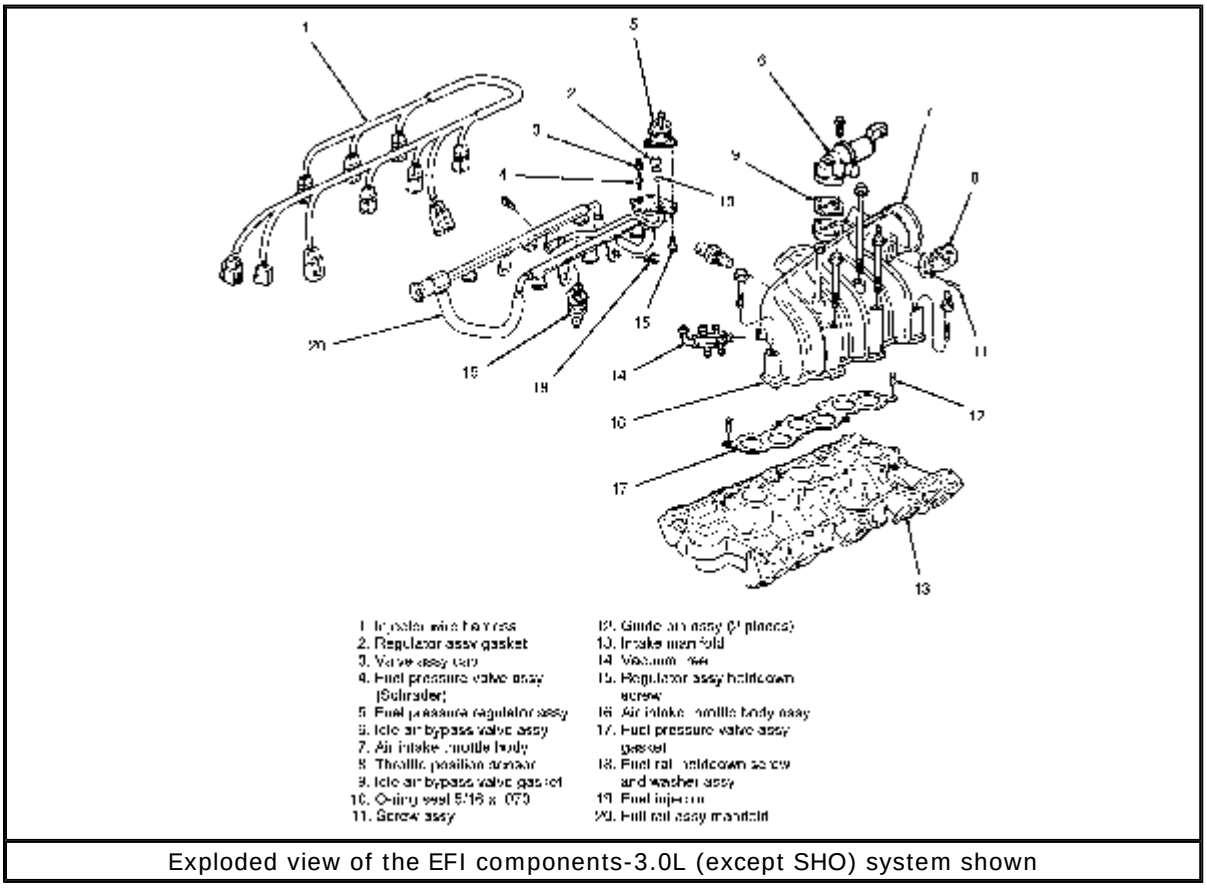
ELECTRONIC FUEL INJECTION (EFI)

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

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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

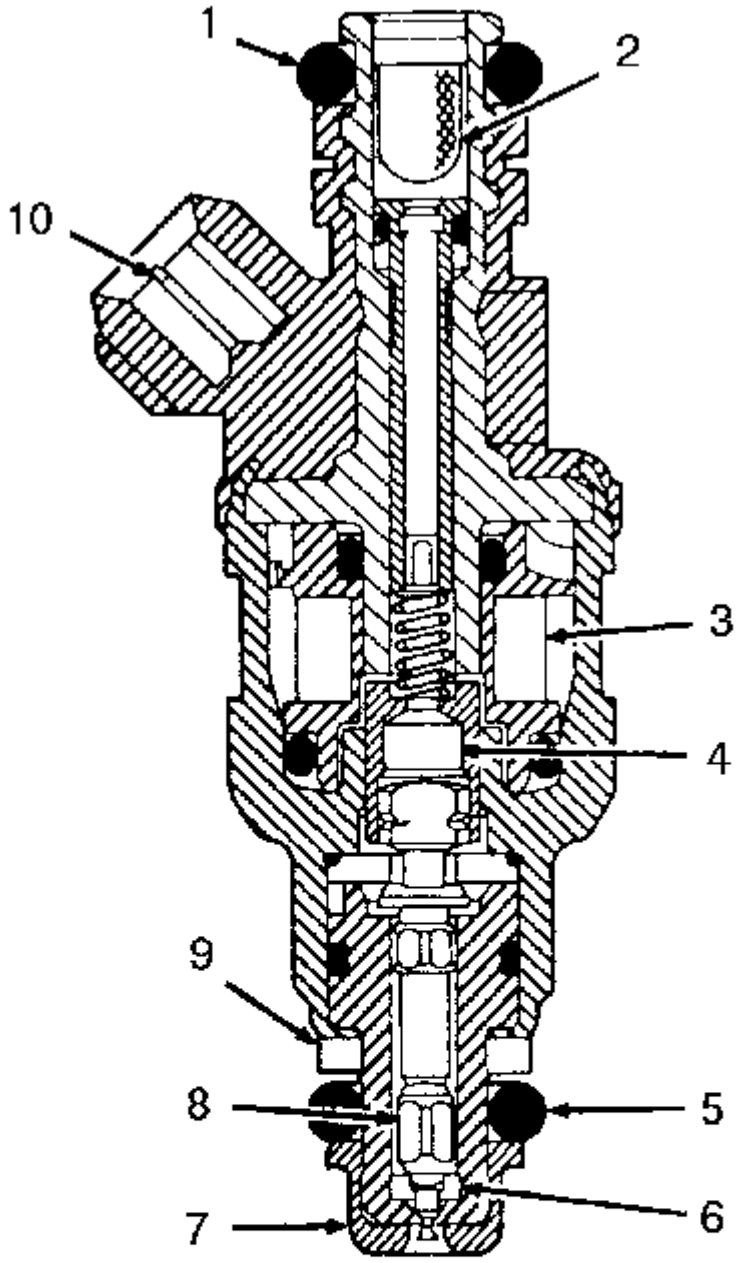
diaphragm. Control of the fuel system is maintained through the Electronic Engine Control (EEC) power relay and the EEC-IV control unit, although electrical power is routed through the fuel pump relay and an inertia switch. The fuel pump relay is normally located on a bracket somewhere above the Electronic 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.

