaks.
12. Install the air cleaner.

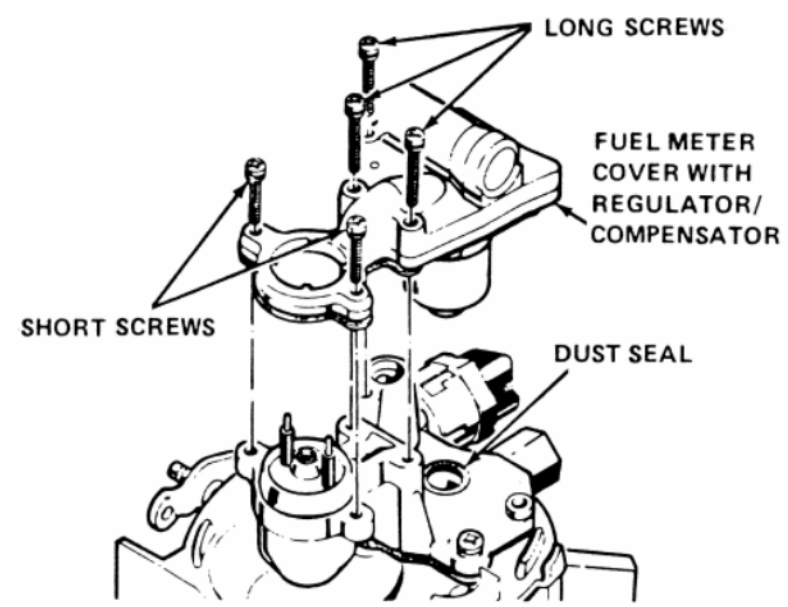


Fig. 1: Fuel meter cover removal

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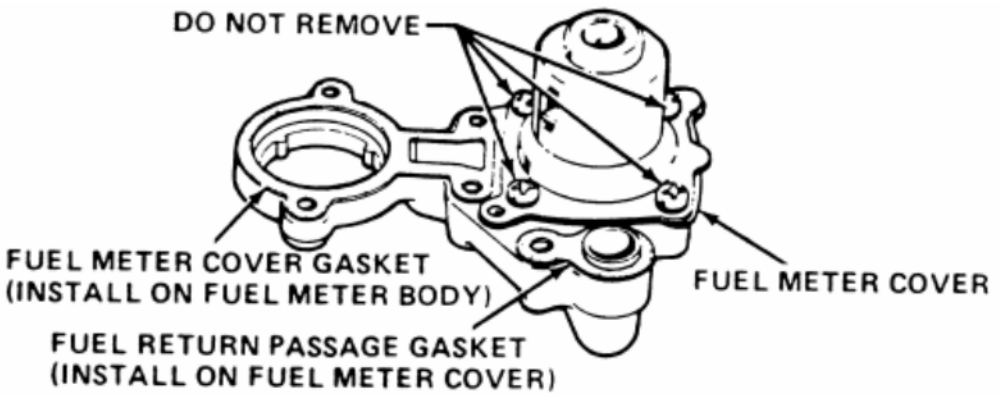


Fig. 2: Fuel pressure regulator assembly

## THROTTLE POSITION SENSOR (TPS)

### REMOVAL & INSTALLATION

1. Remove the air cleaner.
2. Disconnect the electrical connector.
3. Remove the TPS attaching screws and lockwashers.
4. Remove the TPS.

To install:

5. Install the throttle position sensor. On 2.5L engines, make sure the TPS pickup lever is located above the tang on the throttle actuator lever. On 5.0L engines, line up the TPS lever with the TPS drive lever on the throttle body.
6. Install the TPS attaching screws.
7. Adjust the TPS voltage, if applicable.
8. Reconnect the electrical connector.
9. Install the air cleaner.

## IDLE AIR CONTROL (IAC) VALVE

### REMOVAL & INSTALLATION

1. Unplug the electrical connector from idle air control valve.
2. Remove the idle air control valve.

To install:

3. Before installing the idle air control valve, measure the distance that the valve is extended. Measurement should be made from the motor housing to the end of the cone. It should not exceed 28.5mm ($1^1/_8$ in.), or damage to the valve may occur when installed.
4. Identify the replacement IAC valve as being either Type 1 (with collar at electric terminal end) or Type 2 (without collar). If measuring distance is greater than specified above, proceed as follows:
    - Type 1: Use finger pressure to slowly retract the pintle.

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- Type 2: Compress retaining spring from valve while turning valve in with a clockwise motion. Return spring to original position with straight portion of spring end aligned with flat surface of valve.

*On IAC valves that have already been in service, do not push or pull on the valve pintle. The force required to move the pintle may damage the threads on the worm drive.*

5. Use a new gasket or O-ring and install the IAC valve into the throttle body.
6. Allow the ECM to reset the idle air control valve using the procedure described earlier in this section.

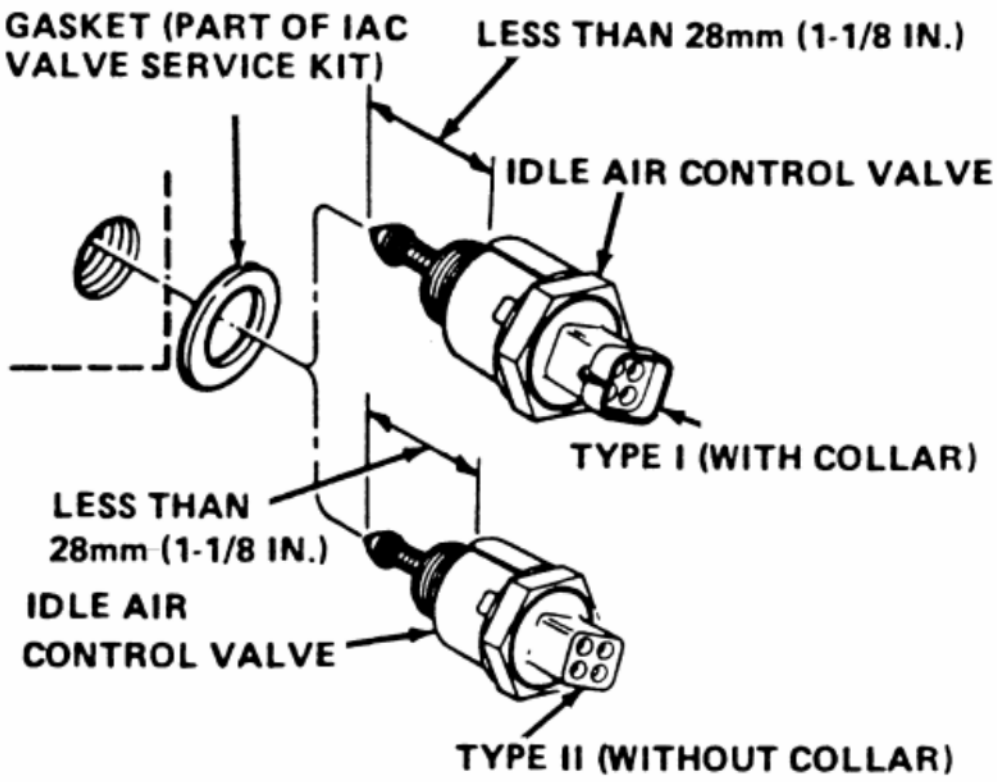


Fig. 1: Idle air control valve installation

## CROSSFIRE INJECTION SYSTEM

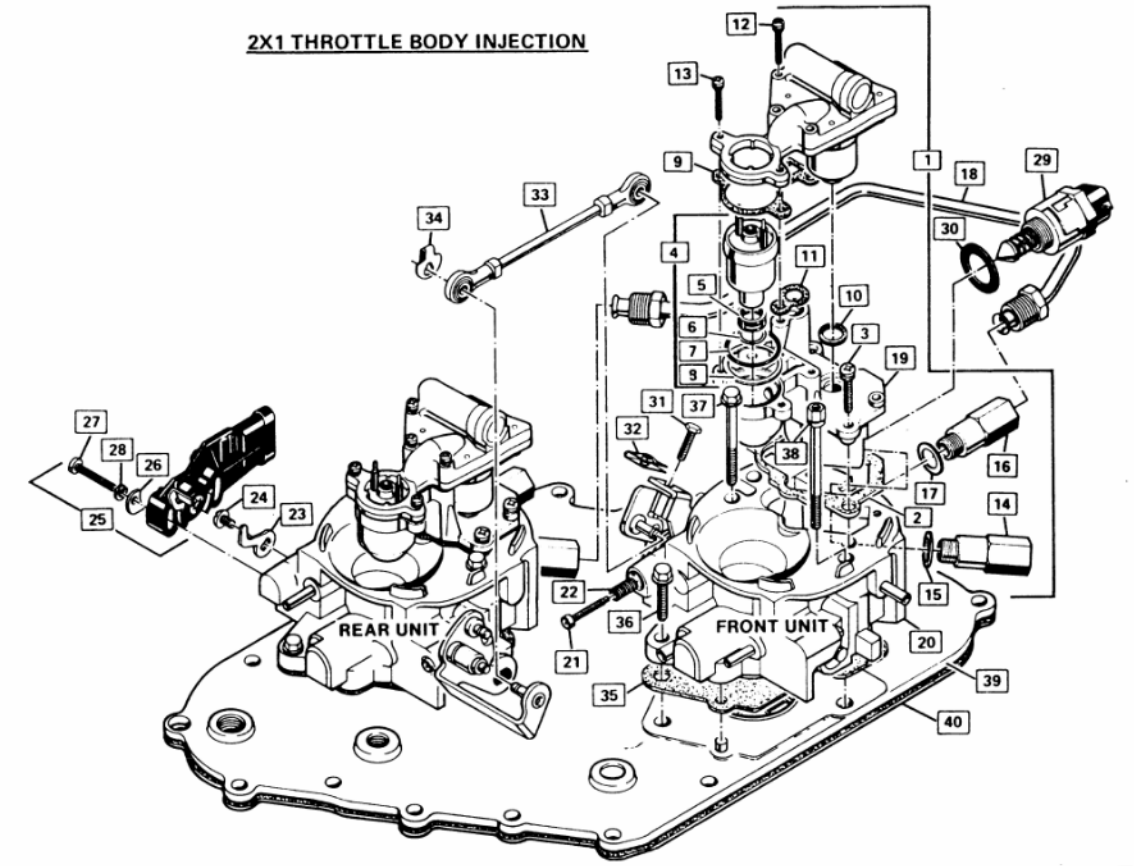
### SYSTEM DESCRIPTION

The Model 400 Electronic Fuel Injection (EFI) system is a computer controlled system that uses a pair of Throttle Body Injection (TBI) units, which are mounted on a single manifold cover on the 5.0L (VIN 7) engine. Since each TBI feeds the cylinders on the opposite side of the engine, the system has acquired the name of Crossfire Injection.

Fuel is supplied, by an electric fuel pump located in the fuel tank, to the front TBI fuel accumulator. From the accumulator, it is carried to the rear TBI fuel pressure regulator by a connecting tube. Unused fuel is sent to the fuel tank through a separate return line.

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Fuel is supplied to the engine through electronically pulsed injector valves located in the throttle body.




NOTE: ALL PARTS COMMON BETWEEN THE FRONT AND REAR UNITS EXCEPT THOSE MARKED F (FRONT) OR R (REAR). FRONT UNIT EXPLODED VIEW IS TYPICAL ILLUSTRATION.

FUEL METERING PARTS

1 FUEL METER ASSY–F
FUEL METER ASSY–R
2 GASKET–FUEL METER BODY
3 SCREW & WASHER ASSY–ATTACH. (3)
4 FUEL INJECTOR KIT–F
FUEL INJECTOR KIT–R
5 FILTER–FUEL INJECTOR NOZZLE
6 SEAL–SMALL "O" RING
7 SEAL–LARGE "O" RING
8 BACK-UP WASHER–FUEL INJECTOR
9 GASKET–FUEL METER COVER
10 DUST SEAL–PRESSURE REG.–R
11 GASKET–FUEL METER OUTLET
12 SCREW & WASHER ASSY–LONG (3)
13 SCREW & WASHER ASSY–SHORT (2)
14 NUT–FUEL INLET
15 GASKET–FUEL INLET NUT
16 NUT–FUEL OUTLET
17 GASKET–FUEL OUTLET NUT
18 FUEL TUBE ASSY
19 FUEL METER BODY ASSY

THROTTLE BODY PARTS

20 THROTTLE BODY ASSY–F
THROTTLE BODY ASSY–R
21 SCREW–IDLE STOP
22 SPRING–IDLE STOP SCREW
23 LEVER–TPS–R
24 SCREW–TPS LEVER ATTACHING–R
25 SENSOR–THROTTLE POSITION KIT–R
26 RETAINER–TPS (2)
27 SCREW–TPS ATTACHING (2)
28 WASHER–TPS SCREW (2)
29 IDLE AIR CONTROL VALVE
30 GASKET–CONTROL VALVE TO T.B.
31 SCREW–IDLE BALANCE
32 CLIP–IDLE BALANCE SCREW (SERVICE ONLY)
33 THROTTLE ROD & BEARING ASSEMBLY
34 CLIP–THROTTLE ROD (2)
35 GASKET–TBI MOUNTING
36 BOLT–TBI ATTACH.–SHORT (2)
37 BOLT–TBI ATTACH.–LONG (2)
38 STUD–TBI & AIR CLEANER ATTACH. (2)

INLET MANIFOLD PARTS

39 INLET MANIFOLD COVER
40 GASKET–MANIFOLD COVER

Fig. 1: Crossfire fuel injection components

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## RELIEVING FUEL SYSTEM PRESSURE

1. Remove the fuse marked "Fuel Pump" from the fuse block in the passenger compartment.
2. Crank the engine. The engine will start and run until the fuel supply remaining in the lines is exhausted. When the engines stops, engage the starter again for three seconds to assure dissipation of any remaining pressure.
3. With the ignition *OFF*, disconnect the negative battery cable to prevent fuel discharge if the key is accidentally turned to the *ON* position. Replace the fuse with the ignition *OFF*.

*When disconnecting fuel lines, there may still be a small amount of fuel released. Cover the fuel line connection with a shop cloth to collect the fuel, then place the cloth in an approved container.*

## ELECTRIC FUEL PUMP

### REMOVAL & INSTALLATION

The removal and installation procedures for the Crossfire injection system fuel pump is identical to the Throttle Body Injection (TBI) system. Please refer to the TBI fuel pump procedures earlier in this repair guide.

### TESTING

The testing procedures for the Crossfire injection system fuel pump is identical to the Throttle Body Injection (TBI) system. Please refer to the TBI fuel pump procedures earlier in this repair guide.

## THROTTLE BODY

### REMOVAL & INSTALLATION

### FRONT UNIT

1. Relieve the fuel system pressure.
2. Remove the air cleaner assembly, noting the connection points of the vacuum lines.
3. Detach the electrical connectors at the injector and the idle air control motor.
4. Disconnect the vacuum lines from the TBI unit, noting the connection points. During installation, refer to the underhood emission control information decal for vacuum line routing information.
5. Disconnect the transmission detent cable from the TBI unit.
6. Disconnect the fuel inlet (feed) and fuel balance line connections at the front TBI unit.
7. Remove and discard the throttle control rod retaining clip from the front TBI throttle lever stud. A new clip must be used during reassembly.
8. Unbolt and remove the TBI unit.

