2007 ENGINE

Fuel System - Nitro

SPECIFICATIONS

TORQUE SPECIFICATION

TORQUE SPECIFICATION

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Accelerator Pedal Bracket Mounting Nuts	12	-	105
Crankshaft Position Sensor - 3.7L	28	21	-
Crankshaft Position Sensor - 4.0L	28	21	-
Fuel Filler Hose Clamp at Tank	3	-	30
Fuel Filler Housing-to-Body Screws	2	-	17
Fuel Filler Tube Clamp	3.5	-	30
Fuel Rail Mounting Bolts - 3.7L	11	-	100
Fuel Rail Mounting Bolts - 4.0L	11	-	100
Fuel Tank Mounting Strap Bolts	61	45	-
Map Sensor Mounting Screws	3	-	25
O2 Sensor	30	22	-
Throttle Body Mounting Bolts - 3.7L	7.5	-	65
Throttle Body Mounting Bolts - 4.0L	5.6	-	50
Oxygen Sensors	41	30	-

FUEL DELIVERY - GAS

OPERATION

FUEL DELIVERY SYSTEM

Fuel is picked up in the fuel tank by the fuel pump module. This module is located on the bottom of the fuel tank.

A fuel return system is provided within the fuel pump module using check valves. A separate fuel return line from the engine to the tank is not used.

The fuel pressure regulator and the main fuel filter are combined within the fuel pump module.

The fuel tank assembly consists of: the fuel tank, fuel pump module assembly, fuel pump module lock ring/gasket, ORVR components. Refer to **DESCRIPTION** .

A fuel filler/vent tube assembly using a pressure/vacuum, 1/4 turn fuel filler cap is used. A one-way check valve is installed into the tanks fuel fill fitting.

Also to be considered part of the fuel system is the evaporation control system and ORVR system. This is designed to reduce the emission of fuel vapors into the atmosphere.

Both fuel filters are designed for extended service. They do not require normal scheduled maintenance.

STANDARD PROCEDURE

DRAINING FUEL TANK - GAS

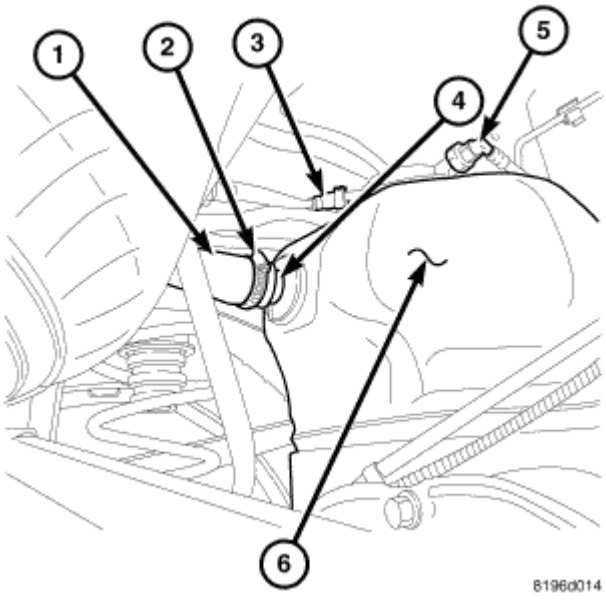

Fig. 1: Identifying Fuel Fill Hose, Clamp, Fuel Tank Fitting & Tank
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove fuel fill cap.
3. Raise and support vehicle.
4. Remove fuel fill hose clamp (2) at rear of tank (6).
5. Remove fuel fill hose (1) from fuel tank fitting (4).
6. Position a drain hose into the fuel fill hose opening. Note that a small flapper valve is installed into the

opening.

7. Drain fuel tank using an approved gasoline, or diesel fuel draining station.

FUEL SYSTEM PRESSURE RELEASE

1. Remove fuel fill cap.
2. Remove fuel pump fuse from Totally Integrated Power Module (TIPM). For location of fuse, refer to label on underside of TIPM cover.
3. Start and run engine until it stalls.
4. Attempt restarting engine until it will no longer run.
5. Turn ignition key to OFF position.
6. Place a rag or towel below fuel line quick-connect fitting at fuel rail.
7. Disconnect quick-connect fitting at fuel rail. See **STANDARD PROCEDURE**.
8. When the repair is complete, return fuel pump fuse to TIPM.
9. One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory due to fuel pump fuse removal. A diagnostic scan tool must be used to erase a DTC.

SPECIFICATIONS

FUEL SYSTEM PRESSURE

400 kPa +/- 34 kPa (58 psi +/- 5 psi).

SPECIAL TOOLS

FUEL SYSTEM

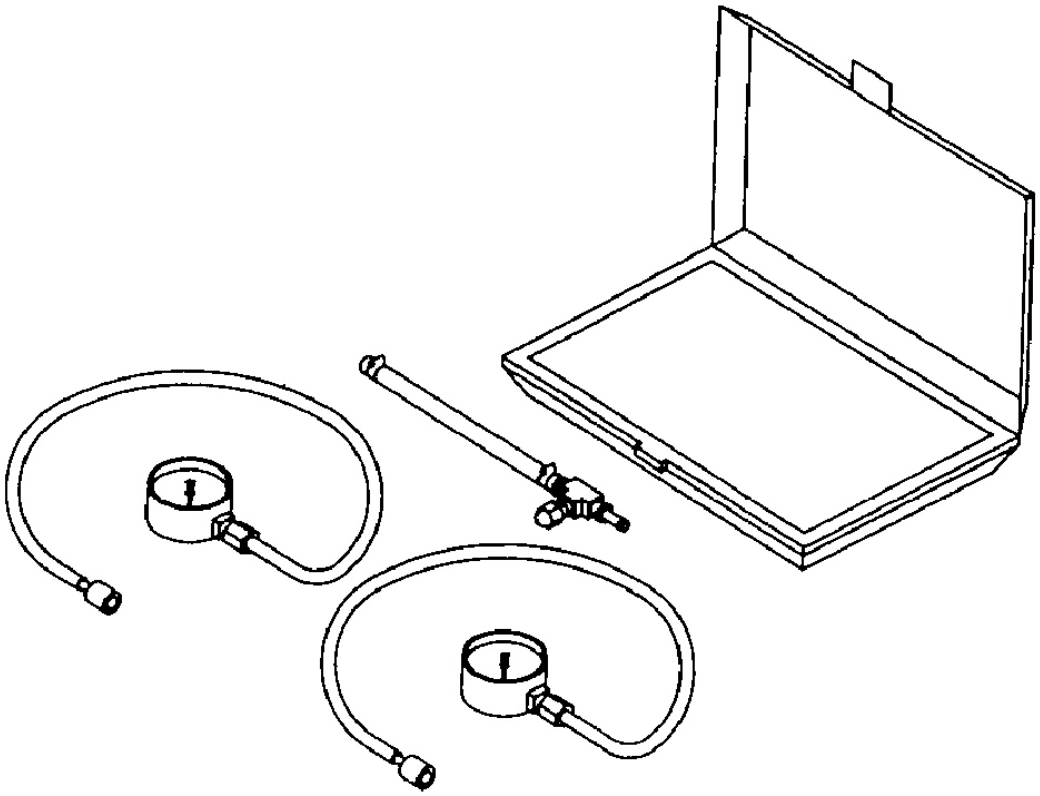

Fig. 2: Test Kit, Fuel Pressure 50
Courtesy of CHRYSLER LLC

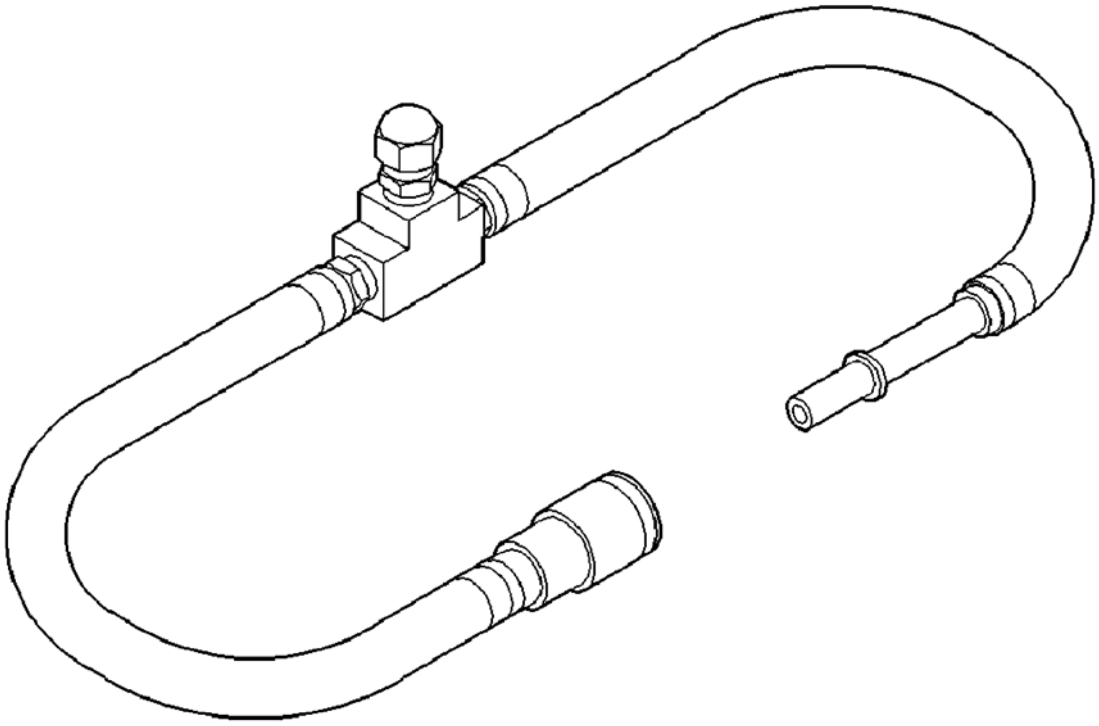

Fig. 3: Adapters, Fuel Pressure Test
Courtesy of CHRYSLER LLC

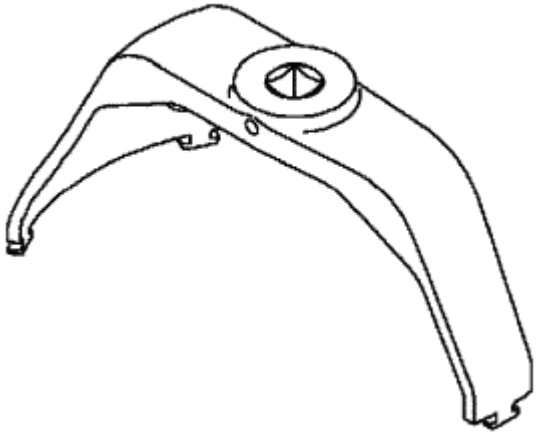

Fig. 4: Lockring Remover/Installer 9340
Courtesy of CHRYSLER LLC

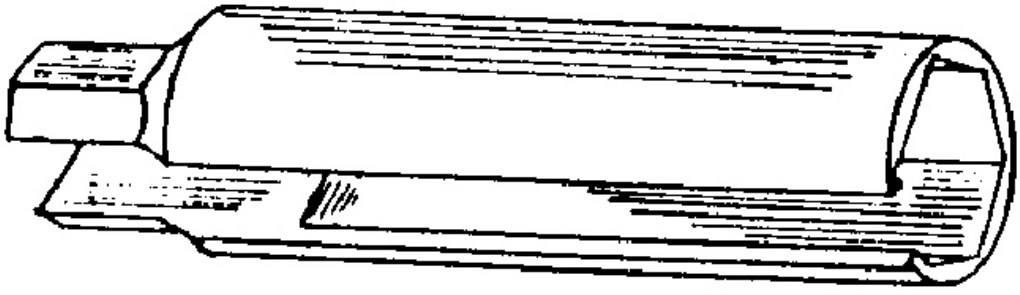

Fig. 5: O2S (Oxygen Sensor) Remover/Installer
Courtesy of CHRYSLER LLC

FILTER-FUEL

DESCRIPTION

DESCRIPTION

The fuel filter and fuel pressure regulator are combined within the fuel pump module assembly. They are not serviceable.

SENSOR-FUEL LEVEL SENDING UNIT

DESCRIPTION

FUEL LEVEL SENDING UNIT SENSOR

The fuel gauge sending unit (fuel level sensor) is attached to the fuel pump module. The sending unit consists of a float, an arm, and a variable resistor track (card).

The sensor is serviceable.

REMOVAL

SENSOR-FUEL LEVEL SENDING UNIT

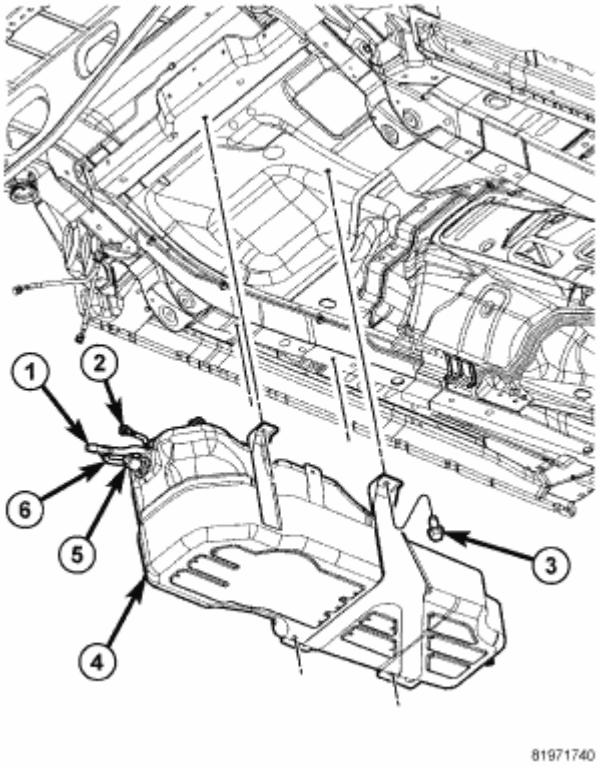

Fig. 6: Removing/Installing Fuel Tank
Courtesy of CHRYSLER LLC

1. Drain and remove fuel tank (4). Refer to **REMOVAL** .
2. Remove the fuel pump module. See **REMOVAL**.
3. Remove the fuel level sending unit.

INSTALLATION

SENSOR-FUEL LEVEL SENDING UNIT

1. Install the fuel level sending unit to the module.
2. Install the fuel pump module in the tank. See **INSTALLATION**.

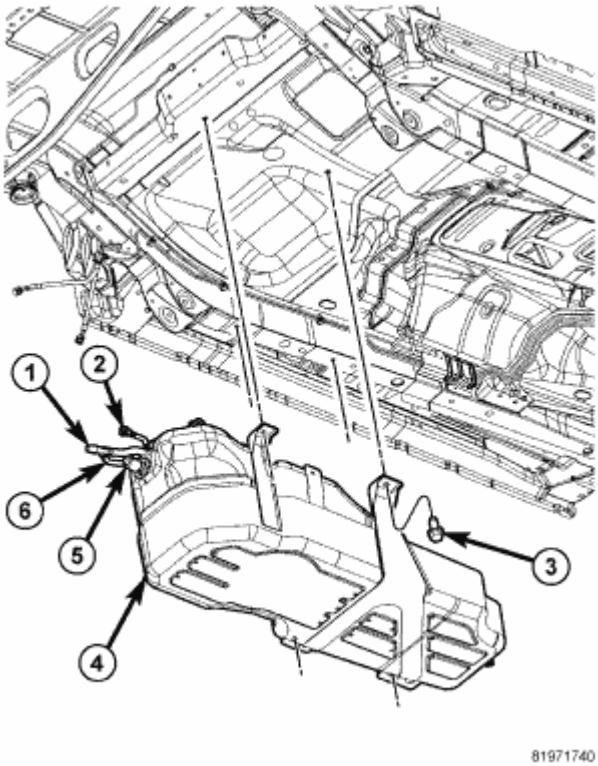

Fig. 7: Removing/Installing Fuel Tank
Courtesy of CHRYSLER LLC

3. Install fuel tank (4). See **INSTALLATION**.

LINES-FUEL

DESCRIPTION

FUEL LINES

See **STANDARD PROCEDURE**.