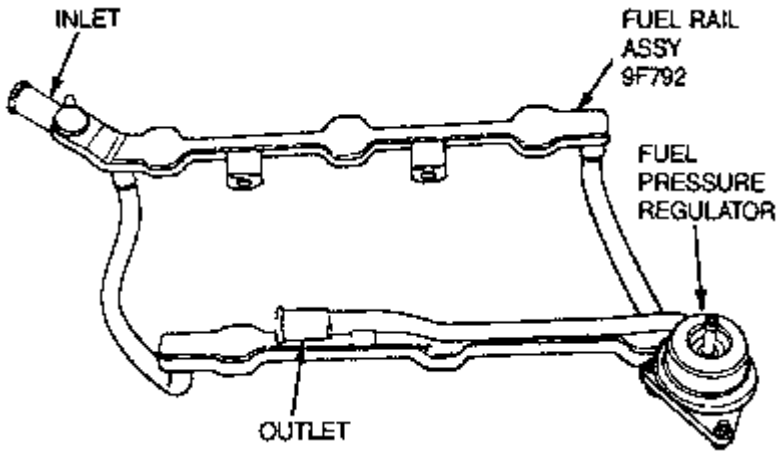
The injectors receive high pressure fuel from the fuel manifold (fuel rail) assembly. The complete assembly includes a single, preformed tube with six injector connectors, a mounting flange for the fuel pressure regulator, mounting attachments which locate the fuel manifold assembly and provide fuel 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

Click to enlarge



Fuel supply manifold assembly

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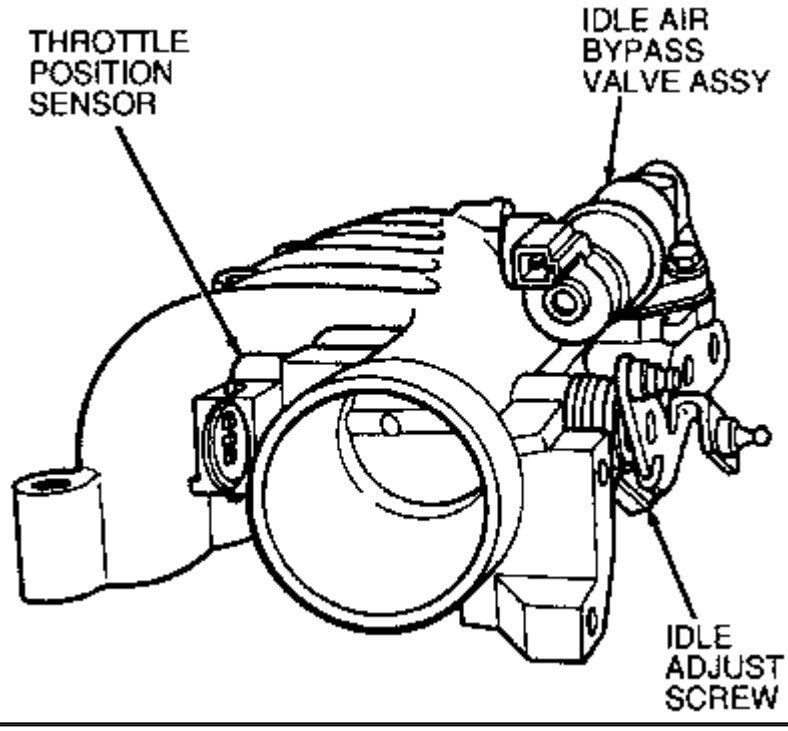
The fuel manifold is normally removed with fuel injectors and pressure regulator attached. Fuel injector electrical connectors are plastic and have locking tabs that must be released when disconnecting the wiring harness.

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

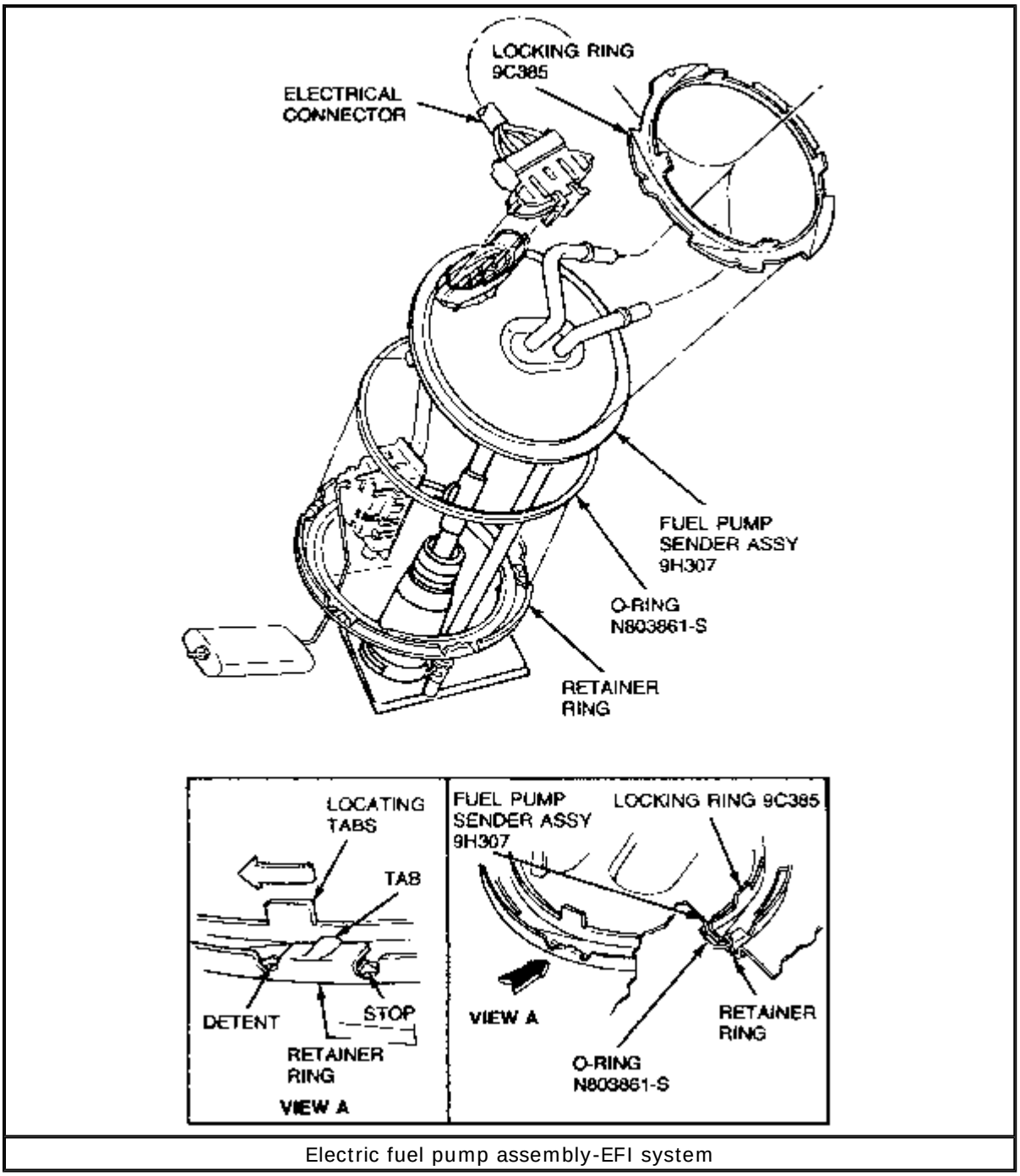
1. **Remove the fuel tank cap.**
2. **Remove the cap from the pressure relief Schrader valve on the fuel rail.**
3. **Attach pressure gauge tool T80L-9974-A or equivalent, to the fuel pressure relief valve.**
4. **Release the pressure from the system into a suitable container.**
5. **Remove the pressure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