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To install:

9. Replacement of the manifold cover or either throttle body requires throttle valve synchronizing and checking of the throttle rod alignment (see "Preliminary Adjustments"). Before installing the replacement throttle body unit(s) on the engine, perform the following steps:
    a. If the tamper resistant plugs covering the throttle stop screws are in place, remove the plugs.
    b. If the front TBI unit throttle synchronizing screw has a welded retaining collar, grind off the weld.
    c. Block possible movement of the throttle lever, relieving the force of the heavy spring against the throttle synchronizing screw. This prevents the levers from coming into contact.

*If the lever is not blocked before the throttle synchronizing screw is removed, the screw may be damaged, and reinstallation will be accomplished only with great difficulty.*

    d. Remove the synchronizing screw and collar. Discard the collar and reinstall the screw. The blocking from the throttle lever (installed in the previous step) can now be removed.

**CAUTION** - The collar must be removed to prevent possible interference with the air cleaner. Failure to do so could result in personal injury

10. Use new gaskets and tighten the TBI bolts to 120-168 inch lbs. (13-19 Nm) during installation.
11. Perform the preliminary adjustments. These procedures must be followed before further assembly.
12. Reconnect the fuel lines to the TBI units. Use a backup wrench to prevent the nuts from turning in the TBI unit.
13. Reconnect the throttle cable and detent cable.
14. Reconnect all related vacuum lines.
15. Reconnect the electrical connectors.
16. With the engine OFF, depress the accelerator pedal to the floor and release. Check for free return of the pedal.
17. Check the throttle position sensor voltage and adjust if necessary.
18. Perform the Minimum Idle and Throttle Valve Synchronization adjustment procedures.

Rear Unit

1. Relieve the fuel system pressure.
2. Remove the air cleaner assembly, noting the connection points of the vacuum lines.
3. Disconnect the electrical connectors at the injector, idle air control motor, and throttle position sensor.
4. Disconnect the vacuum lines from the TBI unit, noting the connection points. During installation, refer to the underhood emission control information decal for vacuum line routing information.

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5. Disconnect the throttle and cruise control (if so equipped) cables at the TBI unit.
6. Disconnect the fuel return and balance line connections from the rear TBI unit.
7. Remove and discard the throttle control rod retaining clip from the front TBI unit throttle lever stud. A new clip must be used during reassembly.

*One throttle rod end bearing is permanently attached to the throttle lever stud of the rear TBI unit, and must not be removed from it. If the throttle rod and bearing assembly needs replacement, The entire rear throttle body must be replaced.*

8. Unbolt and remove the TBI unit.

To install:

9. Replacement of the manifold cover or either throttle body requires throttle valve synchronizing and checking of the throttle rod alignment (see "Preliminary Adjustments"). Before installing the replacement throttle body unit(s) on the engine, perform the following steps:
    a. If the tamper resistant plugs covering the throttle stop screws are in place, remove the plugs.
    b. If the front TBI unit throttle synchronizing screw has a welded retaining collar, grind off the weld.
    c. Block possible movement of the throttle lever, relieving the force of the heavy spring against the throttle synchronizing screw. This prevents the levers from coming into contact.

*If the lever is not blocked before the throttle synchronizing screw is removed, the screw may be damaged, and reinstallation will be accomplished only with great difficulty.*

    d. Remove the synchronizing screw and collar. Discard the collar and reinstall the screw. The blocking from the throttle lever (installed in the previous step) can now be removed.

**CAUTION** - The collar must be removed to prevent possible interference with the air cleaner. Failure to do so could result in personal injury.

10. Use new gaskets and tighten the TBI bolts to 120-168 inch lbs. (13-19 Nm) during installation.
11. Perform the preliminary adjustments. These procedures must be followed before further assembly.
12. Reconnect the fuel lines to the TBI units. Use a backup wrench to prevent the nuts from turning in the TBI unit.
13. Reconnect the throttle cable and the cruise control cable.
14. Reconnect all related vacuum lines.
15. Reconnect the electrical connectors.
16. With the engine OFF, depress the accelerator pedal to the floor and release. Check for free return of the pedal.

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17. Check the throttle position sensor voltage and adjust if necessary.
18. Perform the Minimum Idle and Throttle Valve Synchronization adjustment procedures.

## INJECTOR REPLACEMENT

The removal and installation procedures for the Crossfire injection system's fuel injector is identical to the Throttle Body Injection (TBI) system. Please refer to the TBI fuel injector procedures earlier in this repair guide.

## ADJUSTMENTS

## PRELIMINARY ADJUSTMENTS

*The preliminary adjustments are performed if tampering with the idle speed or synchronization is evident and when either of the throttle bodies or the manifold cover have been replaced. They must be performed* BEFORE the Minimum Idle and Throttle Valve Synchronizing procedure.

## THROTTLE VALVE SYNCHRONIZING

1. Turn BOTH front and rear unit throttle stop screws counterclockwise enough to break contact with the related throttle lever tangs.
2. Adjust the throttle synchronizing screw to allow BOTH throttle valves to close. The throttle rod end bearing will move freely on the front unit throttle lever stud when both valves are closed.
3. Turn the front unit throttle stop screw clockwise slowly until it makes contact with the throttle lever tang. Turn the screw clockwise an additional $^{1}/_{4}$ turn.
4. Turn the rear unit throttle stop screw clockwise slowly until it makes contact with the throttle lever tang. Turn the screw an additional $^{1}/_{2}$ turn.

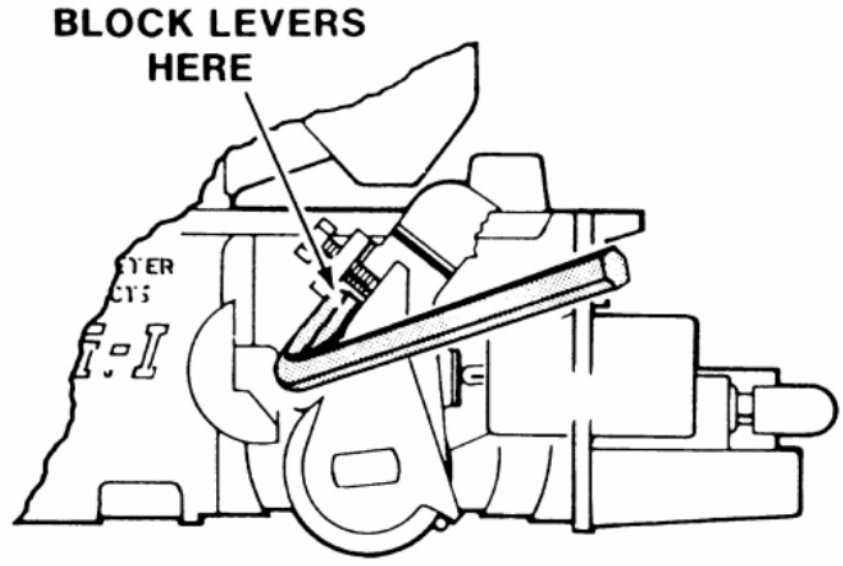



Fig. 1: Blocking the throttle levers

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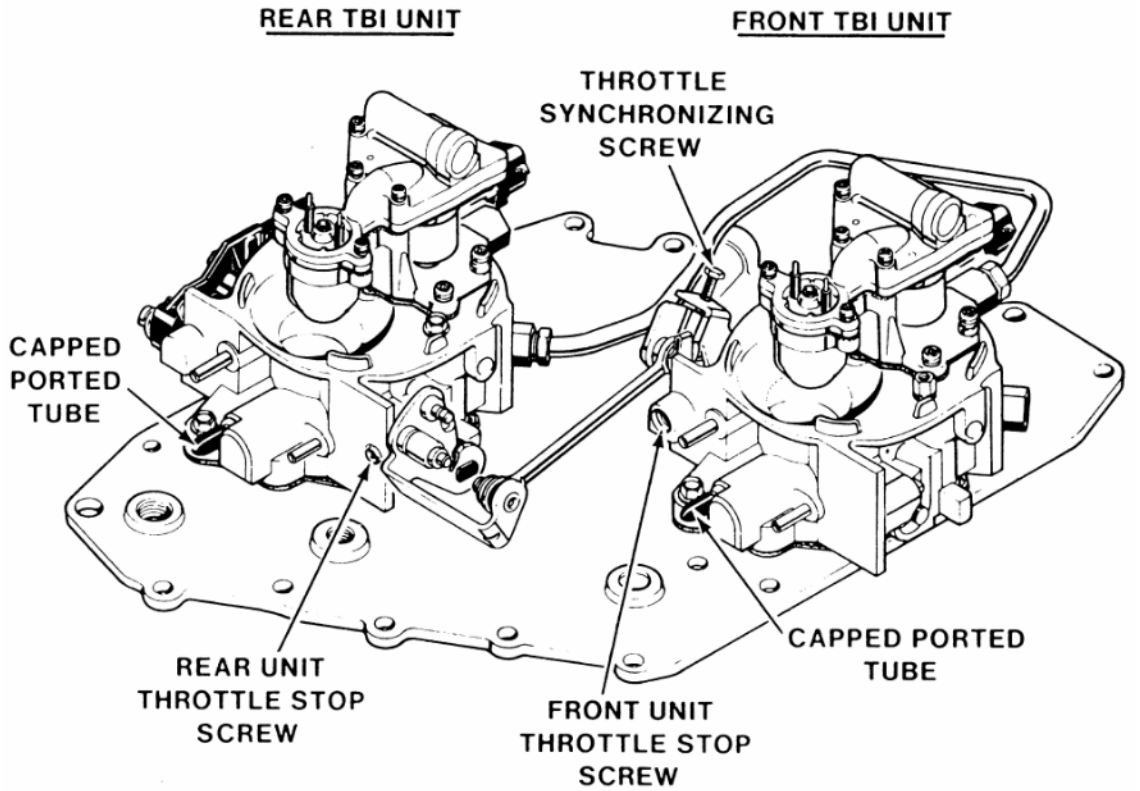


Fig. 2: Throttle stop and synchronizing screws

## THROTTLE ROD ALIGNMENT CHECK

*The throttle rod alignment check procedure is followed only if a replacement manifold cover or TBI unit has been installed. If not, proceed to "Minimum Idle and Throttle Valve Synchronizing".*

1. Actuate the rear unit throttle lever to bring both units to the wide open throttle position, loading the throttle valves. Move the throttle rod toward the front unit casting boss.
2. Check the clearance between the shoulder of the stud and the side of the ball surface. Maximum clearance must not exceed 0.200 in. (5mm). If the clearance is greater, the assembly (manifold cover, TBI unit or throttle body) must be replaced and the preliminary adjustments repeated.
3. Use needle-nose pliers to install a NEW throttle rod and bearing assembly retaining clip.
4. Move both front and rear throttle levers through the total throttle travel, loading both valves.
5. Check the clearance between the throttle rod and the front unit throttle body casting boss. If minimum clearance is less than 0.040 in. (1.02mm), the assembly must be replaced. If minimum clearance is at least 0.040 in. (1.02mm), proceed with assembly.

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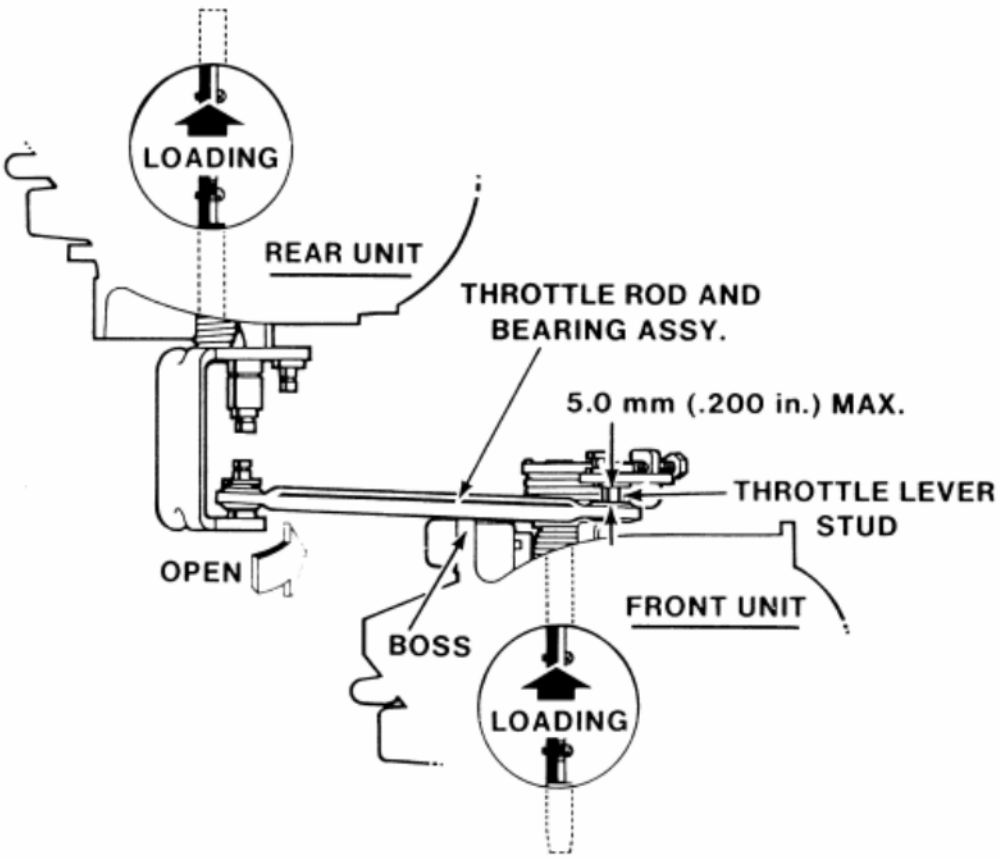



Fig. 3: Maximum shoulder-to-ball clearance check

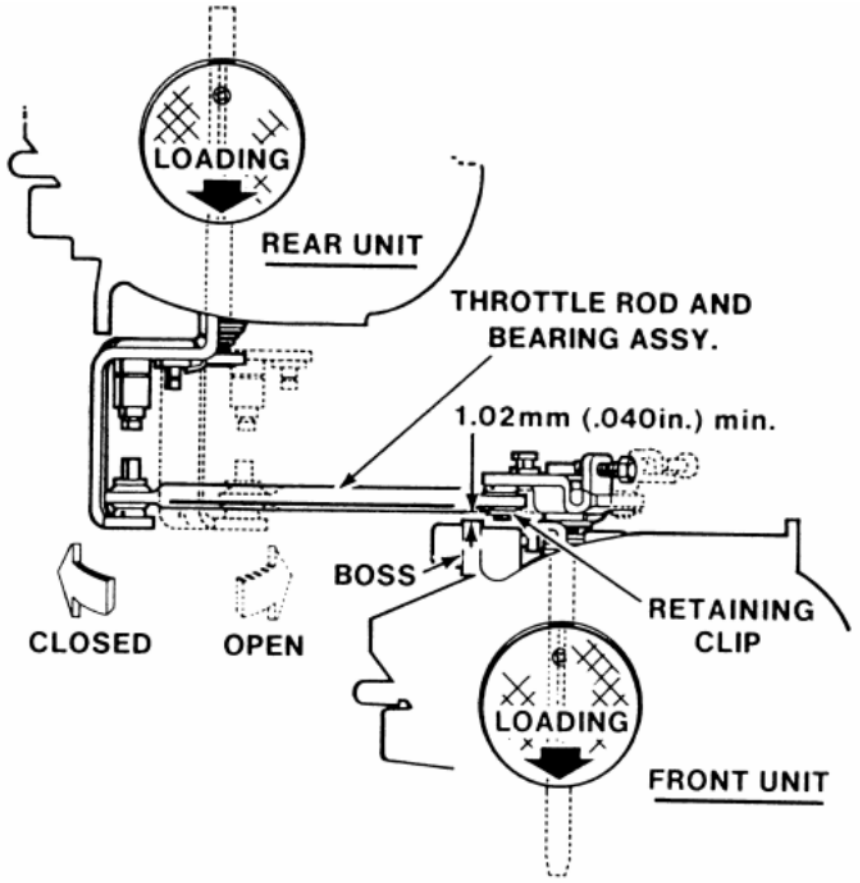



Fig. 4: Minimum throttle rod-to-casting clearance check

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## MINIMUM IDLE AND THROTTLE VALVE SYNCHRONIZING

*The throttle position of each throttle body must be balanced so that the throttle plates are synchronized and open simultaneously. These adjustment procedures must be followed* AFTER performing the "Preliminary Adjustments".