> **WARNING: The fuel system may be under a constant pressure (even with the engine off). Before servicing any fuel system hoses, fittings, lines, or most components, fuel system pressure must be released. Refer to the FUEL SYSTEM PRESSURE RELEASE procedure.**

The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, only those marked EFM/EFI may be used.

If equipped: The hose clamps used to secure rubber hoses on fuel injected vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause

high-pressure fuel leaks.

Use new original equipment type hose clamps.

FITTING-QUICK CONNECT

DESCRIPTION

FITTING-QUICK CONNECT

Different types of quick-connect fittings are used to attach the various fuel system components, lines and tubes. These are: a single-button type, a two-button type, a pinch type, a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Some may require the use of a special tool for disconnection and removal. See **STANDARD PROCEDURE**.

CAUTION: Before separating a quick-connect fitting, pay attention to what type of fitting is being used by referring to Quick-Connect Fitting Removal. This will prevent unnecessary fitting or fitting latch breakage.

CAUTION: The interior components (O-rings, clips) of quick-connect fittings are not serviced separately, but new plastic spacers and latches are available for some types. If service parts are not available, do not attempt to repair the damaged fitting or fuel line (tube). If repair is necessary, replace the complete fuel line (tube) assembly.

STANDARD PROCEDURE

FITTING-QUICK CONNECT

Different types of quick-connect fittings are used to attach the various fuel system components, lines and tubes. These are: a single-button type, a two-button type, a pinch type, a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Some may require the use of a special tool for disconnection and removal.

DISCONNECTING

WARNING: The fuel system is under a constant pressure (even with engine off). Before servicing any fuel system hose, fitting or line, fuel system pressure must be released. Refer to FUEL SYSTEM PRESSURE RELEASE procedure.

CAUTION: Before separating a quick-connect fitting, pay attention to what type of fitting is being used by referring to Quick-Connect Fitting Removal. This will prevent unnecessary fitting or fitting latch breakage.

CAUTION: The interior components (O-rings, clips) of quick-connect fittings are not

serviced separately, but new plastic spacers and latches are available for some types. If service parts are not available, do not attempt to repair the damaged fitting or fuel line (tube). If repair is necessary, replace the complete fuel line (tube) assembly.

1. Perform fuel pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** Procedure.
2. Disconnect negative battery cable from battery.
3. Clean fitting of any foreign material before disassembly.

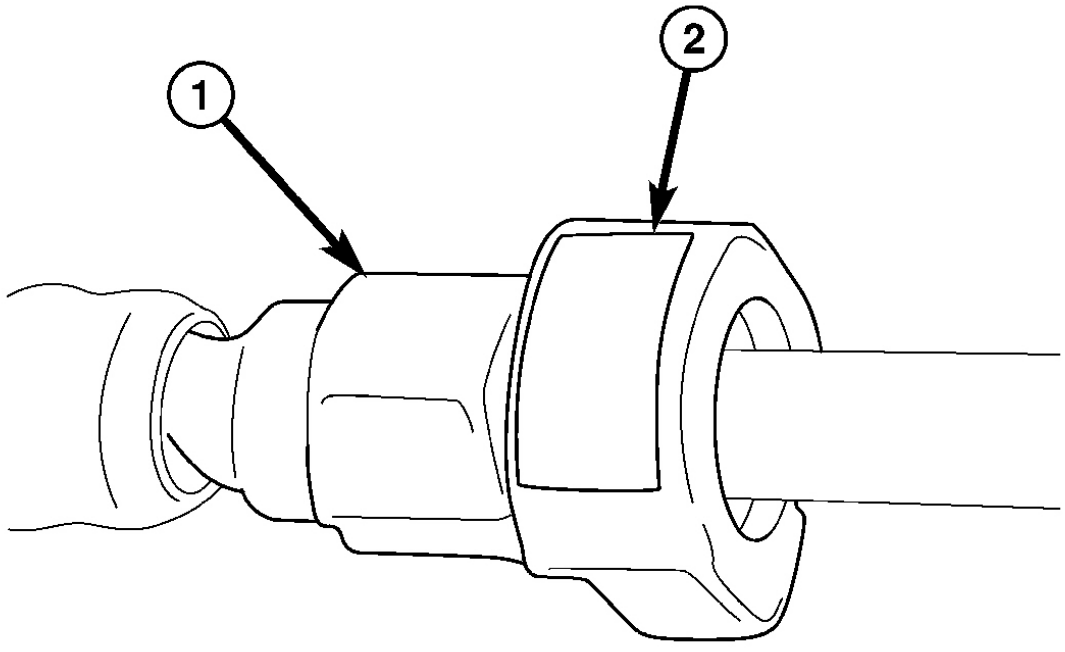

Fig. 8: Single Button Fitting
Courtesy of CHRYSLER LLC

4. **Single-Button Type Fitting:** This type of fitting is equipped with a single push-button (2) located on the quick-connect fitting.

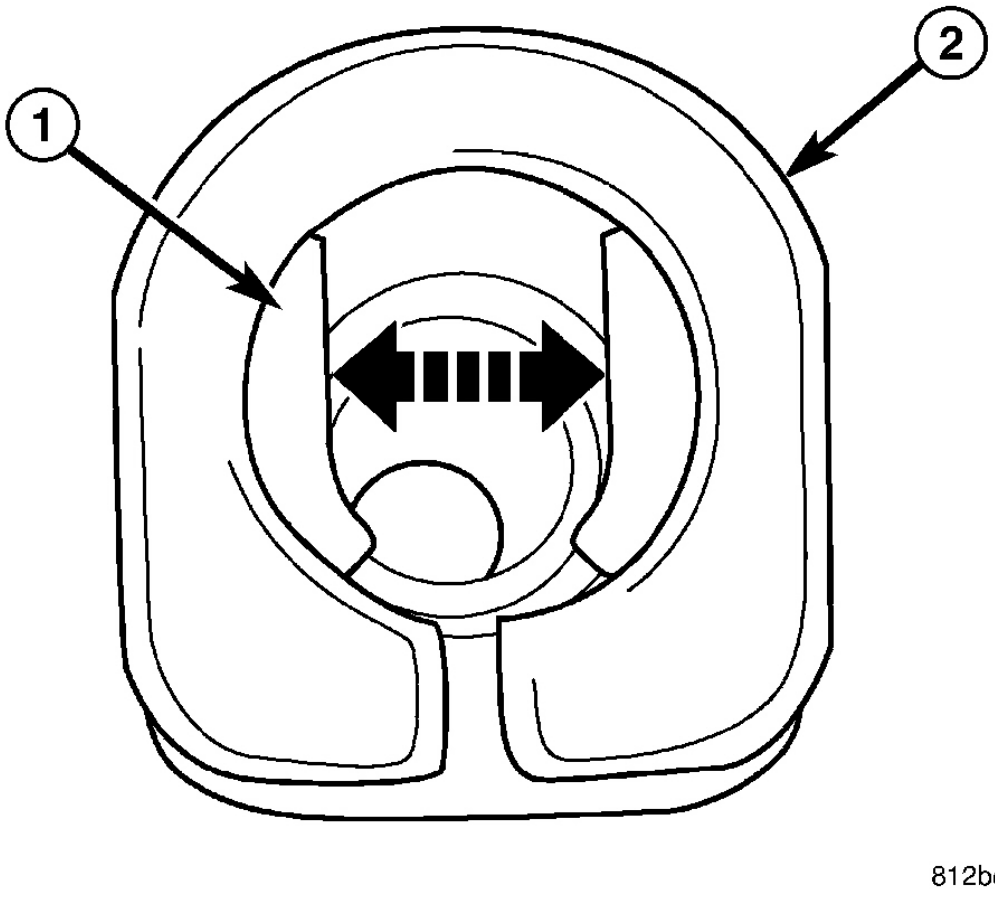

Fig. 9: Fitting Latches
Courtesy of CHRYSLER LLC

5. The push-button is attached to two internal latches (1). To disconnect, press on push-button with your thumb and unlatch fitting from fuel line. Special tools are not required for disconnection. **DO NOT ATTEMPT TO PRY OR PULL UP ON PUSH-BUTTON. LATCHES WILL BE BROKEN.**

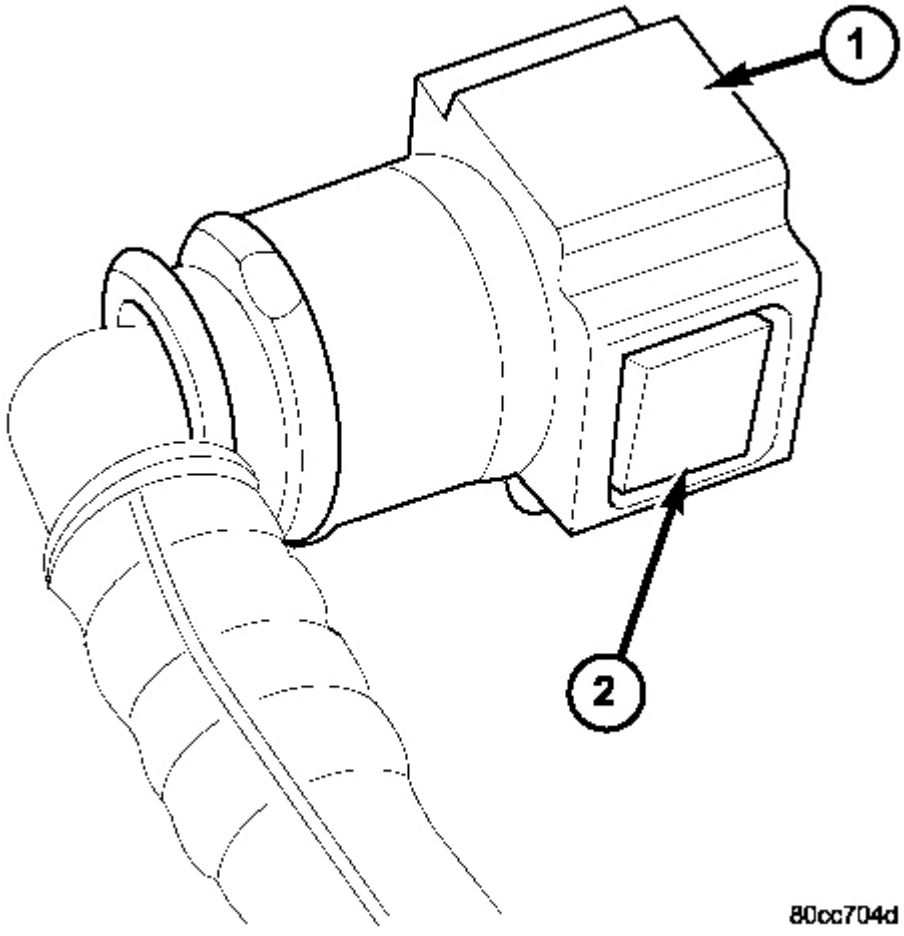

Fig. 10: 2-Button Type Fitting
Courtesy of CHRYSLER LLC

6. Perform fuel pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** Procedure.
7. Disconnect negative battery cable from battery.
8. Clean fitting of any foreign material before disassembly.
9. **2-Button Type Fitting:** This type of fitting (1) is equipped with a push-button located on each side of quick-connect fitting (2). Press on both buttons simultaneously for removal. Special tools are not required for disconnection.

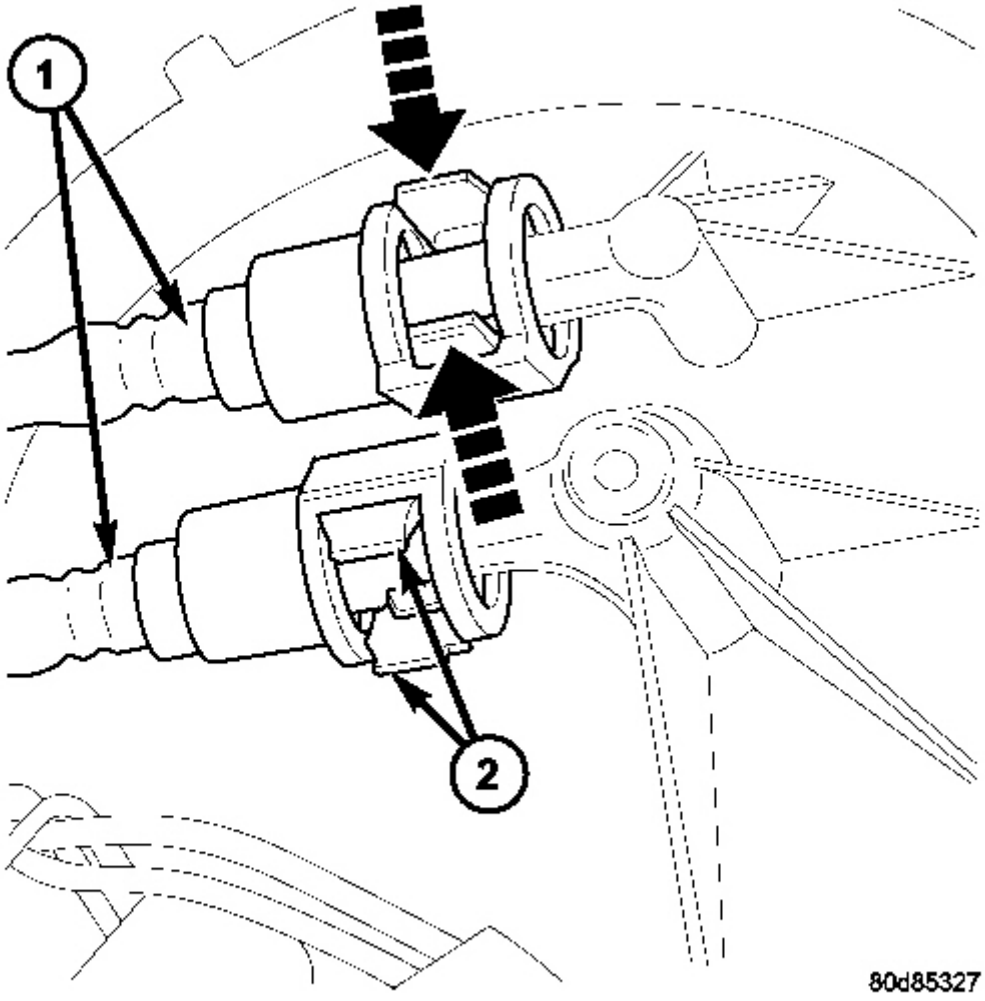

Fig. 11: Pinch Type Quick-Connect Fitting
Courtesy of CHRYSLER LLC

10. **Pinch-Type Fitting:** This fitting (1) is equipped with two finger tabs (2). Pinch both tabs together while removing fitting. Special tools are not required for disconnection.

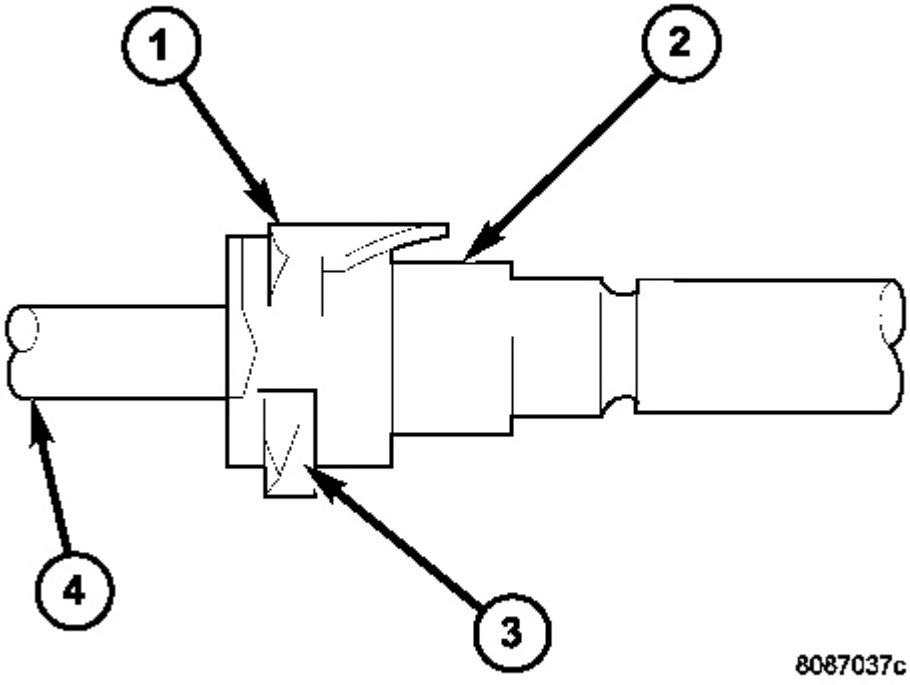

Fig. 12: Single-Tab Type Fitting
Courtesy of CHRYSLER LLC

11. **Single-Tab Type Fitting:** This type of fitting (3) is equipped with a single pull tab (1). The tab is removable. After tab is removed, quick-connect fitting can be separated from fuel system component. Special tools are not required for disconnection.