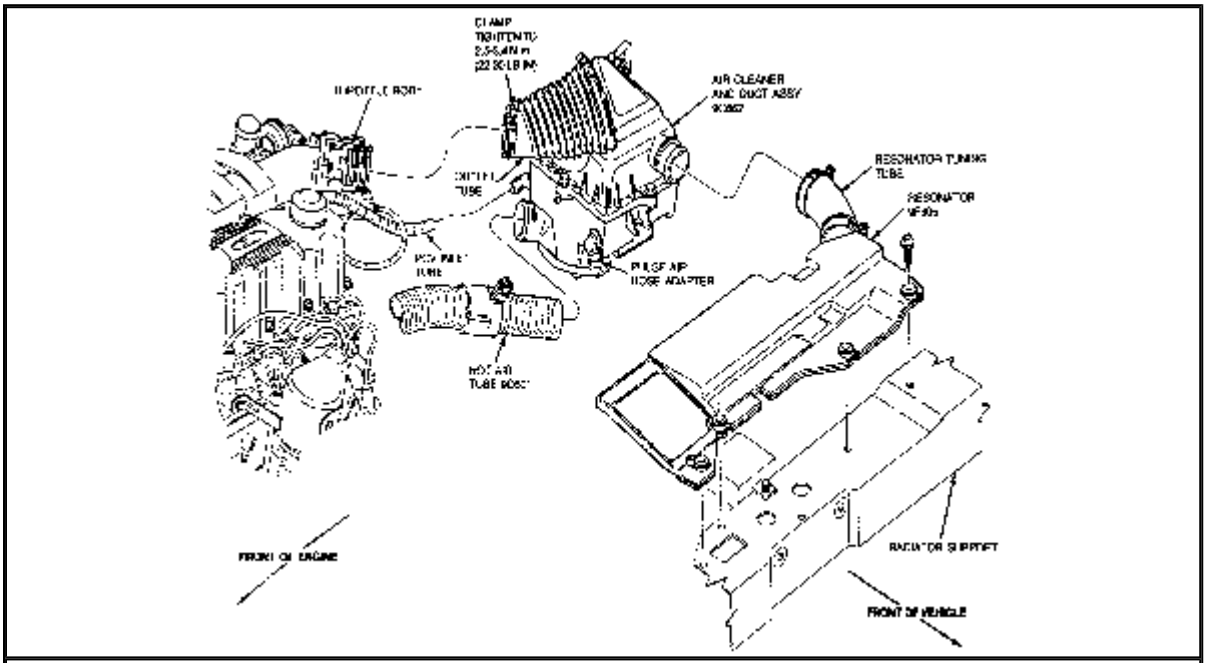
REMOVAL & INSTALLATION

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

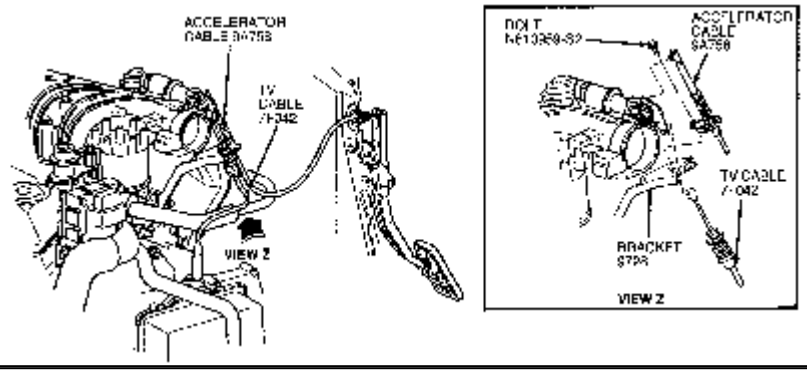
To install:

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

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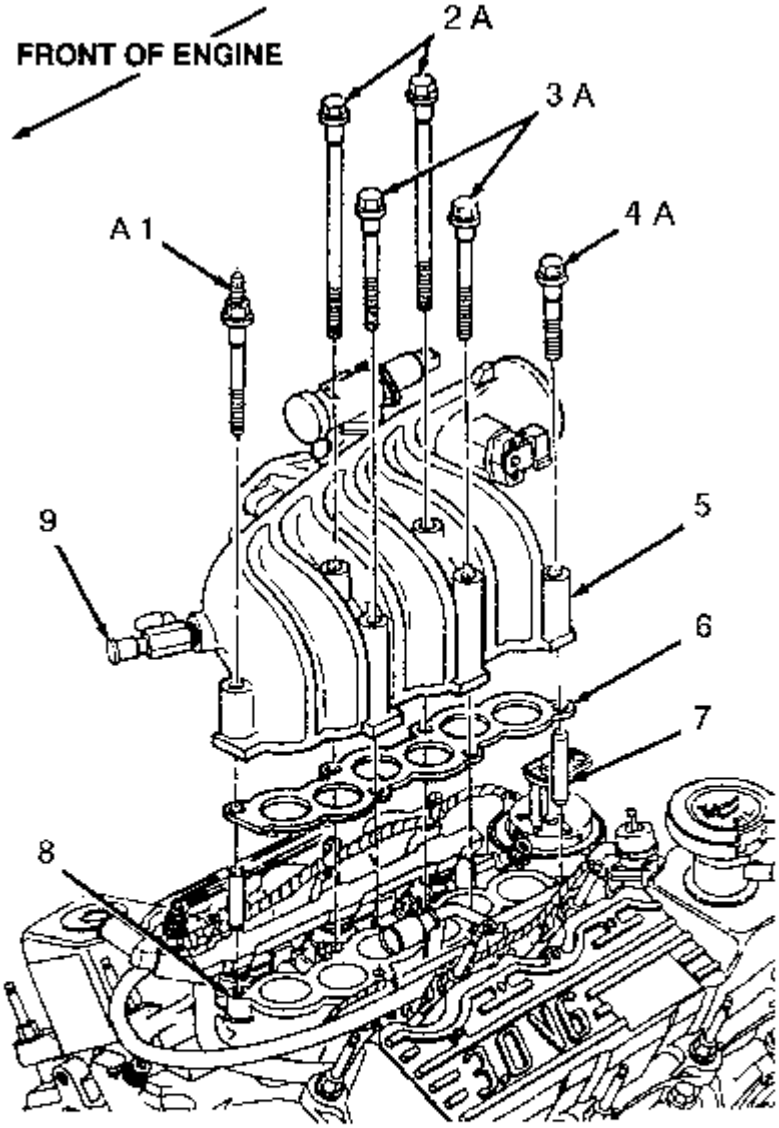
5. **Matchmark and disconnect the vacuum hoses at the vacuum tree.**
6. **If equipped, loosen the EGR tube nuts at the EGR valve and exhaust manifold fitting. Remove the tube or rotate it out of the way.**
7. **Disengage the Air Charge Temperature (ACT), Idle Speed Control (ISC) and Throttle Position (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**

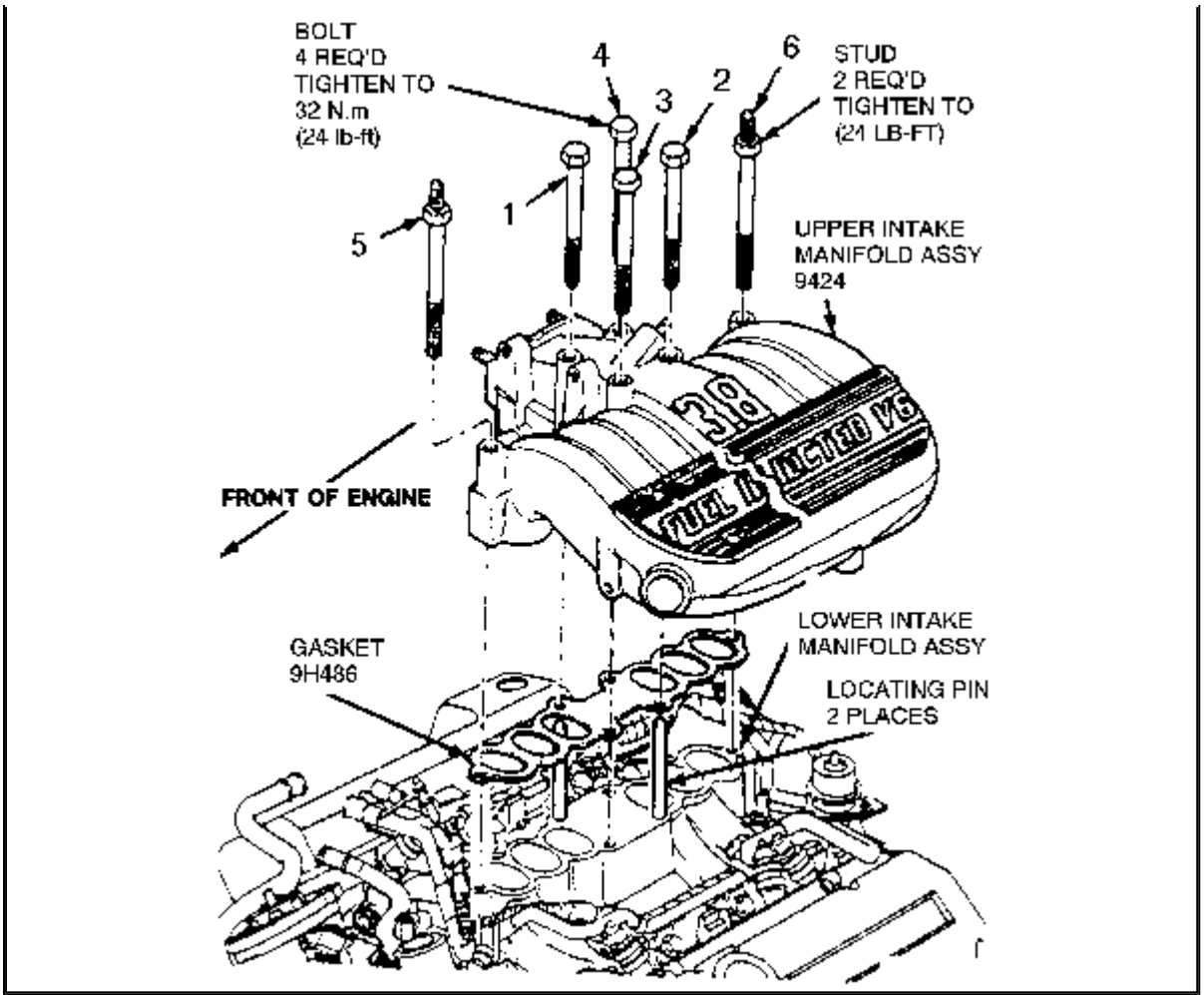
body primary lever (the lever to which the TV-driving nail is attached) by hand to the wide-open-throttle position. The white adjuster shank must be seen to advance. If not, look for the cable sheath/foam hang-up on engine/body components. Attach the TV cable in the top position of the right intake manifold 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