1. Remove the air cleaner and plug the vacuum port on the rear TBI unit for the thermostatic air cleaner.
2. Remove the tamper resistant plugs covering both unit throttle stop screws, if necessary.
3. Block the drive wheels and apply the parking brake.
4. Connect a tachometer to measure rpm.
5. Start the engine and allow the engine rpm to stabilize at normal operating temperature.
6. Have a helper apply the brakes and place the transmission in DRIVE.
7. Plug the idle air passages of each throttle body with plugs (J-33047 or equivalent). Make sure the plugs are seated fully in the passage so that no air leaks exist. The engine rpm should decrease below curb idle speed. If the engine rpm does not decrease, check for a vacuum leak.
8. Remove the cap from the ported tube on the rear TBI unit and connect a vacuum gauge or water manometer.
9. Adjust the rear unit throttle stop screw to obtain approximately $^1/_2$ in. Hg as read on the vacuum gauge, or 6 in. $H_2O$ as read on the manometer. If not able to adjust to this level, check that the front unit throttle stop is not limiting throttle travel.
10. Remove the vacuum gauge or manometer from the rear unit and install the cap on the ported vacuum tube.
11. Remove the cap from the ported vacuum tube on the front TBI unit and install the gauge or manometer as before. If the reading is not the same as the rear unit, proceed as follows:
    a. Locate the throttle synchronizing screw and collar on the front TBI unit. The screw may be welded to discourage tampering with this adjustment. Break the weld, if necessary, and install a new screw with a thread sealing compound applied.
    b. Adjust the screw to obtain approximately $^1/_2$ in. Hg as read on the vacuum gauge, or 6 in. $H_2O$ on the manometer.
12. Remove the gauge or manometer from the ported tube and reinstall the cap.
13. Adjust the rear throttle stop screw to obtain 475 rpm, with the transmission in *D* and the parking brake applied. On manual transmission models, leave the gear selector in *N*.
14. Turn the ignition OFF and place automatic transmission in *N*.
15. Remove idle air passage plugs.
16. Start the engine. It may run at a high rpm but the engine speed should decrease when the idle air control valves close the air passages. Stop the engine when the rpm decreases.
17. The throttle position sensor (TPS) voltage should be checked and adjusted, if necessary.
18. Connect the vacuum line to the TBI unit and install the air cleaner.
19. Reset the idle speed control motors by driving the vehicle to 45 mph.

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## THROTTLE POSITION SENSOR (TPS)

*An accurate digital voltmeter is needed to perform this adjustment.*

1. Remove the air cleaner.
2. Disconnect the TPS electrical connector.
3. Install three jumper wires between the TPS and the TPS wiring terminal connections.
4. Turn the ignition ON, engine stopped, measure the voltage between terminals B and C.
5. The display should read between 0.45-0.60 volts.
6. Loosen the screws and rotate the TPS to obtain the correct voltage, if necessary.
7. Tighten the TPS screws and turn the ignition OFF. Remove the jumpers.
8. Reconnect the wiring to the TPS.
9. Install the air cleaner.

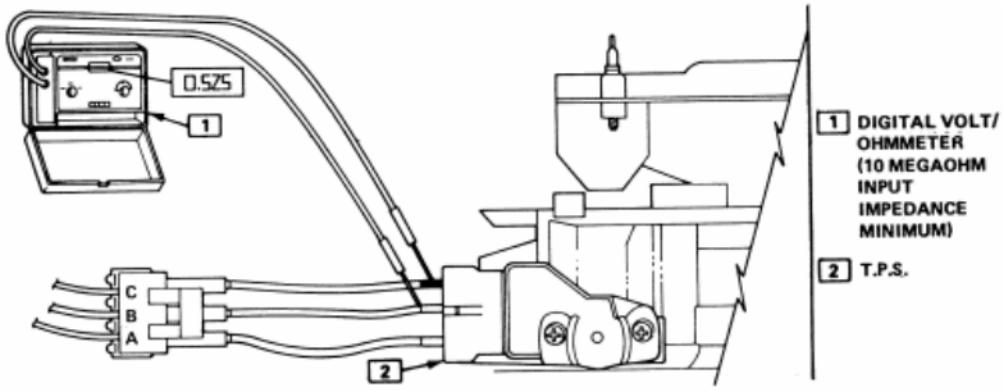



Fig. 5: TPS adjustment

## FUEL PRESSURE REGULATOR

### REMOVAL & INSTALLATION

The removal and installation procedures for the Crossfire injection system's fuel pressure regulator is identical to the Throttle Body Injection (TBI) system. Please refer to the TBI fuel pressure regulator procedures earlier in this repair guide.

## THROTTLE POSITION SENSOR (TPS)

### REMOVAL & INSTALLATION

1. Remove the air cleaner.
2. Disconnect the electrical connector.
3. Remove the TPS attaching screws and lockwashers.
4. Remove the TPS.

To install:

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5. Install the throttle position sensor. Make sure the TPS pickup lever is located above the tang on the throttle actuator lever.
6. Install the TPS attaching screws.
7. Adjust the TPS voltage.
8. Reconnect the electrical connector.
9. Install the air cleaner.

## IDLE AIR CONTROL VALVE

### REMOVAL & INSTALLATION

1. Remove the air cleaner.
2. Detach the electrical connection from the idle air control assembly.
3. Using a $1^1/_4$ in. wrench, remove the IAC valve from the throttle body. On IAC valves secured with screws, remove the attaching screws.

*Before installing a NEW IAC valve, measure the distance that the conical valve is extended. Measurement should be made from the motor housing to the end of the cone. Distance should be no greater than $1^1/_4$ in. (32mm). If the cone is extended too far, damage may result when the motor is installed. If necessary, push on the end of cone until it is retracted the correct distance.*

4. Installation is the reverse of removal. Torque threaded valves to 13 ft. lbs. (17 Nm).

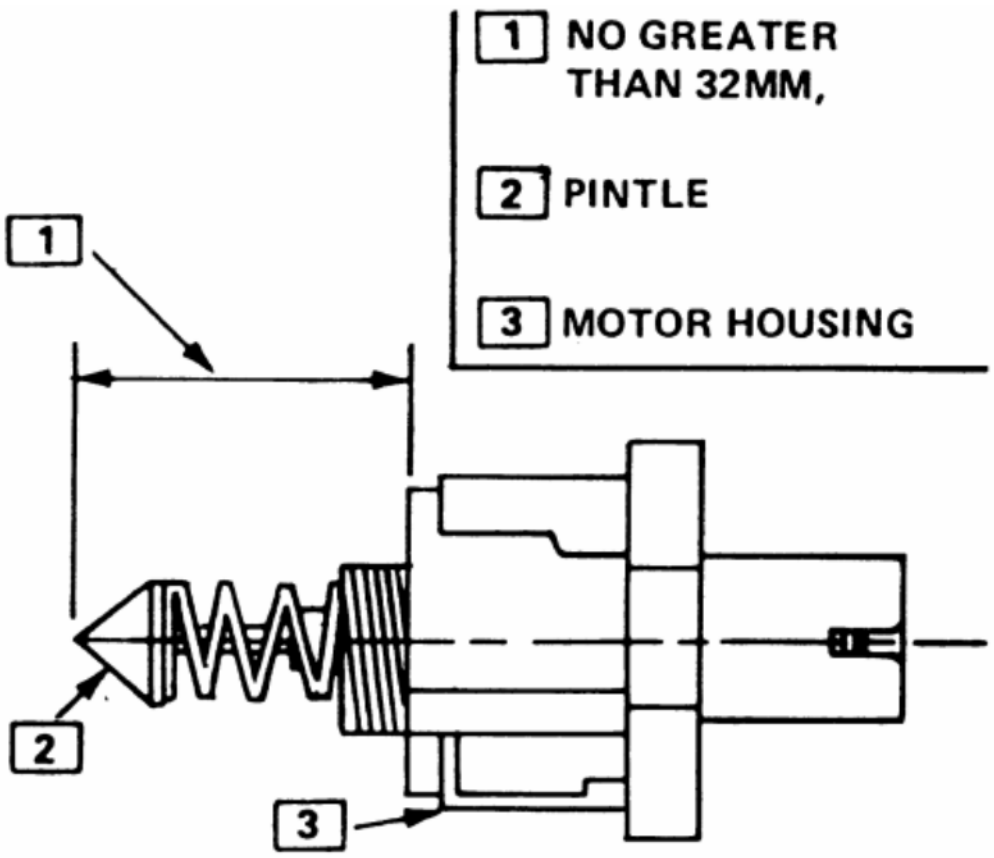



Fig. 1: IAC valve pintle measurement

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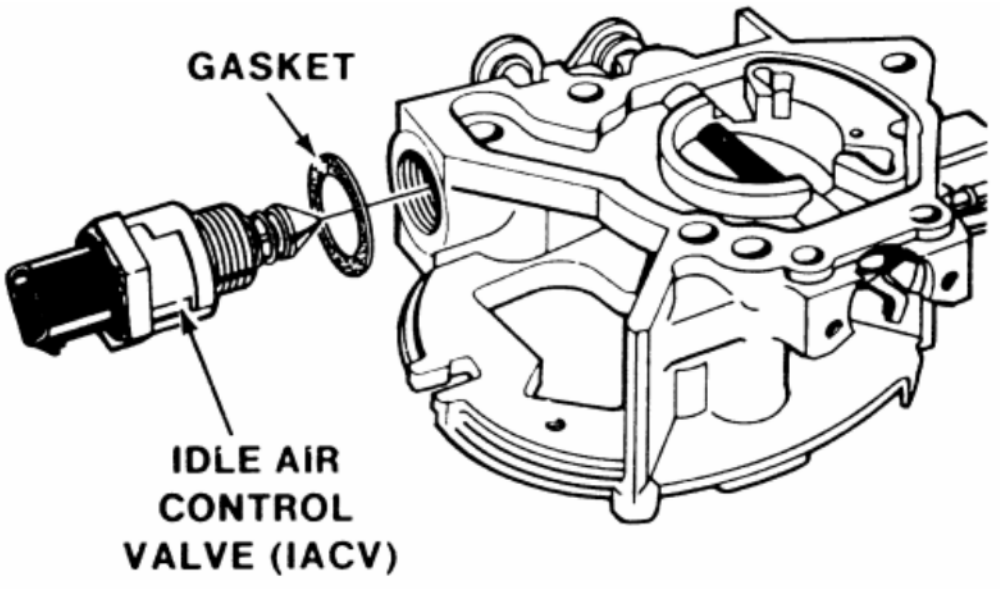



Fig. 2: IAC valve installation

## MULTI-PORT FUEL INJECTION SYSTEMS

### SYSTEM DESCRIPTIONS

The Multi-Port Fuel Injection (MPFI or MFI) systems were first introduced on the 1985 models. They may be called different names (Port Fuel Injection-PFI, Tuned Port Injection-TPI, Sequential Fuel Injection-SFI), however, all of the systems are similar in operation.

The systems are controlled by an Electronic Control Module (ECM) which monitors the engine operations and generates output signals to provide the correct air/fuel mixture, ignition timing and idle speed. Input information to the ECM is provided by the oxygen sensor, temperature sensors, detonation sensor, mass air flow sensor and throttle position sensor. A system may use all or some of these sensors, depending on the year and engine application. The ECM also receives information concerning engine rpm, road speed, transmission gear position, power steering and air conditioning status.

All of the systems use multiple injectors, aimed at the intake valve at each intake port, rather than the centrally located injector(s) found on the earlier Throttle Body Injection (TBI) and Crossfire Injection systems. The injectors are mounted on a fuel rail and are activated by a signal from the electronic control module. The injector is a solenoid-operated valve which remains open depending on the width of the electronic pulses (length of the signal) from the ECM; the longer the open time, the more fuel is injected. In this manner, the air/fuel mixture can be precisely controlled for maximum performance with minimum emissions.

There are two different types of fuel management systems used on the multi-port fuel injection engines. The mass air flow system and the speed density system.

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The mass air flow systems measure the mass of air that is drawn into the engine cylinders, rather than just the volume. The sensor contains a hot-wire sensing unit, which is made up of an electronic balanced bridge network. Whenever current is supplied to the sensor, the bridge is energized and the sensing hot-wire is heated. As the air enters the mass air flow sensor, it passes over and cools the hot wire. When the hot wire is cooled, it's resistance changes and additional current is needed to keep the bridge network balanced. This increase in current is sent to the computer as a voltage signal and is used to calculate the mass of the incoming air. The ECM uses this information to determine the duration of fuel injection pulse, ignition timing and EGR operation.

The speed density systems calculate the volume of air moving through the intake. The ECM establishes the speed factor through a signal from the ignition module. The Manifold or Intake Air Temperature (MAT/IAT) and the Engine Coolant Temperature (ECT) sensors work together to assure that proper temperature information gets to the ECM while the Manifold Absolute Pressure (MAP) sensor monitors the changes in manifold pressure which results from changes in engine loading. These three sensors contribute to the density factor. Together, these inputs (engine speed, coolant temperature sensor, etc ...) are the major determinants of the air/fuel mixture delivered by the fuel injection system.