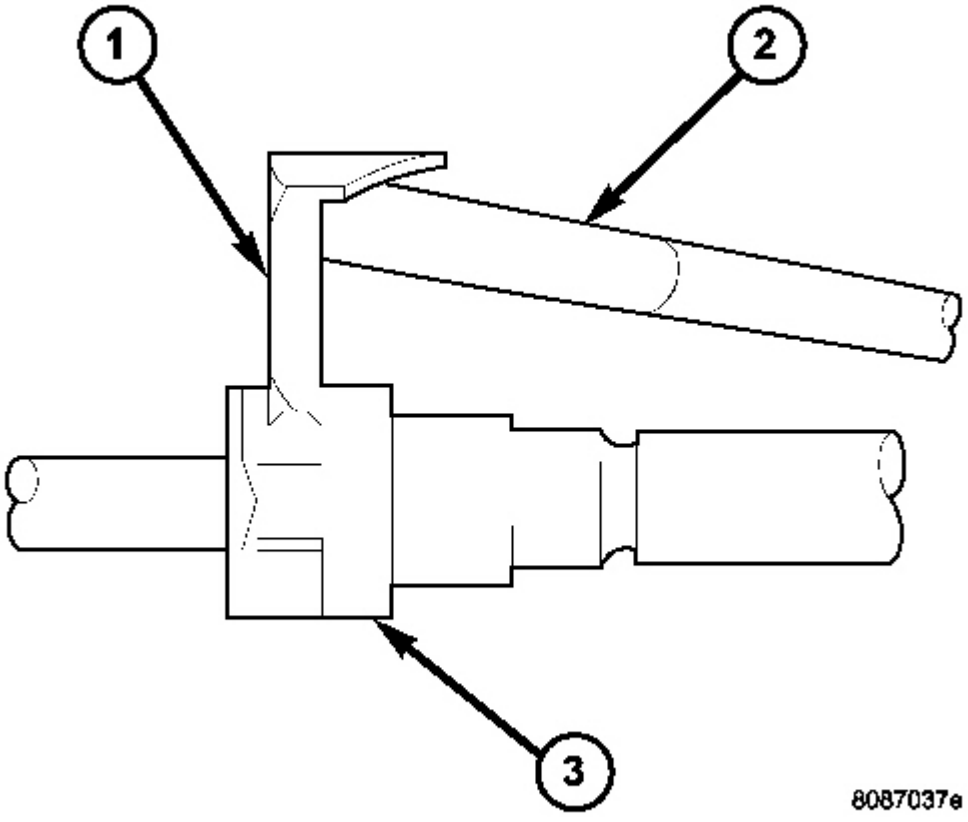

Fig. 13: Disconnecting Single-Tab Type Fitting
Courtesy of CHRYSLER LLC

12. Press release tab on side of fitting to release pull tab (1). **If release tab is not pressed prior to releasing pull tab, pull tab will be damaged.**
13. While pressing release tab on side of fitting, use screwdriver (2) to pry up pull tab.
14. Raise pull tab until it separates from quick-connect fitting.

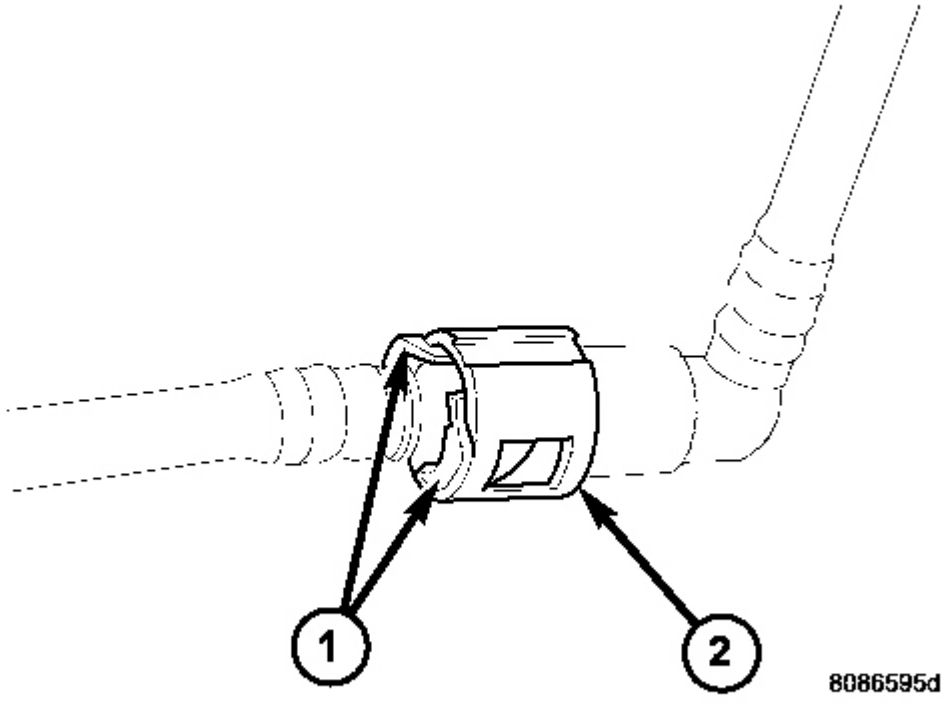

Fig. 14: Typical Two-Tab Type Quick-Connect Fitting
Courtesy of CHRYSLER LLC

15. **Two-Tab Type Fitting:** This type of fitting (2) is equipped with tabs located on both sides of fitting (1). The tabs are supplied for disconnecting quick-connect fitting from component being serviced.
    - To disconnect quick-connect fitting, squeeze plastic retainer tabs (1) against sides of quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer.
    - Pull fitting from fuel system component being serviced.
    - The plastic retainer will remain on component being serviced after fitting is disconnected. The O-rings and spacer will remain in quick-connect fitting connector body.

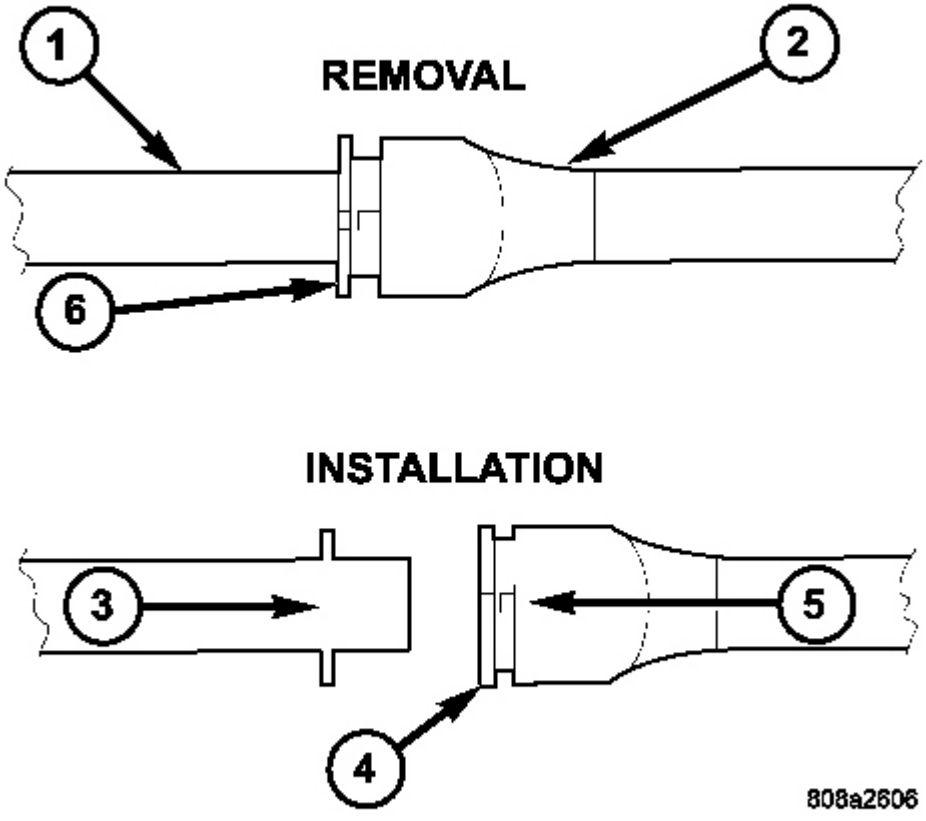

Fig. 15: Plastic Retainer Ring Type Fitting
Courtesy of CHRYSLER LLC

16. **Plastic Retainer Ring Type Fitting:** This type of fitting can be identified by the use of a full-round plastic retainer ring (4) usually black in color.
    - To release fuel system component from quick-connect fitting, firmly push fitting towards component being serviced while firmly pushing plastic retainer ring into fitting (6). With plastic ring depressed, pull fitting from component. **The plastic retainer ring must be pressed squarely into fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on shoulder of plastic retainer ring to aid in disconnection.**
    - After disconnection, plastic retainer ring will remain with quick-connect fitting connector body.
    - Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.

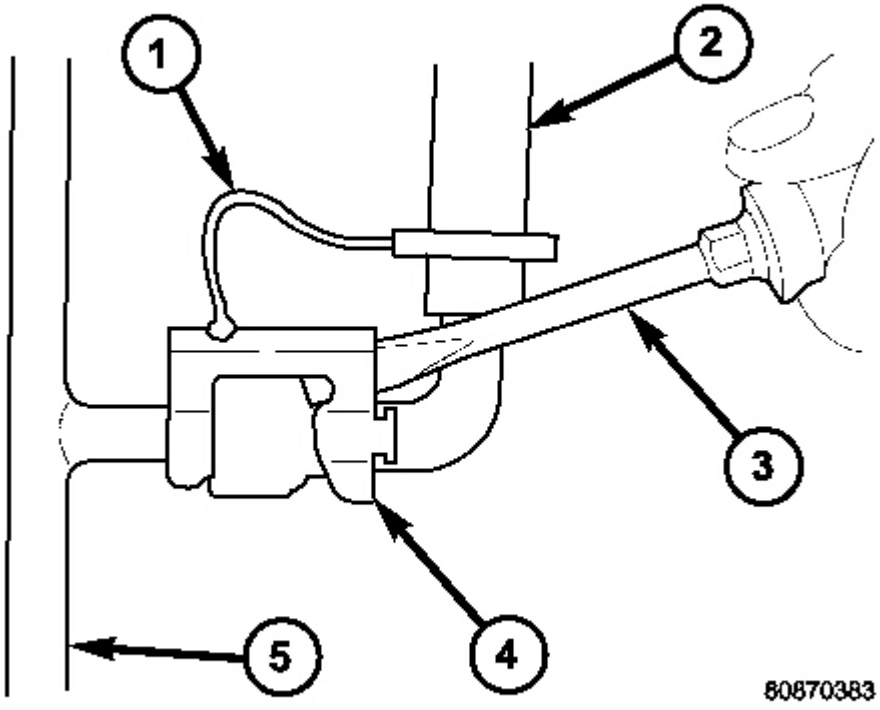

Fig. 16: Latch Clip-Type 1
Courtesy of CHRYSLER LLC

17. **Latch Clips - Type 1:** Depending on vehicle model and engine, 2 different types of safety latch clips are used. Type-1 (4) is tethered to fuel line and type-2 is not. A special tool will be necessary to disconnect fuel line after latch clip is removed. The latch clip may be used on certain fuel line/fuel rail connection, or to join fuel lines together.
18. Pry up on latch clip with a screwdriver (3).
19. Slide latch clip toward fuel rail while lifting with screwdriver.

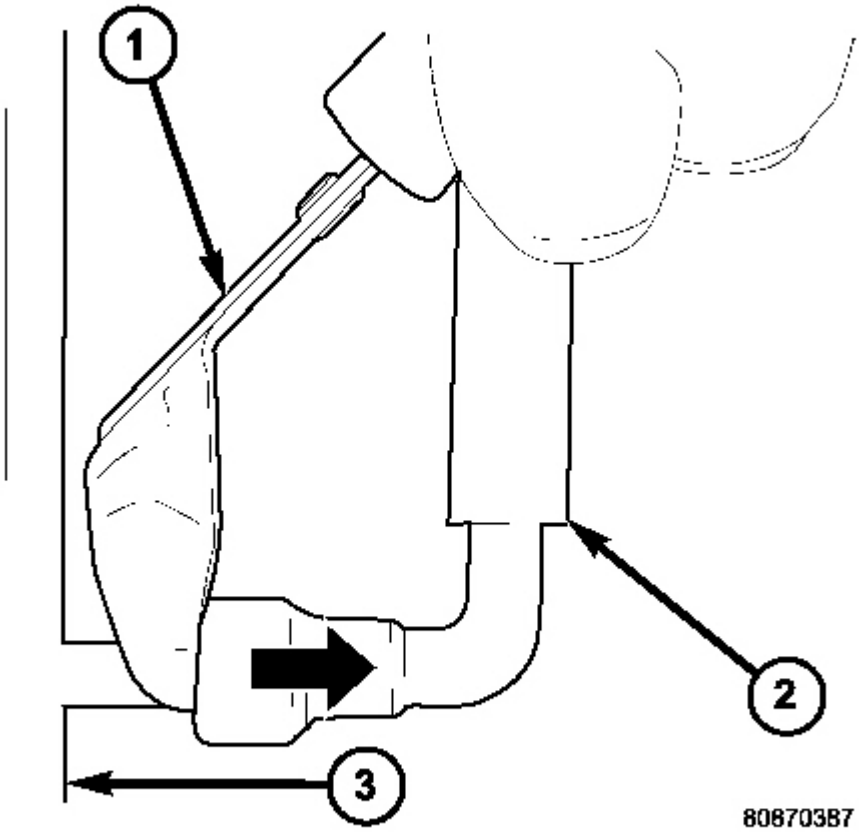

Fig. 17: Fuel Line Disconnection Using Special Tool
Courtesy of CHRYSLER LLC

20. Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into fuel line (1). Use tool to release locking fingers in end of line.
21. With special tool still inserted, pull fuel line from fuel rail.
22. After disconnection, locking fingers will remain within quick-connect fitting at end of fuel line.
23. Disconnect quick-connect fitting from fuel system component being serviced.

