# BASIC FUEL SYSTEM DIAGNOSIS

## Introduction

When there is a problem starting or driving a vehicle, two of the most important checks involve the ignition and the fuel systems. The two questions that 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 ***Section 2*** of this manual. If the ignition system checks out (there is spark), then you must determine if the fuel system is operating properly (is there fuel?).

## Precautions

Safety is the most important factor when performing not only fuel system maintenance, but any type of maintenance. Failure to conduct maintenance and repairs in a safe manner may result in serious personal injury or death. Maintenance and testing of the vehicle's fuel system components can be accomplished safely and effectively by adhering to the following rules and guidelines:

- **To avoid the possibility of fire and personal injury, always disconnect the negative battery cable unless the repair or test procedure requires that battery voltage be applied.**
- **Always relieve the fuel system pressure prior to disconnecting any fuel system component (injector, fuel rail, pressure regulator, etc.), fitting or fuel line connection. Exercise extreme caution whenever relieving fuel system pressure to avoid exposing skin, face and eyes to fuel spray. Please be advised that fuel under pressure may penetrate the skin or any part of the body that it contacts.**
- **Always place a shop towel or cloth around the fitting or connection prior to loosening to absorb any excess fuel due to spillage. Ensure that all fuel spillage (should it occur) is quickly removed from engine surfaces. Ensure that all fuel soaked cloths or towels are deposited into a suitable waste container.**
- **Always keep a dry chemical (Class B) fire extinguisher near the work area.**
- **Do not allow fuel spray or fuel vapors to come into contact with a spark or open flame.**
- **Always use a backup wrench when loosening and tightening fuel line connection fittings. This will prevent unnecessary stress and torsion to fuel line piping. Always follow the proper torque specifications.**
- **Always replace worn fuel fitting O-rings with new ones. Do not substitute fuel hose or equivalent where fuel pipe is installed.**
- **Due to the possibility of a fire or explosion, never drain or store gasoline in an open container.**

# CENTRAL FUEL INJECTION (CFI)

## General Description

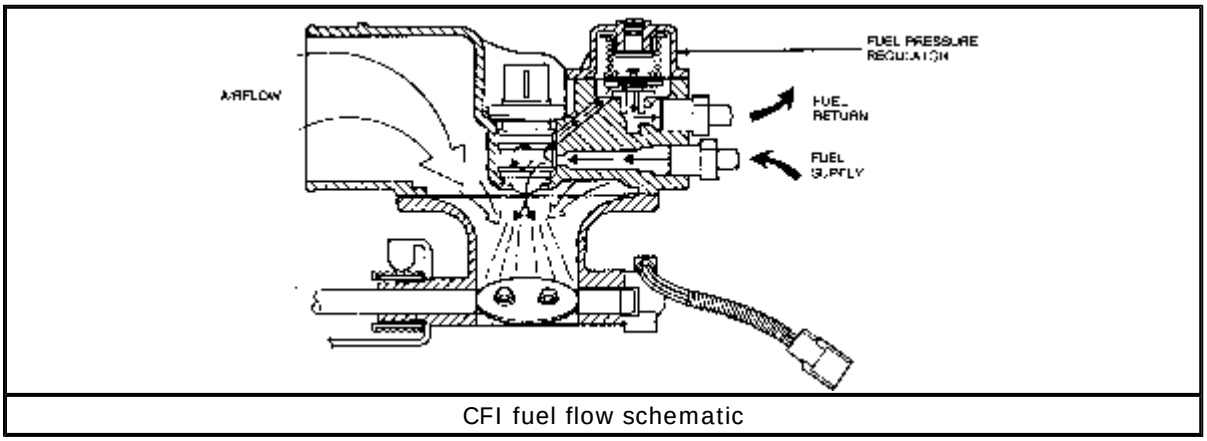
The Central Fuel Injection (CFI) system is a single point, pulse time modulated injection system which was used on 1986-90 2.5L engines. Fuel is metered into the air intake stream according to engine demands by one or two solenoid injection valves, mounted in a throttle body on the intake manifold. Fuel is supplied from the fuel tank by a single low-pressure pump. The fuel is filtered and sent to the air throttle body, where a regulator keeps the fuel delivery pressure at a constant 39 psi (269 kPa) on high-pressure systems, or 14.5 psi (100 kPa) on low-pressure systems. One or two injector nozzles are mounted vertically above the throttle plates and connected in parallel with the fuel pressure regulator. Excess fuel supplied by the pump, but not needed by the engine, is returned to the fuel tank by a steel fuel return line.

The fuel charging assembly controls air/fuel ratio. It consists of a typical carburetor type throttle body, and has one or two bores without venturis. The throttle shaft and valves control engine air flow based on driver demand. The throttle body attaches to the intake manifold mounting pad.

A throttle position sensor is attached to the throttle shaft. It includes a potentiometer (or rheostat) that electrically senses throttle opening. A throttle kicker solenoid fastens opposite the throttle position sensor. During air conditioning operation, the solenoid extends to slightly increase engine idle speed.

Cold engine speed is controlled by an automatic kick-down vacuum motor. There is also an all-electric, bimetal coil spring which controls cold idle speed. The bimetal electric coil operates like a conventional carburetor choke coil, but the fuel injection system uses no choke. Fuel enrichment for cold starts is controlled by the computer and injectors.

The fuel pressure regulator controls critical injector fuel pressure. The regulator receives fuel from the electric fuel pump and then adjusts the fuel pressure for uniform fuel injection. The regulator sets fuel pressure at 39 psi (269 kPa) on high pressure systems, or 14.5 psi (100 kPa) on low pressure systems.




CFI fuel flow schematic

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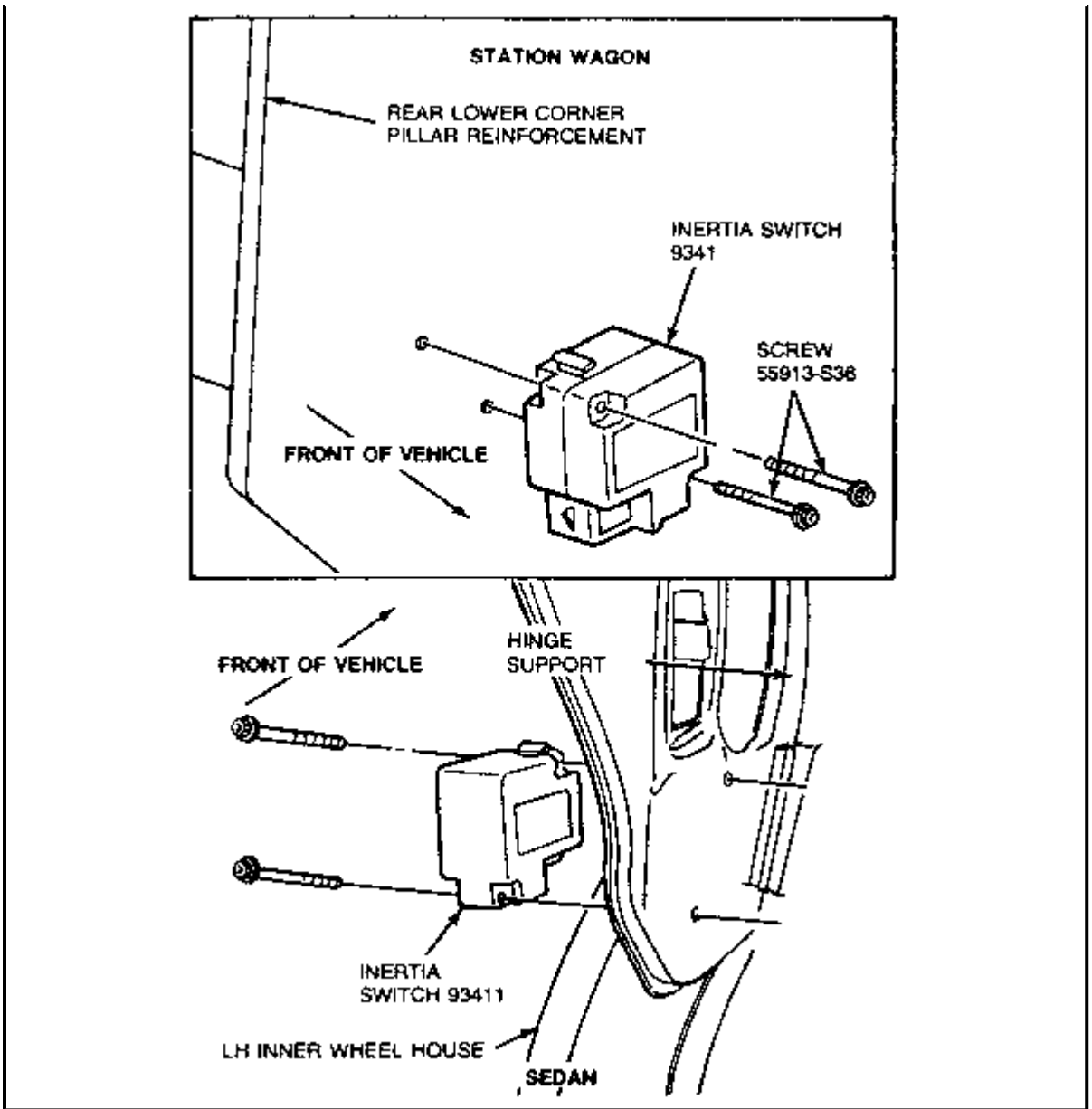
The fuel manifold (or fuel rail) evenly distributes fuel to each injector. Its main purpose is to equalize the fuel flow. One end of the fuel rail contains a relief valve for testing fuel pressure during engine operation.

The fuel injectors are electromechanical devices. The electrical solenoid operates a pintle or ball metering valve which always travels the same distance from closed to open to closed. Injection is controlled by varying the length of time the valve is open.

The computer, based on voltage inputs from the crank position sensor, operates each injector solenoid two times per engine revolution. When the injector metering valve unseats, fuel is sprayed in a fine mist into the intake manifold. The computer varies fuel enrichment based on voltage inputs from the exhaust gas oxygen sensor, barometric pressure sensor, manifold absolute pressure sensor, etc., by calculating how long to hold the injectors open. The longer the injectors remain open, the richer the mixture. This injector ON time is called pulse duration.

## Relieving Fuel System Pressure

1. **Disengage the electrical connector from the inertia switch located on the left side of the storage compartment.**




Inertia switch location

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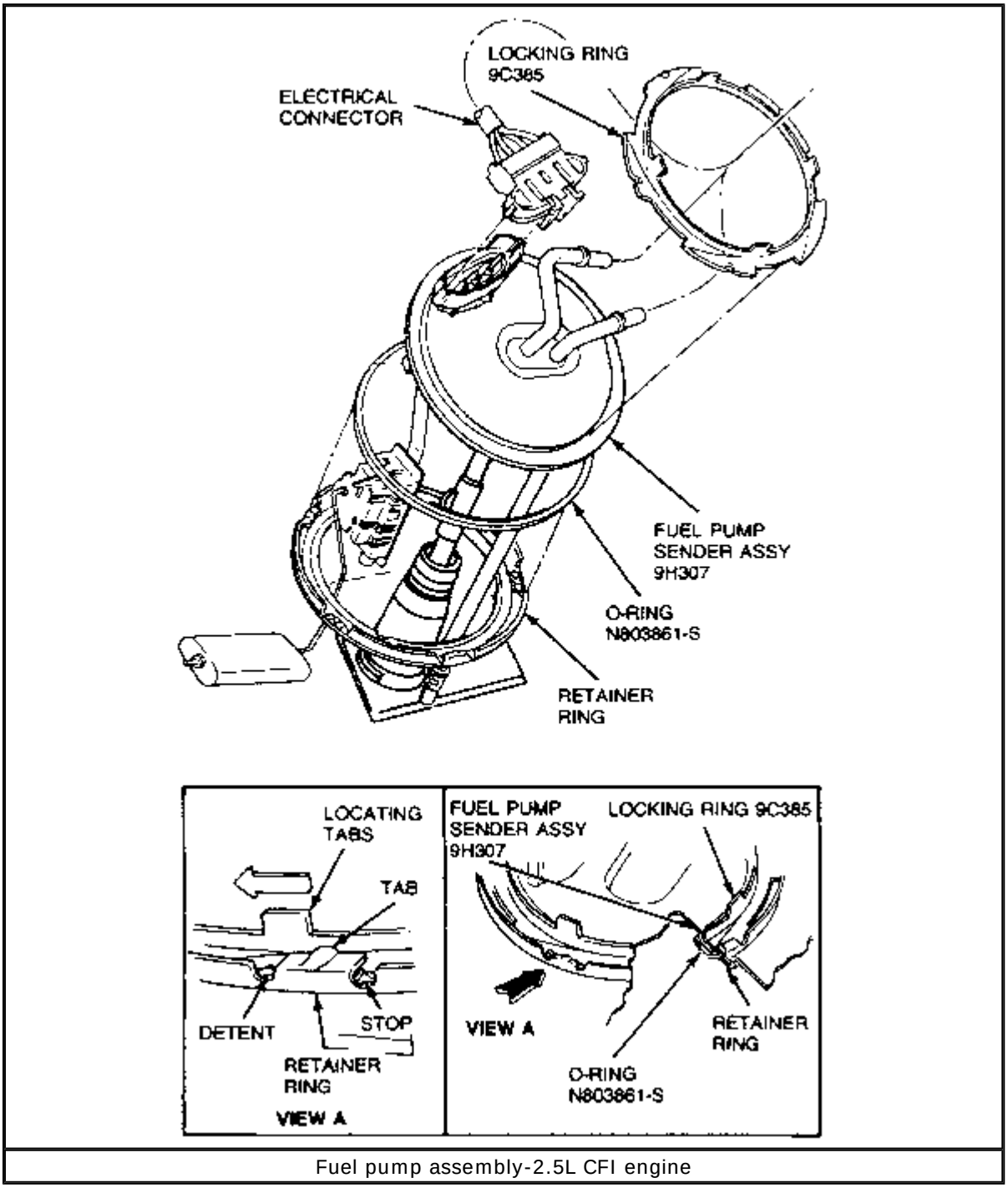
2. **Crank the engine for 15 seconds.**
3. **Engage the electrical connector to the inertia switch located on the left side of the storage compartment.**

## Electric Fuel Pump

### REMOVAL & INSTALLATION

1. **Relieve the fuel system pressure. For details, please refer to the procedure located earlier in this section.**
2. **Disconnect the negative battery cable.**
3. **Remove the fuel from the fuel tank by pumping it out through the filler neck using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00011, or equivalent.**

4. **Raise and safely support the vehicle, then disconnect and remove the fuel filler tube.**
5. **Support the fuel tank, then remove the fuel tank support straps. Partially lower the fuel tank, then remove the fuel lines, electrical connectors and vent lines from the tank. Remove the fuel tank from the vehicle, then place it on a work bench. Remove any dirt around the fuel pump attaching flange, so it will not get into the fuel tank.**
6. **Using Fuel Tank Sender Wrench D84P-9275-A or equivalent, turn the fuel pump locking ring counterclockwise, then remove the lock ring.**
7. **Remove the fuel pump and bracket assembly from the fuel tank, then remove and discard the flange gasket.**




Fuel pump assembly-2.5L CFI engine

**Click to enlarge**

**To install:**

8. Clean the fuel pump mounting flange, along with the fuel tank mounting surface and seal ring groove.
9. Put a light coating of grease on the new seal gasket to hold it in place during assembly, then install the gasket in the fuel ring groove.
10. Carefully install the fuel pump and sender assembly, making sure that the filter is not damaged. Make sure that the locating keys are in the keyways and that the seal ring stays in place.
11. Hold the assembly in place, then install the lock ring finger-tight, making sure all locking tabs are under the tank lock ring tabs.
12. Tighten the lock ring using Fuel Tank Sender Wrench D84P-9275-A, by turning it clockwise until the the ring is up against the stops.
13. Remove the fuel tank from the bench and support the tank while connecting the fuel lines, vent lines and electrical connectors to their proper locations.
14. Install the tank in the vehicle, then secure with the retaining straps. Carefully lower the vehicle.
15. Install the filler tube and tighten the retaining screws.
16. Fill the tank with at least 10 gallons of fuel, then check for leaks.
17. Connect the negative battery cable.
18. Connect a suitable fuel pressure gauge. Turn the ignition switch to the ON position 5-10 times, leaving it on for 3 seconds at a time, until the pressure gauge reads at least 30 psi (270 kPa). Check for leaks at the fittings.
19. Remove the pressure gauge, start the engine and recheck for leaks.

### TESTING

1. Ground the fuel pump lead of the self-test connector through a jumper wire at the FP lead.
2. Connect a suitable fuel pressure tester to the fuel pump outlet.
3. Turn the ignition key to the RUN position to operate the fuel pump.
4. Note the pressure reading. The fuel pressure should be 13-17 psi (90-117 kPa) for the CFI engine.

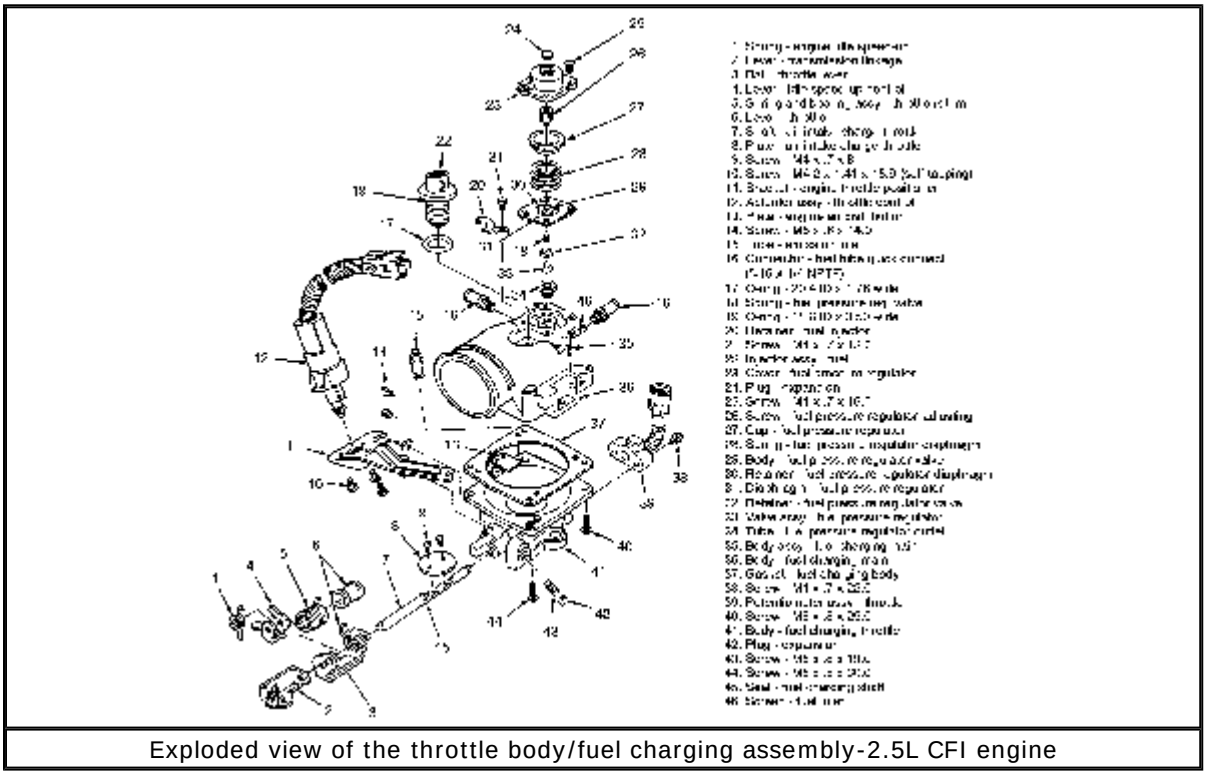
**A safety inertia switch is installed to shut off the electric fuel pump in case of collision. The switch is located on the left-hand side (driver's side) of the car, behind the rearmost seat side trim panel, or inside the rear quarter shock tower access door. If the pump shuts off, or if the vehicle has been hit and will not start, check for leaks first, then reset the switch. The switch is reset by pushing down on the button provided.**

## Throttle Body/Fuel Charging Assembly

### REMOVAL & INSTALLATION

1. Remove the air tube clamp at the fuel charging/throttle body assembly air inlet.
2. Disengage the electrical connector at the inertia switch located on the left-hand side of the luggage compartment.

3. **Remove the fuel cap and release the fuel tank pressure. Release the fuel system pressure by disengaging the inertia switch electrical connector, then cranking the engine for 15 seconds.**
4. **Disconnect the negative battery cable.**
5. **Disconnect the throttle cable and transmission throttle valve lever.**
6. **Disengage the electrical connector at the idle speed control (ISC), the throttle position (TP) sensor and the fuel injector.**
7. **Disconnect the fuel inlet and outlet connections, and the PCV vacuum lines at the throttle body assembly.**
8. **Remove fuel charging assembly retaining nuts, then remove the fuel charging assembly/throttle body.**
9. **Remove the mounting gasket from the intake manifold. Always use a new gasket for installation.**



Exploded view of the throttle body/fuel charging assembly-2.5L CFI engine

**Click to enlarge**

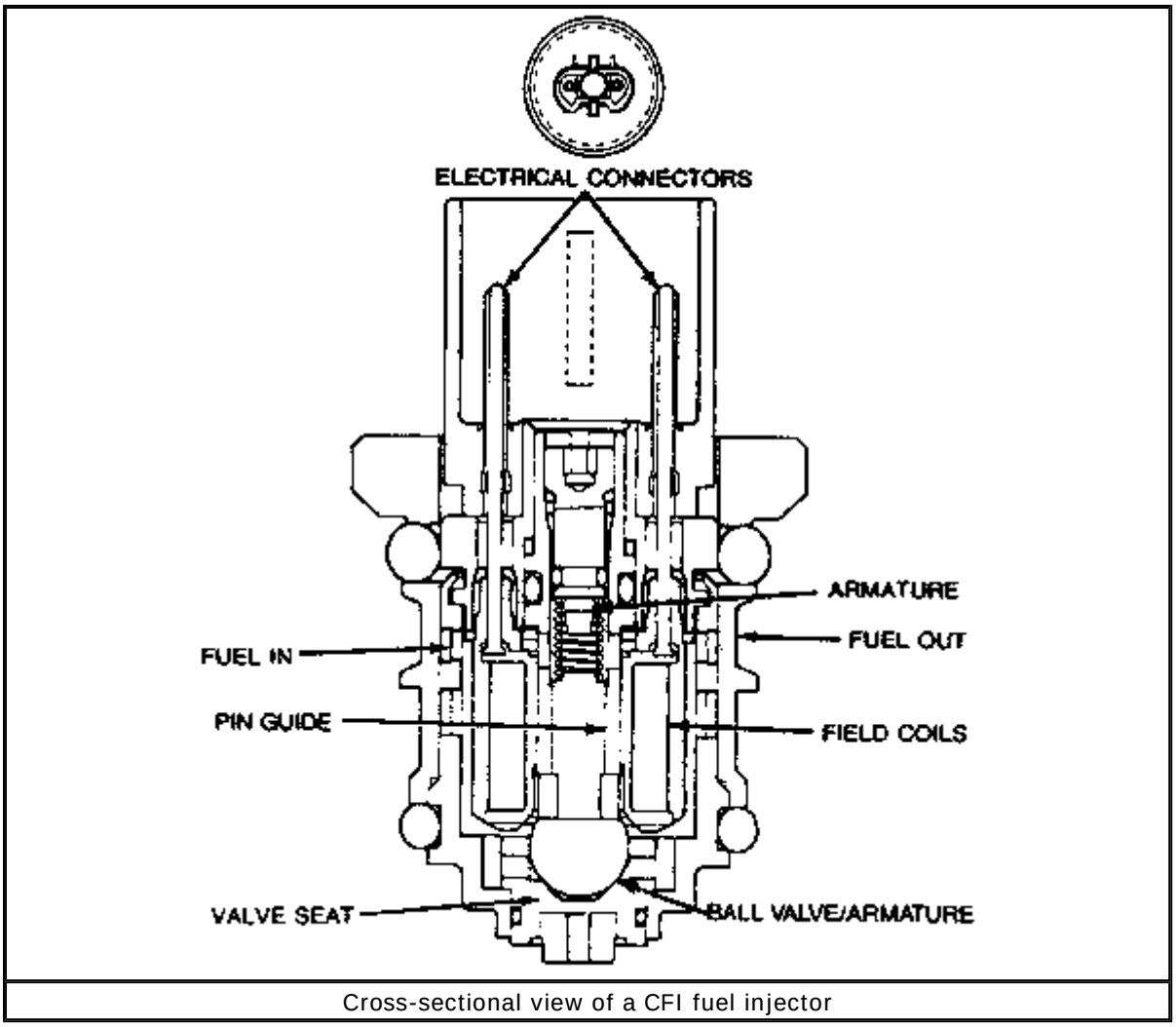
**To install:**

10. **Clean the mounting surfaces, then position a new gasket on the intake manifold.**
11. **Position the throttle body/fuel charging assembly on the intake manifold, then secure with the two retaining nuts. Tighten the nuts to 15-25 ft. lbs. (20-34 Nm).**
12. **Engage the ISC, TP sensor and fuel injector electrical connectors.**
13. **Fasten the fuel inlet and outlet connections, then connect the PCV vacuum line at the throttle body/fuel charging assembly.**
14. **Connect the throttle cable and transaxle throttle valve lever.**
15. **Engage the electrical connector at the inertia switch. Install the air tube and clamp at the fuel charging assembly.**
16. **Connect the negative battery cable, then start the engine and check for leaks.**

**Adjust the engine idle speed if necessary. Refer to the Engine/Emission Control Decal for idle speed specifications.**

## INJECTOR REPLACEMENT

1. **Remove the fuel injector retaining screw and retainer.**
2. **Remove the injector and the lower O-ring. Discard the O-ring.**




Cross-sectional view of a CFI fuel injector

**Click to enlarge**

**To install:**

3. **Lubricate a new lower O-ring and the injector seat area with clean engine oil. Do NOT use transmission oil!**
4. **Install the lower O-ring on the injector.**
5. **Lubricate the upper O-ring, then clean and lubricate the throttle body O-ring seat.**
6. **Install the injector by centering and applying a steady downward pressure with a slight rotational force.**
7. **Install the injector and the injector retaining screw. Tighten the retaining screw to 18-22 inch lbs. (2.0-2.5 Nm).**

## TESTING

1. Disengage the electrical connector from inertia switch on the left-hand side of the luggage compartment.
2. Crank the engine for 15 seconds to reduce fuel system pressure.
3. Disconnect the fuel supply line at the throttle body using Spring Lock Coupling Adapter D85L-9974-C or equivalent.
4. Connect a fuel pressure gauge that is suitable for reading 0-60 psi (0-300 kPa) to the adapter.
5. Connect the inertia switch in the luggage compartment.
6. Start the engine and check for fuel system pressure, then accelerate the engine. The pressure should remain stable throughout acceleration.

## Fuel Pressure Regulator

### REMOVAL & INSTALLATION

1. Relieve the fuel system pressure. For details, please refer *Relieving Fuel System Pressure*.

**The fuel pressure regulator cover is spring loaded. Apply downward pressure when removing it to avoid losing any of the components.**

2. Remove the four fuel pressure regulator retaining screws.
3. Remove the cover assembly, cup, spring, and diaphragm assembly, then remove the regulator valve seat.

**To install:**

4. Install the fuel pressure regulator valve seat.
5. Install the fuel pressure regulator diaphragm assembly, spring and spring cover.
6. While applying downward pressure to the cover, install the four retaining screws, then tighten them to 27-35 inch lbs. (3.1-3.9 Nm).

## Pressure Relief Valve

### REMOVAL & INSTALLATION

1. If the fuel charging assembly is mounted to the engine, remove the fuel tank gas cap.
2. Properly release the fuel system pressure. For details, please refer to the procedure located earlier in this section.
3. Using the proper wrench, remove the pressure relief valve from the fuel injection manifold.

**To install:**

4. Install the pressure relief valve to the fuel injection manifold. Tighten the valve to 4-6 inch lbs. (0.5-0.7 Nm).
5. Install the fuel tank gas cap.

## Throttle Position (TP) Sensor

## REMOVAL & INSTALLATION

1. **Disconnect the negative battery cable.**
2. **Disconnect the Throttle Position (TP) sensor from the wiring harness.**
3. **Scribe a reference mark across the edge of the sensor where it meets the throttle body to ensure correct position during installation.**
4. **Unfasten the retaining screws, then remove the TP sensor.**

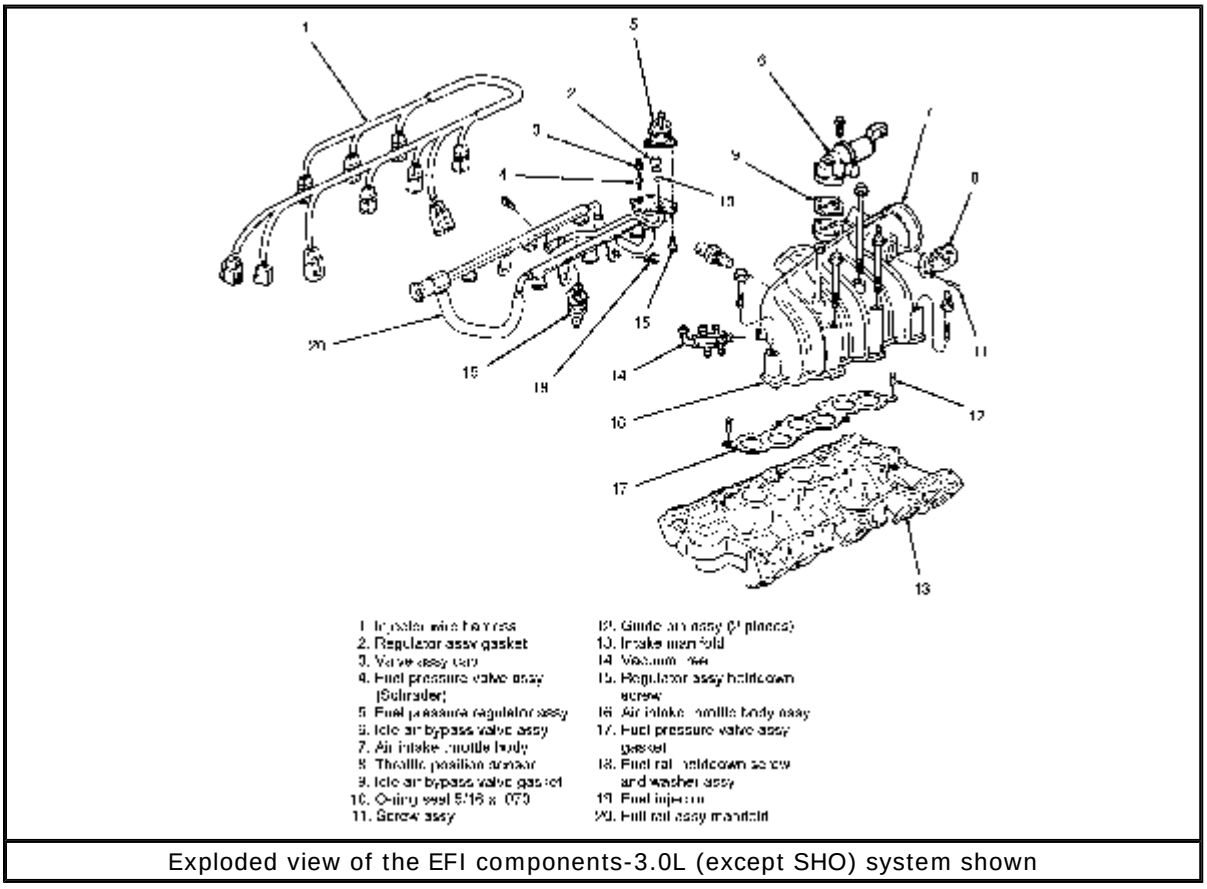
**To install:**

5. **Position the TP sensor according to the marks made during removal, then install the retaining screws. Tighten the the screws to 11-16 inch lbs. (1.2-1.8 Nm).**
6. **Connect the negative battery cable.**

# ELECTRONIC FUEL INJECTION (EFI)

## General Description

The Electronic Fuel Injection (EFI) system was used on 1991 2.5L, 1986-92 3.0L (except SHO) and 1988-92 3.8L engines. The EFI fuel system includes a high pressure (30-45 psi/209-310 kPa) tank-mounted electric fuel pump, throttle body, fuel charging manifold, pressure regulator, fuel filter, and both solid and flexible fuel lines. The fuel charging manifold includes six electronically controlled fuel injectors, each mounted directly above an intake port in the lower intake manifold. The Electronic Engine Control (EEC-IV) computer outputs a command to the fuel injectors to meter the appropriate quantity of fuel.




Exploded view of the EFI components-3.0L (except SHO) system shown

**Click to enlarge**

The fuel pressure regulator maintains a constant pressure drop across the injector nozzles. The regulator is referenced to intake manifold vacuum and is connected parallel to the fuel injectors and positioned on the far end of the fuel rail. Any excess fuel supplied by the pump passes through the regulator and is returned to the fuel tank via a return line.

The fuel pressure regulator is a diaphragm operated relief valve in which one side of the diaphragm senses fuel pressure and the other side senses manifold vacuum. Normal fuel pressure is established by a spring preload applied to the

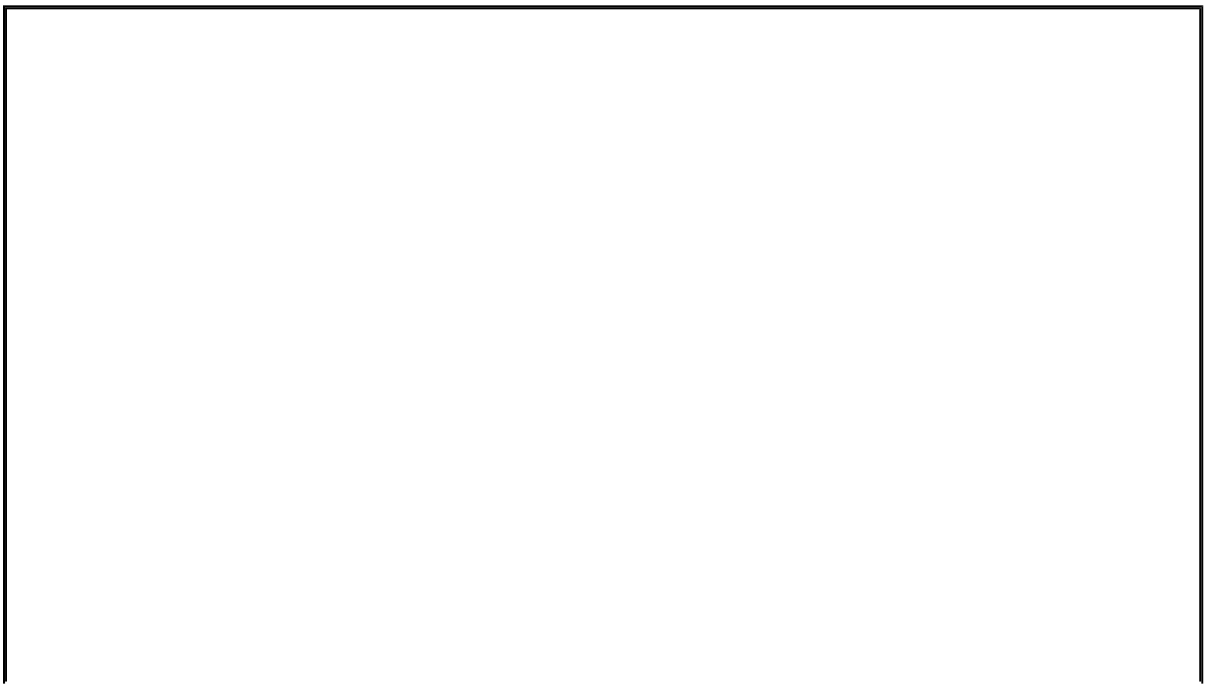
diaphragm. Control of the fuel system is maintained through the Electronic Engine Control (EEC) power relay and the EEC-IV control unit, although electrical power is routed through the fuel pump relay and an inertia switch. The fuel pump relay is normally located on a bracket somewhere above the Electronic Control Assembly (ECA) and the inertia switch is located in the storage compartment. Tank-mounted pumps can be either high or low-pressure, depending on the model.

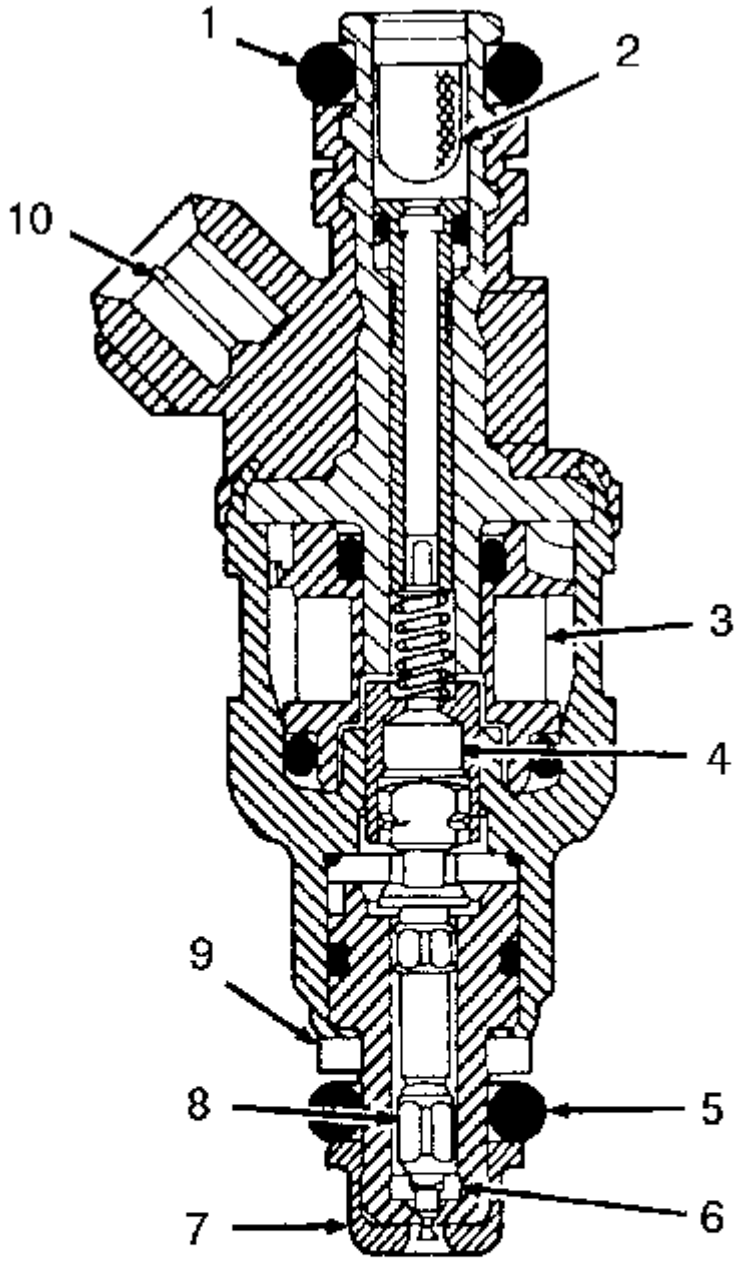
The inertia switch opens the power circuit to the fuel pump in the event of a collision. Once tripped, the switch must be reset manually by pushing the reset button on the assembly. Check to make sure that the inertia switch is reset before diagnosing power supply problems to the fuel pump circuit.

The fuel injectors used with the EFI system are an electromechanical (solenoid) type designed to meter and atomize fuel delivered to the intake ports of the engine. The injectors are mounted in the lower intake manifold and positioned so that their spray nozzles direct the fuel charge in front of the intake valves. The injector body consists of a solenoid actuated pintle and needle valve assembly. The control unit sends an electrical impulse that activates the solenoid, causing the pintle to move inward off the seat and allow the fuel to flow. The amount of fuel delivered is controlled by the length of time the injector is energized (pulse width), since the fuel flow orifice is fixed and the fuel pressure drop across the injector tip is constant. Correct atomization is achieved by contouring the pintle at the point where the fuel enters the pintle chamber.

**Exercise care when handling fuel injectors during service. Be careful not to lose the pintle cap and always replace old O-rings with new ones to assure a tight seal. Never apply direct battery voltage to test a fuel injector.**

The injectors receive high pressure fuel from the fuel manifold (fuel rail) assembly. The complete assembly includes a single, preformed tube with six injector connectors, a mounting flange for the fuel pressure regulator, mounting attachments which locate the fuel manifold assembly and provide fuel injector retention and a Schrader® quick-disconnect fitting used to perform fuel pressure tests.






1. Rail O-ring seal
2. Integral filter
3. Coil
4. Armature
5. Manifold O-ring seal
6. Stainless steel body
7. Pintle protection cap
8. Stainless steel needle or pintle
9. Washer
10. Electrical connector

Cross-sectional view of an EFI fuel injector

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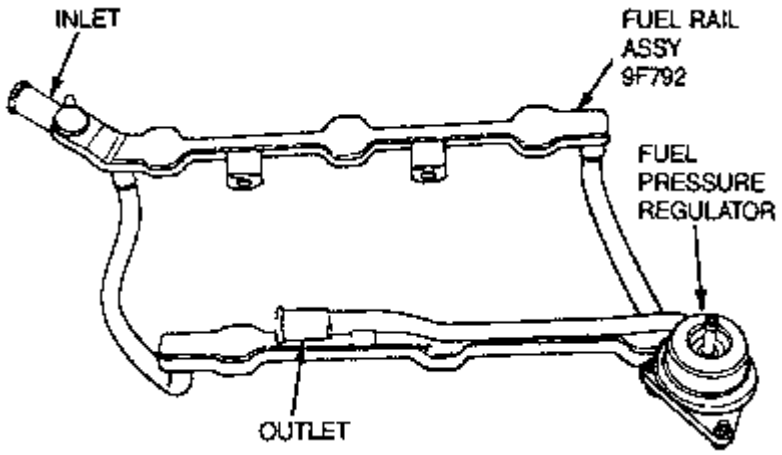


Fuel supply manifold assembly

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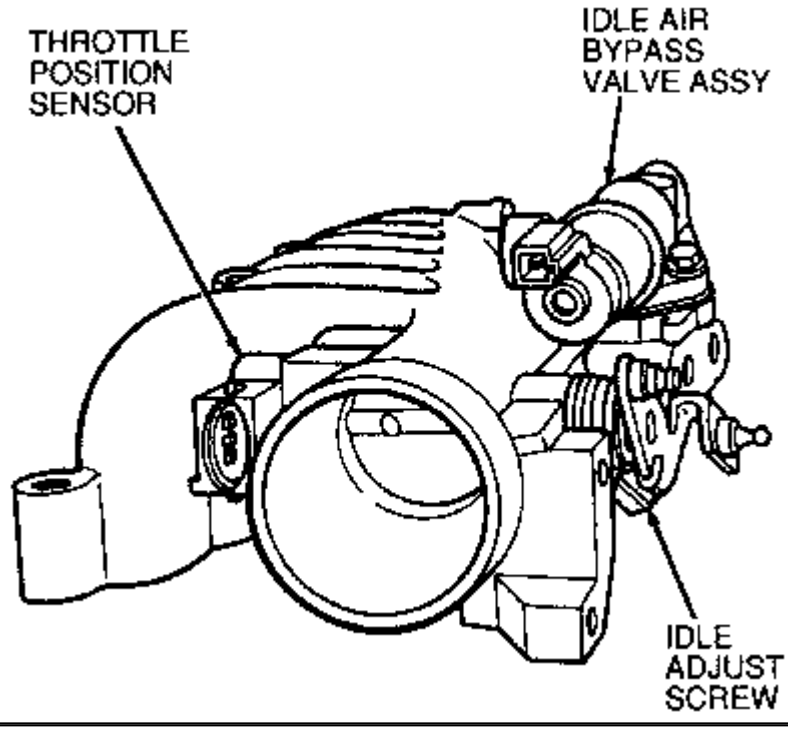
The fuel manifold is normally removed with fuel injectors and pressure regulator attached. Fuel injector electrical connectors are plastic and have locking tabs that must be released when disconnecting the wiring harness.

The air subsystem components include the air cleaner assembly, air flow (vane) meter, throttle air bypass valve and air ducts that connect the air system to the throttle body assembly. The throttle body regulates the air flow to the engine through a single butterfly-type throttle plate controlled by conventional accelerator linkage. The throttle body has an idle adjustment screw (throttle air bypass valve) to set the throttle plate position, a PCV fresh air source upstream of the throttle plate, individual vacuum taps for PCV and control signals, and a throttle position sensor that provides a voltage signal for the EEC-IV control unit.



Throttle position sensor and idle air bypass valve location on the throttle body

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The throttle air bypass valve is an electro-mechanical (solenoid) device whose operation is controlled by the EEC-IV control unit. A variable air metering valve controls both cold and warm idle air flow in response to commands from the control unit. The valve operates by bypassing a regulated amount of air around the throttle plate; the higher the voltage signal from the control unit, the more air is bypassed through the valve. In this manner, additional air can be added to the fuel mixture without moving the throttle plate. At curb idle, the valve provides smooth idle for various engine coolant temperatures, compensates for A/C load and compensates for transaxle load and no-load conditions. The valve also provides fast idle for start-up, replacing the fast idle cam, throttle kicker and anti-dieseling solenoid common to previous models.

There are no curb idle or fast idle adjustments. As in curb idle operation, the fast idle speed is proportional to engine coolant temperature. Fast idle kick-down will occur when the throttle is kicked. A time-out feature in the ECA will also automatically kick-down fast idle to curb idle after approximately 15-25 seconds once the coolant has reached approximately 160°F (71°C). The signal duty cycle from the ECA to the valve will be at 100% (maximum current) during the crank to provide maximum air flow, allowing no-touch starting at any time (engine cold or hot).

## Relieving Fuel System Pressure

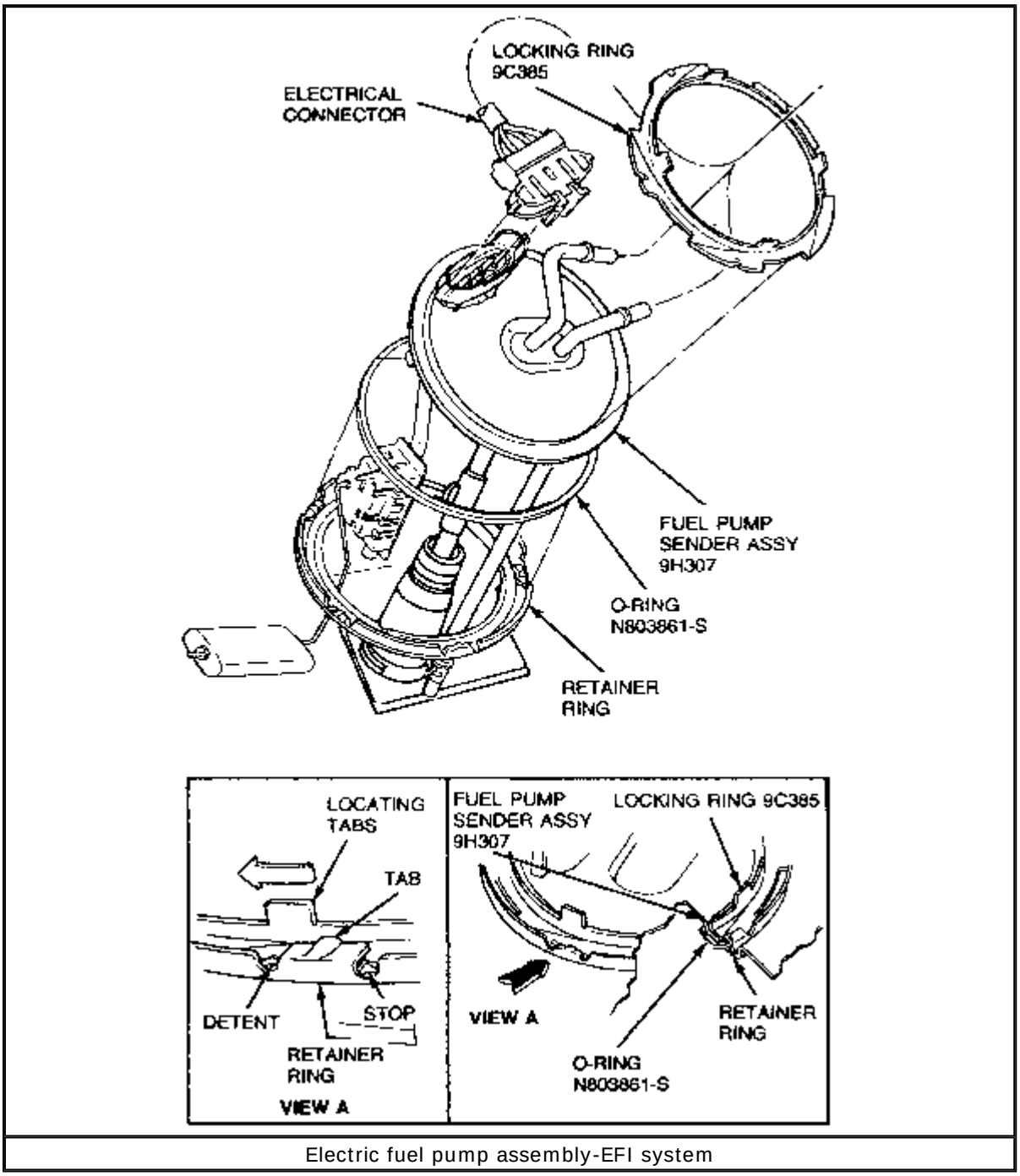
1. **Remove the fuel tank cap.**
2. **Remove the cap from the pressure relief Schrader valve on the fuel rail.**
3. **Attach pressure gauge tool T80L-9974-A or equivalent, to the fuel pressure relief valve.**
4. **Release the pressure from the system into a suitable container.**
5. **Remove the pressure gauge tool, then install the cap on the pressure relief valve. Install the fuel tank cap.**

## Electric Fuel Pump

### REMOVAL & INSTALLATION

1. **Disconnect the negative battery cable.**
2. **Relieve the fuel system pressure. For details, please refer to the procedure located earlier in this section.**
3. **Remove the fuel from the fuel tank by pumping it out through the filler neck using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00011, or equivalent.**
4. **Raise and safely support the vehicle, then disconnect and remove the fuel filler tube.**
5. **Support the fuel tank, then remove the fuel tank support straps. Partially lower the fuel tank, then detach the fuel lines, electrical connectors and vent lines from the tank. Remove the fuel tank from the vehicle, then place it on a work bench. Remove any dirt around the fuel pump attaching flange, so it will not get into the fuel tank.**

6. **Using Fuel Tank Sender Wrench D84P-9275-A or equivalent, turn the fuel pump lock ring counterclockwise, then remove the lock ring.**
7. **Remove the fuel pump and bracket assembly from the fuel tank, then remove and discard the flange gasket.**




Electric fuel pump assembly-EFI system

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**To install:**

8. **Clean the fuel pump mounting flange, as well as the fuel tank mounting surface and seal ring groove.**
9. **Put a light coating of grease on the new seal gasket to hold it in place during assembly, then install the gasket in the fuel ring groove.**
10. **Carefully install the fuel pump and sender assembly, making sure that the filter is**

not damaged. Make sure that the locating keys are in the keyways and that the seal ring stays in place.

11. Hold the assembly in place, then install the lock ring finger-tight, making sure all locking tabs are under the tank lock ring tabs.
12. Tighten the lock ring using Fuel Tank Sender Wrench D84P-9275-A or equivalent, by turning it clockwise until the ring is up against the stops.
13. Remove the fuel tank from the bench and support the tank while attaching the fuel lines, vent lines and electrical connectors to their proper locations.
14. Install the tank in the vehicle, then secure with the retaining straps. Carefully lower the vehicle.
15. Install the filler tube and tighten the retaining screws.
16. Fill the tank with at least 10 gallons of fuel, then check for leaks.
17. Connect the negative battery cable.
18. Connect a suitable fuel pressure gauge. Turn the ignition switch to the ON position 5-10 times, leaving it on for 3 seconds at a time, until the pressure gauge reads at least 30 psi (207 kPa). Check for leaks at the fittings.
19. Remove the pressure gauge, then start the engine and recheck for leaks.

### TESTING

1. Ground the fuel pump lead of the self-test connector through a jumper wire at the FP lead.
2. Connect a suitable fuel pressure tester to the fuel pump outlet.
3. Turn the ignition key to the RUN position to operate the fuel pump.
4. The fuel pressure should be 35-45 psi (241-310 kPa) for the 3.0L and 3.8L engines. For the 2.5L engine, the fuel pressure should be 45-60 psi (310-414 kPa).

**A safety inertia switch is installed to shut off the electric fuel pump in case of collision. The switch is located on the left-hand side (driver's side) of the car, behind the rearmost seat side trim panel, or inside the rear quarter shock tower access door. If the pump shuts off, or if the vehicle has been hit and will not start, check for leaks first, then reset the switch. The switch is reset by pushing down on the button provided.**

## Throttle Body

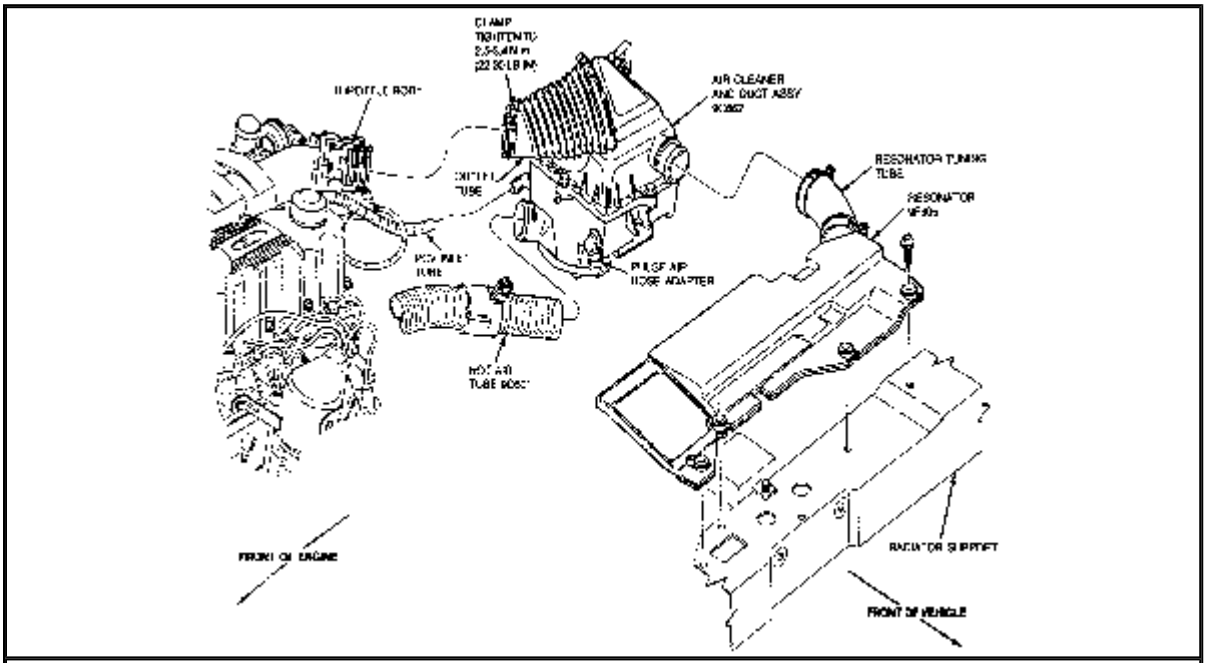
### REMOVAL & INSTALLATION

#### 2.5L Engine

1. Disconnect the negative battery cable. Remove the engine air cleaner outlet tube.
2. Relieve the fuel system pressure, as previously described.
3. Remove the throttle body retaining bolts. Be sure that the TPS electrical connector has been disengaged from the wiring harness.
4. Disconnect the air bypass hose.
5. Disconnect the throttle control cable. If equipped with speed control, disconnect the speed control cable.
6. If equipped with an automatic transaxle, disconnect the Throttle Valve (TV) control

rod.

7. Disconnect and remove the throttle bracket. Carefully separate the throttle body from the upper intake manifold.
8. Remove and discard the gasket between the throttle body and upper intake manifold. If scraping is necessary to clean the surfaces, be careful not to damage the air bypass valve or throttle body gasket surfaces. Also, do not allow gasket material to drop into the throttle body.




Throttle body and related components-2.5L EFI engine

Click to enlarge

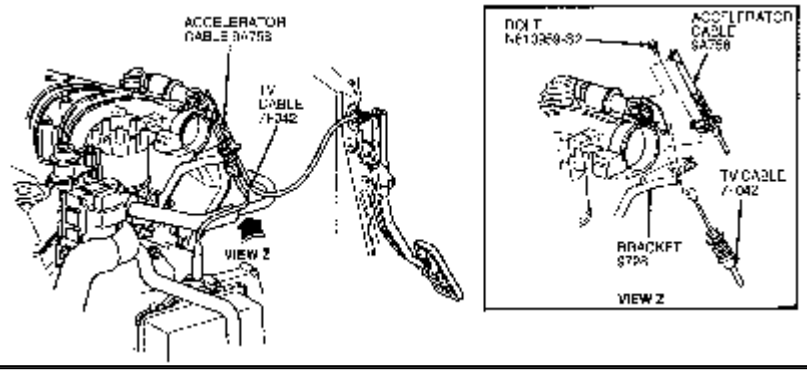
**To install:**

9. Make sure that the throttle body and upper intake manifold mating surfaces are clean.
10. Install the upper throttle body gasket on the two studs of the upper intake manifold.
11. Retain the throttle body to the intake manifold with the attaching bolts. Tighten the bolts to 12-15 ft. lbs. (16-20 Nm).
12. Install the throttle bracket, then secure using the two retaining nuts. Tighten the nuts to 12-15 ft. lbs. (16-20 Nm).
13. Engage the TPS electrical connector and the air bypass hose.
14. If the fuel charging assembly is still mounted to the engine, connect the engine air cleaner outlet tube to the throttle body intake, securing with a hose clamp. Tighten the clamp to 23-30 inch lbs. (2.5-3.4 Nm).
15. Connect the throttle control cable, speed control cable and transaxle TV control rod, as required.
16. Connect the negative battery cable.

## 3.0L Engine-Except SHO

1. Disconnect the negative battery cable.

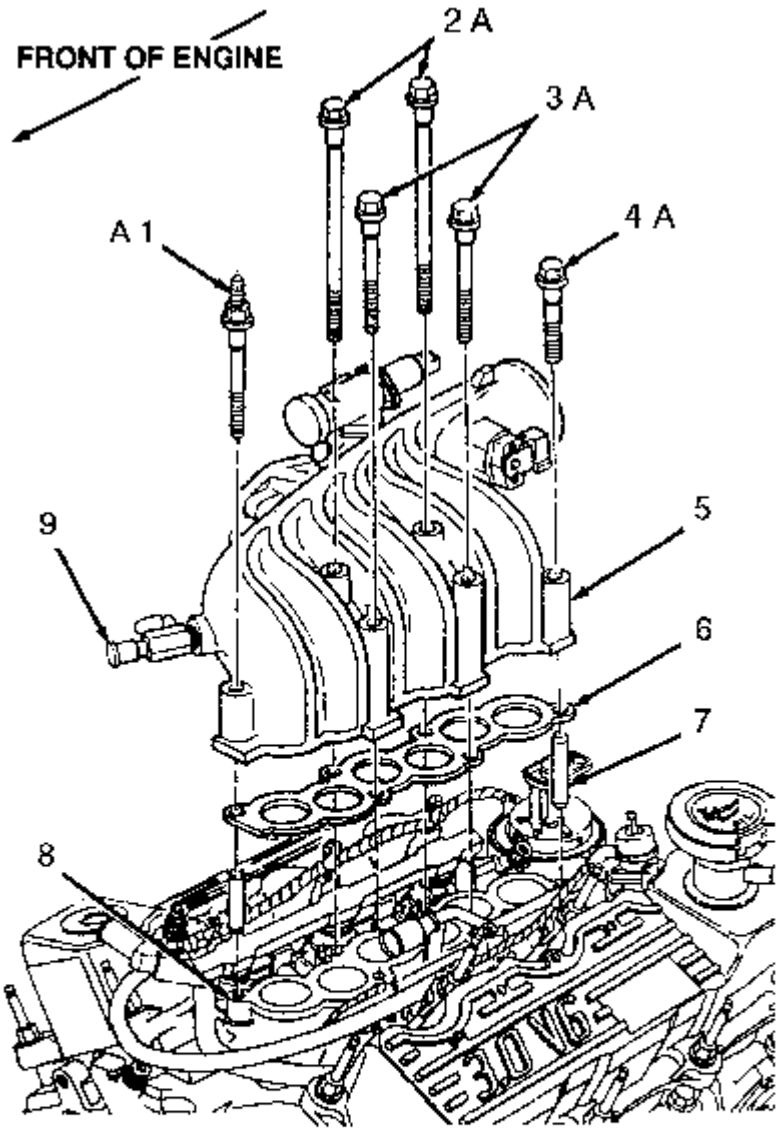
2. **Loosen the air cleaner duct hose retaining clamps, then remove the hose.**
3. **Remove the idle speed control solenoid shield.**
4. **Disconnect the throttle/accelerator and TV cable from the throttle body linkage.**




Accelerator and TV cable locations

**Click to enlarge**

5. **Matchmark and disconnect the vacuum hoses at the vacuum tree.**
6. **If equipped, loosen the EGR tube nuts at the EGR valve and exhaust manifold fitting. Remove the tube or rotate it out of the way.**
7. **Disengage the Air Charge Temperature (ACT), Idle Speed Control (ISC) and Throttle Position (TP) sensor electrical connectors.**
8. **Remove the retaining nuts from the alternator brace, then remove the brace.**
9. **Note the location of the six throttle body retaining bolts, then loosen and remove the retaining bolts.**




1A. Stud bolt
2A. Bolt-M8 x 1.25 x 130
3A. Bolt-M8 x 1.25 x 100
4A. Bolt-M8 x 1.25 x 68
5. Air intake throttle body
6. Air intake throttle body gasket
7. Guide pin
8. Lower intake manifold
9. Fitting and cap
A. Tighten to 20-30 N.m (15-22 lb-ft)

Tag and remove the six throttle body retaining bolts, then lift the throttle body from the intake manifold

Click to enlarge

10. **Lift and remove the throttle body assembly from the intake manifold, then discard the old gasket.**

**To install:**

11. **Lightly oil all bolt and stud threads. Clean and inspect the intake manifold and throttle body mating surfaces.**

**Be careful when cleaning the gasket mating surfaces because aluminum gouges easily and may form leak paths.**

12. **If available, position guide pins to aid in the alignment during installation.**
13. **Place a new gasket on the intake manifold.**
14. **Aligning the bolt holes, install the throttle body on the intake manifold. Install the one stud bolt and the five retaining bolts. Tighten the bolts to 15-22 ft. lbs. (20-30 Nm).**
15. **Install the alternator brace to the throttle body and alternator bracket. Tighten the nuts to 12 ft. lbs. (16 Nm).**
16. **Connect the PCV hose to the tube underneath the throttle body.**
17. **If equipped, install the EGR tube to the EGR valve and exhaust manifold fitting. Tighten to 37 ft. lbs. (50 Nm).**
18. **Connect the vacuum hoses to their proper locations as marked during removal.**
19. **Engage the electrical connectors to the ACT, ISC and TP sensors.**
20. **Connect the throttle and TV cables to the throttle body linkage.**
21. **Connect the air cleaner duct hose to the throttle body and air cleaner assembly. Tighten the clamp to 36 inch lbs. (4 Nm).**
22. **Connect the negative battery cable.**
23. **Start the engine and check for vacuum leaks. Check the engine idle.**

**The Throttle Valve (TV) cable must be adjusted if the throttle body is removed for any reason and/or the throttle plate idle adjustment screw position is changed.**

24. **Adjust the TV cable as follows:**
    1. **Connect the TV cable eye to the transaxle throttle control lever link, then attach the cable boot to the chain cover.**
    2. **If equipped with the 3.0L engine, with the TV cable mounted in the engine bracket, make sure the threaded shank is fully retracted. To retract the shank, pull up on the spring rest with the index fingers and wiggle the top of the thread shank through the spring with the thumbs.**
    3. **If equipped with the 3.8L engine, the TV cable must be unclipped from the right intake manifold clip. To retract the shank, span the crack between the two 180° segments of the adjuster spring rest with a suitable tool. Compress the spring by pushing the rod toward the throttle body with the right hand. While the spring is compressed, push the threaded shank toward the spring with the index and middle fingers of the left hand. Do not pull on the cable sheath.**
    4. **Attach the end of the TV cable to the throttle body.**
    5. **If equipped with the 3.8L engine, rotate the throttle**

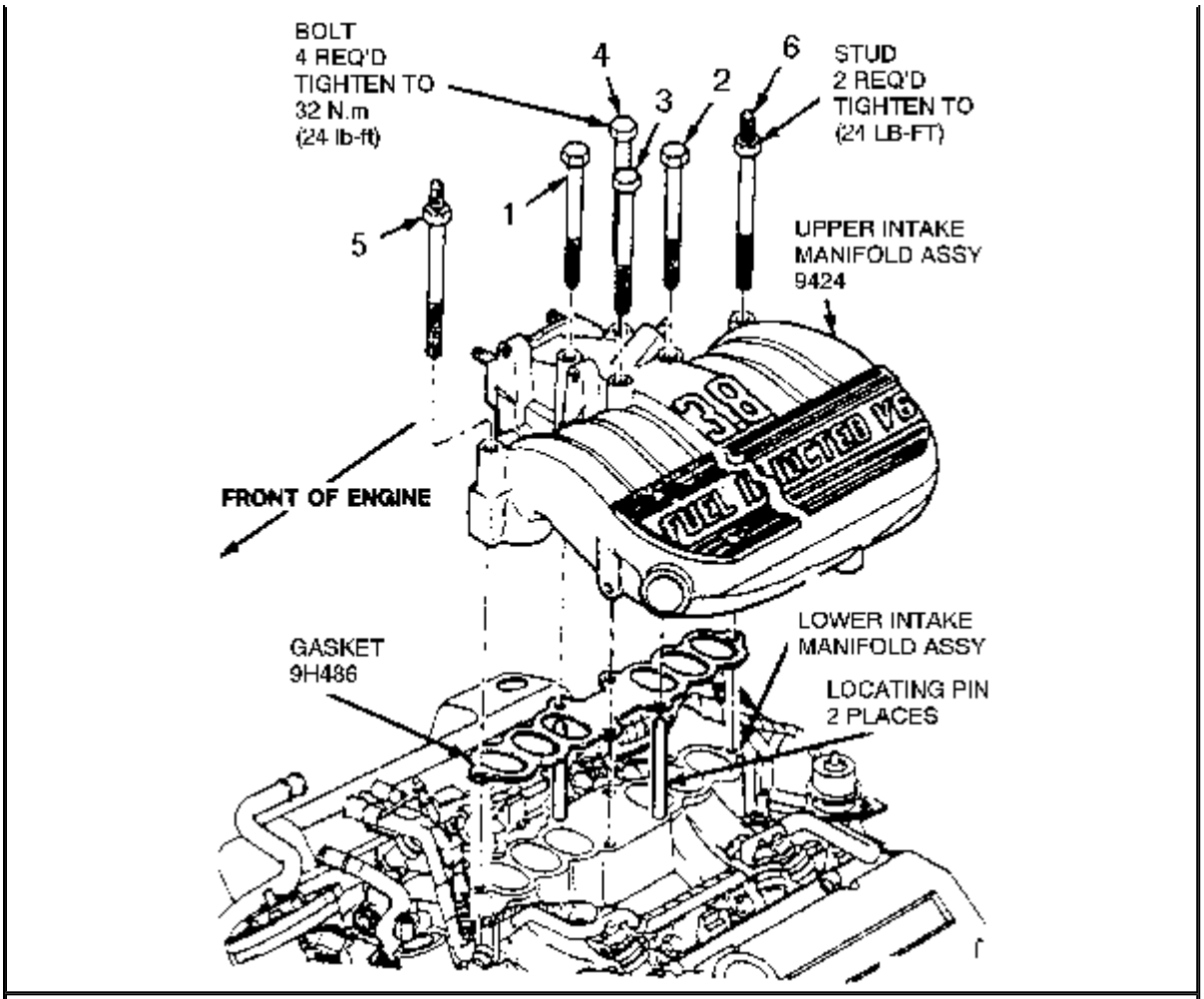
body primary lever (the lever to which the TV-driving nail is attached) by hand to the wide-open-throttle position. The white adjuster shank must be seen to advance. If not, look for the cable sheath/foam hang-up on engine/body components. Attach the TV cable in the top position of the right intake manifold clip. The threaded shank must show movement or "ratchet" out of the grip jaws. If there is no movement, inspect the TV cable system for broken or disconnected components, then repeat the procedure.