The following engines and fuel management systems are covered in this section:

- 1985-1989 2.8L MPFI - Mass Air Flow
- 1990-1992 3.1L MPFI - Speed Density
- 1985-1989 5.0L and 5.7L TPI - Mass Air Flow
- 1990-1992 5.0L and 5.7L TPI - Speed Density

Relieving Fuel System Pressure

1. Disconnect the negative battery cable to prevent fuel discharge if the key is accidentally turned to the RUN position.
2. Loosen the fuel filler cap to relieve the tank pressure and do not tighten until service has been completed.
3. Connect J-34730-1 fuel pressure gauge or equivalent, to the fuel pressure test valve. Wrap a shop towel around the fitting while connecting the gauge to prevent spillage.
4. Place the end of the bleed hose into a suitable container and open the valve to relieve the fuel system pressure.

## ELECTRIC FUEL PUMP

### REMOVAL & INSTALLATION

The fuel pump is part of the fuel sender assembly located inside the fuel tank.

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1. Release the fuel system pressure and disconnect the negative battery cable.
2. Drain the fuel tank, then raise and safely support the vehicle.
3. Remove the fuel tank from the vehicle.
4. Clean the area surrounding the sender assembly to prevent contamination of the fuel system.
5. Using tool J-24187 or equivalent, remove the sending unit retaining cam. Remove the fuel sender and O-rings from the tank. Discard the O-rings.

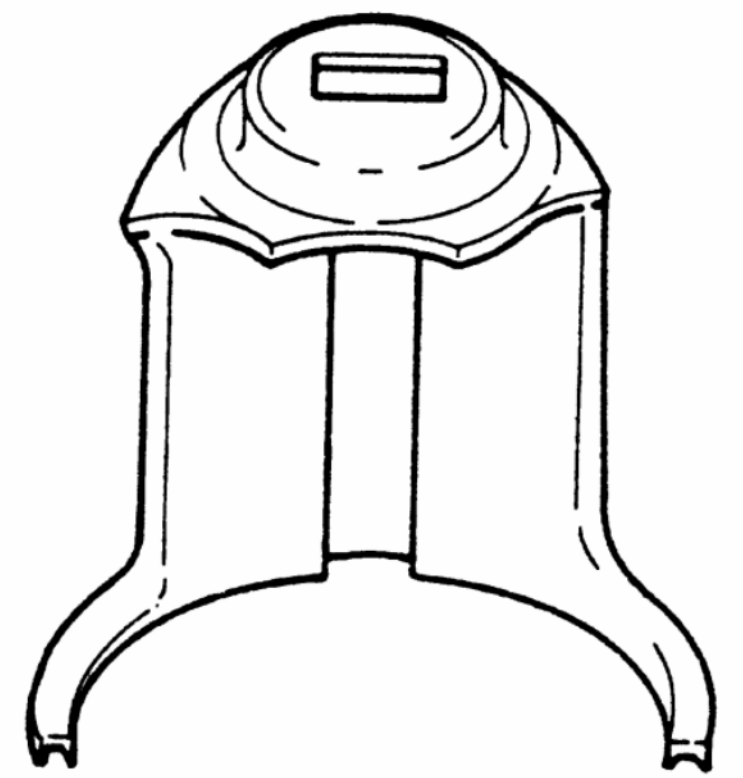


Fig. 1: A special tool is usually available to remove or install the fuel pump locking cam

6. If necessary, separate the fuel pump from the sending unit assembly.

To install:

7. If removed, install the fuel pump to the sending unit. If the strainer was removed, it must be replaced with a new one.
8. Inspect and clean the O-ring mating surfaces.
9. Install a new O-ring in the groove around the tank opening. If applicable, install a new O-ring on the fuel sender feed tube.
10. Install the fuel sender assembly as follows:
    a. The fuel pump strainer must be in a horizontal position, and when installed, must not block the travel of the float arm. Gently fold the strainer over itself and slowly position the sending assembly in the tank so the strainer is not damaged or trapped by the sump walls.
11. Install the retaining cam using tool J-24187 or equivalent.
12. Install the fuel tank assembly.
13. Lower the vehicle.

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14. Fill the fuel tank, tighten the fuel filler cap and connect the negative battery cable.
15. Turn the ignition switch to the ON position for 2 seconds, OFF for 10 seconds, then back to the ON position. Check for fuel leaks.

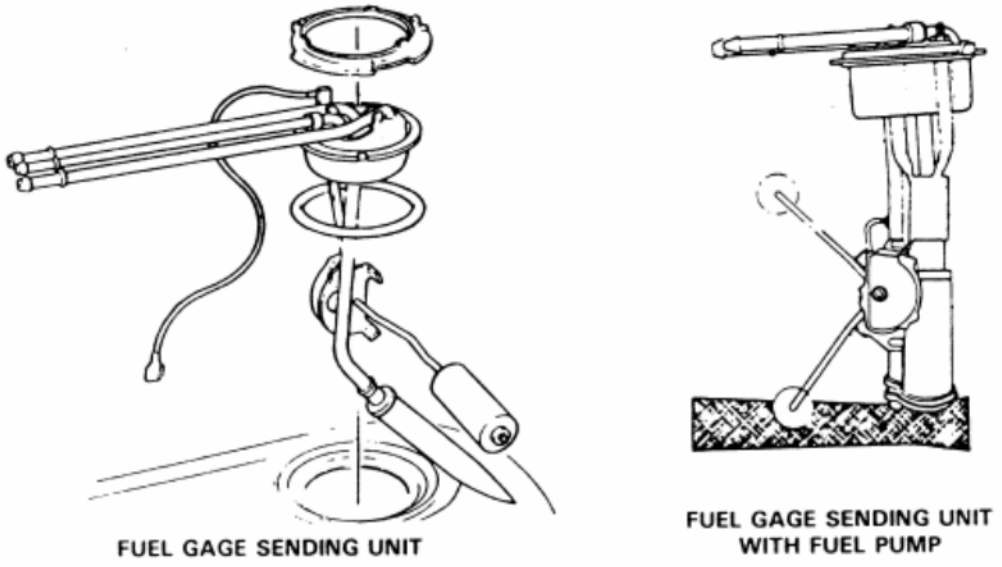



Fig. 2: Fuel pump assembly

**TESTING**

1. Relieve the fuel system pressure and check that there is an adequate quantity of fuel in the tank.
2. Connect a fuel pressure gauge to the pressure connector fitting located on the end of the fuel rail.

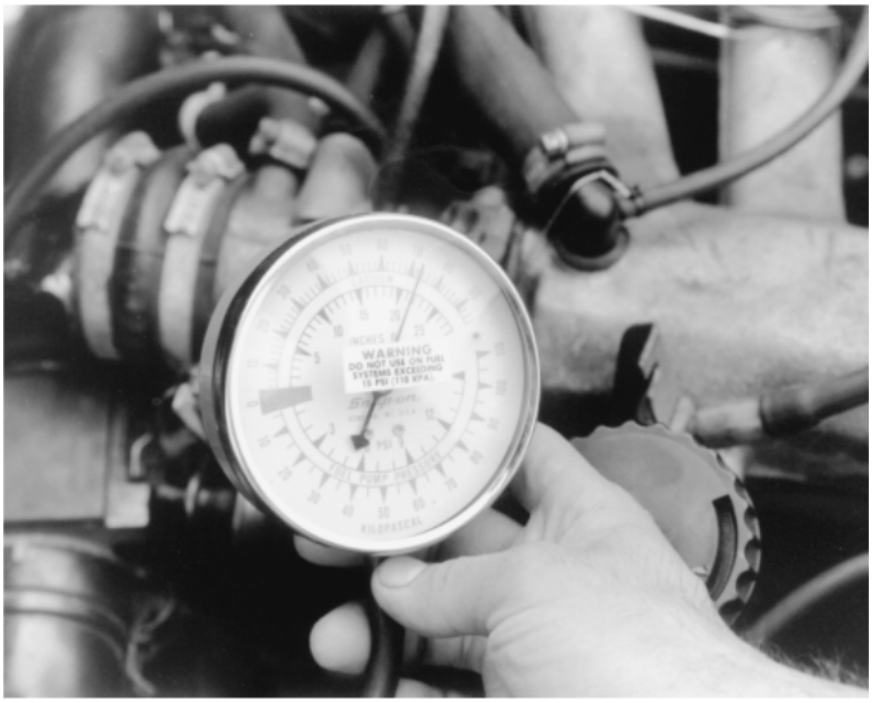


Fig. 3: Fuel pressure can be checked using an inexpensive pressure/vacuum gauge

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3. Make sure the ignition switch has been in the OFF position for at least 10 seconds and that all accessories are OFF.
4. Turn the ignition switch ON and the pump will run for about 2 seconds. Note the system pressure with the pump running, it should be between 40-47 psi.

*The ignition switch may have to be cycled to the ON position more than once to obtain maximum pressure. It is also normal for the pressure to drop slightly when the pump first stops, but it should then hold steady.*

5. If the pressure is not as specified, verify that fuel pump operation is heard in the tank.
6. If fuel pump operation is not heard, inspect the fuel pump relay and wiring.
7. If fuel pump operation is heard, inspect the filter and lines for restriction.
8. Start the engine and make sure the pressure decreases about 3-10 psi at idle.
9. If fuel pressure does not decrease, inspect the fuel pressure regulator and hose.
10. Disconnect the fuel pressure gauge.

## THROTTLE BODY

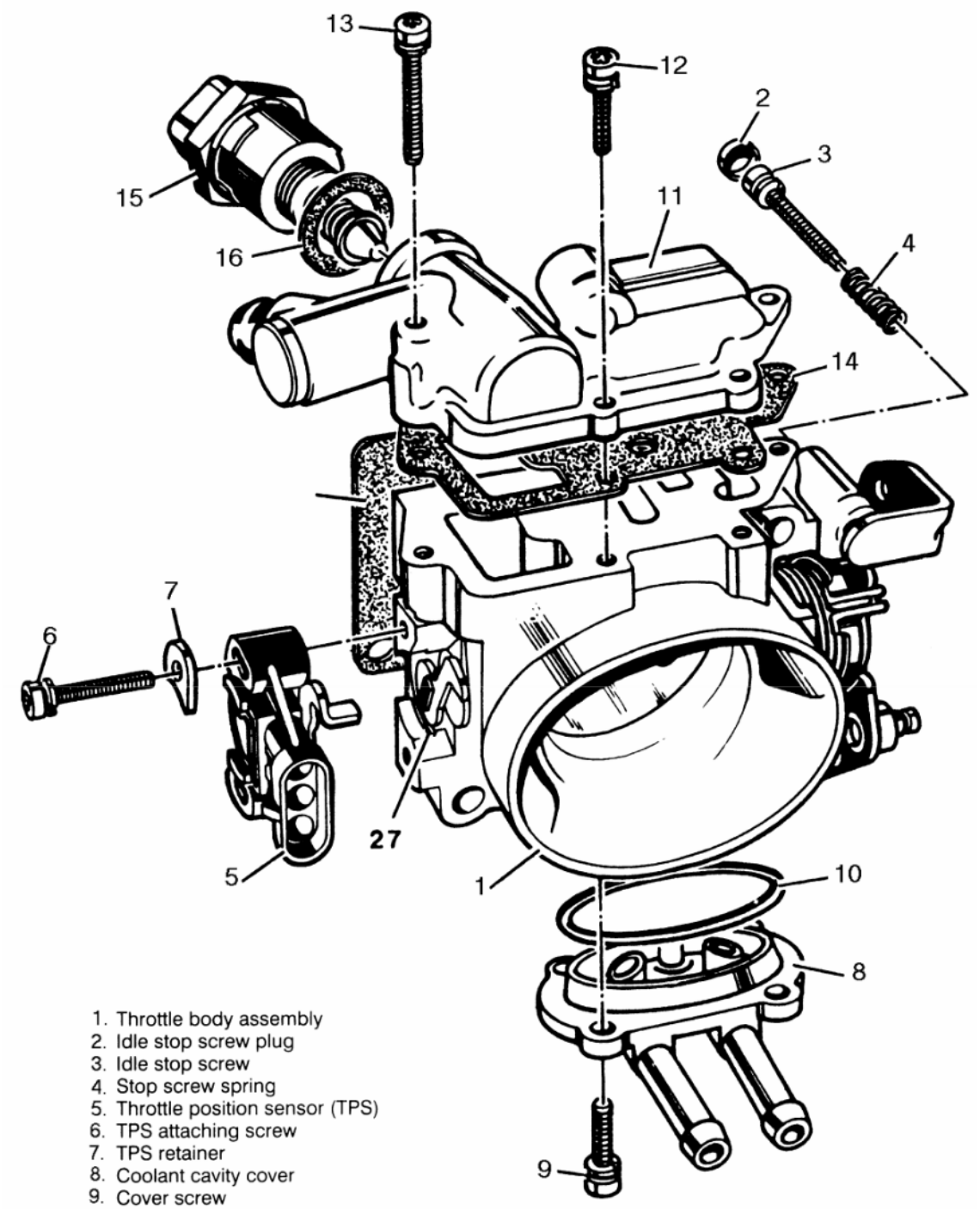
### REMOVAL & INSTALLATION

1. Disconnect the negative (-) battery cable and partially drain the radiator.
2. Remove the air inlet duct and unplug the IAC and TPS electrical connectors.
3. Label and disconnect the vacuum and coolant lines.
4. Disconnect the accelerator, throttle valve (transmission control) and cruise control cables, as applicable.
5. Remove the throttle body attaching bolts, then separate the throttle body from the plenum.
6. Discard the gasket.

To install:

7. Install the throttle body to the plenum using a new gasket. Tighten the bolts to specification.
8. Engage the accelerator, throttle valve and cruise control cables, as necessary. Make sure that the linkages do not hold the throttle open.
9. Connect the vacuum and coolant lines.
10. Install the air inlet duct and plug the IAC and TPS electrical connectors into their sockets.
11. Connect the negative (-) battery cable and refill the radiator.
12. With the engine OFF, check to see that the accelerator pedal is free. Depress the pedal to the floor and release.