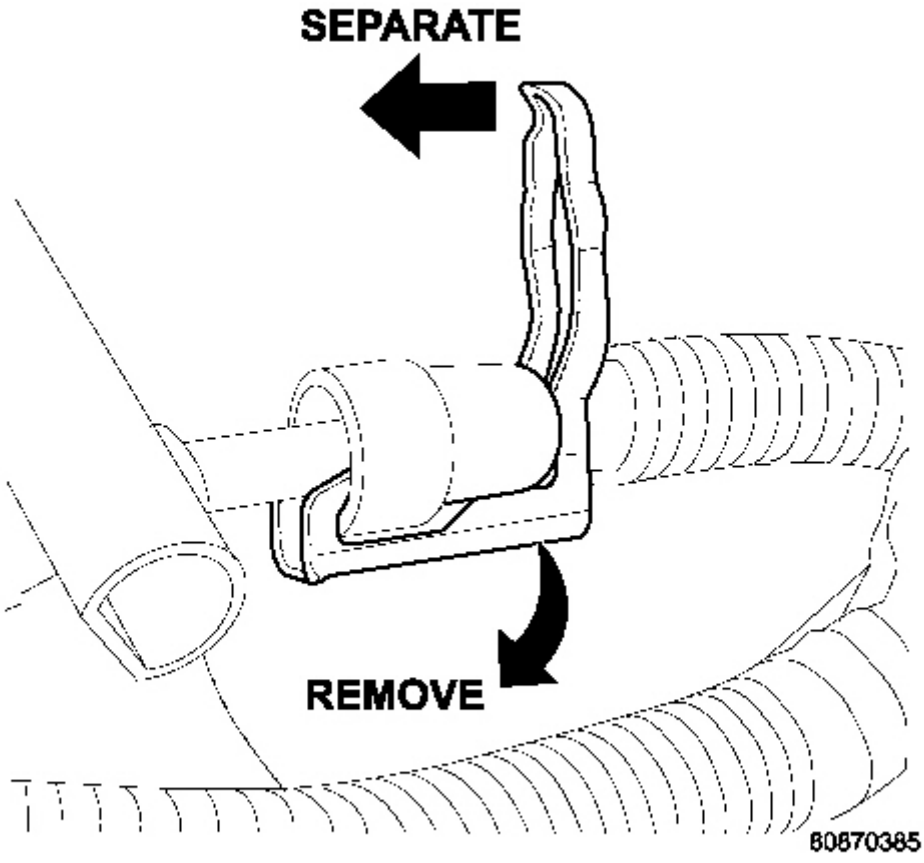

Fig. 18: Latch Clip-Type 2 Disconnect
Courtesy of CHRYSLER LLC

24. **Latch Clips - Type 2:** Depending on vehicle model and engine, 2 different types of safety latch clips are used. Type-1 is tethered to fuel line and type-2 is not. A special tool will be necessary to disconnect fuel line after latch clip is removed. The latch clip may be used on certain fuel line/fuel rail connection, or to join fuel lines together.
25. Type 2: Separate and unlatch small arms on end of clip and swing away from fuel line.
26. Slide latch clip toward fuel rail while lifting with screwdriver.

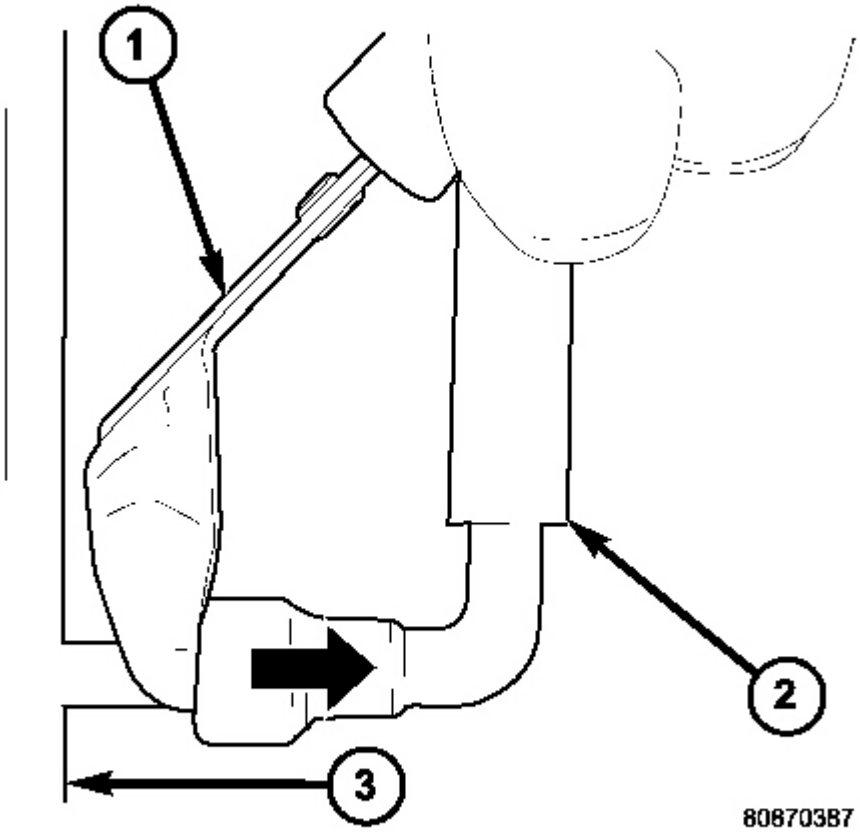

Fig. 19: Fuel Line Disconnection Using Special Tool
Courtesy of CHRYSLER LLC

27. Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into fuel line (1). Use tool to release locking fingers in end of line.
28. With special tool still inserted, pull fuel line from fuel rail.
29. After disconnection, locking fingers will remain within quick-connect fitting at end of fuel line.
30. Disconnect quick-connect fitting from fuel system component being serviced.

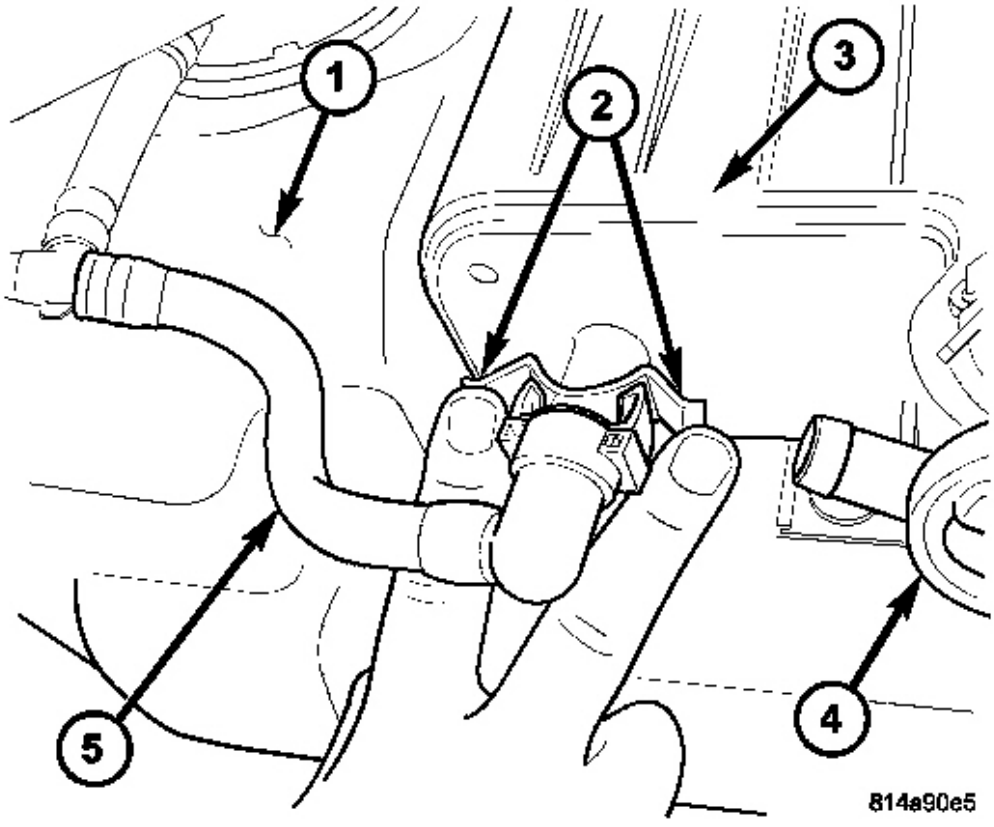

Fig. 20: EVAP Can. Vapor Hose
Courtesy of CHRYSLER LLC

31. **Wing Type:** A special tool will not be necessary to disconnect this type of fitting (2). This line is used on different fuel and emission components. The graphic shows the fitting used on an EVAP canister.
32. Use two fingers to push on fitting wings (2)
33. Pull and disconnect fitting while holding wings.
34. After disconnection, locking fingers will remain within quick-connect fitting.

CONNECTING

1. Inspect quick-connect fitting body and fuel system component for damage. Replace as necessary.
2. Prior to connecting quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.
3. Insert quick-connect fitting into fuel tube or fuel system component until built-on stop on fuel tube or

component rests against back of fitting.
4. Continue pushing until a click is felt.
5. Single-tab type fitting: Push new tab down until it locks into place in quick-connect fitting.
6. Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).
7. Latch Clip Equipped: Install latch clip (snaps into position). **If latch clip will not fit, this indicates fuel line is not properly installed to fuel rail (or other fuel line). Recheck fuel line connection.**
8. Connect negative cable to battery.
9. Start engine and check for leaks.

REGULATOR-FUEL PRESSURE

DESCRIPTION

FUEL PRESSURE REGULATOR

The fuel pressure regulator is located within the fuel pump module. It is serviced by replacing the fuel pump module assembly.

PUMP-FUEL

DESCRIPTION

FUEL PUMP

The electric fuel pump is located inside of the fuel pump module. A 12 volt, permanent magnet, electric motor powers the fuel pump. The electric fuel pump is not a separate, serviceable component.

OPERATION

FUEL PUMP

Voltage to operate the electric pump is supplied through the fuel pump relay.

Fuel is drawn in through a filter at the bottom of the module and pushed through the electric motor gearset to the pump outlet.

Check Valve Operation: The fuel pump module contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors.**Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.**

The electric fuel pump is not a separate, serviceable component.

MODULE-FUEL PUMP

REMOVAL

FUEL PUMP MODULE

WARNING: The fuel system is under a constant pressure (even with the engine off). Before servicing the fuel pump module, the fuel system pressure must be released. Refer to STANDARD PROCEDURE

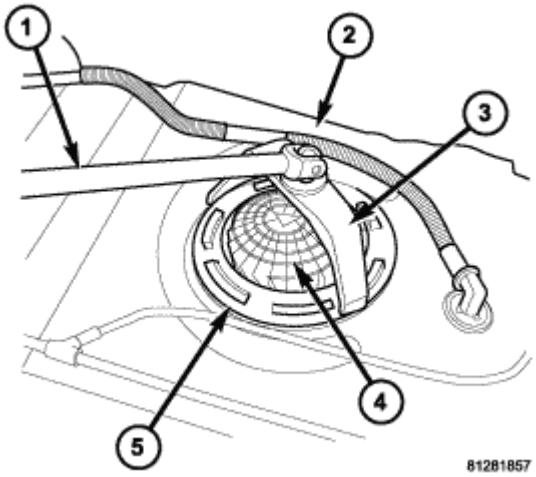

Fig. 21: Identifying Drive Breaker Bar, Lockring Remover/Installer Tool 9340 & Lockring
Courtesy of CHRYSLER LLC

1. Drain and remove fuel tank. Refer to **REMOVAL** .
2. Note rotational position of module before attempting removal. An indexing arrow is located on top of module for this purpose.
3. Position special Lockring Remover/Installer tool 9340 (3) into notches on outside edge of lockring (5).
4. Install 1/2 inch drive breaker bar (1) to special Lockring Remover/Installer tool 9340 (3).
5. Rotate breaker bar counter-clockwise to remove lockring.
6. Remove lockring. The module will spring up slightly when lockring is removed.
7. Remove module from fuel tank. Be careful not to bend float arm while removing.

INSTALLATION

FUEL PUMP MODULE

CAUTION: Whenever the fuel pump module is serviced, the rubber seal (gasket) must be replaced.

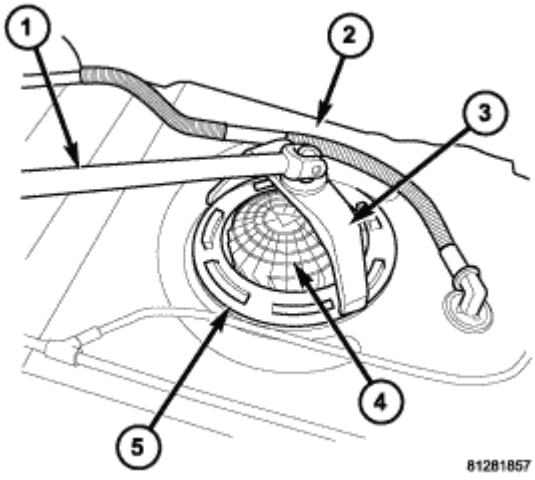

Fig. 22: Identifying Drive Breaker, Lockring Remover/Installer 9340 & Lockring
Courtesy of CHRYSLER LLC

1. Using a new seal (gasket), position fuel pump module into opening in fuel tank.
2. Position lockring (5) over top of fuel pump module.
3. Rotate module until embossed alignment arrow points to center alignment mark. This step must be performed to prevent float from contacting side of fuel tank.
4. Install Lockring Remover/Installer 9340 (3) to lockring.
5. Install 1/2 inch drive breaker (1) into Lockring Remover/Installer 9340 (3).
6. Tighten lockring (clockwise) until all seven notches have engaged.
7. Install fuel tank.

RAIL-FUEL

REMOVAL

REMOVAL - 3.7L

WARNING: The fuel system is under constant pressure even with engine off. Before servicing fuel rail, fuel system pressure must be released.

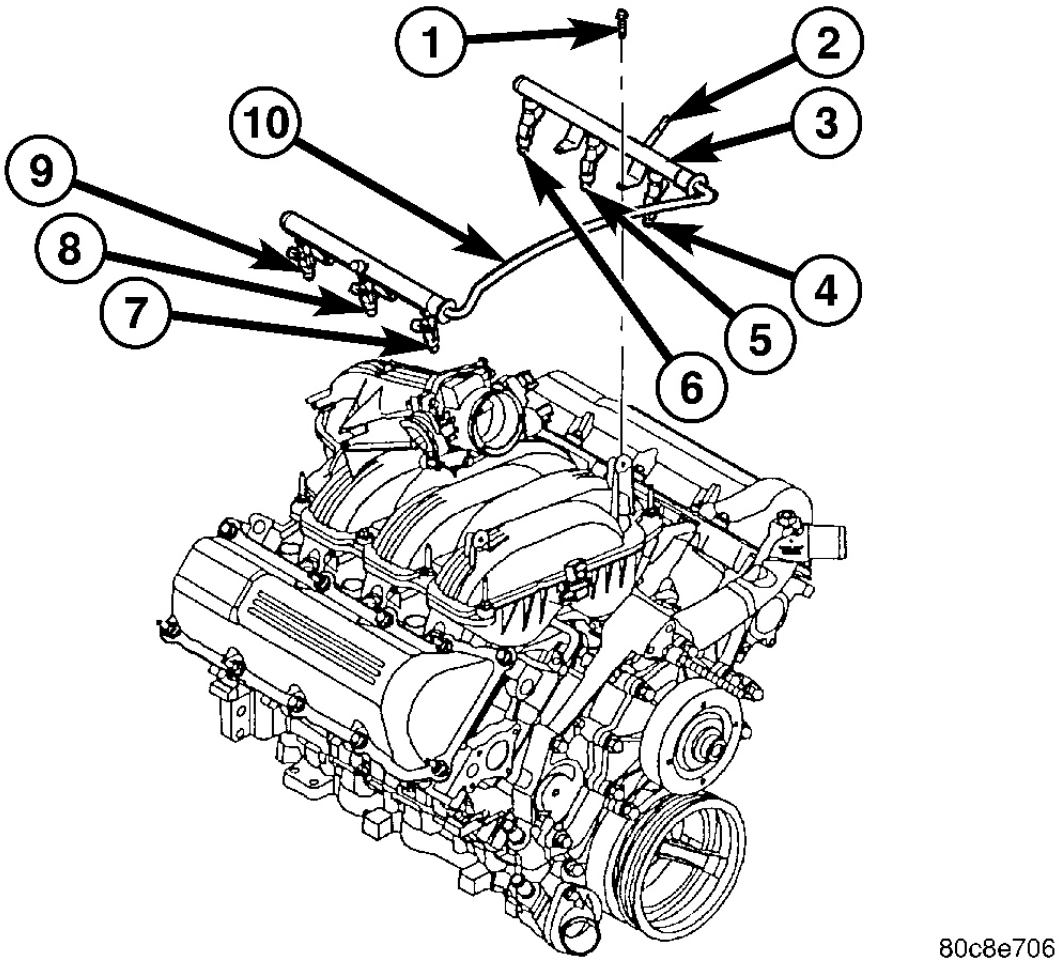

Fig. 23: Removing/Installing Fuel Rail - 3.7L
Courtesy of CHRYSLER LLC

1 - MOUNTING BOLTS (4)
2 - QUICK-CONNECT FITTING
3 - FUEL RAIL
4 - INJ. #1
5 - INJ. #3
6 - INJ. #5
7 - INJ. #2
8 - INJ. #4
9 - INJ. #6
10 - CONNECTOR TUBE

CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tube (10). Due to design of tube, it does not use any clamps. Never attempt to install a clamping device of any kind to tube. When removing fuel rail assembly for any reason, be careful not to bend or kink tube.