25. Install the shield onto the idle speed control solenoid, then tighten the bolts to 13 inch lbs. (1.4 Nm).

## 3.8L Engine

### UPPER INTAKE MANIFOLD AND THROTTLE BODY

1. Disconnect the negative battery cable.
2. Disengage the electrical connectors at the idle air bypass valve, throttle position sensor and the EGR position sensor.
3. Disconnect the throttle linkage at the throttle ball and transmission linkage from the throttle body. Remove the two retaining bolts securing the bracket to the intake manifold, then position the bracket with the cables out of the way.
4. Disengage the upper intake manifold vacuum fitting connections by disconnecting all of the vacuum lines to the vacuum tree, EGR valve and fuel pressure regulator.
5. Disconnect the PCV system by removing the hose from the fitting on the rear of the upper manifold.
6. Remove the nut retaining the EGR transducer to the upper intake manifold. Loosen the EGR tube at the exhaust manifold, then disconnect at the EGR valve.
7. Remove the two bolts retaining the EGR valve to the upper intake manifold, then remove the EGR valve and the EGR transducer as an assembly.
8. Remove the two canister purge lines from the fittings on the throttle body.
9. Remove the six upper intake manifold retaining bolts.
10. Remove the two retaining bolts on the front and rear edges of the upper intake manifold where the manifold support brackets are located.
11. Remove the nut retaining the alternator bracket to the upper intake manifold, then remove the two bolts retaining the alternator bracket to the water pump and alternator.
12. Remove the upper intake and throttle body as an assembly from the lower intake manifold.




Upper intake manifold mounting-3.8L engine

Click to enlarge

**To install:**

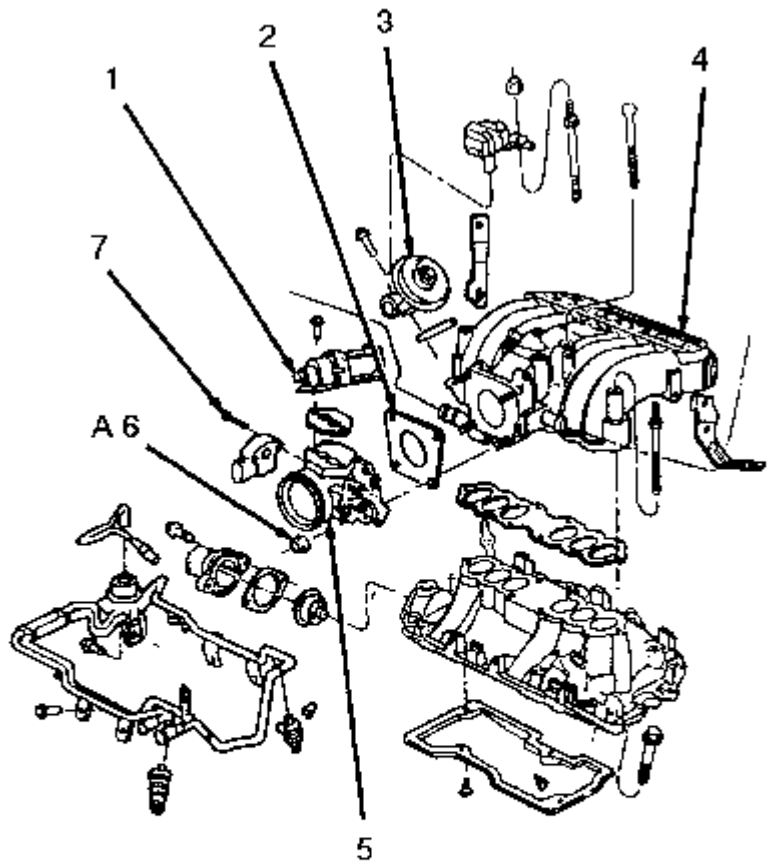
13. **Clean and inspect the mating surfaces of the lower and upper intake manifold.**
14. **Position a new gasket on the lower intake manifold mounting surface. Using alignment studs will make the job easier.**
15. **Install the upper intake manifold and throttle body assembly to the lower intake manifold. If alignment studs are not used, make sure the gasket stays in place.**
16. **Install the four center retaining bolts and two studs to the upper manifold and tighten to 8 ft. lbs. (10 Nm). Repeat, in sequence, in two steps:**
    1. **Step 1: 15 ft. lbs. (20 Nm).**
    2. **Step 2: 24 ft. lbs. (32 Nm).**
17. **Install the two bolts retaining the manifold support brackets to the upper manifold, then tighten to 19 ft. lbs. (25 Nm).**
18. **Position the alternator bracket, then install the two retaining bolts to the water pump and alternator. Install the alternator bracket to the upper intake manifold retaining nut, then tighten to 19 ft. lbs. (26 Nm).**
19. **Connect the EGR valve to the EGR tube, making sure that the tube is properly seated in the EGR valve. Connect the EGR valve to the upper manifold, then tighten to 19 ft. lbs. (26 Nm).**
20. **Install the canister purge lines to the fittings on the throttle body.**

21. **Connect the PCV hose to the rear of the upper manifold.**
22. **Connect the vacuum lines to the vacuum tree, EGR valve, and fuel pressure regulator.**
23. **Position the throttle linkage bracket with cables to the upper intake manifold. Install the two retaining bolts, then tighten them to 13 ft. lbs. (17 Nm). Connect the throttle cable and the transaxle cable to the throttle body.**
24. **Engage the air bypass valve, TP sensor and EGR position sensor electrical connectors.**

**If the lower intake manifold was removed, fill and bleed the cooling system.**

## AIR INTAKE THROTTLE BODY

1. **Disconnect the negative battery cable.**
2. **Disengage the TP sensor and air bypass valve electrical connectors.**
3. **Remove the four throttle body retaining bolts. Remove the throttle body assembly, then remove and discard the gasket between the throttle body and the upper intake manifold.**
4. **If scraping is necessary, be careful not to damage the air bypass valve or throttle body gasket surfaces. Also, do not allow gasket material to drop into the throttle body.**




1. Idle air bypass valve
2. Gasket
3. EGR valve
4. Upper intake manifold
5. Throttle body
6A. Nut
7. Screw
A. Tighten to 25 N.m (19 lb-ft)

Throttle body and related components-3.8L engine

Click to enlarge

**To install:**

5. **Install the throttle body using a new gasket on the four studs of the upper intake manifold. Tighten the retaining nuts to 19 ft. lbs. (26 Nm).**
6. **Engage the throttle position sensor and the idle air bypass valve.**
7. **Connect the negative battery cable.**

# Fuel Charging Assembly

## REMOVAL & INSTALLATION

### 2.5L Engine

1. **Disconnect the negative battery cable. Properly relieve fuel system pressure. Disconnect the air bypass connector from the EEC-IV harness. Disconnect the**

spring lock coupling. Remove the engine air cleaner outlet tube.

2. Disconnect and remove the accelerator and speed control cables from the accelerator mounting bracket and the throttle lever.
3. Detach the top manifold vacuum fitting by disconnecting the rear vacuum line to the dash panel vacuum tee, the vacuum line at the intake manifold, the MAP sensor vacuum line and the fuel pressure regulator vacuum line.
4. Disconnect the PCV system hoses. Disconnect the EGR vacuum line at the EGR valve.
5. Detach the EGR tube from the upper intake manifold by supporting the connector while loosening the compression nut.
6. Disconnect the upper support manifold bracket by removing only the top bolt. Leave the bottom bolts attached.
7. Disengage the electrical connectors at the main engine harness.
8. Remove the fuel supply and return lines. Remove the eight manifold retaining bolts.
9. Disconnect the lower support manifold bracket by removing only the top bolt. Leave the bottom bolts attached.
10. Remove the manifold along with the wiring harness and gasket.

**To install:**

11. Clean and inspect the mounting surfaces. Install a new gasket.
12. Install the manifold assembly and finger-tighten the retaining bolts.
13. Install the fuel return line. Tighten the manifold retaining bolts to 15-22 ft. lbs. (20-30 Nm).
14. Connect the upper and lower manifold support brackets. Tighten the retaining bolts to 15-22 ft. lbs. (20-30 Nm).
15. Install the EGR tube and connect the PCV system hoses. Fasten the rear manifold connections.
16. Connect the accelerator and speed control linkages. Connect the electrical wiring harness.
17. Connect the fuel supply line and the fuel return line. Install the spring lock coupling.
18. Use the EEC-IV self-test connector to check that the EEC-IV sensor is functioning properly.
19. Connect the negative battery cable.
20. Start the engine and check for fuel leaks. Adjust the idle speed, as required.

## 3.0L Engine-Except SHO

1. With the ignition OFF, disconnect the negative battery cable.
2. Remove the fuel cap and release the pressure at the pressure relief valve on the fuel rail assembly using, Fuel Pressure Gauge part No. T80L-9974-B or equivalent.
3. Detach electrical connectors at the air bypass valve, throttle position sensor, EGR sensor and air charge temperature sensor (ACT).
4. Disconnect the fuel supply and return lines using Fuel Line Disconnect Tool part No. D87L-9280-A or equivalent.

5. **Detach the wiring connectors from the fuel injectors.**
6. **Remove the snow/ice shield to expose the throttle linkage. Disconnect the throttle cable from the ball stud.**
7. **Remove the engine air cleaner outlet tube (between the air cleaner and air throttle body) by loosening the two clamps.**
8. **Disconnect and remove the accelerator and speed control cables, if so equipped, from the throttle lever.**
9. **Remove the transaxle Throttle Valve (TV) linkage from the throttle lever (automatic transaxle only).**
10. **Loosen the bolt which retains the A/C line at the upper rear of the upper manifold and disengage the retainer.**
11. **Remove the six retaining bolts and lift air intake throttle body assembly from the lower intake manifold assembly.**
12. **Clean and inspect the mounting faces of the lower and upper intake manifold.**

**To install:**

13. **Position a new gasket on the lower intake mounting face. The use of alignment studs may be helpful.**
14. **Install the upper intake manifold and throttle body assembly to the lower manifold, making sure the gasket remains in place (if alignment studs aren't used). Align EGR tube in valve.**
15. **Install the six upper intake manifold retaining bolts. Tighten to 15-22 ft. lbs. (20-30 Nm) in sequence as shown in the fuel charging assembly diagram in this section.**
16. **Engage the A/C line retainer cup and tighten the bolt to specification.**
17. **Tighten the EGR tube and flare fitting. Tighten the lower retainer nut at the exhaust manifold.**
18. **Install the canister purge line to the fitting.**
19. **Connect the PCV vacuum hose to the bottom of the upper manifold and the PCV closure hose to the throttle body.**
20. **Connect the vacuum lines to the vacuum tree, EGR valve, and fuel pressure regulator.**
21. **Connect the throttle cable to the throttle body and install snow/ice shield.**
22. **Attach the electrical connectors to the air bypass valve, TPS sensor, EGR sensor, and ACT sensor.**
23. **Connect the negative battery cable.**
24. **Install the fuel cap, start the engine and check for vacuum, fuel, or coolant leaks.**
25. **The transaxle TV linkage has to be readjusted after the fuel charging assembly has been serviced:**
    1. **With the ignition key OFF and shift selector in PARK.**
    2. **Reset the automatic transaxle TV linkage by holding the ratchet in the released position and pushing the cable fitting toward the accelerator control bracket.**
    3. **At the throttle body, reset the TV cable by rotating the throttle linkage to the wide-open throttle position by hand, then releasing it.**

**If the lower intake manifold was removed, fill and bleed the cooling system.**

### 3.8L Engine

1. Disconnect the negative battery cable.
2. Drain the cooling system.
3. Remove the fuel cap at the tank.
4. Release the fuel pressure by attaching a Fuel Pressure Gauge part No. T80L-9974-B or equivalent to the pressure relief valve on the fuel rail assembly.
5. Detach the electrical connectors at the air bypass valve, throttle position sensor, and EGR position sensor.
6. Disconnect the throttle linkage at the throttle ball and the transaxle linkage from the throttle body.
7. Position the throttle and speed control linkage out of the way.
8. Disconnect the upper intake manifold vacuum fittings at the vacuum tree.
9. Remove the six upper intake manifold retaining bolts.
10. Remove the upper intake and throttle body assembly from the lower intake.

**To install:**

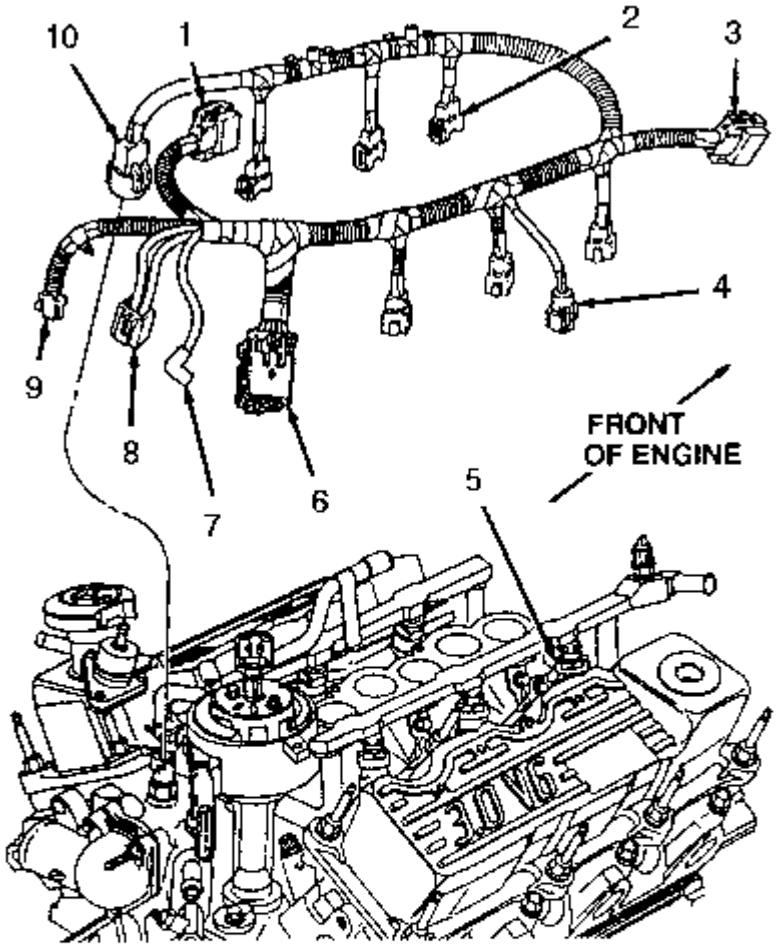
11. Clean and inspect the mounting surfaces of the upper and lower intake manifolds. Be careful not to damage the mounting surfaces.
12. Install the new gasket and upper intake into position using the alignment studs. If alignment studs are not used, make sure the gasket stays in place.
13. Install the six manifold retaining bolts and tighten to 20-28 ft. lbs. (27-38 Nm).
14. Install the canister purge lines, PCV hose, and vacuum lines to the vacuum tree.
15. Install the throttle and speed control, if so equipped, to the upper intake manifold. Connect the TV cable to the throttle body.
16. The transaxle TV linkage has to be readjusted after the fuel charging assembly has been serviced. Proceed as follows:
    1. Turn the ignition key OFF and put the shift selector in PARK
    2. Reset the automatic transaxle TV linkage by holding the ratchet in the released position and pushing the cable fitting toward the accelerator control bracket.
    3. At the throttle body, reset the TV cable by rotating the throttle linkage to the wide-open throttle position by hand, then releasing it.
17. Refill the engine with coolant, then connect the negative battery cable. Start the engine and check for fuel, vacuum, and coolant leaks.

## Fuel Injection Wiring Harness

### REMOVAL & INSTALLATION

1. Make sure the ignition switch is in the OFF position, then release the fuel system pressure. For details, please refer to the procedure earlier in this section.

2. **Disconnect the negative battery cable.**
3. **Remove the throttle body and/or upper intake manifold. For details, please refer to the procedure earlier in this section.**
4. **Disengage the electrical connectors from the fuel injectors.**
5. **Disengage the electrical connectors from the main wiring harness and throttle position sensor, ACT sensor and the air bypass valve.**
6. **Remove the wiring assembly.**




1. To throttle position sensor
2. Fuel injector wiring harness
3. To PFE transducer assy
4. To air charge temperature sensor
5. Fuel injector assy (6 req'd)
6. To harness assy
7. To oil pressure switch assy
8. To EGR vacuum regulator assy
9. To idle speed control
10. To engine coolant temperature sensor

View of the 3.0L EFI injector wiring harness

**Click to enlarge**

**To install:**

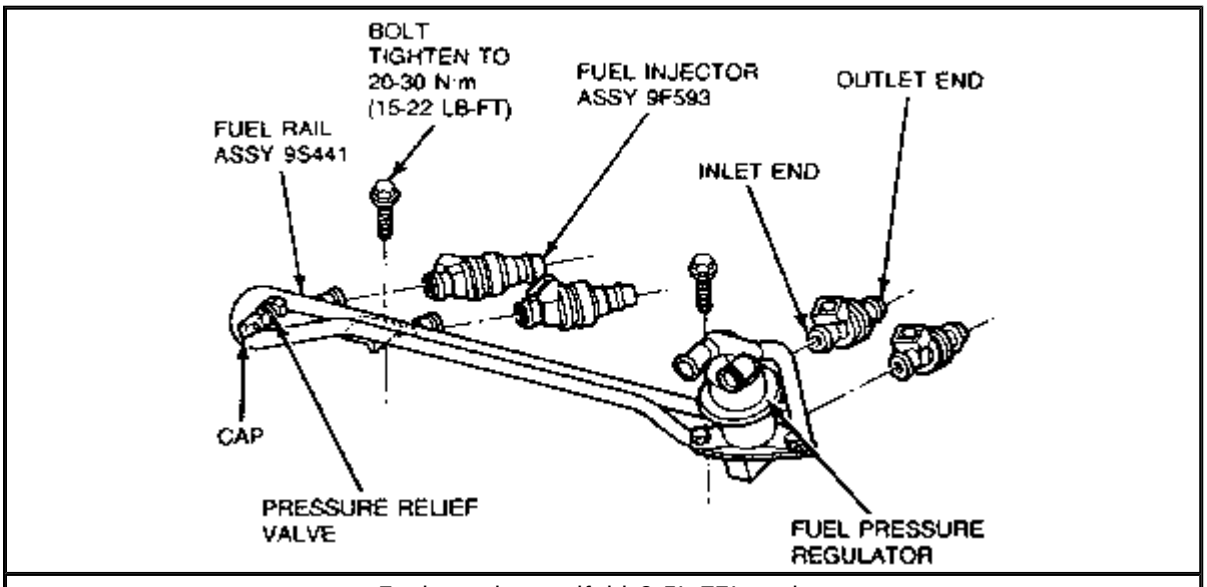
7. Position the wiring harness alongside the fuel injectors.
8. Snap the electrical connectors into position on the injectors.
9. Install the throttle body. For details, please refer to the procedure earlier in this section.
10. Make sure that all of the electrical connectors are firmly in place.
11. Connect the negative battery cable.

# Fuel Injector Manifold/Rail Assembly

## REMOVAL & INSTALLATION

### 2.5L Engine

1. Remove the fuel tank cap, then release the fuel system pressure at the relief valve using Fuel Pressure Gauge T80L-9974-B or equivalent.
2. Remove the spring lock coupling. For details please refer to the procedure later in this section.
3. Disconnect the fuel supply and return lines.
4. Disconnect the wiring harness from the fuel injectors.
5. Remove the upper intake manifold.
6. Remove the two fuel injector manifold retaining bolts.
7. Carefully disengage the manifold from the fuel injectors.
8. Disconnect the vacuum line from the fuel pressure regulator valve, then remove the manifold.




Fuel supply manifold-2.5L EFI engine

Click to enlarge

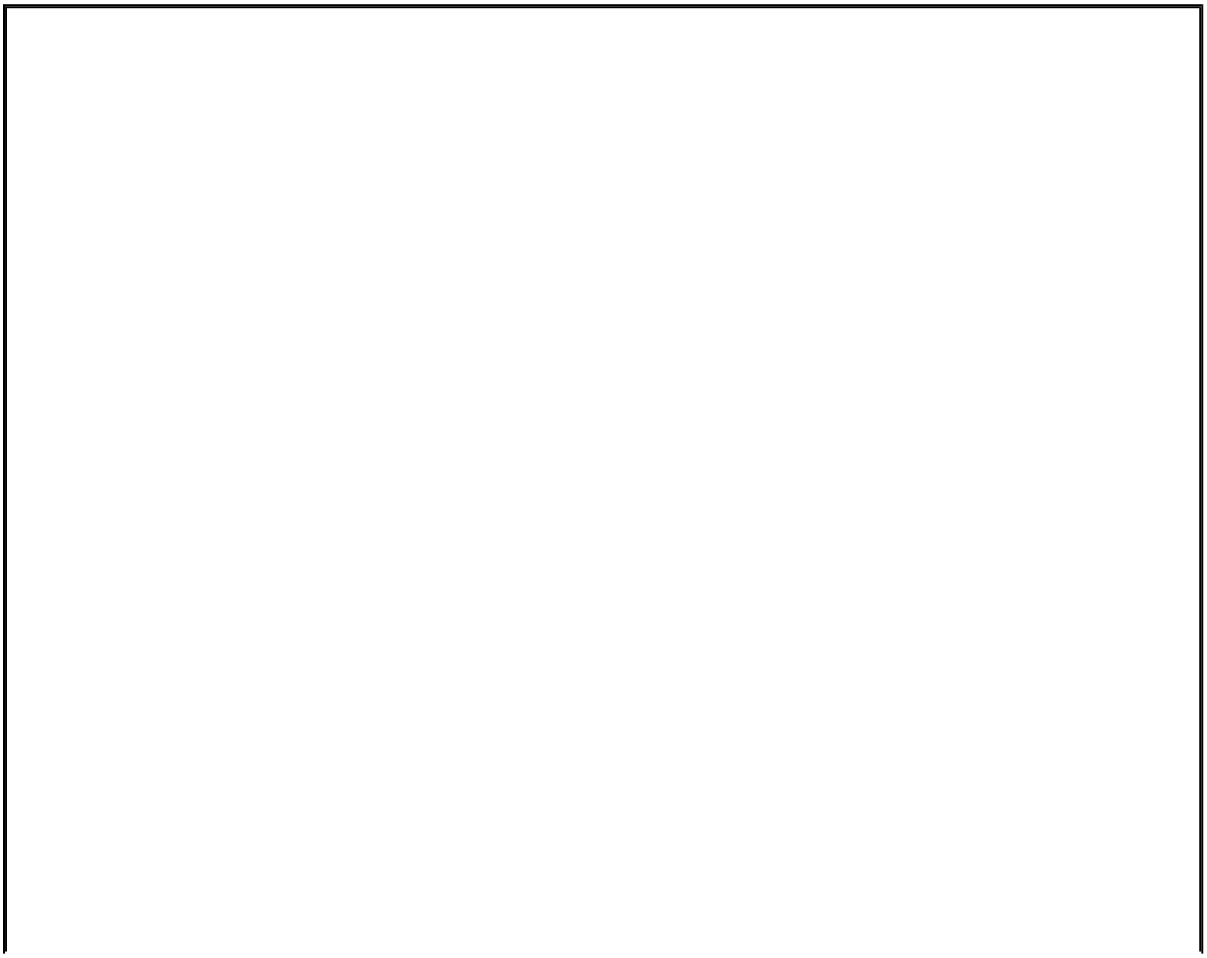
**To install:**

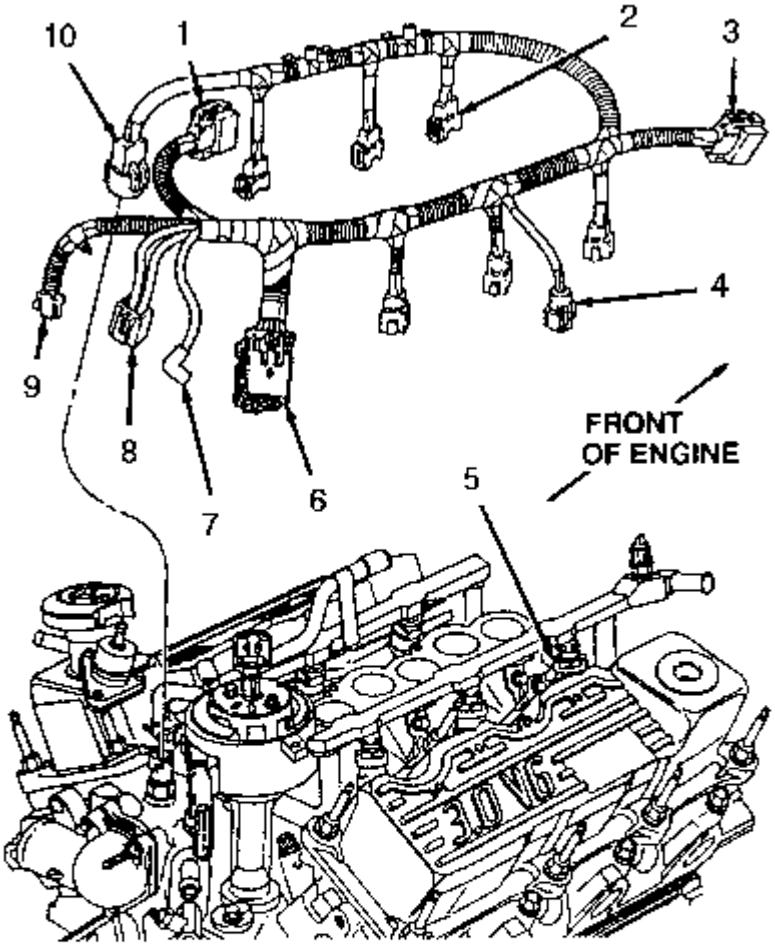
**When installing the fuel rail assemblies, make sure the O-rings seat properly so that no fuel leaks will occur.**

9. **Push the fuel rail down to be sure that all of the injector O-rings are fully seated in the fuel rail cups and intake manifold.**
10. **While holding the fuel rail down, install and tighten the retaining bolts to 15-22 ft. lbs. (20-30 Nm).**
11. **Install the spring lock coupling. For details, please refer to the procedure later in this section.**
12. **With the injector wiring still disconnected, turn the ignition to the ON position to allow the fuel pump to pressurize the system. Using a clean towel, check for fuel leaks.**
13. **Connect the fuel injector wiring harness.**
14. **Run the vehicle at idle for two minutes, then turn the engine OFF and check for fuel leaks.**

## 3.0L Engine-Except SHO

1. **Disconnect the negative battery cable.**
2. **Relieve the fuel system pressure. Remove the air intake throttle body.**
3. **On the 1992 engine, the distributor must be raised to allow the crossover tube to clear the distributor housing and lower intake manifold assembly.**
4. **Disconnect the fuel supply and return lines.**
5. **Carefully disconnect the wiring harness from the injectors.**
6. **Disconnect the vacuum line from the fuel pressure regulator valve.**
7. **Remove the four fuel injector manifold retaining bolts.**

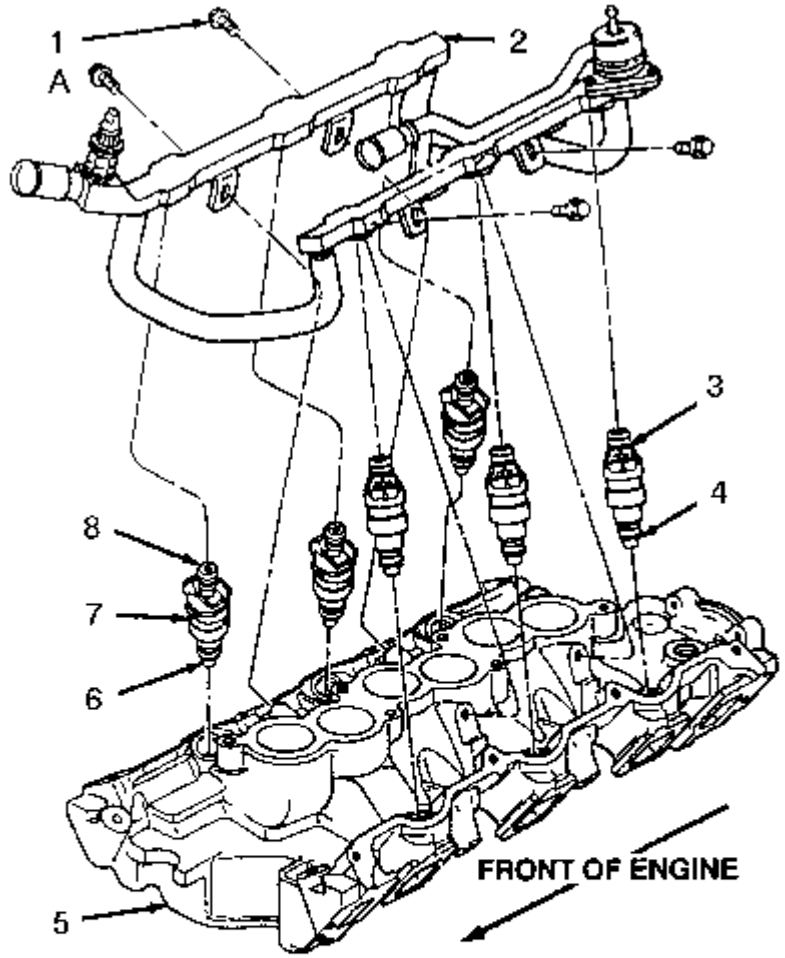





1. To throttle position sensor
2. Fuel injector wiring harness
3. To PFE transducer assy
4. To air charge temperature sensor
5. Fuel injector assy (6 req'd)
6. To harness assy
7. To oil pressure switch assy
8. To EGR vacuum regulator assy
9. To idle speed control
10. To engine coolant temperature sensor

View of the 3.0L EFI injector wiring harness

Click to enlarge




1A. Screw and washer assy
M6 x 1 x 22 hex head (4 req'd)
2. Fuel rail assy
3. Upper O-ring seal
4. Lower O-ring seal
5. Intake manifold assy/lower
6. Outlet end
7. Fuel injector assy
8. Inlet end
A. Tighten to 10 N.m (7 lb-ft)

Fuel injector manifold mounting-3.0L engine

Click to enlarge

8. **Carefully disengage the fuel rail assembly from the fuel injectors by lifting and gently rocking the rail.**
9. **Remove the injectors by lifting while gently rocking from side to side.**

**Place removed components in a clean container to keep clean and free of contamination.**

**WARNING**

Be very careful when handling the fuel injectors and fuel rail to

prevent damage to the sealing areas and sensitive fuel metering openings.

**To install:**

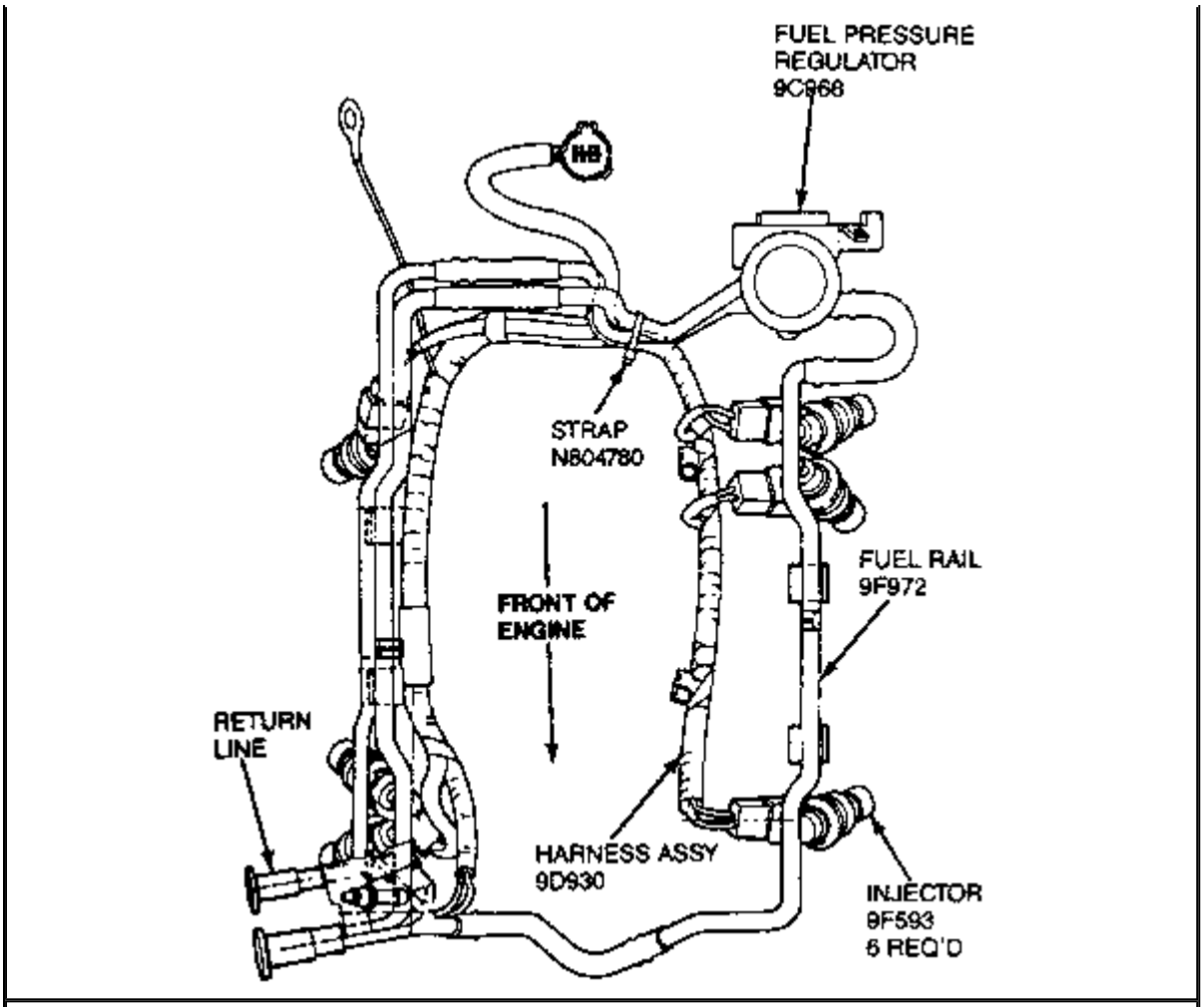
10. **Lubricate new O-rings with engine oil and install 2 on each injector.**
11. **Make sure the injector cups are clean and undamaged.**
12. **Install the injectors in the fuel rail using a light twisting-pushing motion.**
13. **Carefully install the rail assembly and injectors into the lower intake manifold, 1 side at a time. Make sure the O-rings are seated by pushing down on the fuel rail.**
14. **While holding the fuel rail assembly in place, install the 2 retaining bolts and tighten to 7 ft. lbs. (10 Nm).**
15. **Connect the fuel supply and return lines.**
16. **Connect the negative battery cable.**
17. **Before connecting the fuel injector harness, turn the ignition switch to the ON position. This will pressurize the fuel system.**
18. **Using a clean paper towel, check for leaks where the injector connects to the fuel rail.**
19. **Install the air intake throttle body and connect the vacuum line to the fuel pressure regulator valve.**
20. **Connect the fuel injector harness, then start the engine and let it idle for 2 minutes.**
21. **Using a clean paper towel, check for leaks where the injector is installed into the intake manifold.**

## 3.8L Engine

1. **Disconnect the negative battery cable.**
2. **Remove the fuel cap and release tank pressure. Release the fuel system pressure. For details, please refer to the procedure earlier in this section.**
3. **Remove the upper intake manifold assembly. For details, please refer to the procedure earlier in this section.**
4. **Remove the spring lock coupling retaining clips from the fuel inlet and return fittings.**
5. **Using Spring Lock Coupling Disconnect Tool D87L-9280-A or equivalent, disconnect the inlet and outlet fuel lines from the fuel rail assembly.**
6. **Remove the four fuel rail assembly retaining bolts. There are two on each side.**
7. **Carefully disengage the fuel rail from the fuel injectors, then remove the rail.**

**It may be easier to remove the injectors with the fuel rail as an assembly.**

8. **Use a rocking, side-to-side motion while lifting to remove the injectors from the fuel rail.**




Fuel rail assembly-3.8L EFI engine

Click to enlarge

**To install:**

**When you are installing the fuel rail assemblies, make sure that the O-rings are properly seated so that no fuel leaks occur.**

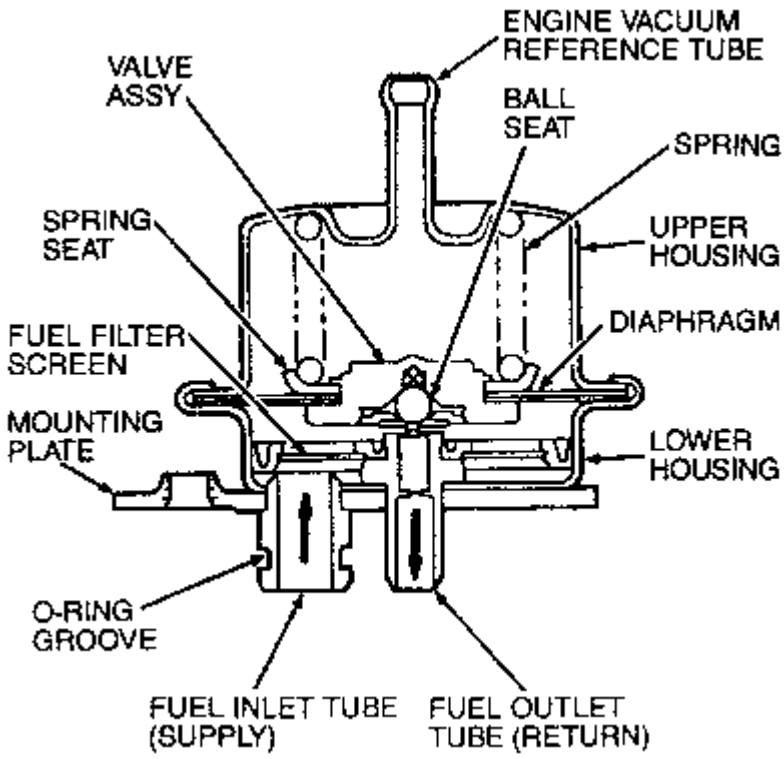
9. **Push the fuel rail down to be sure that all of the injector O-rings are fully seated in the fuel rail clips and intake manifold.**
10. **While holding the fuel rail down, install the retaining bolts and tighten them to 7 ft. lbs. (10 Nm).**
11. **Install the spring lock coupling. For details please refer to the procedure later in this section.**
12. **With the injector wiring still disconnected, turn the ignition to the RUN position to allow the fuel pump to pressurize the system. Using a clean towel, check for fuel leaks.**
13. **Connect the fuel injector wiring harness.**
14. **Run the vehicle at idle for two minutes, then turn the engine OFF and check for leaks.**

## Fuel Pressure Regulator

## REMOVAL & INSTALLATION

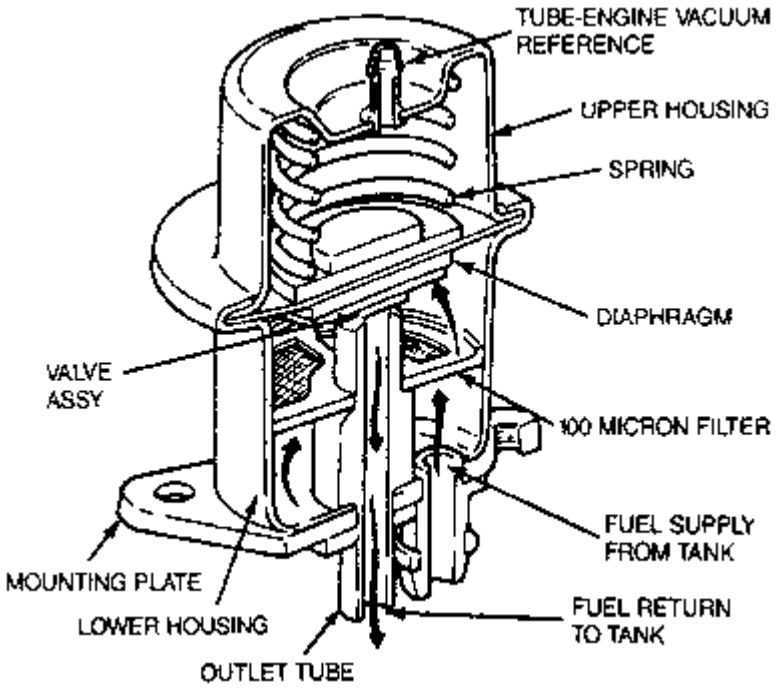
1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank cap and release the pressure from the fuel system at the Schrader (pressure relief) valve of the fuel rail assembly, using Fuel Pressure Gauge T80L-9974-B or equivalent.**
3. **For the 2.5L engine, remove the three bolts retaining the fuel supply manifold shield, then remove the shield.**
4. **Tag and remove the vacuum line(s) at the pressure regulator.**
5. **Remove the two fuel rail-to-lower intake manifold retaining bolts. Carefully lift the fuel rail (regulator side only) off of the injectors to gain access to the regulator retaining screws.**
6. **Remove the three Allen® retaining screws from the regulator housing, then discard the screws.**
7. **Remove the pressure regulator assembly, gasket and O-ring. Discard the gasket and the O-ring.**

**If scraping is necessary, be careful not to damage the fuel pressure regulator or fuel rail gasket surfaces.**




Cross-sectional view of the fuel pressure regulator-3.0L (except SHO) EFI engine

Click to enlarge




Cross-sectional view of the fuel pressure regulator-2.5L and 3.8L EFI engine

Click to enlarge

**To install:**

8. **Lubricate the new fuel pressure regulator O-ring with clean engine oil.**
9. **Ensure that the gasket surfaces of the fuel pressure regulator and fuel rail assembly are clean.**
10. **Install the new O-ring and new gasket on the regulator.**
11. **Using new Allen® head retaining screws, install the fuel pressure regulator on the fuel rail assembly. Tighten the three retaining screws to 34 inch lbs. (4 Nm).**
12. **Carefully install the regulator side of the fuel rail to the injectors. If the injector(s) were completely disengaged from the fuel rail cup(s), lubricate the injector O-rings with clean engine oil prior to inserting in the fuel rail cups. Push the regulator side of the fuel rail down on the injectors, then tighten the retaining bolts to 7 ft. lbs. (10 Nm) while holding down the fuel rail.**
13. **Install the vacuum line(s) to the regulator.**
14. **For the 2.5L engine, install the fuel supply manifold shield, then tighten the retaining bolts to 15-22 ft. lbs. (20-30 Nm).**
15. **Connect the negative battery cable.**

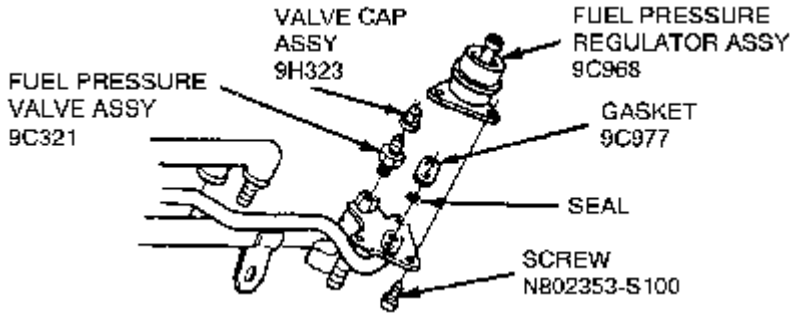
## Pressure Relief Valve

### REMOVAL & INSTALLATION

1. **If the fuel rail assembly is mounted to the engine, remove the fuel tank cap, then release system pressure at the Schrader valve on the fuel injection manifold, using Fuel Pressure Gauge T80L-9974-B or equivalent.**

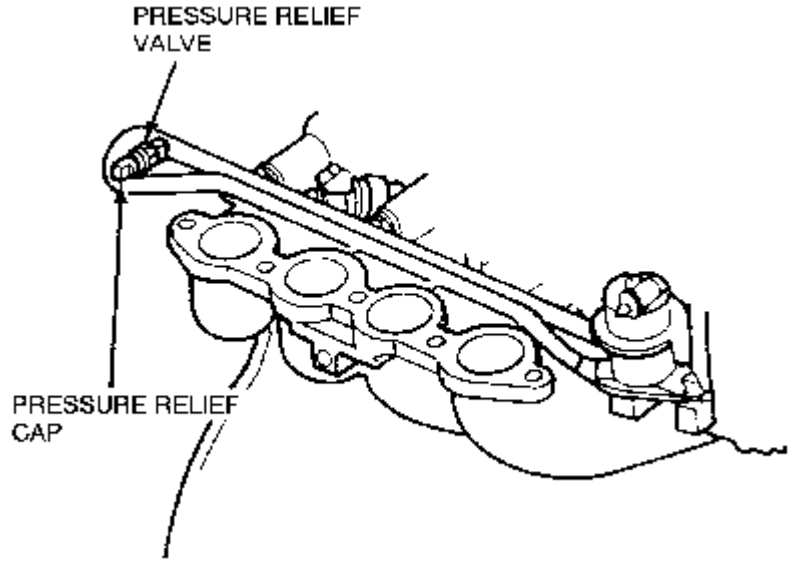
**The cap on the relief valve must be removed.**

2. **Using an open-end wrench or suitable deep well socket, remove the pressure relief valve from the fuel injection manifold.**




Fuel pressure valve and related components

**Click to enlarge**




Fuel pressure relief valve location-2.5L EFI engine

**Click to enlarge**

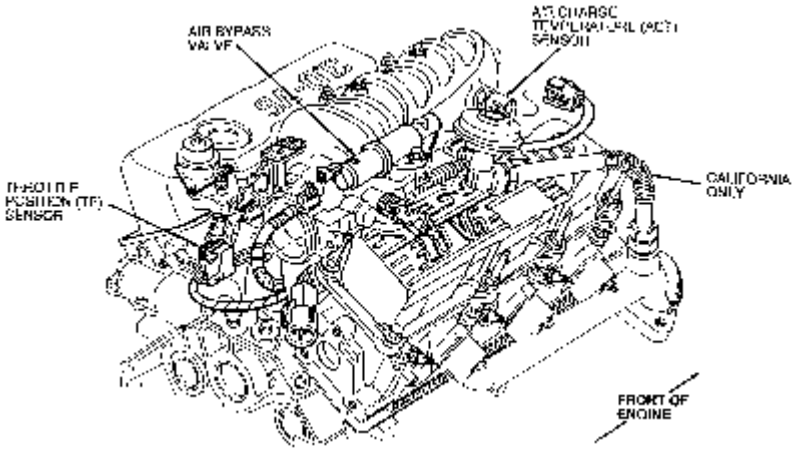
**To install:**

3. **Install the pressure relief valve and the cap. Tighten the valve to 66 inch lbs. (7.4 Nm) and the cap to 5.5 inch lbs. (0.6 Nm).**

## Throttle Position (TP) Sensor

### REMOVAL & INSTALLATION

1. **Disconnect the negative battery cable.**
2. **Disconnect the Throttle Position (TP) sensor from the wiring harness.**
3. **Unfasten the two retaining screws, then remove the throttle position sensor.**




Location of the throttle position sensor-3.0L EFI engine

Click to enlarge

**To install:**

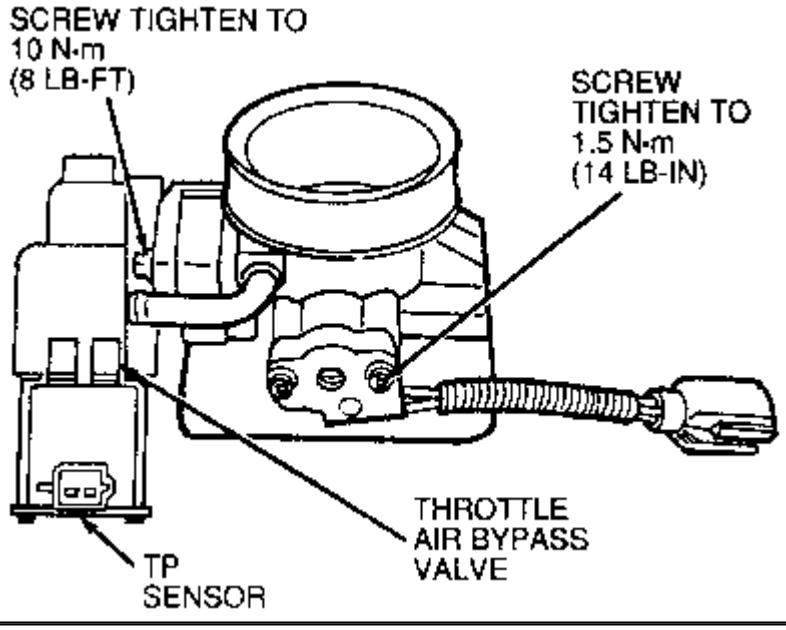
4. **Install the throttle position sensor. Make sure that the rotary tangs on the sensor are properly aligned and that the red seal is inside the connector housing.**

**Slide the rotary tangs into position over the throttle shaft blade, then rotate the TP sensor clockwise to its installed position. Failure to install the TP sensor in this manner may result in excessive idle speeds.**

5. **Secure the sensor to the throttle body using the two retaining screws. Tighten the screws to 14 inch lbs. (1.5 Nm).**

**The Throttle Position (TP) sensor is NOT adjustable.**

6. **Engage the sensor electrical connector to the wiring harness.**
7. **Connect the negative battery cable.**



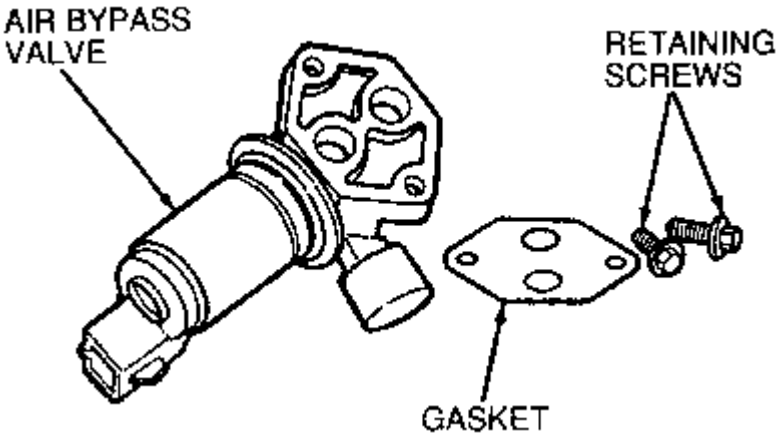

Throttle position sensor and idle air bypass locations-3.8L EFI engine

Click to enlarge

## Idle Air Bypass Valve

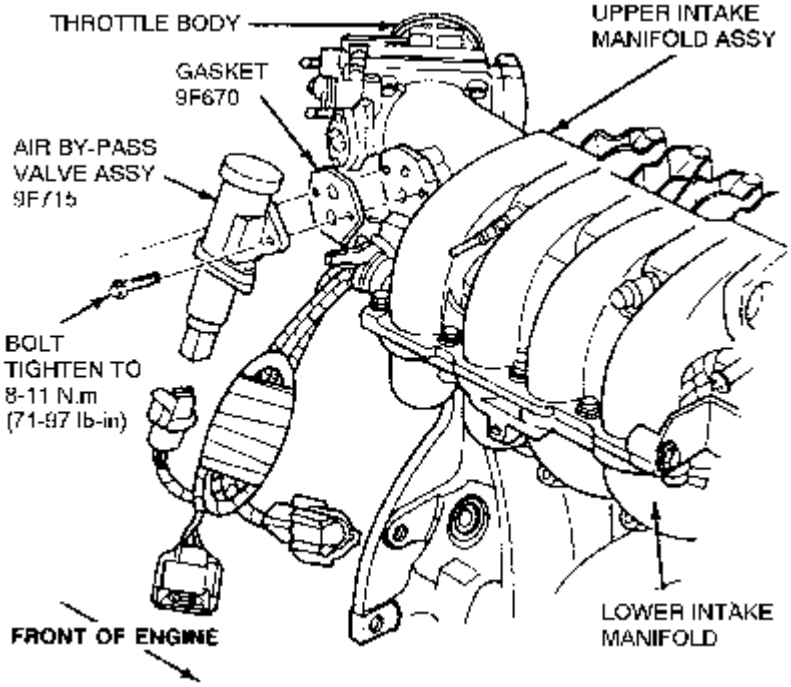
### REMOVAL & INSTALLATION

1. **Disconnect the negative battery cable.**
2. **Disengage the idle air bypass valve electrical connector from the wiring harness.**
3. **Remove the two idle air bypass retaining screws, then remove the idle air bypass valve and gasket.**




Idle air bypass valve-3.0L (except SHO) EFI engine

**If scraping is necessary to clean the mating surfaces, be careful not to damage the idle air bypass valve or throttle body gasket surfaces, or drop any gasket material or debris into the throttle body.**

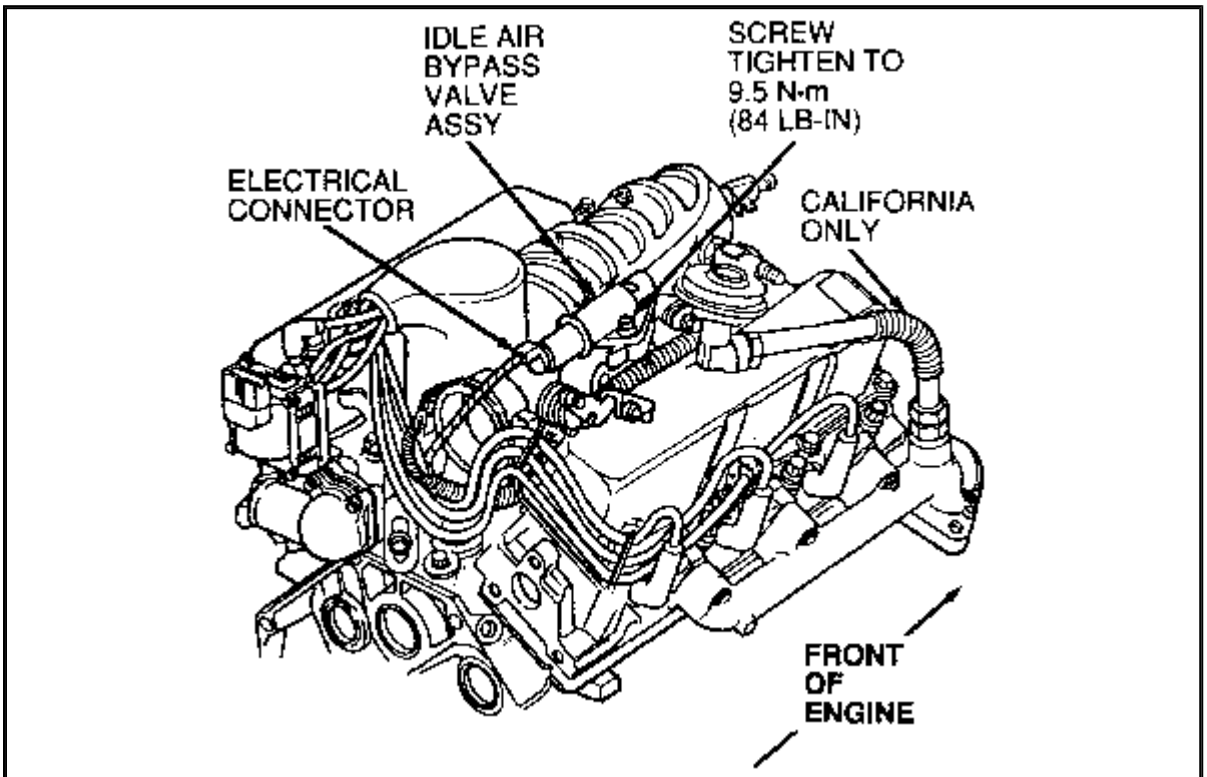



Idle air bypass valve location-2.5L EFI engine

Click to enlarge

**To install:**

4. **Make sure that the throttle body and air bypass valve mating surfaces are clean.**
5. **Install the gasket on the throttle body surface, then mount the idle air bypass valve assembly, using the two retaining screws to secure it. Tighten the screws to 84 inch lbs. (9.5 Nm).**




Idle air bypass valve mounting and electrical connector location

Click to enlarge

6. **Engage the electrical connector to the idle air bypass valve.**
7. **Connect the negative battery cable.**

# SEQUENTIAL ELECTRONIC FUEL INJECTION (SEFI)

## General Information

The Sequential Electronic Fuel Injection (SEFI) system is used on all Super High Output (SHO) vehicles, as well as on 1993 and later 3.0L and 3.8L engines. It is classified as a multi-point, pulse time, speed density control fuel injection system. The fuel is metered into the intake manifold port, in sequence, in accordance with the engine demand through the injectors mounted on a tuned intake manifold. The Electronic Engine Control (EEC-IV) computer outputs a command to the fuel injectors to meter the appropriate quantity of fuel. The remainder of the fuel system is basically the same as the EFI system installed on some earlier model 3.0L and 3.8L engines.

The SEFI fuel subsystem includes a high pressure (30-45 psi/209-310 kPa) tank-mounted electric fuel pump, fuel charging manifold, pressure regulator, fuel filter, and both solid and flexible fuel lines.

The fuel pressure regulator maintains a constant pressure drop across the injector nozzles. The regulator is referenced to intake manifold vacuum and is connected parallel to the fuel injectors and positioned on the far end of the fuel rail. Any excess fuel supplied by the pump passes through the regulator and is returned to the fuel tank via a return line.

The fuel pressure regulator is a diaphragm operated relief valve in which one side of the diaphragm senses fuel pressure and the other side senses manifold vacuum. Normal fuel pressure is established by a spring preload applied to the diaphragm. Control of the fuel system is maintained through the EEC-IV power relay and the EEC-IV control unit, although electrical power is routed through the fuel pump relay and an inertia switch. The fuel pump relay is normally located on a bracket somewhere above the Electronic Control Assembly (ECA) and the inertia switch is located in the storage compartment. Tank-mounted pumps can be either high or low pressure, depending on the model.

The fuel injectors used with the SEFI system are an electromechanical (solenoid) type designed to meter and atomize fuel delivered to the intake ports of the engine. The injectors are mounted in the lower intake manifold and positioned so that their spray nozzles direct the fuel charge in front of the intake valves. The injector body consists of a solenoid actuated pintle and needle valve assembly. The control unit sends an electrical impulse that activates the solenoid, causing the pintle to move inward off the seat, allowing the fuel to flow. The amount of fuel delivered is controlled by the length of time the injector is energized (pulse width), since the fuel flow orifice is fixed and the fuel pressure drop across the injector tip is constant. Correct atomization is achieved by contouring the pintle at the point where the fuel enters the pintle chamber.

**Exercise care when handling fuel injectors during service. Be careful not to lose the pintle cap and replace O-rings to assure a tight seal. Never apply direct battery voltage to test a fuel injector.**

The injectors receive high pressure fuel from the fuel manifold (fuel rail) assembly. The complete assembly includes a single, preformed tube with six injector connectors, mounting flange for the pressure regulator, mounting attachments which locate the fuel manifold assembly and provide fuel injector retention, and a Schrader® quick-disconnect fitting used to perform fuel pressure tests.

The fuel manifold is normally removed with fuel injectors and pressure regulator attached. Fuel injector electrical connectors are plastic and have locking tabs that must be released when disconnecting the wiring harness.

The air subsystem components include the air cleaner assembly, air flow (vane) meter, throttle air bypass valve and air ducts that connect the air system to the throttle body assembly. The throttle body regulates the air flow to the engine through a single butterfly-type throttle plate controlled by conventional accelerator linkage. The throttle body has an idle adjustment screw (throttle air bypass valve) to set the throttle plate position, a PCV fresh air source upstream of the throttle plate, individual vacuum taps for PCV and control signals, and a throttle position sensor that provides a voltage signal for the EEC-IV control unit.

The throttle air bypass valve is an electro-mechanical (solenoid) device whose operation is controlled by the EEC-IV control unit. A variable air metering valve controls both cold and warm idle air flow in response to commands from the control unit. The valve operates by bypassing a regulated amount of air around the throttle plate; the higher the voltage signal from the control unit, the more air is bypassed through the valve. In this manner, additional air can be added to the fuel mixture without moving the throttle plate. At curb idle, the valve provides smooth idle for various engine coolant temperatures, adjusts for A/C load, and compensates for transaxle load and no-load conditions. The valve also provides fast idle for start-up, replacing the fast idle cam, throttle kicker and anti-dieseling solenoid common to previous models.

There are no curb idle or fast idle adjustments. As in curb idle operation, the fast idle speed is proportional to engine coolant temperature. Fast idle kick-down will occur when the throttle is kicked. A time-out feature in the ECA will also automatically kick-down fast idle to curb idle after approximately 15-25 seconds once the coolant has reached approximately 160°F (71°C). The signal duty cycle from the ECA to the valve will be at 100% (maximum current) during the crank to provide maximum air flow, allowing no-touch starting at any time (engine cold or hot).

## Relieving Fuel System Pressure

1. **Remove the air cleaner assembly. For details, please refer to the procedure in *Section 1* of this manual.**
2. **Connect EFI/CFI Fuel Pressure Gauge T80L-9974-B or equivalent to the fuel pressure relief valve on the fuel supply manifold.**
3. **Open the manual valve on the EFI/CFI fuel pressure gauge tool to relieve the fuel system pressure.**

## Fuel Filter

### REMOVAL & INSTALLATION

1. **Disconnect the negative battery cable. Relieve the fuel system pressure.**

2. Remove the push connect fittings at both ends of the fuel filter. This is accomplished by removing the hairpin clips from the fittings. Remove the hairpin clips by first bending and then breaking the shipping tabs on the clips. Then spread the 2 clip legs approximately $^{1}/_{8}$ in. (3mm) to disengage the body and push the legs into the fitting. Pull on the triangular end of the clip and work it clear of the fitting.
3. Remove the filter from the mounting bracket by loosening the worm gear mounting clamp enough to allow the filter to pass through.

**To install:**

4. Install the filter in the mounting bracket, ensuring that the flow direction arrow is pointing forward. Locate the fuel filter against the tab at the lower end of the bracket.
5. Insert a new hairpin clip into any 2 adjacent openings on each push connect fitting, with the triangular portion of the clip pointing away from the fitting opening. Install the clip to fully engage the body of the fitting. This is indicated by the legs of the hairpin clip being locked on the outside of the fitting body. Apply a light coat of engine oil to the ends of the fuel filter and then push the fittings onto the ends of the fuel filter. When the fittings are engaged, a definite click will be heard. Pull on the fittings to ensure that they are fully engaged.
6. Tighten the worm gear mounting clamp to 15-25 inch lbs. (1.7-2.8 Nm).
7. Start the engine and check for leaks.

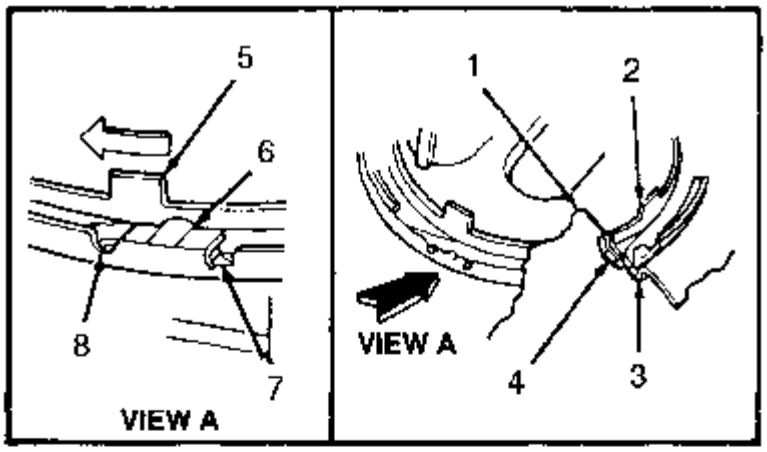
# Electric Fuel Pump

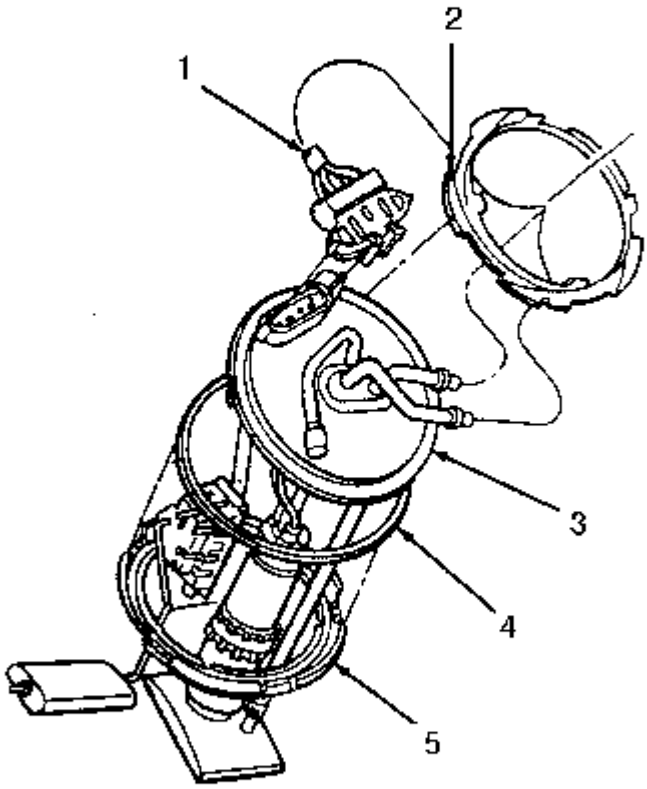
## REMOVAL & INSTALLATION

### Except 3.0L Flexible Fuel (FF) Vehicles

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure. For details, please refer to the procedure earlier in this section.
3. Drain the fuel from the fuel tank by inserting Rotunda Fuel Tanker Adapter Hose 034-00012 or equivalent into the fuel tank through the fuel tank filler pipe, then remove the fuel tank with Rotunda Fuel Storage Tanker 034-00002 or equivalent.
4. Remove the fuel tank filler pipe:
    1. Open the filler door to remove the three screws securing the fuel tank filler pipe to the pocket. Mark the fuel tank filler cap tether location.
    2. Raise and safely support the vehicle.
    3. Loosen the filler and vent hose on the fuel tank filler pipe.
    4. Remove the bolt securing the fuel tank filler pipe assembly to the underbody of the vehicle, then remove the fuel tank filler pipe.
5. Support the fuel tank, then remove the fuel tank straps. Partially lower the tank, then remove the fuel lines, electrical connectors and vent lines from the tank. Remove the fuel tank and place it on a work bench.
6. Remove any accumulated dirt from around the fuel pump retaining flange so that it will not enter the fuel tank during removal and installation.