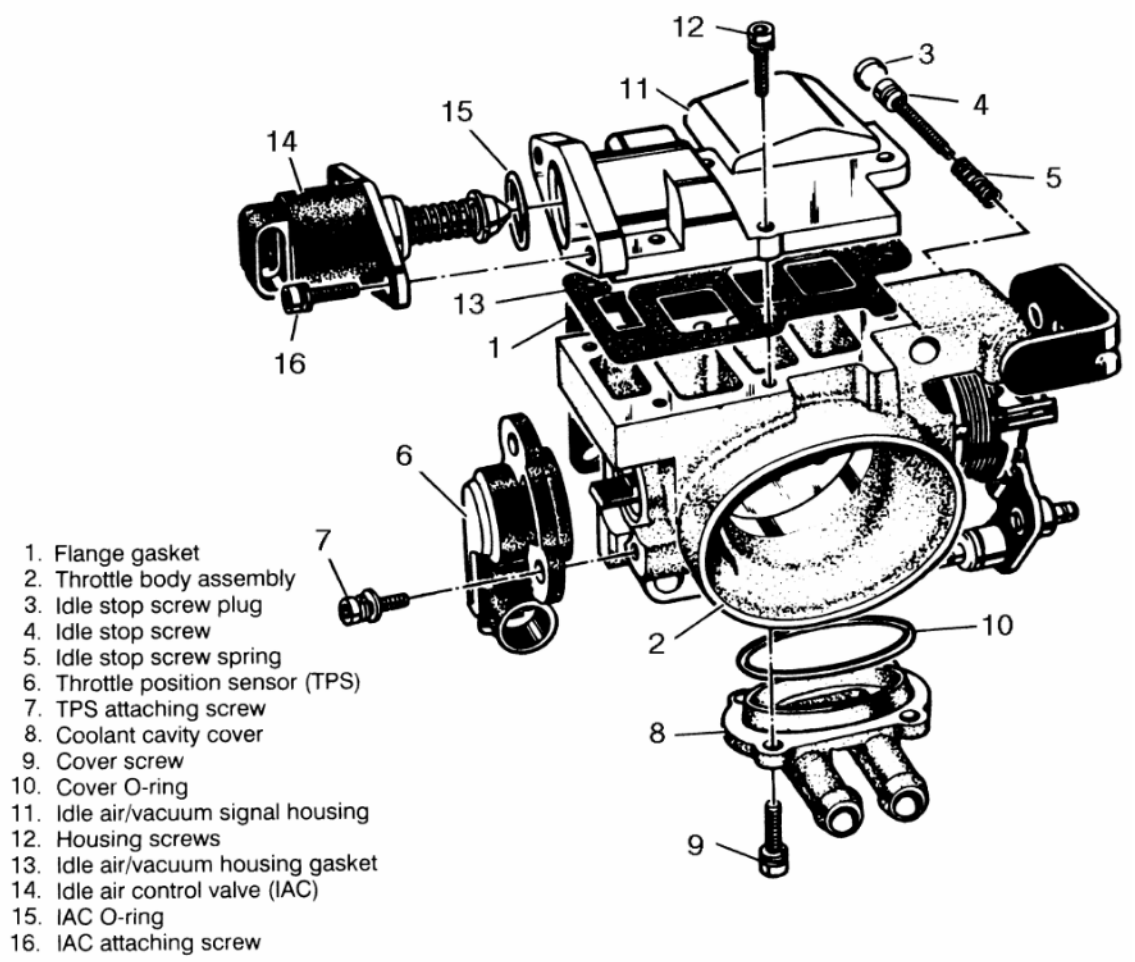
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1. Throttle body assembly
2. Idle stop screw plug
3. Idle stop screw
4. Stop screw spring
5. Throttle position sensor (TPS)
6. TPS attaching screw
7. TPS retainer
8. Coolant cavity cover
9. Cover screw
10. Cover O-ring
11. Idle air/vacuum signal housing
12. Idle air/vacuum signal assembly screw
13. Idle air/vacuum signal assembly screw
14. Idle air/vacuum assembly gasket
15. Idle air control valve (IAC)
16. IAC valve gasket

Fig. 1: Throttle body assembly on 2.8L engines

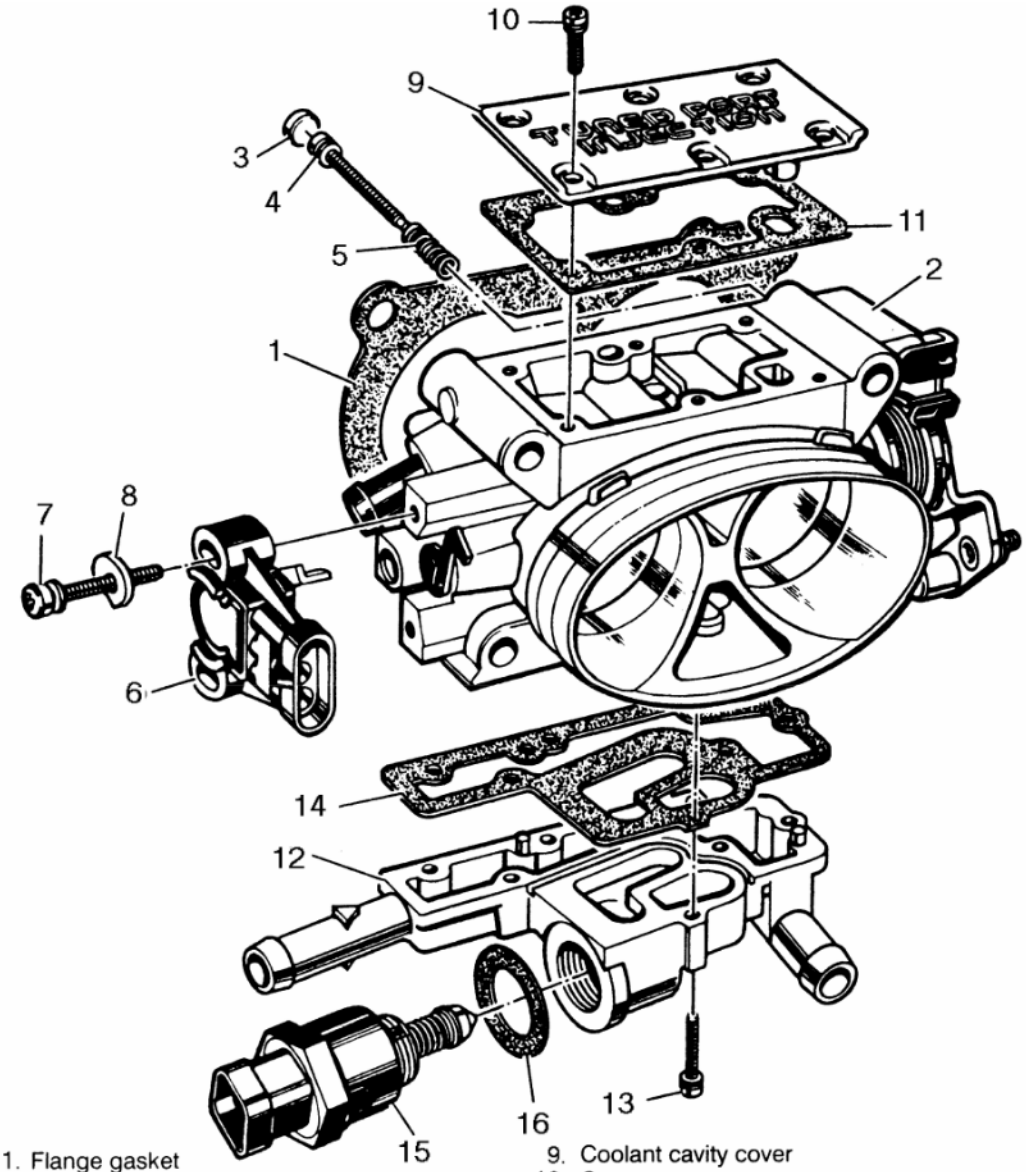
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1. Flange gasket
2. Throttle body assembly
3. Idle stop screw plug
4. Idle stop screw
5. Idle stop screw spring
6. Throttle position sensor (TPS)
7. TPS attaching screw
8. Coolant cavity cover
9. Cover screw
10. Cover O-ring
11. Idle air/vacuum signal housing
12. Housing screws
13. Idle air/vacuum housing gasket
14. Idle air control valve (IAC)
15. IAC O-ring
16. IAC attaching screw

Fig. 2: Throttle body assembly on 3.1L engines

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1. Flange gasket
2. Throttle body assembly
3. Idle stop screw plug
4. Idle stop screw
5. Idle stop screw spring
6. Throttle position sensor (TPS)
7. TPS attaching screw
8. TPS retainer
9. Coolant cavity cover
10. Cover screw
11. Cover gasket
12. Idle air/vacuum signal housing
13. Housing screws
14. Idle air/vacuum housing gasket
15. Idle air control valve (IAC)
16. IAC gasket

Fig. 3: Throttle body assembly on 5.0L and 5.7L TPI engines

## ADJUSTMENTS

### IAC VALVE POSITION

The ECM will need to relearn the Idle Air Control (IAC) valve position anytime battery power has been interrupted to it. A scan tool must be used on 3.1L engines to update the ECM with the correct IAC valve position and provide a stable idle speed. The IAC valve position on others can be reset by starting and running the engine for 5 seconds, then turning the ignition OFF for 10 seconds. Start the engine again and check for proper operation.

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## MINIMUM IDLE SPEED

The minimum idle speed should only be adjusted under two conditions:

*If the throttle body has been replaced.*

*After every other possible cause for the incorrect idle speed has been explored.*

There are many possible causes for incorrect idle speed, most of which require a high level of diagnostic skill as well as expensive testing equipment. Check the vehicle for vacuum leaks, incorrect valve or ignition timing, deposit accumulation in the throttle bore or valve, sticking throttle linkage or bent throttle valves. If the vehicle will still not idle properly after checking these areas, it should be diagnosed by a professional.

1. Pierce the idle stop screw with an awl. Apply leverage to remove it.
2. Make sure the IAC valve is connected. Short the A and B terminals of the ALDL connector together with a length of wire.
3. Turn the ignition to the ON position, but do not start the engine. Wait at least 30 seconds before proceeding.
4. With the ignition ON, disconnect the IAC valve connector.
5. Separate the set-timing connector. This eliminates the possibility of changes in engine speed due to variations of engine timing.
6. Start the engine and remove the wire shorting the A and B terminals together. It may be necessary to hold the throttle open slightly to prevent the engine from stalling.
7. Allow the engine to reach normal operating temperature.
8. Adjust the idle speed to the following:
    a. 2.8L Engines - 450-550 rpm A/T or 550-650 rpm M/T
    b. 3.1L Engines - Refer to the underhood emissions sticker
    c. 5.0L and 5.7L TPI engines - 400-450 rpm.

    *If these figures differ from those on the underhood emissions sticker, always follow the specifications on the emissions sticker.*

9. Turn the ignition OFF and connect the IAC valve harness. On models up to 1989, adjust the Throttle Position Sensor.

## THROTTLE POSITION SENSOR (TPS)

1. Install three jumper wires between the TPS and the harness connector.
2. Use a digital voltmeter connected to terminals A and B of the TPS.
3. Turn the ignition switch ON, but do not start the engine.
4. Loosen the TPS attaching screws and adjust the sensor to the following:
    a. 2.8L Engines - 0.50-0.60 volts
    b. 5.0L and 5.7L TPI Engines - 0.47-0.61 volts
5. Tighten the attaching screws, then check that the reading has not been disturbed.
6. With the ignition OFF, remove the jumper wires. Reconnect the TPS harness.

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7. Start the engine and check for proper operation.

## FUEL INJECTORS

## REMOVAL & INSTALLATION

*Use care in removing injectors to prevent damage to the electrical connector pins and the nozzle. The fuel injector is serviced as a complete assembly only. Since it is an electrical component, DO NOT immerse it in a cleaner.*

### 2.8L AND 3.1L ENGINES

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Remove the intake plenum and the fuel rail assembly.
4. Rotate the injector retaining clip to the unlocked position and remove the injector. Discard the O-rings and the injector retaining clip.

*Different injectors are calibrated for different flow rates. When ordering new injectors, be sure to order the identical part number that is inscribed on the old injector.*

To install:

5. Lubricate the new O-ring seals with engine oil and install them on the injector. Assemble a new retaining clip on the injector.
6. Install the injector into the fuel rail socket with the electrical connections facing outward. Rotate the retaining clip to the lock position.
7. Install the fuel rail assembly.
8. Install the intake plenum with new gaskets.
9. Tighten the fuel filler cap and connect the negative battery cable.
10. With the engine OFF and the ignition ON, check for fuel leaks.