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure. See **STANDARD PROCEDURE**.
3. Remove negative battery cable at battery.
4. Remove air duct at throttle body air box.
5. Remove air box at throttle body.
6. Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. See **STANDARD PROCEDURE**.
7. Remove necessary vacuum/vapor lines at throttle body.

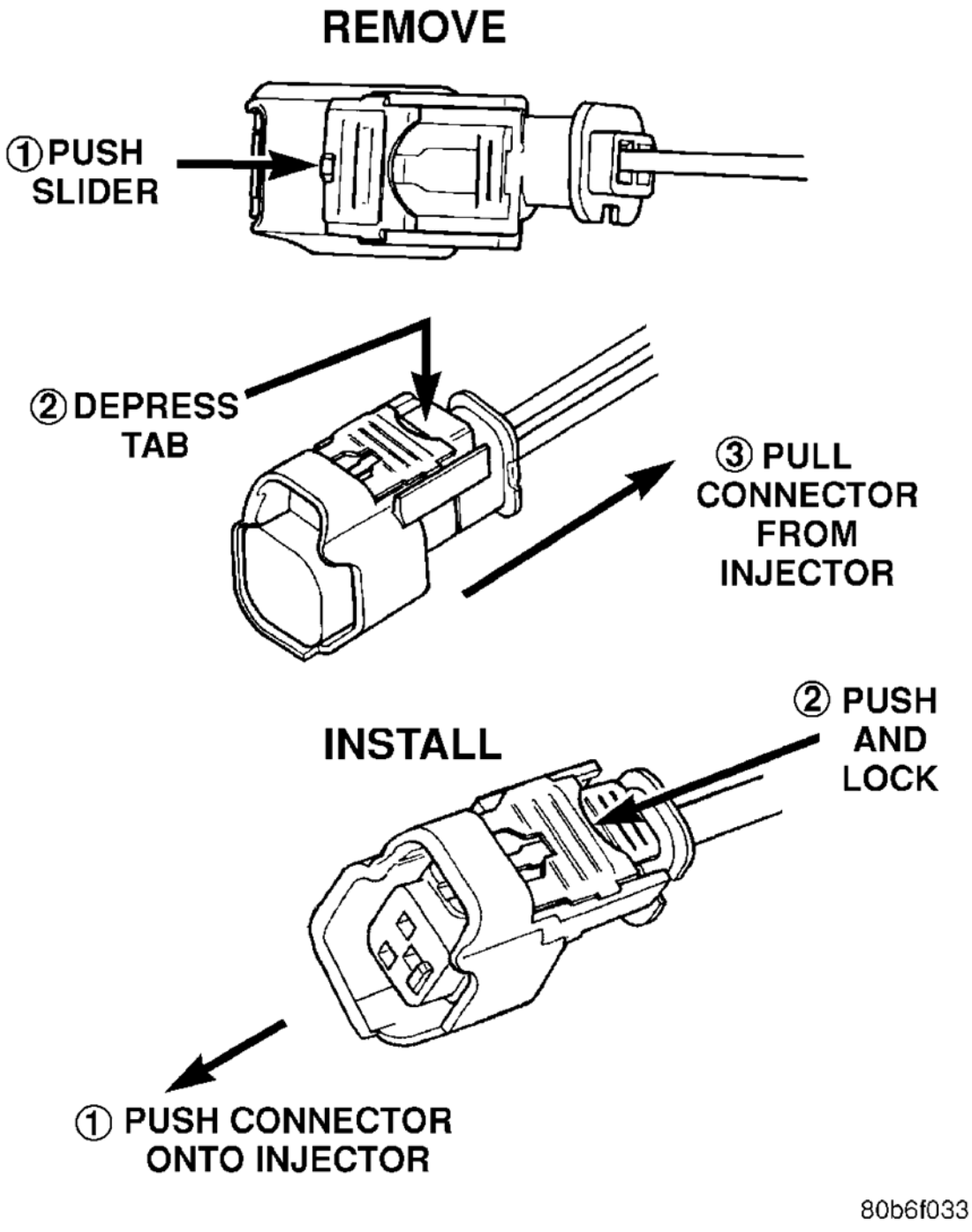

Fig. 24: Removing/Installing Fuel Injectors Electrical Connectors
Courtesy of CHRYSLER LLC

8. Disconnect electrical connectors at all 6 fuel injectors. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.

9. Disconnect electrical connectors at throttle body sensors.
10. Remove 6 ignition coils. Refer to **REMOVAL** .

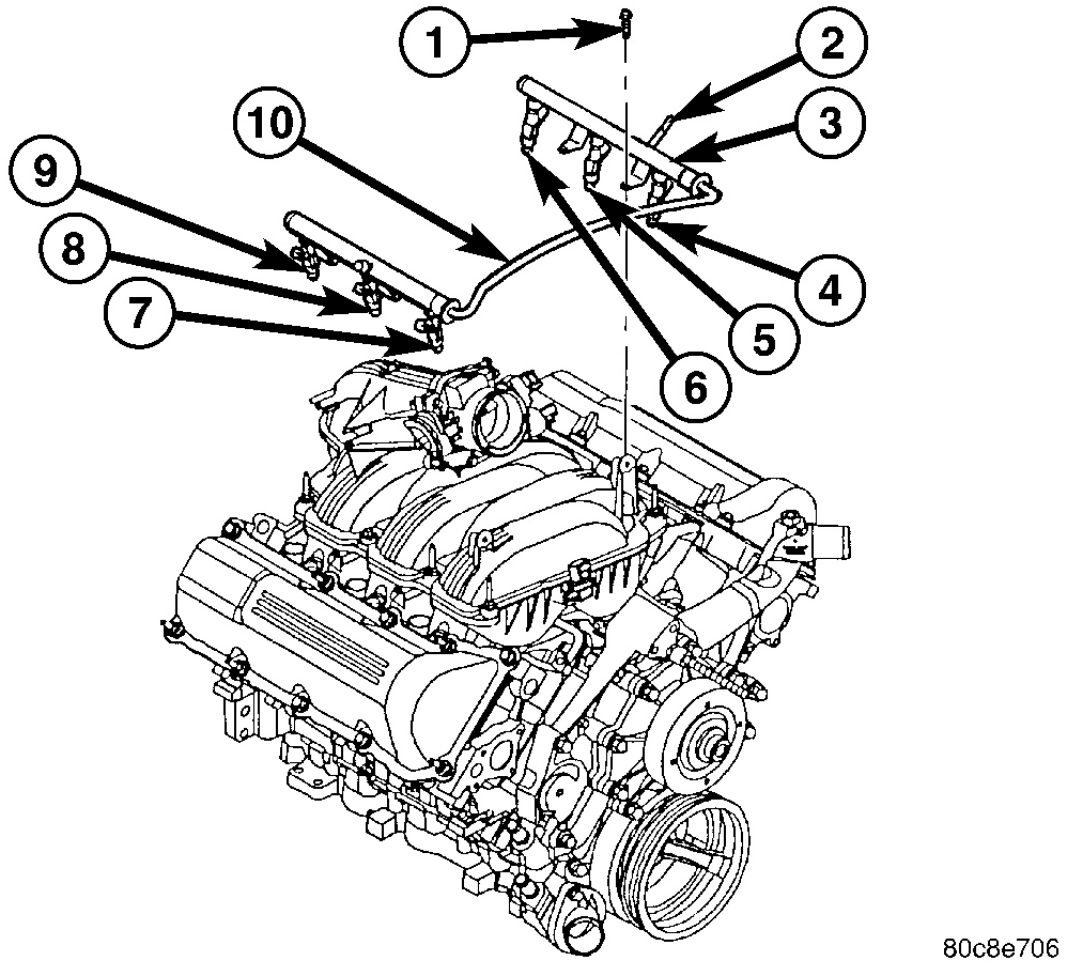

Fig. 25: Removing/Installing Fuel Rail - 3.7L
Courtesy of CHRYSLER LLC

1 - MOUNTING BOLTS (4)
2 - QUICK-CONNECT FITTING
3 - FUEL RAIL
4 - INJ. #1
5 - INJ. #3
6 - INJ. #5
7 - INJ. #2
8 - INJ. #4

9 - INJ. #6 10 - CONNECTOR TUBE

11. Remove four fuel rail mounting bolts (1).
12. Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in cylinder head. Gently rock and pull **right** side of rail until injectors just start to clear cylinder head holes. Repeat this procedure (left/right) until all injectors have cleared cylinder head holes.
13. Remove fuel rail (with injectors attached) from engine.
14. If fuel injectors are to be removed, see **REMOVAL**.

REMOVAL

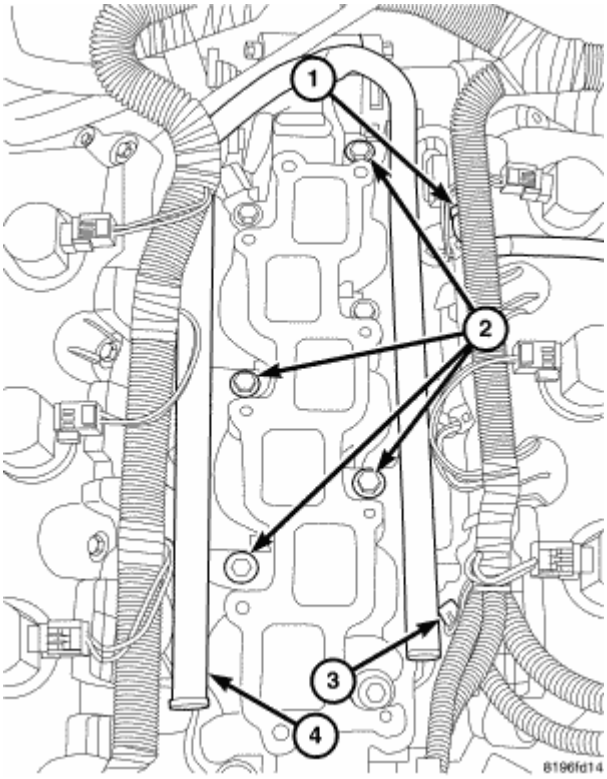

Fig. 26: Identifying Fuel Line, Mounting Bolts, Electrical Connectors & Fuel Rail
Courtesy of CHRYSLER LLC

WARNING: The fuel system is under constant pressure even with engine off. Before servicing fuel rail, fuel system pressure must be released.

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure.
3. Remove negative battery cable at battery.
4. Disconnect air duct at throttle body.

5. Remove air intake ducts between throttle body and air filter assembly.
6. Remove upper half of intake manifold.
7. Disconnect electrical connectors (3) at all six fuel injectors. For procedures, proceed to step 10.
8. Disconnect fuel line latch clip and fuel line (1) at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to **FITTING-QUICK CONNECT** for removal procedures.
9. Remove necessary vacuum/vapor lines at throttle body.

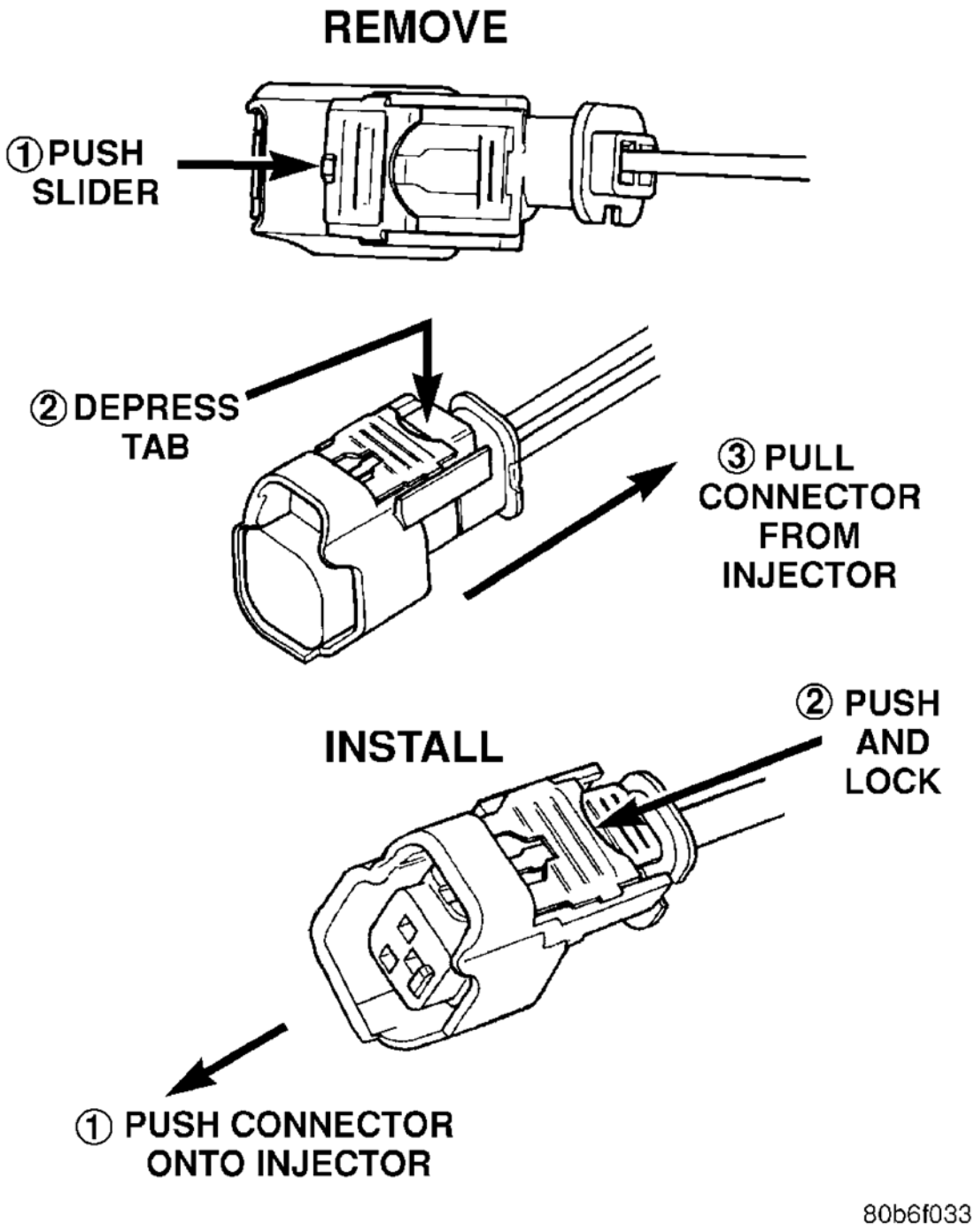

Fig. 27: Removing/Installing Fuel Injectors Electrical Connectors
Courtesy of CHRYSLER LLC

10. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.