7. **Turn the fuel pump locking ring counterclockwise using Fuel Tank Sender Wrench D84P-9275-A or equivalent, then remove the lock ring.**
8. **Remove the fuel pump from the fuel tank and discard the flange gasket.**




1. Fuel pump
2. Fuel pump locking retainer ring
3. Retainer ring (part of 9C385)
4. O-ring
5. Locating tabs (part of 9C385)
6. Tab (part of 9C385)
7. Stop (part of 9C385)
8. Detent (part of 9C385)

View of the SEFI system fuel pump-except 3.0L FF vehicles

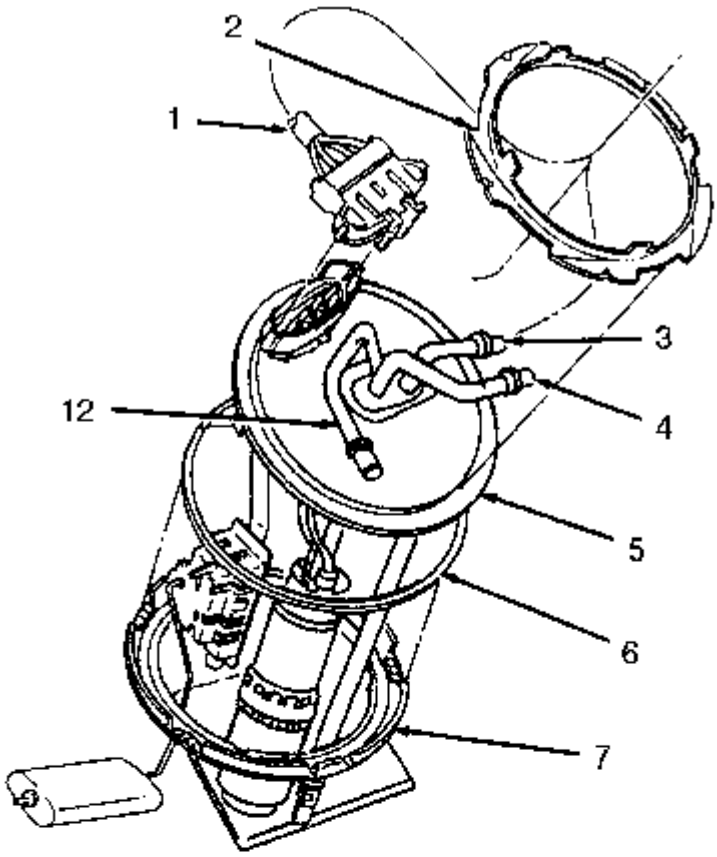
**Click to enlarge**

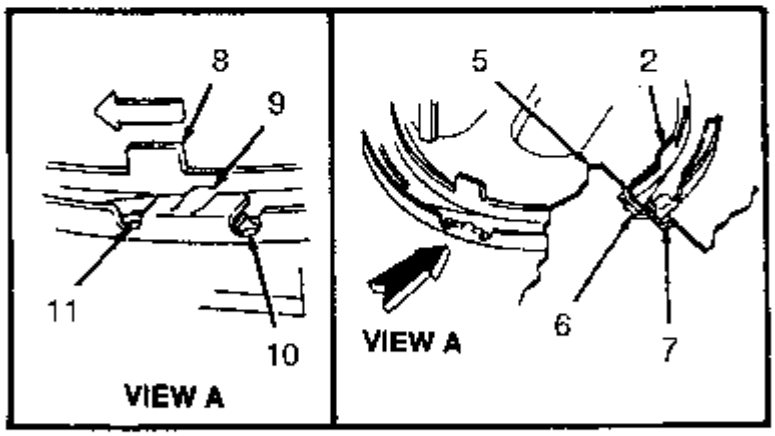
**To install:**

9. **Clean the fuel pump mounting flange and fuel tank mating surfaces and seal ring groove.**
10. **Put a light coating of grease on the new seal gasket to hold it in place during assembly and install it in the fuel ring groove.**
11. **Install the fuel pump and sender assembly carefully to be sure that the filter is not damaged. Make sure the locating keys are in the keyways and the seal gasket remains in place.**
12. **Hold the assembly in place and install the lock ring making sure all locking tabs are under the tank lock ring tabs. Tighten the lock ring by turning it clockwise using Fuel Tank Sender Wrench D84P-9275-A until it is up against the stops.**
13. **Remove the fuel tank from the bench and to the vehicle, then support the fuel tank while connecting the fuel lines, vent line and electrical connectors to the appropriate places. Install the fuel tank and secure it with the tank support straps.**
14. **Lower the vehicle.**
15. **Install the fuel tank filler pipe:**
    1. **Position the fuel tank filler pipe in the body location.**
    2. **Connect the hoses with clamps to the fuel tank filler pipe.**
    3. **Install the underbody fuel tank filler pipe assembly bolt, then tighten the bolt to 36-53 inch lbs. (4-6 Nm), then lower the vehicle.**
    4. **Install the fuel tank filler cap to the tether location, then install the three retaining screws.**
16. **Fill the tank with a minimum of 10 gallons of fuel, then check for leaks.**
17. **Connect the negative battery cable.**
18. **Connect a suitable fuel pressure gauge. Turn the ignition switch to the ON position 5-10 times, leaving it on for 3 seconds at a time, until the pressure gauge reads at least 30 psi (207 kPa). Check for leaks at the fittings.**
19. **Remove the pressure gauge, start the engine and recheck for leaks.**

## 3.0L Flexible Fuel (FF) Engine

1. **Disconnect the negative battery cable.**
2. **Depressurize the fuel system. For details, please refer to the procedure earlier in this section.**



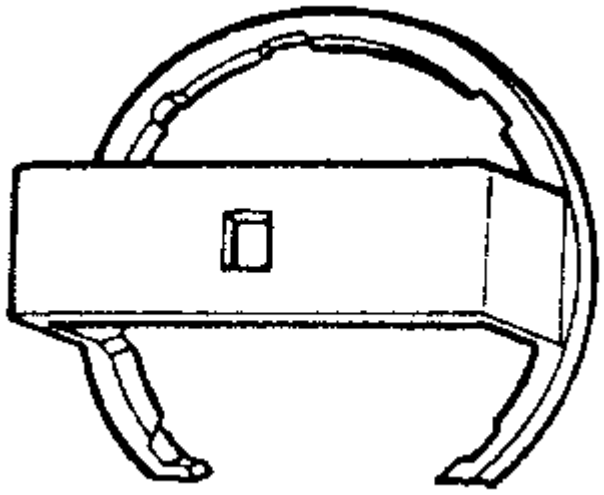

1. Electrical connector
2. Fuel pump locking retainer ring
3. Fuel return
4. Fuel supply
5. Fuel pump
6. Fuel pump mounting gasket
7. Retainer ring
8. Locating tabs
9. Tab
10. Stop
11. Detent
12. Fuel tank drain tube

Exploded view of the fuel pump and related components-3.0L Flexible Fuel (FF) engine

Click to enlarge

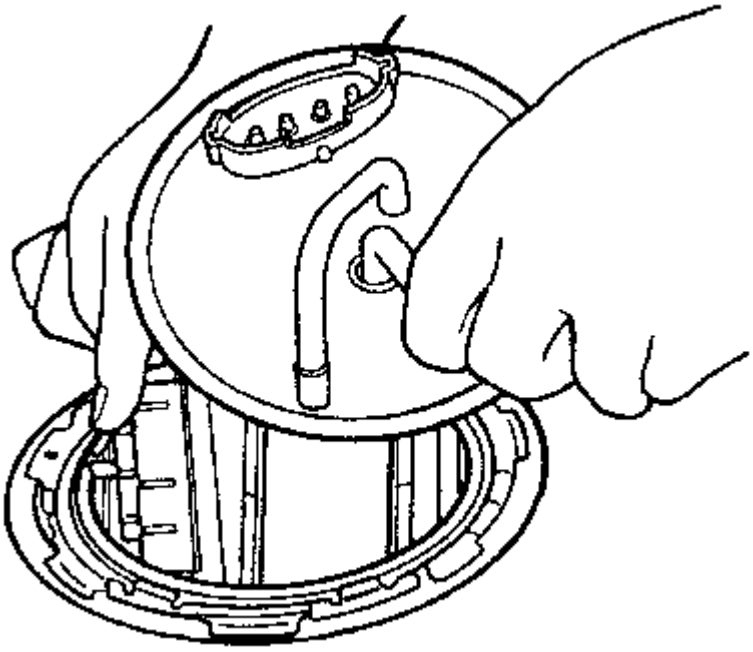
**The FF fuel tank cannot be drained through the fuel tank filler pipe because a special screen is installed in the fuel tank filler pipe to prevent siphoning of fuel through the pipe. The fuel tank on this vehicle is equipped with a drain tube connected to the fuel pump module on the right-hand side of the vehicle, which had a quick disconnect for this purpose. It is not necessary to lower the fuel tank to drain the system.**

3. **Drain the fuel tank:**
    1. **Remove the foam cover and protective rubber cover from the drain tube.**
    2. **Connect the drain tube quick disconnect fitting to the Rotunda Fuel Storage Tanker and Adapter Hose 034-00020, then drain the fuel from the tank into a suitable container.**
4. **Raise and safely support the vehicle.**
5. **Disconnect and remove the fuel filler pipe:**
    1. **Open the filler door to remove the three screws securing the fuel tank filler pipe to the pocket. Mark the fuel tank filler cap tether location.**
    2. **If not done already, raise and safely support the vehicle.**
    3. **Loosen the filler and vent hose on the fuel tank filler pipe.**
    4. **Remove the bolt securing the fuel tank filler pipe assembly to the underbody of the vehicle, then remove the fuel tank filler pipe.**
6. **Support the fuel tank, then remove the fuel tank support straps. Partially lower the tank, then disconnect the fuel lines, electrical connectors and fuel vapor and vent lines from the fuel tank.**
7. **Remove the fuel tank and place it on a work bench. Remove any dirt that has accumulated around the fuel pump so that dirt does not enter the fuel tank during pump removal.**
8. **Remove the fuel pump locking retainer ring using Fuel Tank Locking Wrench D90P-9275-A,or equivalent.**



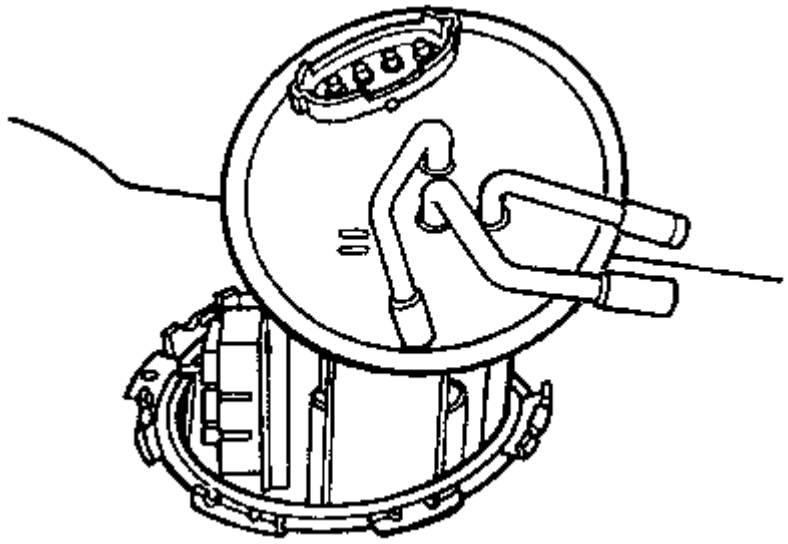
Fuel pump locking retainer ring

9. **Lift the fuel pump locating tabs from the fuel tank location slots.**
10. **Lift the fuel pump upward rotating left, while aligning the float wiper arm retainer and return line into the fuel tank location slots.**



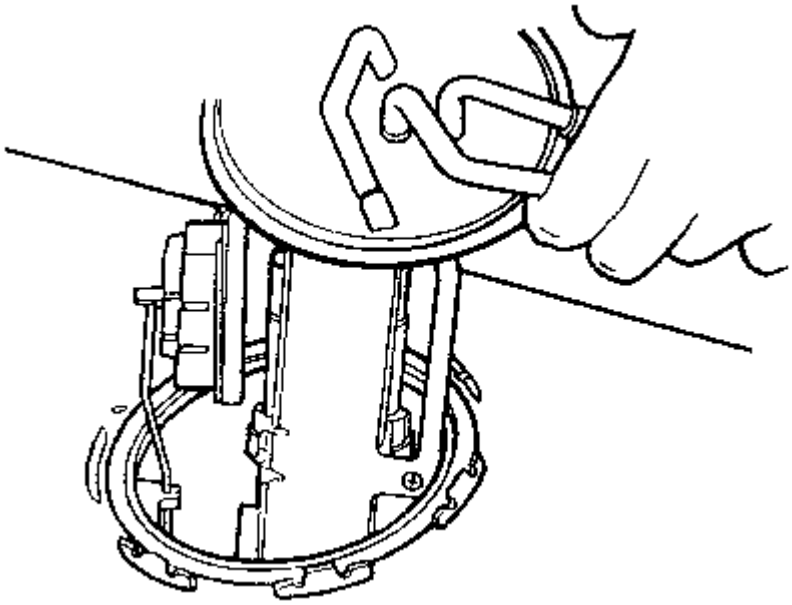
Lift fuel pump upward rotating left, while aligning the float wiper arm retainer and return line into the fuel tank location slots

11. **Apply light pressure to remove the fuel pump.**



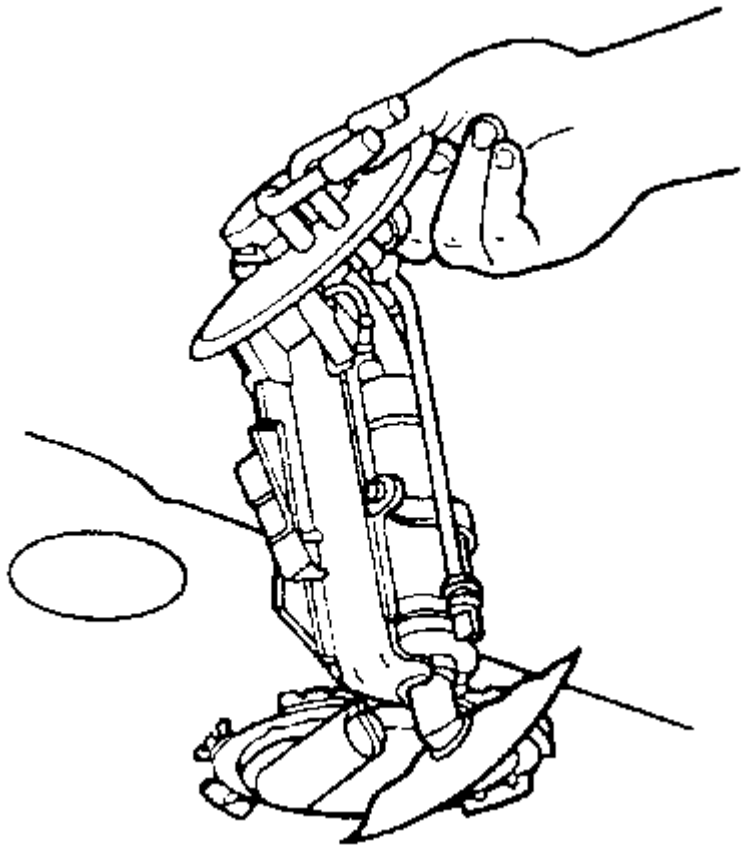
Apply slight pressure to remove the fuel pump

**12. Lift the float wiper arm through the left-hand fuel tank slot, then pass the pump motor retaining bracket through the right-hand fuel tank slot.**



Lift the float wiper arm through the left-hand fuel tank slot and pass the pump motor retaining bracket through the right-hand fuel tank slot

**13. Remove the fuel pump keeping return line in the fuel tank slot. Lift the fuel pump inlet filter then sender arm float through the fuel tank opening.**



Remove the fuel pump while keeping the return line in the fuel tank slot. Lift the fuel pump inlet filter and then the sender arm float through the fuel tank opening

14. **Remove and discard the fuel pump mounting gasket.**

**To install:**

15. **Position a new methanol compatible pump gasket on the fuel pump.**
16. **Install the fuel pump carefully to be sure that it is not damaged.**
17. **Hold the assembly in place and install the the fuel pump locking retainer finger tight. Make sure that all of the locking tabs are are under the fuel tank lock ring tabs.**
18. **Secure the unit with the fuel pump locking retainer ring using Fuel Tank Locking Wrench D90P-9275-A, or equivalent.**
19. **Remove the fuel tank from the bench to the vehicle, then support the fuel tank while connecting the fuel vapor and vent lines, electrical connectors and the fuel lines.**
20. **Install the fuel tank in the vehicle, then connect the support straps.**
21. **Install the fuel filler pipe:**
    1. **Position the fuel tank filler pipe in the body location.**
    2. **Connect the hoses with clamps to the fuel tank filler pipe.**
    3. **Install the underbody fuel tank filler pipe assembly bolt, then tighten the bolt to 36-53 inch lbs. (4-6 Nm), then lower the vehicle.**
    4. **Install the fuel tank filler cap to the tether location,**

then install the three retaining screws.

22. Insert Rotunda Fuel Tanker Adapter Hose 034-00020 or equivalent into the fuel tank through the fuel tank filler pipe.
23. Transfer the fuel from the Rotunda Fuel Storage Tanker 034-00002 or equivalent to the fuel tank.
24. Connect the negative battery cable, then check for fuel leaks.

### TESTING

1. Ground the fuel pump lead of the self-test connector through a jumper wire at the FP lead.
2. Connect a suitable fuel pressure tester to the fuel pump outlet.
3. Turn the ignition key to the RUN position to operate the fuel pump.
4. The fuel pressure should be 35-45 psi for all engines.

**A safety inertia switch is installed to shut off the electric fuel pump in case of collision. The switch is located on the left hand side (driver's side) of the car, behind the rear most seat side trim panel, or inside the rear quarter shock tower access door. If the pump shuts off, or if the vehicle has been hit and will not start, check for leaks first then reset the switch. The switch is reset by pushing down on the button provided.**

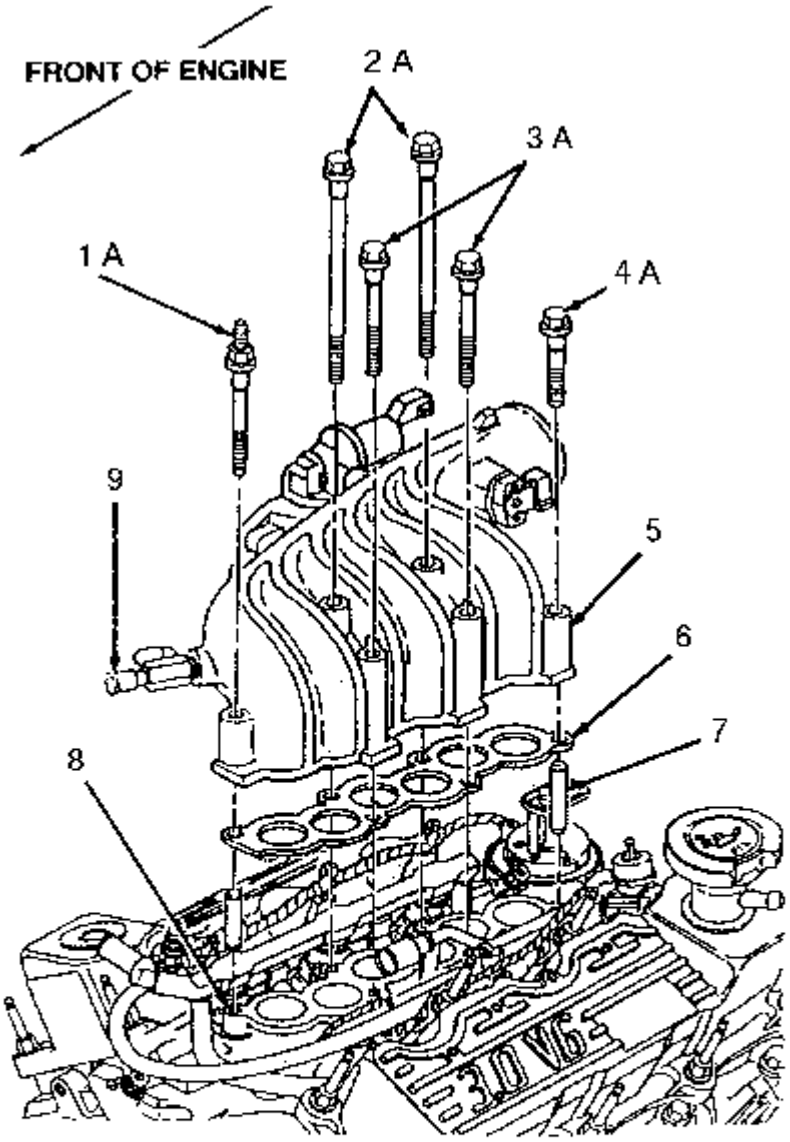
## Throttle Body

### REMOVAL & INSTALLATION

#### 3.0L Engine-Except SHO and FF

1. Disconnect the negative battery cable. Loosen the air cleaner tube retaining clamps.
2. Disconnect the crankcase ventilation tube and aspirator hoses from the air cleaner outlet tube, then remove the air cleaner outlet tube.
3. Remove the idle speed control solenoid shield.
4. Remove the accelerator cable retaining bolt, then disconnect the accelerator cable from the throttle body lever.
5. Remove the two accelerator cable bracket retaining bolts from the side of the throttle body, then remove the accelerator cable bracket.
6. Tag and disconnect the vacuum hoses from the intake manifold vacuum outlet fitting and cap and the EGR valve.
7. Loosen the EGR valve to exhaust manifold tube nuts at the EGR valve and the EGR valve tube-to-manifold connector. Remove or rotate the tube to the side, out of the way.
8. Remove the PCV hose from the fitting under the throttle body.
9. Disengage the electrical connectors for the intake air temperature (IAT) sensor, idle control valve and the TP sensor.
10. Remove the retaining bolts from the alternator brace, then remove the brace.
11. Loosen and remove the five throttle body retaining bolts and the one stud bolt. Make sure to note the location of the bolt to aid in installation.

12. **Lift and remove the throttle body assembly from the manifold. Discard the intake manifold upper gasket.**




1. Stud bolt
2. Bolt (2 required)
3. Bolt (2 required)
4. Bolt
5. Throttle body
6. Intake manifold upper gasket
7. Guide pin (part of 9H486)
8. Intake manifold
9. Intake manifold vacuum outlet fitting and cap

A. Tighten to 20-30 N.m (15-22 lb-ft)

Throttle body assembly-3.0L SEFI engine (except SHO and FF)

Click to enlarge

**To install:**

13. **Clean and inspect all gasket surfaces. When cleaning aluminum parts be careful**

**not to gouge the surfaces. Lightly coat all bolts with clean engine oil prior to installation.**

14. **If available, install guide pins to guide the assembly onto its mounting. Place a new gasket on the manifold surface.**
15. **Aligning the bolt holes, install the throttle body on the intake manifold. Install the stud bolt and five retaining bolts then tighten to 15-22 ft. lbs. (20 -30 Nm).**
16. **Install the alternator brace to the throttle body mounting stud and alternator mounting bracket. Tighten the nuts to 9-15 ft. lbs. (12-20 Nm).**
17. **Connect the PCV hose to the fitting under the throttle body.**
18. **Install the EGR valve-to-exhaust manifold tube to the EGR valve and the EGR valve tube to manifold connector. Tighten to 26-48 ft. lbs. (35-65 Nm).**
19. **Connect the vacuum hoses to the intake manifold vacuum outlet fitting and cap and the EGR valve.**
20. **Engage the electrical connectors to the intake air temperature sensor, idle air control valve and the TP sensor.**
21. **Install the accelerator cable bracket to the side of the throttle body. Tighten the retaining bolts to 13 ft. lbs. (17 Nm).**
22. **Connect the accelerator cable to the throttle body lever, then install the retaining bolt and tighten to 13 inch lbs. (1.4 Nm).**
23. **Connect the air cleaner outlet tube to the throttle body and the air cleaner assembly. Tighten the clamp to 12-22 inch lbs. (1.4-2.5 Nm). Connect the crankcase tube and the aspirator hose.**
24. **Connect the negative battery cable. Start the engine and check for vacuum leaks.**

**The Throttle Valve (TV) cable must be adjusted if the throttle body is removed for any reason and if the throttle plate idle adjustment screw position is changed.**

25. **Adjust the TV cable as follows:**
    1. **Connect the TV cable eye to the transaxle throttle control lever link, then attach the cable boot to the chain cover.**
    2. **If equipped with the 3.0L engine, with the TV cable mounted in the engine bracket, make sure the threaded shank is fully retracted. To retract the shank, pull up on the spring rest with the index fingers and wiggle the top of the thread shank through the spring with the thumbs.**
    3. **If equipped with the 3.8L engine, the TV cable must be unclipped from the right intake manifold clip. To retract the shank, span the crack between the two 180° segments of the adjuster spring rest with a suitable tool. Compress the spring by pushing the rod toward the throttle body with the right hand. While the spring is compressed, push the threaded shank toward the spring with the index and middle fingers of the left hand. Do not pull on the cable sheath.**
    4. **Attach the end of the TV cable to the throttle body.**
    5. **If equipped with the 3.8L engine, rotate the throttle body primary lever by hand, the lever to which the**

**TV-driving nail is attached, to the wide-open-throttle position. The white adjuster shank must be seen to advance. If not, look for the cable sheath/foam hang-up on engine/body components. Attach the TV cable into the top position of the right intake manifold clip. The threaded shank must show movement or "ratchet" out of the grip jaws. If there is no movement, inspect the TV cable system for broken or disconnected components, then repeat the procedure.**

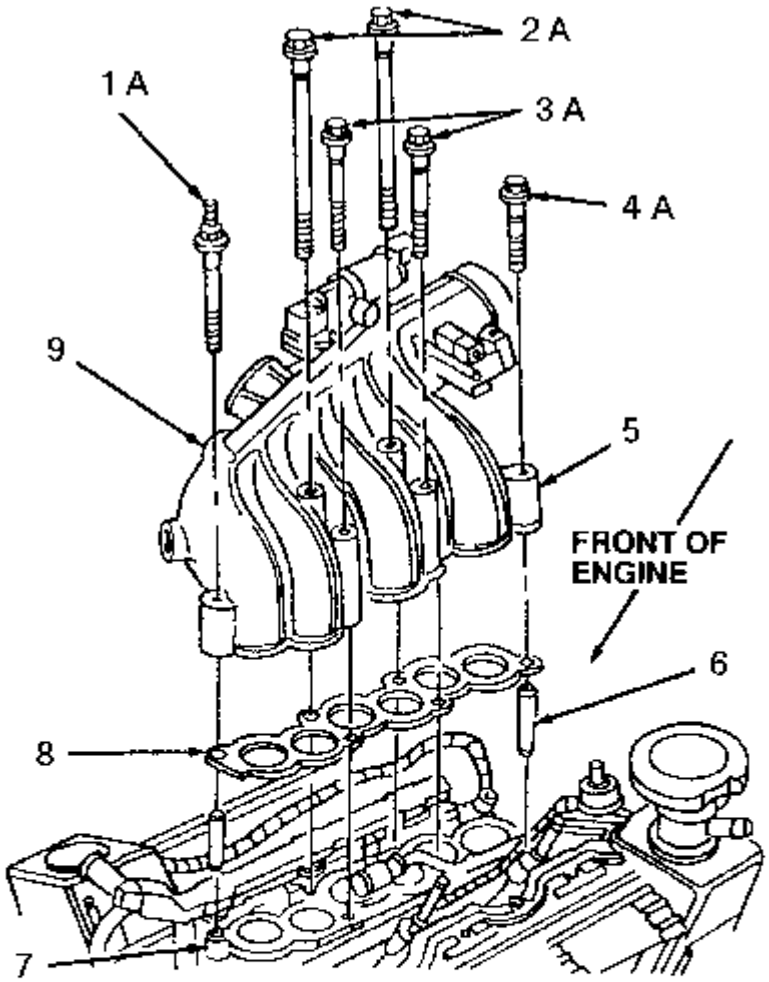
26. **Check and adjust the engine idle speed as necessary. Adjust the transaxle TV cable. Install the idle speed control solenoid shield. Tighten the retaining bolts to 13 inch lbs. (1.5 Nm).**

## 3.0L Flexible Fuel (FF) Engine

1. **Disconnect the negative battery cable.**
2. **Remove the crankcase ventilation tube and the aspirator hoses from the air cleaner outlet tube.**
3. **Loosen the air cleaner tube clamp at the throttle body and the air cleaner outlet tube.**

**Before relieving fuel pressure, cover the hoses with a shop cloth to prevent accidental fuel spray into eyes!**

4. **Properly relieve the fuel system pressure.**
5. **Remove the snow shield from the idle air control valve.**
6. **Remove the accelerator cable retaining bolts, then disconnect the accelerator cable from the throttle body.**
7. **Remove the two accelerator cable bracket retaining bolts from the side of the throttle body, then remove the bracket.**
8. **Tag and disconnect the vacuum hoses attached to the intake manifold vacuum outlet fitting and cap and the EGR valve.**
9. **Disconnect the differential pressure feedback (DPFE) sensor hoses from the EGR valve-to-exhaust manifold tube.**
10. **Loosen the EGR valve-to-exhaust manifold tube nut at the EGR valve.**
11. **Remove the crankcase ventilation tube from the fitting on the throttle body.**
12. **Disengage the fuel charging wiring connections from the idle air control valve, differential pressure feedback and the throttle position sensors.**
13. **Remove the alternator brace retaining nuts from the alternator mounting bracket and throttle body stud, then remove the brace.**
14. **Note the location of the throttle body retaining bolts, then loosen and remove the five throttle body retaining bolts and the stud bolt.**
15. **Lift and remove the throttle body from the intake manifold, then discard the intake manifold upper gasket.**




1. Stud bolt
2. Bolt (2 required)
3. Bolt (2 required)
4. Bolt
5. Throttle body
6. Guide pin (2 required)
7. Intake manifold
8. Intake manifold upper gasket
9. Intake manifold vacuum outlet fitting and cap

A. Tighten to 20-30 N.m (15-22 lb-ft)

Throttle body assembly-3.0L Flexible Fuel (FF) engine

Click to enlarge

**To install:**

**For the FF vehicle, the throttle body is to be replaced as an assembly. If replacing the throttle body with a new one, reuse the original intake manifold vacuum outlet fitting and cap, EGR valve and EGR pressure sensor with the new throttle body.**

16. **Carefully clean the intake manifold and throttle body gasket mating surfaces, being careful not the gouge the aluminum which will cause leaks, then inspect the mating surfaces for damage. Lightly coat all bolt and stud threads with oil.**
17. **If available, install guide pins in the front and rear bolt holes to aid in alignment.**
18. **Place a new intake manifold gasket on the intake manifold, using the guide pins if available.**
19. **Aligning the bolt holes, install the throttle body on the intake manifold. Install and hand-tighten the four center retaining bolts, then remove the guide pins if used. Install the stud bolt and the remaining retaining bolt. Tighten the bolts to 15-22 ft. lbs. (20-30 Nm).**
20. **Install the alternator brace to the throttle body mounting stud and alternator mounting bracket. Tighten the nuts to 9-15 ft. lbs. (12-20 Nm).**
21. **Install the EGR valve-to-exhaust manifold tube to the EGR valve and EGR valve tube to the manifold connector. Tighten the EGR valve-to-exhaust manifold tube nut to 26-48 ft. lbs. (35-65 Nm).**
22. **Connect the hoses from the EGR pressure sensor to the EGR valve-to-exhaust manifold tube. Check the condition of the hoses, and replace if damaged.**
23. **Connect the vacuum lines to their original locations on the intake manifold vacuum outlet fitting and cap, and EGR valve as tagged during removal. Check the condition of the hoses, and replace if damaged.**
24. **Engage the electrical connectors to the throttle position sensor, EGR pressure sensor and intake air temperature sensor.**
25. **Install the crankcase ventilation tube to the throttle body.**
26. **Install the accelerator cable bracket to the side of the throttle body, then tighten the retaining bolts to 13 ft. lbs. (17 Nm).**
27. **Connect the accelerator cable to the throttle body lever. Install the accelerator cable retaining bolt and tighten to 13 inch lbs. (1.4 Nm).**
28. **Install the air cleaner outlet tube to the throttle body. Tighten the tube clamps to 12-22 inch lbs. (1.4-2.5 Nm). Connect the crankcase ventilation tube and aspirator hose to their original locations.**
29. **Connect the negative battery cable, then start the engine and check for vacuum, exhaust and fuel leaks.**

**The Throttle Valve (TV) cable must be adjusted if the throttle body is removed for any reason and if the throttle plate idle adjustment screw position is changed.**

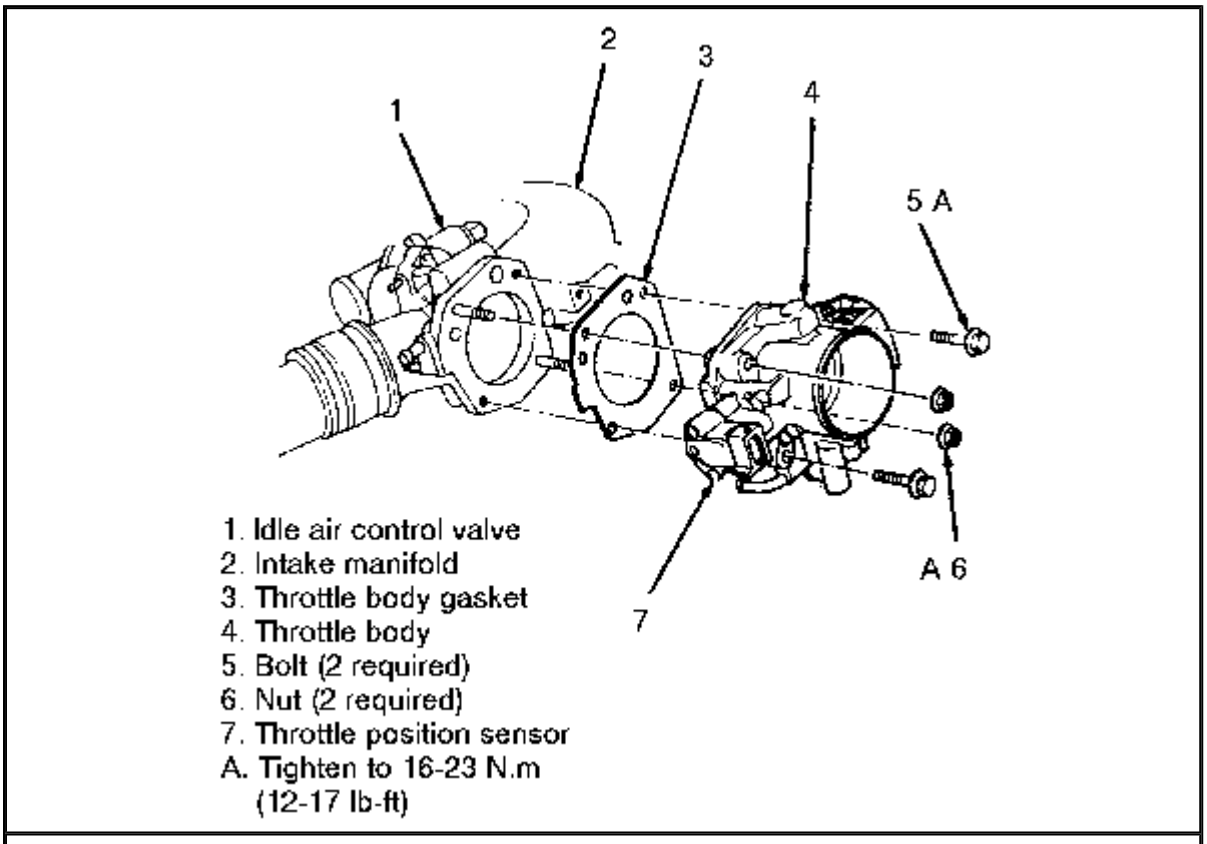
30. **Adjust the TV cable as follows:**
    1. **Connect the TV cable eye to the transaxle throttle control lever link, then attach the cable boot to the chain cover.**
    2. **If equipped with the 3.0L engine, with the TV cable mounted in the engine bracket, make sure the threaded shank is fully retracted. To retract the shank, pull up on the spring rest with the index fingers and wiggle the top of the thread shank through the spring with the thumbs.**
    3. **Attach the end of the TV cable to the throttle body. The threaded shank must show movement or "ratchet" out of the grip jaws. If there is no movement, inspect the TV cable system for broken**

**or disconnected components, then repeat the procedure.**

31. **Install the snowshield onto the idle air control valve, then tighten the retaining screw to 13 inch lbs. (1.4 Nm).**

## 3.0L and 3.2L SHO Engines

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap to relieve the fuel tank pressure, then properly relieve the fuel system pressure. There is a fuel pressure relief valve located on the fuel injection supply manifold for this purpose. For more details, please refer to the fuel pressure relief procedure located earlier in this section.**
3. **Remove the air cleaner outlet tube and accelerator cables.**
4. **Disconnect the fuel charging wiring connectors at the throttle position (TP) sensor and the idle air control valve.**
5. **Carefully relieve the cooling system pressure by releasing the pressure at the radiator cap, then remove the water bypass hoses.**
6. **Disconnect the crankcase ventilation tubes.**
7. **Remove the throttle body retaining bolts and nuts, then remove the throttle body from the vehicle. Discard the gasket.**




Throttle body mounting-3.0L and 3.2L SHO SEFI engines

Click to enlarge

**To install:**

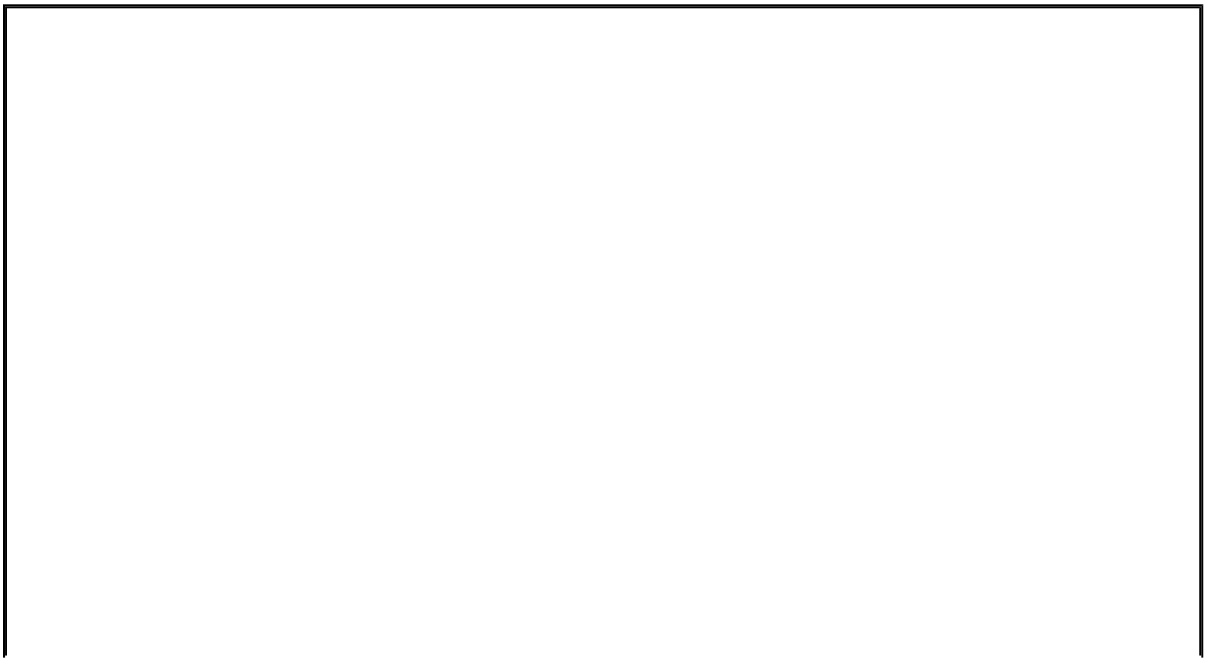
8. **Clean and inspect the throttle body and intake manifold mating surfaces. If scraping is necessary to clean the surfaces, be careful not to damage to gasket**

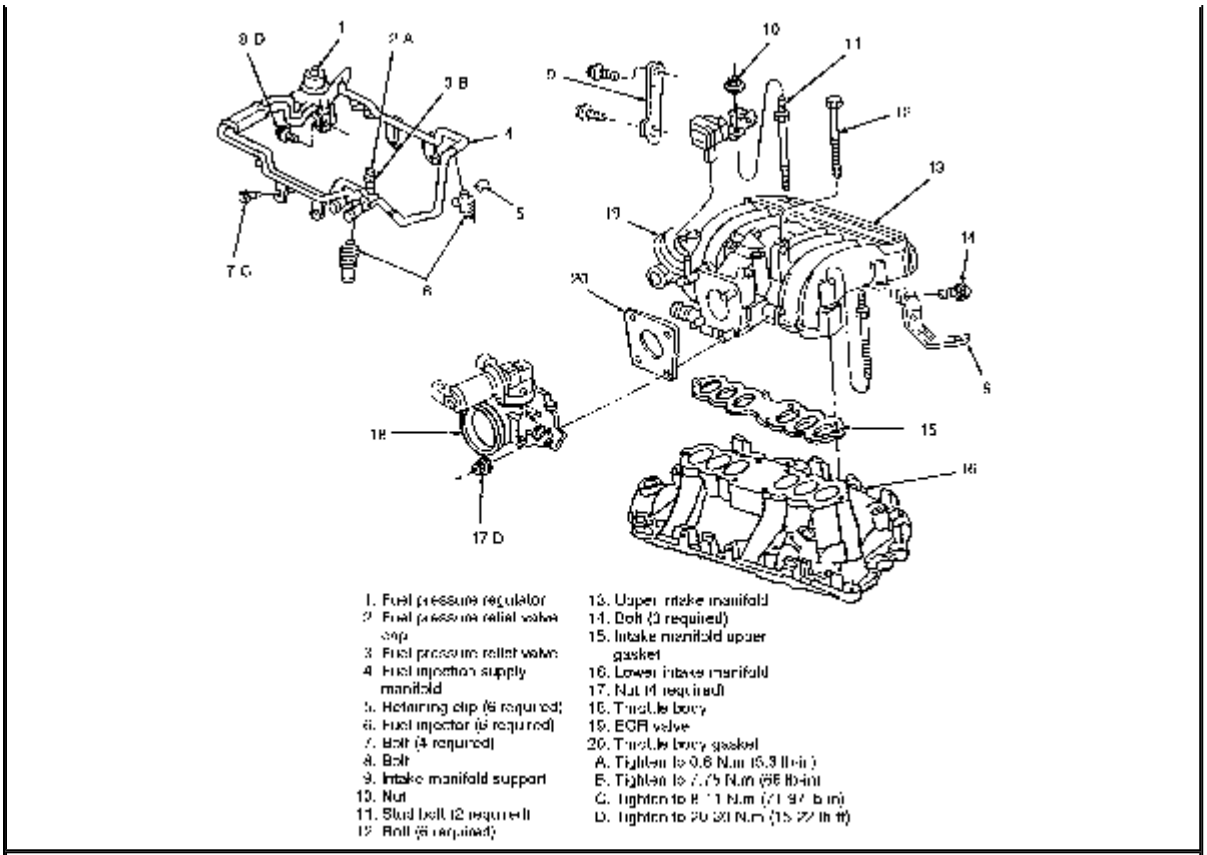
**surfaces or allow and gasket and/or foreign material to enter the intake manifold.**

9. **Install a new throttle body gasket, then position the throttle body and secure using the retaining bolts. Tighten the bolts to 12-17 ft. lbs. (16-23 Nm).**
10. **Connect the crankcase ventilation tubes.**
11. **Connect the water bypass hoses, then refill the cooling system to the proper level. For details regarding this procedure, please refer to *Section 1* of this manual.**
12. **Fasten the fuel charging wiring connectors at the throttle position (TP) sensor and idle air control valve.**
13. **Install the accelerator cables and the air cleaner outlet tube.**
14. **Install the fuel tank filler cap at the fuel tank.**
15. **Connect the negative battery cable, then check all of the connections at the fuel injection supply manifold, fuel injectors, push connect fittings, etc. to make sure they are all connected/fastened securely.**
16. **Turn the ignition switch ON and OFF several times without starting the engine to pressurize the fuel system.**
17. **Start the engine and run it until the engine reaches normal operating temperatures, then check for coolant leaks. Check the coolant level and add if necessary.**

## 3.8L Engine

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap to relieve the fuel tank pressure, then properly relieve the fuel system pressure. There is a fuel pressure relief valve located on the fuel injection supply manifold for this purpose. For more details, please refer to the fuel pressure relief procedure located earlier in this section.**
3. **Remove the air cleaner outlet tube from the throttle body, then disconnect the accelerator cable from the throttle body lever.**
4. **Disengage the fuel charging wiring connectors from the throttle position (TP) sensor and the idle air control valve.**
5. **Remove the four throttle body retaining nuts, then remove the throttle body from the upper intake manifold and discard the throttle body gasket.**






Exploded view of the throttle body and related fuel system components-3.8L SEFI engine

Click to enlarge

**To install:**

6. **Clean and inspect the gasket mating surfaces. If scraping is required to clean the surface, be careful not the damage the gasket surfaces or allow any gasket material or foreign material to drop into the intake manifold.**
7. **Using a new throttle body gasket, install the throttle body in the four studs of the upper intake manifold, then tighten the retaining nuts to 15-22 ft. lbs. (20-30 Nm).**
8. **Engage the fuel charging wiring connectors to the throttle position sensor and idle air control valve.**
9. **Install the air cleaner outlet tube to the throttle body.**
10. **Install the fuel tank filler cap at the fuel tank.**
11. **Connect the negative battery cable, then check all of the connections at the fuel injection supply manifold, fuel injectors, push connect fittings, etc. to make sure they are all connected/fastened securely.**
12. **Turn the ignition switch ON and OFF several times without starting the engine to pressurize the fuel system.**

## Fuel Charging Assembly

### REMOVAL & INSTALLATION

**The fuel charging assembly consists of the air throttle body, and the upper and lower intake manifolds. Prior to service or removal of the fuel charging assembly, the following procedures must be taken.**

1. **Open the hood and install protective fender covers.**
2. **Disconnect the negative battery cable.**
3. **Remove the fuel cap at the tank.**
4. **Release the fuel pressure from the fuel system. Depressurize the fuel system by connecting a Fuel Pressure Gauge part No. T80L-9974-B or equivalent to the pressure relief valve on the fuel rail assembly.**
5. **Remove the intake air boot from the throttle body and airflow sensor and disconnect the throttle cable.**
6. **Disconnect the vacuum and electrical connectors from the throttle body.**
7. **Disconnect the coolant bypass hoses at the throttle body.**

**WARNING**

The cooling system may be under pressure. Release the pressure at the radiator cap before removing the hoses. Also, allow the engine to cool down before performing any service.

8. **Disconnect the EGR pipe from the EGR valve, if so equipped.**
9. **Remove the eight bolts at the intake manifold support brackets and remove the brackets.**
10. **Remove the bolt retaining the coolant hose bracket and disconnect the PCV hoses, if so equipped.**
11. **Remove the intake and throttle body assembly.**

**To install:**

12. **Clean and inspect the manifold mounting surfaces.**
13. **Position new intake manifold gaskets and install the manifold assembly onto the cylinder heads.**
14. **Install the 12 intake-to-head attaching bolts and tighten to 11-17 ft. lbs. (15-23 Nm).**
15. **Install the intake manifold support brackets and coolant hose bracket.**
16. **Connect all the coolant and vacuum hoses.**
17. **Connect the electrical connectors at the DIS module, vacuum switching valve, throttle position sensor, and the air bypass valve.**
18. **Install the throttle cable and intake air boot.**
19. **Connect the negative battery cable. Start the engine and check for fuel and coolant leaks.**

# Fuel Injectors

## REMOVAL & INSTALLATION

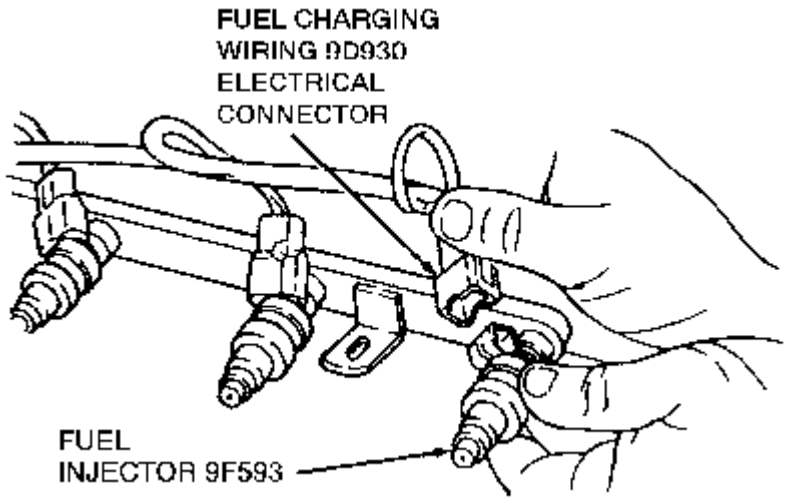
### 3.0L Engine

1. **Disconnect the negative battery cable.**

**CAUTION**

The fuel system is under high pressure. Use care when servicing the fuel system or personal injury may occur.

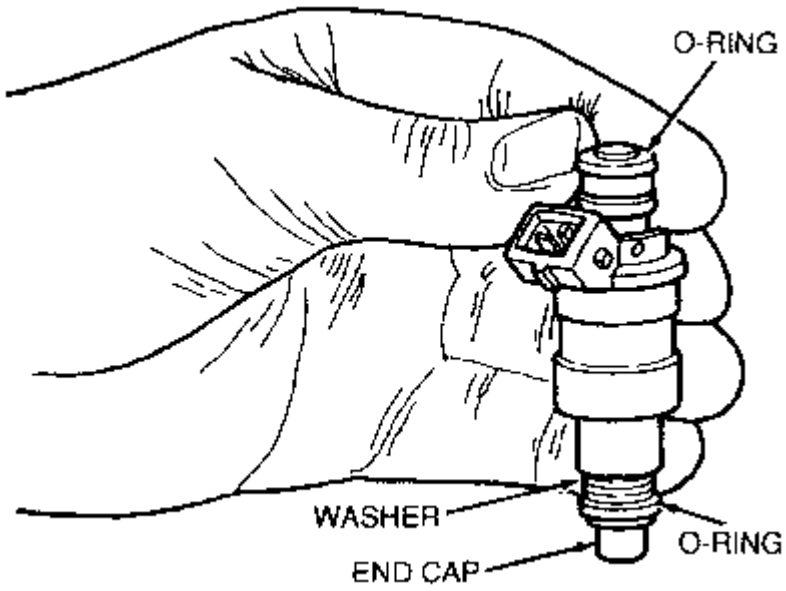
2. **Remove the fuel tank filler cap to release the fuel tank pressure, then properly release the fuel system pressure.**
3. **Remove the fuel injection supply manifold. For details, please refer to the procedure located later in this section.**
4. **Carefully remove the fuel charging wiring connectors from the fuel injectors, as required.**




Removing the fuel charging wiring electrical connector(s) from the fuel injector(s)

Click to enlarge

5. **Grasping the fuel injector body, pull up while gently rocking the fuel injector from side-to-side.**
6. **Inspect the fuel injector O-rings, there are two per injector, for signs of damage and/or deterioration and replace as necessary.**
7. **Inspect the fuel injector end cap, body and washer for signs of dirt and/or deterioration and replace as necessary.**




Inspect the injector O-rings, end cap, body and washer for signs of damage and/or deterioration, and replace worn components as necessary

**To install:**

8. **Lubricate new O-rings with clean engine oil.**
9. **Install the fuel injectors using a light, twisting-pushing motion.**
10. **Install the fuel injection supply manifold. For details, please refer to the procedure later in this section.**
11. **Engage the fuel charging wiring connectors to the fuel injectors.**
12. **Install the fuel tank filler cap, then connect the negative battery cable.**
13. **Turn the ignition switch ON and OFF several times without starting the engine to pressurize the system, then check for fuel leaks.**

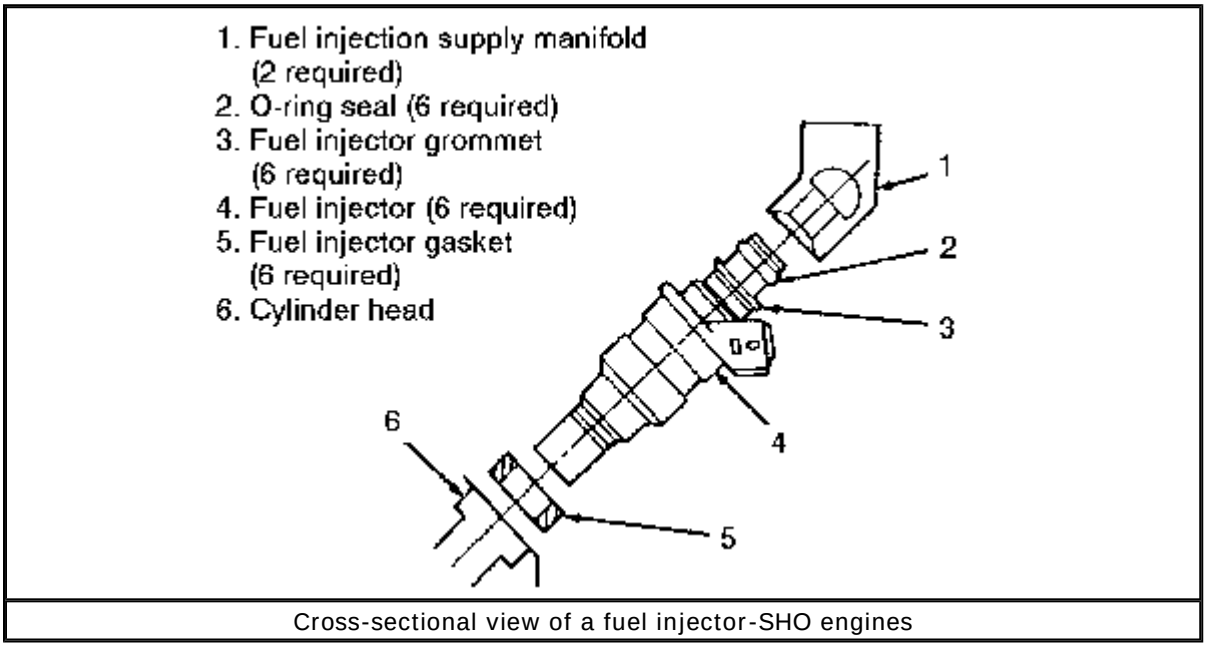
## 3.0L and 3.2L SHO Engines

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap, then properly relieve the fuel system pressure.**
3. **Remove the intake manifold as follows:**
    1. **Properly drain the cooling system into a suitable container.**
    2. **Remove the intake air tube from the throttle body and MAP sensor. Disconnect the throttle cables.**
    3. **Disengage the electrical connectors at the TP sensor, air bypass valve, vacuum switching valve and DIS module.**
    4. **Disconnect the coolant bypass hoses and vacuum lines.**
    5. **Disconnect the EGR pipe from the EGR valve.**
    6. **Remove the 8 bolts at the intake manifold support brackets, then remove the brackets.**
    7. **Remove the bolt retaining the coolant hose bracket,**

then disconnect the PCV hoses.

8. Remove the 12 manifold retaining bolts, then remove the intake manifold and throttle body assembly.

4. Disengage the electrical connectors at the fuel injectors.
5. Remove the fuel injection supply manifold/rail retaining bolts.
6. Raise and slightly rotate the fuel injection supply manifold/rail assembly, then remove the injectors.




Cross-sectional view of a fuel injector-SHO engines

Click to enlarge

**To install:**

7. Inspect the fuel injector O-ring seals and insulators for damage and/or deterioration, then replace as necessary.
8. Lubricate new O-rings with engine oil, then install them on the fuel injectors.
9. Install the injectors in the fuel injection supply manifold/rail by lightly twisting and pushing the injectors into position.
10. Install the fuel injection supply manifold/rail, making sure the injectors seat properly in the cylinder head.
11. Install the fuel injection supply manifold/rail retaining bolts, then tighten the bolts to 11-17 ft. lbs. (15-23 Nm).
12. Engage the electrical connectors at the fuel injectors.
13. Install the intake manifold by reversing the removal procedure.
14. Install the fuel tank filler cap, then connect the negative battery cable.
15. Then turn the ignition switch ON and OFF several times to pressurize the fuel system.
16. Start the engine and let it run until it reaches normal operating temperature, then check for leaks for fuel and/or coolant leaks. Check the coolant level and add if necessary.

## 3.8L Engine

1. Disconnect the negative battery cable.
2. Remove the fuel cap at the tank to release the fuel tank pressure.
3. Properly relieve the pressure from the fuel system. For details, please refer to the procedure located earlier in this section.
4. Remove the upper intake manifold and the fuel supply manifold as follows:
    1. Disengage the electrical connectors at the air bypass valve, TP sensor and EGR position sensor.
    2. Disconnect the throttle linkage at the throttle ball and the transmission linkage from the throttle body. Remove the 2 bolts securing the bracket to the intake manifold and position the bracket with the cables aside.
    3. Disconnect the upper intake manifold vacuum fitting connections by disconnecting all vacuum lines to the vacuum tree, EGR valve and pressure regulator.
    4. Disconnect the PCV hose and remove the nut retaining the EGR transducer to the upper intake manifold.
    5. Loosen the EGR tube at the exhaust manifold, then disconnect at the EGR valve.
    6. Remove 2 bolts retaining the EGR valve to the upper intake manifold, then remove the EGR valve and EGR transducer as an assembly.
    7. Remove the 2 canister purge lines from the fittings on the throttle body, then remove the 6 upper intake manifold retaining bolts.
    8. Remove 2 retaining bolts on the front and rear edges of the upper intake manifold where the manifold support brackets are located.
    9. Remove the nut retaining the alternator bracket to the upper intake manifold and the 2 bolts retaining the alternator bracket to the water pump and alternator.
    10. Remove the upper intake manifold and throttle body as an assembly.
    11. Disconnect the fuel supply and return lines from the fuel rail assembly.
    12. Remove the fuel rail assembly retaining bolts, carefully disengage the fuel rail from the fuel injectors, then remove the fuel rail.
5. Remove the injector retaining clips.
6. Remove the electrical connectors from the fuel injectors.
7. To remove the injector, pull it up while gently rocking it from side-to-side.
8. Inspect the injector O-rings, pintle protection cap (plastic hat) and washer for deterioration and replace, as required.

**To install:**

9. **Lubricate new engine O-rings with engine oil and install 2 on each injector.**
10. **Install the injectors, using a light, twisting, pushing motion to install them.**
11. **Reconnect the injector retaining clips.**
12. **Install the fuel rail assembly.**
13. **Install the electrical harness connectors to the injectors.**
14. **Install the upper intake manifold by reversing the removal procedure.**
15. **Install the fuel cap at the tank.**
16. **Connect the negative battery cable.**
17. **Turn the ignition switch from ON to OFF position several times without starting the engine to check for fuel leaks.**

# Fuel Injection Supply Manifold

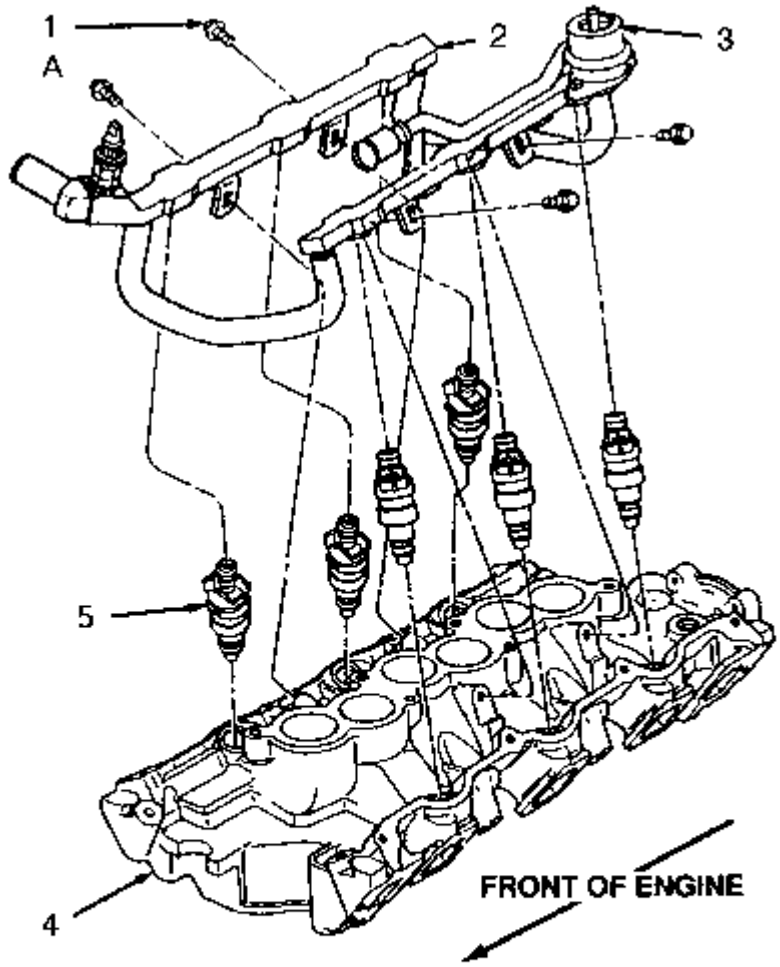
## REMOVAL & INSTALLATION

### 3.0L Engine-Except SHO

1. **Disconnect the negative battery cable, then properly relieve the fuel system pressure.**
2. **Remove the throttle body. For details, please refer to the procedure located earlier in this section.**
3. **On unleaded gasoline vehicles only:**
    1. **Scribe an alignment mark on the base of the distributor and the intake manifold.**
    2. **Remove the hold down clamp, then lift the distributor enough to allow the fuel injection supply manifold to clear the distributor and intake manifold.**
4. **Disconnect the fuel supply and return lines.**
5. **Carefully disconnect the fuel charging wiring from the fuel injectors.**
6. **Disconnect the fuel charging wiring from the fuel pressure regulator.**
7. **Remove the four fuel injection supply manifold retaining bolts. There are two on each side.**

> **WARNING**
>
> The fuel injectors and supply manifold must be handled with extreme care to avoid damage to the sealing areas and sensitive fuel-metering orifices.

8. **Carefully disengage the fuel injection supply manifold from the fuel injectors by lifting and gently rocking the fuel injection supply manifold, then remove the fuel injectors by lifting while gently rocking from side-to-side.**
9. **Place the removed components in a clean container to avoid dirt of other contamination.**




1. Bolt (4 required)
2. Fuel injection supply manifold
3. Fuel pressure regulator
4. Intake manifold
5. Fuel injector (6 required)
A. Tighten to 8-12 N.m (71-106 lb-in)

Fuel injection supply manifold-3.0L SEFI engine (except SHO)

Click to enlarge

**To install:**

**When installing the manifold, make sure that the O-rings are properly seated to avoid leakage.**

10. **Examine the fuel injector O-rings for deterioration, and install new ones if necessary.**

**To avoid cutting the O-rings, do NOT try to install them if they are swollen. Allow them to dry out first.**

11. **Using clean engine oil, lubricate the O-rings, then install two on each injector.**
12. **Make sure that the cups are clean and do not have any dirt or contamination.**
13. **Install the fuel injectors in the fuel injection supply manifold using a light, twisting-pushing motion.**

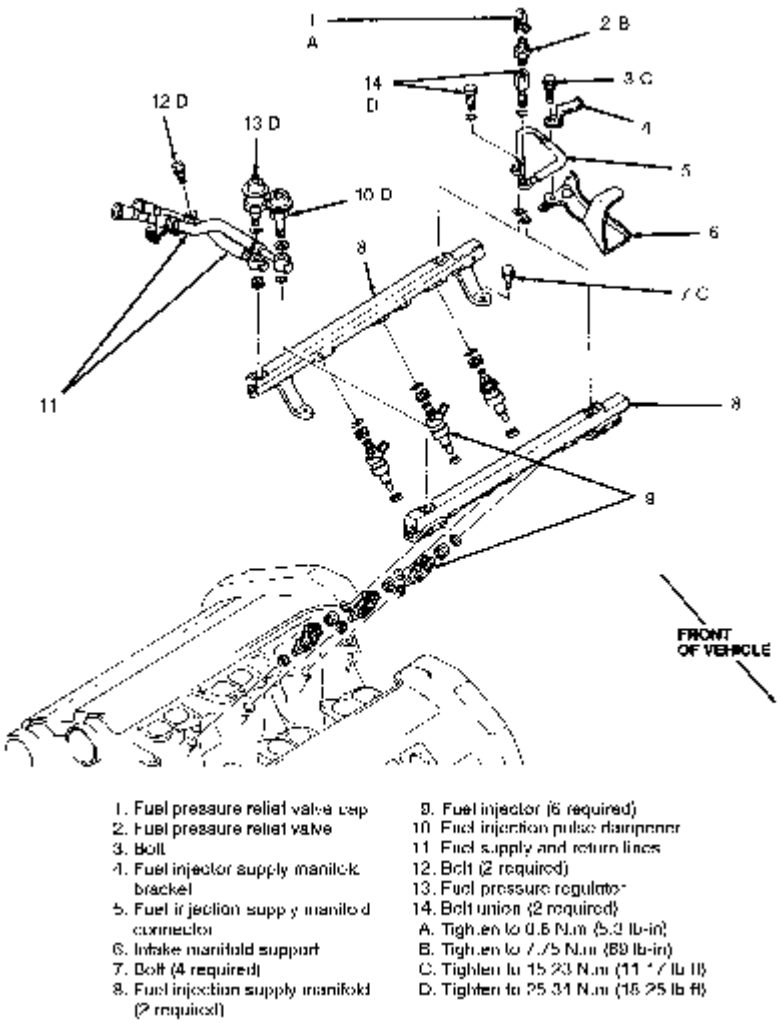
14. **On unleaded gasoline engines only:**
    1. **Lift the distributor enough to allow the fuel injection supply manifold to clear the distributor and intake manifold, then position the fuel injection manifold.**
    2. **Lower the distributor into position, then install the hold-down clamp and align the scribe marks made during removal. Tighten the clamp bolt to 18 ft. lbs. (24 Nm).**
15. **Carefully install the fuel injection supply manifold and fuel injectors into the intake manifold, one side at a time. Firmly push down on the fuel injection supply manifold to be sure that the injector O-rings are fully seated.**
16. **While holding the fuel injection manifold in place, install the retaining bolts, then tighten to 6-9 ft. lbs. (8-12 Nm).**
17. **Connect the fuel supply and return lines.**
18. **Connect the negative battery cable, then turn the ignition switch ON and OFF several times to pressurize the fuel system.**
19. **Using a clean paper towel and rubber gloves, check for leaks where the fuel injectors connect to the fuel injection supply manifold and intake manifold.**
20. **Connect the fuel charging wiring to the fuel injectors.**
21. **Connect the vacuum line to the fuel injectors.**
22. **Install the throttle body. For details, please refer to the procedure located earlier in this section.**
23. **Start the engine and allow it to idle, then check for fuel leaks and service as necessary.**

## 3.0L and 3.2L SHO Engines

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap to release the fuel tank pressure, then properly relieve the fuel system pressure. For details, please refer to the procedure located earlier in this section.**
3. **Remove the intake manifold. For details, please refer to the procedure located in *Section 3* of this manual.**
4. **Disconnect the fuel line spring lock couplings. For details, please refer to the procedure located earlier in this section.**
5. **Disengage the connectors from the fuel charging wiring at the fuel injectors. Disconnect the vacuum hose at the fuel pressure regulator.**

**The fuel injection supply manifolds are mounted on bushings. Keep the bushings for installation.**

6. **Remove the four fuel injection supply manifold retaining bolts, then remove the fuel injection supply manifold.**




Fuel injection supply manifold-3.0/3.2L SHO engines

Click to enlarge

**To install:**

**WARNING**

ALWAYS use new gaskets when assembling the fuel injection supply manifold to avoid possible fire from fuel leakage!