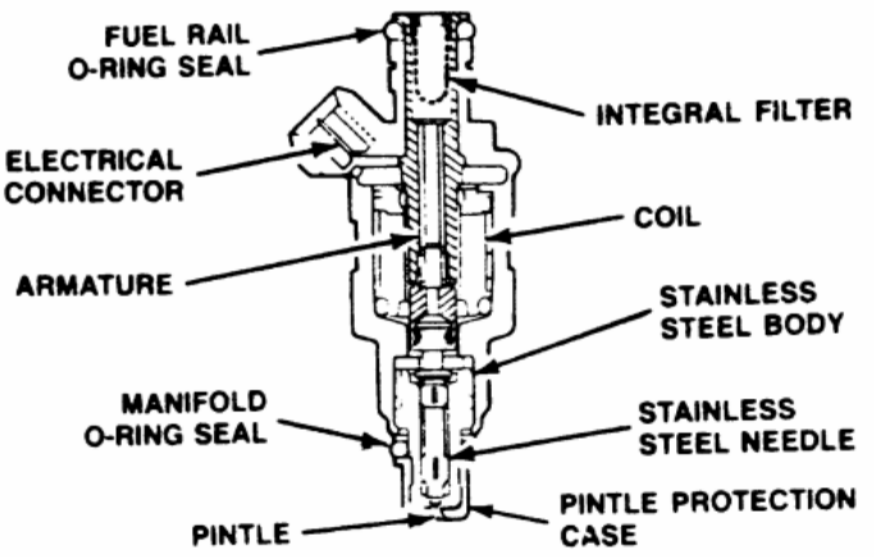



Fig. 1: Sectional view of a fuel injector

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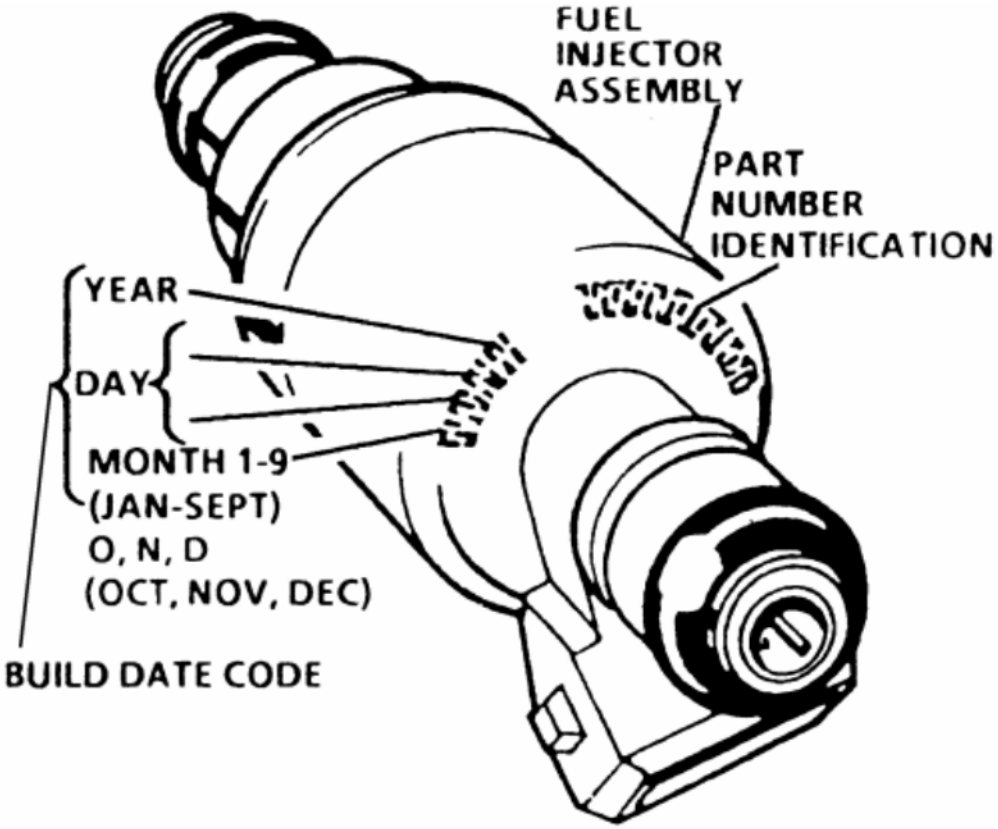
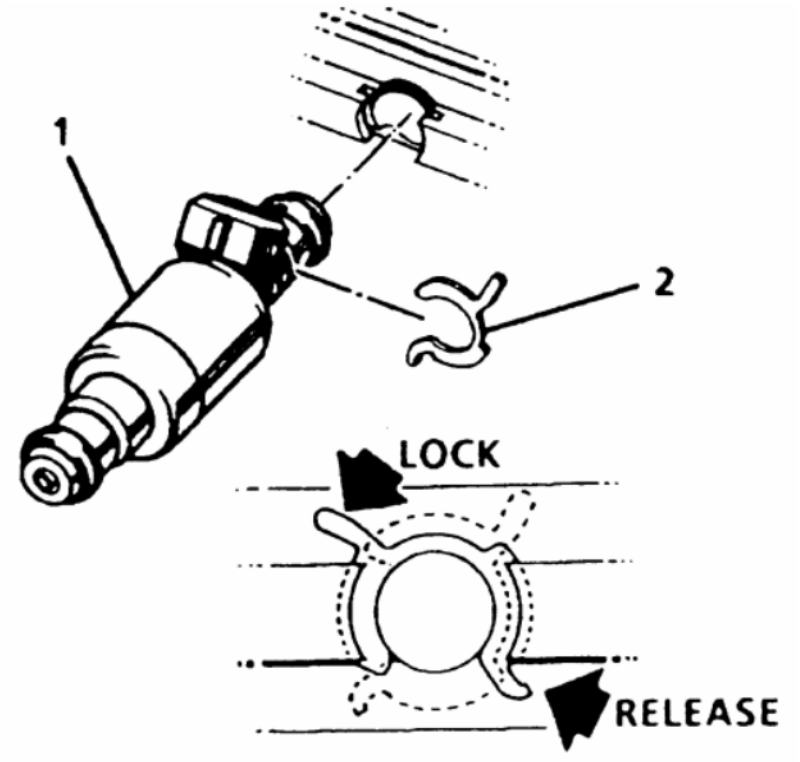



Fig. 2: Fuel injector part number location




1 INJECTOR ASSEMBLY - MFI FUEL

2 CLIP - INJECTOR RETAINER

Fig. 3: Injector retaining clip

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### 5.0L AND 5.7L TPI ENGINES

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Remove the intake plenum and runners.
4. Remove the fuel rail assembly.
5. Rotate the injector retaining clip to the unlocked position and remove the injector. Discard the O-rings and the injector retaining clip.

*There are two different injector part numbers for the 5.0L and the 5.7L engine. Do not intermix injectors with different part numbers, as this will result in engine roughness and excessive emissions. When ordering new injectors, be sure to order the identical part number that is inscribed on the old injector. However, if a complete set of injectors is being replaced, either part number for that engine application may be used.*

To install:

6. Lubricate the new O-ring seals with engine oil and install them on the injector. Assemble a new retaining clip on the injector.
7. Install the injector into the fuel rail socket with the electrical connections facing outward. Rotate the retaining clip to the lock position.
8. Install the fuel rail assembly.
9. Install the intake plenum and runners with new gaskets.
10. Tighten the fuel filler cap and connect the negative battery cable.
11. With the engine OFF and the ignition ON, check for fuel leaks.

## FUEL RAIL ASSEMBLY

### REMOVAL & INSTALLATION

*When servicing the fuel system, be sure to relieve the pressure of the system and drain the fuel into an approved container. Cap all open fuel lines and plug any other open passages. DO NOT allow dirt or other contaminants to enter the system.*

### 2.8L AND 3.1L ENGINES

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Remove the intake plenum.
4. Clean the fuel rail assembly to prevent dirt from entering the system.
5. Remove the cold start tube at the fuel rail fitting. Use a backup wrench on the fuel rail fitting to prevent it from turning.
6. Disconnect the fuel feed and return lines at the rail.
7. Disconnect the vacuum hose at the pressure regulator.
8. Unplug the electrical connectors.
9. Loosen and remove the fuel rail attaching bolts.
10. Remove the fuel rail assembly from the intake manifold.
11. Discard all of the O-ring seals that are exposed during this procedure.

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To install:

12. Lubricate with clean engine oil, then install the injector nozzle O-rings.
13. Install the fuel rail assembly. Tilt the assembly to install the injectors.
14. Tighten the fuel rail attaching bolts to specification.
15. Engage the injector electrical connectors. Rotate each injector as required to avoid stretching the harness.
16. Connect the vacuum hose to the pressure regulator.
17. Connect the fuel feed and return lines. New O-rings must be used.
18. Install a new O-ring seal on the cold start tube. Thread the tube nut to the fitting on the fuel rail. Use a backup wrench on the fuel rail fitting to prevent it from turning.
19. Temporarily connect the negative battery terminal.
    a. With the engine OFF and the ignition ON, check for fuel leaks. Repair as necessary.
    b. Disconnect the negative battery cable.
20. Install the intake plenum using new gaskets.
21. Connect the negative battery cable.

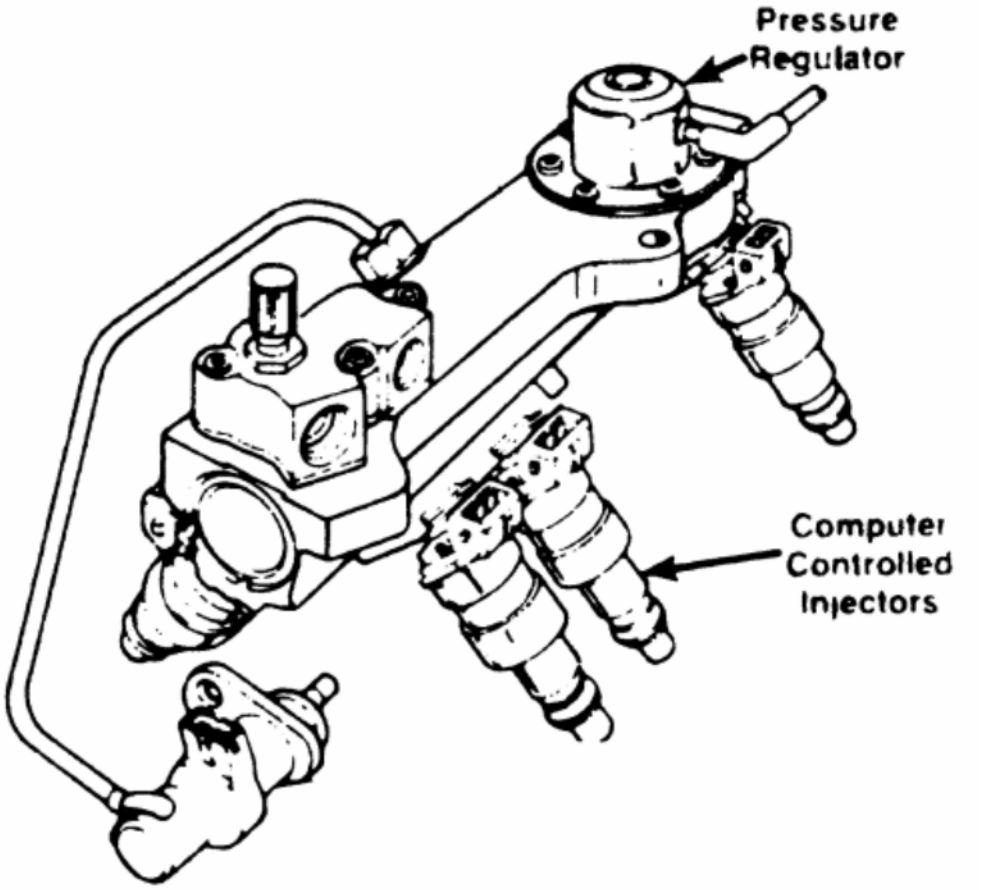
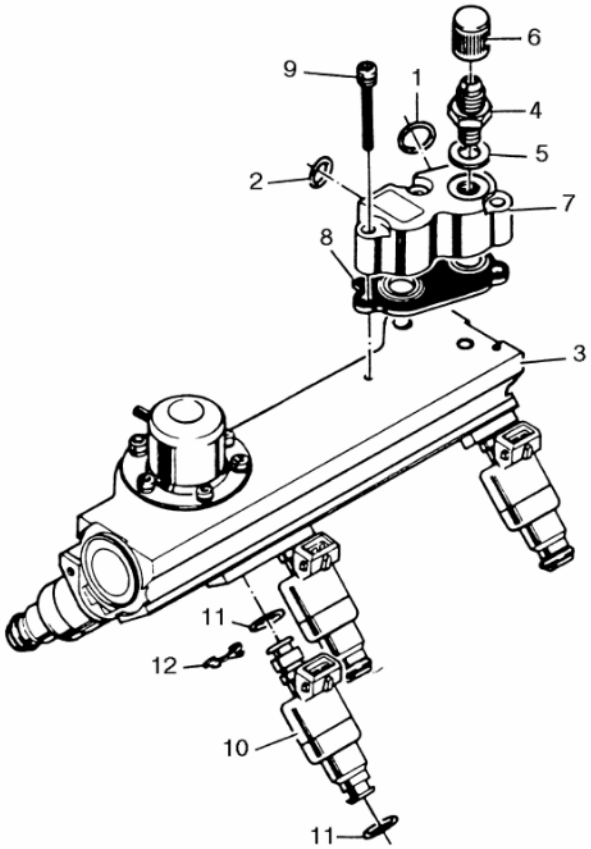



Fig. 1: Fuel rail assembly on 2.8L engines

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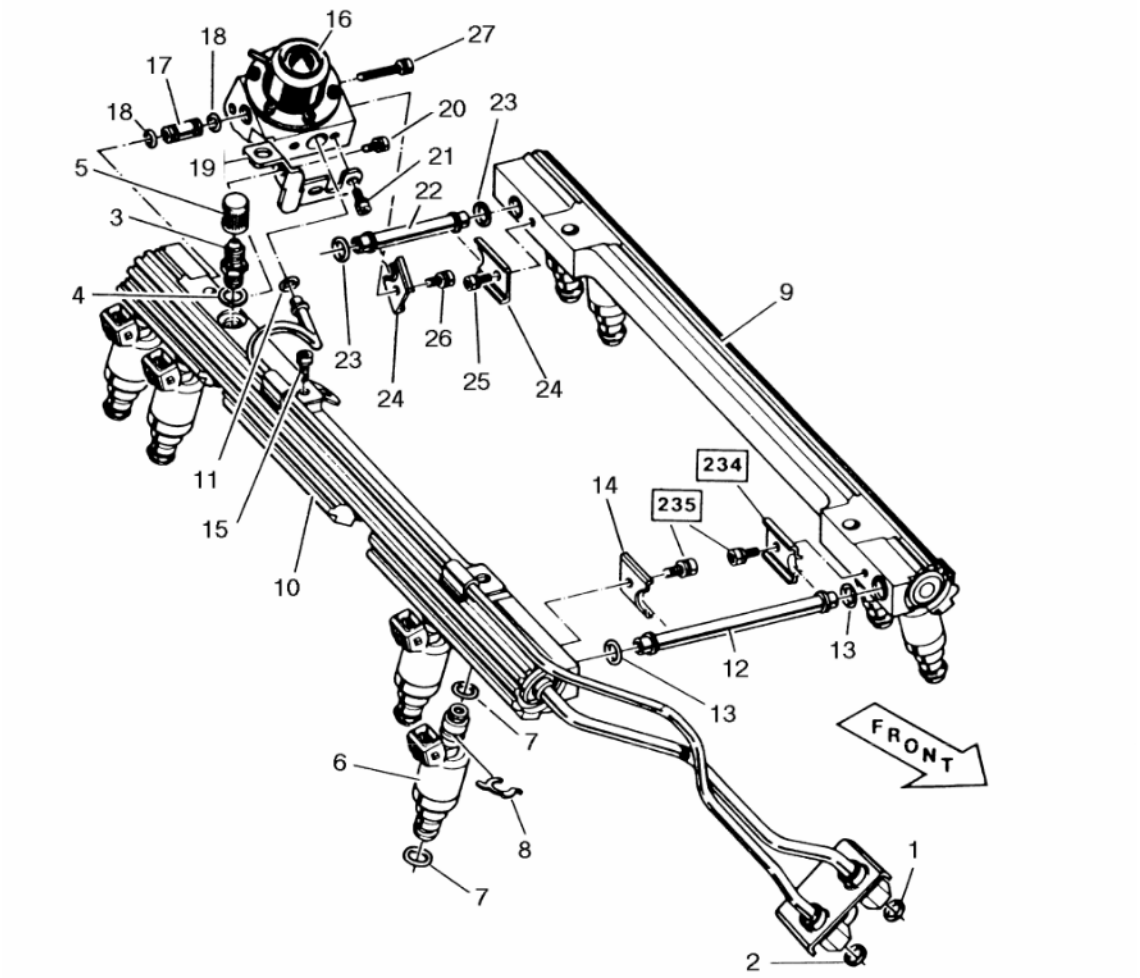



**PART NAMES**

1. **O-ring - Fuel Inlet Line**
2. **O-ring - Fuel Return Line**
3. **Fuel Rail and Pressure Regulator Assembly**
4. **Fuel Pressure Connection Assembly**
5. **Seal - Fuel Pressure Connection Assembly**
6. **Cap - Fuel Pressure Connection**
7. **Fuel Block**
8. **Seal - Fuel Block**
9. **Screw Assembly - Fuel Block Attaching**
10. **MPFI Injector Assembly**
11. **O-ring Seal - Injector**
12. **Clip - Injector Retainer**

Fig. 2: Fuel rail assembly on 3.1L engines

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| | | |
|---|---|---|
| 1. O-RING - FUEL INLET LINE | 10. FUEL RAIL AND TUBE ASSEMBLY (RH) | 19. BRACKET - PRESSURE REGULATOR AND BASE ASSEMBLY |
| 2. O-RING - FUEL RETURN LINE | 11. SEAL - O-RING - FUEL OUTLET TUBE | 20. SCREW ASSEMBLY - BRACKET TO RAIL ATTACHING |
| 3. FUEL PRESSURE CONNECTION ASSEMBLY | 12. TUBE - FRONT CROSSOVER | 21. SCREW ASSEMBLY - BRACKET TO BASE ATTACHING |
| 4. SEAL - FUEL PRESSURE CONNECTION | 13. SEAL - O-RING - FRONT CROSSOVER TUBE | 22. TUBE - REAR CROSSOVER |
| 5. CAP - FUEL PRESSURE CONNECTION | 14. RETAINER - CROSSOVER TUBE | 23. SEAL - O-RING - CROSSOVER TUBE |
| 6. MPFI INJECTOR ASSEMBLY | 15. SCREW ASSEMBLY - RETAINER ATTACHING | 24. RETAINER - REAR CROSSOVER TUBE |
| 7. SEAL - O-RING - INJECTOR | 16. PRESSURE REGULATOR AND BASE ASSEMBLY | 25. SCREW ASSEMBLY - RETAINER TO LH RAIL |
| 8. CLIP - INJECTOR RETAINER | 17. CONNECTOR - BASE TO RAIL | 26. SCREW ASSEMBLY - RETAINER TO BASE |
| 9. FUEL RAIL AND PLUG ASSEMBLY (LH) | 18. SEAL - O-RING - CONNECTOR | 27. SCREW ASSEMBLY - BASE TO RH RAIL |

Fig. 3: Fuel rail assembly on 5.0L and 5.7L engines

## 5.0L AND 5.7L TPI ENGINES

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Remove the intake plenum and runners.
4. Clean the fuel rail assembly to prevent dirt from entering the system.
5. Disconnect the fuel feed and return lines at the rail. Use a back-up wrench to support the fuel rail tube fittings.