11. Disconnect electrical connectors at throttle body sensors.

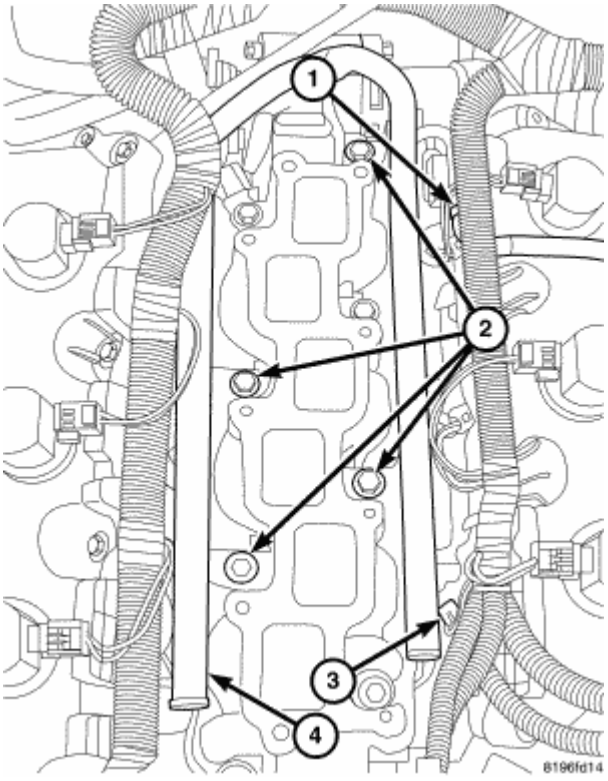

Fig. 28: Identifying Fuel Line, Mounting Bolts, Electrical Connectors & Fuel Rail
Courtesy of CHRYSLER LLC

12. Remove four fuel rail mounting bolts (2).
13. Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in cylinder head. Gently rock and pull **right** side of rail until injectors just start to clear cylinder head holes. Repeat this procedure (left/right) until all injectors have cleared cylinder head holes.
14. Remove fuel rail (with injectors attached) from engine.
15. If fuel injectors are to be removed, refer to Fuel Injector **REMOVAL**.

INSTALLATION

FUEL RAIL

1. If fuel injectors are to be installed, refer to **INSTALLATION** .
2. Clean out fuel injector machined bores in intake manifold.
3. Apply a small amount of engine oil to each fuel injector O-ring. This will help in fuel rail installation.
4. Position fuel rail/fuel injector assembly to machined injector openings in cylinder head.
5. Guide each injector into cylinder head. Be careful not to tear injector O-rings.
6. Push **right** side of fuel rail down until fuel injectors have bottomed on cylinder head shoulder. Push **left** fuel rail down until injectors have bottomed on cylinder head shoulder.

7. Install four fuel rail mounting bolts and tighten to 11 N.m (100 in. lbs.).
8. Install six ignition coils. Refer to **INSTALLATION** .
9. Connect electrical connectors to throttle body.

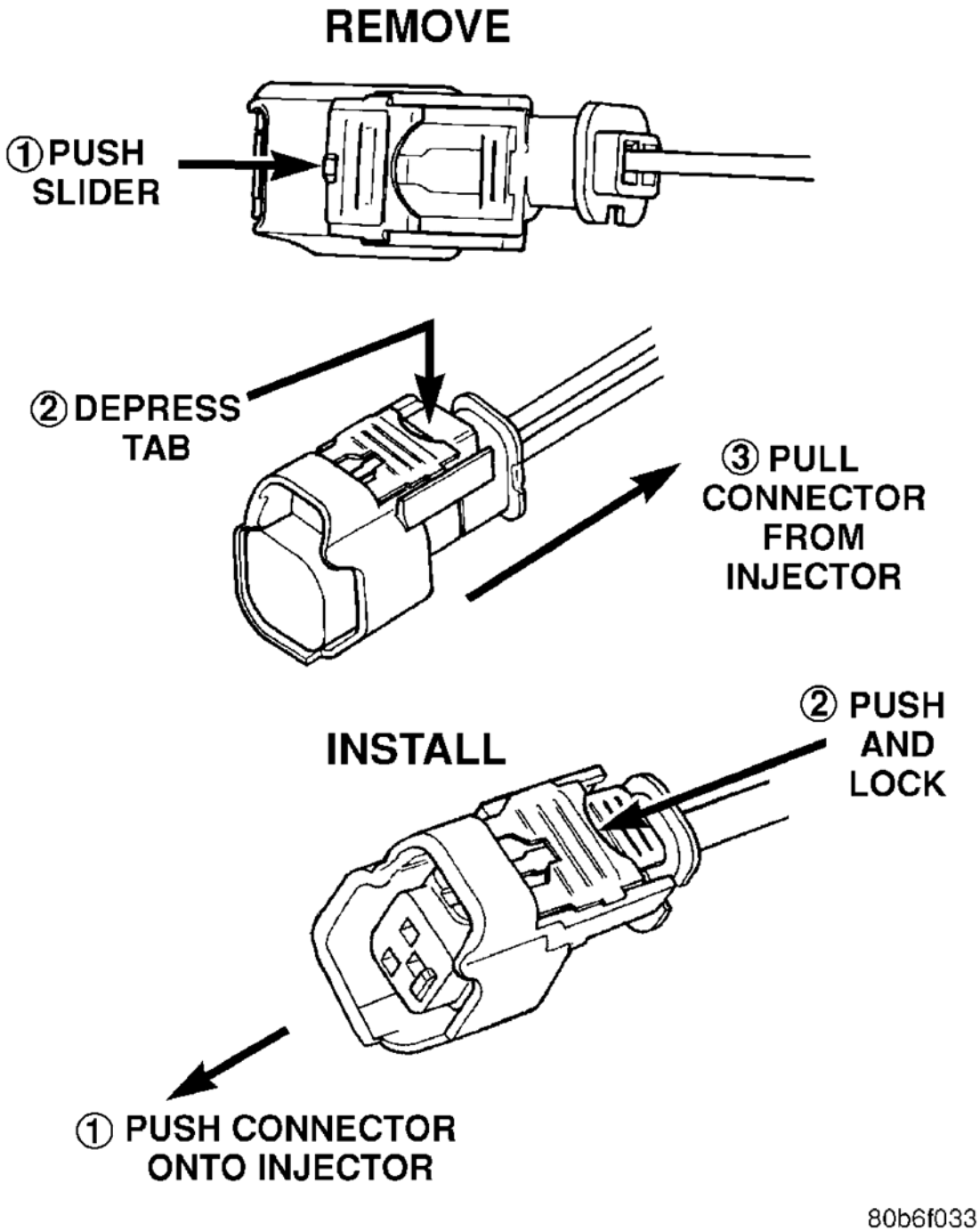

Fig. 29: Removing/Installing Fuel Injectors Electrical Connectors
Courtesy of CHRYSLER LLC

10. Connect electrical connectors at all fuel injectors. Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.
11. Connect necessary vacuum/vapor lines to throttle body.
12. Connect fuel line latch clip and fuel line to fuel rail.
13. Install air box to throttle body.
14. Install air duct to air box.
15. Connect battery cable to battery.
16. Start engine and check for leaks.

INSTALLATION

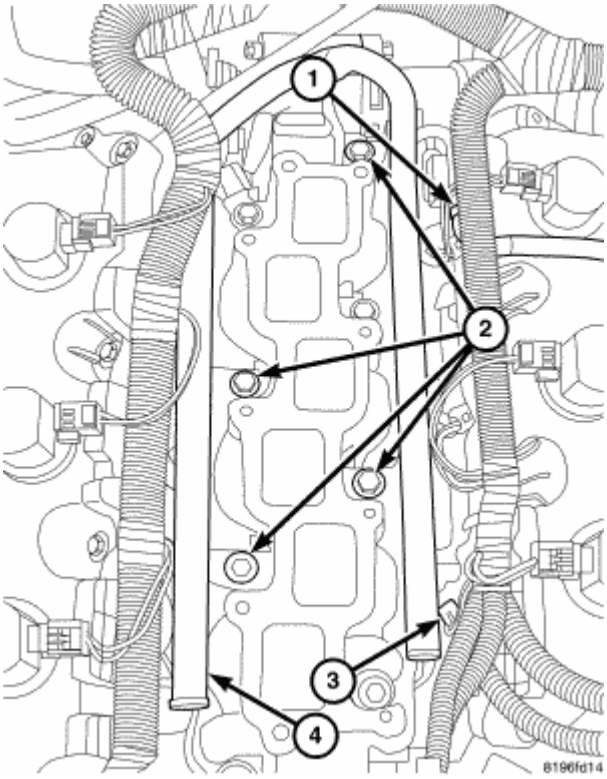

Fig. 30: Identifying Fuel Line, Mounting Bolts, Electrical Connectors & Fuel Rail
Courtesy of CHRYSLER LLC

1. If fuel injectors are to be installed, refer to Fuel Injector **INSTALLATION**.
2. Clean out fuel injector machined bores in intake manifold.
3. Apply a small amount of engine oil to each fuel injector O-ring. This will help in fuel rail installation.
4. Position fuel rail/fuel injector assembly to machined injector openings in cylinder head.
5. Guide each injector into cylinder head. Be careful not to tear injector O-rings.
6. Push **right** side of fuel rail down until fuel injectors have bottomed on cylinder head shoulder. Push **left** fuel rail down until injectors have bottomed on cylinder head shoulder.
7. Install four fuel rail mounting bolts (2) and tighten to 11 N.m (100 in. lbs.).

8. Connect electrical connectors (3) at all fuel injectors. Push connector onto injector and then push and lock red colored slider. Verify connector is locked to injector by lightly tugging on connector.
9. Install upper half of intake manifold.
10. Connect electrical connectors to throttle body.
11. Connect fuel line latch clip and fuel line (1) to fuel rail.
12. Connect necessary vacuum/vapor lines to throttle body.
13. Install air intake ducts to throttle body and air filter.
14. Install fuel tank filler tube cap.
15. Connect battery cable to battery.
16. Start engine and check for leaks.

TANK - FUEL

REMOVAL

REMOVAL

WARNING: The fuel system is under constant pressure even with engine off. Before servicing fuel rail, fuel system pressure must be released.

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure.
3. Raise and support vehicle.

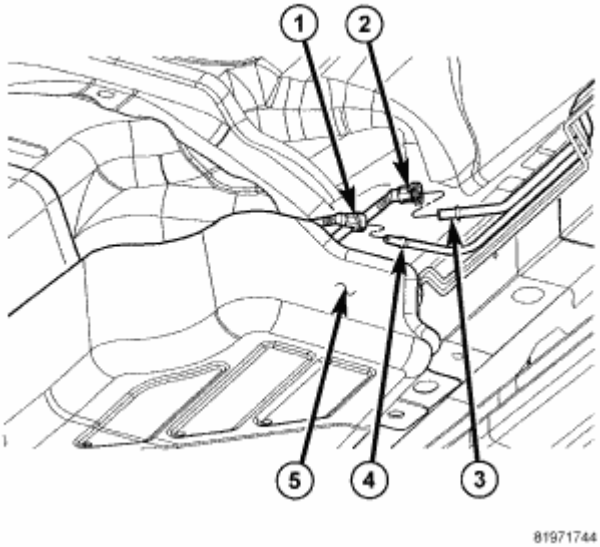

Fig. 31: Disconnecting/Connecting Fuel Line Quick Connect Fittings And At Front Of Fuel Tank
Courtesy of CHRYSLER LLC

4. Disconnect fuel line quick connect fittings (1) and (2) at front of fuel tank (5).

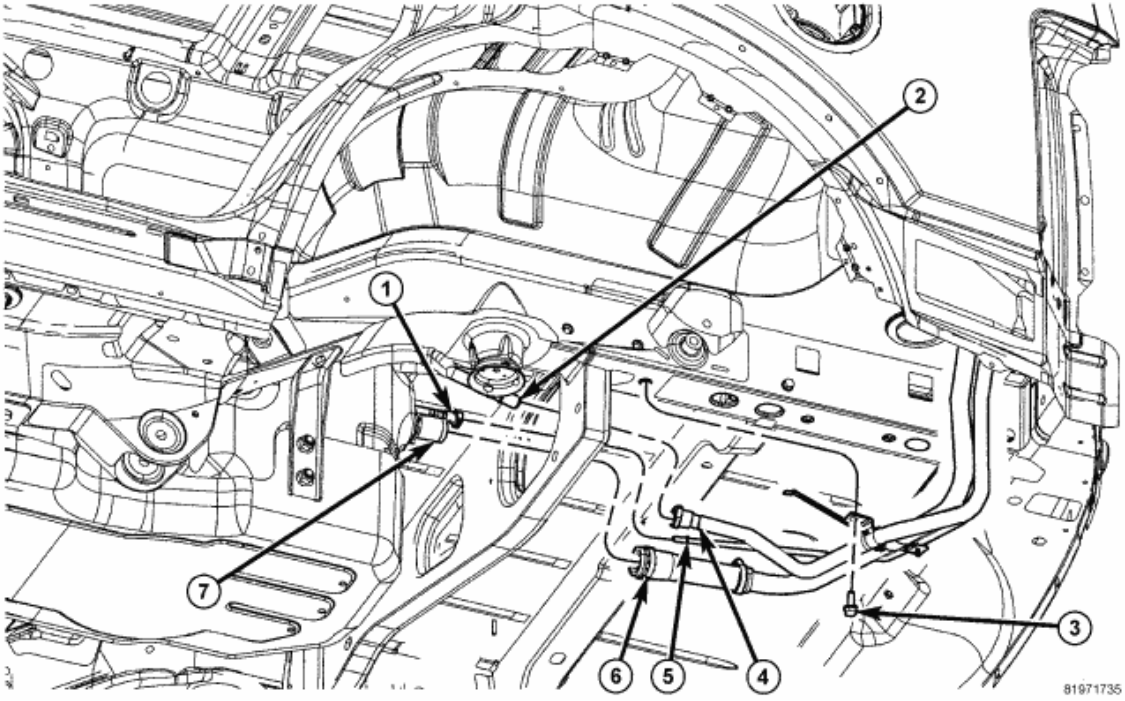

Fig. 32: Disconnecting/Connecting Vapor Lines And At Rear Of Tank & Fuel Fill Hose And Clamp At Rear Of Tank
Courtesy of CHRYSLER LLC

5. Remove fuel fill hose and clamp (6) at rear of tank.
6. Position a drain hose into the fuel fill hose opening. Note that a small flapper valve is installed into the opening.
7. Disconnect vapor lines (4) and (5) at rear of tank.
8. Remove rear propshaft.
9. Support tank with a hydraulic jack.

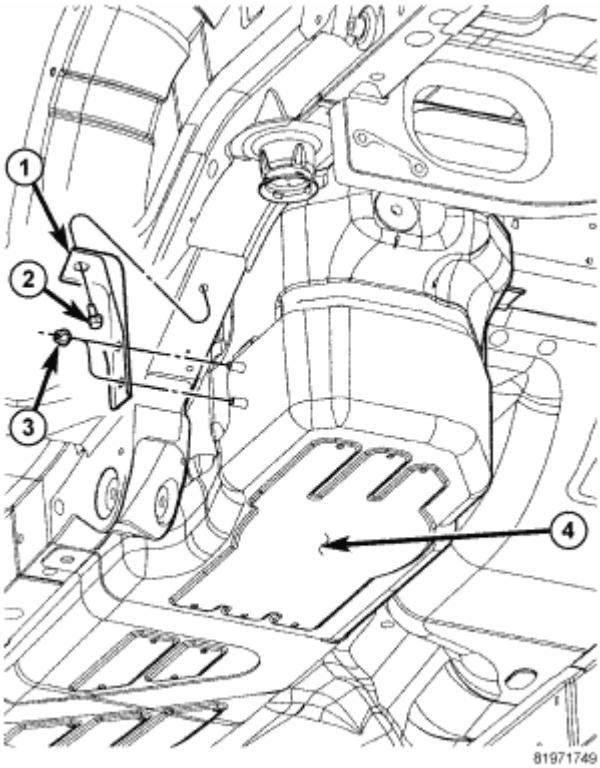

Fig. 33: Tank Support Bracket, Bolt & Nuts
Courtesy of CHRYSLER LLC

10. Loosen two nuts (3) at tank support bracket (1).
11. Remove bolt (2) from tank support bracket (1).

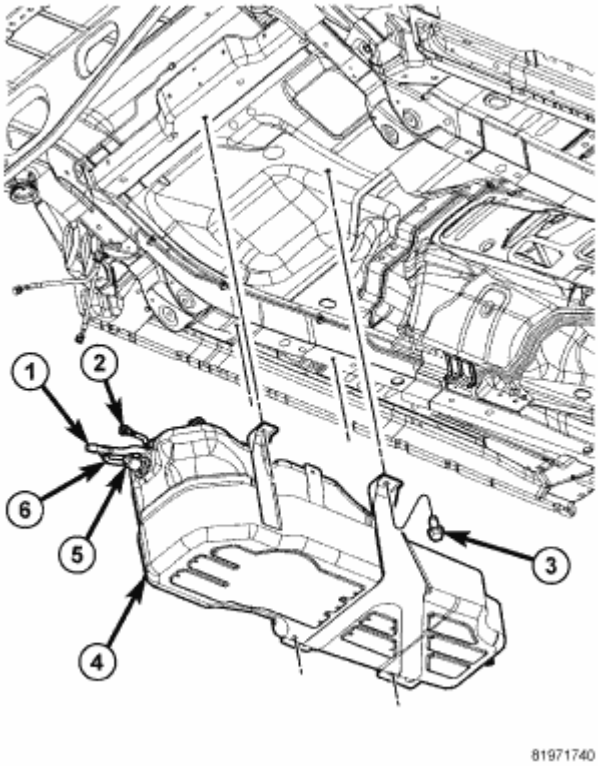

Fig. 34: Removing/Installing Fuel Tank
Courtesy of CHRYSLER LLC

12. Remove tank mounting bolts (3) at both sides of tank.
13. Partially lower tank to gain access to pump module electrical connector.
14. Disconnect electrical connector at fuel pump module.
15. Continue lowering tank for removal.
16. If fuel tank is to be replaced, remove fuel pump module from tank.