7. **Using a new gasket, install the fuel injection supply manifolds, making sure that all of the injectors are properly seated.**
8. **Install the four fuel injection supply manifold retaining bolts, then tighten the bolts to 11-17 ft. lbs. (15-23 Nm).**
9. **Connect the fuel line spring couplings. For details, please refer to the procedure located later in this section.**
10. **Install the intake manifold. For details regarding this procedure, please refer to the intake manifold installation in *Section 3* of this manual.**
11. **Connect the vacuum lines, then fasten the remaining fuel charging wiring connectors.**
12. **Install the cap on the fuel tank.**

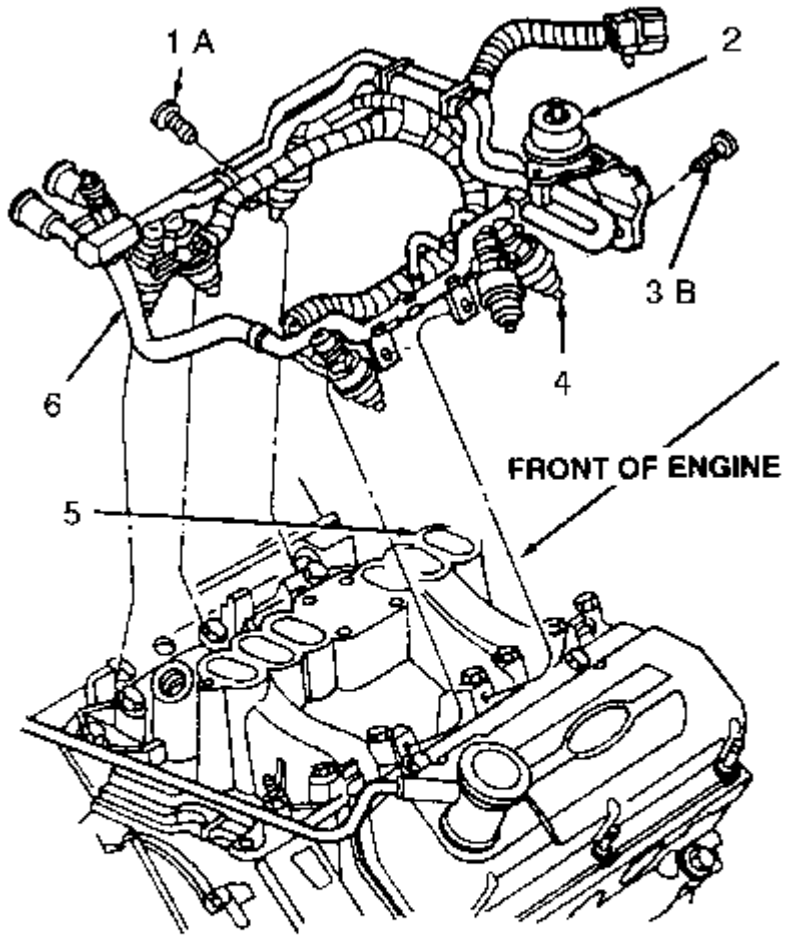
13. **Connect the negative battery cable, then turn the ignition ON and OFF several times, without starting the engine, to pressurize the fuel system.**
14. **Start and run the engine, then check for leaks.**

## 3.8L Engine

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap to release the fuel tank pressure, then properly relieve the fuel system pressure. There is a fuel pressure relief valve located on the fuel injection supply manifold for this purpose. For more details, please refer to the procedure located earlier in this section.**
3. **Remove the upper intake manifold. For details regarding this procedure, please refer to the intake manifold removal procedure located in *Section 3* of this manual.**
4. **Remove the spring lock coupling fittings from the fuel inlet and return fittings. For details, please refer to the procedure located later in this section.**
5. **Using Spring Lock Coupling Disconnect Tool D87L-9280-A ($^3/_8$ in.) or D87L-9280-B ($^1/_2$ in.) or equivalent, disconnect the inlet and outlet fuel lines from the fuel injection supply manifold.**
6. **Remove the four fuel injection supply manifold retaining bolts. There are two on each side. Remove the fuel pressure regulator bracket retaining bolt from the cylinder head.**

**It may be easier to remove the fuel injectors with the fuel injection supply manifold as an assembly.**

7. **Carefully disengage the fuel injection supply manifold from the fuel injectors, then remove the fuel injection supply manifold.**




1. Bolt (4 required)
2. Fuel pressure regulator
3. Bolt
4. Fuel injector (6 required)
5. Lower intake manifold
6. Fuel injection supply manifold
A. Tighten to 8-11 N.m (71-97 lb-in)
B. Tighten to 20-30 N.m (15-22 lb-ft)

Fuel injection supply manifold and related components-3.8L SEFI engine

Click to enlarge

**To install:**

**When installing the fuel injection supply manifold, make sure that the O-rings are properly seated so that there is no fuel leakage.**

8. **Push the fuel injector supply manifold down to be sure that all of the fuel injector O-rings are fully seated in the cylinder head pockets.**
9. **While holding the fuel injection supply manifold down, install the retaining bolts. Tighten the fuel injection supply manifold retaining bolts to the lower intake manifold to 6-8 inch lbs. (8-11 Nm). Tighten the fuel pressure regulator bracket retaining bolt to cylinder head to 15-22 ft. lbs. (20-30 Nm).**
10. **Install the spring lock coupling as described later in this section.**

11. **Install the fuel tank cap, then connect the negative battery cable.**
12. **With the fuel charging wiring still disconnected, turn the ignition switch ON and OFF several times. This allows the fuel pump to pressurize the system. Using a clean towel, check for fuel leaks.**
13. **Connect the fuel charging wiring.**
14. **Install the upper intake manifold. For details regarding this procedure, please refer to the upper intake manifold installation procedure in *Section 3* of this manual.**
15. **Start the vehicle and let it run for two minutes, then turn the engine OFF and check for leaks.**

# Fuel Pressure Regulator

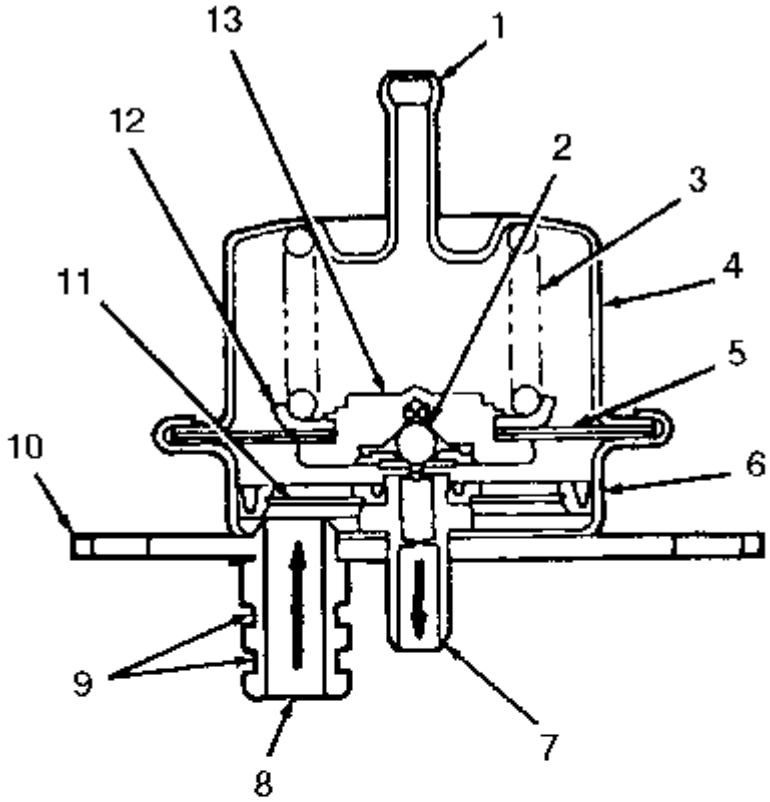
## REMOVAL & INSTALLATION

### 3.0L Engine-Except SHO

**WARNING**

Flexible Fuel vehicle pressure regulator components are strictly methanol compatible. Do NOT use components that are not specially designed for use with methanol fuel. The use of different parts or materials could produce an untested configuration that could result in fire, personal injury and/or engine damage.

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap to release the fuel tank pressure.**
3. **Properly release the fuel system pressure. There is a fuel pressure relief valve on the fuel injection supply manifold for this purpose. For more details, please refer to the fuel system relief procedure located earlier in this section.**
4. **Remove the vacuum line at the fuel pressure regulator.**
5. **Remove the two fuel injection supply manifold-to-intake manifold retaining bolts. Carefully lift the fuel injection supply manifold off of the fuel injectors to get to the fuel pressure regulator retaining screws.**
6. **Remove the Allen® head retaining screws from the fuel pressure regulator housing and discard them.**
7. **Remove the fuel pressure regulator, return seal and O-rings, then discard the return seal and the O-rings.**




1. Engine vacuum reference tube (part of 9C968)
2. Ball seat (part of 9C968)
3. Spring (part of 9C968)
4. Upper housing (part of 9C968)
5. Diaphragm (part of 9C968)
6. Lower housing (part of 9C968)
7. Fuel outlet (return tube) (part of 9C968)
8. Fuel inlet (supply tube) (part of 9C968)
9. O-ring grooves (part of 9C968)
10. Mounting plate (part of 9C968)
11. Fuel filter screen (part of 9C968)
12. Spring seat (part of 9C968)
13. Valve assembly (part of 9C968)

Cross-sectional view of a fuel pressure regulator-3.0L SEFI engine (except SHO)

Click to enlarge

**To install:**

8. **Lubricate new regulator O-rings with clean engine oil, then make sure the mating surfaces of the regulator and fuel injection supply manifold are clean. If scraping is necessary, be careful not to damage the fuel pressure regulator or fuel injection supply manifold sealing surfaces.**
9. **Install the new fuel pressure regulator return seal and O-rings on the fuel pressure regulator.**

10. **Using new Allen® head retaining screws, install the fuel pressure regulator on the fuel injection supply manifold. Tighten the screws to 34 inch lbs. (4 Nm).**
11. **Carefully install the fuel injection supply manifold to the fuel injectors. If the fuel injectors were completely disengaged from the fuel injection supply manifold, lubricate the fuel injector O-rings with clean engine oil before inserting them in the fuel supply manifold cups. Push the fuel injection supply manifold down on the fuel injector, then tighten the retaining bolts to 6-9 ft. lbs. (8-12 Nm) while holding down on the fuel injection supply manifold.**
12. **Install the fuel filler tank cap to the fuel tank.**
13. **Check all of the connections at the fuel injection supply manifold, fuel injectors, fuel line push connect fittings, etc. to make sure they are all fastened securely.**
14. **Connect the negative battery cable, then turn the ignition switch ON and OFF several times without starting the engine to pressurize the fuel system and check for fuel leaks.**
15. **Start the engine and allow it to warm up to normal operating temperature, then check for leaks.**

## 3.0L and 3.2L SHO Engines

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap to release the fuel tank pressure, the properly relieve the fuel system pressure. There is a pressure relieve valve located on the fuel injection supply manifold for this purpose. For details, please refer to the procedure located earlier in this section.**
3. **Disconnect the vacuum hose at the pressure regulator.**
4. **Remove the fuel pressure regulator from the fuel return lines and fuel injection supply manifold, then discard the sealing gaskets.**

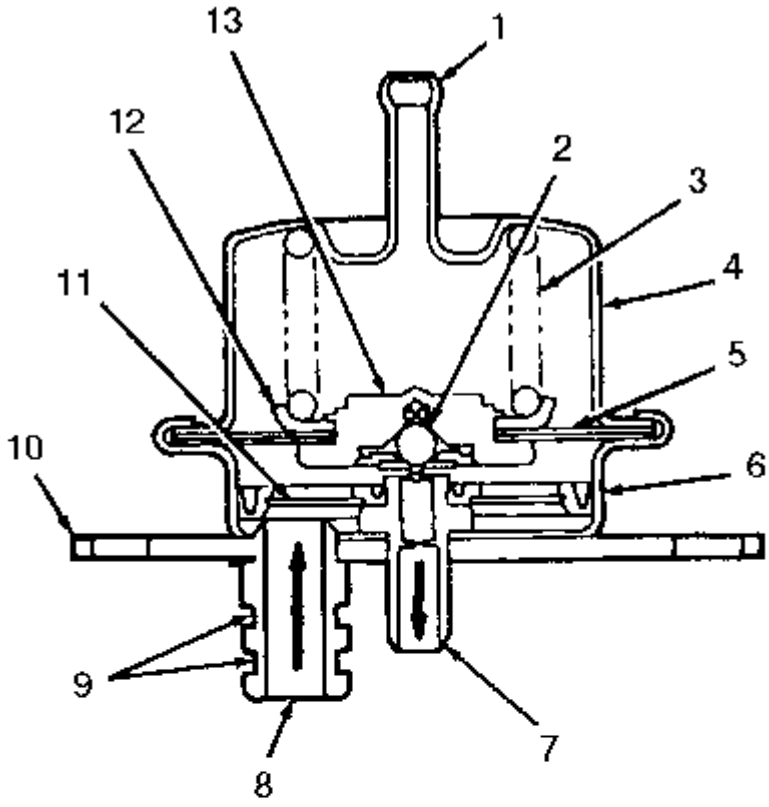
**To install:**

5. **Install the fuel pressure regulator into the fuel return line and fuel injection supply manifold using new gaskets. Tighten the fuel pressure regulator to 18-25 ft. lbs. (25-34 Nm).**
6. **Connect the vacuum hose to the fuel pressure regulator.**
7. **Install the fuel tank cap, then connect the negative battery cable.**
8. **Check all of the fuel system connections to make sure they are all fastened/connected securely.**
9. **Turn the ignition switch ON and OFF without starting the engine and check for fuel leaks.**

## 3.8L Engine

1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank filler cap to release the fuel tank pressure, the properly relieve the fuel system pressure. There is a pressure relieve valve located on the fuel injection supply manifold for this purpose. For details, please refer to the procedure located earlier in this section.**
3. **Remove the vacuum hose at the fuel pressure regulator.**
4. **Remove the Allen® head retaining screw from the fuel pressure regulator housing.**

5. **Remove the fuel pressure regulator, return seal and the O-rings. Discard the return seal and the O-rings.**




1. Engine vacuum reference tube (part of 9C968)
2. Ball seat (part of 9C968)
3. Spring (part of 9C968)
4. Upper housing (part of 9C968)
5. Diaphragm (part of 9C968)
6. Lower housing (part of 9C968)
7. Fuel outlet (return tube) (part of 9C968)
8. Fuel inlet (supply tube) (part of 9C968)
9. O-ring grooves (part of 9C968)
10. Mounting plate (part of 9C968)
11. Fuel filter screen (part of 9C968)
12. Spring seat (part of 9C968)
13. Valve assembly (part of 9C968)

Cross-sectional view of a fuel pressure regulator-3.8L SEFI engine

Click to enlarge

**To install:**

6. **Make sure the mating surfaces of the fuel pressure regulator and the fuel injection supply manifold are clean. If scraping is necessary, be careful not to damage the regulator or manifold.**

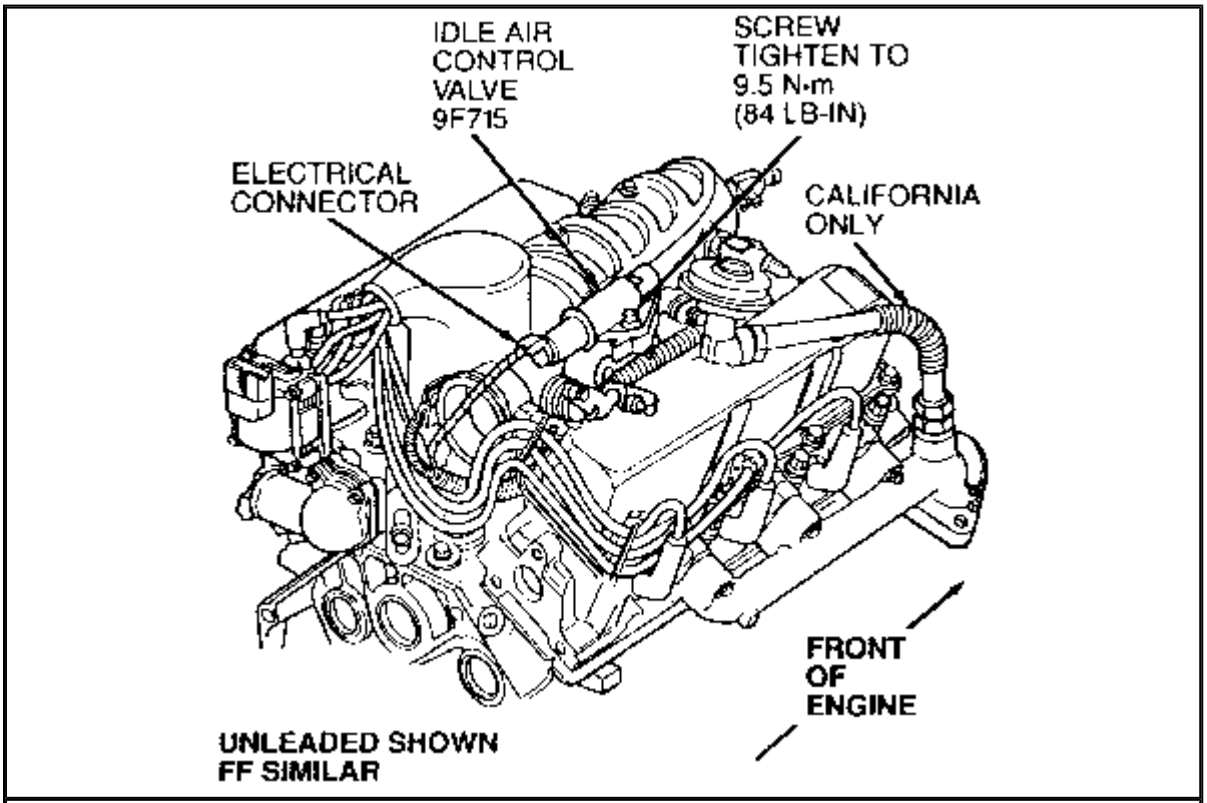
7. **Lubricate new O-rings with clean engine oil, then install a new return seal and O-rings on the fuel pressure regulator.**
8. **Install the fuel pressure regulator on the fuel injection supply manifold. Tighten the retaining screws to 34 inch lbs. (4 Nm).**
9. **Install the vacuum hose to the fuel pressure regulator.**
10. **Install the fuel tank cap, then connect the negative battery cable.**
11. **Check all of the fuel system connections to make sure they are all fastened/connected securely.**
12. **Turn the ignition switch ON and OFF without starting the engine and check for fuel leaks.**

# Idle Air Control (IAC) Bypass Valve

## REMOVAL & INSTALLATION

### 3.0L (Except SHO) and 3.8L Engine

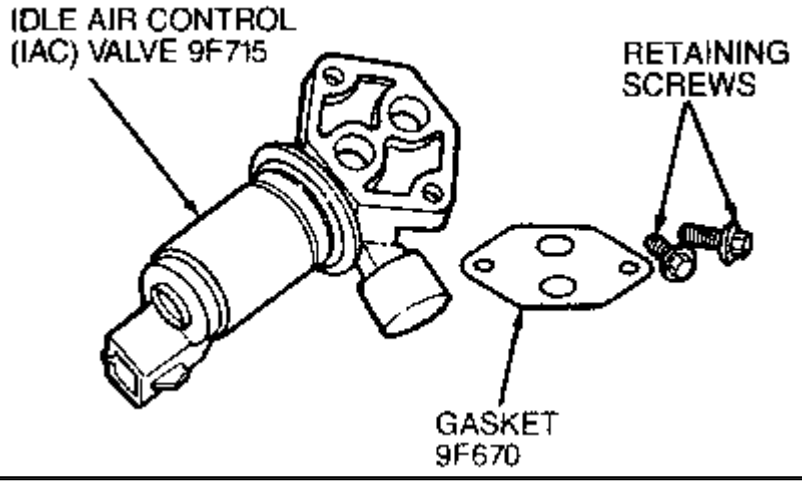
1. **Disconnect the negative battery cable. Properly relieve the fuel system pressure, as required.**




IAC valve location-3.0L engine (except SHO)

**Click to enlarge**

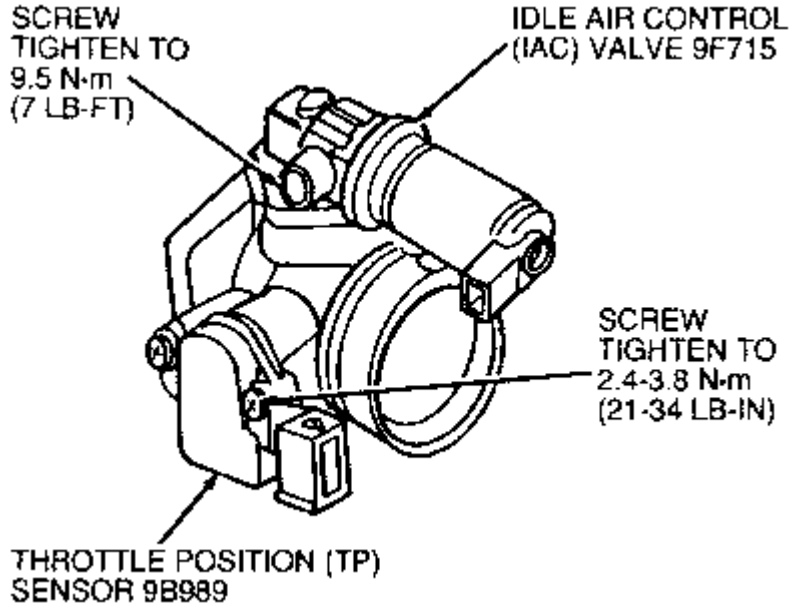
2. **Disengage the idle air control bypass valve assembly electrical connector from the wiring harness.**
3. **Remove the two IAC valve retaining screws, then remove the valve and gasket.**




Idle Air Control (IAC) valve-3.0L engine (except SHO)

**To install:**

4. **Clean the gasket mating surfaces. If scraping is necessary, be careful not to damage the idle air control valve or throttle body gasket surfaces. Also, do not allow gasket material to drop into the throttle body.**
5. **Install the gasket on the throttle body surface, then mount the IAC valve to its mounting and secure using the retaining screws. Tighten the screws to 84 inch lbs. (9.5 Nm).**




Idle Air Control (IAC) valve-3.8L engine

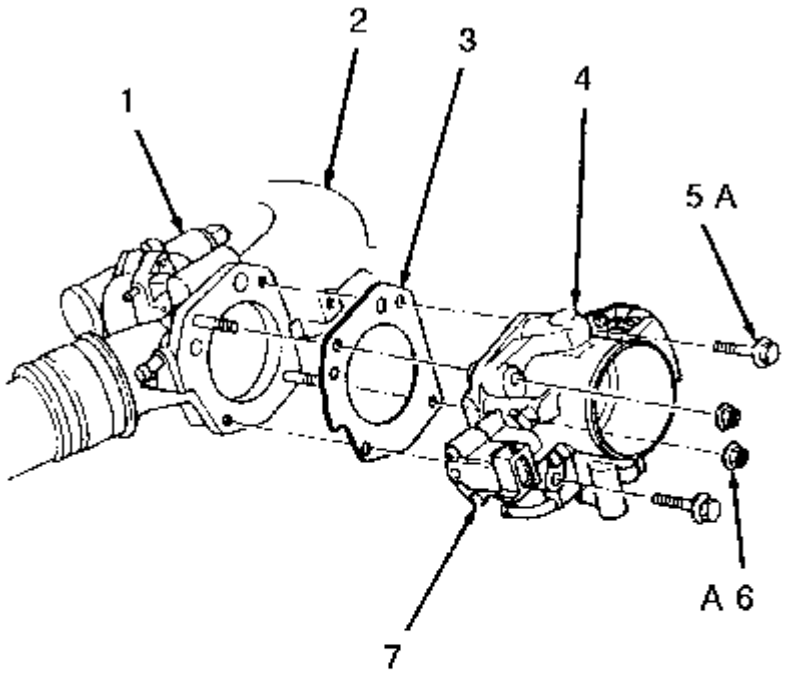
Click to enlarge

6. **Engage the air bypass valve electrical connector to the wiring harness.**
7. **Connect the negative battery cable.**

## 3.0L and 3.2L SHO Engines

1. **Disconnect the negative battery cable. Properly relieve the fuel system pressure, as required.**

2. **Disengage the idle air control bypass valve assembly electrical connector from the wiring harness.**
3. **Remove the IAC valve retaining bolts. Remove the top retaining bolt first and swing the valve upward to provide working clearance in order to remove the lower retaining bolt. Remove the valve and gasket.**




1. Idle air control valve
2. Intake manifold
3. Air charge control to intake manifold gasket
4. Throttle body assembly

5A. Bolt

6A. Nut

7. Throttle position sensor

A. Tighten to 16-23 N.m (12-17 lb-ft)

Idle Air Control (IAC) valve-SHO engines

Click to enlarge

**To install:**

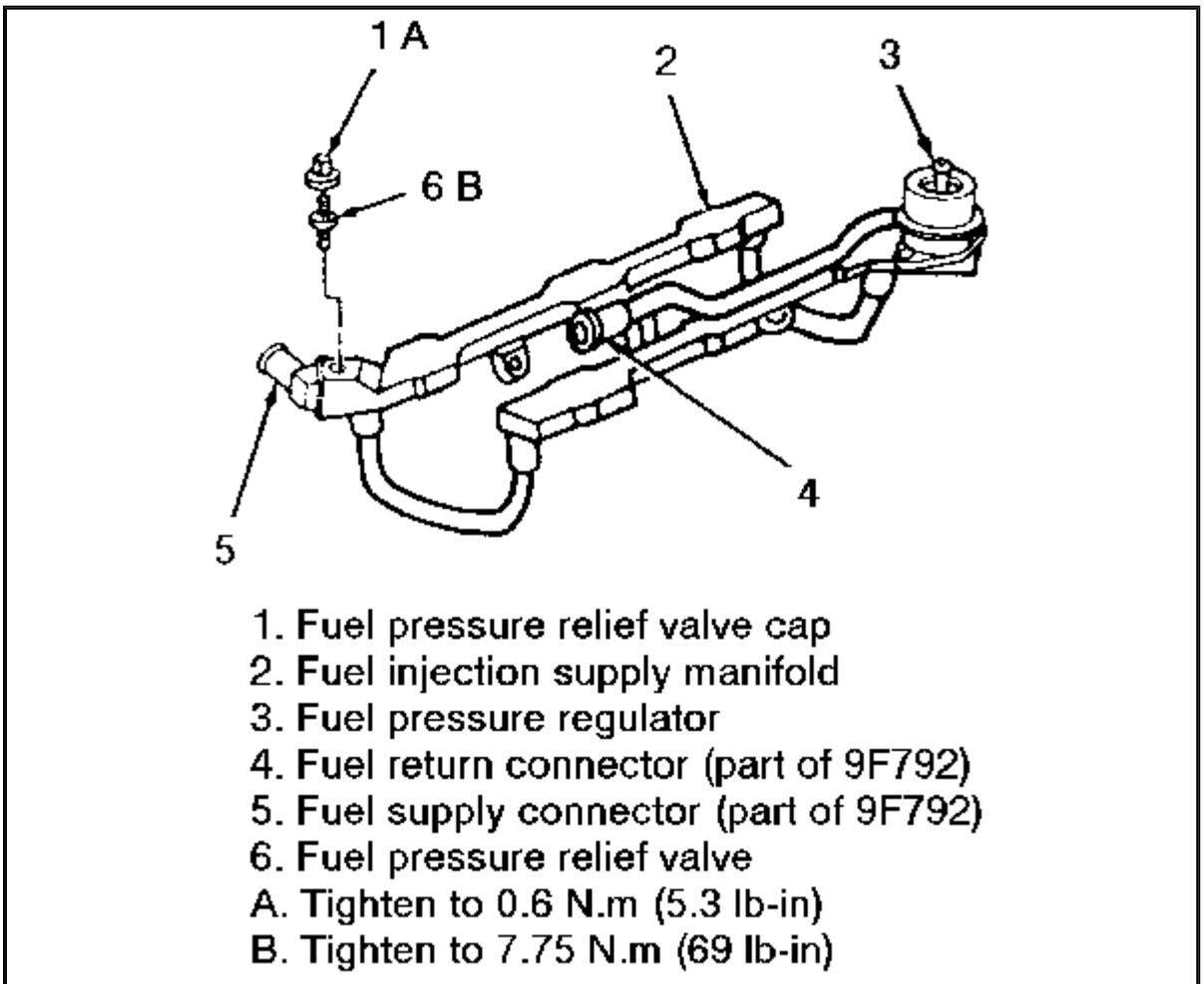
4. **Clean the gasket mating surfaces. If scraping is necessary, be careful not to damage the IAC valve or throttle body gasket surfaces. Also, do not allow gasket material to drop into the throttle body.**
5. **Install the gasket on the throttle body surface. Mount the air bypass valve to its mounting.**
6. **Tighten the retaining bolts to 63-97 inch lbs. (7-11 Nm).**
7. **Engage the IAC valve electrical connector to the wiring harness.**
8. **Connect the negative battery cable.**

# Fuel Pressure Relief Valve

## REMOVAL & INSTALLATION

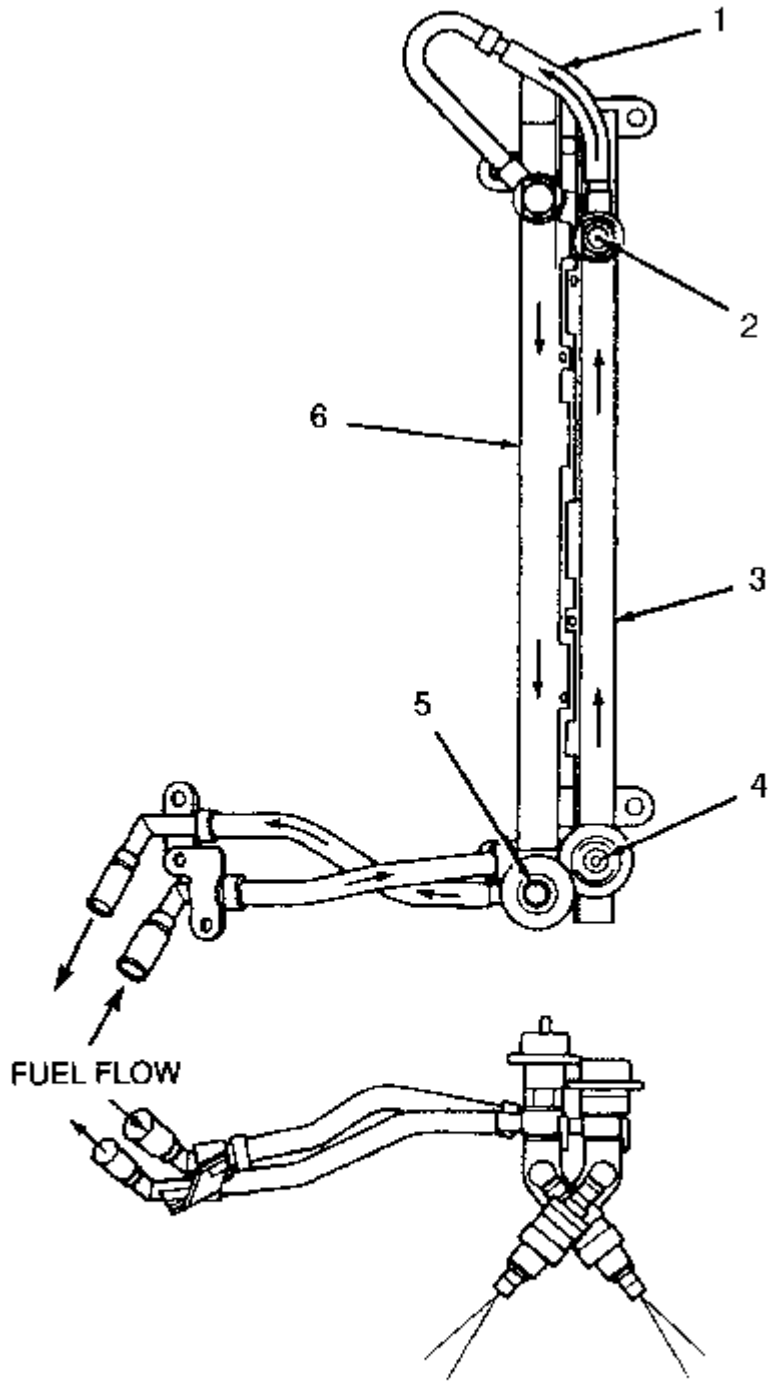
**Be sure to remove the cap from the fuel pressure relief valve!**

1. **Disconnect the negative battery cable.**
2. **If the fuel injection supply manifold is mounted to the engine, remove the fuel tank filler cap. Release the fuel system pressure at the fuel pressure relief valve on the fuel injection supply manifold using EFI/CFI Fuel Pressure Gauge T80L-9974-B, or equivalent.**
3. **Using an open-end wrench or a suitable deep-well socket, remove the fuel pressure relief valve.**




Fuel pressure relief valve location-3.0L SEFI engine (except SHO)

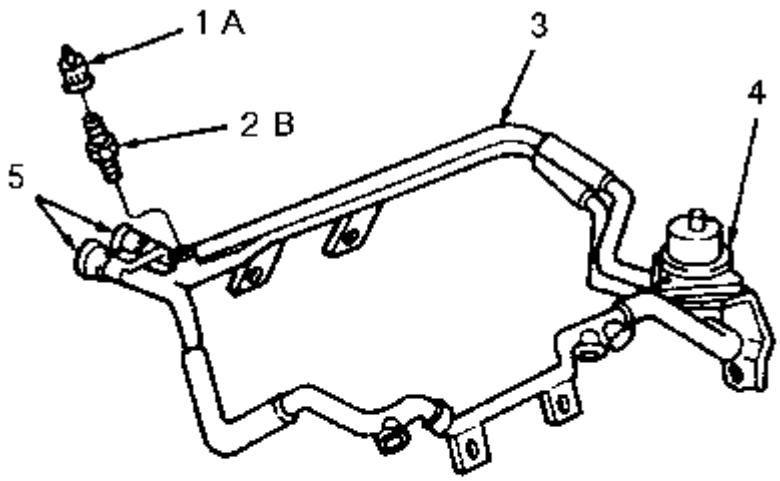
Click to enlarge




1. Fuel injection supply manifold connector hose
2. Fuel pressure relief valve
3. Fuel injection supply manifold, RH
4. Fuel injection pulse dampener, RH
5. Fuel pressure regulator
6. Fuel injection supply manifold, LH

Location of the fuel pressure relief valve-3.0L and 3.2L SHO engines

Click to enlarge




1. Fuel pressure relief valve cap
2. Fuel pressure relief valve
3. Fuel injection supply manifold
4. Fuel pressure regulator
5. Fuel supply and return connectors (part of 9F792)

A. Tighten to 0.6 N.m (5.3 lb-in)
B. Tighten to 7.75 N.m (69 lb-in)

Fuel pressure relief valve location-3.8L SEFI engine

Click to enlarge

**To install:**

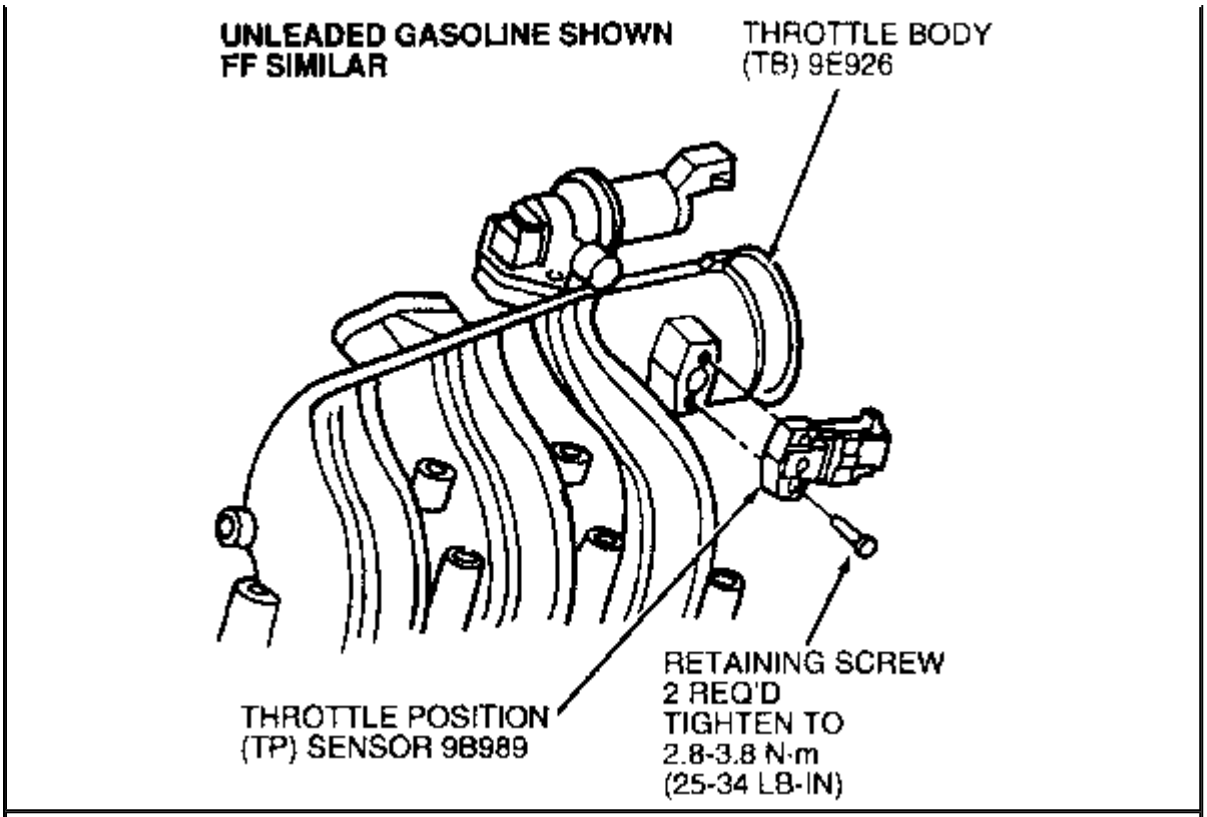
4. **Install the fuel pressure relief valve and fuel pressure relief valve cap. Tighten the valve to 69 inch lbs. (7.75 Nm) and the cap to 5.3 inch lbs. (0.6 Nm).**
5. **Connect the negative battery cable.**

# Throttle Position (TP) Sensor

## REMOVAL & INSTALLATION

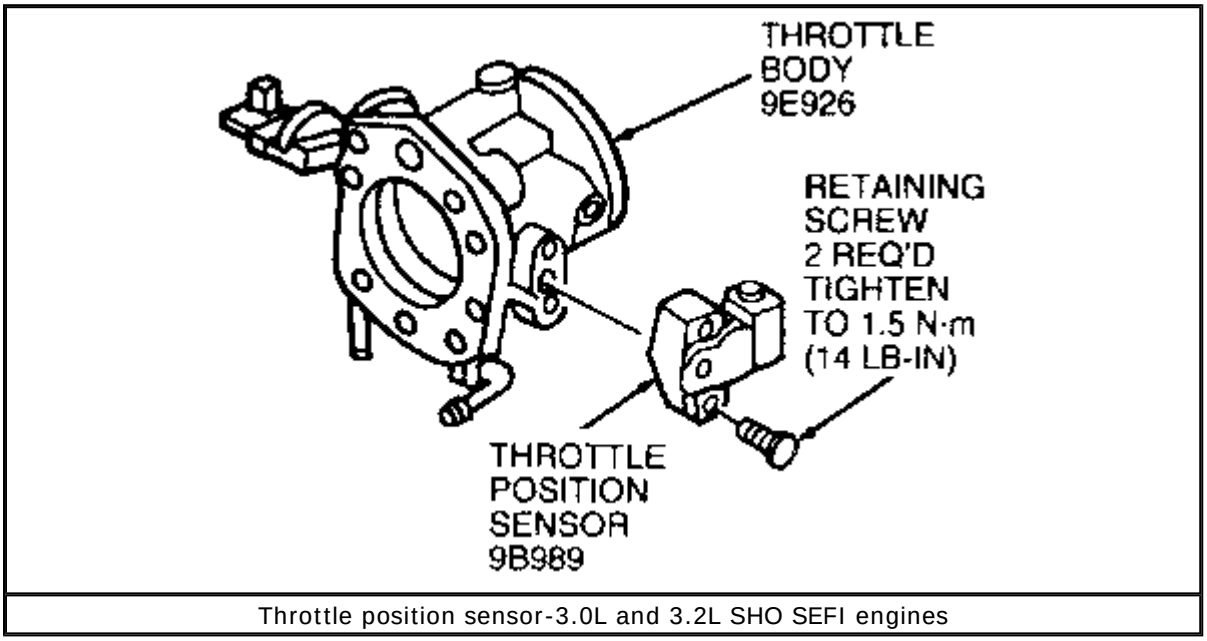
### 3.0L, 3.0L SHO and 3.2L SHO Engines

1. **Disconnect the negative battery cable.**
2. **Disconnect the throttle position (TP) sensor from the fuel charging wiring.**
3. **Remove the two throttle position (TP) sensor retaining screw, then remove the sensor.**




Throttle position sensor-3.0L SEFI engine (except SHO)

Click to enlarge




Throttle position sensor-3.0L and 3.2L SHO SEFI engines

Click to enlarge

**To install:**

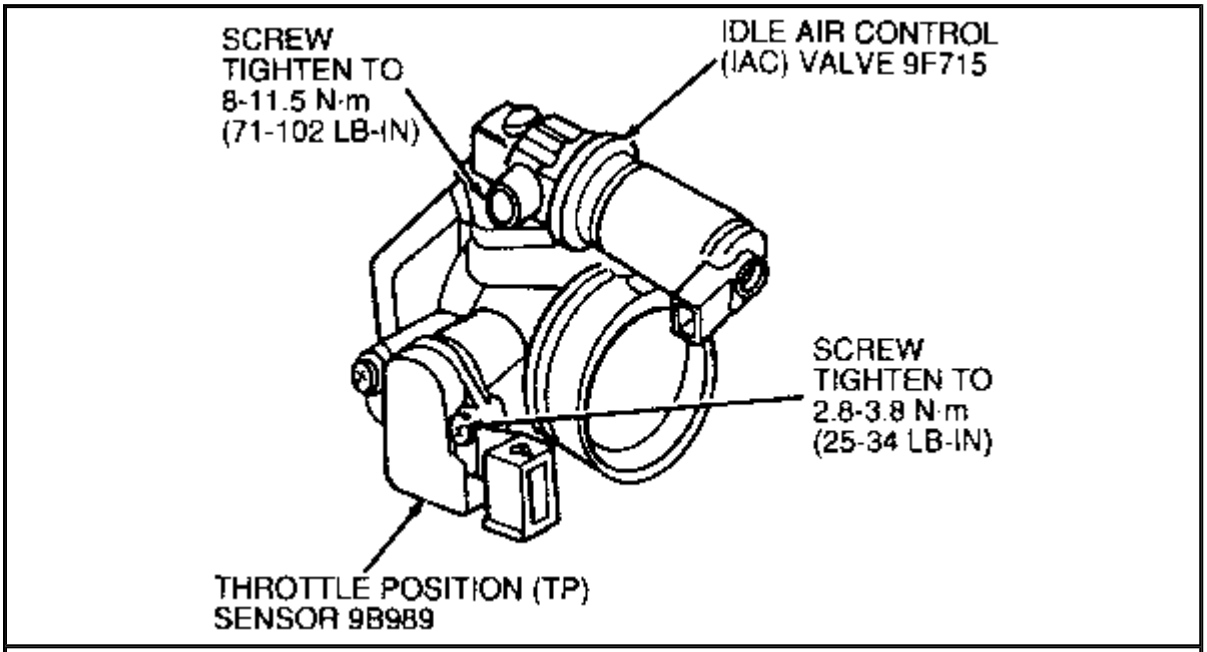
**Slide the rotary tangs into position over the throttle shaft blade, then rotate the throttle position sensor clockwise to the installed position only. Failure to install the TP sensor in this way may result in excessive idle speeds.**

4. Install the TP sensor, make sure that the rotary tangs on the sensor are in proper alignment and that the red seal is inside the connector.
5. Secure the TP sensor to the throttle body assembly with the two retaining screws, then tighten the screws as follows:
    1. For the 3.0L unleaded and flexible fuel vehicles, tighten the screws to 25-34 inch lbs. (2.8-3.8 Nm).
    2. For the 3.0L SHO and the 3.2L SHO, tighten the screws to 14 inch lbs. (1.5 Nm).
6. Connect the fuel charge wiring to the TP sensor, then connect the negative battery cable.

### 3.8L Engine

1. Disconnect the negative battery cable.
2. Disconnect the TP sensor from the engine control sensor wiring.
3. Remove the two throttle position sensor retaining screws, then remove sensor.

**To install:**




Throttle position sensor-3.8L SEFI engine

Click to enlarge

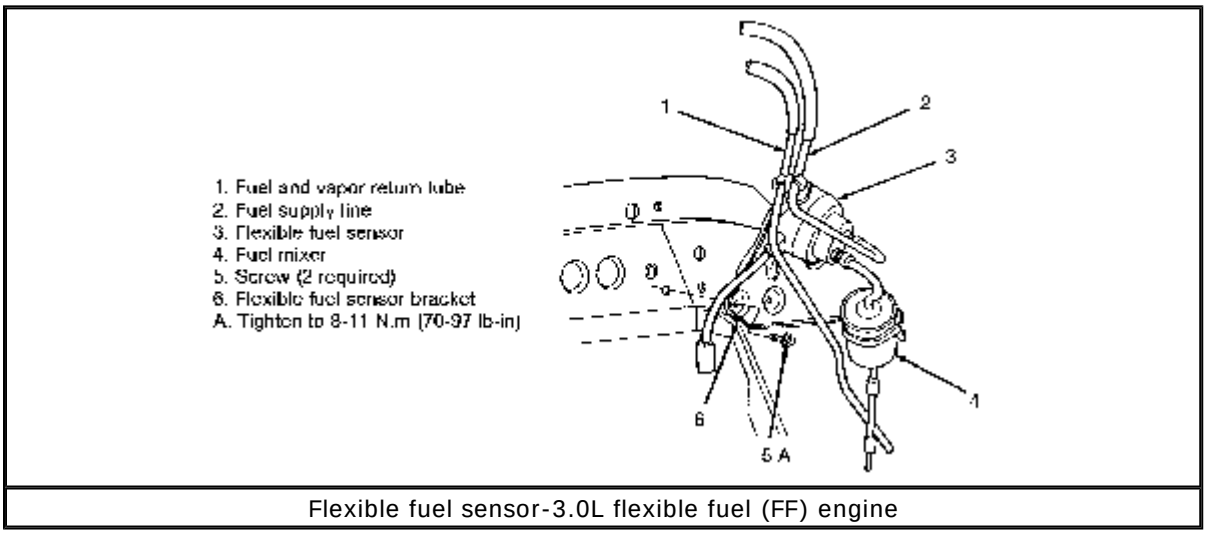
4. Install the TP sensor, then secure using the two retaining screws. Tighten the screws to 25-34 inch lbs. (2.8-3.8 Nm).
5. Connect the TP sensor to the engine control sensor wiring, then connect the negative battery cable.

## Flexible Fuel (FF) Sensor

### REMOVAL & INSTALLATION

#### 3.0L Flexible Fuel (FF) Vehicles

1. **Disconnect the negative battery cable.**
2. **Remove the fuel filler tank cap to relieve the fuel tank pressure.**
3. **Properly relieve the fuel system pressure. There is a pressure relief valve located on the fuel injection supply manifold for this purpose. For more details regarding this procedure, please refer to the fuel pressure relief procedure located earlier in this section.**
4. **Disengage the flexible fuel sensor electrical connector.**
5. **Raise and safely support the vehicle.**
6. **Remove the front right-hand side tire and wheel assembly.**
7. **Remove the fuel line retaining clip, and the fuel line from the fuel mixer at the inlet hose using Fuel Lines Disconnect Tool ($^3/_8$ in.) T90T-9550-C, or equivalent.**
8. **Disconnect the flexible fuel sensor outlet hose using Fuel Line Disconnect Tool ($^3/_8$) T90T-9550-C.**
9. **Remove the flexible fuel bracket-to-frame rail retaining bolts and flexible fuel sensor/mixer and bracket assembly from the vehicle.**
10. **Loosen the fuel mixer retainer clamp and disconnect the fuel mixer outlet tube from the flexible fuel sensor using Fuel Line Disconnect Tool ($^3/_8$) T90T-9550-C.**
11. **Remove the flexible fuel sensor retaining bolts, then remove the sensor from the bracket.**




Flexible fuel sensor-3.0L flexible fuel (FF) engine

**Click to enlarge**

**To install:**

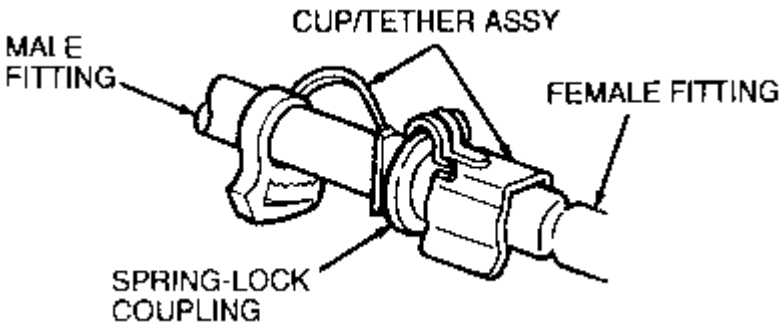
12. **Install the flexible fuel sensor to the bracket, then secure using the retaining bolts. Tighten the bolts to 27-34 inch lbs. (3-4 Nm).**
13. **Connect the fuel mixer outlet tube to the flexible fuel sensor, then tighten the fuel mixer retaining clamp to 51-82 inch lbs. (5.8-9.3 Nm).**
14. **Install the flexible fuel sensor/mixer and bracket assembly and secure with the retaining bolts. Tighten the bolts to 70-97 inch lbs. (8-11 Nm).**
15. **Connect the flexible fuel sensor outlet hose, then connect the fuel line to the fuel mixer and install the fuel line retaining clip.**
16. **Install the front right-hand wheel and tire assembly. Tighten the lug nuts to 85-105 ft. lbs. (115-142 Nm).**

17. **Carefully lower the vehicle.**
18. **Engage the flexible fuel sensor electrical connector.**
19. **Install the fuel tank filler cap at the fuel tank.**
20. **Connect the negative battery cable, then check all of the connections at the fuel injection supply manifold, fuel injectors, push connect fittings, etc. to make sure they are all properly connected/fastened.**
21. **Turn the ignition switch ON and OFF several times without starting the engine to pressurize the fuel system, then check for fuel leaks.**

# FUEL LINE FITTINGS

## Spring Lock Coupling

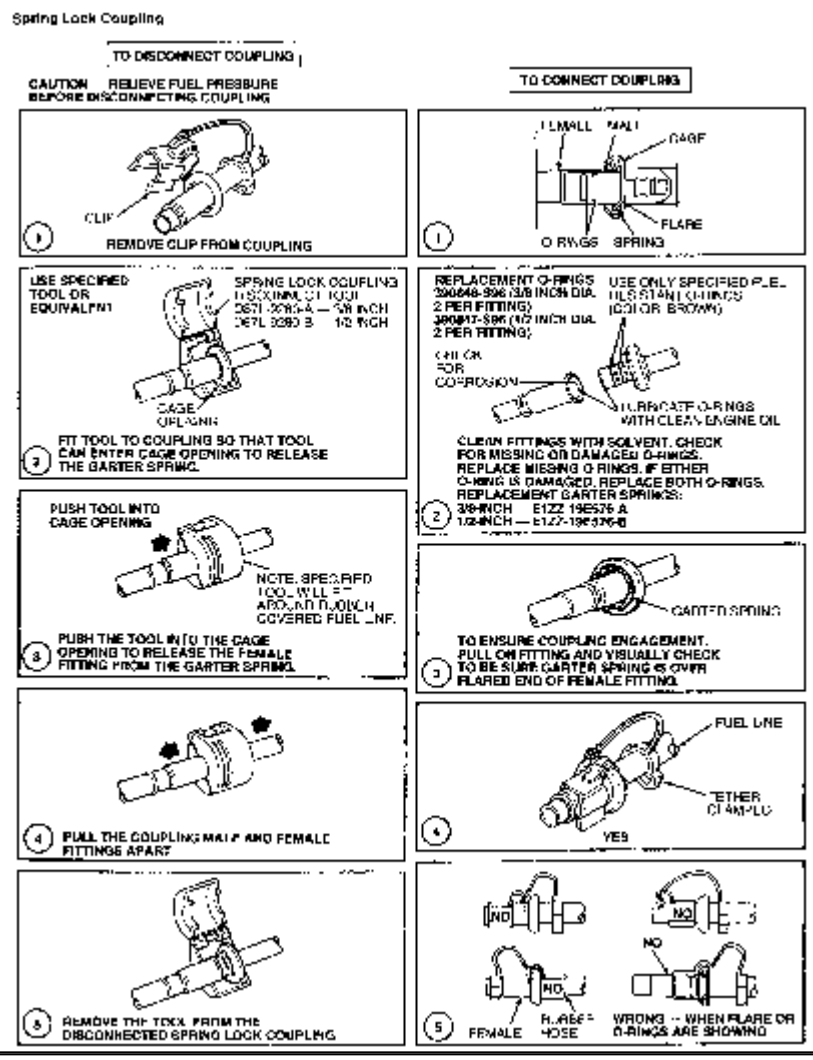
The spring lock coupling is a fuel line coupling held together by a garter spring inside a circular cage. When the coupling is connected, the flared end of the female fitting slips behind the garter spring inside the cage of the male fitting. The garter spring and cage then prevent the flared end of the female fitting from pulling out of the cage. As a redundant locking feature, a horseshoe-shaped retaining clip is used to improve the retaining ability of the spring lock coupling.




Spring lock coupling assembly

### REMOVAL & INSTALLATION

1. **Disconnect the negative battery cable, then properly relieve the fuel system pressure. For details, please refer to the procedure covered in the appropriate fuel system in this section.**
2. **Using your hand only, remove the retaining clip from the spring lock coupling. Do NOT use any sharp tool or screwdriver because it may damage the coupling.**
3. **Twist the fitting to free it from any adhesion at the O-ring seals.**
4. **Fit Spring Lock Coupling Disconnect Tool D87L-9280-A ($^3/_8$ in.) or D87L-9280-B ($^1/_2$ in.), or equivalent, to coupling.**
5. **Close the tool and push into the open side of the cage to expand the garter spring and release the female fitting.**
6. **After the garter spring is expanded, pull the fittings apart.**
7. **Remove the tool from the disconnected coupling.**




Disconnecting and connecting the spring lock coupling

**Click to enlarge**

8. **Make sure that the garter spring is in the cage of the male fitting. If the garter spring is missing, install a new spring by pushing it into the cage opening. If the garter spring is damaged, remove it from the cage with a small wire hook (do NOT use a screwdriver) and install a new spring.**
9. **Clean all dirt and/or foreign material from both pieces of the coupling.**

**Flexible fuel vehicles use special Methanol compatible O-rings.**

10. **Replace any missing or damaged O-rings. Only use the fuel resistant O-rings specified in the accompanying figure. For all vehicles except flexible fuel vehicles, lubricate the male fitting, O-rings and the inside of the female fitting with clean engine oil. For flexible fuel vehicles, lubricate with oil that has an API designation of Multi-Fuel Vehicles (MFV).**

**Use only the specified (brown) O-rings because they are made of a special material. The use of other types of O-rings, may cause the connection to leak during engine operation.**

11. **Fit the female fitting to the male fitting and push until the garter spring snaps over the flared end of the female fitting.**
12. **Make sure the coupling is engaged or fastened securely by pulling on the fitting**

**and visually checking to make sure the garter spring is over the flared end of the female fitting.**

**All vehicles require the large black clip to be installed on the supply-side fuel line and the small grey clip to be installed on the return-side fuel line.**

13. **Position the retaining clip over the metal portion of the spring lock coupling. Firmly push the retaining clip onto the spring lock coupling. Make sure that the horseshoe portion of the clip is over the coupling. Do not install the retaining clip over the rubber fuel line.**

## Push Connect Fittings

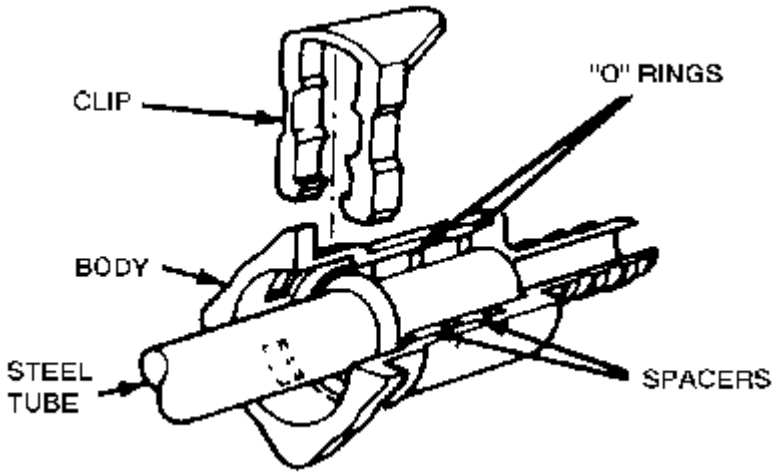
Push connect fittings are designed with two different retaining clips. The fittings used with 8mm diameter tubing use a hairpin clip, while the fittings used with 6mm and 12.7mm diameter tubing use a "duck bill'' clip. Each type of fitting requires different procedures for service.

**Push connect fitting disassembly must be accomplished prior to fuel component removal (filter, pump, etc.), except for the fuel tank, where removal is necessary for access to the push connect fittings.**

### REMOVAL & INSTALLATION

#### Hairpin Clip Fittings ($^{5}/_{16}$ in.)

1. **Inspect the internal portion of the fitting for dirt accumulation. If more than a light coating of dust is present, clean the fitting before disassembly.**




Push connect fittings with a hairpin clip

Click to enlarge

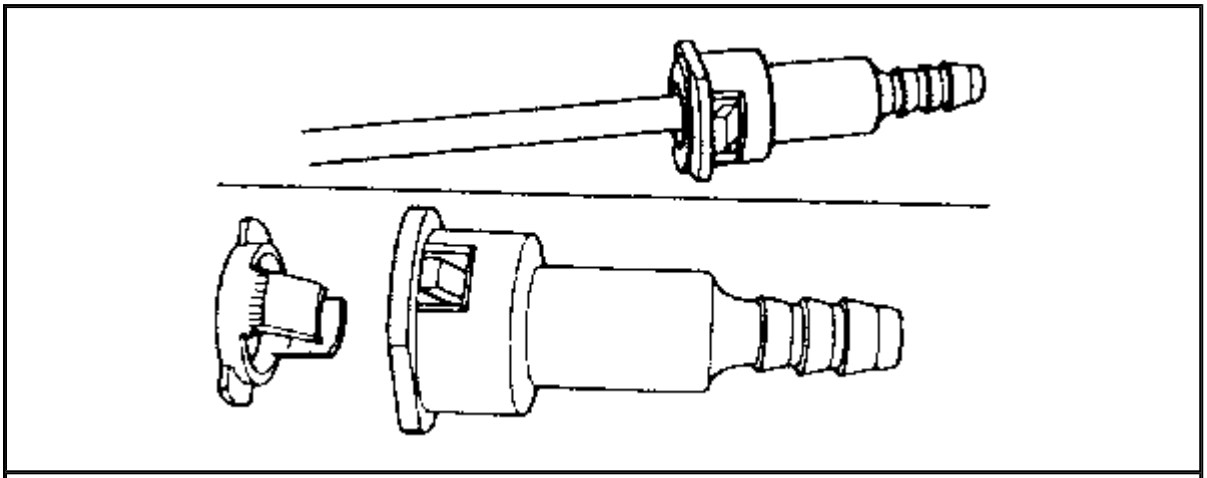
2. **Remove the hairpin type clip from the fitting. This is done (using hands only) by spreading the two clip legs about 3mm each to disengage the body and pushing the legs into the fitting. Complete removal is accomplished by lightly pulling from the triangular end of the clip and working it clear of the tube and fitting.**

**Do not use any tools.**

3. **Grasp the fitting and hose assembly and pull in an axial direction to remove the fitting from the steel tube. Adhesion between sealing surfaces may occur. A slight twist of the fitting may be required to break this adhesion and permit effortless removal.**
4. **When the fitting is removed from the tube end, inspect clip to ensure it has not been damaged. If damaged, replace the clip. If undamaged, immediately reinstall the clip, insert the clip into any two adjacent openings with the triangular portion pointing away from the fitting opening. Install the clip to fully engage the body (legs of hairpin clip locked on outside of body). Piloting with an index finger is necessary.**
5. **Before installing the fitting on the tube, wipe the tube end with a clean cloth. Inspect the inside of the fitting to ensure it is free of dirt and/or obstructions.**
6. **To reinstall the fitting onto the tube, lubricate the sealing O-rings with clean engine oil, align the fitting and tube axially and push the fitting onto the tube end. When the fitting is engaged, a definite click will be heard. Pull on the fitting to ensure it is fully engaged.**

## Duck Bill Clip Fittings

The fitting consists of a body, spacers, O-rings and a duck bill retaining clip. The clip maintains the fitting to the steel tube juncture. When disassembly is required for service, be sure to use the appropriate following method.

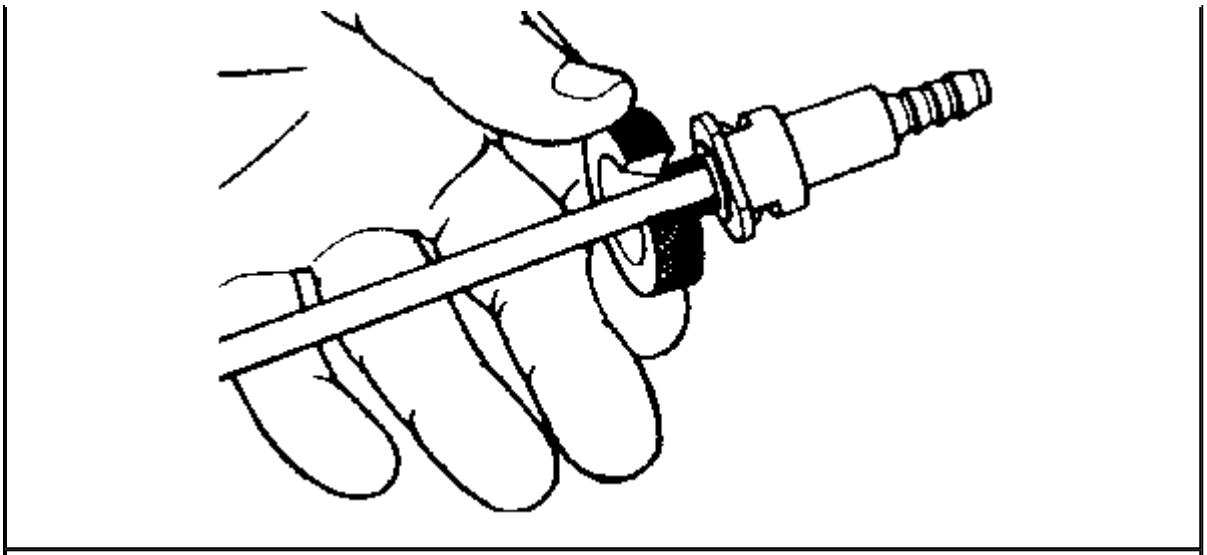


Push connect fittings with a duck bill clip

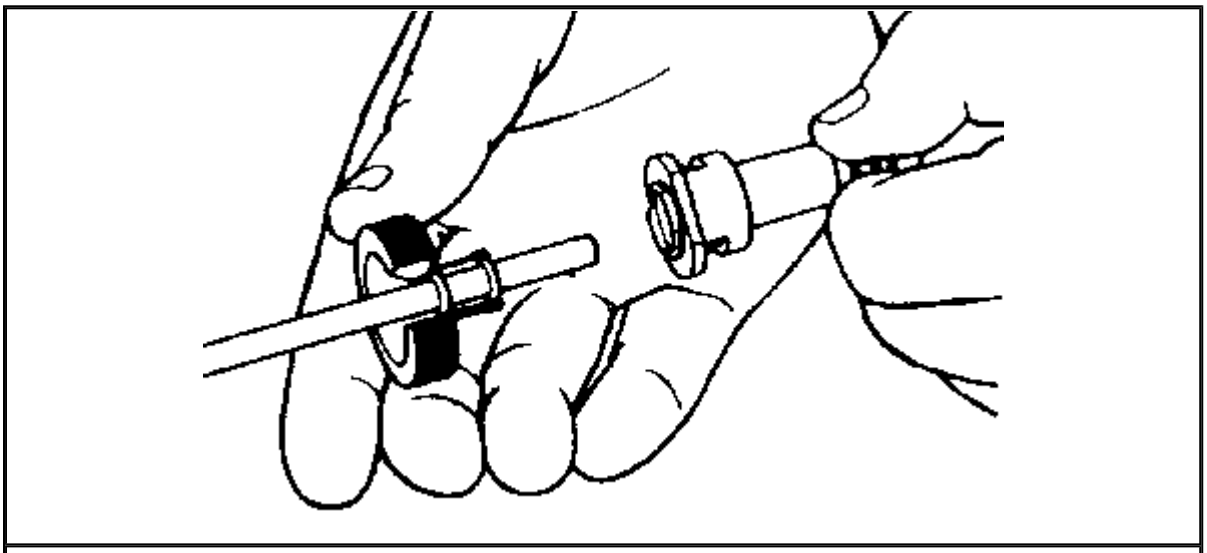
### 1/4 IN. FITTINGS

To disengage the tube from the fitting, align the slot on the Push Connect Disassembly Tool T82L-9500-AH, or equivalent, with either tab on the clip (90° from slots on side of fitting), then insert the tool. This disengages the duck bill from the tube. Holding the tool and the tube with one hand, pull the fitting away from the tube.