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To install:

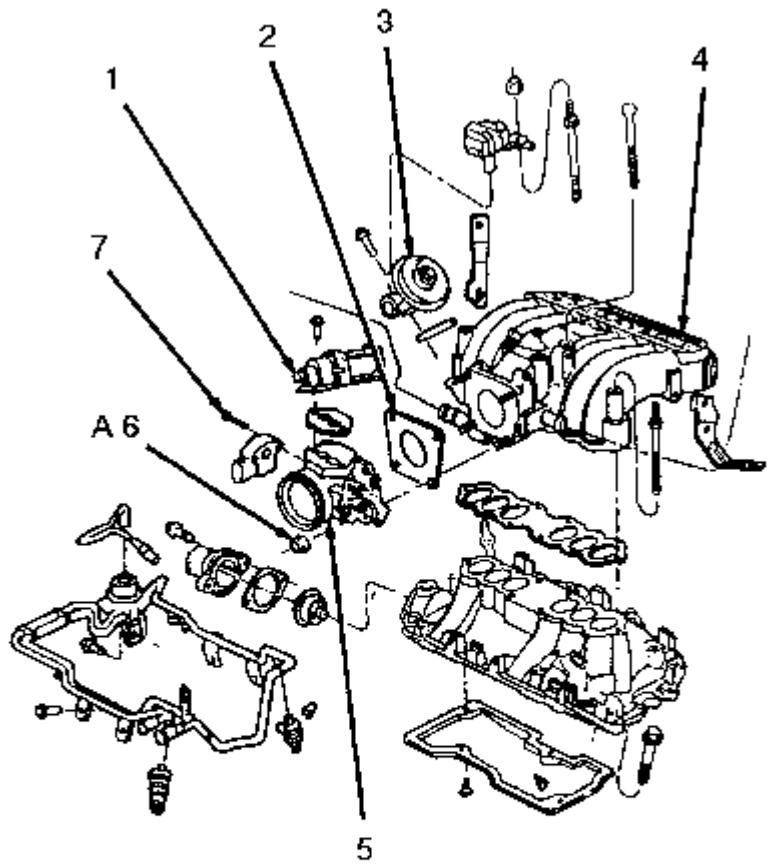
13. **Clean and inspect the mating surfaces of the lower and upper intake manifold.**
14. **Position a new gasket on the lower intake manifold mounting surface. Using alignment studs will make the job easier.**
15. **Install the upper intake manifold and throttle body assembly to the lower intake manifold. 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:

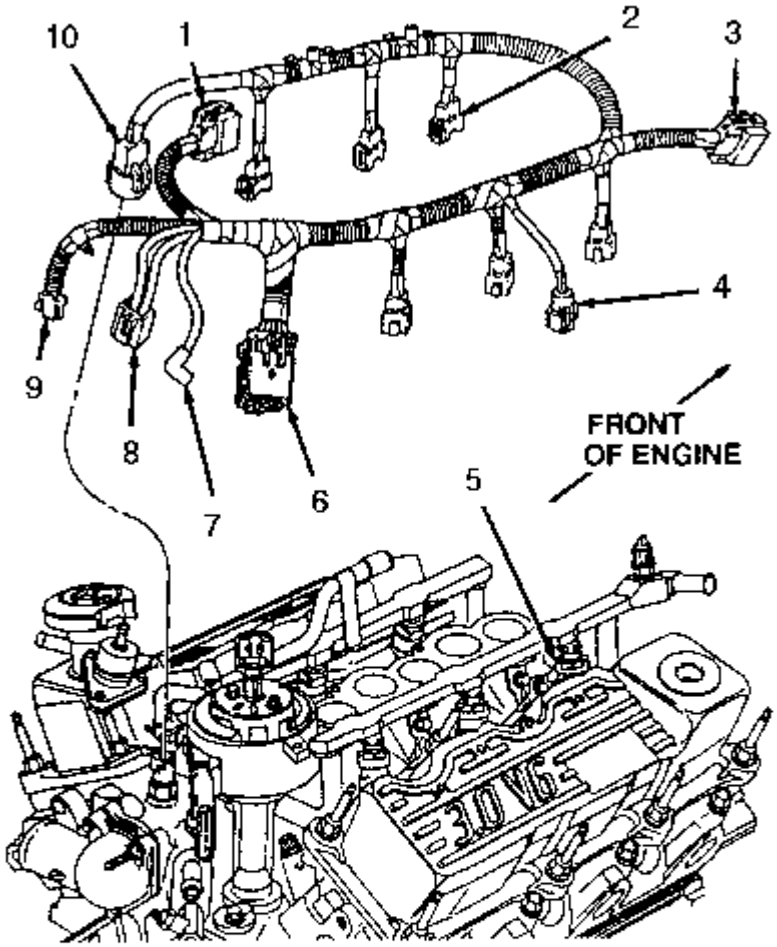
11. Clean and inspect the mounting surfaces of the upper and lower intake manifolds. Be careful not to damage the mounting surfaces.
12. Install the new gasket and upper intake into position using the alignment studs. If alignment studs are not used, make sure the gasket stays in place.
13. Install the 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:

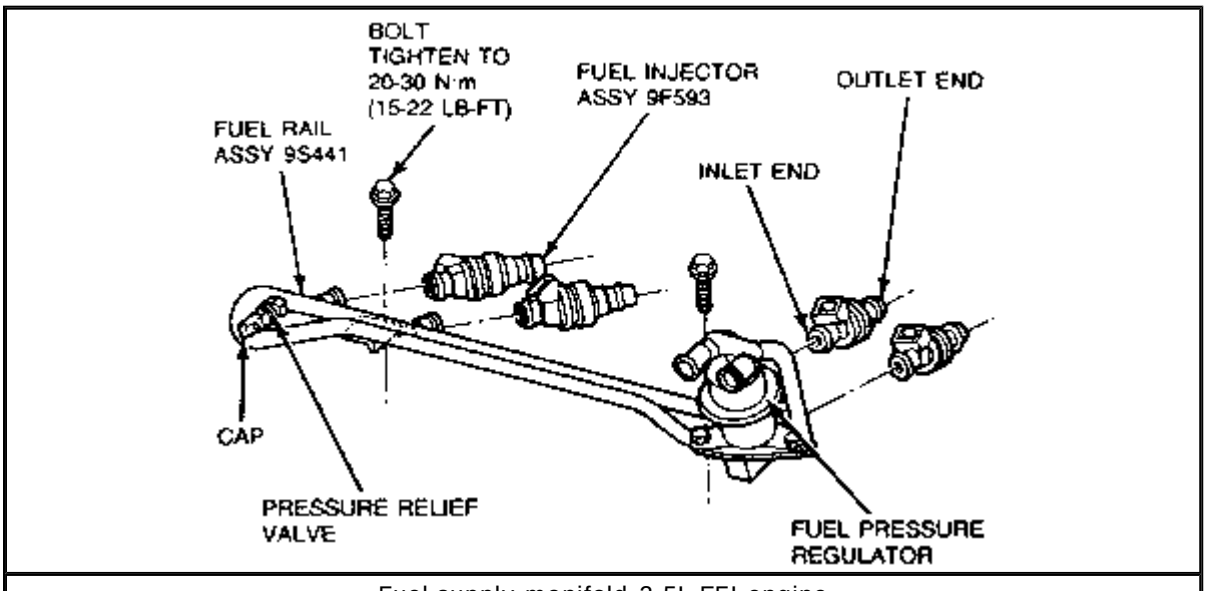
7. Position the wiring harness alongside the fuel injectors.
8. Snap the electrical connectors into position on the injectors.
9. Install the throttle body. For details, please refer to the procedure earlier in this section.
10. Make sure that all of the electrical connectors are firmly in place.
11.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