INSTALLATION

INSTALLATION

1. If fuel pump module is to be installed, install module to tank.
2. Place tank to a hydraulic jack and raise just enough to connect fuel pump module electrical connector.
3. Continue raising tank until snug to body.

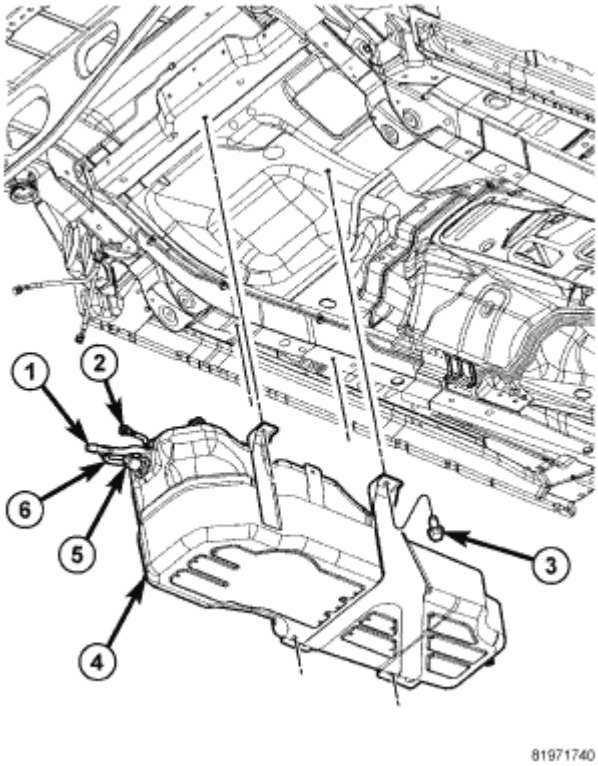

Fig. 35: Removing/Installing Fuel Tank
Courtesy of CHRYSLER LLC

4. Install tank mounting bolts (3) at both sides of tank. Tighten to 61 N.m (45 ft. lbs.).

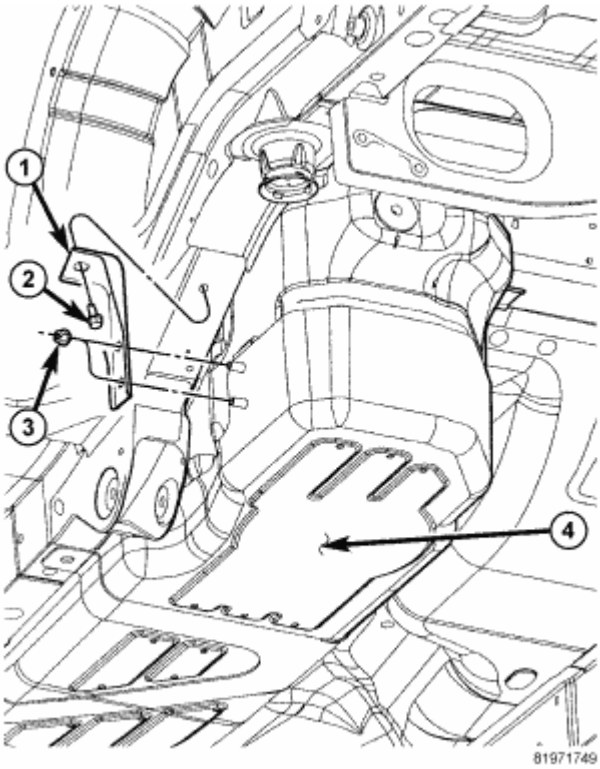

Fig. 36: Tank Support Bracket, Bolt & Nuts
Courtesy of CHRYSLER LLC

5. Tighten two nuts (3) at tank support bracket (1) to 61 N.m (45 ft. lbs.).
6. Install bolt (2). Tighten to 61 N.m (45 ft. lbs.).
7. Install rear propshaft.

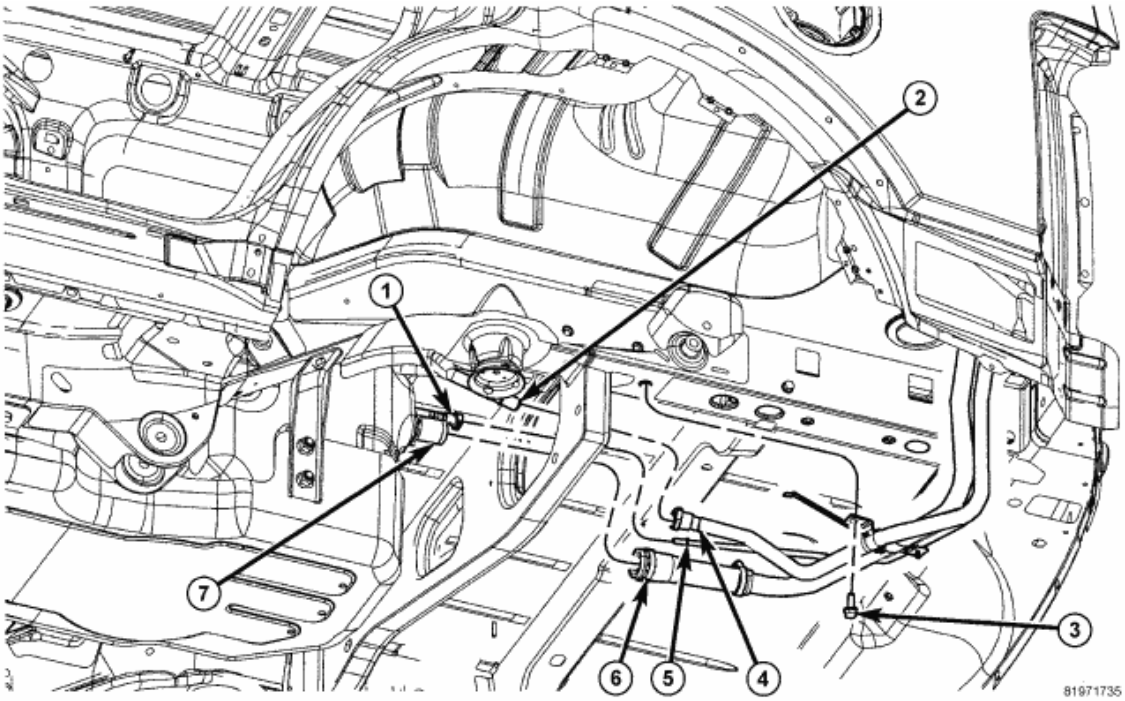

Fig. 37: Disconnecting/Connecting Vapor Lines And At Rear Of Tank & Fuel Fill Hose And Clamp At Rear Of Tank
Courtesy of CHRYSLER LLC

8. Connect vapor lines (4) and (5) at rear of tank.
9. Connect fuel fill hose and clamp (6) at rear of tank.

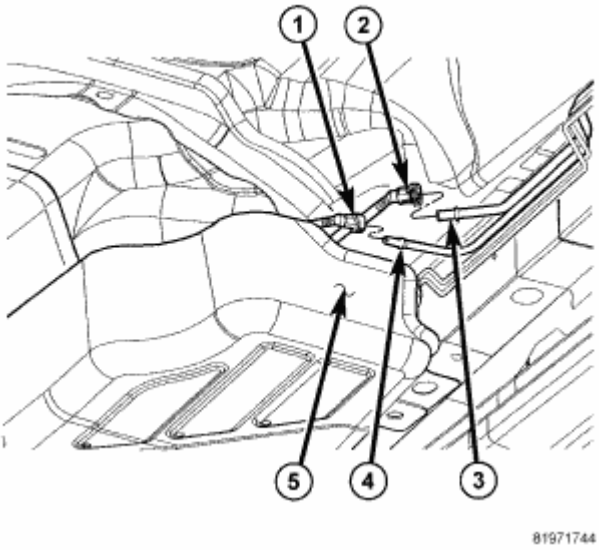

Fig. 38: Disconnecting Fuel Line Quick Connect Fittings And At Front Of Fuel Tank
Courtesy of CHRYSLER LLC

10. Connect fuel line quick connect fittings (1) and (2) at front of fuel tank (5).
11. Lower vehicle, fill tank with fuel and install fuel fill cap.
12. Check for fuel leaks.

FUEL DELIVERY - 2.8L DIESEL

WARNING

HIGH FUEL SYSTEM PRESSURE

WARNING: High-pressure fuel lines deliver fuel under extreme pressure from the injection pump to the injectors. This may be as high as 1600bar (23,200psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

DIAGNOSIS AND TESTING

FUEL SUPPLY RESTRICTIONS

LOW-PRESSURE LINES

Fuel supply line restrictions or a restricted fuel filter can cause starting problems and prevent engine from accelerating. The starting problems include; no start, longer cranking times, low power and/or white fog like exhaust.

Inspect all fuel supply lines for restrictions or blockage, including the fuel filter. Flush or replace as necessary.

HIGH-PRESSURE LINES

CAUTION: High-pressure lines cannot contact each other or other components. Do not attempt to weld high-pressure fuel lines or to repair lines that are damaged. High-pressure lines can be reused only after close inspection for cracks or deformation around the sealing cone. Corroded pipes must be replaced. Use only recommended lines when replacement of high-pressure fuel line is necessary.

NOTE: High-pressure fuel lines must be replaced at each disassembly.

Restricted (kinked or bent) high-pressure lines can cause starting problems, poor engine performance, engine mis-fire and white smoke from exhaust.

TESTING FUEL INJECTORS

NOTE: The fuel pump pressure must be between 0.8 and 1.2 bar (13-17 psi), and engine must be at operating temperature, engine coolant 88°C (190°F).

1. Refer to **WARNING**. Run engine until operating temperature is obtained.
2. Turn Off the ignition.
3. Disconnect the fuel injector fuel return hose (3) at the return hose tee directly behind the generator, next to the air purge fitting, leaving the return hose to the high pressure injection pump connected to the pump (1).

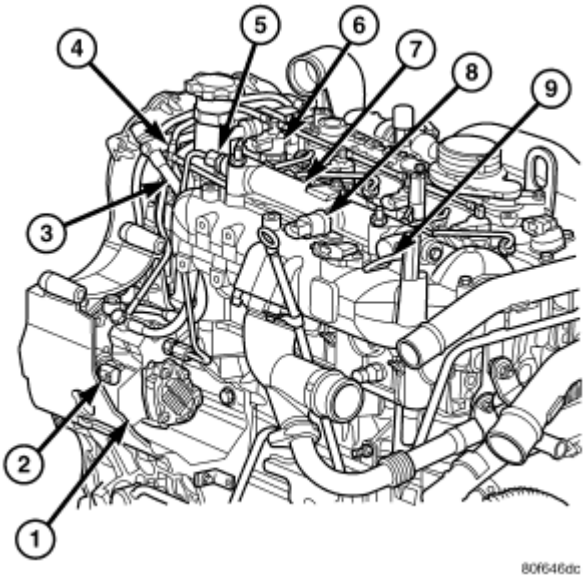

Fig. 39: Diesel Fuel System Components
Courtesy of CHRYSLER LLC

1 - HIGH PRESSURE FUEL INJECTION PUMP
2 - FUEL PRESSURE SOLENOID
3 - AIR PURGE FITTING
4 - FUEL INJECTOR FUEL RETURN HOSE TEE
5 - HIGH PRESSURE FUEL SUPPLY LINE
6 - FUEL INJECTOR
7 - FUEL RAIL
8 - FUEL RAIL PRESSURE SENSOR
9 - FUEL RAIL RETURN LINE

4. Block off fuel return line (3) to high pressure injection pump.
5. Connect a hose to the return hose tee and place it in a suitable container.
6. Start the engine and use a suitable measuring cup to measure the return fuel flow for 1 minute at idle.

NOTE: If the quantity of fuel is above 100ml. it means one or more of the fuel

injectors has a problem.

7. If the measured return fuel flow quantity is above 100ml, disconnect each individual injector and measure the quantity of return fuel into the container.

NOTE: Make sure to block off the fuel return hose at each individual fuel injector before taking a measurement.

8. Replace any fuel injector that has a return rate above 25ml. for one minute at idle. See **REMOVAL**.
9. If the test does not give a positive result, disconnect the fuel return line at the fuel rail. If fuel is present, replace the fuel rail. See **REMOVAL**.
10. Perform the fuel system air purge procedure after replacing any components. See **STANDARD PROCEDURE**.

HIGH PRESSURE LEAKS

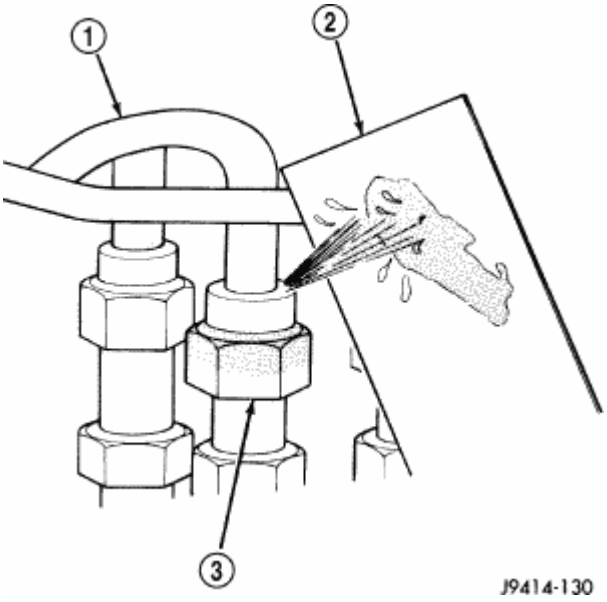

Fig. 40: Typical Test For Fuel Leak
Courtesy of CHRYSLER LLC

1 - HIGH-PRESSURE LINE
2 - CARDBOARD
3 - FITTING

WARNING: High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 160,000 kpa (23,206 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet

of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

High-pressure fuel leaks can cause starting problems and poor engine performance.

Carefully place a piece of cardboard (2) over the high-pressure fuel lines or suspected area. Move your body and hands away from the area. Start the engine and run till warm. **TURN THE ENGINE OFF** . Inspect the piece of cardboard for witness marks. If a high-pressure line connection is leaking, replace damaged, restricted or leaking high-pressure fuel lines with the correct replacement line.

CAUTION: The high-pressure fuel lines cannot contact each other or other components. Do not attempt to weld high-pressure fuel lines or to repair lines that are damaged. Only use the recommended lines when replacement of high-pressure fuel line is necessary.