**Only moderate effort is required if the tube has been properly disengaged. Use hands only. After disassembly, inspect and clean the tube sealing surface. Also inspect the inside of the fitting for damage to the retaining clip. If the retaining clip appears to be damaged, replace it. Some fuel tubes have a secondary bead which aligns with the outer surface of the clip. These beads can make tool insertion difficult. If there is extreme difficulty, use the following disassembly method.**



Removing the push connect fitting using the proper tool



Removing the push connect fitting

## 1/2 IN. FITTING (AND ALTERNATE METHOD FOR 1/4 IN. FITTING)

This method of disassembly disengages the retaining clip from the fitting body.

Use a pair of narrow pliers (6 in. locking pliers are ideal). The pliers must have a jaw width of 5mm or less.

Align the jaws of the pliers with the openings in the side of the fitting case and compress the portion of the retaining clip that engages the fitting case. This disengages the retaining clip from the case (often one side of the clip will disengage before the other. It is necessary to disengage the clip from both openings). Pull the fitting off the tube.

**Only moderate effort is required if the retaining clip has been properly disengaged. Use hands only.**

The retaining clip will remain on the tube. Disengage the clip from the tube bead and remove. Replace the retaining clip if it appears to be damaged.

**The clip's ring will often have a slight oval shape. If there are no visible**

**cracks and the ring will pinch back to its circular configuration, it is not damaged. If there is any doubt, replace the clip.**

Install the clip into the body by inserting one of the retaining clip serrated edges on the duck bill portion into one of the window openings. Push on the other side until the clip snaps into place. Lubricate the O-rings with clean engine oil and slide the fuel line back into the clip.

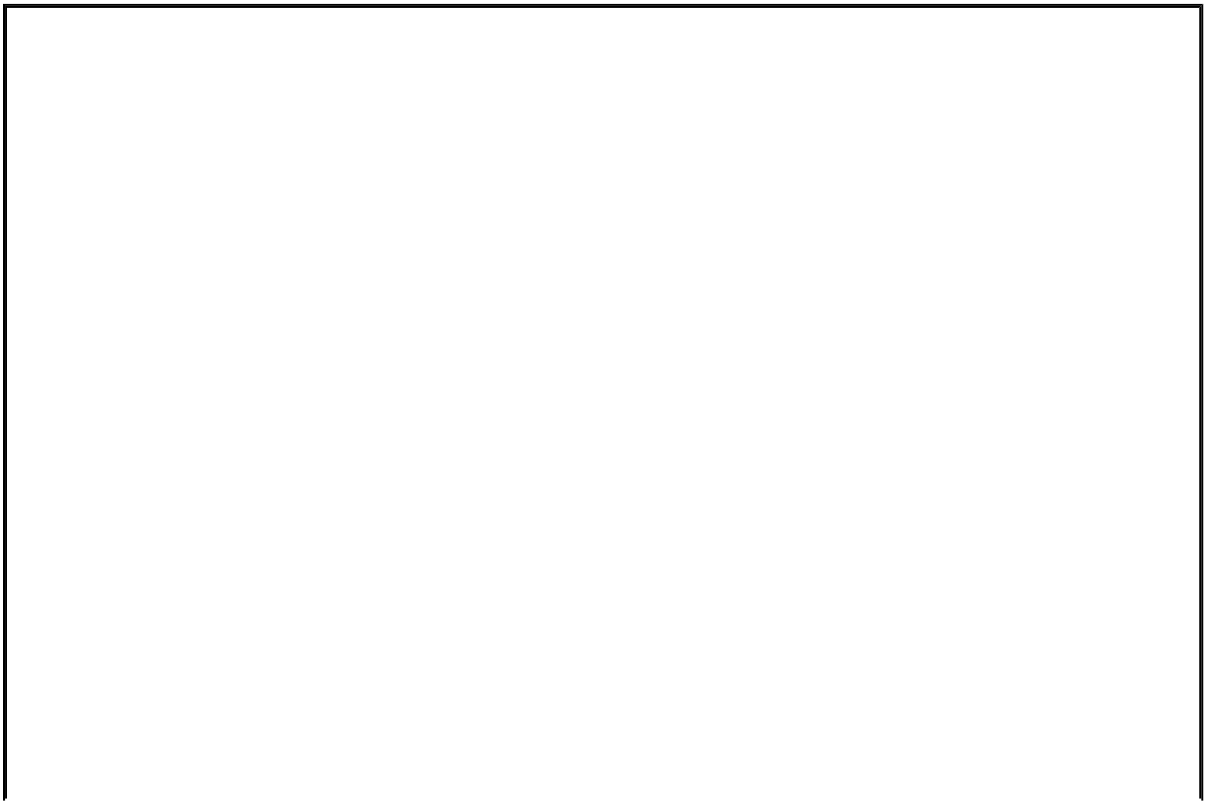
# FUEL TANK

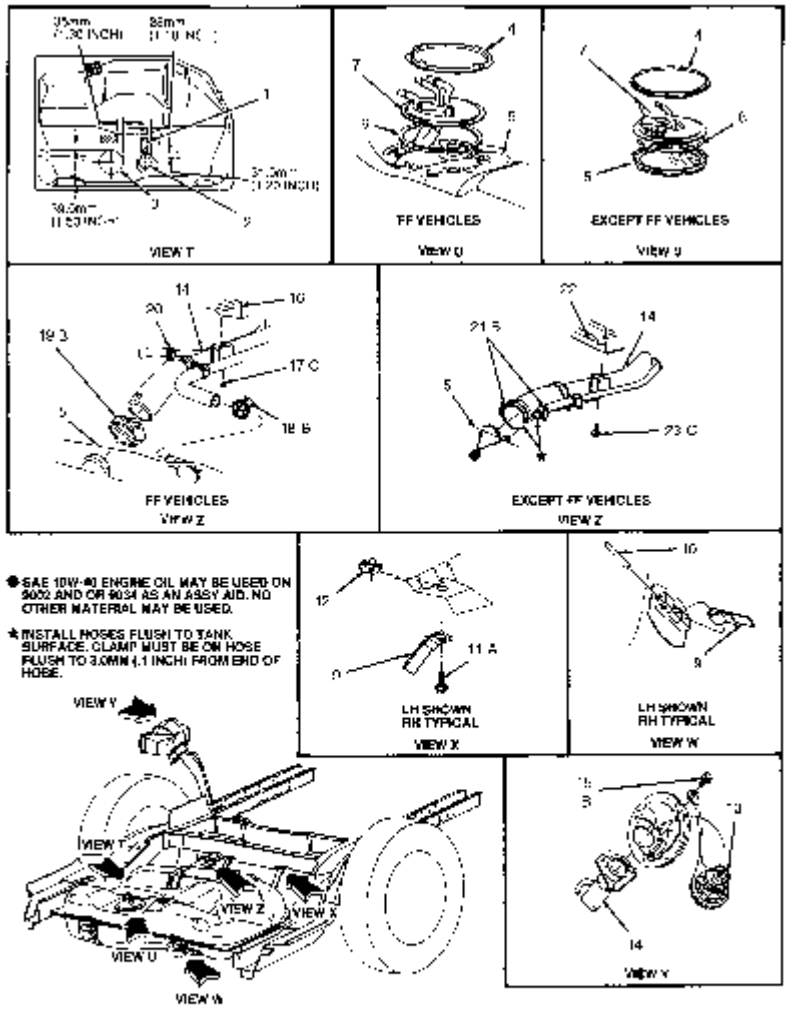
## REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure.
3. Siphon or pump the fuel from the fuel tank, through the filler neck, into a suitable container.

**There are reservoirs inside the fuel tank to maintain fuel near the fuel pickup during cornering and under low fuel operating conditions. These reservoirs could block siphon tubes or hoses from reaching the bottom of the tank. A few repeated attempts using different hose orientations can overcome this situation.**

4. Raise and safely support the vehicle.
5. Loosen the filler pipe and vent hose clamps at the tank and remove the hoses from the tank.
6. Place a safety support under the fuel tank and remove the bolts from the rear of the fuel tank straps. The straps are hinged at the front and will swing aside.
7. Partially remove the tank. Remove the hairpin clips from the push connect fitting and disconnect the fuel lines. Disconnect the electrical connector from the fuel sender/pump assembly.
8. Remove the fuel tank from the vehicle.






Common fuel tank location and related components

Click to enlarge

**To install:**

**If the fuel pump has been removed, the O-ring seal on unleaded gasoline vehicles, or gasket on flexible fuel vehicles must be replaced.**

9. **Before installing the fuel tank, check the following:**
   1. **Check the fuel pump for leaks.**
   2. **Make sure the evaporative emission valve is installed completely on the fuel tank top.**
   3. **Make all of the required fuel line, fuel return line, vapor vent and electrical connections which will be inaccessible after the fuel tank is installed. Route lines through the clip on the fuel tank.**
10. **Raise the fuel tank into proper position in the vehicle.**
11. **Bring the fuel tank straps around the tank and start the retaining bolt. Align the**

tank as far forward in the vehicle as possible while securing the retaining bolts.

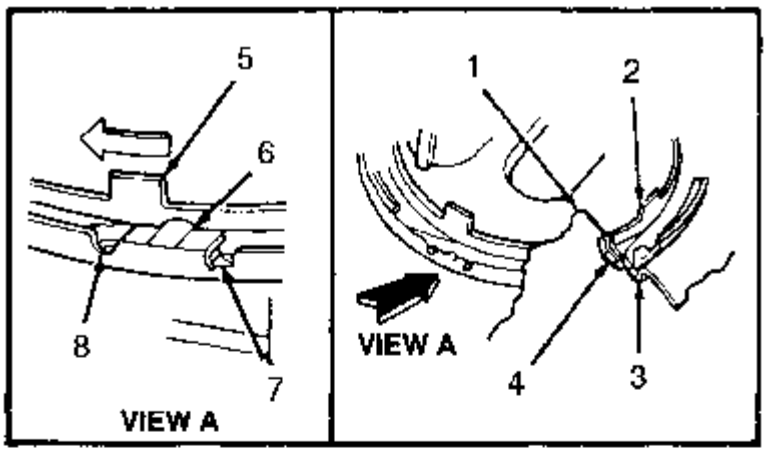
**If equipped with a heat shield, make sure it is installed with the straps and positioned correctly on the tank.**

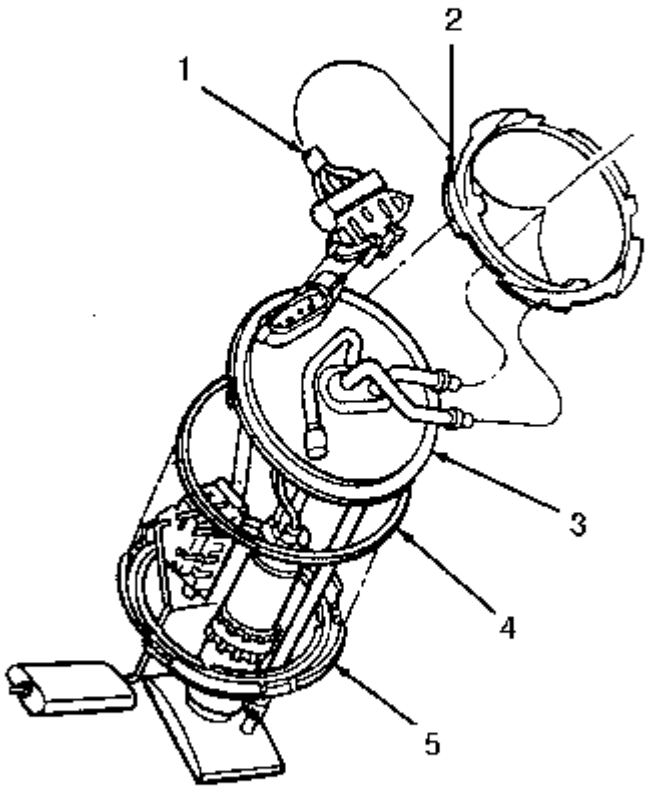
12. Check the hoses and wiring mounted on the tank top, to make sure they are correctly routed and will not be pinched between the tank and the body.
13. Tighten the fuel tank strap retaining bolts to 22-30 ft. lbs. (29-41 Nm).
14. Install the fuel filler hoses which connect the fuel tank to the fuel tank filler pipe. Install the hose pipes, then tighten the clamps to 24-32 inch lbs. (2.7-3.7 Nm). Refill the fuel tank.
15. Check all connections for leaks, then connect the negative battery cable.
16. Start the engine, then recheck all of the connections for leaks.

## SENDING UNIT REPLACEMENT

### Except 3.0L Flexible Fuel (FF) Vehicles

1. Disconnect the negative battery cable.
2. Relieve the fuel system pressure. For details, please refer to the procedure located earlier in this section.
3. Drain the fuel from the fuel tank by inserting Rotunda Fuel Tanker Adapter Hose 034-00012 or equivalent into the fuel tank through the fuel tank filler pipe, then remove the fuel tank with Rotunda Fuel Storage Tanker 034-00002 or equivalent.
4. Remove the fuel tank filler pipe:
    1. Open the filler door to remove the three screws securing the fuel tank filler pipe to the pocket. Mark the fuel tank filler cap tether location.
    2. Raise and safely support the vehicle.
    3. Loosen the filler and vent hose on the fuel tank filler pipe.
    4. Remove the bolt securing the fuel tank filler pipe assembly to the underbody of the vehicle, then remove the fuel tank filler pipe.
5. Support the fuel tank, then remove the fuel tank straps. Partially lower the tank, then remove the fuel lines, electrical connectors and vent lines from the tank. Remove the fuel tank and place it on a work bench.
6. Remove any accumulated dirt from around the fuel pump retaining flange so that it will not enter the fuel tank during removal and installation.
7. Turn the fuel pump locking ring counterclockwise using Fuel Tank Sender Wrench D84P-9275-A or equivalent, then remove the lock ring.
8. Remove the fuel tank sending unit/pump assembly from the fuel tank, then discard the flange gasket.




1. Fuel pump
2. Fuel pump locking retainer ring
3. Retainer ring (part of 9C385)
4. O-ring
5. Locating tabs (part of 9C385)
6. Tab (part of 9C385)
7. Stop (part of 9C385)
8. Detent (part of 9C385)

View of the fuel tank sending unit and pump assembly-except 3.0L FF vehicles

Click to enlarge

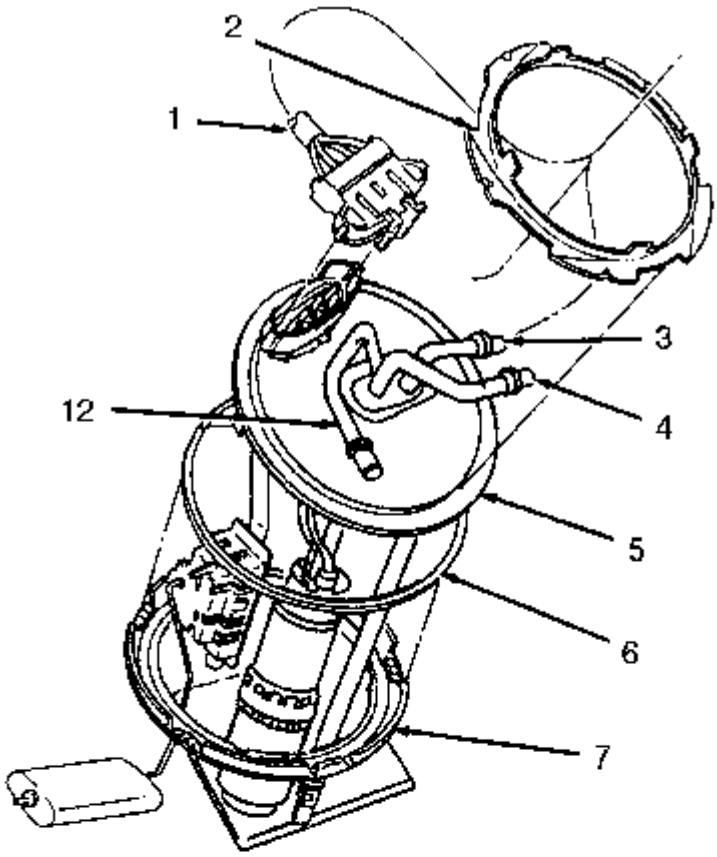
**To install:**

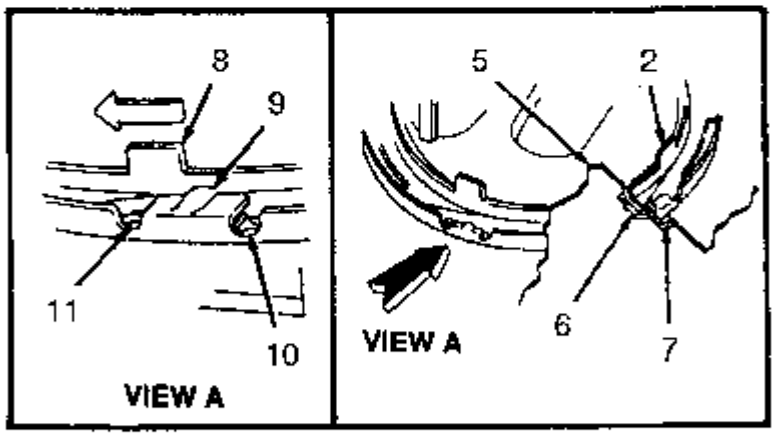
9. **Clean the sending unit/pump mounting flange and fuel tank mating surfaces and seal ring groove.**

10. **Put a light coating of grease on the new seal gasket to hold it in place during assembly and install it in the fuel ring groove.**
11. **Install the fuel pump and sender assembly carefully to be sure that the filter is not damaged. Make sure the locating keys are in the keyways and the seal gasket remains in place.**
12. **Hold the assembly in place and install the lock ring making sure all locking tabs are under the tank lock ring tabs. Tighten the lock ring by turning it clockwise using Fuel Tank Sender Wrench D84P-9275-A or equivalent until it is up against the stops.**
13. **Remove the fuel tank from the bench and to the vehicle, then support the fuel tank while connecting the fuel lines, vent line and electrical connectors to the appropriate places. Install the fuel tank and secure it with the tank support straps.**
14. **Lower the vehicle.**
15. **Install the fuel tank filler pipe:**
    1. **Position the fuel tank filler pipe in the body location.**
    2. **Connect the hoses with clamps to the fuel tank filler pipe.**
    3. **Install the underbody fuel tank filler pipe assembly bolt, then tighten the bolt to 36-53 inch lbs. (4-6 Nm), then lower the vehicle.**
    4. **Install the fuel tank filler cap to the tether location, then install the three retaining screws.**
16. **Fill the tank with a minimum of 10 gallons of fuel, then check for leaks.**
17. **Connect the negative battery cable.**
18. **Connect a suitable fuel pressure gauge. Turn the ignition switch to the ON position 5-10 times, leaving it on for 3 seconds at a time, until the pressure gauge reads at least 30 psi (207 kPa). Check for leaks at the fittings.**
19. **Remove the pressure gauge, start the engine and recheck for leaks.**

## 3.0L Flexible Fuel (FF) Engine

1. **Disconnect the negative battery cable.**
2. **Depressurize the fuel system. For details, please refer to the procedure located earlier in this section.**




1. Electrical connector
2. Fuel pump locking retainer ring
3. Fuel return
4. Fuel supply
5. Fuel pump
6. Fuel pump mounting gasket
7. Retainer ring
8. Locating tabs
9. Tab
10. Stop
11. Detent
12. Fuel tank drain tube

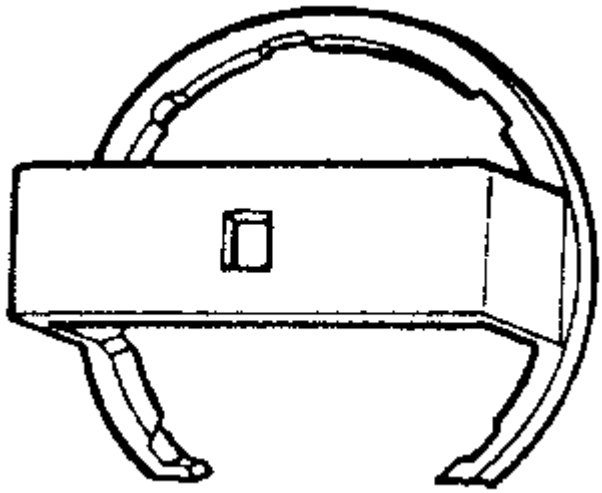
Exploded view of the fuel tank sending unit/pump and related components-3.0L Flexible

Fuel (FF) engine

Click to enlarge

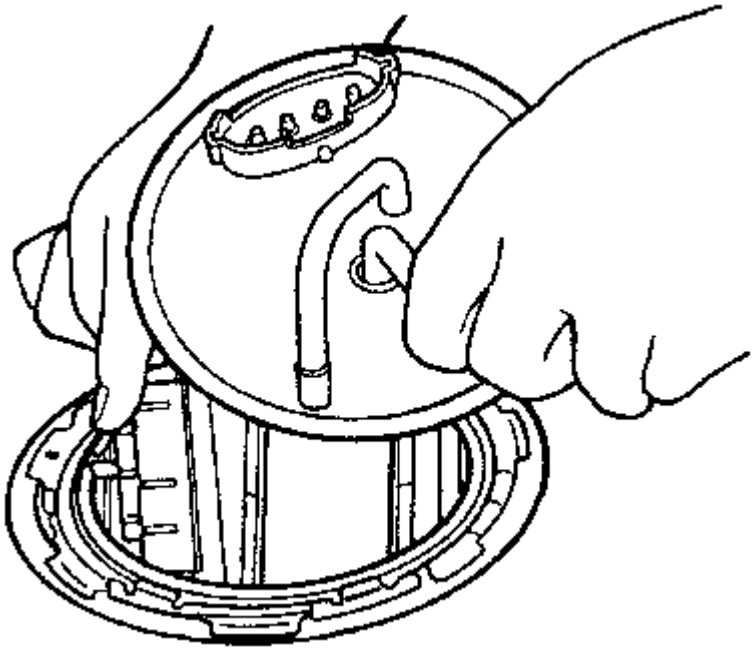
**The FF fuel tank cannot be drained through the fuel tank filler pipe because a special screen is installed in the fuel tank filler pipe to prevent siphoning of fuel through the pipe. The fuel tank on this vehicle is equipped with a drain tube connected to the fuel pump module on the right-hand side of the vehicle, which had a quick disconnect for this purpose. It is not necessary to lower the fuel tank to drain the system.**

3. **Drain the fuel tank:**
    1. **Remove the foam cover and protective rubber cover from the drain tube.**
    2. **Connect the drain tube quick disconnect fitting to the Rotunda Fuel Storage Tanker and Adapter Hose 034-00020, then drain the fuel from the tank into a suitable container.**
4. **Raise and safely support the vehicle.**
5. **Disconnect and remove the fuel filler pipe:**
    1. **Open the filler door to remove the three screws securing the fuel tank filler pipe to the pocket. Mark the fuel tank filler cap tether location.**
    2. **If not done already, raise and safely support the vehicle.**
    3. **Loosen the filler and vent hose on the fuel tank filler pipe.**
    4. **Remove the bolt securing the fuel tank filler pipe assembly to the underbody of the vehicle, then remove the fuel tank filler pipe.**
6. **Support the fuel tank, then remove the fuel tank support straps. Partially lower the tank, then disconnect the fuel lines, electrical connectors and fuel vapor and vent lines from the fuel tank.**
7. **Remove the fuel tank and place it on a work bench. Remove any dirt that has accumulated around the fuel pump so that dirt does not enter the fuel tank during pump removal.**
8. **Remove the fuel pump locking retainer ring using Fuel Tank Locking Wrench D90P-9275-A, or equivalent.**



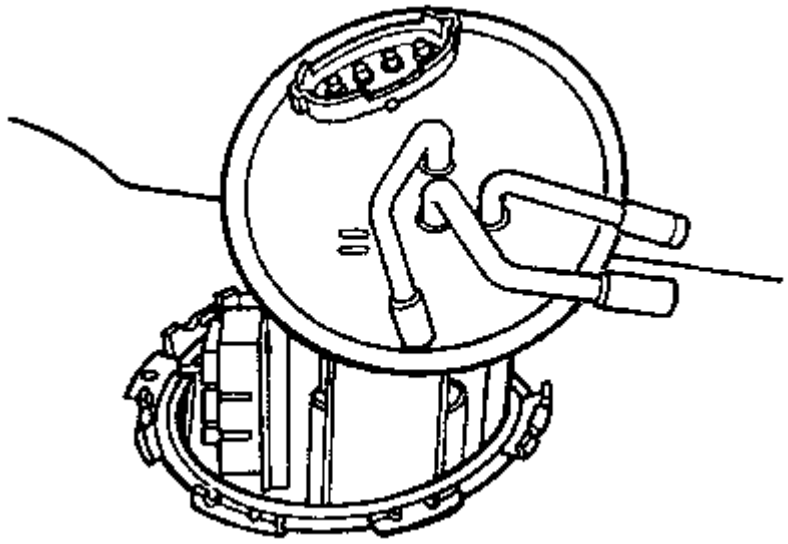
Fuel pump locking retainer ring

9. **Lift the fuel pump locating tabs from the fuel tank location slots.**
10. **Lift the fuel pump upward rotating left, while aligning the float wiper arm retainer and return line into the fuel tank location slots.**



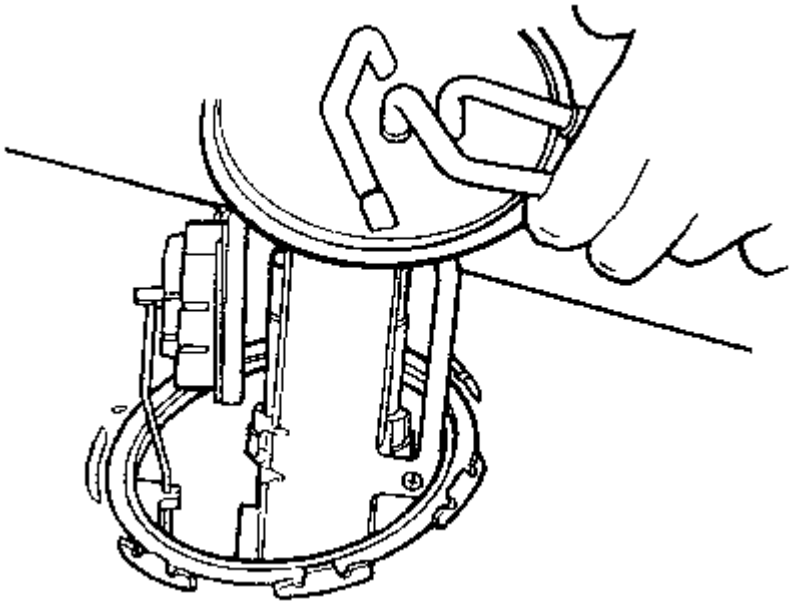
Lift the fuel pump upward and rotate to the left, while aligning the float wiper arm retainer and return line with the fuel tank location slots

11. **Apply light pressure to remove the fuel pump.**



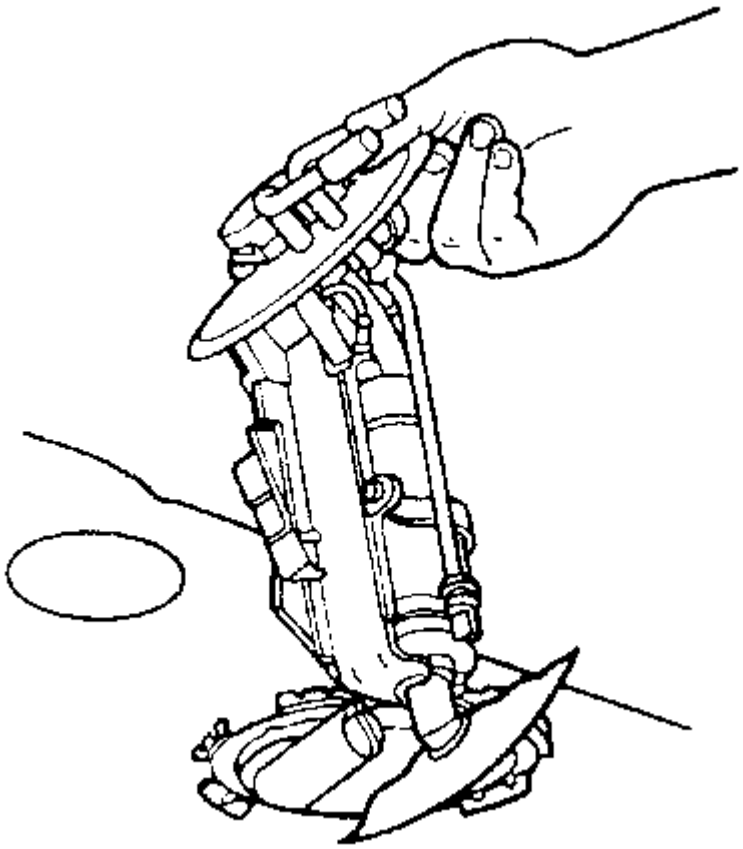
Apply slight pressure to remove the fuel pump

**12. Lift the float wiper arm through the left-hand fuel tank slot, then pass the pump motor retaining bracket through the right-hand fuel tank slot.**



Lift the float wiper arm through the left-hand fuel tank slot and pass the pump motor retaining bracket through the right-hand fuel tank slot

**13. Remove the fuel pump keeping return line in the fuel tank slot. Lift the fuel pump inlet filter then sender arm float through the fuel tank opening.**



Remove the fuel pump while keeping the return line in the fuel tank slot. Lift the fuel pump inlet filter and then the sender arm float through the fuel tank opening

14. **Remove and discard the fuel pump mounting gasket.**

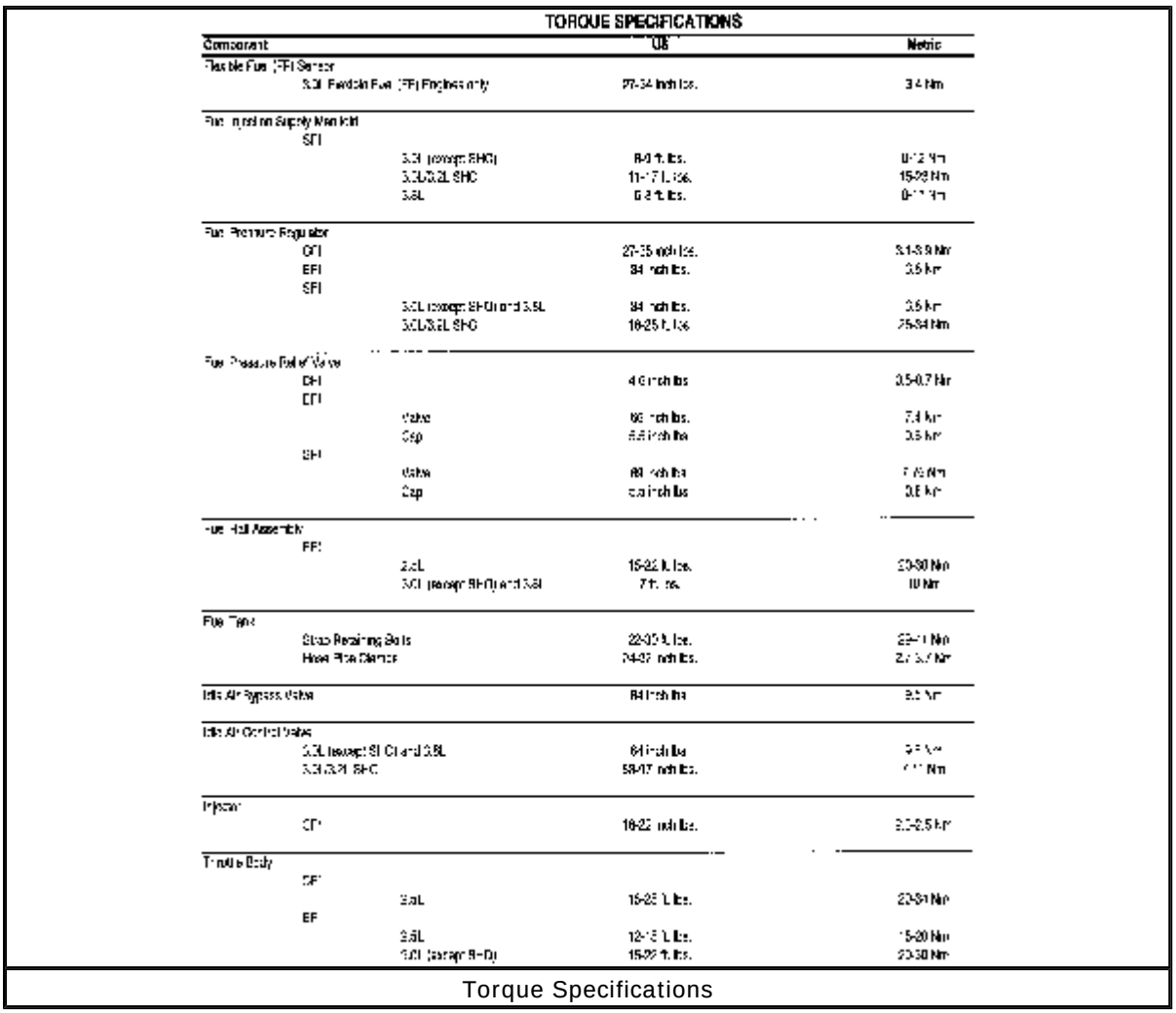
**To install:**

15. **Position a new methanol compatible pump gasket on the fuel pump.**
16. **Install the fuel tank sending unit/pump assembly carefully to be sure that it is not damaged.**
17. **Hold the assembly in place and install the the fuel pump locking retainer finger tight. Make sure that all of the locking tabs are are under the fuel tank lock ring tabs.**
18. **Secure the unit with the fuel pump locking retainer ring using Fuel Tank Locking Wrench D90P-9275-A, or equivalent.**
19. **Remove the fuel tank from the bench to the vehicle, then support the fuel tank while connecting the fuel vapor and vent lines, electrical connectors and the fuel lines.**
20. **Install the fuel tank in the vehicle, then connect the support straps.**
21. **Install the fuel filler pipe:**
    1. **Position the fuel tank filler pipe in the body location.**
    2. **Connect the hoses with clamps to the fuel tank filler pipe.**
    3. **Install the underbody fuel tank filler pipe assembly bolt, then tighten the bolt to 36-53 inch lbs. (4-6 Nm), then lower the vehicle.**

4. **Install the fuel tank filler cap to the tether location, then install the three retaining screws.**

22. **Insert Rotunda Fuel Tanker Adapter Hose 034-00020 or equivalent into the fuel tank through the fuel tank filler pipe.**
23. **Transfer the fuel from the Rotunda Fuel Storage Tanker 034-00002 or equivalent to the fuel tank.**
24. **Connect the negative battery cable, then check for fuel leaks.**

# SPECIFICATION CHARTS

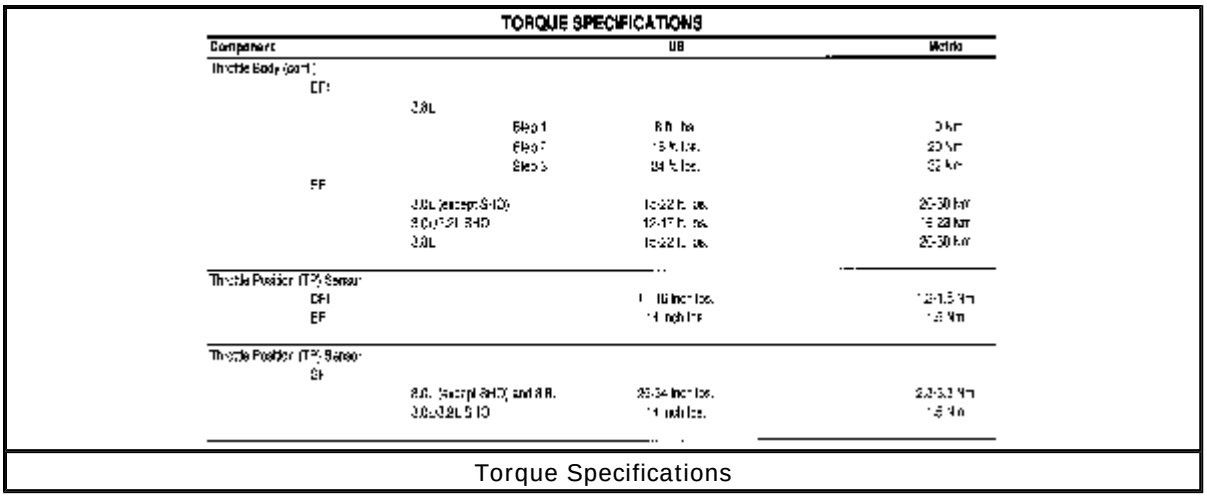


TORQUE SPECIFICATIONS

| Component | | | US | Metric |
|---|---|---|---|---|
| Flexible Fuel (FF) Sensor | | | | |
| | 3.0L Flexible Fuel (FF) Engines only | | 27-34 inch lbs. | 3-4 Nm |
| Fuel Injection Supply Manifold | | | | |
| | SFI | | | |
| | | 3.0L (except SHO) | 84 inch lbs. | 9-12 Nm |
| | | 3.0L/3.2L SHO | 11-17 ft. lbs. | 15-23 Nm |
| | | 3.8L | 6-8 ft. lbs. | 8-11 Nm |
| Fuel Pressure Regulator | | | | |
| | CFI | | 27-35 inch lbs. | 3.1-3.9 Nm |
| | EFI | | 84 inch lbs. | 9.5 Nm |
| | SFI | | | |
| | | 3.0L (except SHO) and 3.8L | 84 inch lbs. | 9.5 Nm |
| | | 3.0L/3.2L SHO | 18-25 ft. lbs. | 25-34 Nm |
| Fuel Pressure Relief Valve | | | | |
| | CFI | | 4-6 inch lbs. | 0.5-0.7 Nm |
| | EFI | | | |
| | | Valve | 66 inch lbs. | 7.4 Nm |
| | | Cap | 5-6 inch lbs. | 0.6 Nm |
| | SFI | | | |
| | | Valve | 66 inch lbs. | 7.45 Nm |
| | | Cap | 5-6 inch lbs. | 0.6 Nm |
| Fuel Rail Assembly | | | | |
| | FFI | | | |
| | | 3.0L | 15-22 ft. lbs. | 20-30 Nm |
| | | 3.0L (except SHO) and 3.8L | 7 ft. lbs. | 10 Nm |
| Fuel Tank | | | | |
| | Strap Retaining Bolts | | 22-30 ft. lbs. | 30-41 Nm |
| | Hose Pipe Clamps | | 24-37 inch lbs. | 2.7-4.2 Nm |
| Idle Air Bypass Valve | | | 84 inch lbs. | 9.5 Nm |
| Idle Air Control Valve | | | | |
| | 3.0L (except SHO) and 3.8L | | 84 inch lbs. | 9.5 Nm |
| | 3.0L/3.2L SHO | | 58-87 inch lbs. | 6.5-9.8 Nm |
| Injector | | | | |
| | CFI | | 18-22 inch lbs. | 2.0-2.5 Nm |
| Throttle Body | | | | |
| | CFI | | | |
| | | 3.0L | 15-22 ft. lbs. | 20-30 Nm |
| | EFI | | | |
| | | 3.8L | 12-15 ft. lbs. | 15-20 Nm |
| | | 3.0L (except SHO) | 15-22 ft. lbs. | 20-30 Nm |

Torque Specifications

Click to enlarge

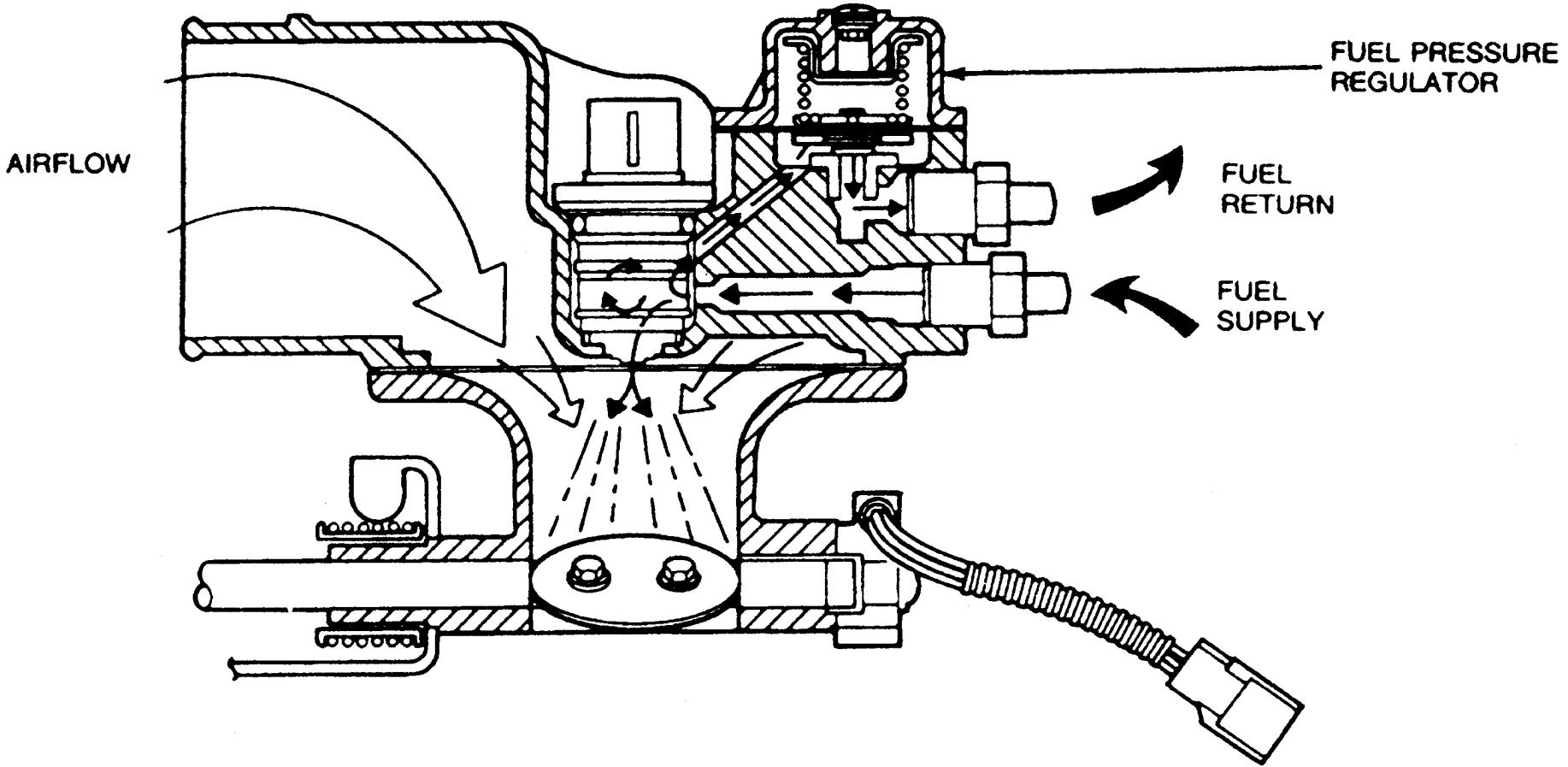


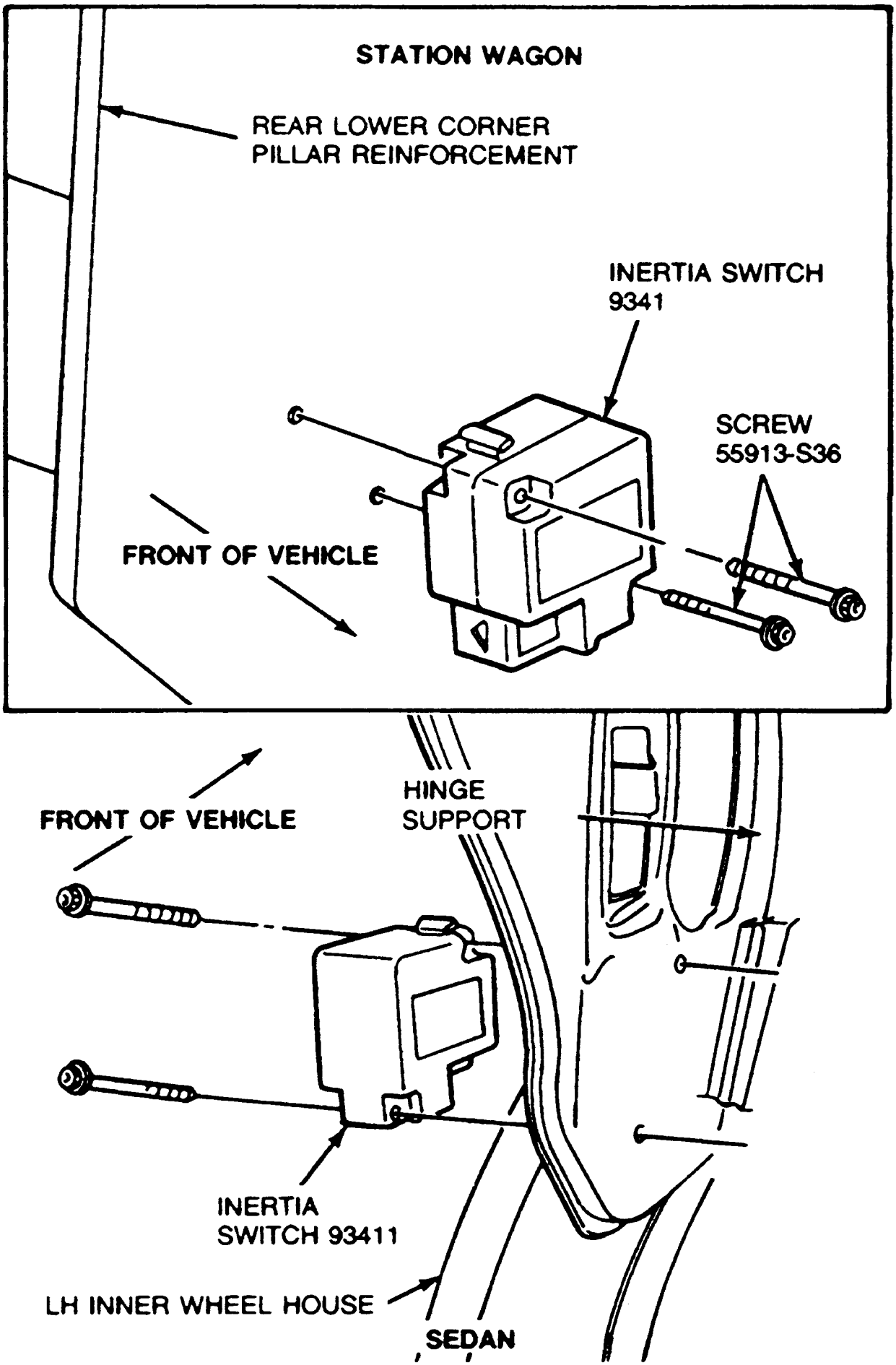
TORQUE SPECIFICATIONS

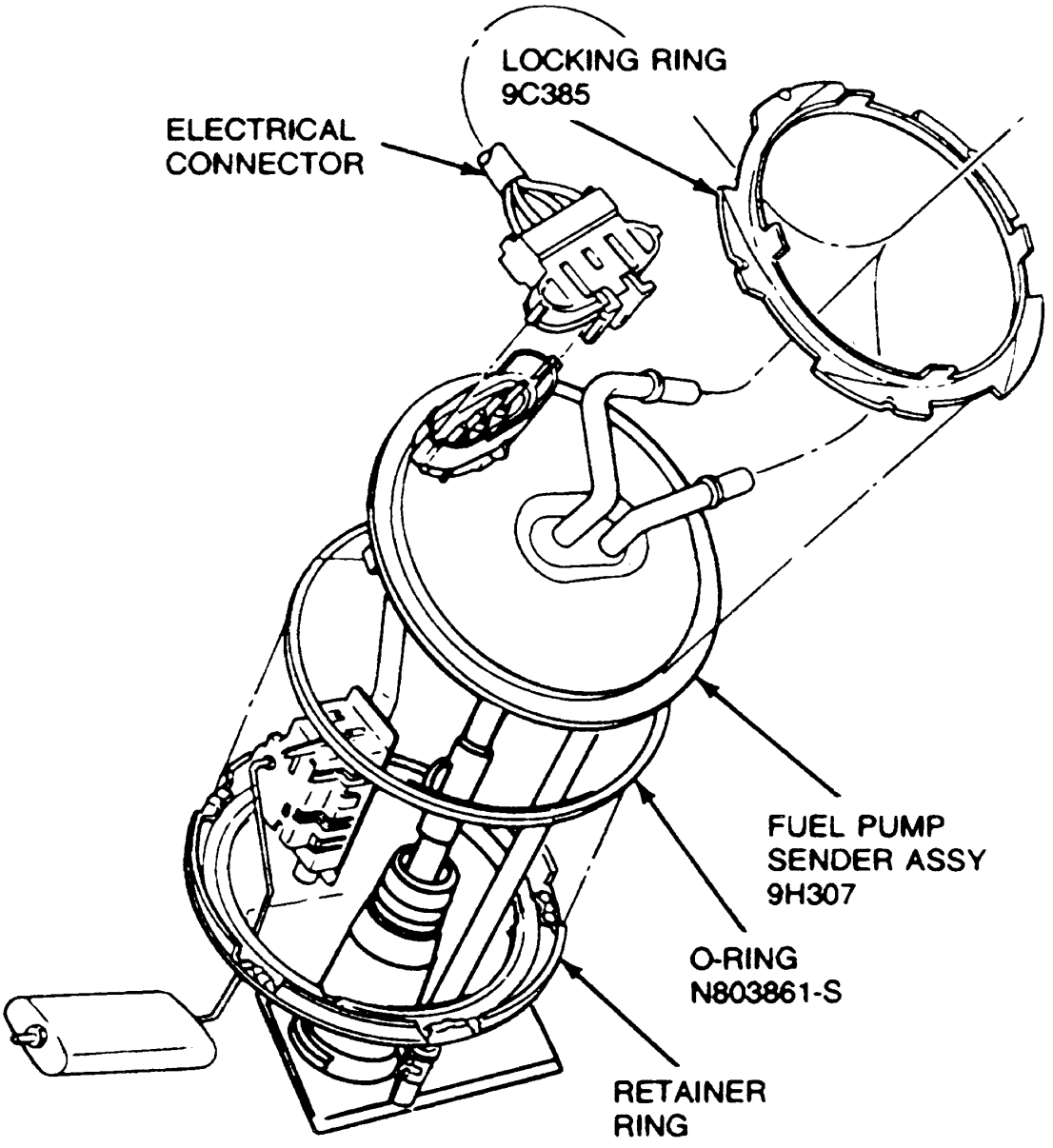
| Component | | | US | Metric |
|---|---|---|---|---|
| Throttle Body (cont.) | | | | |
| | CFI | | | |
| | | 3.8L | | |
| | | | Step 1 | 84 inch lbs. | 9 Nm |
| | | | Step 2 | 15 ft. lbs. | 20 Nm |
| | | | Step 3 | 24 ft. lbs. | 32 Nm |
| | EFI | | | |
| | | 3.0L (except SHO) | 15-22 ft. lbs. | 20-30 Nm |
| | | 3.0L/3.2L SHO | 12-17 ft. lbs. | 15-23 Nm |
| | | 3.8L | 15-22 ft. lbs. | 20-30 Nm |
| Throttle Position (TP) Sensor | | | | |
| | CFI | | 9-10 inch lbs. | 1.0-1.5 Nm |
| | EF | | 14 inch lbs. | 1.6 Nm |
| Throttle Position (TP) Sensor | | | | |
| | SFI | | | |
| | | 3.0L (except SHO) and 3.8L | 26-34 inch lbs. | 3.0-3.8 Nm |
| | | 3.0L/3.2L SHO | 14 inch lbs. | 1.6 Nm |

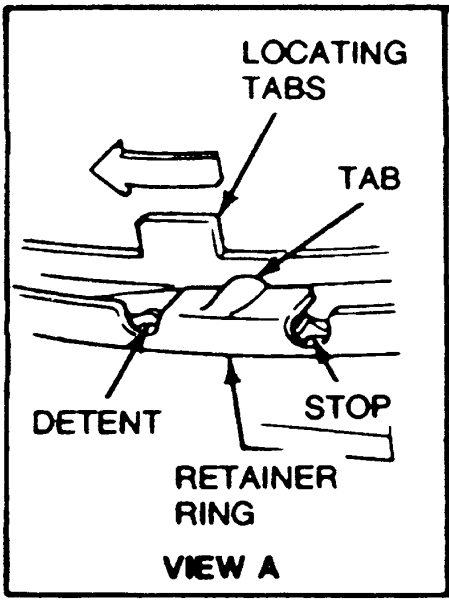
Torque Specifications

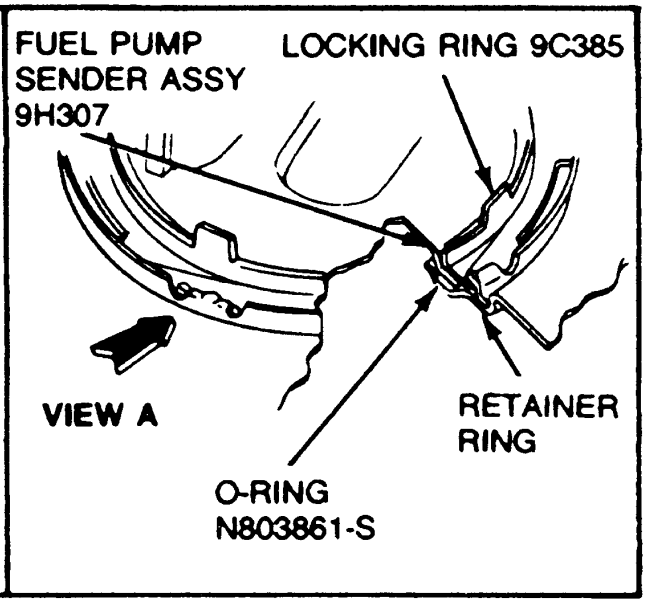
Click to enlarge


AIRFLOW
FUEL PRESSURE REGULATOR
FUEL RETURN
FUEL SUPPLY


STATION WAGON
REAR LOWER CORNER
PILLAR REINFORCEMENT
INERTIA SWITCH
9341
SCREW
55913-S36
FRONT OF VEHICLE
FRONT OF VEHICLE
HINGE
SUPPORT
INERTIA
SWITCH 93411
LH INNER WHEEL HOUSE
SEDAN


LOCKING RING
9C385
ELECTRICAL
CONNECTOR
FUEL PUMP
SENDER ASSY
9H307
O-RING
N803861-S
RETAINER
RING


LOCATING
TABS
TAB
DETENT
STOP
RETAINER
RING
VIEW A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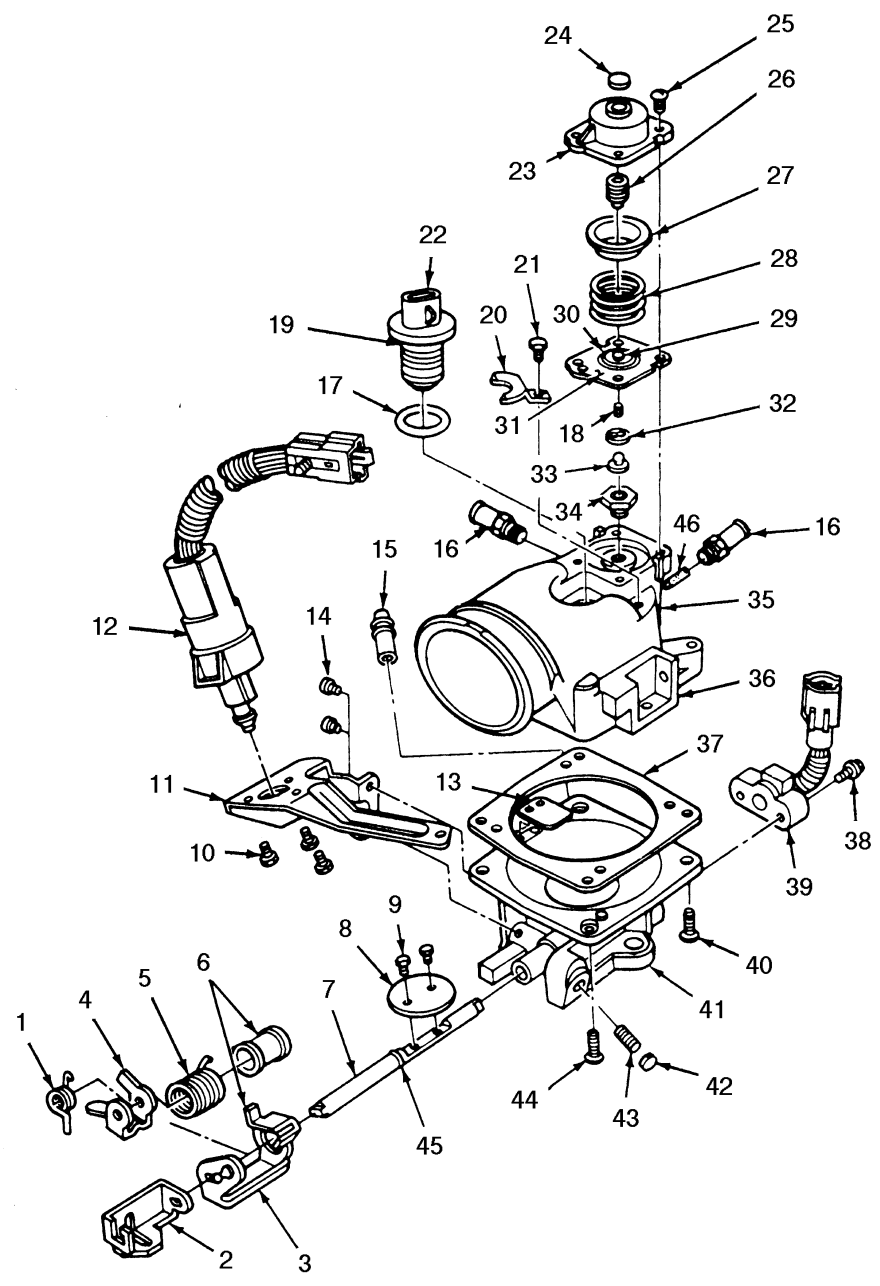
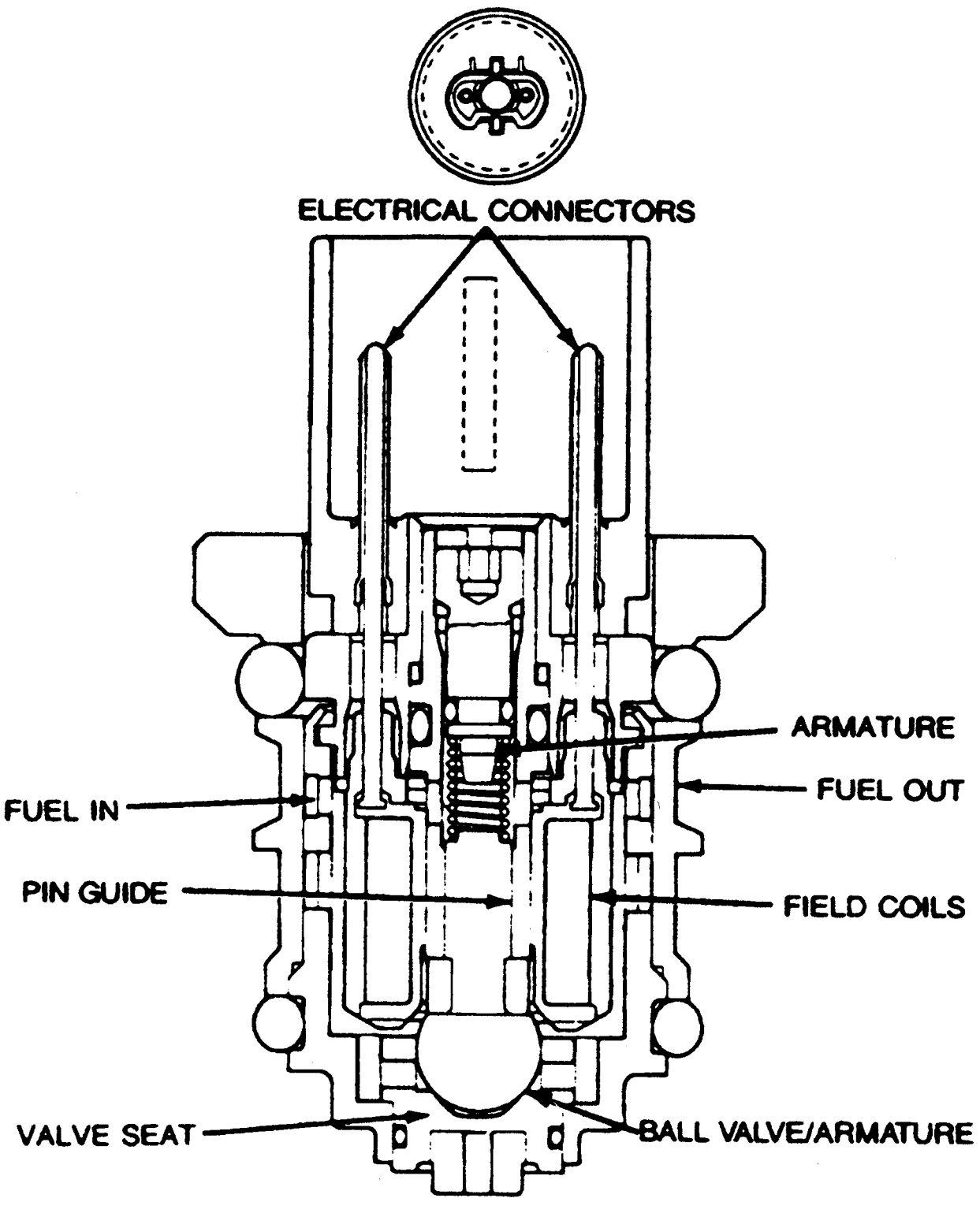
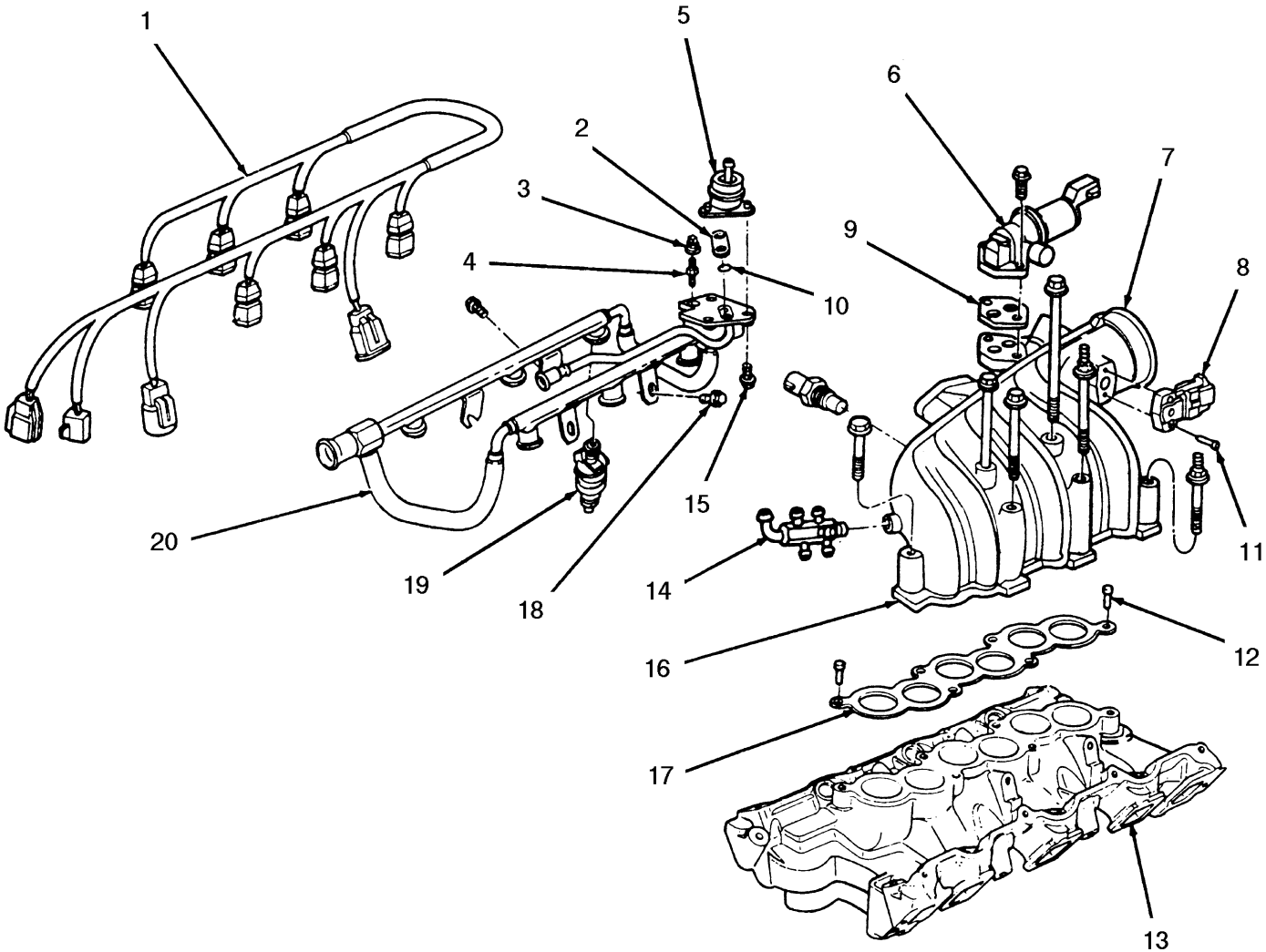
SENDER ASSY
9H307
LOCKING RING 9C385
VIEW A
RETAINER
RING
O-RING
N803861-S