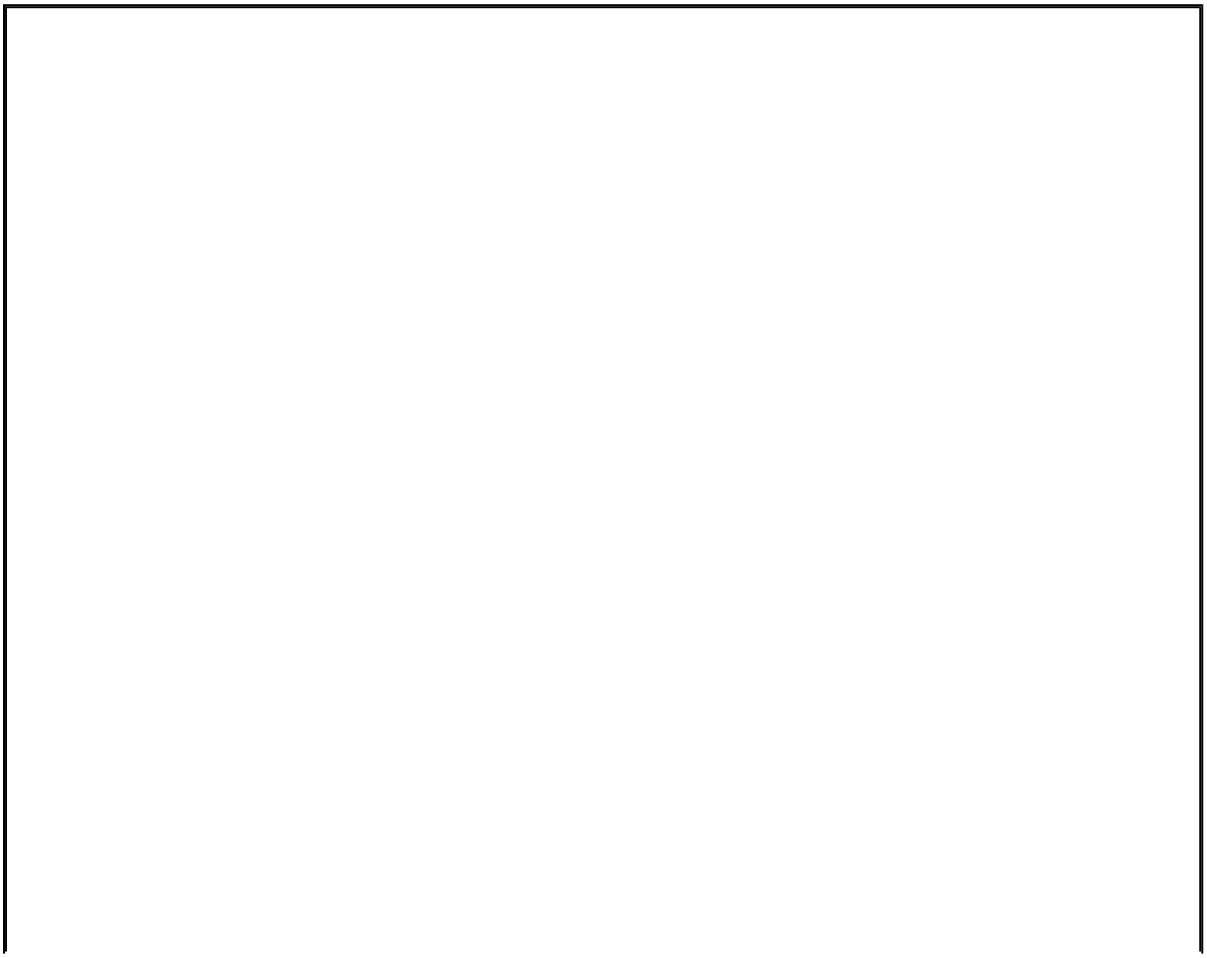
To install:

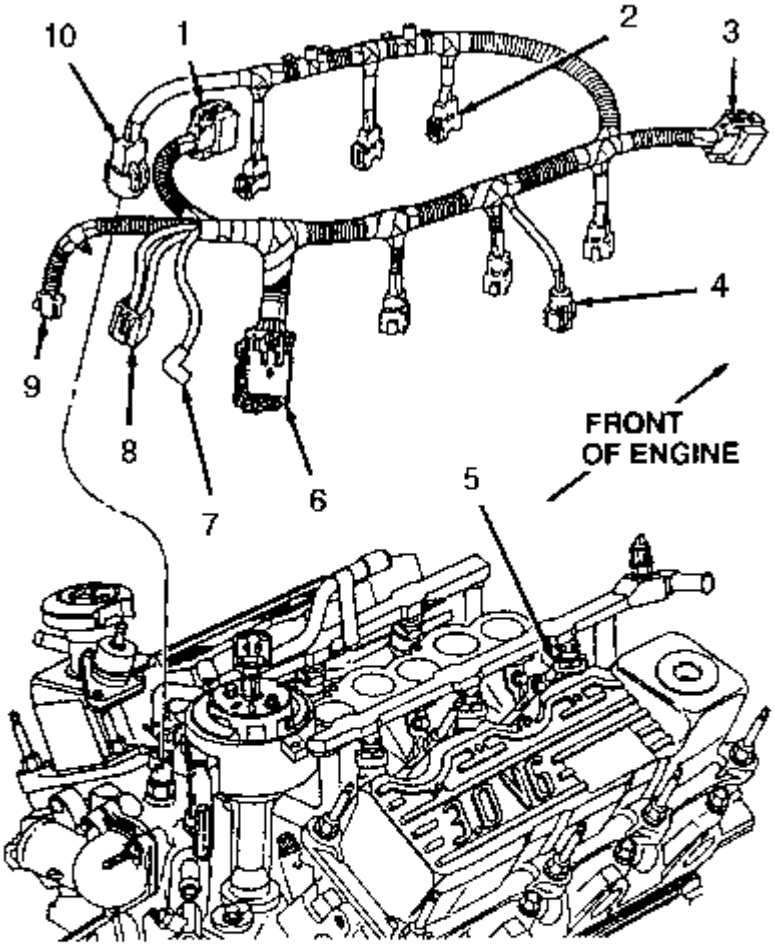
When installing the fuel rail assemblies, make sure the O-rings seat properly so that no fuel leaks will occur.