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6. Disconnect the vacuum hose at the pressure regulator.
7. Unplug the electrical connectors.
8. Loosen and remove the fuel rail attaching bolts.
9. Remove the fuel rail assembly from the intake manifold.
10. Discard all of the O-ring seals that are exposed during this procedure.

To install:

11. Lubricate with clean engine oil, then install the injector nozzle O-rings.
12. Install the fuel rail assembly in the intake manifold.
13. Tighten the fuel rail attaching bolts to specification.
14. Engage the injector electrical connectors. Rotate each injector as required to avoid stretching the harness.
15. Connect the vacuum hose to the pressure regulator.
16. Connect the fuel feed and return lines. New O-rings must be used.
17. Temporarily connect the negative battery terminal.
    a. With the engine OFF and the ignition ON, check for fuel leaks. Repair as necessary.
    b. Disconnect the negative battery cable.
18. Install the intake plenum and runners. Use new gaskets.
19. Connect the negative battery cable.

## FUEL PRESSURE REGULATOR

### REMOVAL & INSTALLATION

#### 2.8L AND 3.1L ENGINES

The pressure regulator and the fuel rail are serviced as a complete assembly only. DO NOT attempt to remove the regulator cover from the fuel rail.

#### 5.0L AND 5.7L TPI ENGINES

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Remove the intake plenum and runners.
4. Remove the fuel rail assembly.
5. Remove the rear crossover retainer and base attaching screw.
6. Remove the rear crossover tube and O-ring from the regulator base. Discard the O-ring.
7. Remove the pressure regulator bracket.
8. Remove the pressure regulator base-to-rail screw.
9. Separate the regulator base from the fuel rail, then disconnect from the fuel outlet tube.
10. Remove the fuel outlet tube O-ring and discard.
11. Remove the regulator base-to-fuel rail connector.

To install:

12. Lubricate and install new regulator base-to-fuel rail O-rings.

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13. Lubricate a new outlet tube 0-ring and install it on the end of the tube.
14. Connect the regulator base to the fuel outlet tube, then to the fuel rail.
15. Finger-tighten the base-to-rail screw.
16. Install the pressure regulator bracket. Finger-tighten the screws only.
17. Lubricate a new rear crossover tube O-ring and install it on the end of the tube.
18. Install the rear crossover tube to the regulator base.
19. Install the crossover tube retainer and finger-tighten the screw.
20. Tighten all attaching screws to 44 inch lbs. (5 Nm).
21. Install the fuel rail assembly.
22. Temporarily connect the negative battery cable.
    a. With the engine OFF and the ignition ON, check for fuel leaks.
    b. Disconnect the negative battery cable.
23. Install the intake plenum and runners.
24. Connect the negative battery cable.

## IDLE AIR CONTROL VALVE

### REMOVAL & INSTALLATION

1. Unplug the electrical connector from idle air control valve.
2. Remove the idle air control valve.

To install:

3. Before installing the idle air control valve, measure the distance that the valve is extended. Measurement should be made from the motor housing to the end of the cone. It should not exceed 28.5mm ($1^1/_8$ in.), or damage to the valve may occur when installed.
4. On 1985-1992 models, identify the replacement IAC valve as being either Type 1 (with collar at electric terminal end) or Type 2 (without collar). If measuring distance is greater than specified above, proceed as follows:
    - Type 1: Use finger pressure to slowly retract the pintle.
    - Type 2: Compress retaining spring from valve while turning valve in with a clockwise motion. Return spring to original position with straight portion of spring end aligned with flat surface of valve.

*On IAC valves that have already been in service, do not push or pull on the valve pintle. The force required to move the pintle may damage the threads on the worm drive.*

5. Use a new gasket or O-ring and install the IAC valve into the throttle body.
6. Allow the ECM to reset the idle air control valve using the procedure described earlier in this section.

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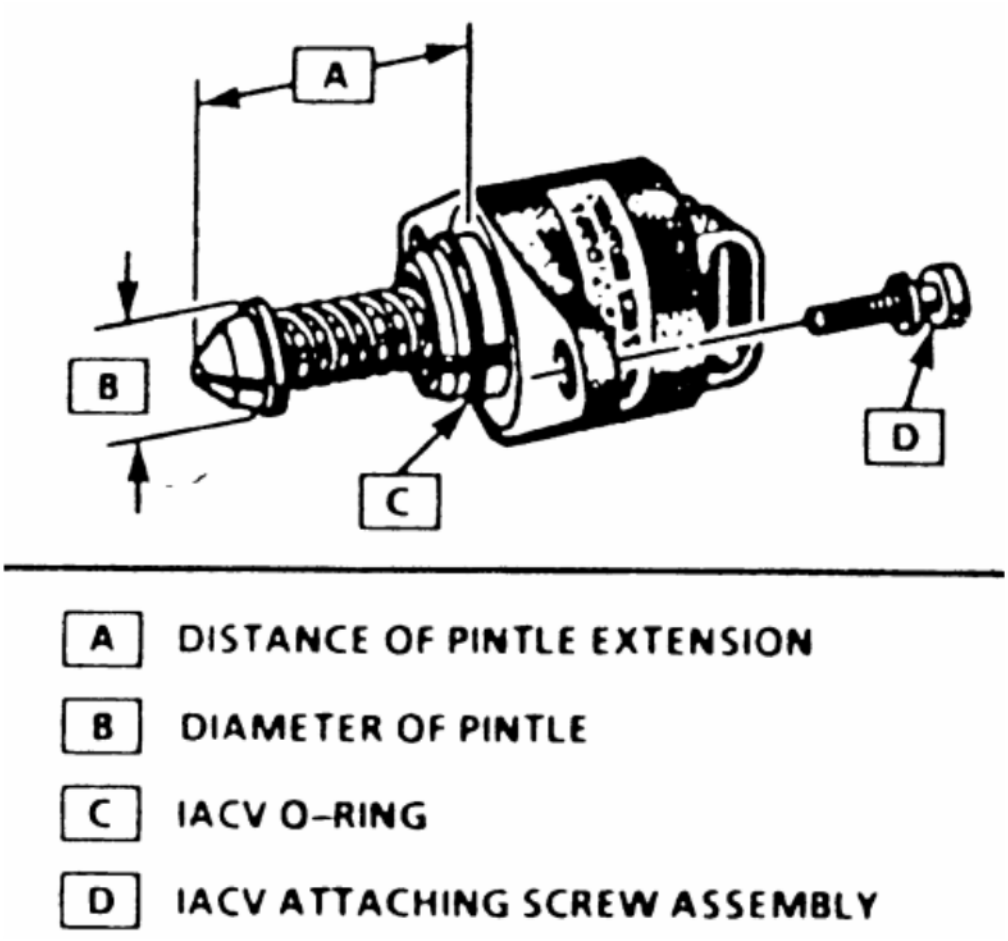



Fig. 1: Idle air control valve

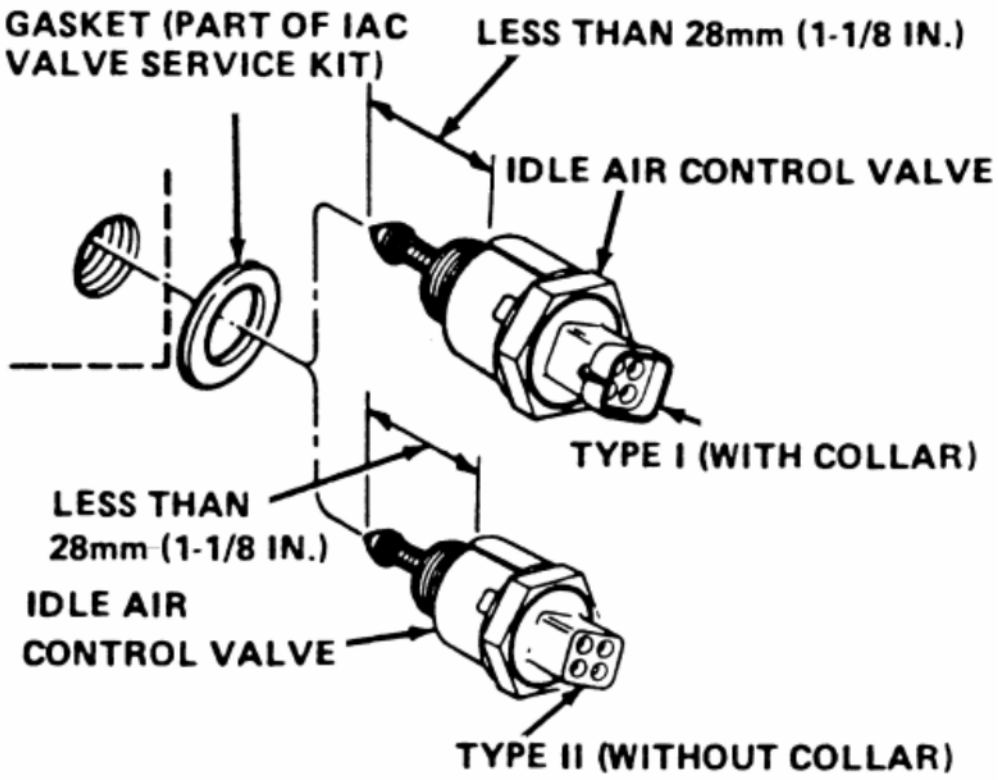



Fig. 2: Idle air control valve installation

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## THROTTLE POSITION SENSOR (TPS)

### REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. Detach the electrical connector from the sensor.
3. Remove the attaching screws, lockwashers and retainers. Some models use a seal between the throttle body and the sensor, do not lose this!
4. Remove the throttle position sensor.

To install:

5. Install the throttle position sensor seal, if applicable.
6. With the throttle valve in the normal closed idle position, install the sensor on the throttle body assembly. Make sure the sensor pickup lever is properly located on the throttle actuator lever.
7. Install the retainers, screws and lockwashers using a thread locking compound. On models up to 1989, DO NOT tighten the screws until the sensor is adjusted. Follow the procedures outlined earlier in this section.

## COLD START VALVE

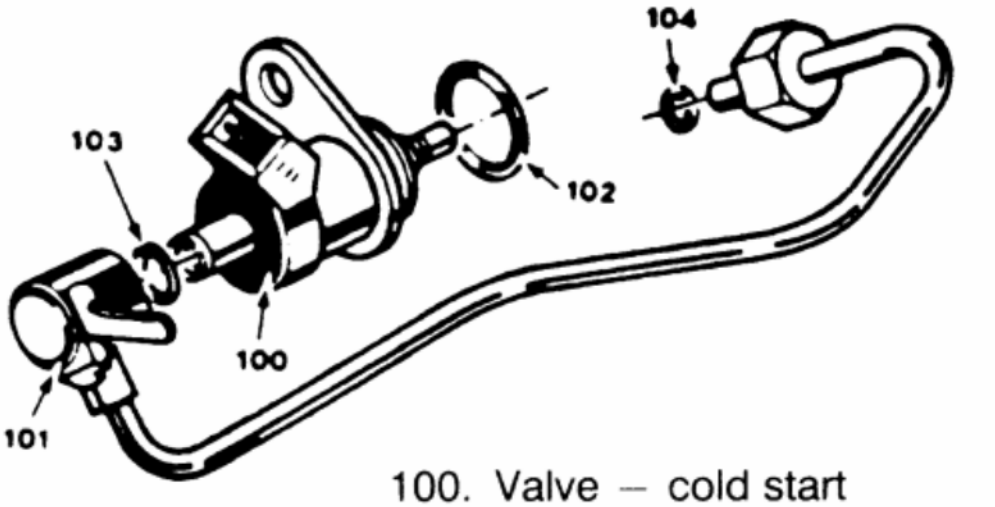
### REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Remove the intake manifold plenum.
4. Unplug the electrical connection.
5. Clean the fuel rail around the cold start valve tube fitting.
6. Remove the tube fitting from the fuel rail. Use a backup wrench to prevent it from turning.
7. Remove the cold start valve retaining bolt and remove the valve from the intake manifold.

To install:

8. Use new O-rings and install the valve and bolt.
9. Connect the wiring harness.
10. Connect the cold start tube at the fuel rail. Use a wrench to prevent it from turning.
11. Install the intake manifold plenum.
12. Connect the negative battery cable. With the engine OFF and the ignition ON, check for fuel leaks.

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100. Valve – cold start
101. Tube and body assembly
102. O-ring seal – valve
103. O-ring seal – body
104. O-ring seal – tube

Fig. 1: Cold start valve assembly

## FUEL TANK

### TANK ASSEMBLY

### REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Drain the fuel from the tank into an approved container. Use a hand-operated pump to drain the fuel through the filler neck.
4. Safely raise and support the vehicle.
5. Remove the fuel filler neck shield.
6. Remove the rear axle assembly.
7. Remove the rear portion of the exhaust system.
8. Remove the exhaust heat shield.
9. Clean all the fuel pipes and hoses in the surrounding areas to prevent contamination of the fuel system.
10. Disconnect the rear fuel feed, fuel return, vapor, and vent hoses at the fuel sender assembly.
11. Separate the electrical connection.
12. With the aid of an assistant, support the fuel tank.
13. Remove the fuel tank strap front attaching bolts. Do not bend the straps as this will damage them.
14. Remove the tank straps and the fuel tank.