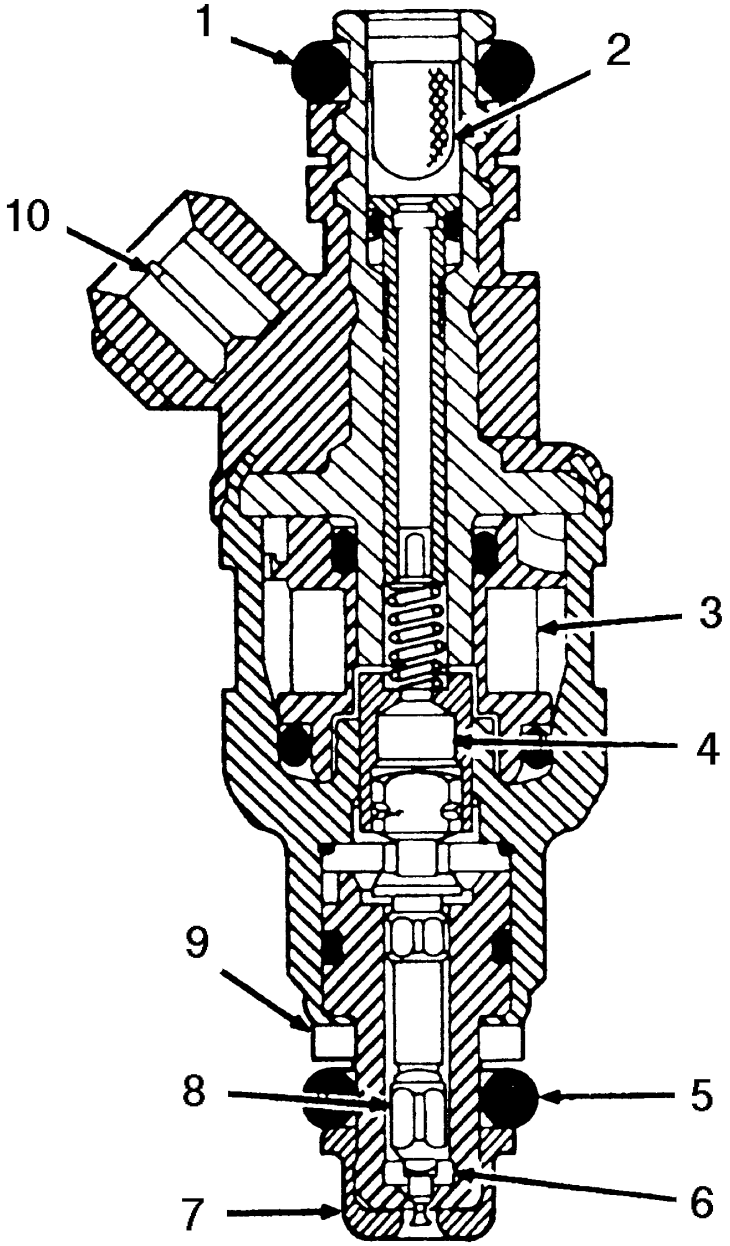


1. Spring - engine idle speed-up
2. Lever - transmission linkage
3. Ball - throttle lever
4. Lever - idle speed-up control
5. Spring and bearing assy - throttle return
6. Lever - throttle
7. Shaft - air intake charge throttle
8. Plate - air intake charge throttle
9. Screw - M4 x .7 x 8
10. Screw - M4.2 x 1.41 x 15.9 (self-tapping)
11. Bracket - engine throttle positioner
12. Actuator assy - throttle control
13. Plate - engine air distribution
14. Screw - M5 x .8 x 14.0
15. Tube - emission inlet
16. Connector - fuel tube quick connect (5/16 x 1/4 NPTF)
17. O-ring - 20.4 ID x 1.78 wide
18. Spring - fuel pressure reg. valve
19. O-ring - 18.6 ID x 3.50 wide
20. Retainer - fuel injector
21. Screw - M4 x .7 x 12.0
22. Injector assy - fuel
23. Cover - fuel pressure regulator
24. Plug - expansion
25. Screw - M4 x .7 x 16.0
26. Screw - fuel pressure regulator adjusting
27. Cup - fuel pressure regulator
28. Spring - fuel pressure regulator diaphragm
29. Body - fuel pressure regulator valve
30. Retainer - fuel pressure regulator diaphragm
31. Diaphragm - fuel pressure regulator
32. Retainer - fuel pressure regulator valve
33. Valve assy - fuel pressure regulator
34. Tube - fuel pressure regulator outlet
35. Body assy - fuel charging main
36. Body - fuel charging main
37. Gasket - fuel charging body
38. Screw - M4 x .7 x 22.0
39. Potentiometer assy - throttle
40. Screw - M5 x .8 x 25.0
41. Body - fuel charging throttle
42. Plug - expansion
43. Screw - M5 x .8 x 19.0
44. Screw - M5 x .8 x 30.0
45. Seal - fuel charging shaft
46. Screen - fuel inlet

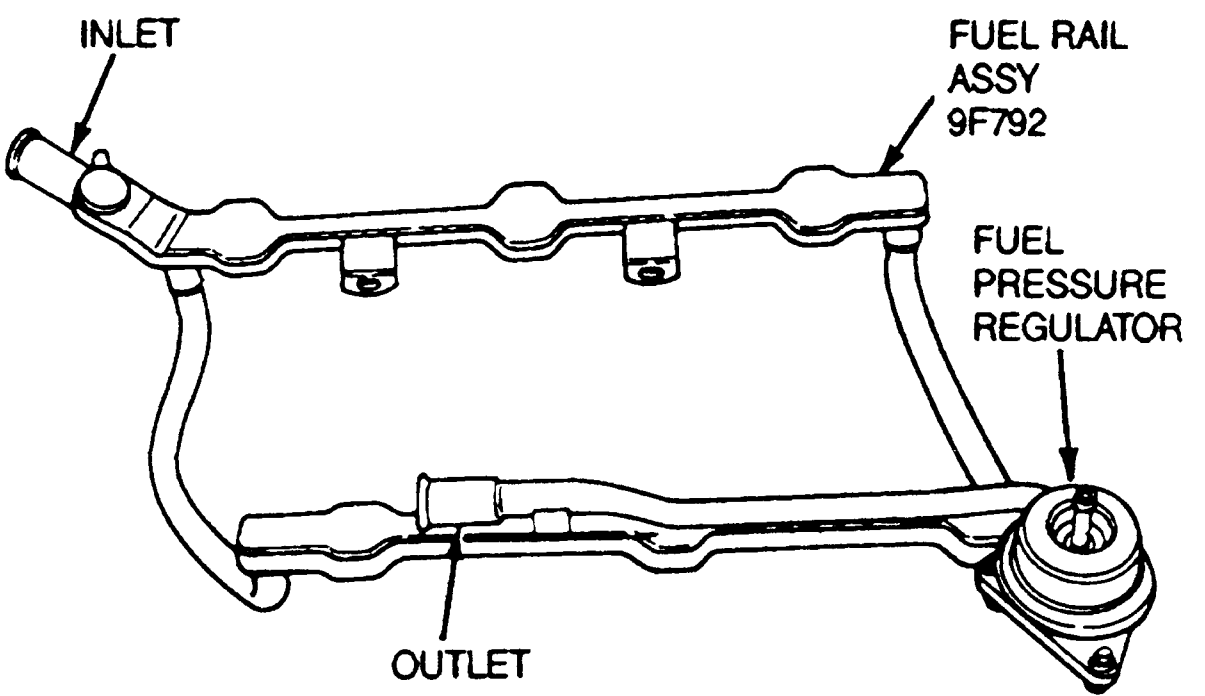

ELECTRICAL CONNECTORS
ARMATURE
FUEL OUT
FUEL IN
PIN GUIDE
FIELD COILS
VALVE SEAT
BALL VALVE/ARMATURE

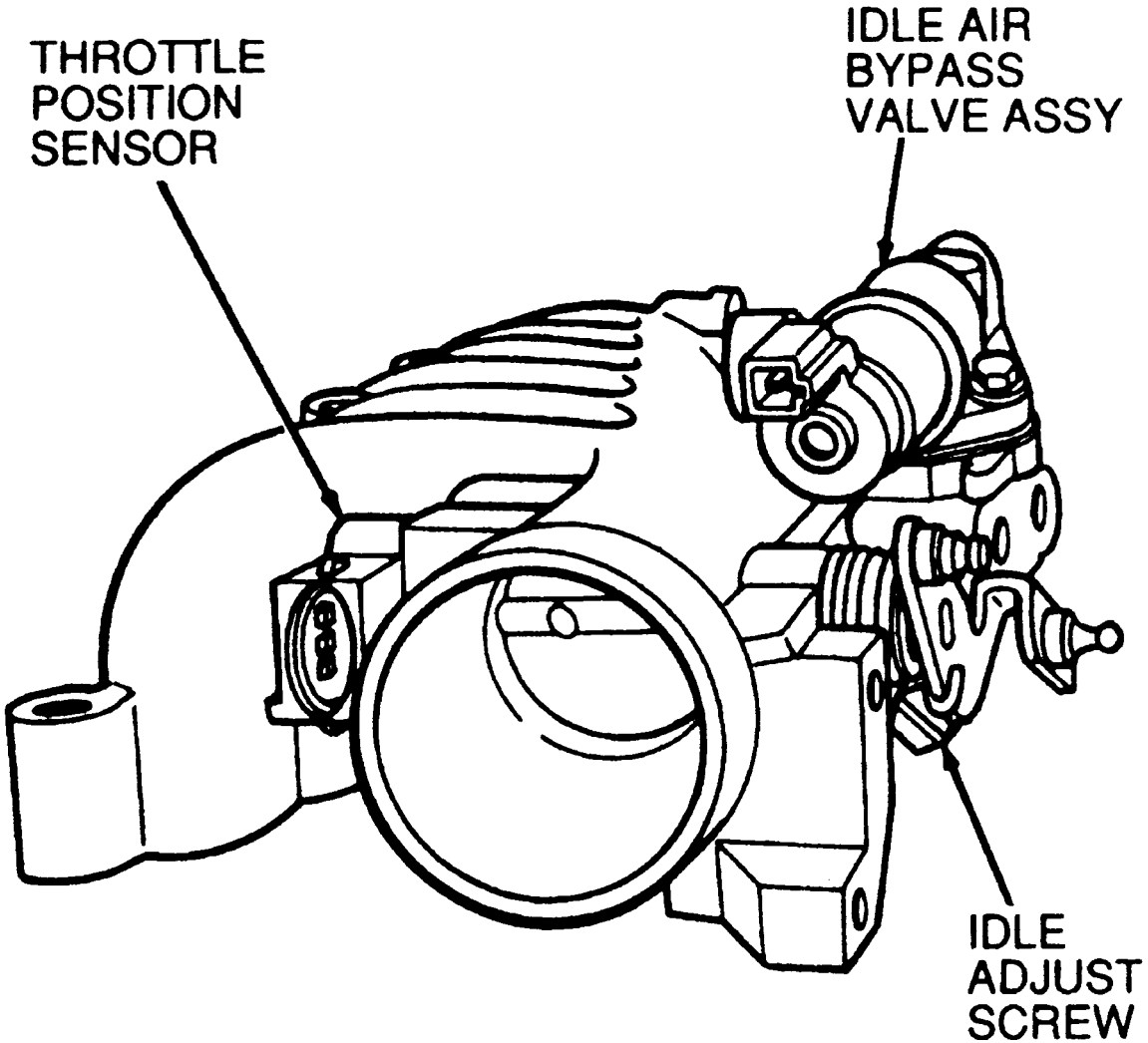


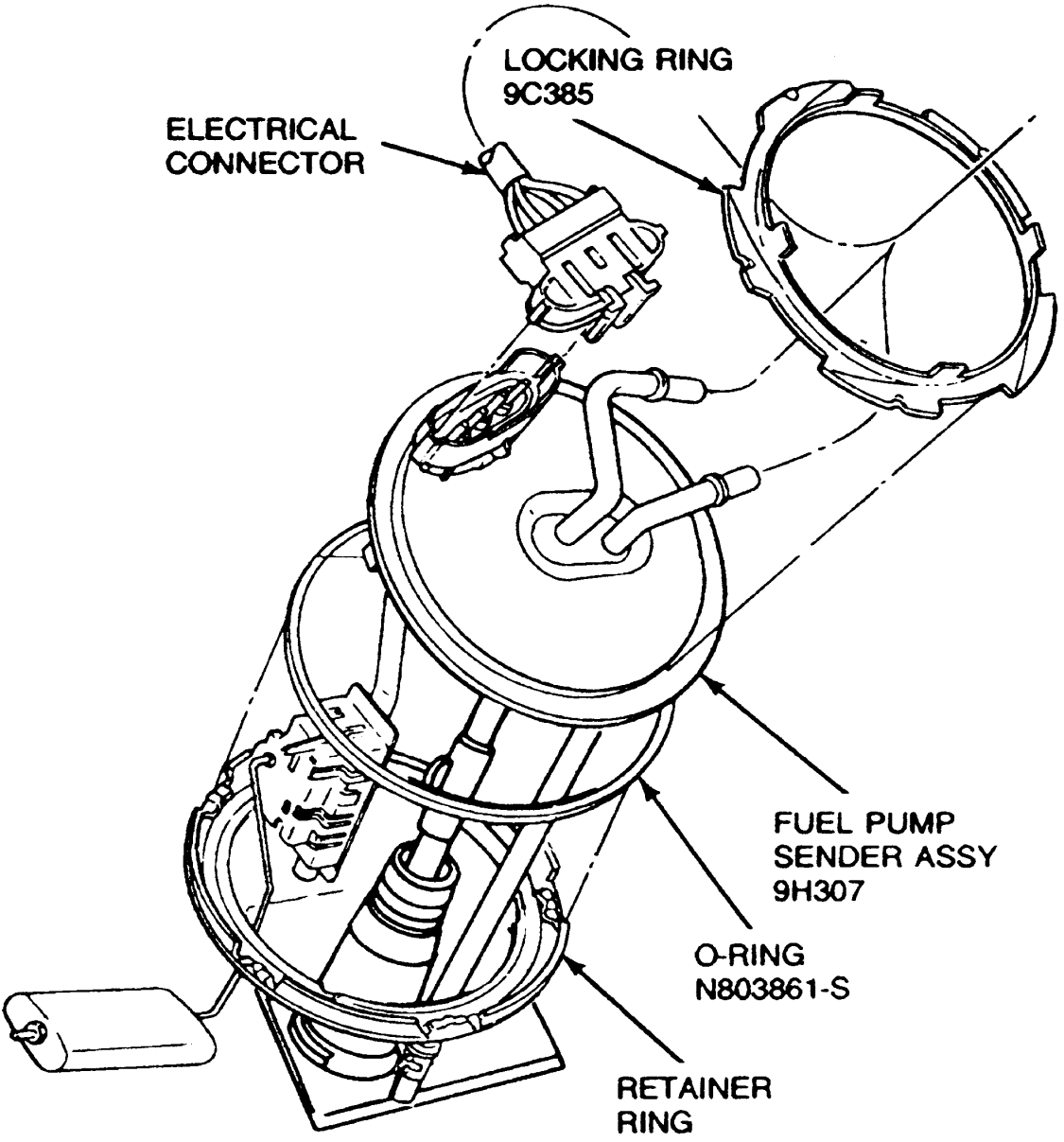

1. Injector wire harness
2. Regulator assy gasket
3. Valve assy cap
4. Fuel pressure valve assy (Schrader)
5. Fuel pressure regulator assy
6. Idle air bypass valve assy
7. Air intake throttle body
8. Throttle position sensor
9. Idle air bypass valve gasket
10. O-ring seal 5/16 x .070
11. Screw assy
12. Guide pin assy (2 places)
13. Intake manifold
14. Vacuum tree
15. Regulator assy holddown screw
16. Air intake throttle body assy
17. Fuel pressure valve assy gasket
18. Fuel rail holddown screw and washer assy
19. Fuel injector
20. Full rail assy manifold

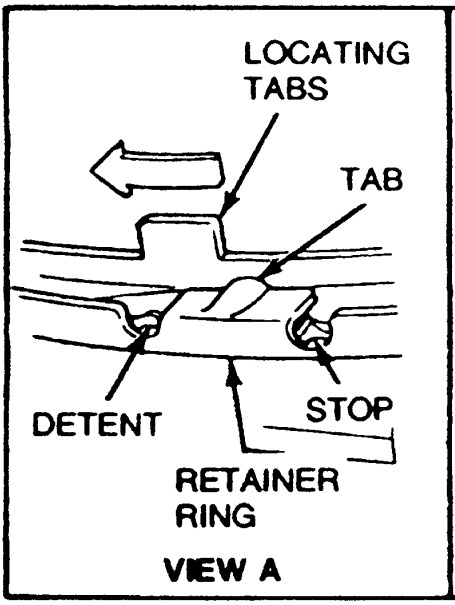


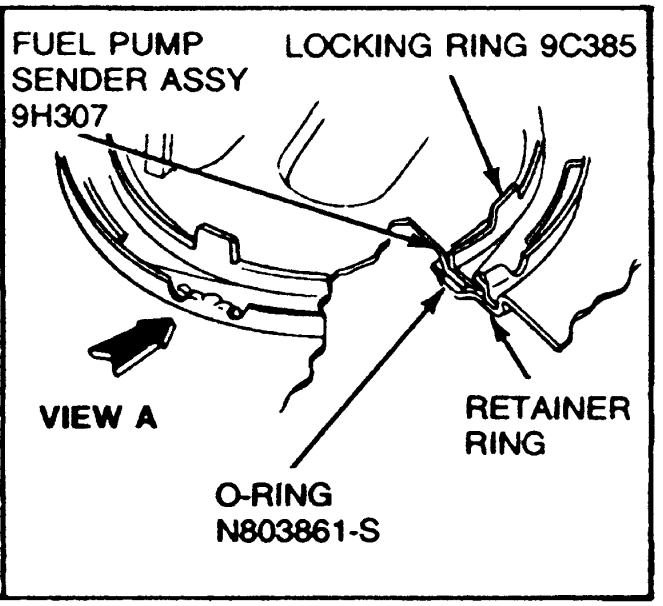

1. Rail O-ring seal
2. Integral filter
3. Coil
4. Armature
5. Manifold O-ring seal
6. Stainless steel body
7. Pintle protection cap
8. Stainless steel needle or pintle
9. Washer
10. Electrical connector

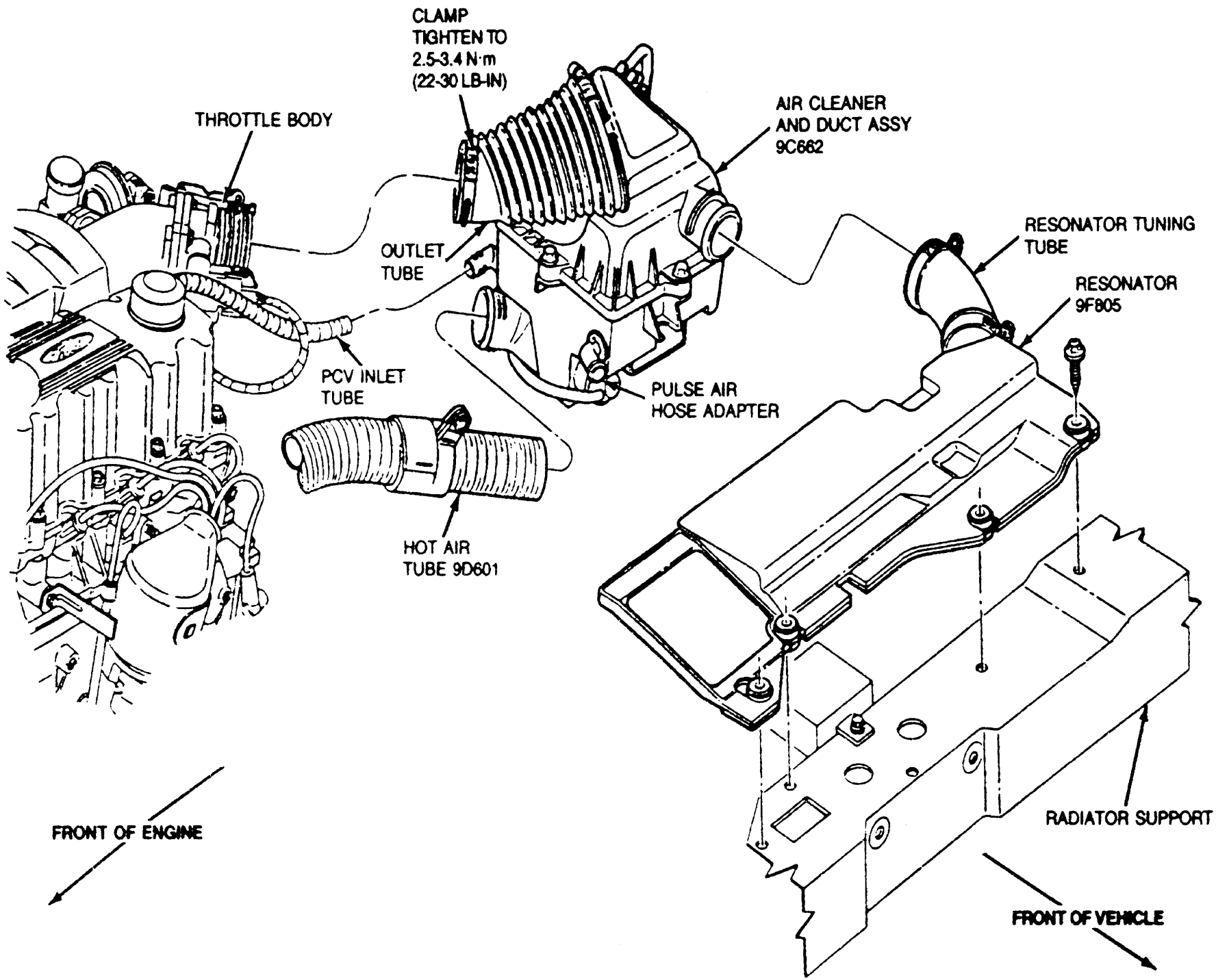

INLET
FUEL RAIL
ASSY
9F792
FUEL
PRESSURE
REGULATOR
OUTLET

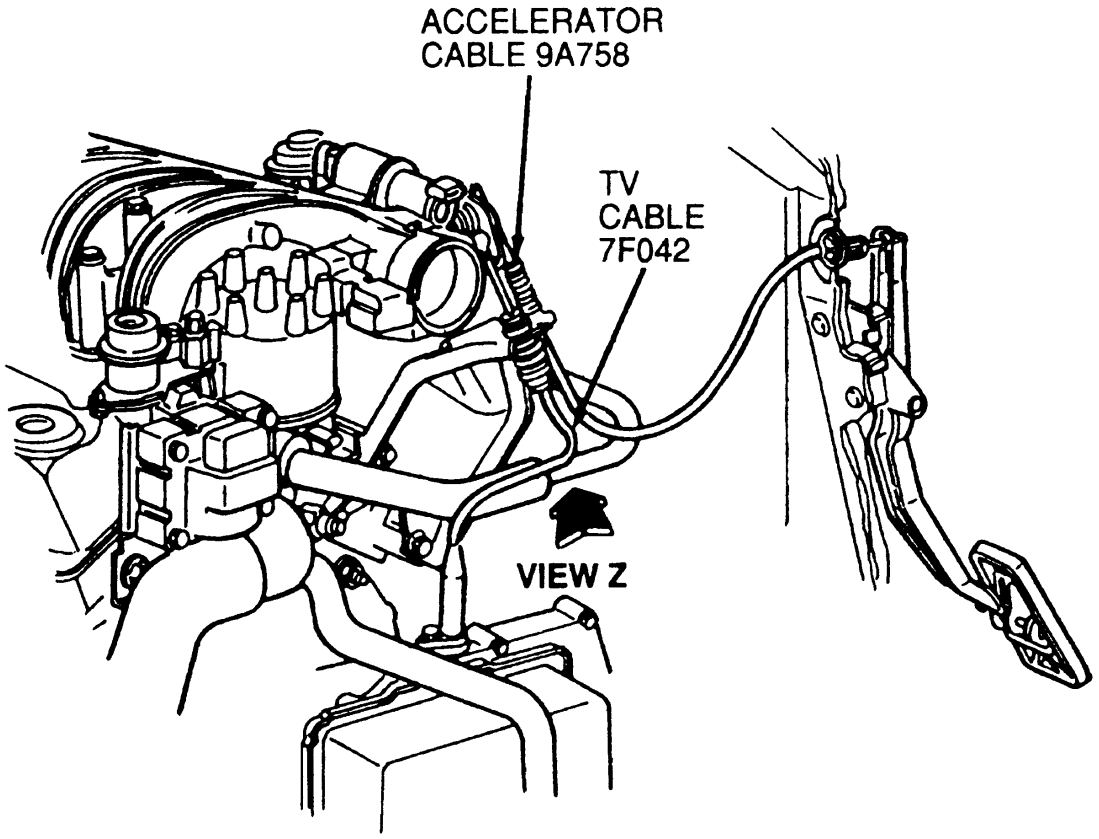

THROTTLE
POSITION
SENSOR
IDLE AIR
BYPASS
VALVE ASSY
IDLE
ADJUST
SCREW

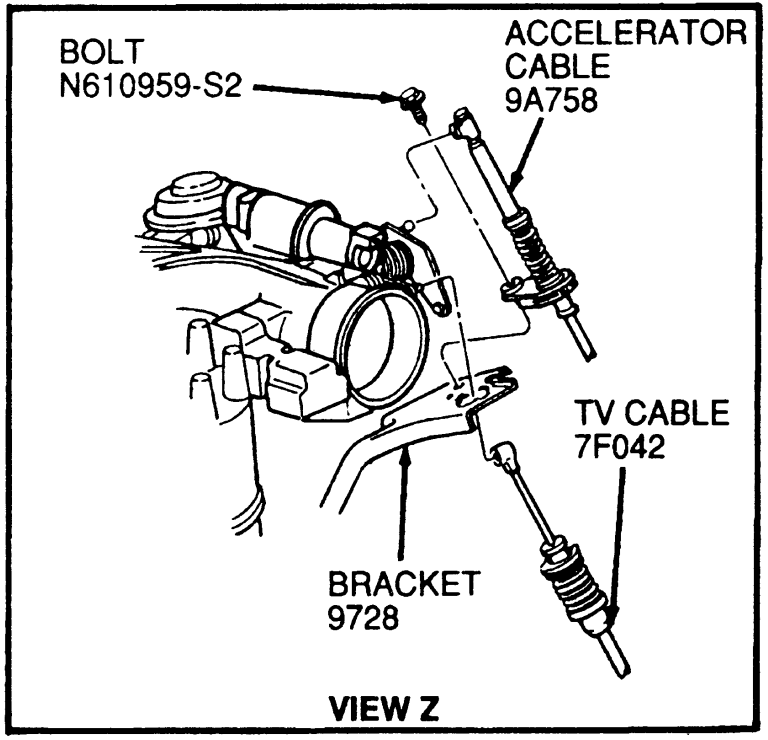

LOCKING RING
9C385
ELECTRICAL
CONNECTOR
FUEL PUMP
SENDER ASSY
9H307
O-RING
N803861-S
RETAINER
RING

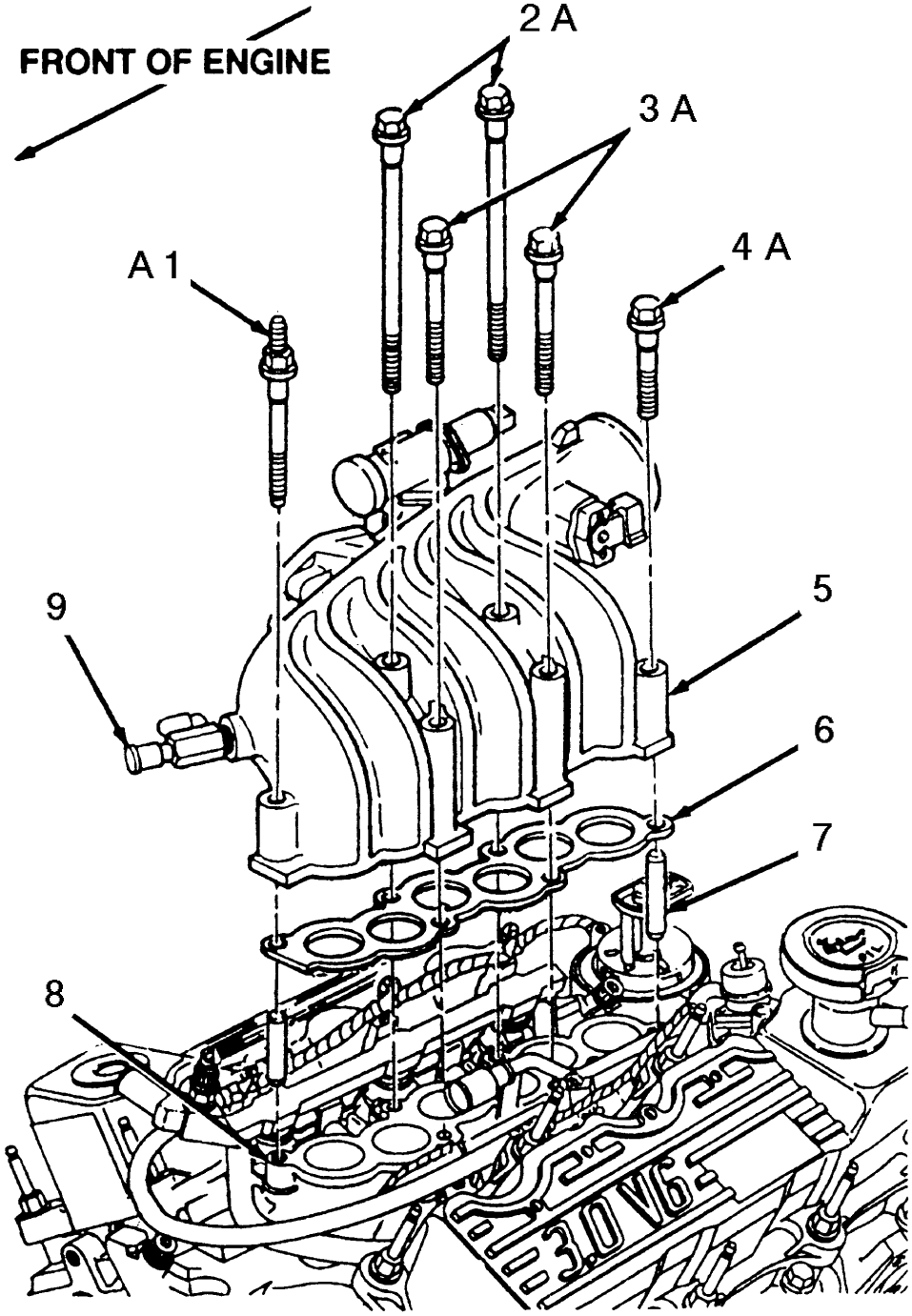

LOCATING
TABS
TAB
DETENT
STOP
RETAINER
RING
VIEW A


FUEL PUMP
SENDER ASSY
9H307
LOCKING RING 9C385
VIEW A
RETAINER
RING
O-RING
N803861-S

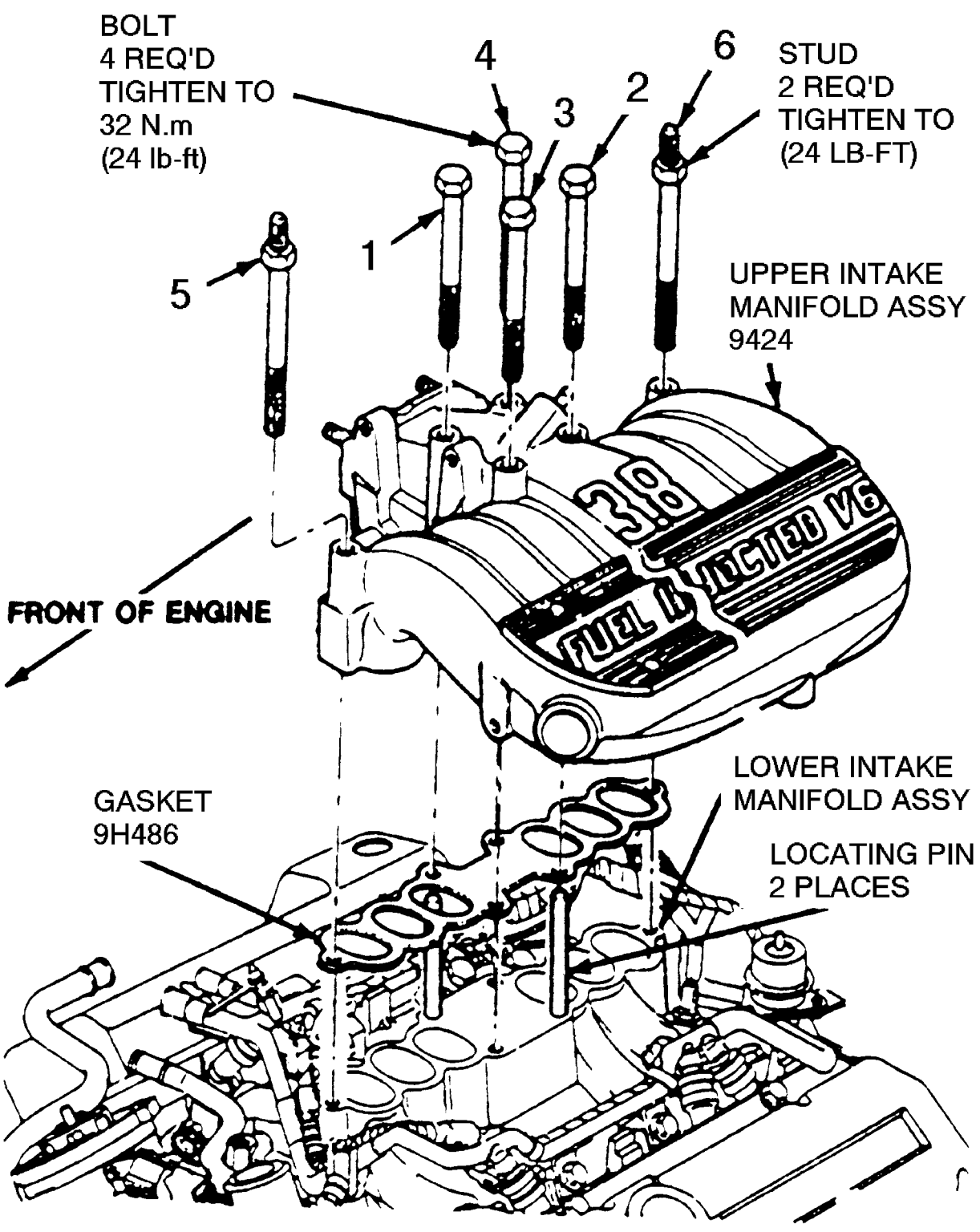

CLAMP
TIGHTEN TO
2.5-3.4 N·m
(22-30 LB-IN)
THROTTLE BODY
AIR CLEANER
AND DUCT ASSY
9C662
RESONATOR TUNING
TUBE
RESONATOR
9F805
OUTLET
TUBE
PCV INLET
TUBE
PULSE AIR
HOSE ADAPTER
HOT AIR
TUBE 9D601
FRONT OF ENGINE
RADIATOR SUPPORT
FRONT OF VEHICLE

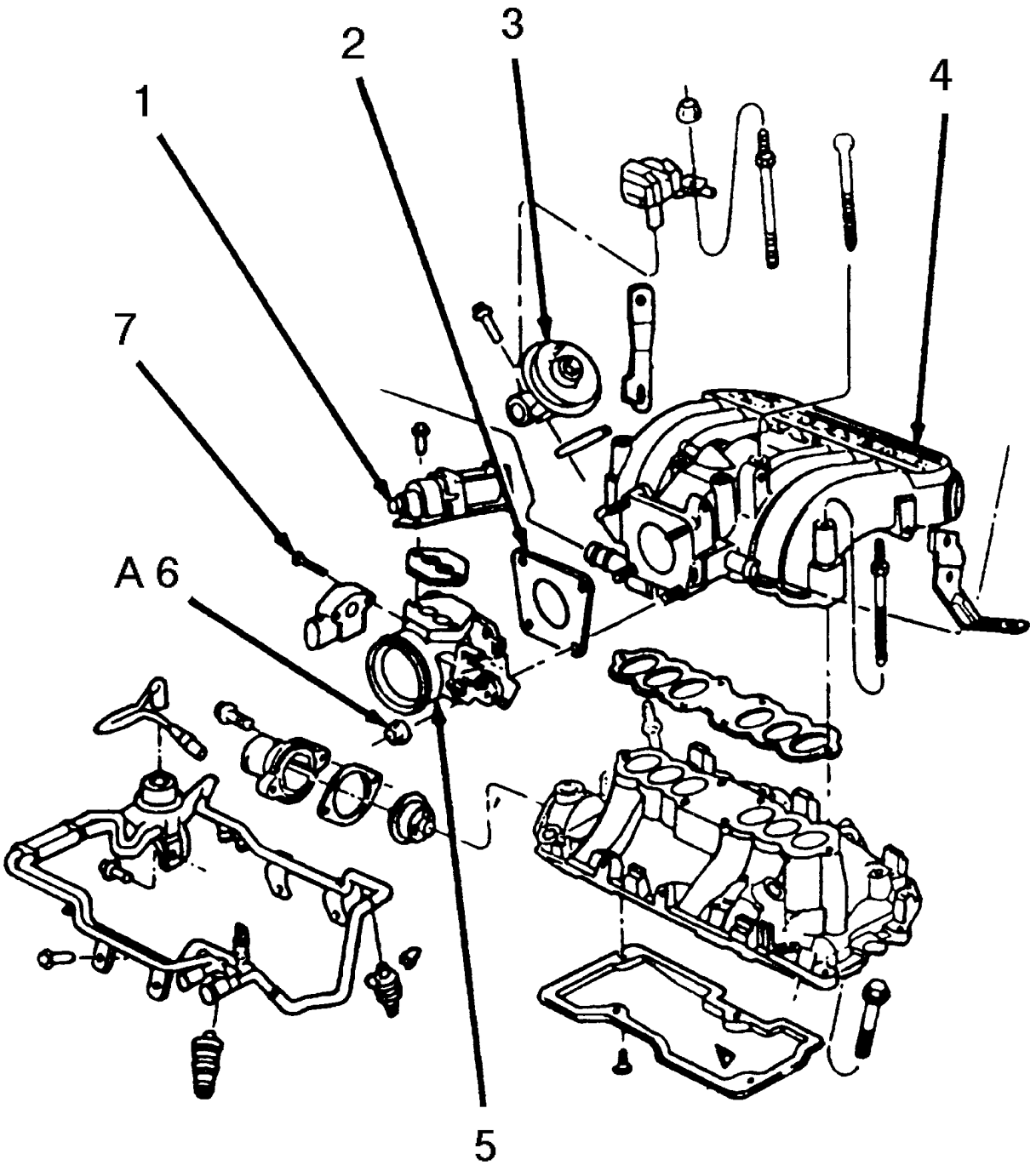

ACCELERATOR
CABLE 9A758
TV
CABLE
7F042
VIEW Z


BOLT
N610959-S2
ACCELERATOR
CABLE
9A758
TV CABLE
7F042
BRACKET
9728
VIEW Z




1A. Stud bolt
2A. Bolt-M8 x 1.25 x 130
3A. Bolt-M8 x 1.25 x 100
4A. Bolt-M8 x 1.25 x 68
5. Air intake throttle body
6. Air intake throttle body gasket
7. Guide pin
8. Lower intake manifold
9. Fitting and cap
A. Tighten to 20-30 N.m (15-22 lb-ft)


BOLT
4 REQ'D
TIGHTEN TO
32 N.m
(24 lb-ft)
4
6
STUD
2 REQ'D
TIGHTEN TO
(24 LB-FT)
3
2
1
5
UPPER INTAKE
MANIFOLD ASSY
9424
3.8
FUEL INJECTED V6
FRONT OF ENGINE
LOWER INTAKE
MANIFOLD ASSY
GASKET
9H486
LOCATING PIN
2 PLACES

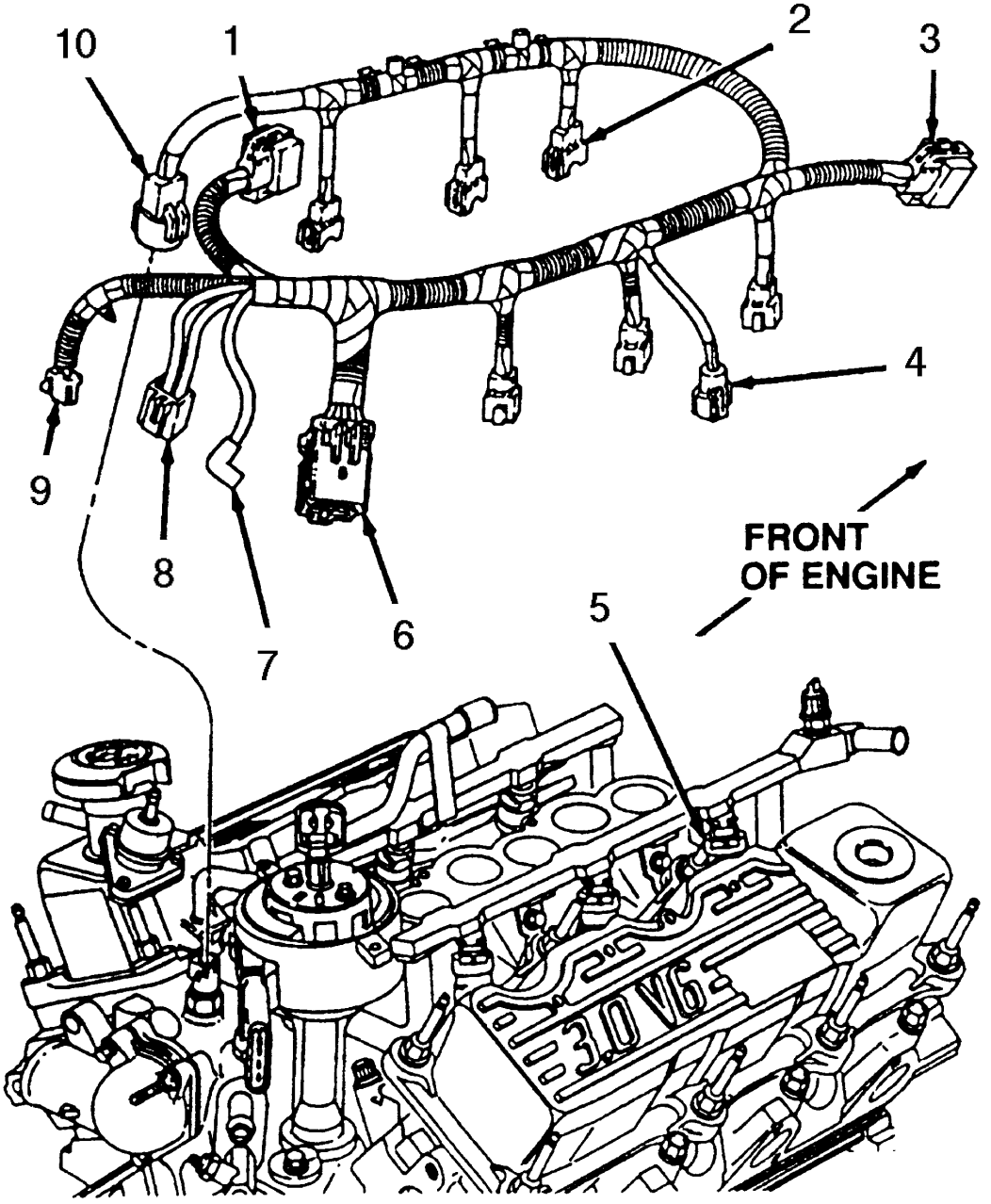



1. Idle air bypass valve
2. Gasket
3. EGR valve
4. Upper intake manifold
5. Throttle body

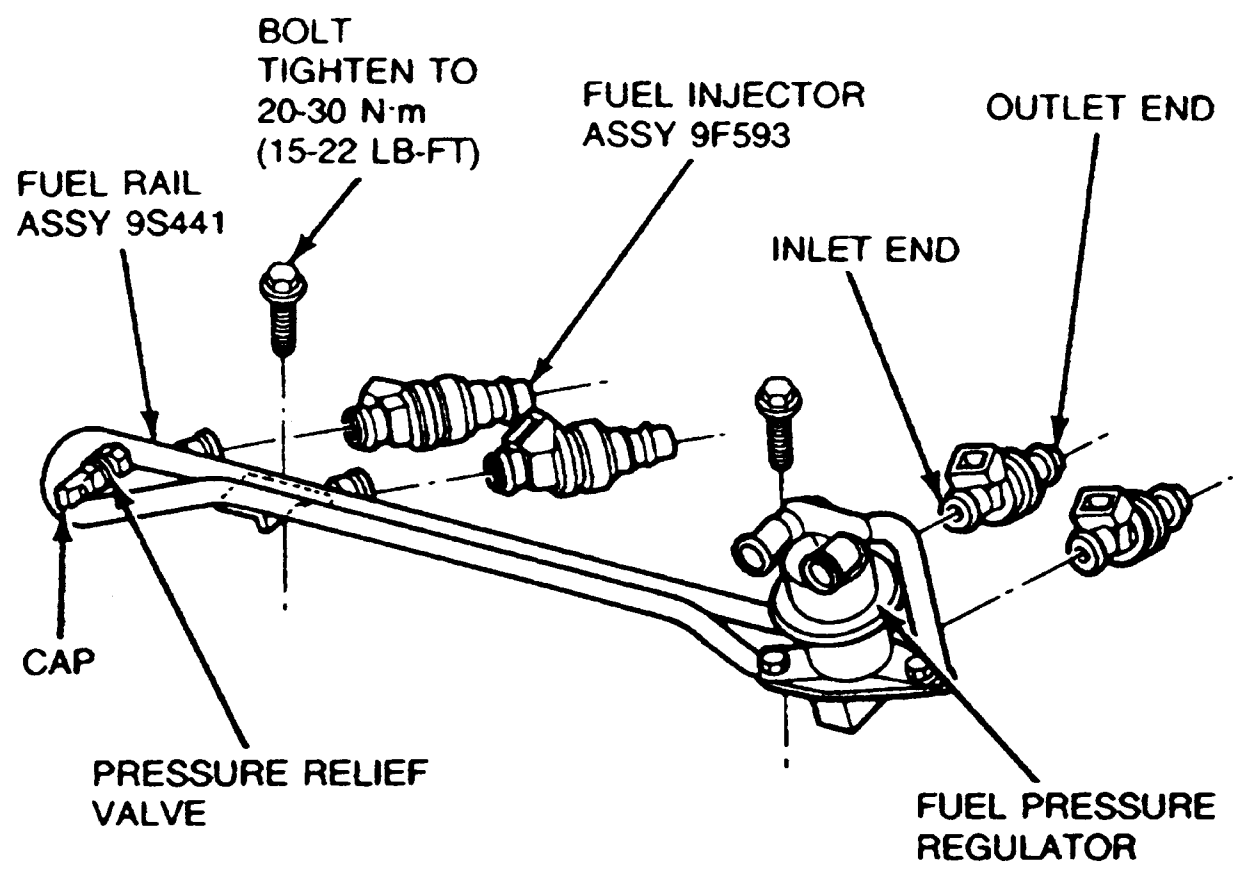
6A. Nut

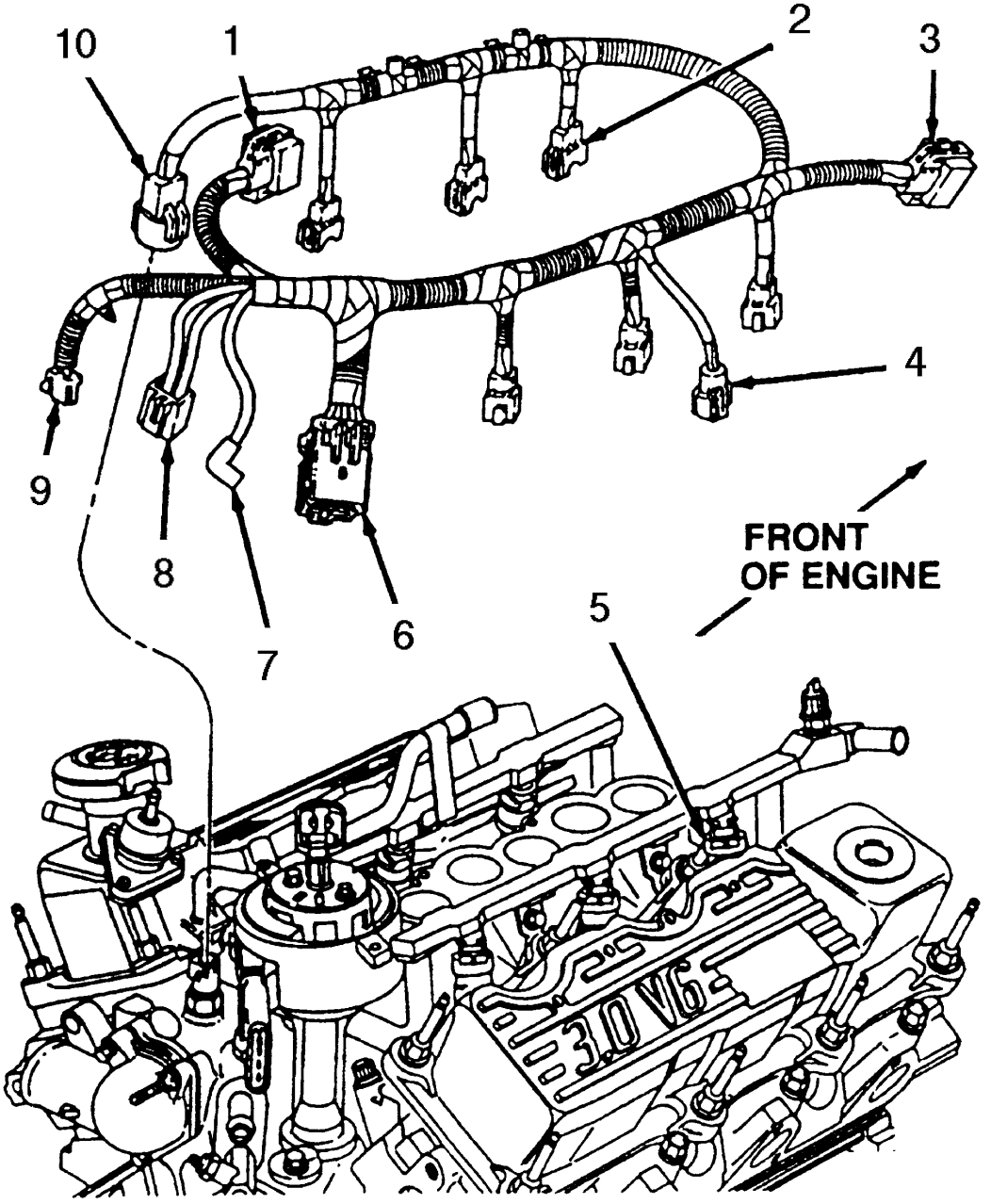
7. Screw

A. Tighten to 25 N.m (19 lb-ft)

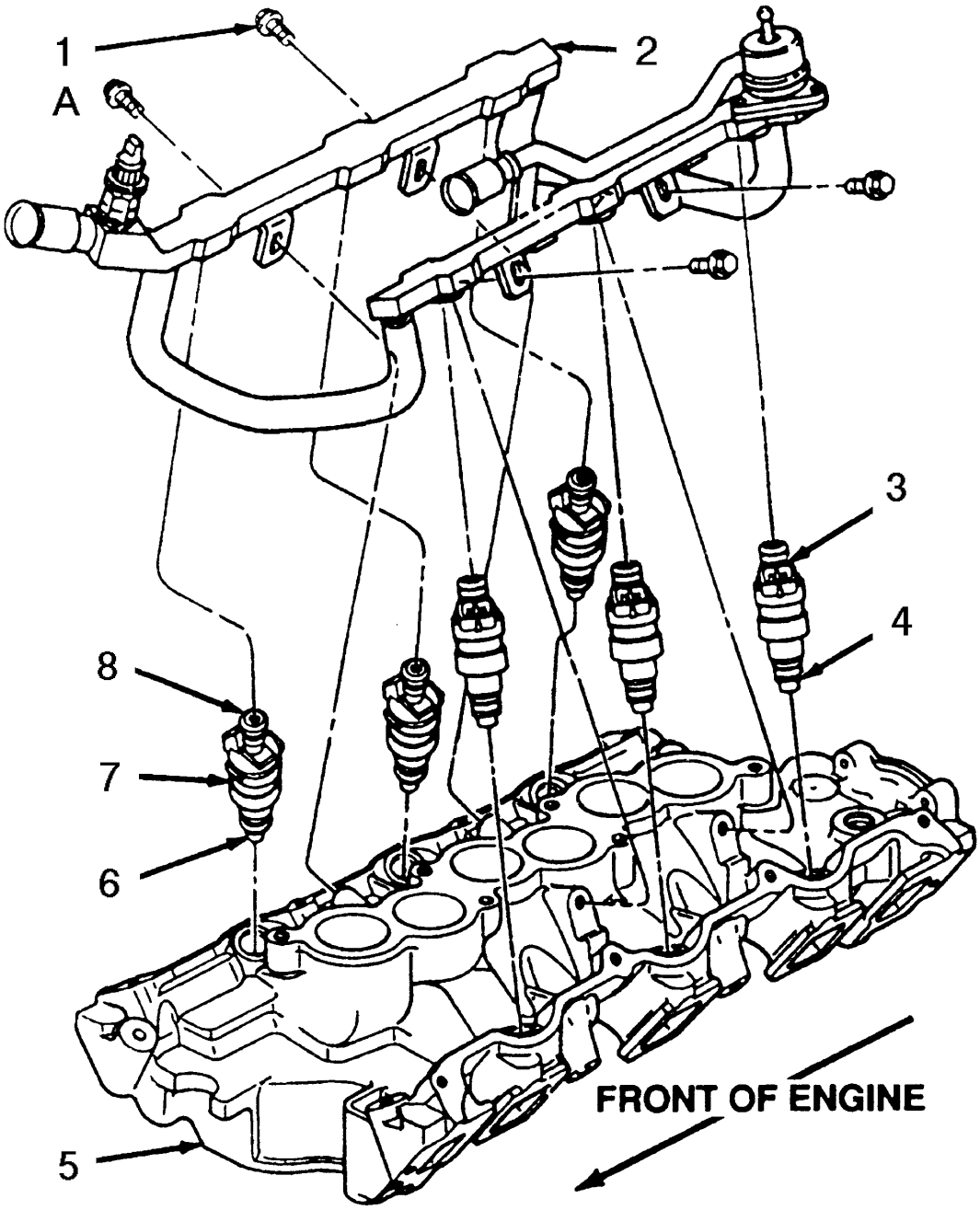



1. To throttle position sensor
2. Fuel injector wiring harness
3. To PFE transducer assy
4. To air charge temperature sensor
5. Fuel injector assy (6 req'd)
6. To harness assy
7. To oil pressure switch assy
8. To EGR vacuum regulator assy
9. To idle speed control
10. To engine coolant temperature sensor

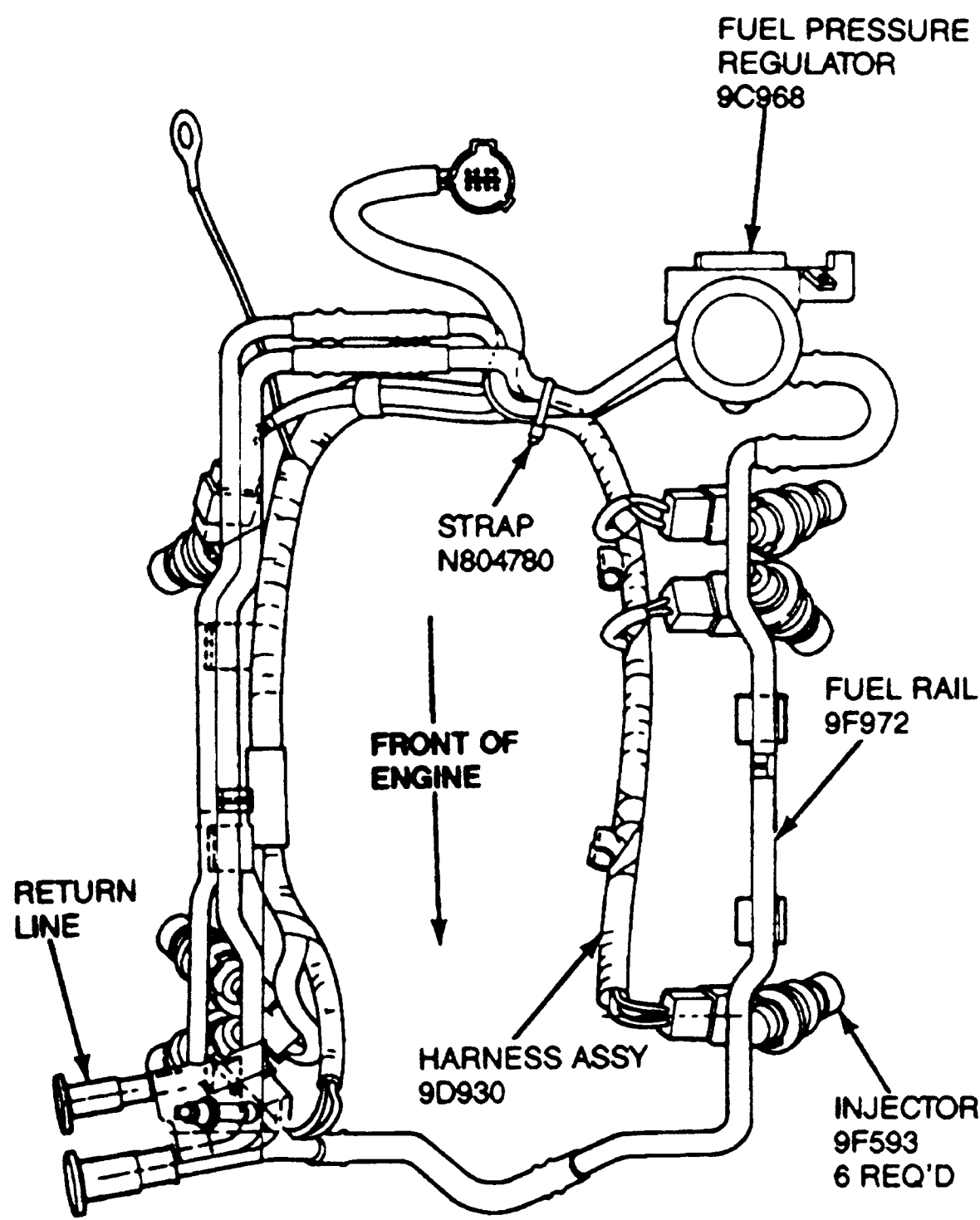

BOLT
TIGHTEN TO
20-30 N·m
(15-22 LB-FT)
FUEL INJECTOR
ASSY 9F593
OUTLET END
FUEL RAIL
ASSY 9S441
INLET END
CAP
PRESSURE RELIEF
VALVE
FUEL PRESSURE
REGULATOR

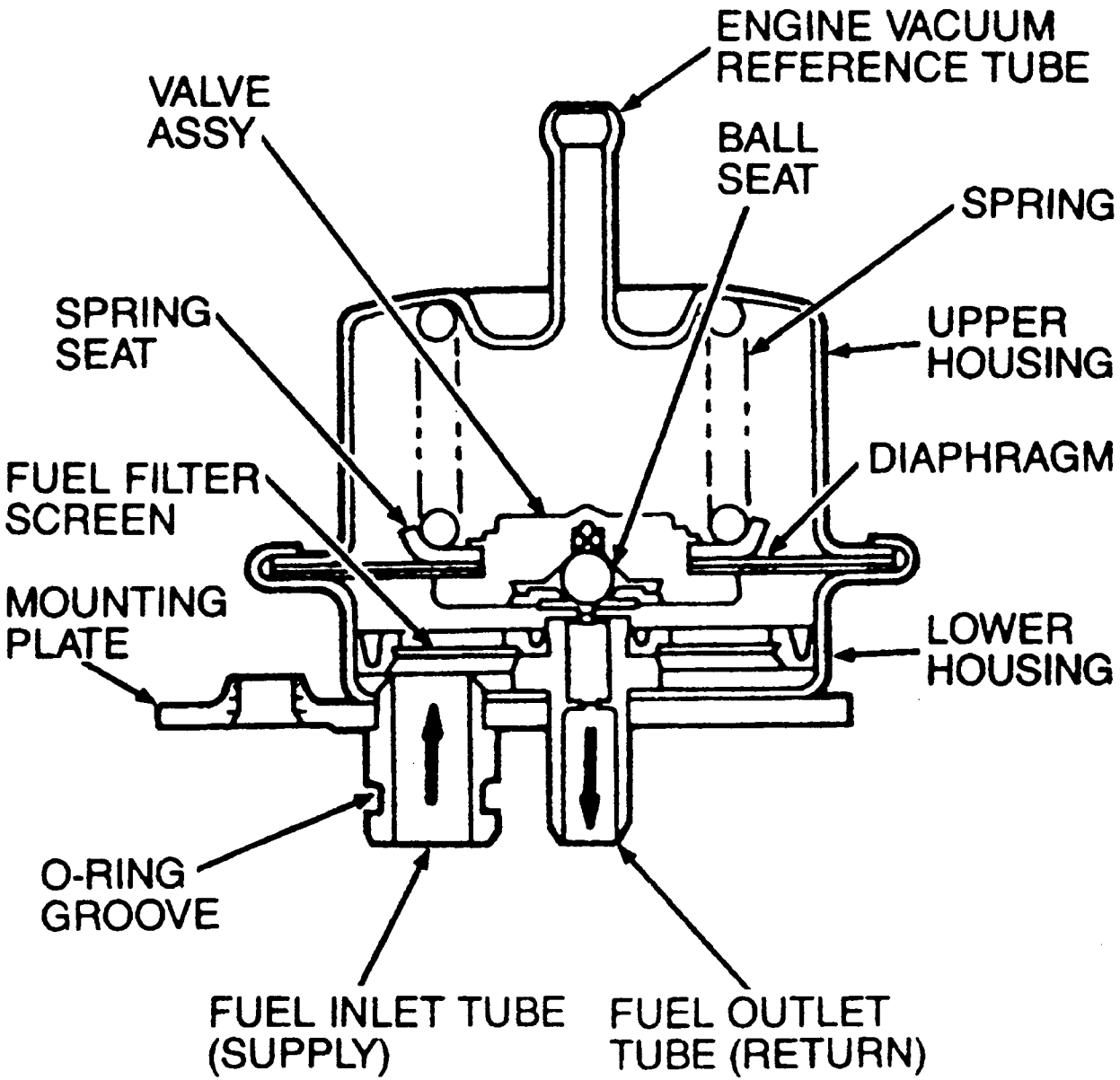


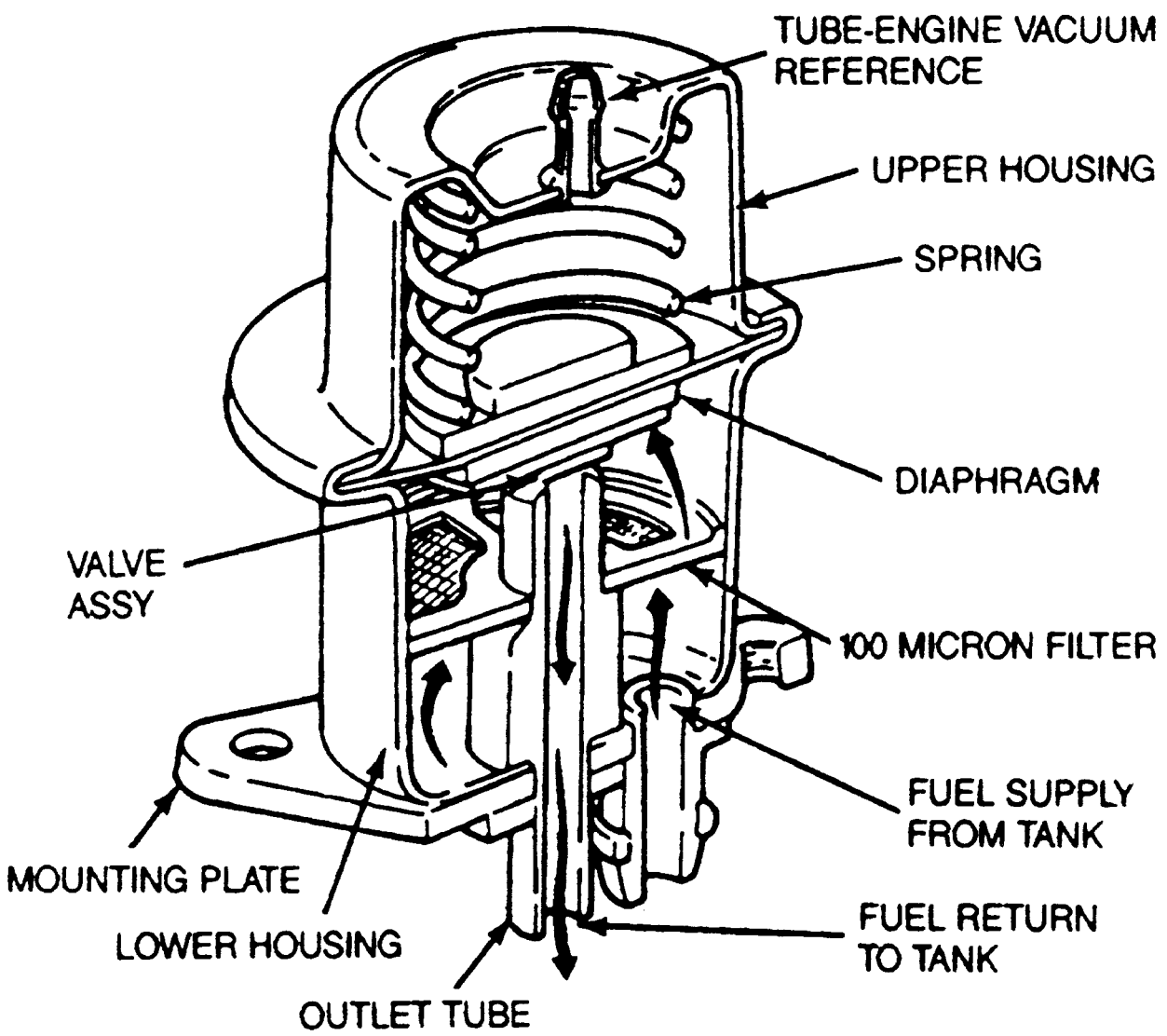

1. To throttle position sensor
2. Fuel injector wiring harness
3. To PFE transducer assy
4. To air charge temperature sensor
5. Fuel injector assy (6 req'd)
6. To harness assy
7. To oil pressure switch assy
8. To EGR vacuum regulator assy
9. To idle speed control
10. To engine coolant temperature sensor