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.**

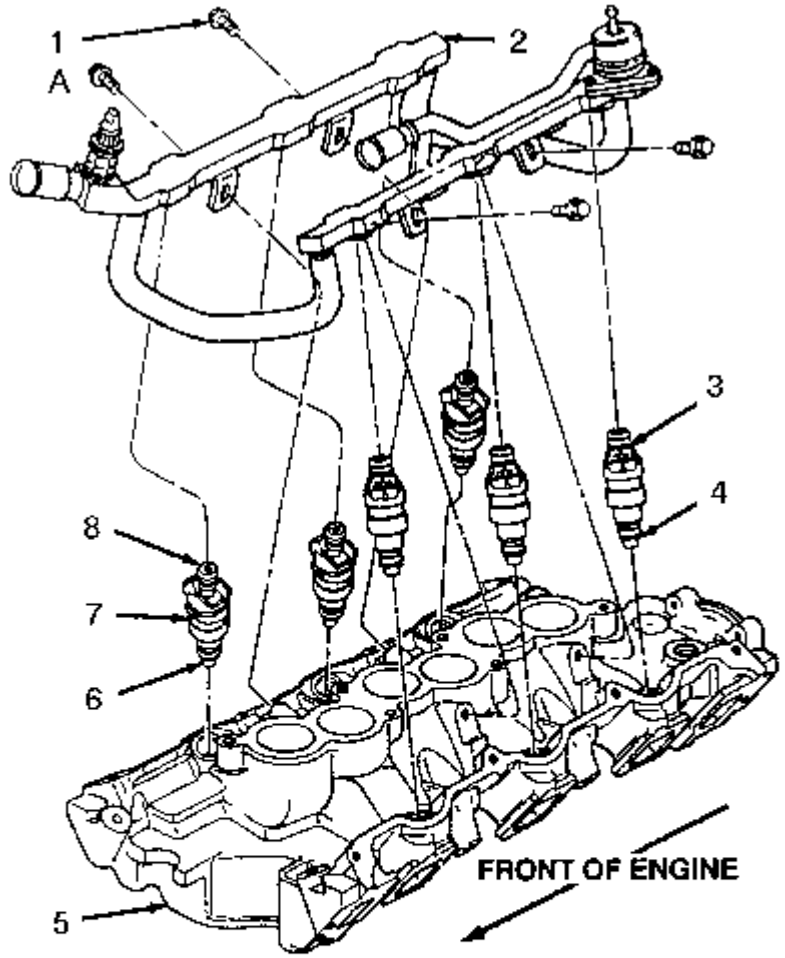




1. To throttle position sensor
2. Fuel injector wiring harness
3. To PFE transducer assy
4. To air charge temperature sensor
5. Fuel injector assy (6 req'd)
6. To harness assy
7. To oil pressure switch assy
8. To EGR vacuum regulator assy
9. To idle speed control
10. To engine coolant temperature sensor

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:

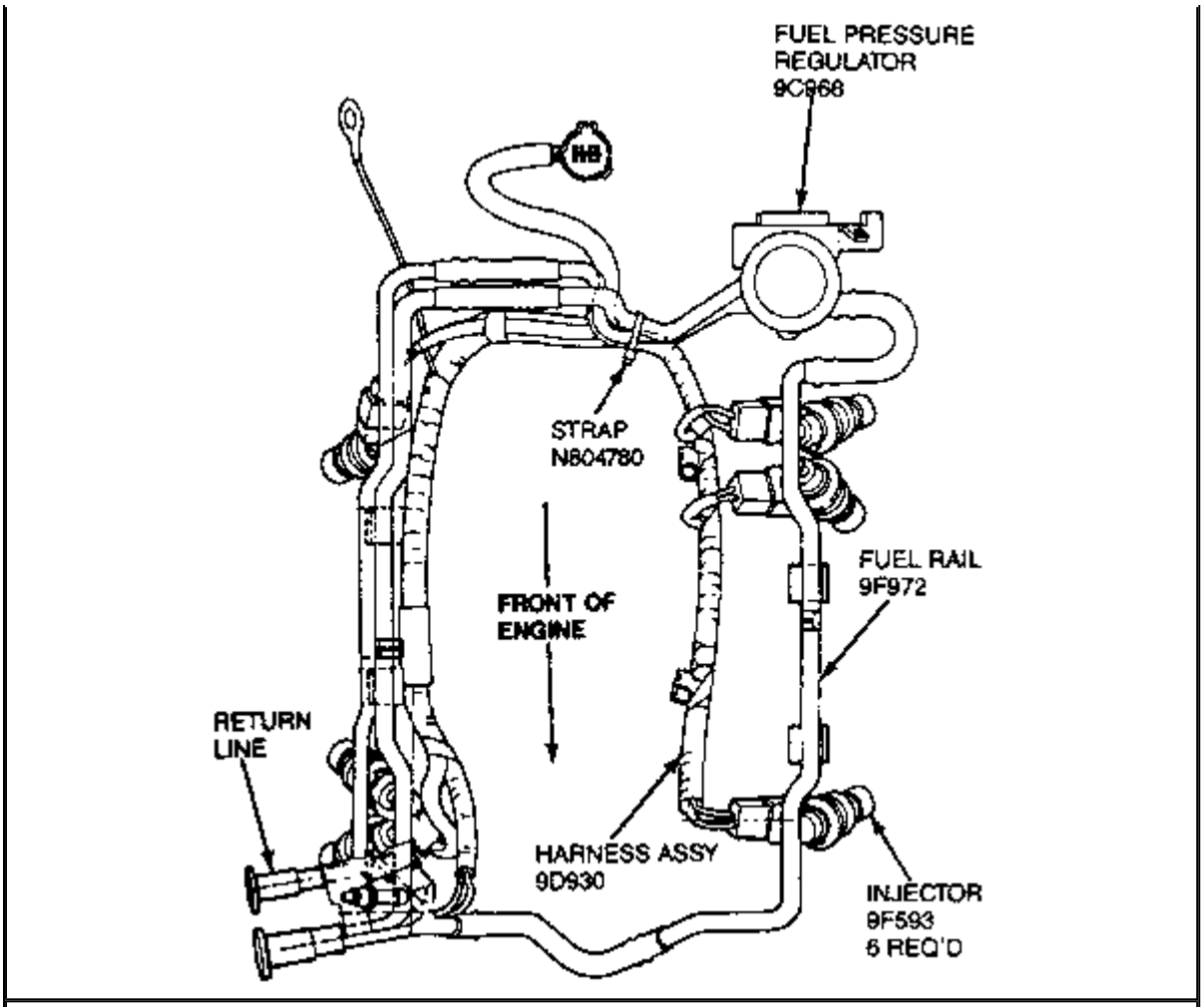
10. **Lubricate new O-rings with engine oil and install 2 on each injector.**
11. **Make sure the injector cups are clean and undamaged.**
12. **Install the injectors in the fuel rail using a light twisting-pushing motion.**
13. **Carefully install the rail assembly and injectors into the lower intake 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.

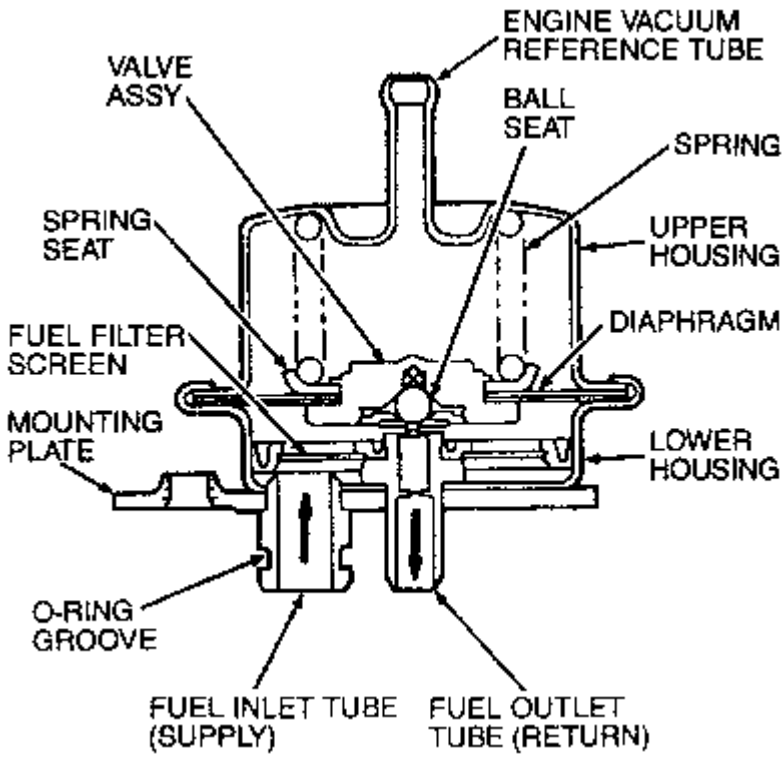
9. **Push the fuel rail down to be sure that all of the injector O-rings are fully seated in the fuel rail clips and intake manifold.**
10. **While holding the fuel rail down, install the retaining bolts and tighten them to 7 ft. lbs. (10 Nm).**
11. **Install the spring lock coupling. For details please 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