To install:

15. Hook the rear end of the fuel tank straps into the underbody bracket.

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16. With the aid of an assistant, position and support the fuel tank with the straps. Loosely install the front fuel tank attaching bolts.
17. Engage the electrical connection.
18. Connect the fuel hoses and lines separated during removal.
19. Install the muffler heat shield and the exhaust system.
20. Install the rear axle and the fuel filler neck shield.
21. Lower the vehicle.
22. Add fuel and install the filler cap.
23. Connect the negative battery cable.
24. With the engine OFF, turn the ignition switch to the ON position for 2 seconds, then turn it to the OFF position for 10 seconds. Again turn it to the ON position and check for fuel leaks.

**SENDING UNIT REPLACEMENT**

1. Remove the fuel tank.
2. Clean the area surrounding the sender assembly to prevent contamination of the fuel system.
3. Using tool J-24187 or equivalent, remove the sending unit retaining cam. Remove the fuel sender and O-rings from the tank. Discard the O-rings.
4. If necessary, separate the fuel pump from the sending unit assembly.

To install:

5. If removed, install the fuel pump to the sending unit. If the strainer was removed, it must be replaced with a new one.
6. Inspect and clean the O-ring mating surfaces.
7. Install a new O-ring in the groove around the tank opening. If applicable, install a new O-ring on the fuel sender feed tube.
8. Install the fuel sender assembly as follows:
    a. The fuel pump strainer must be in a horizontal position, and when installed, must not block the travel of the float arm. Gently fold the strainer over itself and slowly position the sending assembly in the tank so the strainer is not damaged or trapped by the sump walls.
9. Install the retaining cam using tool J-24187 or equivalent.
10. Install the fuel tank assembly.

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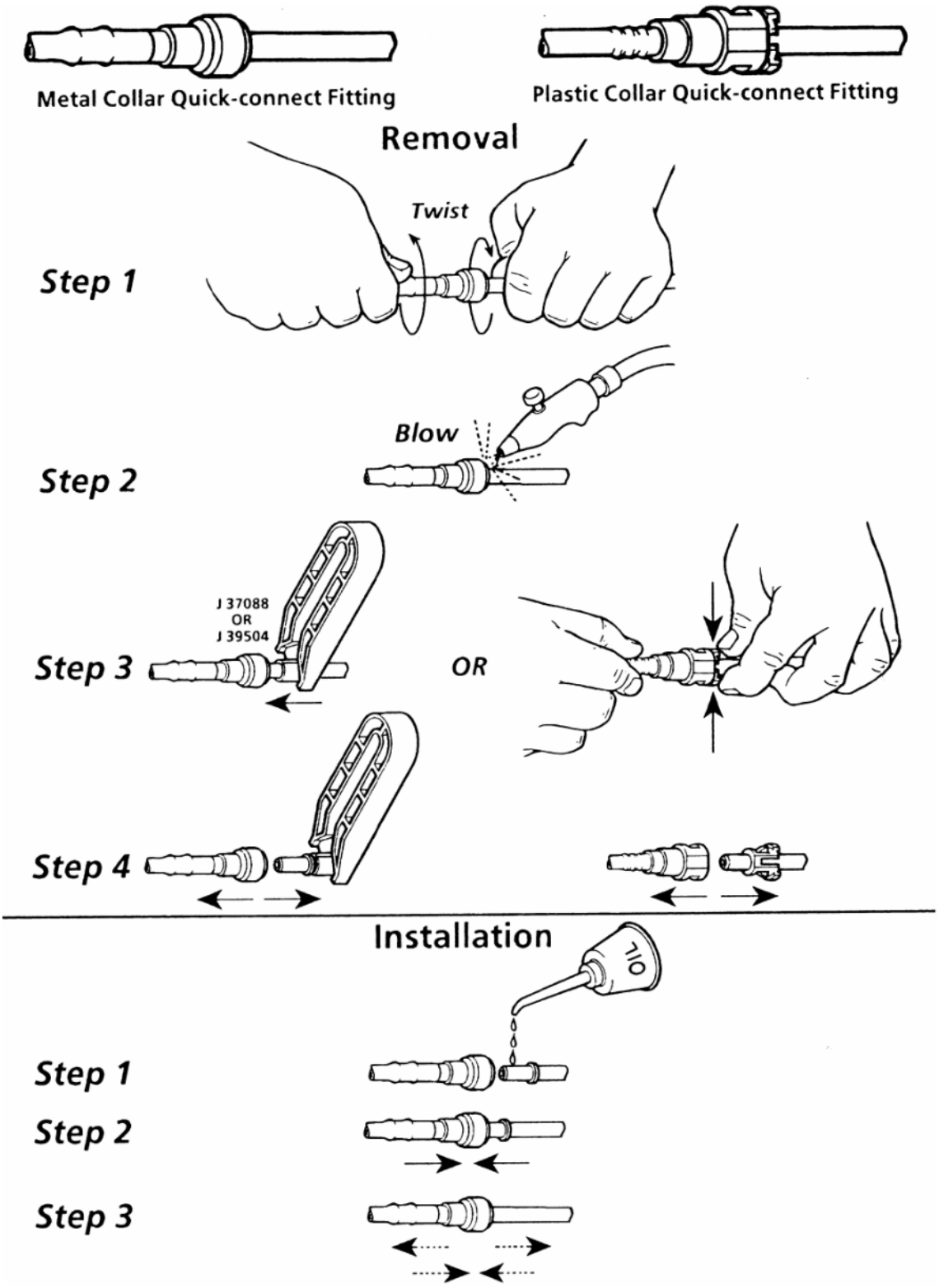



Fig. 1: Quick-connect fittings

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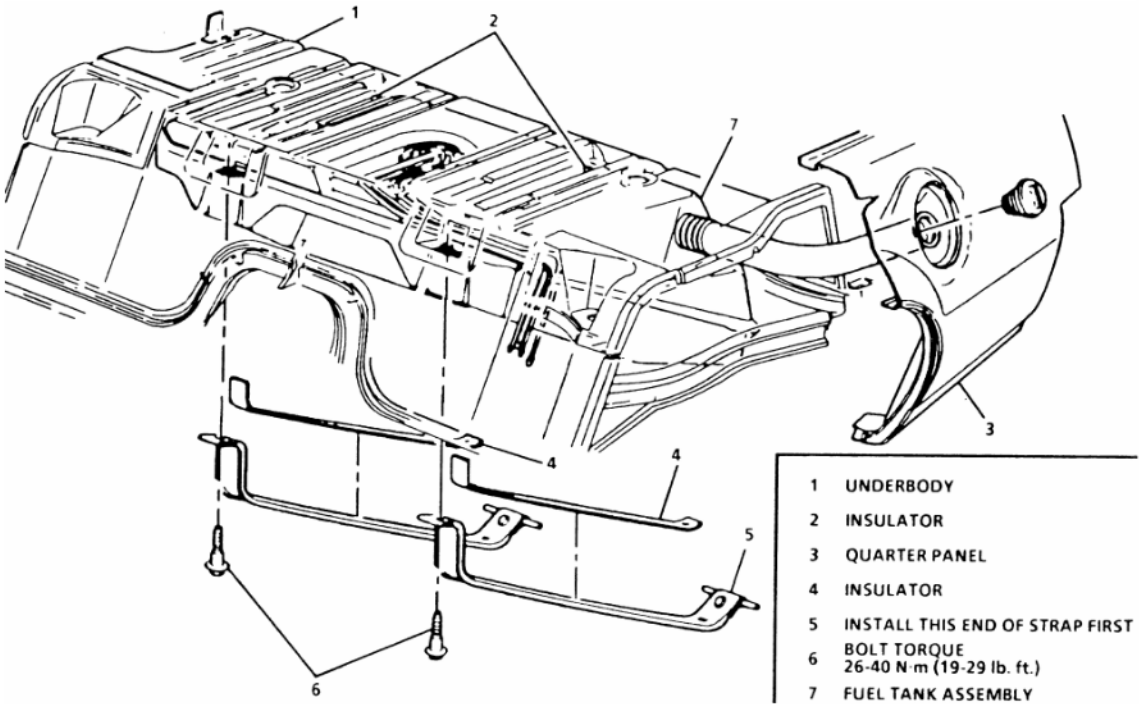



Fig. 2: Fuel tank removal

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## SPECIFICATIONS CHARTS

### E2SE CARBURETOR SPECIFICATIONS

| Year | Carburetor Identification | Float Level (in.) | Pump Rod (in.) | Air Valve Spring (Turns) | Choke Coil Level (in.) | Fast Idle Cam (deg.) | Air Valve Rod (deg.) | Primary Vacuum Break (deg.) | Choke Setting (notches) | Secondary Vacuum Break (deg.) | Choke Unloader (deg.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1982** | 17082390 | 13/32 | Fixed | 1 | 0.085 | 17° | 1° | 26° | Fixed | 34° | 35° |
| | 17082391 | 13/32 | Fixed | 1 | 0.085 | 25° | 1° | 29° | Fixed | 35° | 35° |
| | 17082490 | 13/32 | Fixed | 1 | 0.085 | 17° | 1° | 26° | Fixed | 34° | 35° |
| | 17082491 | 13/32 | Fixed | 1 | 0.085 | 25° | 1° | 29° | Fixed | 35° | 35° |
| **1983** | 17083356 | 13/32 | Fixed | 1 | 0.085 | 22° | 1° | 25° | Fixed | 35° | 30° |
| | 17083357 | 13/32 | Fixed | 1 | 0.085 | 22° | 1° | 25° | Fixed | 35° | 30° |
| | 17083358 | 13/32 | Fixed | 1 | 0.085 | 22° | 1° | 25° | Fixed | 35° | 30° |
| | 17083359 | 13/32 | Fixed | 1 | 0.085 | 22° | 1° | 25° | Fixed | 35° | 30° |
| | 17083368 | 1/8 | Fixed | 1 | 0.085 | 22° | 1° | 25° | Fixed | 35° | 30° |
| | 17083370 | 1/8 | Fixed | 1 | 0.085 | 22° | 1° | 25° | Fixed | 35° | 30° |
| | 17083450 | 1/8 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083451 | 1/8 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083452 | 1/8 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083453 | 1/8 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083454 | 1/8 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083455 | 1/8 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083456 | 1/8 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083630 | 1/4 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083631 | 1/4 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083632 | 1/4 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083633 | 1/4 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083634 | 1/4 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083635 | 1/4 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083636 | 1/4 | Fixed | 1 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| | 17083650 | 1/8 | Fixed | 1/2 | 0.085 | 28° | 1° | 27° | Fixed | 35° | 45° |
| **1984** | 17072683 | 9/32 | Fixed | 1/2 | 0.085 | 28° | 1° | 25° | Fixed | 35° | 45° |
| | 17074812 | 9/32 | Fixed | 1/2 | 0.085 | 28° | 1° | 25° | Fixed | 35° | 45° |
| | 17084356 | 9/32 | Fixed | 3/4 | 0.085 | 22° | 1° | 25° | Fixed | 30° | 45° |
| | 17084357 | 9/32 | Fixed | 3/4 | 0.085 | 22° | 1° | 25° | Fixed | 30° | 30° |
| | 17084358 | 9/32 | Fixed | 3/4 | 0.085 | 22° | 1° | 25° | Fixed | 30° | 30° |
| | 17084359 | 9/32 | Fixed | 3/4 | 0.085 | 22° | 1° | 25° | Fixed | 30° | 30° |
| | 17084368 | 1/8 | Fixed | 3/4 | 0.085 | 22° | 1° | 25° | Fixed | 30° | 30° |
| | 17084370 | 1/8 | Fixed | 3/4 | 0.085 | 22° | 1° | 25° | Fixed | 30° | 30° |
| | 17084430 | 11/32 | Fixed | 1 | 0.085 | 15° | 1° | 26° | Fixed | 38° | 42° |
| | 17084431 | 11/32 | Fixed | 1 | 0.085 | 15° | 1° | 26° | Fixed | 38° | 42° |
| | 17084434 | 11/32 | Fixed | 1 | 0.085 | 15° | 1° | 26° | Fixed | 38° | 42° |
| | 17084435 | 11/32 | Fixed | 1 | 0.085 | 15° | 1° | 26° | Fixed | 38° | 42° |
| | 17084452 | 5/32 | Fixed | 1/2 | 0.085 | 28° | 1° | 25° | Fixed | 35° | 45° |
| | 17084453 | 5/32 | Fixed | 1/2 | 0.085 | 28° | 1° | 25° | Fixed | 35° | 45° |
| | 17084455 | 5/32 | Fixed | 1/2 | 0.085 | 28° | 1° | 25° | Fixed | 35° | 45° |

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## E4ME and E4MC CARBURETOR SPECIFICATIONS

| Year | Carburetor Identification | Float Level (in.) | Air Valve Spring (turn) | Pump Rod (in.) | Primary Vacuum Break (deg.) | Secondary Vacuum Break (deg.) | Air Valve Rod (in.) | Choke Rod (deg.) | Choke Unloader (deg.) | Fast Idle Speed (rpm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 17082202 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ① |
| | 17082204 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ① |
| | 17082203 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ① |
| | 17082207 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ① |
| 1983 | 17083204 | 11/32 | 7/8 | Fixed | — | 27° | .025 | 20° | 38° | ② |
| | 17083206 | 11/32 | 7/8 | Fixed | — | 27° | .025 | 20° | 38° | ② |
| | 17083207 | 11/32 | 7/8 | Fixed | — | 27° | .025 | 38° | 38° | ② |
| | 17083218 | 11/32 | 7/8 | Fixed | — | 27° | .025 | 20° | 38° | ② |
| | 17083236 | 11/32 | 7/8 | Fixed | — | 27° | .025 | 20° | 38° | ② |
| | 17083506 | 7/16 | 7/8 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17083508 | 7/16 | 7/8 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17083524 | 7/16 | 7/8 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| | 17083526 | 7/16 | 7/8 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| 1984 | 17084201 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084205 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084208 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084209 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084210 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084507 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084509 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084525 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| | 17084527 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| 1985 | 17084201 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084205 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084208 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084209 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084210 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084507 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084509 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084525 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| | 17084527 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| 1986 | 17084201 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084205 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084208 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084209 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084210 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084507 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084509 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084525 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| | 17084527 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |

## E4ME and E4MC CARBURETOR SPECIFICATIONS

| Year | Carburetor Identification | Float Level (in.) | Air Valve Spring (turn) | Pump Rod (in.) | Primary Vacuum Break (deg.) | Secondary Vacuum Break (deg.) | Air Valve Rod (in.) | Choke Rod (deg.) | Choke Unloader (deg.) | Fast Idle Speed (rpm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1987 | 17084201 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084205 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084208 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084209 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 38° | 38° | ② |
| | 17084210 | 11/32 | 7/8 | Fixed | 27° | — | .025 | 20° | 38° | ② |
| | 17084507 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084509 | 7/16 | 1 | Fixed | 27° | 36° | .025 | 20° | 36° | ② |
| | 17084525 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |
| | 17084527 | 7/16 | 1 | Fixed | 25° | 36° | .025 | 20° | 36° | ② |

① 3 turns after contacting lever for preliminary setting
② Refer to Emission Label

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