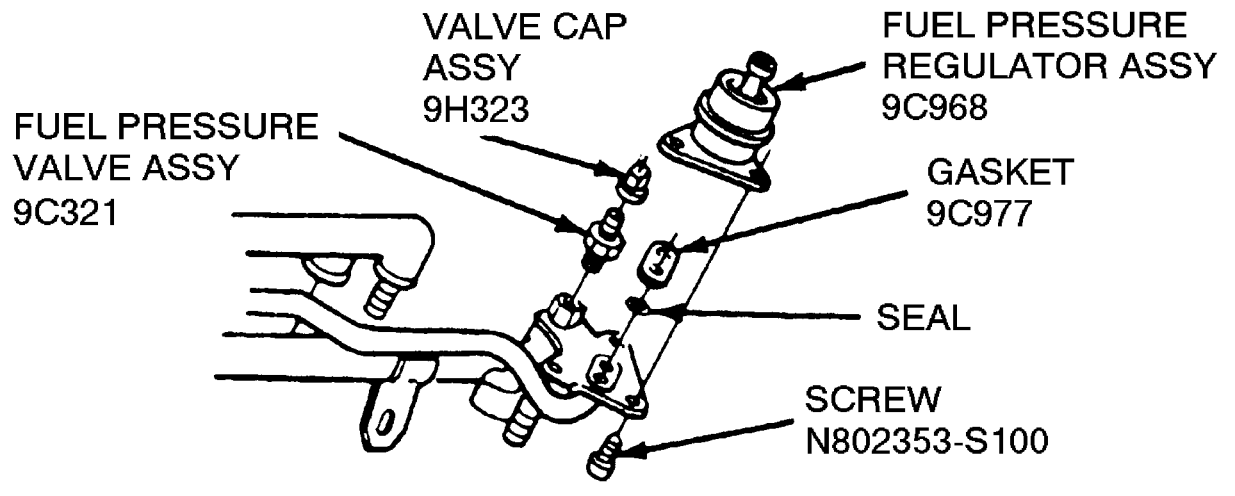


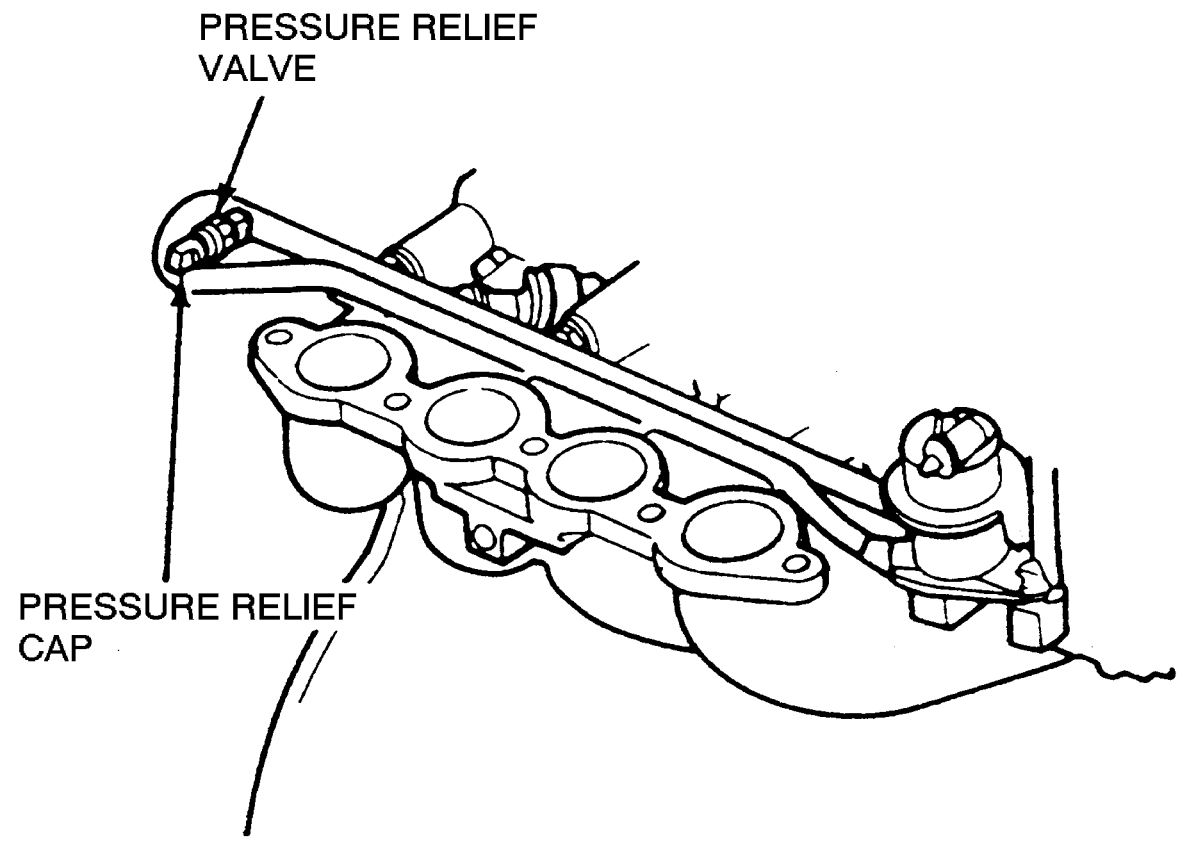

1A. Screw and washer assy
M6 x 1 x 22 hex head (4 req'd)
2. Fuel rail assy
3. Upper O-ring seal
4. Lower O-ring seal
5. Intake manifold assy/lower
6. Outlet end
7. Fuel injector assy
8. Inlet end
A. Tighten to 10 N.m (7 lb-ft)

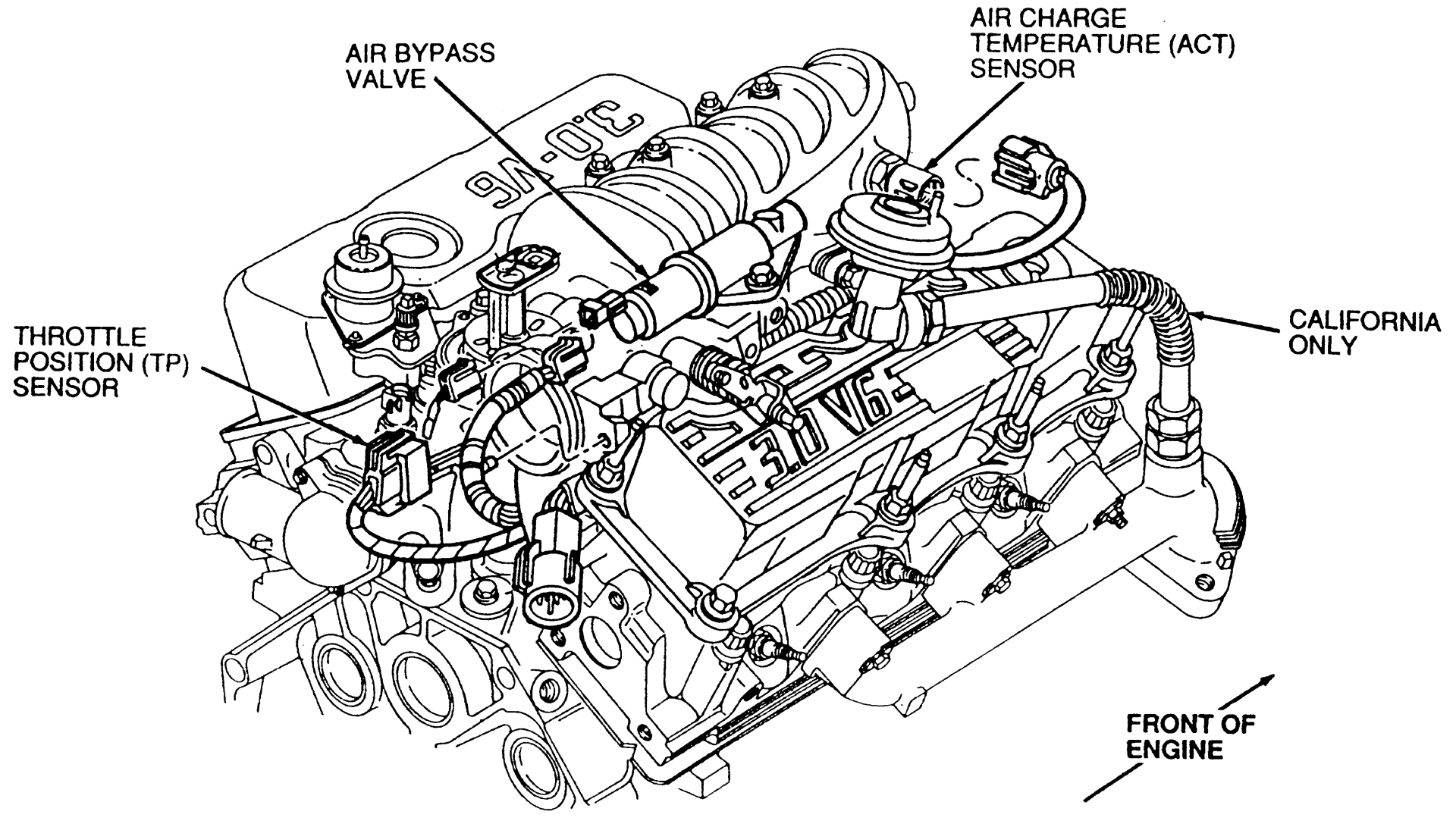

FUEL PRESSURE
REGULATOR
9C968
STRAP
N804780
FRONT OF
ENGINE
FUEL RAIL
9F972
RETURN
LINE
HARNESS ASSY
9D930
INJECTOR
9F593
6 REQ'D

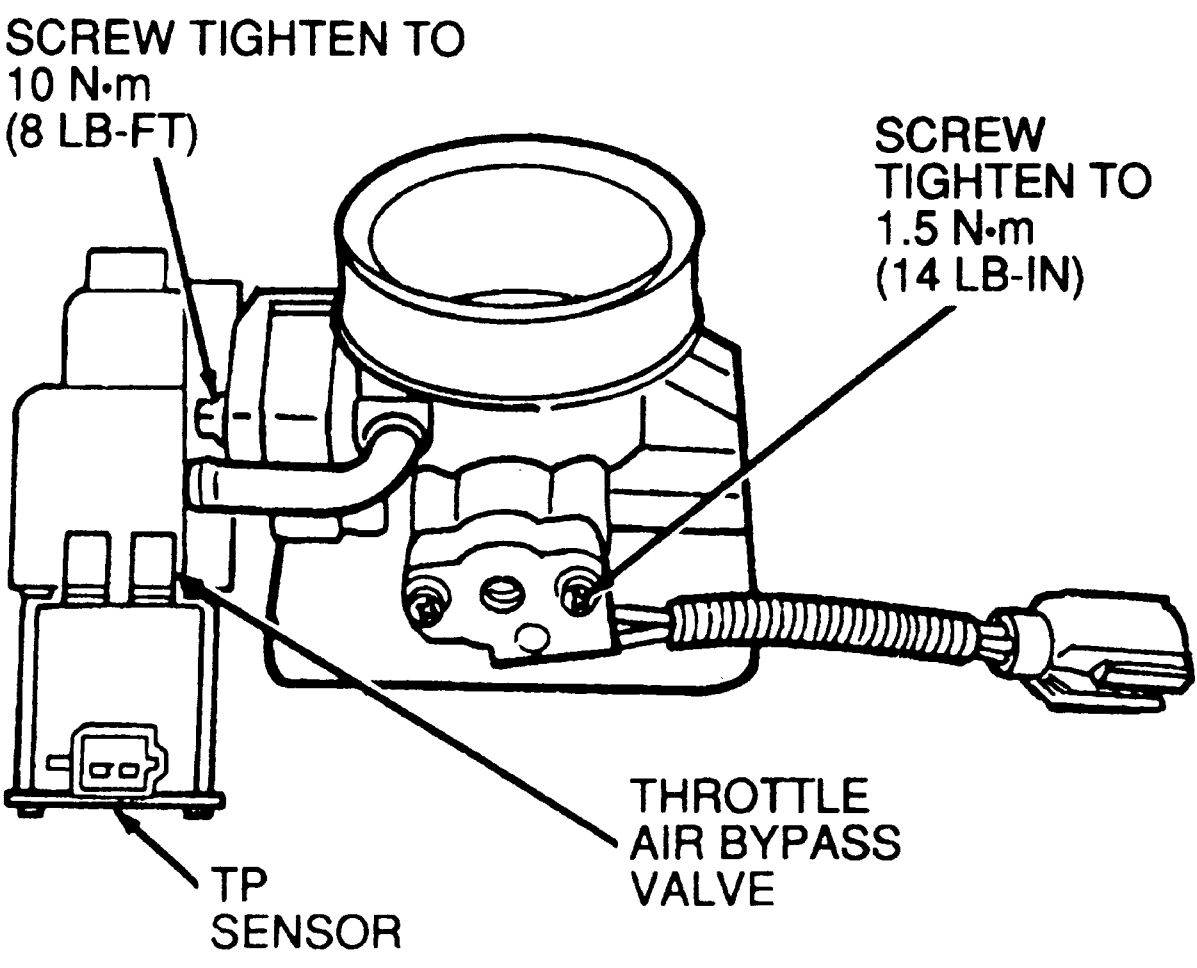

ENGINE VACUUM REFERENCE TUBE
VALVE ASSY
BALL SEAT
SPRING
SPRING SEAT
UPPER HOUSING
DIAPHRAGM
FUEL FILTER SCREEN
MOUNTING PLATE
LOWER HOUSING
O-RING GROOVE
FUEL INLET TUBE (SUPPLY)
FUEL OUTLET TUBE (RETURN)

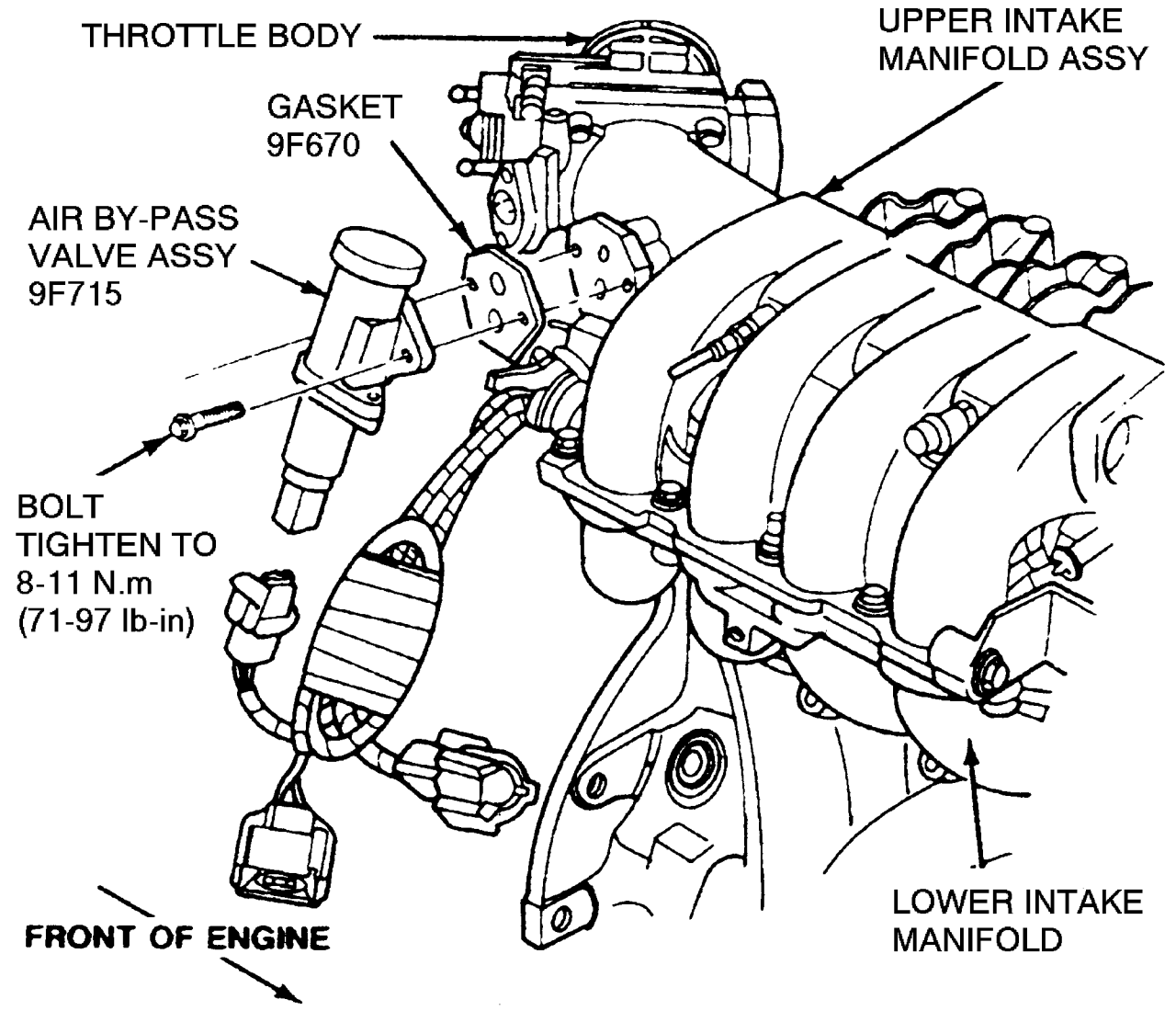

TUBE-ENGINE VACUUM REFERENCE
UPPER HOUSING
SPRING
DIAPHRAGM
VALVE ASSY
100 MICRON FILTER
FUEL SUPPLY FROM TANK
MOUNTING PLATE
LOWER HOUSING
FUEL RETURN TO TANK
OUTLET TUBE

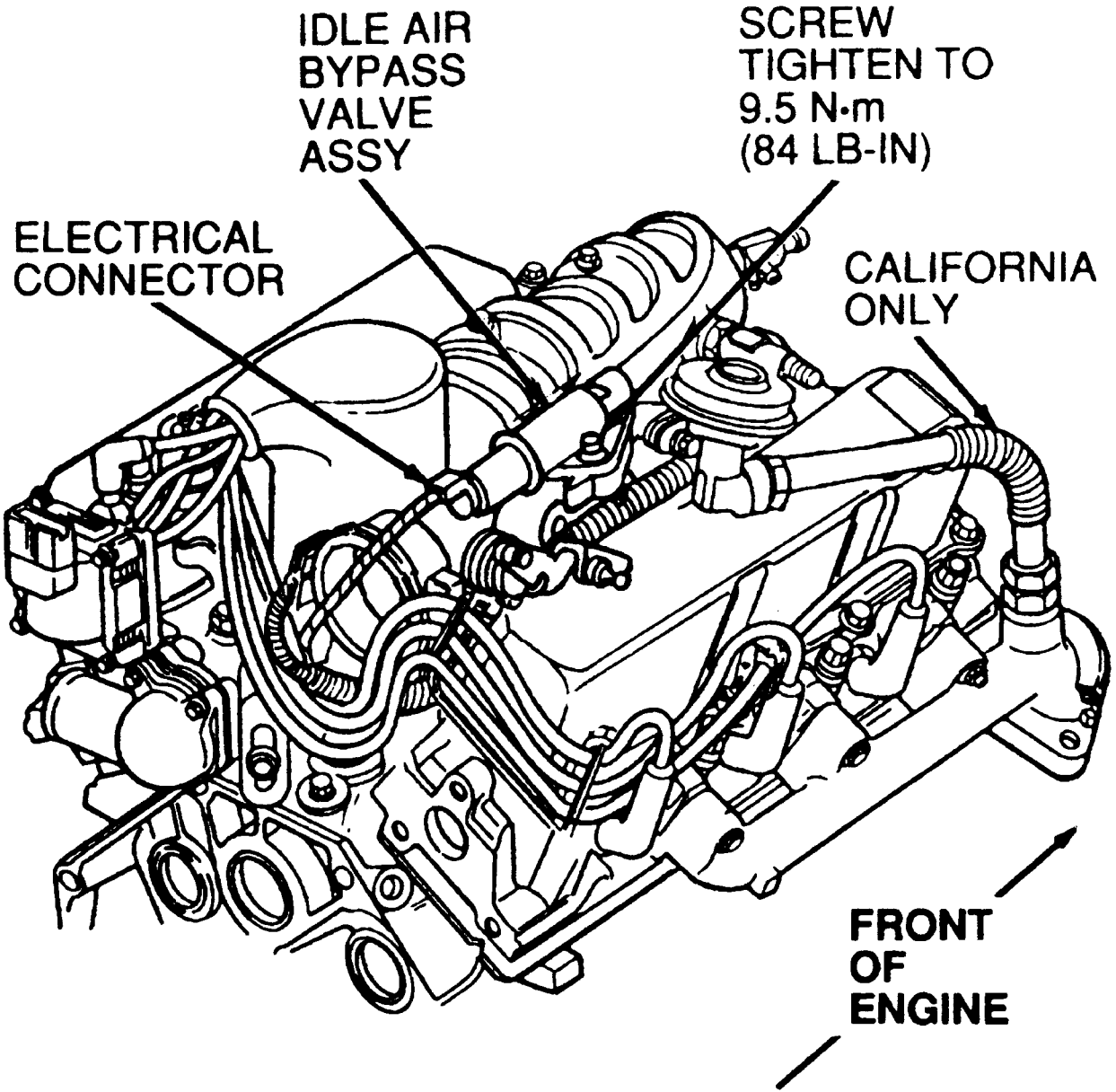

VALVE CAP
ASSY
9H323
FUEL PRESSURE
REGULATOR ASSY
9C968
FUEL PRESSURE
VALVE ASSY
9C321
GASKET
9C977
SEAL
SCREW
N802353-S100


PRESSURE RELIEF
VALVE
PRESSURE RELIEF
CAP


AIR BYPASS VALVE
AIR CHARGE TEMPERATURE (ACT) SENSOR
THROTTLE POSITION (TP) SENSOR
CALIFORNIA ONLY
FRONT OF ENGINE
3.0-V6
3.0 V6


SCREW TIGHTEN TO
10 N·m
(8 LB-FT)
SCREW
TIGHTEN TO
1.5 N·m
(14 LB-IN)
THROTTLE
AIR BYPASS
VALVE
TP
SENSOR

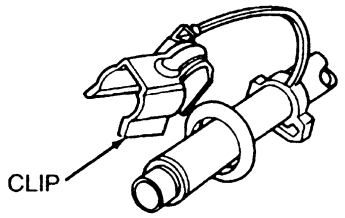

THROTTLE BODY
UPPER INTAKE MANIFOLD ASSY
GASKET 9F670
AIR BY-PASS VALVE ASSY 9F715
BOLT TIGHTEN TO 8-11 N.m (71-97 lb-in)
LOWER INTAKE MANIFOLD
FRONT OF ENGINE


IDLE AIR
BYPASS
VALVE
ASSY
SCREW
TIGHTEN TO
9.5 N·m
(84 LB-IN)
ELECTRICAL
CONNECTOR
CALIFORNIA
ONLY
FRONT
OF
ENGINE

# Spring Lock Coupling

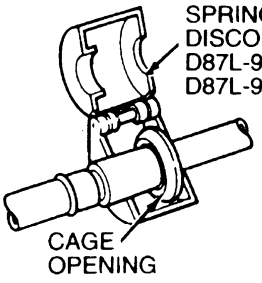
## TO DISCONNECT COUPLING

**CAUTION — RELIEVE FUEL PRESSURE BEFORE DISCONNECTING COUPLING**



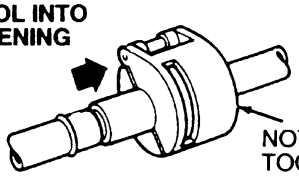

1 **REMOVE CLIP FROM COUPLING**

**USE SPECIFIED TOOL OR EQUIVALENT**

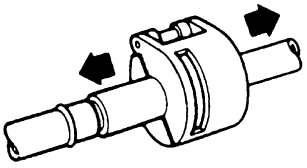



2 **FIT TOOL TO COUPLING SO THAT TOOL CAN ENTER CAGE OPENING TO RELEASE THE GARTER SPRING.**

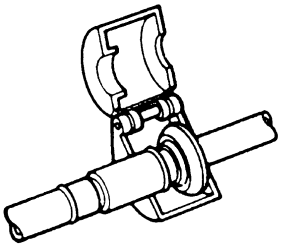
**PUSH TOOL INTO CAGE OPENING**




3 **PUSH THE TOOL INTO THE CAGE OPENING TO RELEASE THE FEMALE FITTING FROM THE GARTER SPRING.**

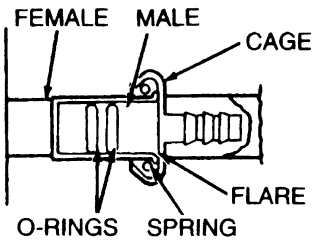


4 **PULL THE COUPLING MALE AND FEMALE FITTINGS APART**



5 **REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING**

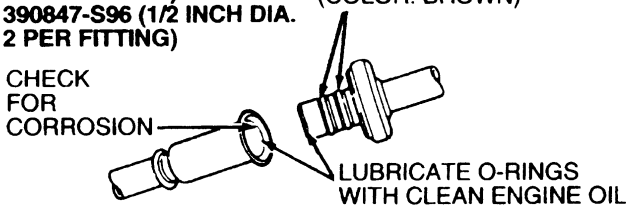
## TO CONNECT COUPLING



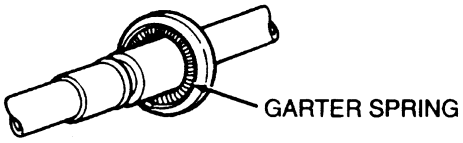

1

**REPLACEMENT O-RINGS**
**390846-S96 (3/8 INCH DIA. 2 PER FITTING)**
**390847-S96 (1/2 INCH DIA. 2 PER FITTING)**

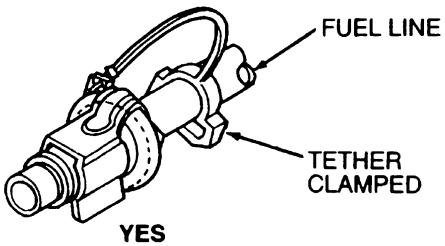
USE ONLY SPECIFIED FUEL RESISTANT O-RINGS (COLOR: BROWN)



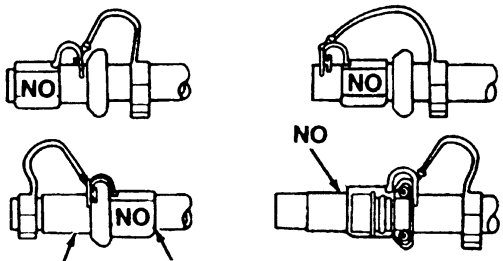

2 **CLEAN FITTINGS WITH SOLVENT. CHECK FOR MISSING OR DAMAGED O-RINGS. REPLACE MISSING O-RINGS. IF EITHER O-RING IS DAMAGED, REPLACE BOTH O-RINGS. REPLACEMENT GARTER SPRINGS:**
**3/8-INCH — E1ZZ-19E576-A**
**1/2-INCH — E1ZZ-19E576-B**



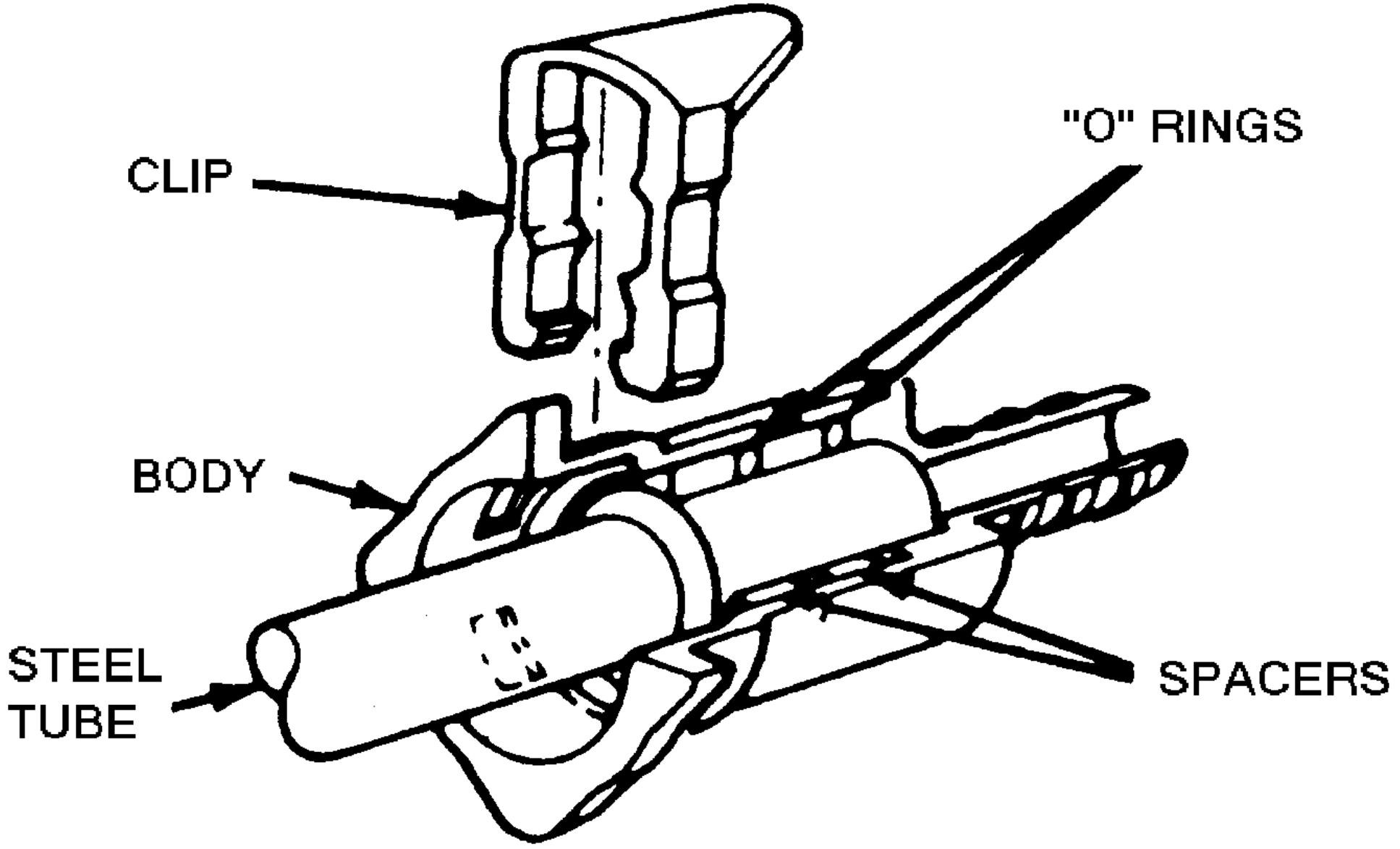

3 **TO ENSURE COUPLING ENGAGEMENT. PULL ON FITTING AND VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING.**

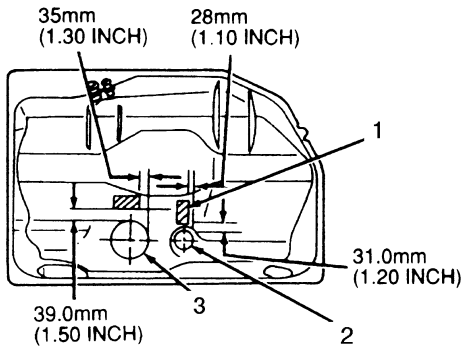



4 **YES**

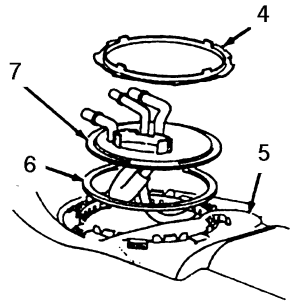



5 **WRONG — WHEN FLARE OR O-RINGS ARE SHOWING**


CLIP
"O" RINGS
BODY
STEEL
TUBE
SPACERS

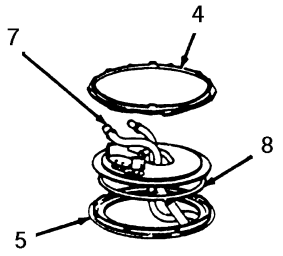



VIEW T



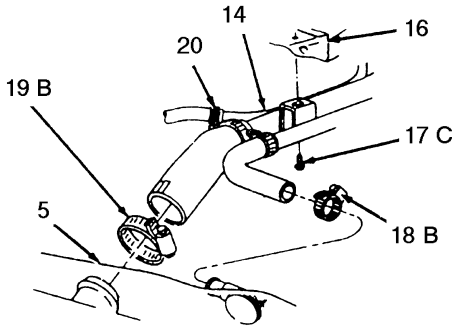

FF VEHICLES

VIEW U



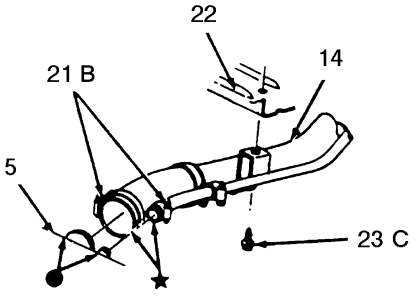

EXCEPT FF VEHICLES

VIEW U




FF VEHICLES

VIEW Z

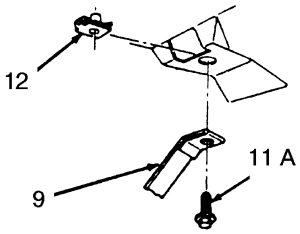



EXCEPT FF VEHICLES

VIEW Z

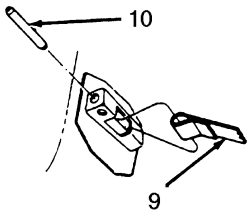
● SAE 10W-40 ENGINE OIL MAY BE USED ON 9002 AND OR 9034 AS AN ASSY AID. NO OTHER MATERIAL MAY BE USED.

★ INSTALL HOSES FLUSH TO TANK SURFACE. CLAMP MUST BE ON HOSE FLUSH TO 3.0MM (.1 INCH) FROM END OF HOSE.



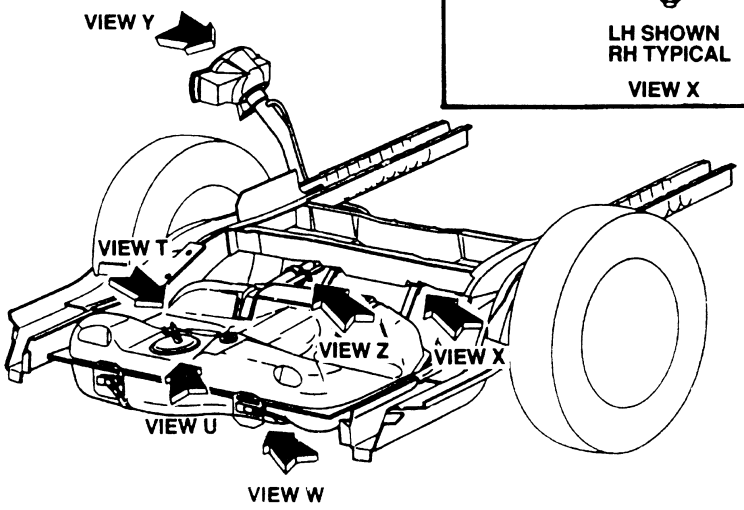

LH SHOWN
RH TYPICAL

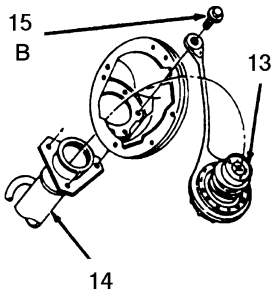
VIEW X




LH SHOWN
RH TYPICAL

VIEW W

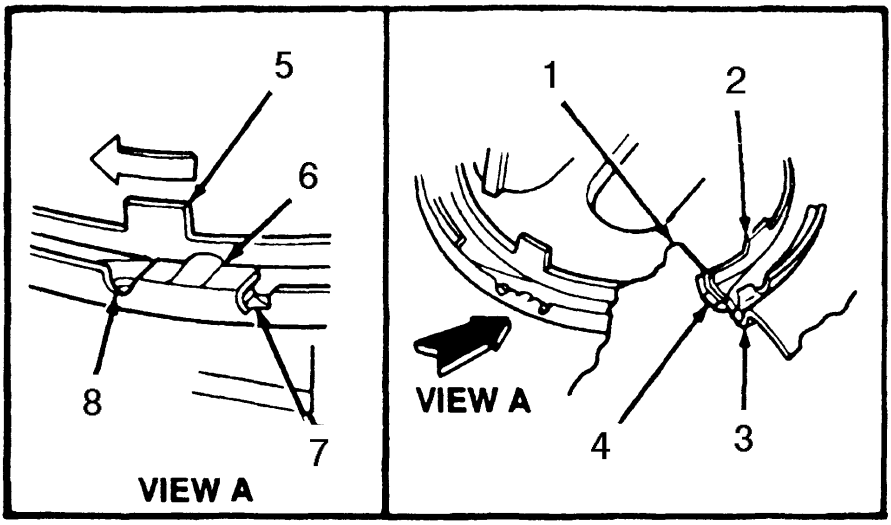


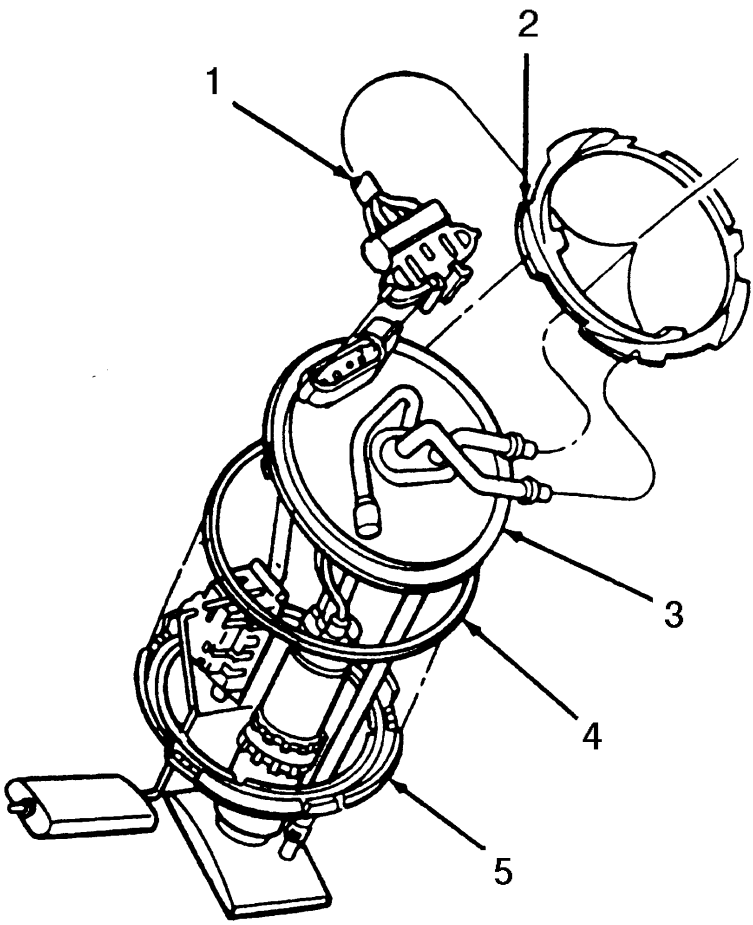




VIEW Y

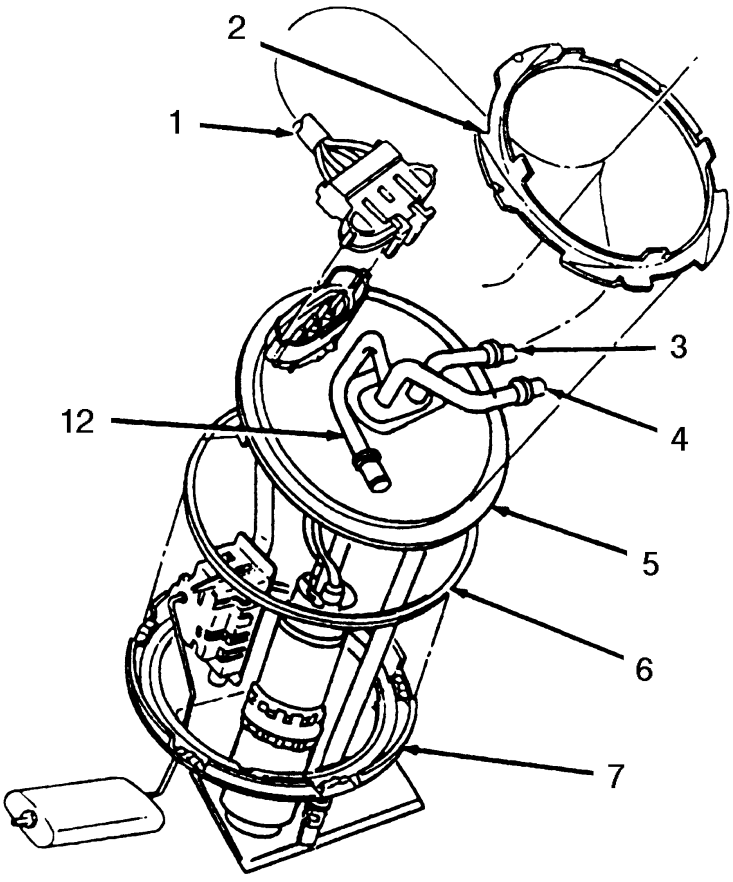
1. Fuel tank to floor pan insulator (2 required)
2. Fuel vapor valve
3. Fuel pump module
4. Fuel pump locking retainer ring
5. Fuel tank
6. Fuel pump mounting gasket
7. Fuel pump (part of fuel pump module)
8. Gasket
9. Fuel tank support strap
10. Pin (2 required)
11. Bolt (2 required)
12. Nut (2 required)
13. Fuel tank filler cap
14. Fuel tank filler pipe
15. Bolt
16. Body
17. Bolt
18. Hose clamp
19. Hose clamp
20. Hose clamp
21. Hose clamp
22. Crossmember
23. Bolt

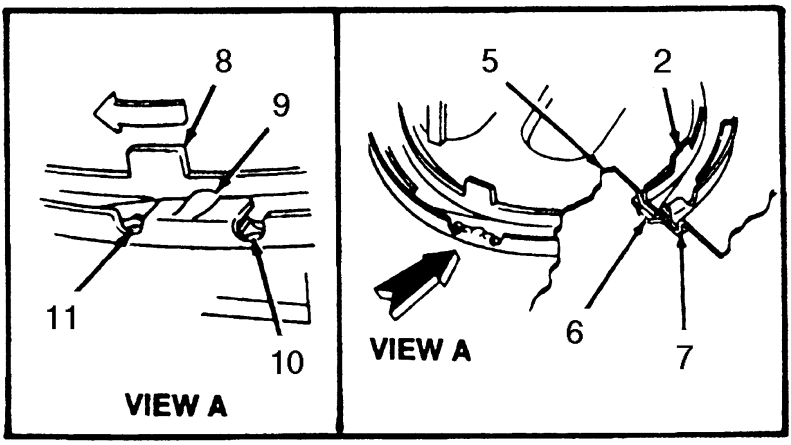
A. Tighten to 29-41 N.m (22-30 lb-ft)
B. Tighten to 2.7-3.7 N.m (24-32 lb-in)
C. Tighten to 4.0-6.0 N.m (35-53 lb-in)



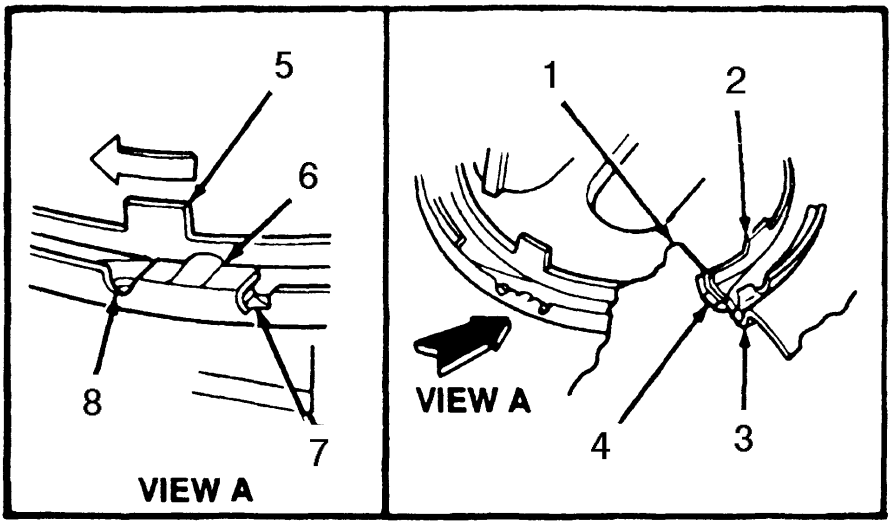



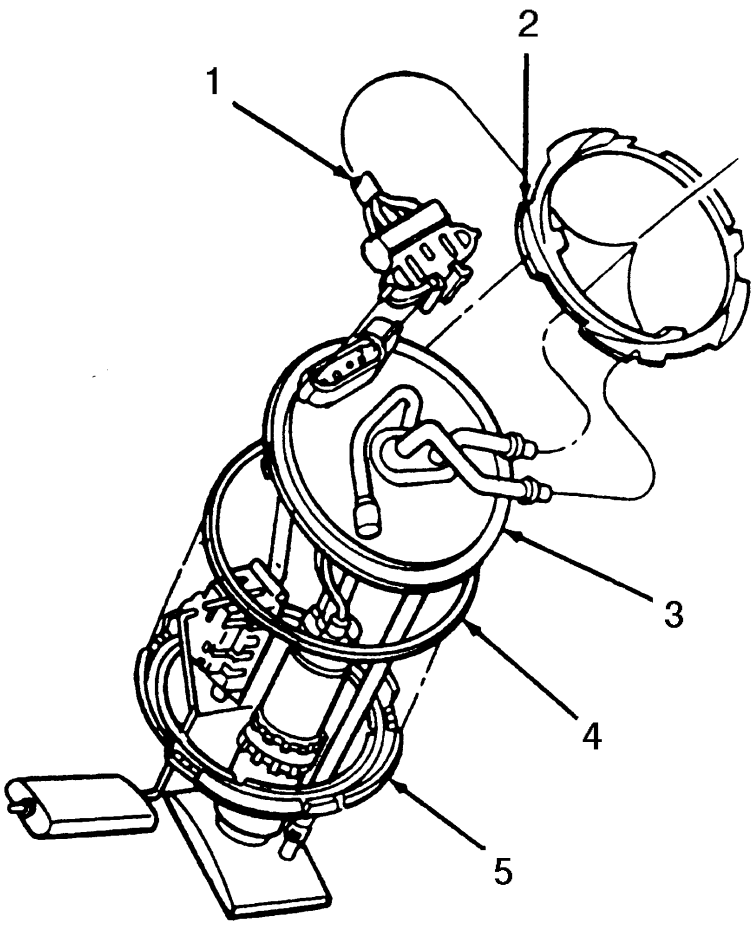

1. Fuel pump
2. Fuel pump locking retainer ring
3. Retainer ring (part of 9C385)
4. O-ring
5. Locating tabs (part of 9C385)
6. Tab (part of 9C385)
7. Stop (part of 9C385)
8. Detent (part of 9C385)



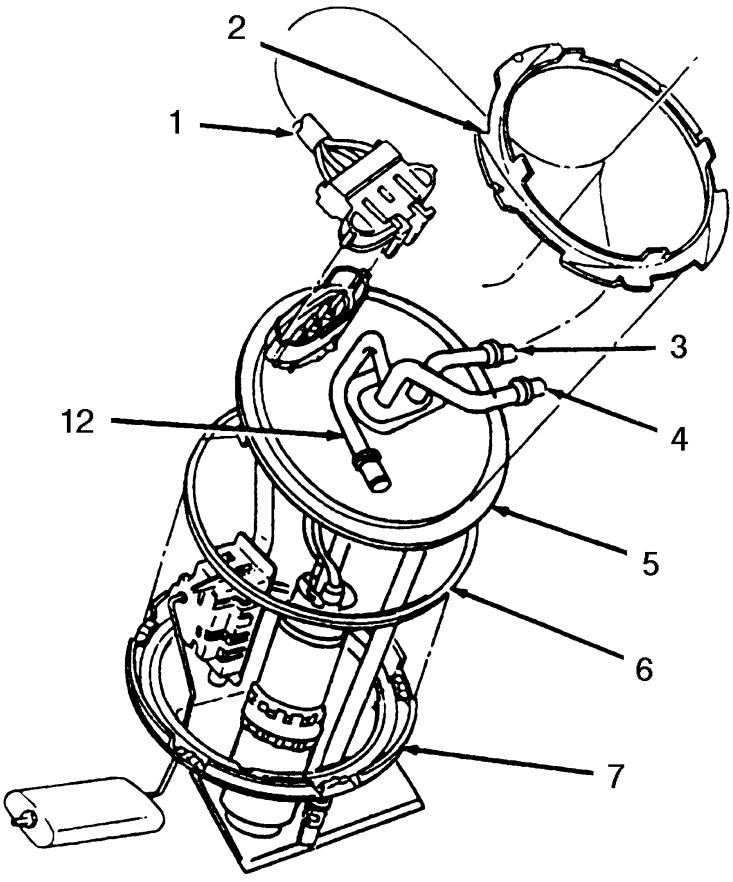



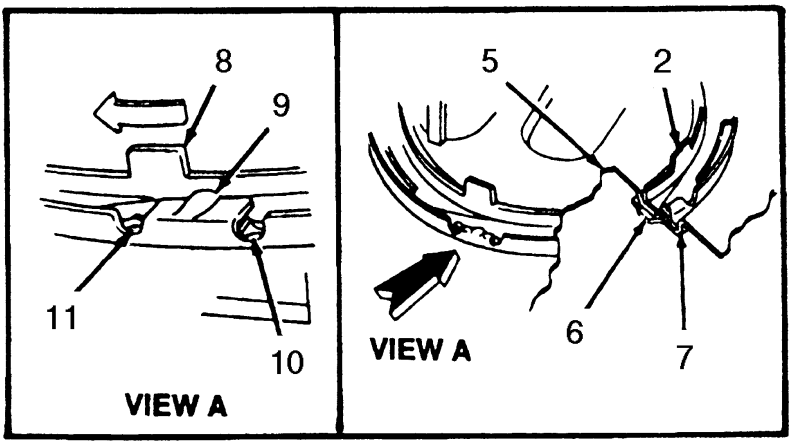

1. Electrical connector
2. Fuel pump locking retainer ring
3. Fuel return
4. Fuel supply
5. Fuel pump
6. Fuel pump mounting gasket
7. Retainer ring
8. Locating tabs
9. Tab
10. Stop
11. Detent
12. Fuel tank drain tube



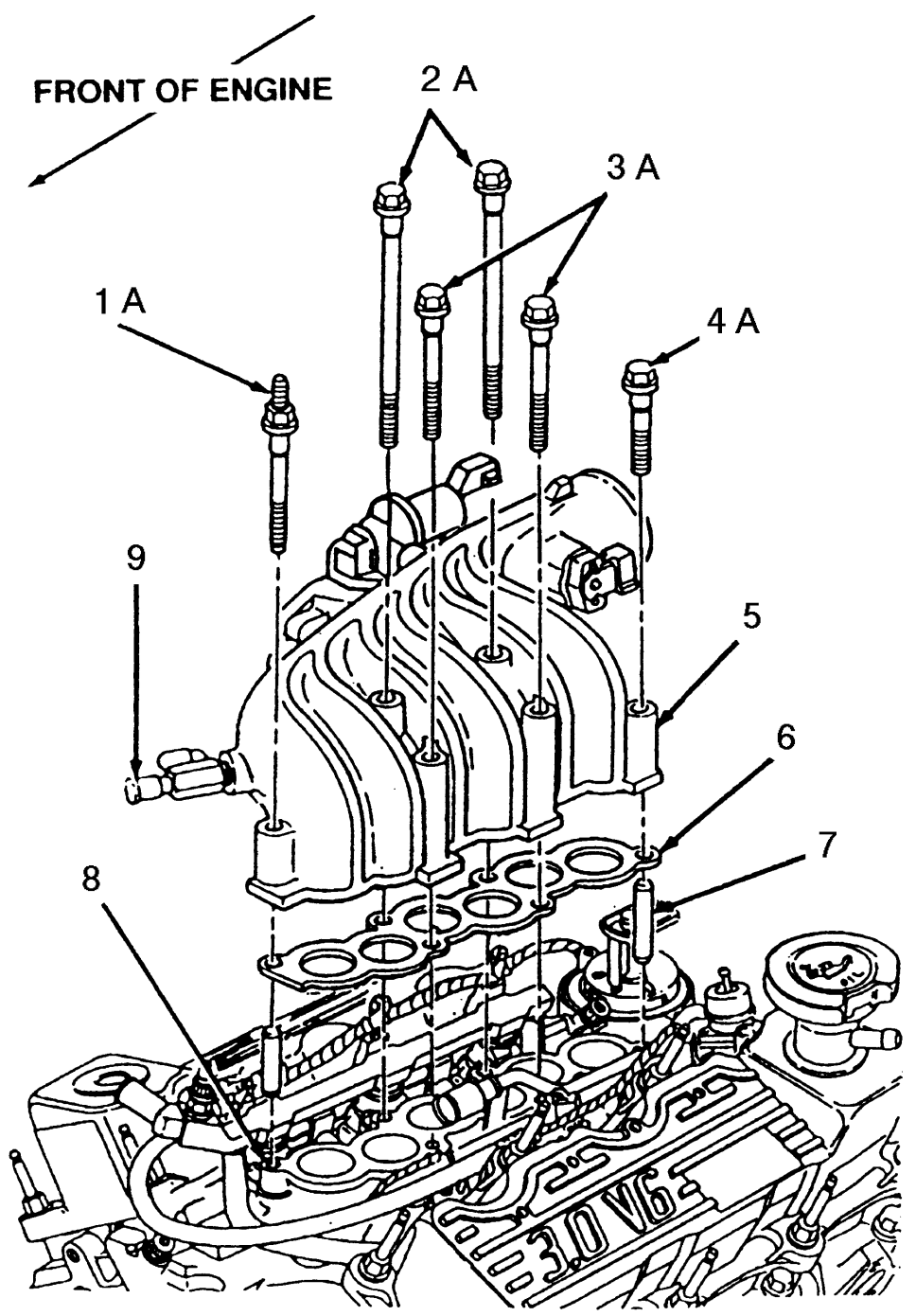




1. Fuel pump
2. Fuel pump locking retainer ring
3. Retainer ring (part of 9C385)
4. O-ring
5. Locating tabs (part of 9C385)
6. Tab (part of 9C385)
7. Stop (part of 9C385)
8. Detent (part of 9C385)



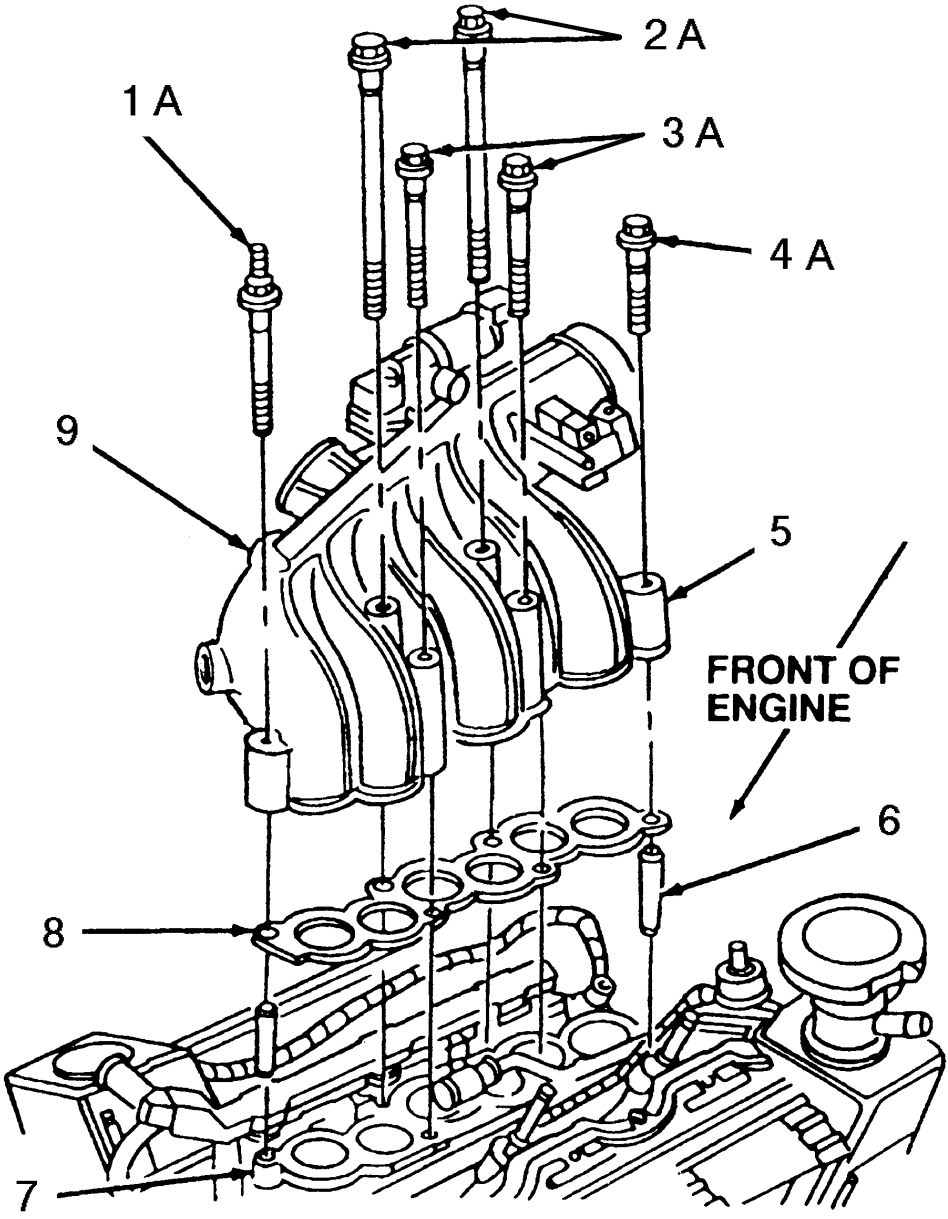




1. Electrical connector
2. Fuel pump locking retainer ring
3. Fuel return
4. Fuel supply
5. Fuel pump
6. Fuel pump mounting gasket
7. Retainer ring
8. Locating tabs
9. Tab
10. Stop
11. Detent
12. Fuel tank drain tube



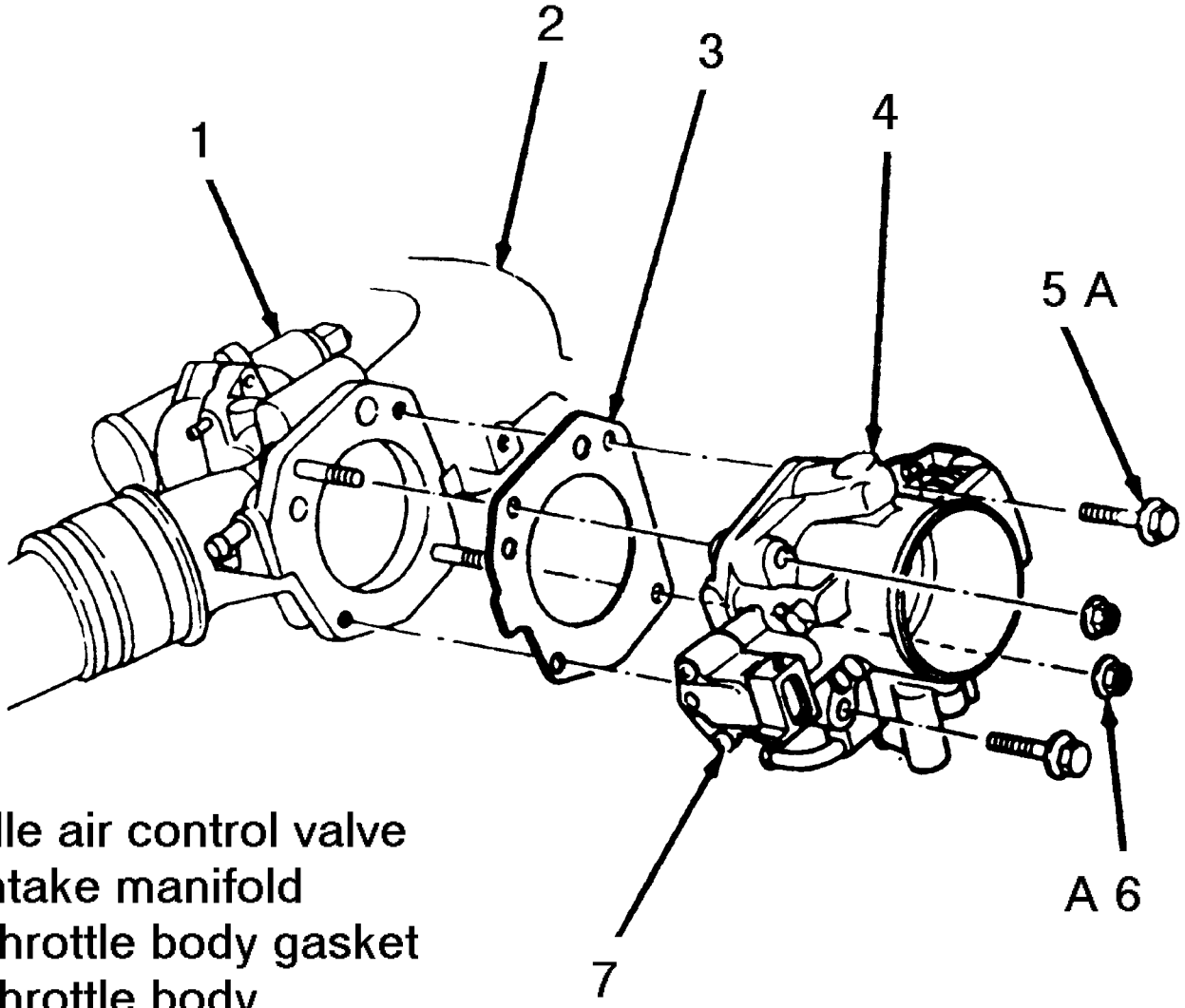

1. Stud bolt
2. Bolt (2 required)
3. Bolt (2 required)
4. Bolt
5. Throttle body
6. Intake manifold upper gasket
7. Guide pin (part of 9H486)
8. Intake manifold
9. Intake manifold vacuum outlet fitting and cap

A. Tighten to 20-30 N.m (15-22 lb-ft)



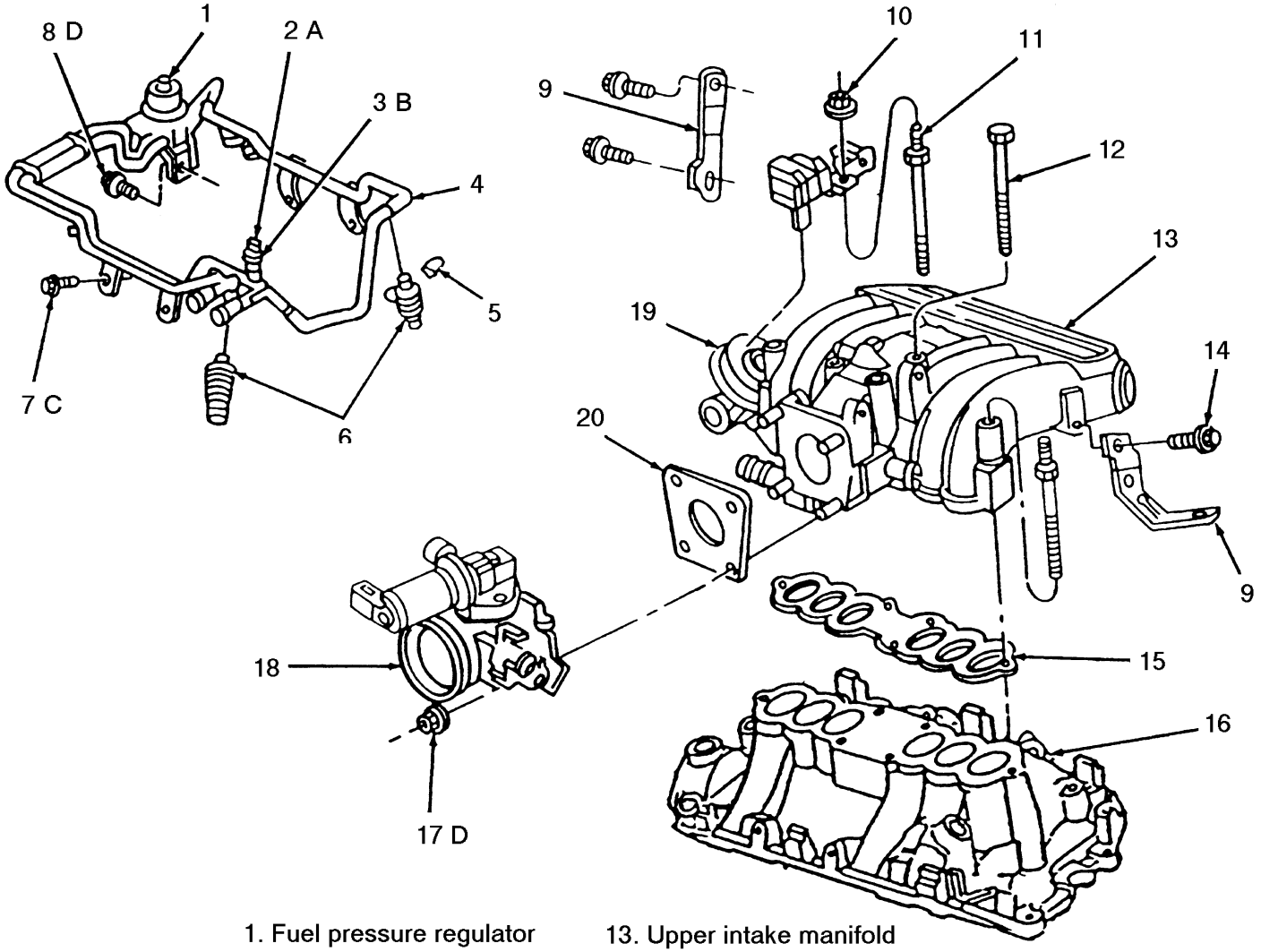

1. Stud bolt
2. Bolt (2 required)
3. Bolt (2 required)
4. Bolt
5. Throttle body
6. Guide pin (2 required)
7. Intake manifold
8. Intake manifold upper gasket
9. Intake manifold vacuum outlet fitting and cap