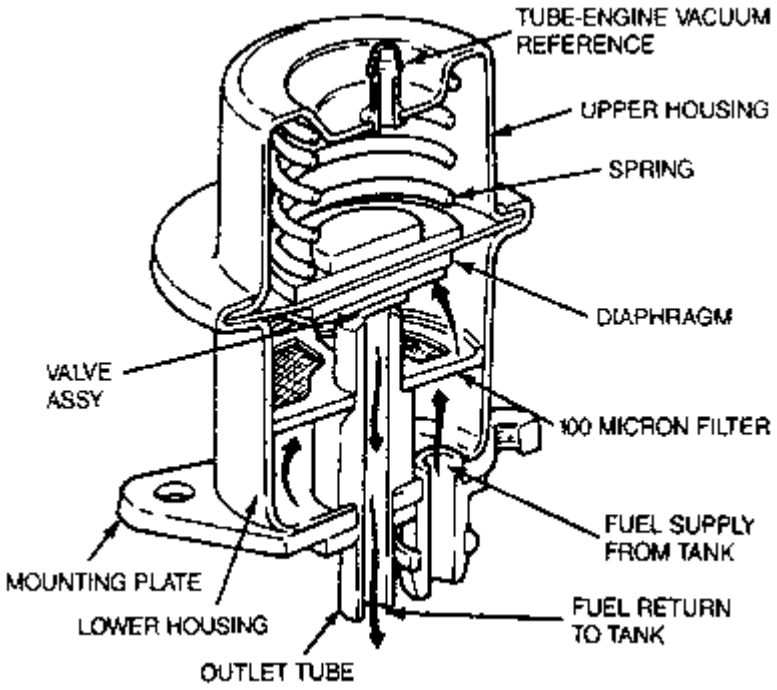
1. **Disconnect the negative battery cable.**
2. **Remove the fuel tank cap and release the pressure from the fuel system at the Schrader (pressure relief) valve of the fuel rail assembly, using Fuel Pressure Gauge T80L-9974-B or equivalent.**
3. **For the 2.5L engine, remove the three bolts retaining 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.**

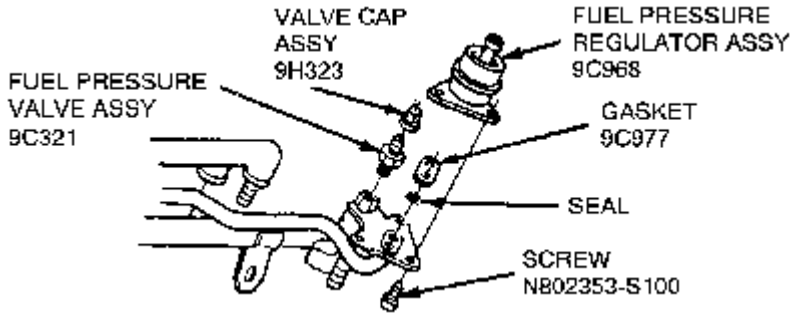
Pressure Relief Valve

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

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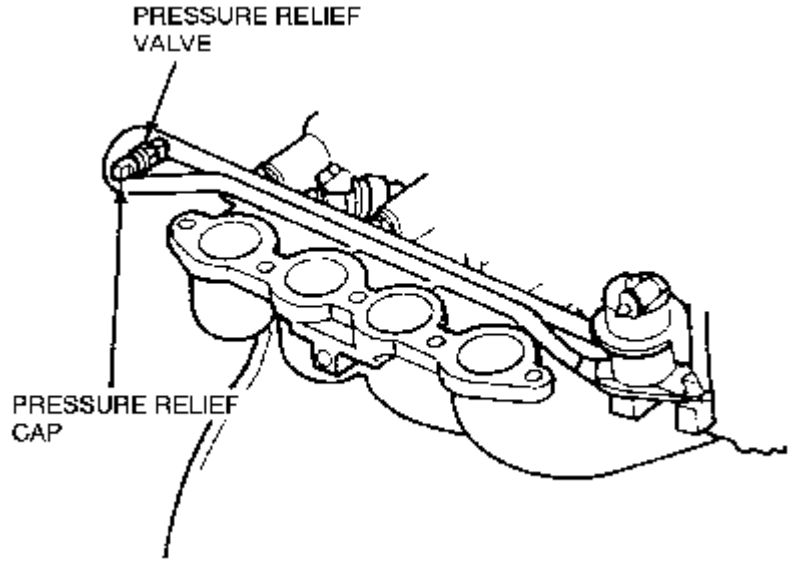


Fuel pressure relief valve location-2.5L EFI engine

Click to enlarge

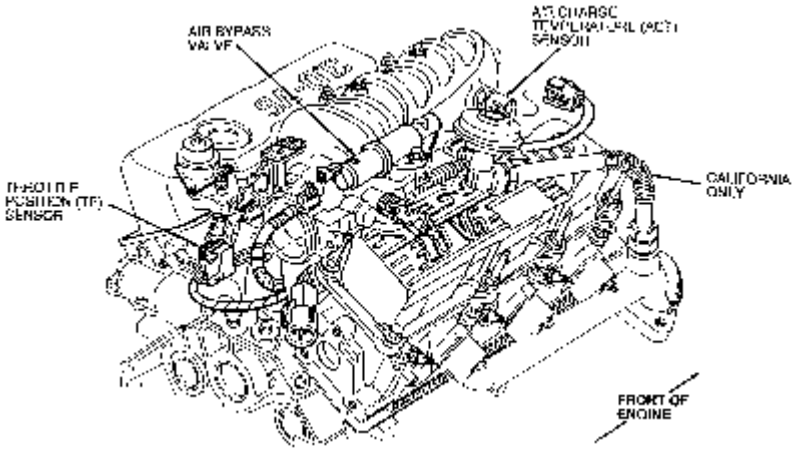
To install:

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:

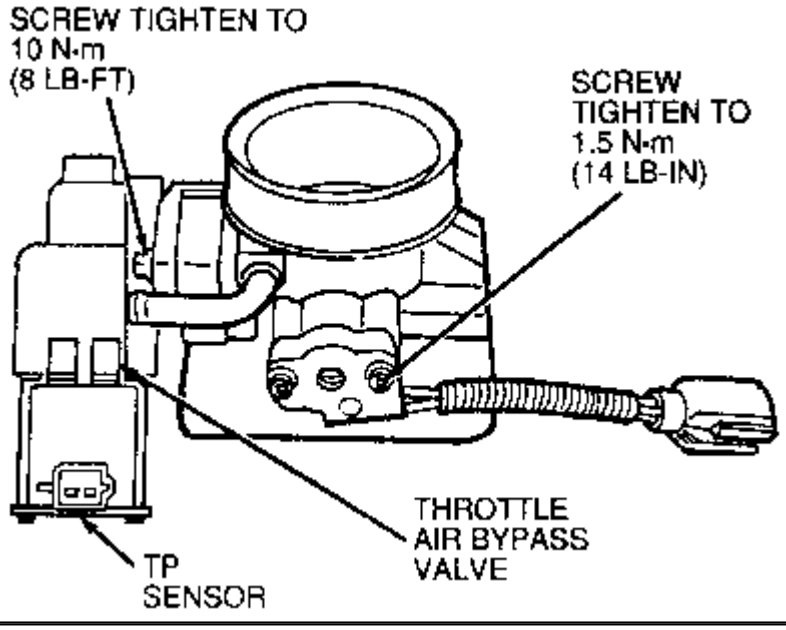
4. **Install the throttle position sensor. Make sure that the rotary tangs on the sensor are properly aligned and that the red seal is inside the connector housing.**