A. Tighten to 20-30 N.m (15-22 lb-ft)



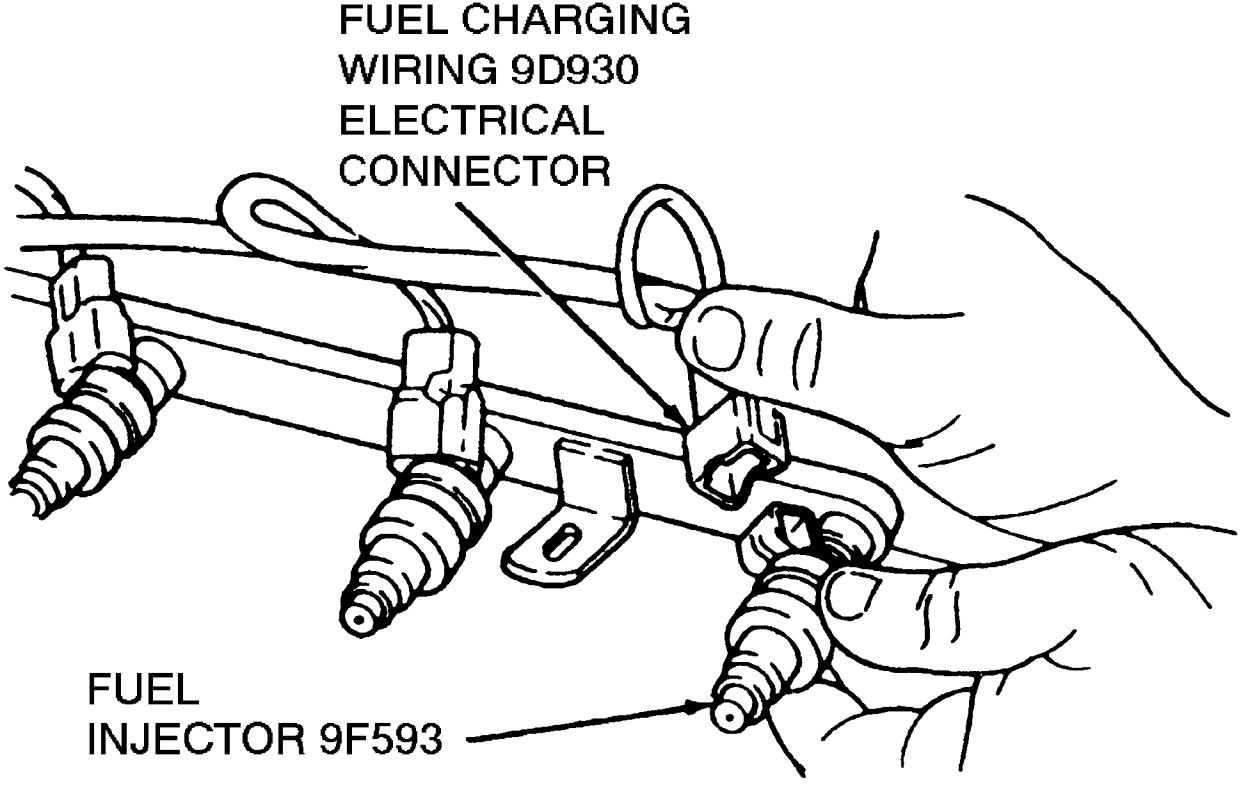

1. Idle air control valve
2. Intake manifold
3. Throttle body gasket
4. Throttle body
5. Bolt (2 required)
6. Nut (2 required)
7. Throttle position sensor

A. Tighten to 16-23 N.m (12-17 lb-ft)

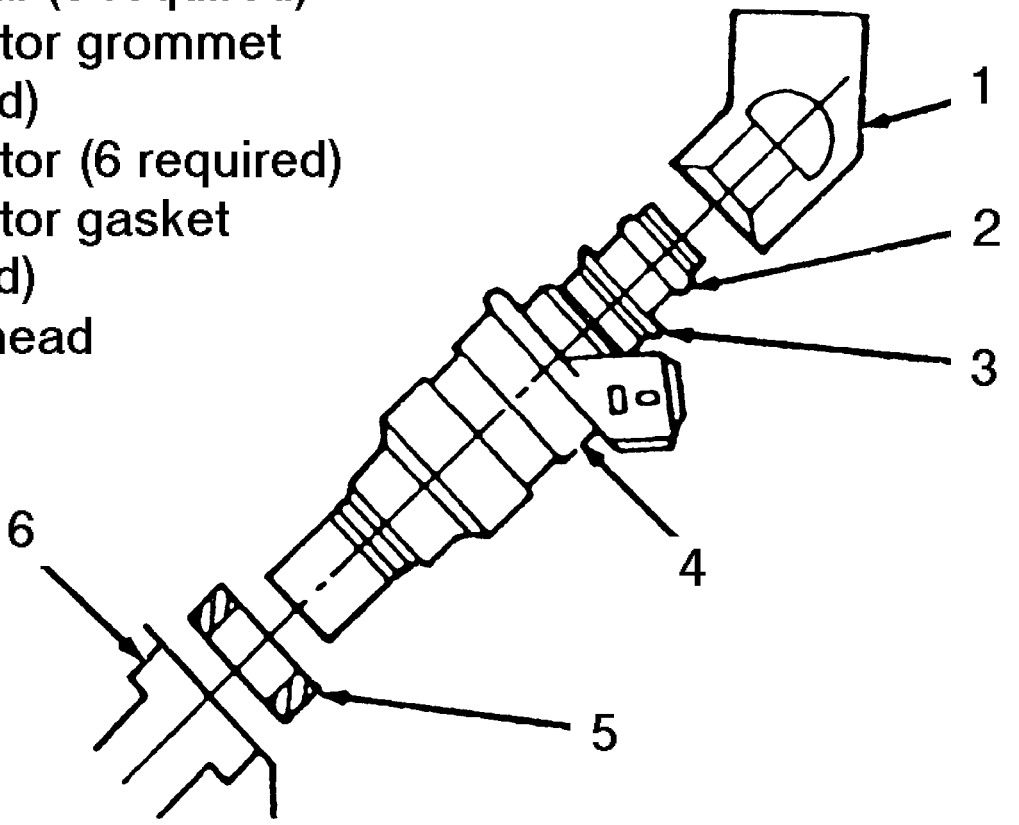


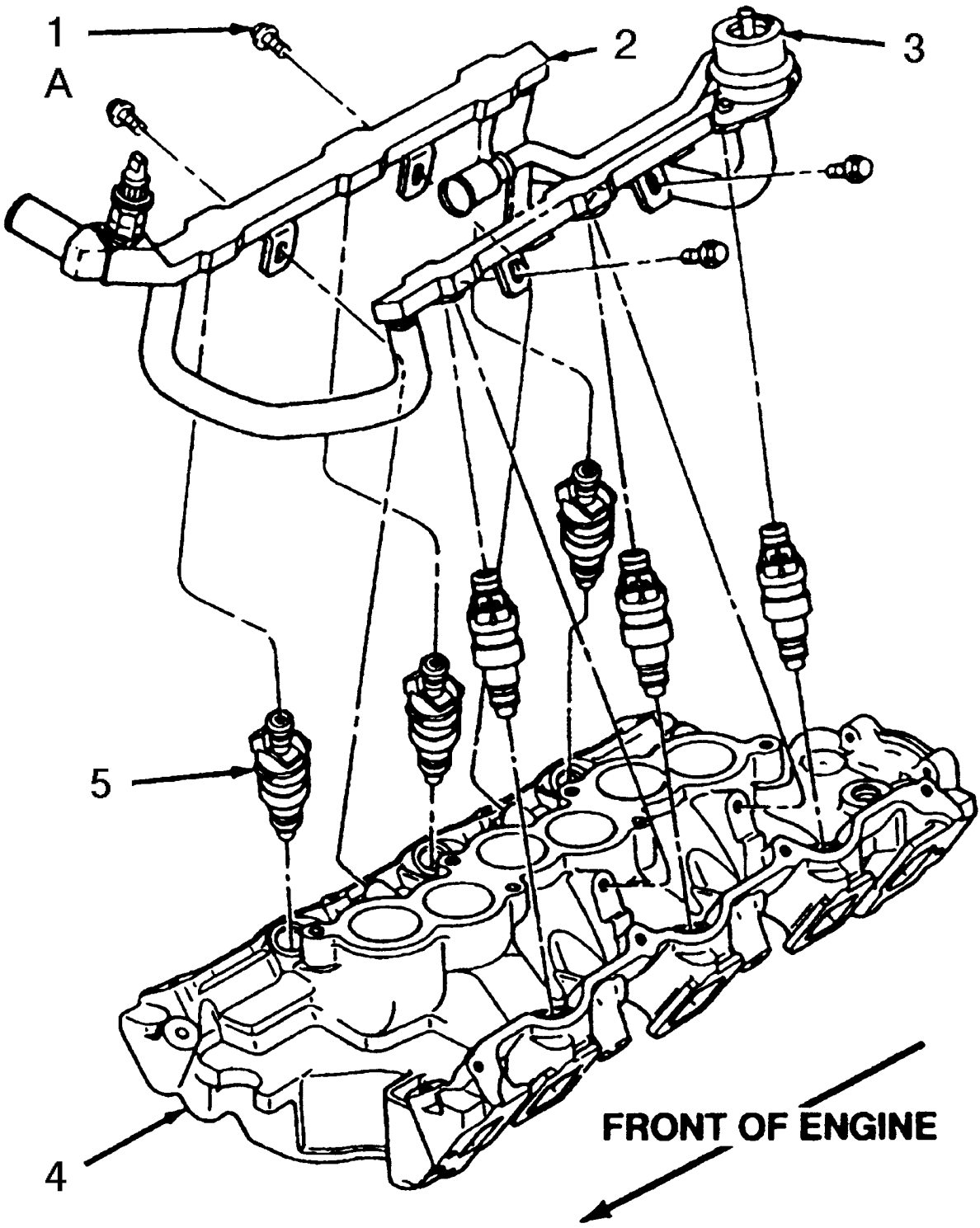

1. Fuel pressure regulator
2. Fuel pressure relief valve cap
3. Fuel pressure relief valve
4. Fuel injection supply manifold
5. Retaining clip (6 required)
6. Fuel injector (6 required)
7. Bolt (4 required)
8. Bolt
9. Intake manifold support
10. Nut
11. Stud bolt (2 required)
12. Bolt (6 required)
13. Upper intake manifold
14. Bolt (3 required)
15. Intake manifold upper gasket
16. Lower intake manifold
17. Nut (4 required)
18. Throttle body
19. EGR valve
20. Throttle body gasket

A. Tighten to 0.6 N.m (5.3 lb-in)
B. Tighten to 7.75 N.m (66 lb-in)
C. Tighten to 8-11 N.m (71-97 lb-in)
D. Tighten to 20-30 N.m (15-22 lb-ft)


FUEL CHARGING
WIRING 9D930
ELECTRICAL
CONNECTOR
FUEL
INJECTOR 9F593

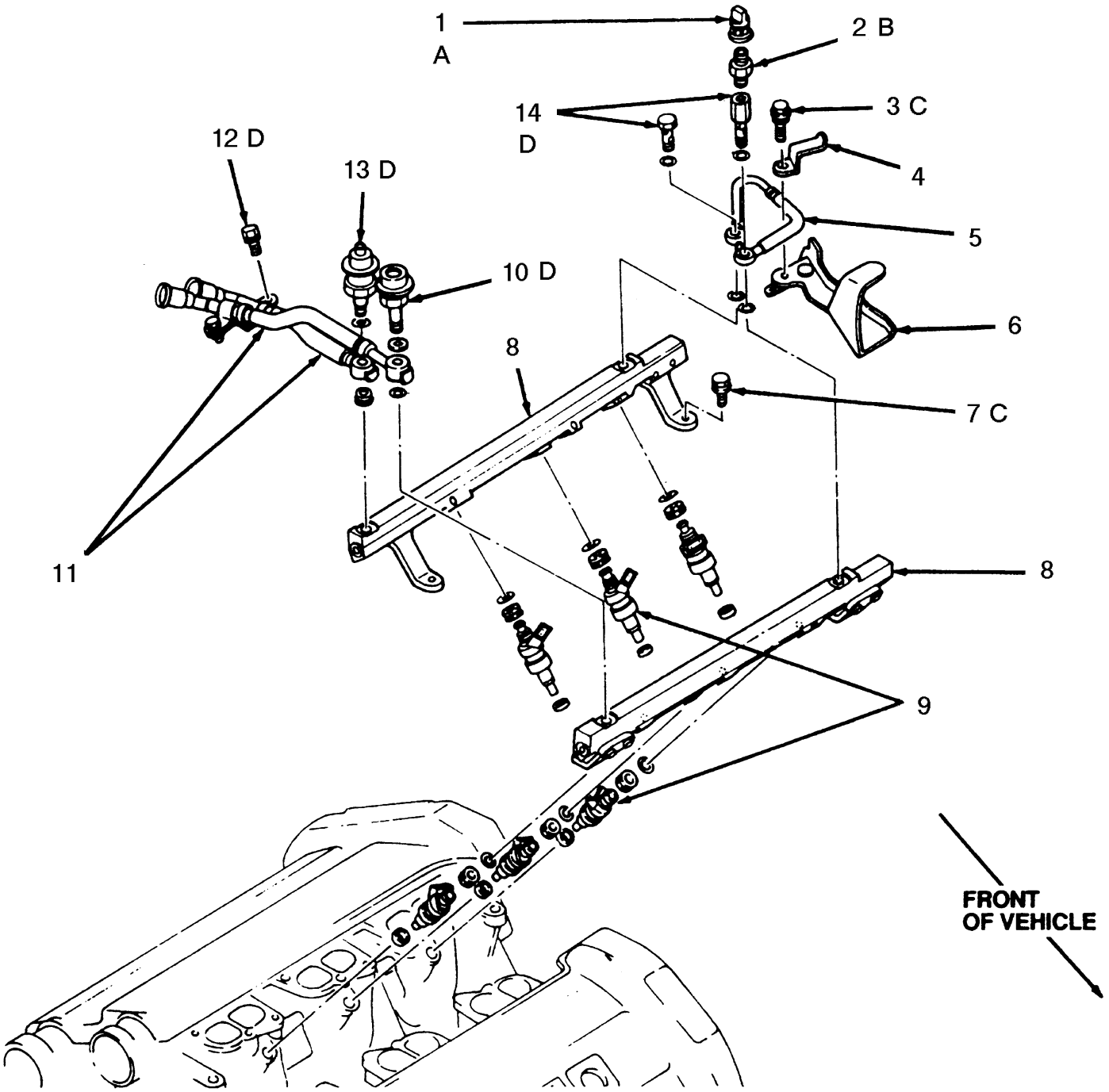
1. Fuel injection supply manifold (2 required)
2. O-ring seal (6 required)
3. Fuel injector grommet (6 required)
4. Fuel injector (6 required)
5. Fuel injector gasket (6 required)
6. Cylinder head





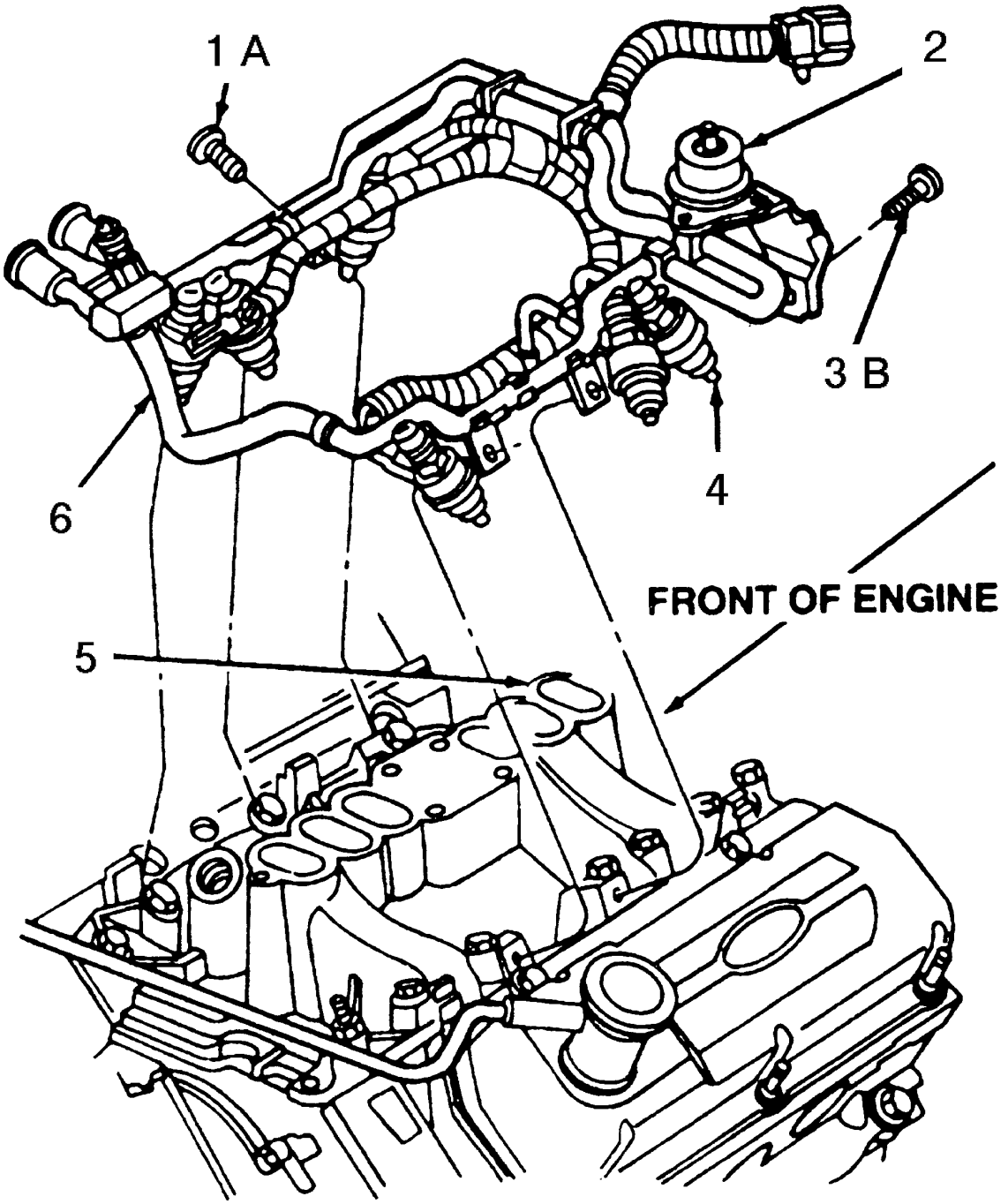

1. Bolt (4 required)
2. Fuel injection supply manifold
3. Fuel pressure regulator
4. Intake manifold
5. Fuel injector (6 required)

A. Tighten to 8-12 N.m (71-106 lb-in)



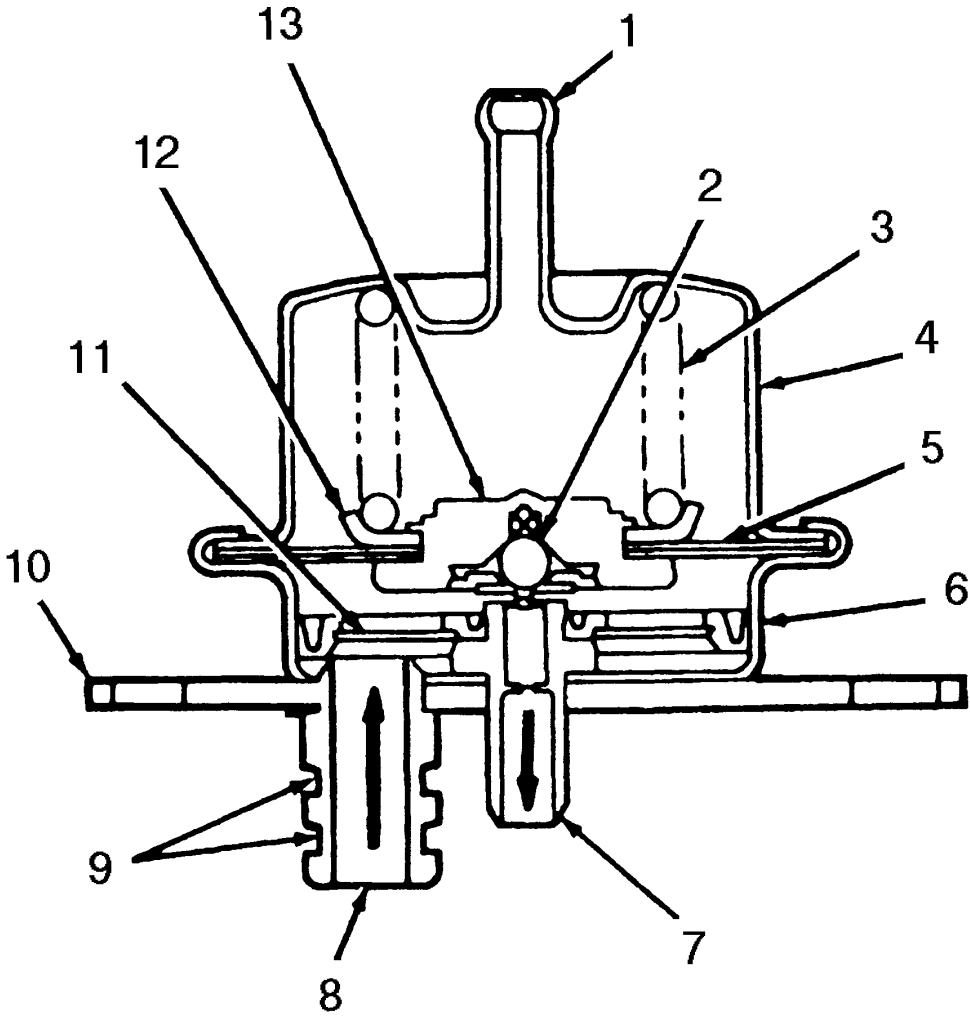

1. Fuel pressure relief valve cap
2. Fuel pressure relief valve
3. Bolt
4. Fuel injector supply manifold bracket
5. Fuel injection supply manifold connector
6. Intake manifold support
7. Bolt (4 required)
8. Fuel injection supply manifold (2 required)
9. Fuel injector (6 required)
10. Fuel injection pulse dampener
11. Fuel supply and return lines
12. Bolt (2 required)
13. Fuel pressure regulator
14. Bolt union (2 required)

A. Tighten to 0.6 N.m (5.3 lb-in)
B. Tighten to 7.75 N.m (69 lb-in)
C. Tighten to 15-23 N.m (11-17 lb-ft)
D. Tighten to 25-34 N.m (18-25 lb-ft)

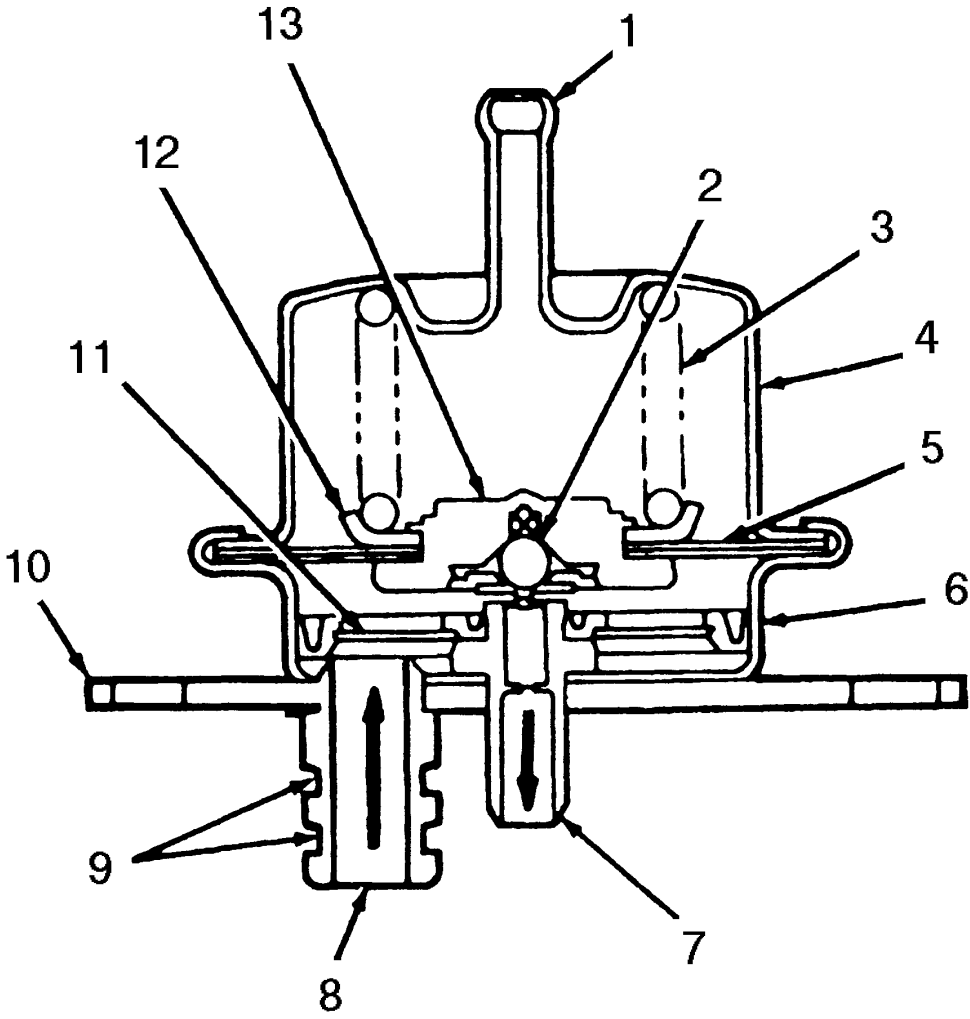



1. Bolt (4 required)
2. Fuel pressure regulator
3. Bolt
4. Fuel injector (6 required)
5. Lower intake manifold
6. Fuel injection supply manifold

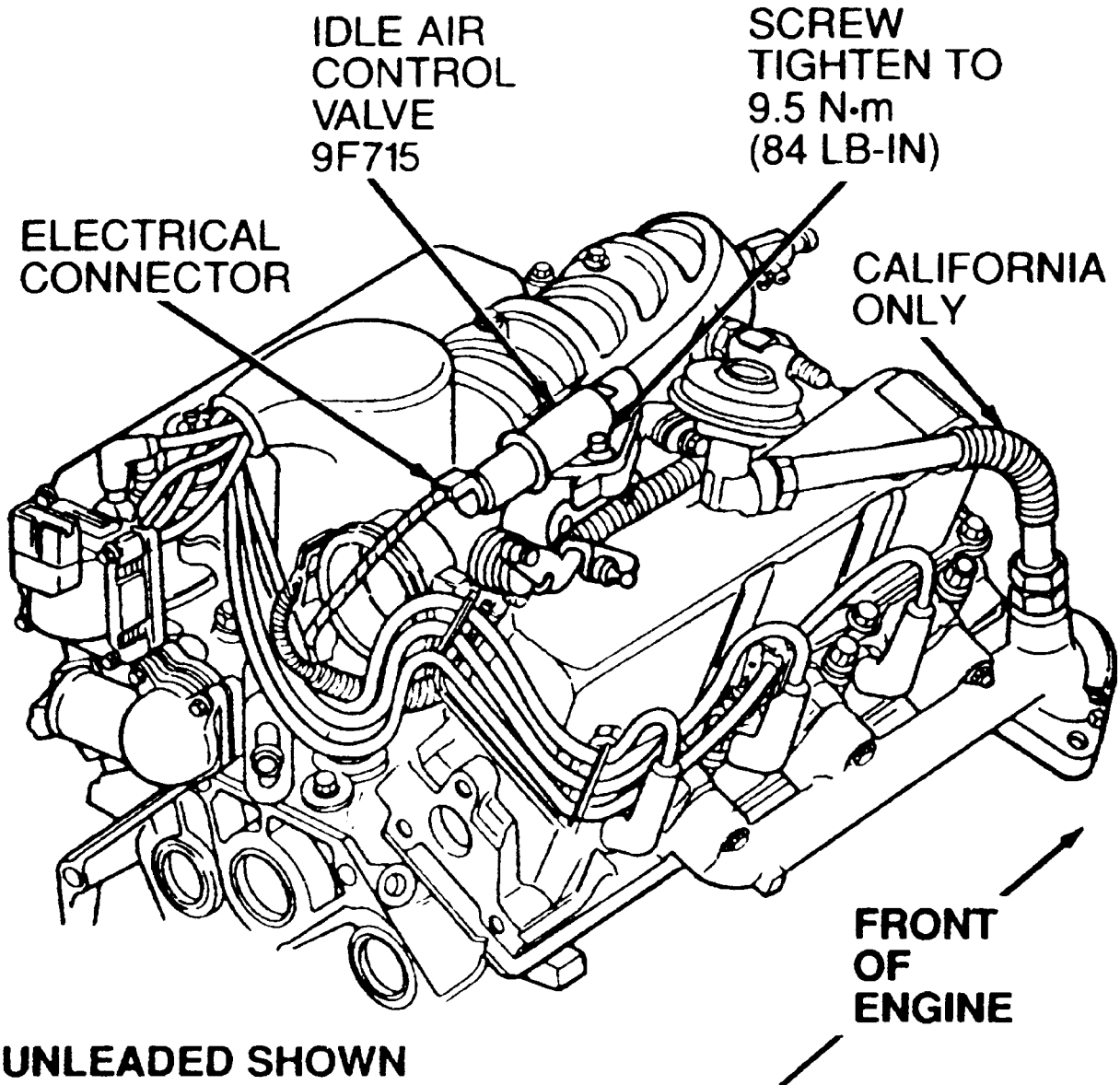
A. Tighten to 8-11 N.m (71-97 lb-in)
B. Tighten to 20-30 N.m (15-22 lb-ft)



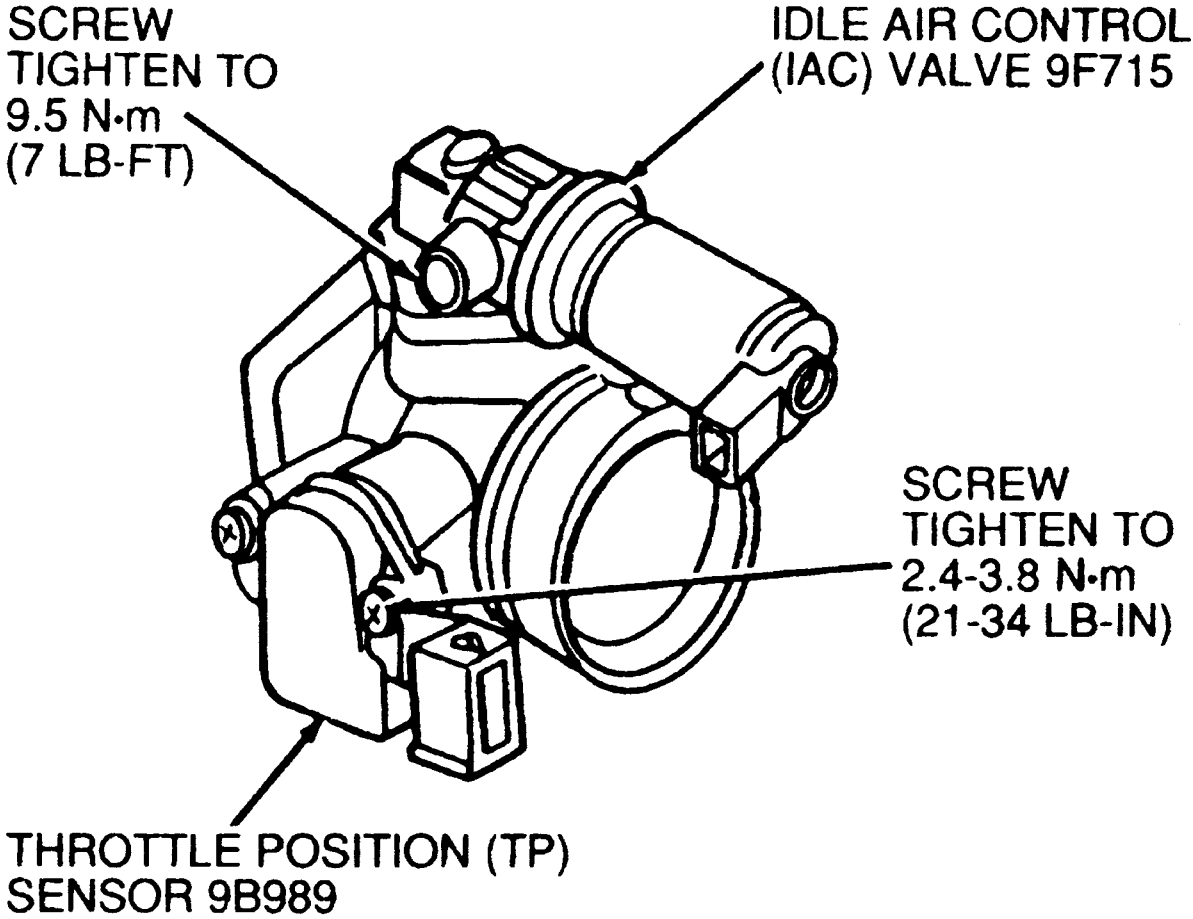

1. Engine vacuum reference tube (part of 9C968)
2. Ball seat (part of 9C968)
3. Spring (part of 9C968)
4. Upper housing (part of 9C968)
5. Diaphragm (part of 9C968)
6. Lower housing (part of 9C968)
7. Fuel outlet (return tube) (part of 9C968)
8. Fuel inlet (supply tube) (part of 9C968)
9. O-ring grooves (part of 9C968)
10. Mounting plate (part of 9C968)
11. Fuel filter screen (part of 9C968)
12. Spring seat (part of 9C968)
13. Valve assembly (part of 9C968)

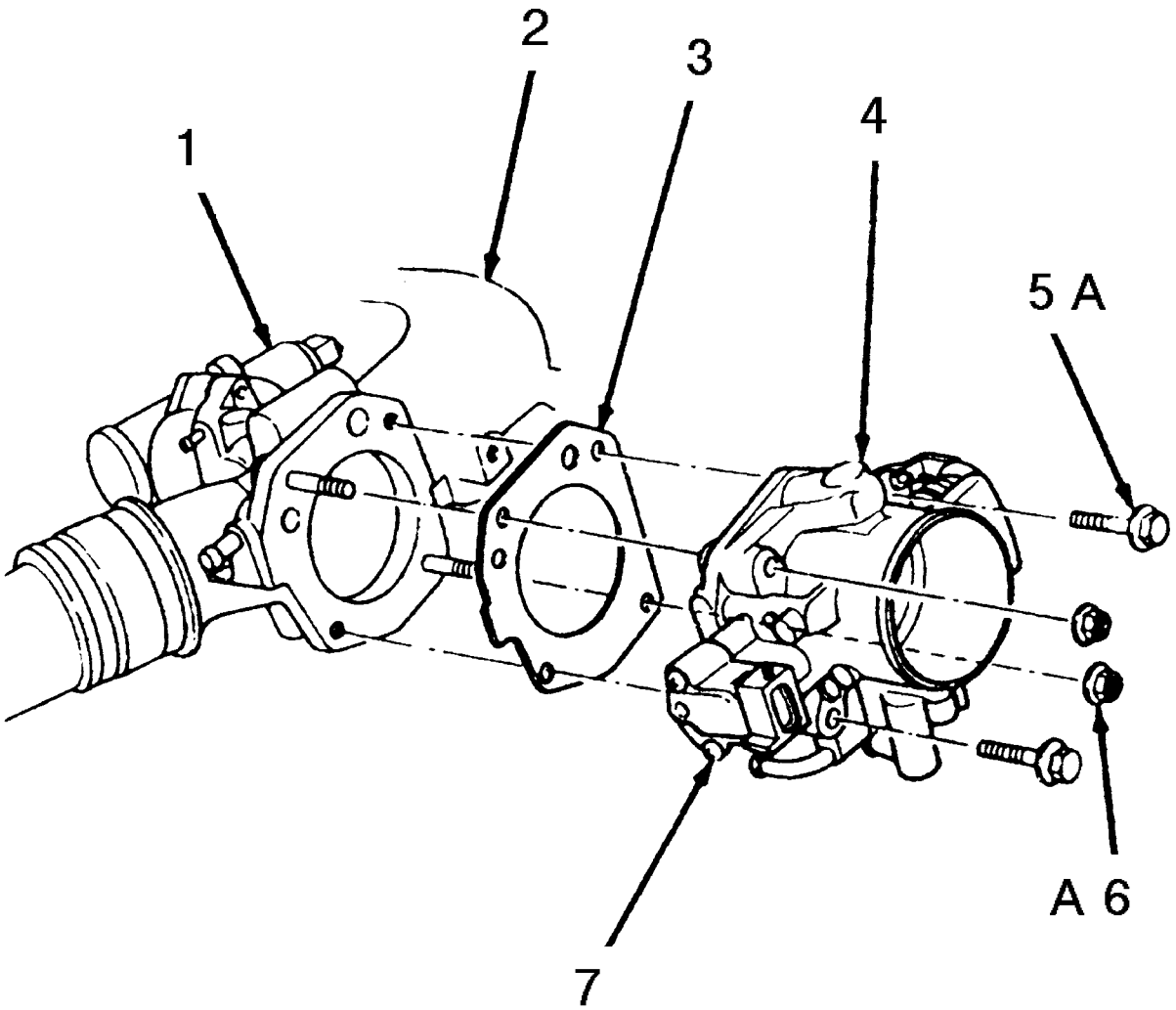



1. Engine vacuum reference tube (part of 9C968)
2. Ball seat (part of 9C968)
3. Spring (part of 9C968)
4. Upper housing (part of 9C968)
5. Diaphragm (part of 9C968)
6. Lower housing (part of 9C968)
7. Fuel outlet (return tube) (part of 9C968)
8. Fuel inlet (supply tube) (part of 9C968)
9. O-ring grooves (part of 9C968)
10. Mounting plate (part of 9C968)
11. Fuel filter screen (part of 9C968)
12. Spring seat (part of 9C968)
13. Valve assembly (part of 9C968)




**UNLEADED SHOWN**
**FF SIMILAR**


SCREW
TIGHTEN TO
9.5 N·m
(7 LB-FT)
IDLE AIR CONTROL
(IAC) VALVE 9F715
SCREW
TIGHTEN TO
2.4-3.8 N·m
(21-34 LB-IN)
THROTTLE POSITION (TP)
SENSOR 9B989



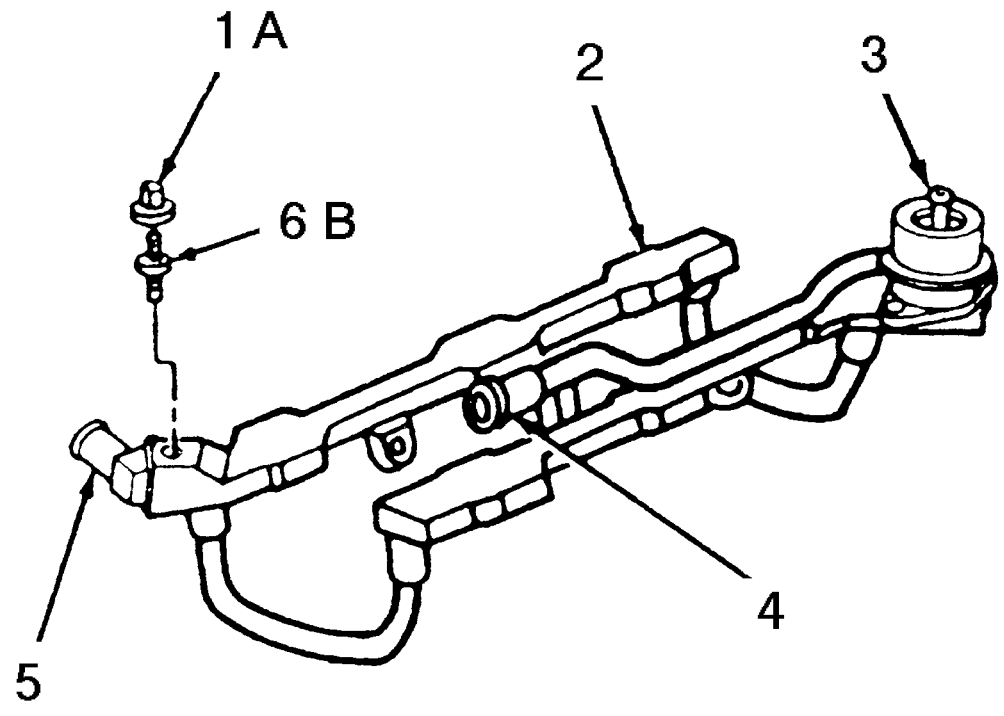

1. Idle air control valve
2. Intake manifold
3. Air charge control to intake manifold gasket
4. Throttle body assembly

5A. Bolt

6A. Nut

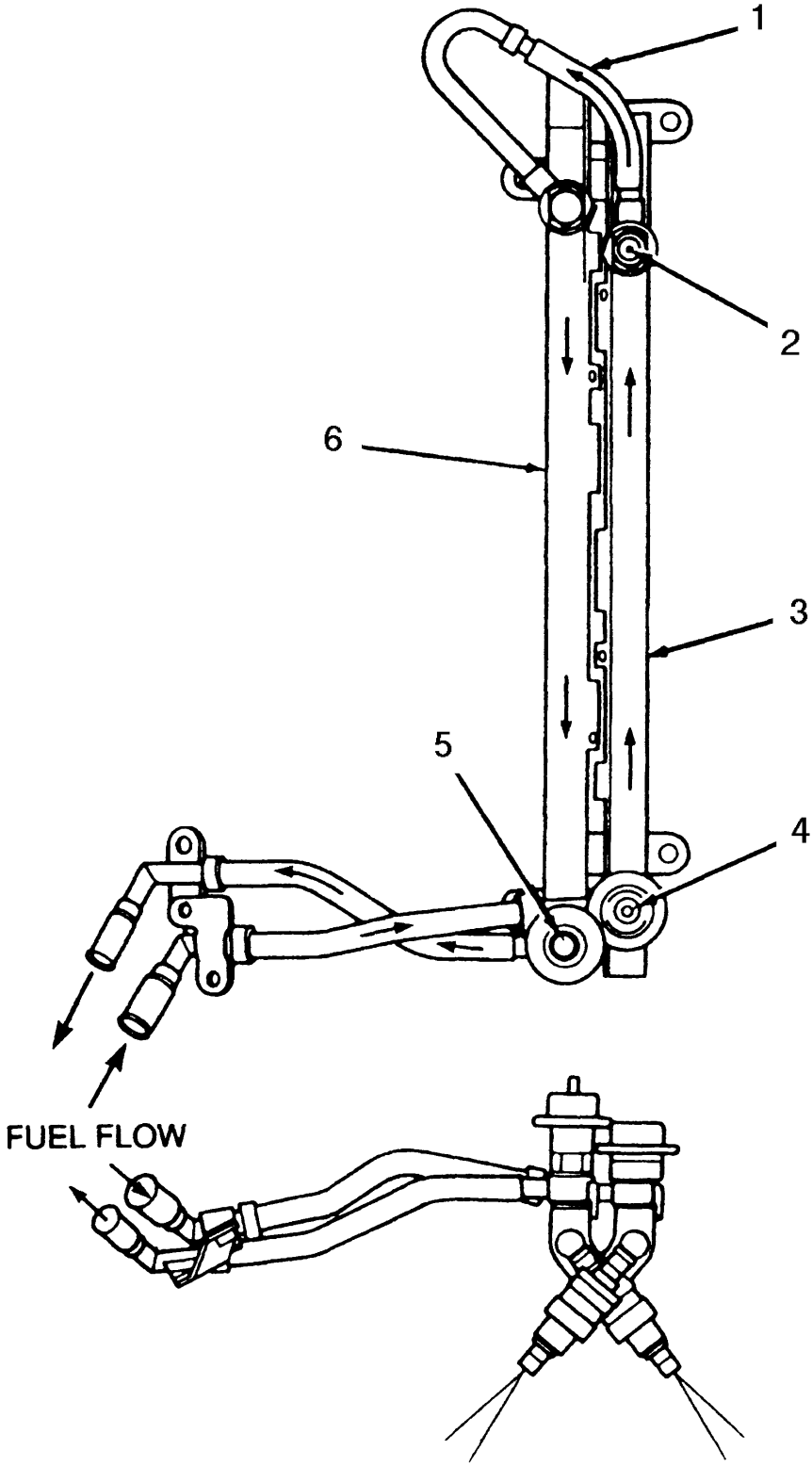
7. Throttle position sensor

A. Tighten to 16-23 N.m (12-17 lb-ft)

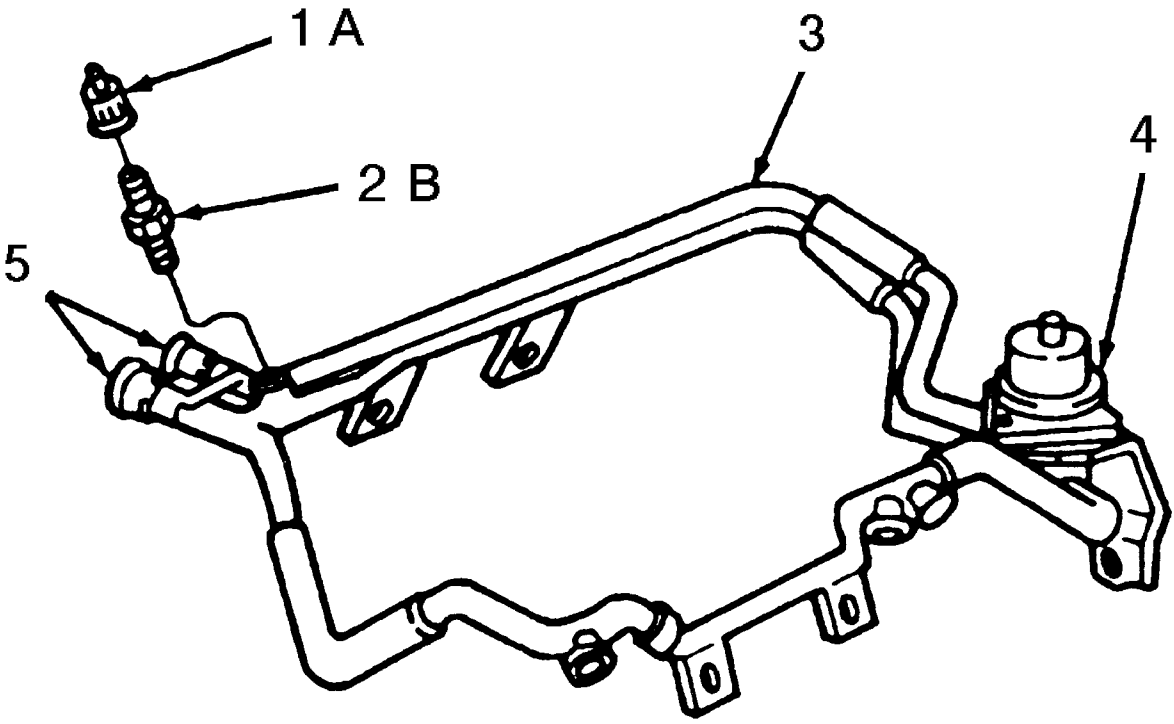



1. Fuel pressure relief valve cap
2. Fuel injection supply manifold
3. Fuel pressure regulator
4. Fuel return connector (part of 9F792)
5. Fuel supply connector (part of 9F792)
6. Fuel pressure relief valve

A. Tighten to 0.6 N.m (5.3 lb-in)
B. Tighten to 7.75 N.m (69 lb-in)



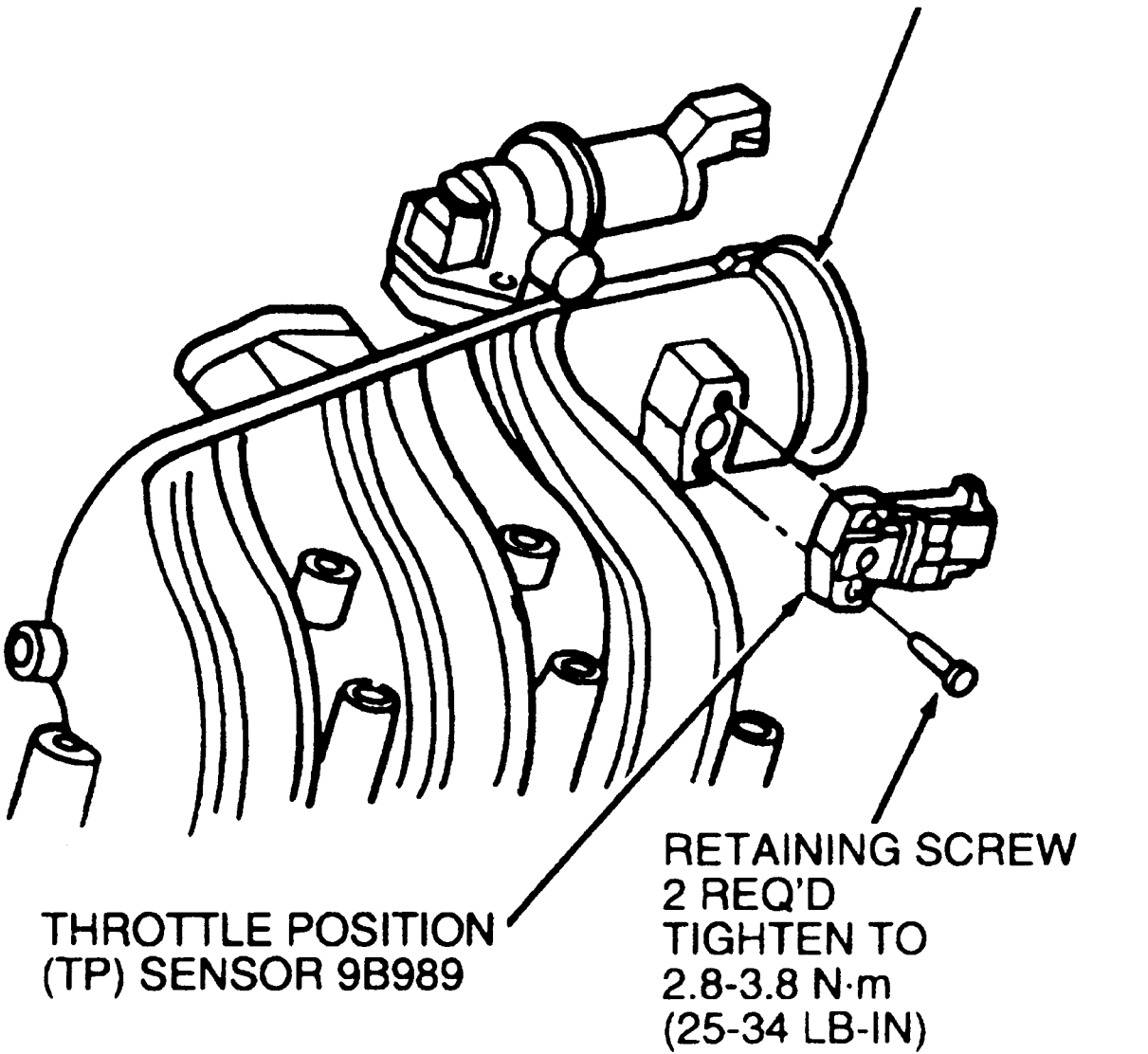

1. Fuel injection supply manifold connector hose
2. Fuel pressure relief valve
3. Fuel injection supply manifold, RH
4. Fuel injection pulse dampener, RH
5. Fuel pressure regulator
6. Fuel injection supply manifold, LH

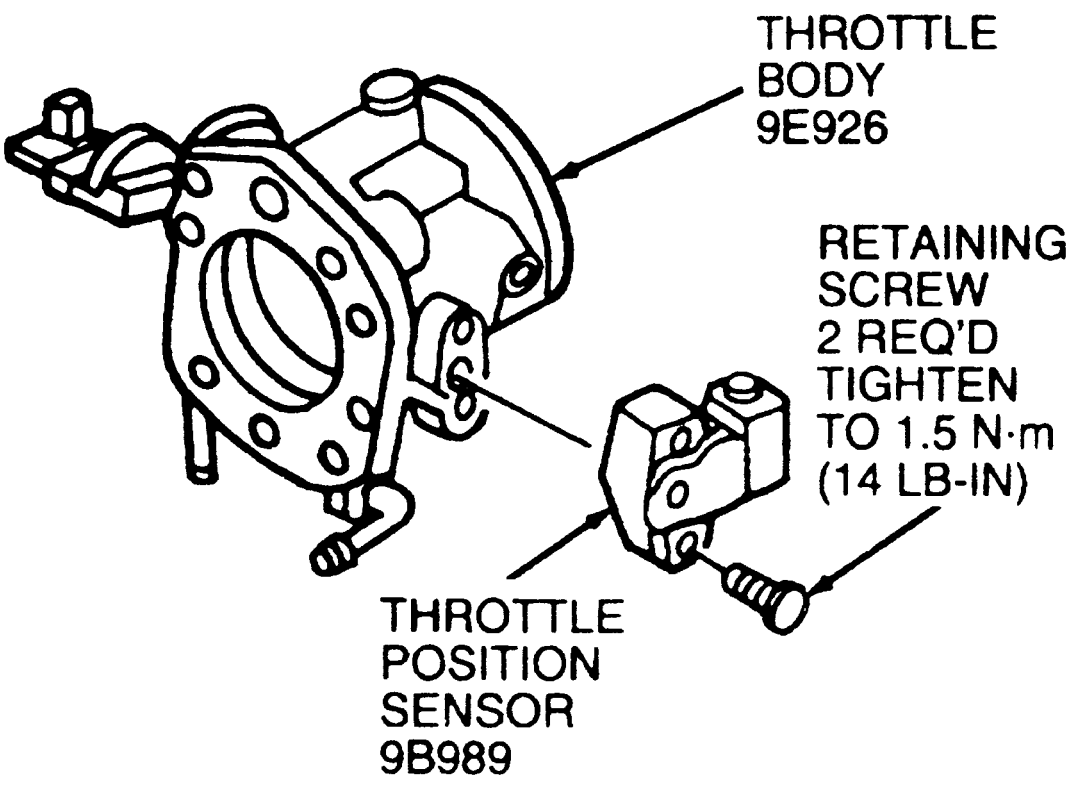


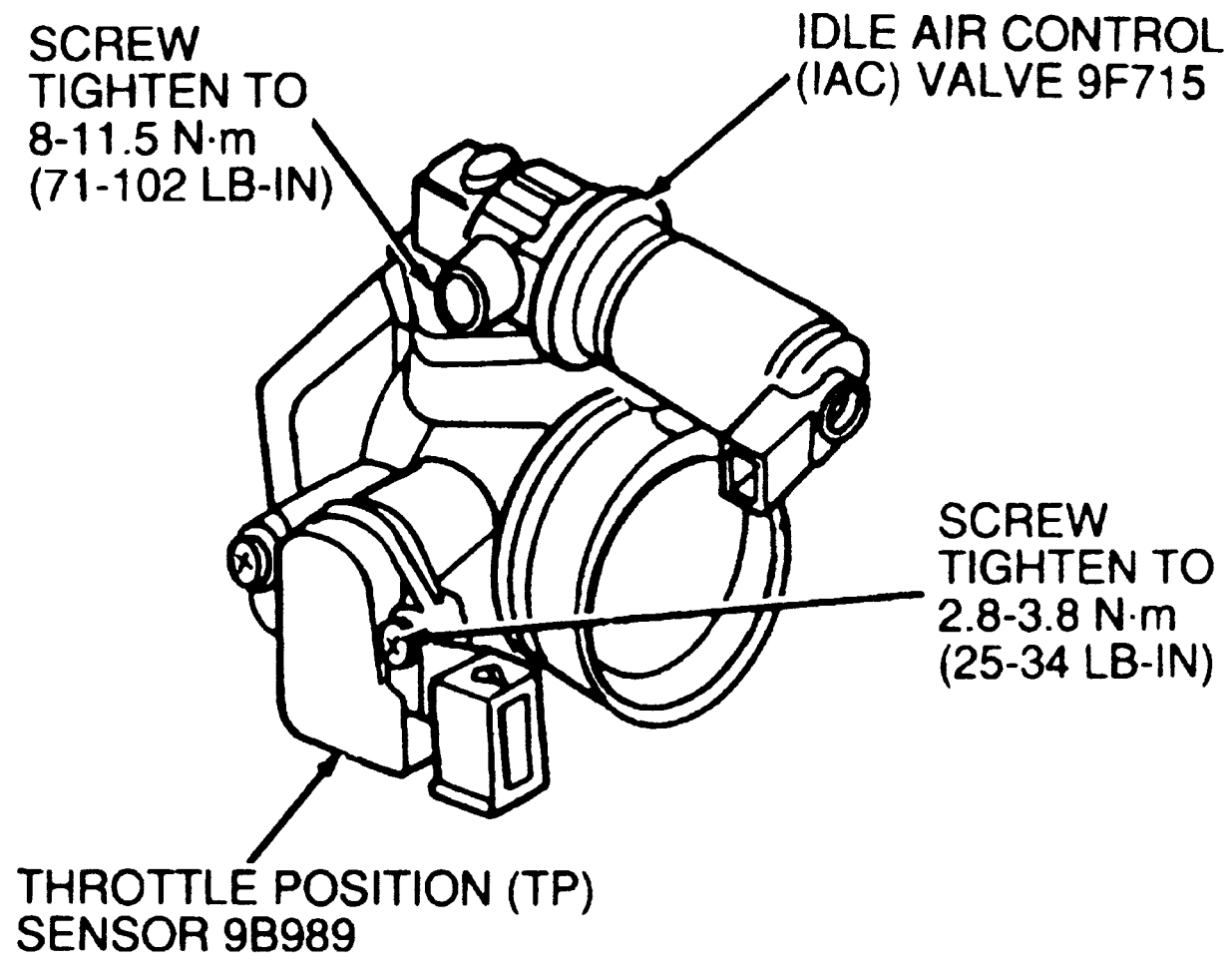

1. Fuel pressure relief valve cap
2. Fuel pressure relief valve
3. Fuel injection supply manifold
4. Fuel pressure regulator
5. Fuel supply and return connectors (part of 9F792)

A. Tighten to 0.6 N.m (5.3 lb-in)
B. Tighten to 7.75 N.m (69 lb-in)

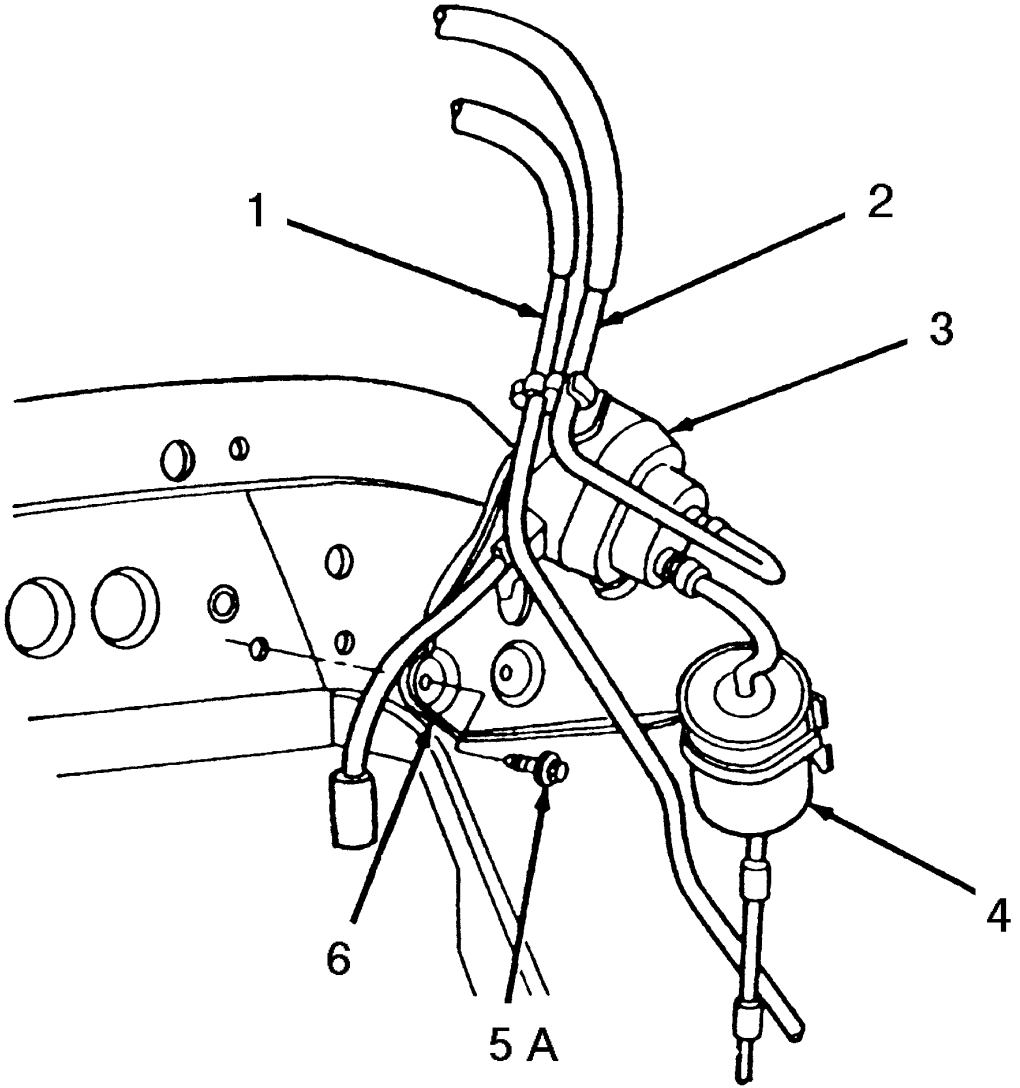
**UNLEADED GASOLINE SHOWN**
**FF SIMILAR**




THROTTLE
BODY
9E926
RETAINING
SCREW
2 REQ'D
TIGHTEN
TO 1.5 N·m
(14 LB-IN)
THROTTLE
POSITION
SENSOR
9B989


SCREW
TIGHTEN TO
8-11.5 N·m
(71-102 LB-IN)
IDLE AIR CONTROL
(IAC) VALVE 9F715
SCREW
TIGHTEN TO
2.8-3.8 N·m
(25-34 LB-IN)
THROTTLE POSITION (TP)
SENSOR 9B989

1. Fuel and vapor return tube
2. Fuel supply line
3. Flexible fuel sensor
4. Fuel mixer
5. Screw (2 required)
6. Flexible fuel sensor bracket
A. Tighten to 8-11 N.m (70-97 lb-in)



# TORQUE SPECIFICATIONS

| Component | | US | Metric |
|---|---|---|---|
| Flexible Fuel (FF) Sensor | | | |
| 3.0L Flexible Fuel (FF) Engines only | | 27-34 inch lbs. | 3-4 Nm |
| Fuel Injection Supply Manifold | | | |
| SFI | | | |
| | 3.0L (except SHO) | 6-9 ft. lbs. | 8-12 Nm |
| | 3.0L/3.2L SHO | 11-17 ft. lbs. | 15-23 Nm |
| | 3.8L | 6-8 ft. lbs. | 8-11 Nm |
| Fuel Pressure Regulator | | | |
| CFI | | 27-35 inch lbs. | 3.1-3.9 Nm |
| EFI | | 34 inch lbs. | 3.8 Nm |
| SFI | | | |
| | 3.0L (except SHO) and 3.8L | 34 inch lbs. | 3.8 Nm |
| | 3.0L/3.2L SHO | 18-25 ft. lbs. | 25-34 Nm |
| Fuel Pressure Relief Valve | | | |
| CFI | | 4-6 inch lbs. | 0.5-0.7 Nm |
| EFI | | | |
| | Valve | 66 inch lbs. | 7.4 Nm |
| | Cap | 5.5 inch lbs. | 0.6 Nm |
| SFI | | | |
| | Valve | 69 inch lbs. | 7.75 Nm |
| | Cap | 5.5 inch lbs. | 0.6 Nm |
| Fuel Rail Assembly | | | |
| EFI | | | |
| | 2.5L | 15-22 ft. lbs. | 20-30 Nm |
| | 3.0L (except SHO) and 3.8L | 7 ft. lbs. | 10 Nm |
| Fuel Tank | | | |
| Strap Retaining Bolts | | 22-30 ft. lbs. | 29-41 Nm |
| Hose Pipe Clamps | | 24-32 inch lbs. | 2.7-3.7 Nm |
| Idle Air Bypass Valve | | 84 inch lbs. | 9.5 Nm |
| Idle Air Control Valve | | | |
| 3.0L (except SHO) and 3.8L | | 84 inch lbs. | 9.5 Nm |
| 3.0L/3.2L SHO | | 63-97 inch lbs. | 7-11 Nm |
| Injector | | | |
| CFI | | 18-22 inch lbs. | 2.0-2.5 Nm |
| Throttle Body | | | |
| CFI | | | |
| | 2.5L | 15-25 ft. lbs. | 20-34 Nm |
| EFI | | | |
| | 2.5L | 12-15 ft. lbs. | 16-20 Nm |
| | 3.0L (except SHO) | 15-22 ft. lbs. | 20-30 Nm |

# TORQUE SPECIFICATIONS

| Component | | | US | Metric |
|---|---|---|---|---|
| Throttle Body (cont.) | | | | |
| | EFI | | | |
| | | 3.8L | | |
| | | | Step 1 | 8 ft. lbs. | 10 Nm |
| | | | Step 2 | 15 ft. lbs. | 20 Nm |
| | | | Step 3 | 24 ft. lbs. | 32 Nm |
| | SFI | | | |
| | | 3.0L (except SHO) | 15-22 ft. lbs. | 20-30 Nm |
| | | 3.0L/3.2L SHO | 12-17 ft. lbs. | 16-23 Nm |
| | | 3.8L | 15-22 ft. lbs. | 20-30 Nm |
| Throttle Position (TP) Sensor | | | | |
| | CFI | | 11-16 inch lbs. | 1.2-1.8 Nm |
| | EFI | | 14 inch lbs. | 1.5 Nm |
| Throttle Position (TP) Sensor | | | | |
| | SFI | | | |
| | | 3.0L (except SHO) and 3.8L | 25-34 inch lbs. | 2.8-3.8 Nm |
| | | 3.0L/3.2L SHO | 14 inch lbs. | 1.5 Nm |