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

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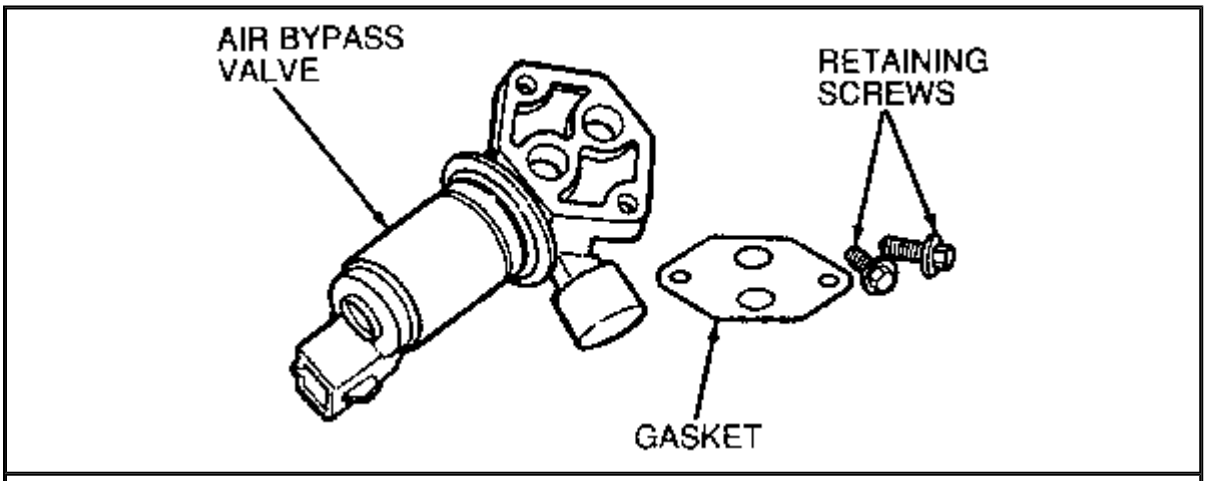
Idle Air Bypass Valve

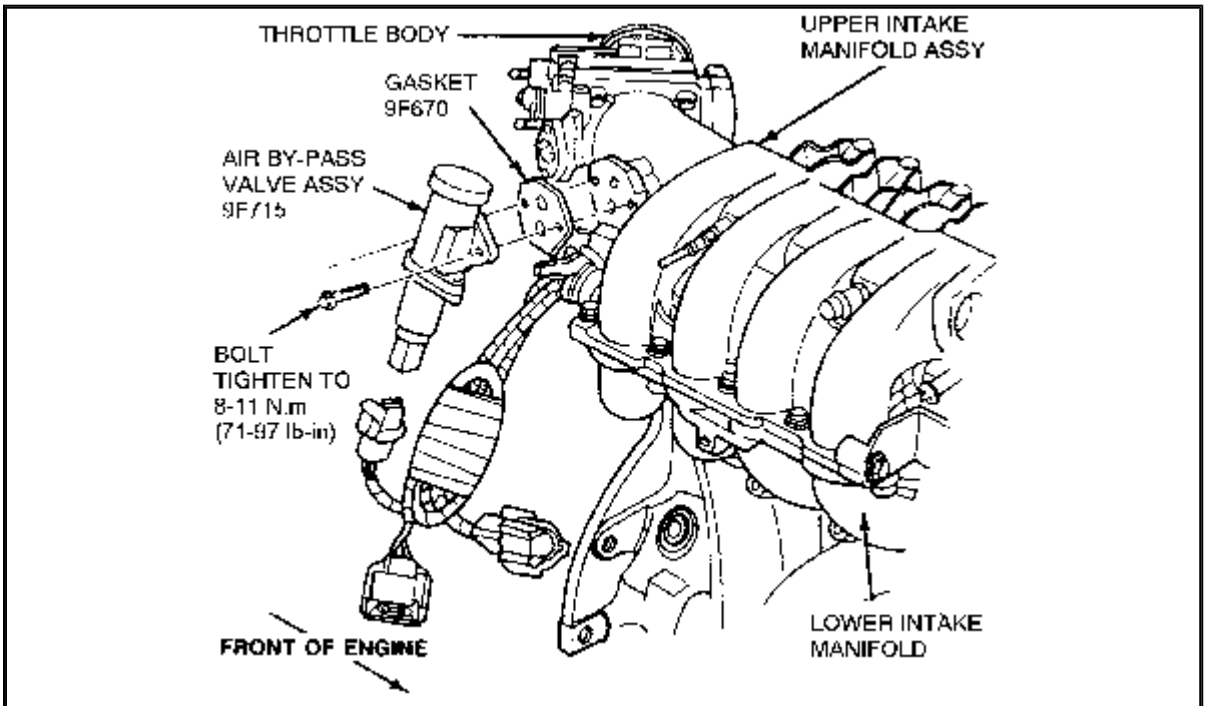
REMOVAL & INSTALLATION

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.

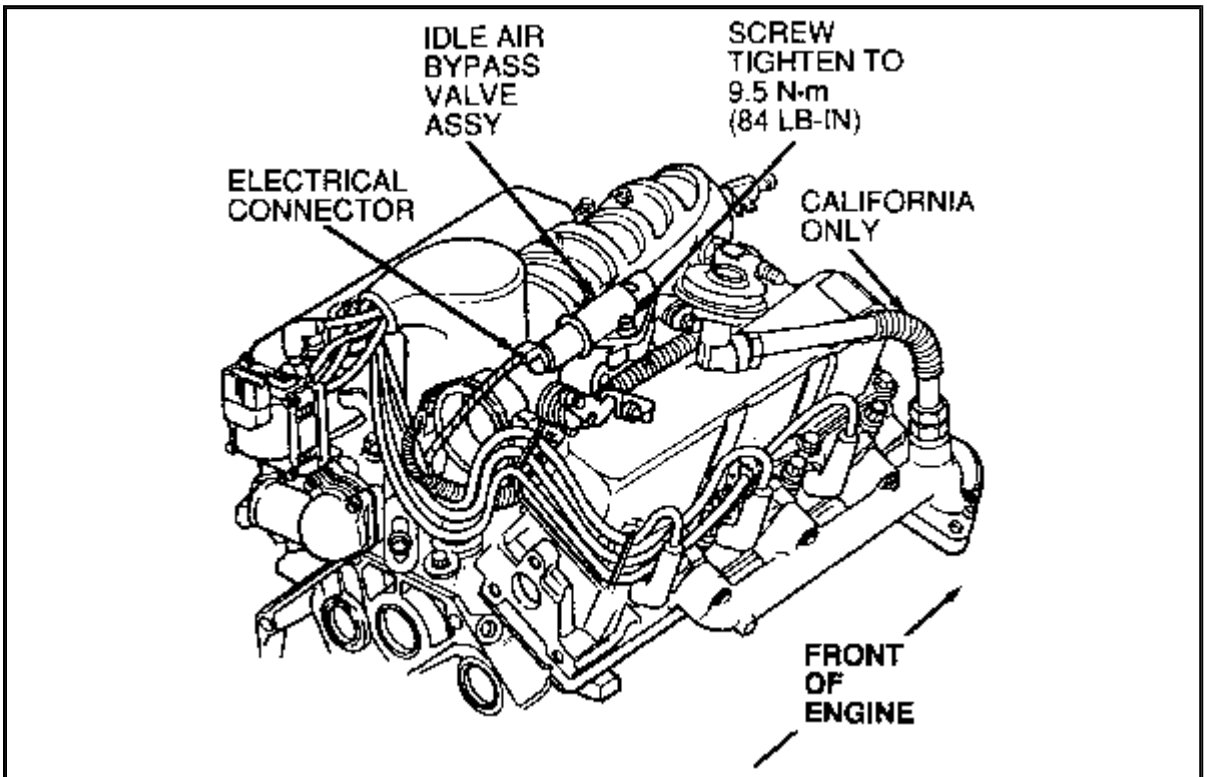


Idle air bypass valve location-2.5L EFI engine

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.**