STANDARD PROCEDURE

STANDARD PROCEDURE - DRAINING FUEL TANK

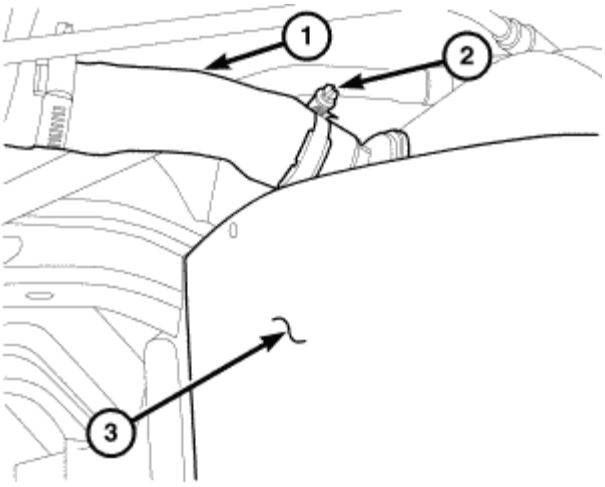

Fig. 41: Identifying Fuel Fill Hose, Fuel Fill Hose Clamp & Tank
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove fuel fill cap.
3. Raise and support vehicle.
4. Remove fuel fill hose clamp (2) at rear of tank (3).
5. Remove fuel fill hose (1) from fuel tank.
6. Position a drain hose into the fuel fill hose opening. Note that a small flapper valve is installed into the opening.
7. Drain fuel tank using an approved gasoline, or diesel fuel draining station.

CLEANING FUEL SYSTEM COMPONENTS

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines, fuel rail, and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. DO NOT wire brush injector nozzles when cleaning. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

SPECIFICATIONS

TORQUE SPECIFICATIONS-2.8L DIESEL

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Fuel Filter Housing Bleeder Screw	10	-	89
Crankshaft Position Sensor Bolt	11	-	97
Crankshaft Position Sensor Shield Bolt	11.8	-	104
Boost Pressure/Intake Air Temperature Sensor Bolts	11.8	-	104
Return Fuel Junction Block at Intake Manifold	10.8	-	96
Fuel Filter	18	-	159
Fuel Filter Screw to Housing	30	22	-
High Pressure Injection Pump Nuts	24.5	18	-
Fuel Line Fittings at Pump	24	17	-
Fuel Rail Sensor	35	25	-
Fuel Line Fittings at Filter Housing	35	25	-
High Pressure Injection Pump Sprocket Nut	88.3	65	-
Fuel Injector Retaining Bolts	32.4	24	-
High Pressure Fuel Lines			

at High Pressure Pump	28	20	247
Fuel Injector Fuel Lines at Fuel Rail	5	-	44
	PLUS 75° TURN		
High Pressure Fuel Feed Line at Fuel Rail	5	-	44
	PLUS 75° TURN		
Fuel Injector Lines at the Fuel Injectors	28	20	247
Fuel Rail Bolts	24.5	18	-
Fuel Pressure Sensor	35	26	-
Water In Fuel Sensor	1.2	-	10
Fuel Water/Separator Mounting Nuts	24.5	24	-
Fuel Line Hose Clamp	14.7	11	62
Fuel Quantity Solenoid	11	-	97
Fuel Tank Bolts	61	45	-
Fuel Filler Tube Clamp	3.5	-	30
APP Sensor	11	-	97
Fuel Pressure Solenoid Mounting Nut	Refer to **INSTALLATION** Procedure.		

SEPARATOR-FUEL FILTER/WATER

DESCRIPTION

FUEL FILTER/WATER SEPARATOR

The fuel filter/water separator assembly (8) is located on the left-rear side of the engine compartment. The assembly includes the fuel filter (7), fuel heater (1), fuel temperature sensor (5), combination water drain valve/Water-In-Fuel (WIF) sensor (6), and a quick-connect fittings attached at the side of the fuel filter canister.

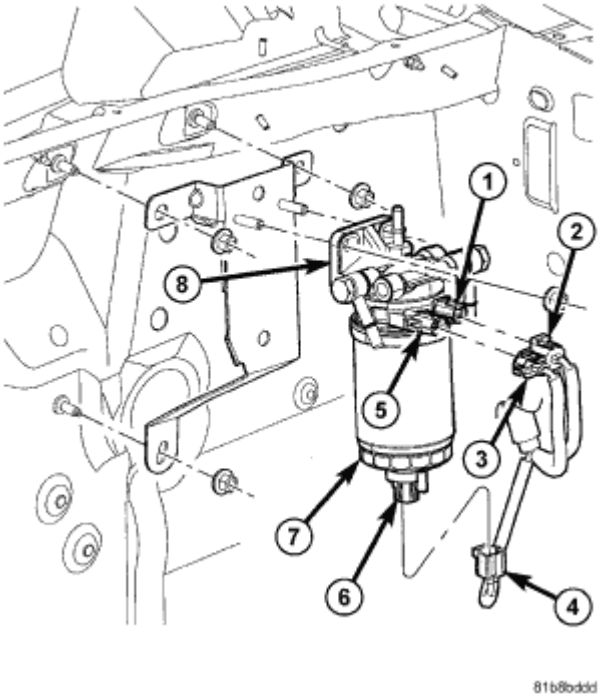

Fig. 42: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

OPERATION

FUEL FILTER/WATER SEPARATOR

The fuel filter/water separator protects the fuel injection pump by removing water and contaminants from the fuel. The construction of the filter/separator allows fuel to pass through it, but helps prevent moisture (water) from doing so. Moisture collects at the bottom of the filter.

Refer to the maintenance schedules in the owners manual for the recommended fuel filter replacement intervals.

For draining of water from canister, refer to Fuel Filter/Water Separator Removal/Installation.

A Water-In-Fuel (WIF) sensor is attached to the bottom of fuel filter element.

The fuel heater and fuel temperature sensor are installed into the side of the filter/separator housing.

REMOVAL

FUEL FILTER/WATER SEPARATOR

Refer to maintenance schedules, or the Owner's Manual for recommended fuel filter replacement intervals.

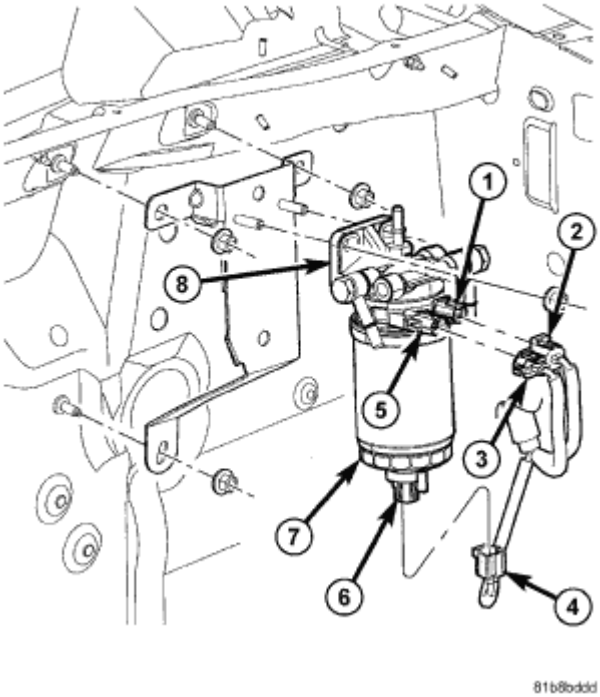

Fig. 43: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

DRAINING WATER FROM FUEL FILTER CANISTER:

The combination housing drain valve/WIF sensor (6) serves two purposes. One is to **partially** drain the filter housing of excess water. The other is to **partially** drain the housing for fuel temperature sensor, fuel filter or fuel heater element replacement.

The filter housing should be partially drained whenever the water-in-fuel warning lamp remains illuminated. (Note that lamp will be illuminated for approximately two seconds when ignition key is initially placed in ON position for a bulb check).

1. A nipple is located at the bottom of drain valve (6). Attach a drain hose to this nipple. Place drain pan under drain hose.
2. **With engine not running,** Disconnect WIF sensor electrical connector (4) then rotate drain valve (6) approximately two revolutions to open it. Leave open until all water and contaminants have been removed and clean fuel exits. Hand tighten drain valve after tightening.
3. If fuel heater element is being replaced, drain housing completely. Dispose of mixture in drain pan according to applicable regulations.
4. After draining operation, close and tighten drain valve (6).

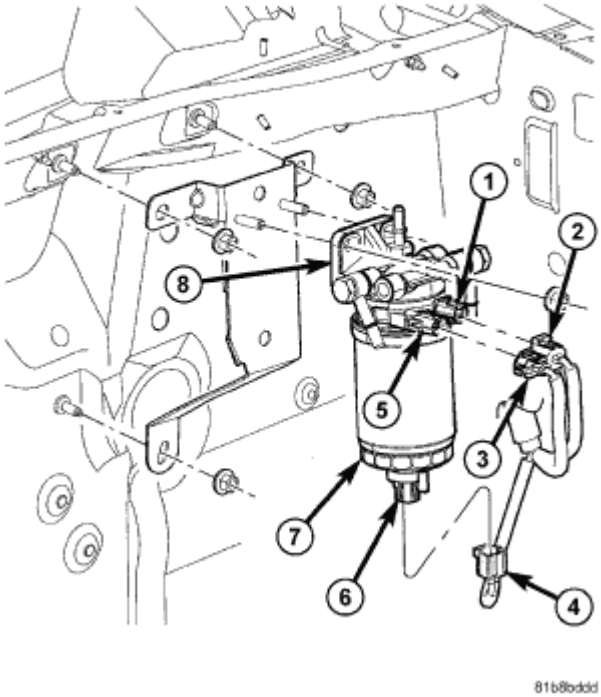

Fig. 44: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

5. **FUEL FILTER REPLACEMENT:**
6. Clean all debris from around filter canister (7) and canister head.
7. Open drain valve (6) two complete revolutions. Drain approximately 1 cup of fuel into a waste canister. Dispose of fuel according to environmental regulations.
8. Remove drain hose from drain valve (6).
9. Use an oil filter type wrench to loosen filter (7). Continue removing filter by hand.

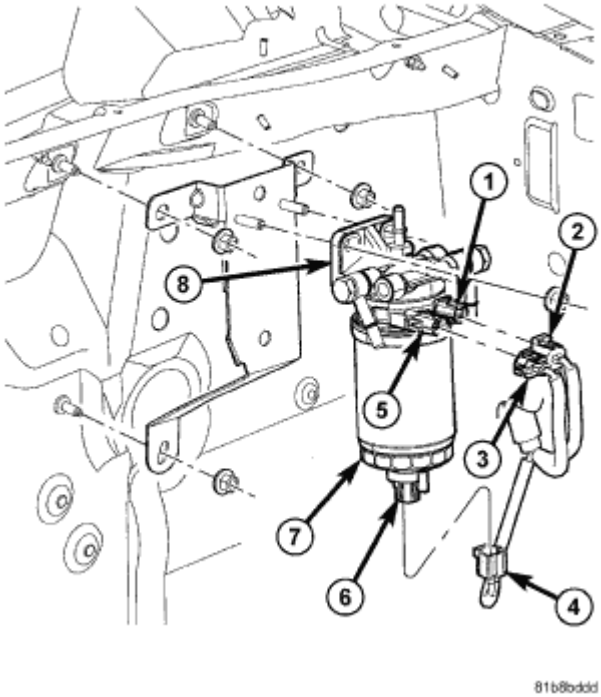

Fig. 45: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

10. **WATER-IN-FUEL (WIF) SENSOR REPLACEMENT:** The combination fuel drain valve/WIF sensor (6) is located on the bottom of the fuel filter housing.

    The WIF sensor is not a separately serviceable item. If diagnostics have led you to replace this sensor, then the whole fuel filter assembly needs to be changed.

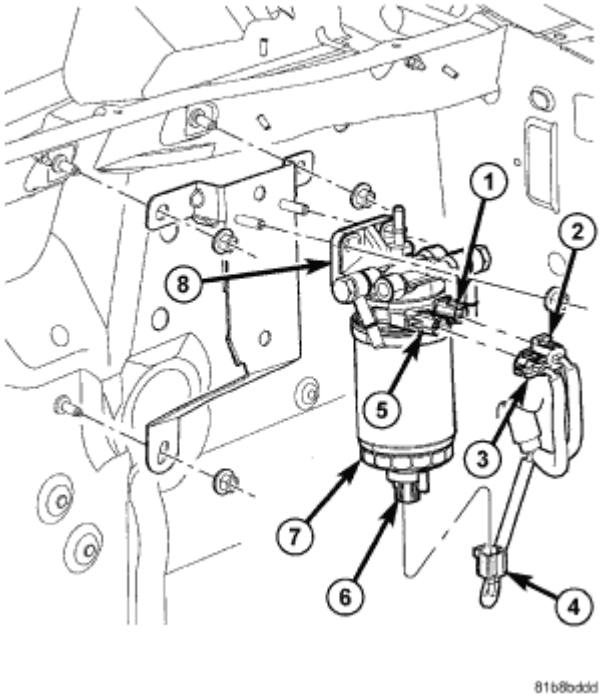

Fig. 46: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

11. **FUEL HEATER ELEMENT REPLACEMENT:** The fuel heater element (1) is located in the fuel filter housing (8). To replace heater, the entire housing assembly must be replaced.
12. Drain fuel filter. See previous steps.

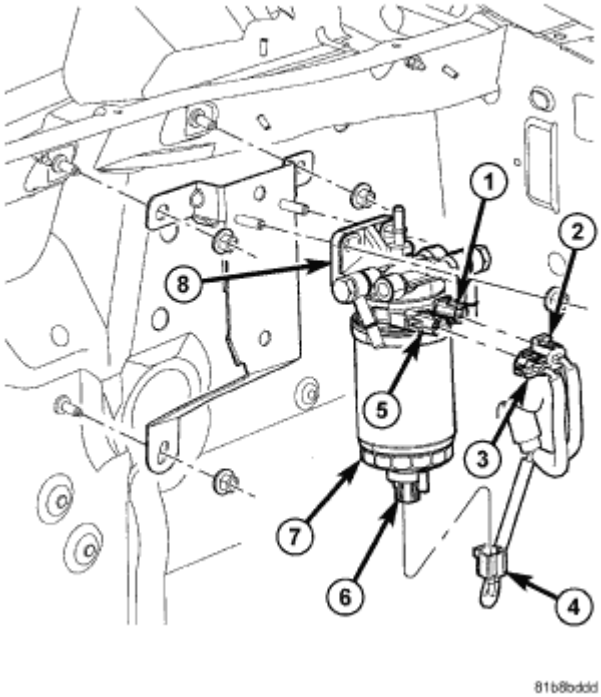

Fig. 47: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

13. Disconnect electrical connectors (2), (3) and (4).

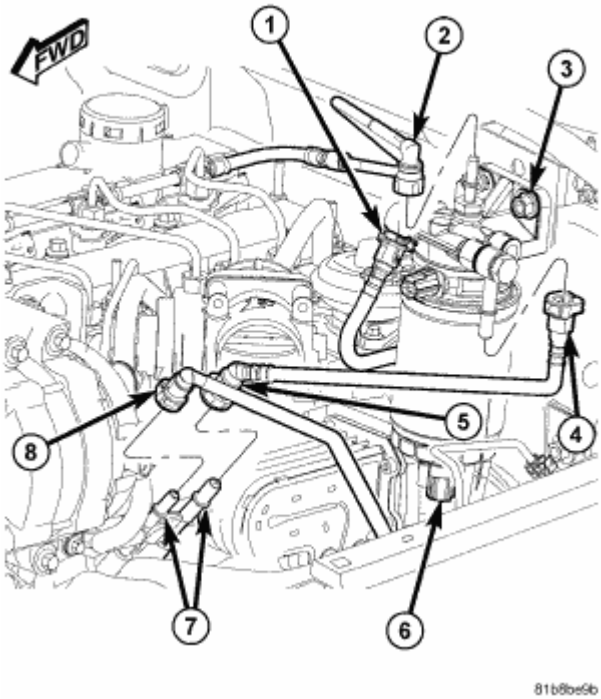

Fig. 48: Disconnecting/Connecting Quick-Connect Fittings At Housing & Removing/Installing Housing Assembly
Courtesy of CHRYSLER LLC

14. Disconnect quick-connect fittings (1), (2) and (4) at housing.
15. Remove housing mounting nuts (3).
16. Remove housing assembly.

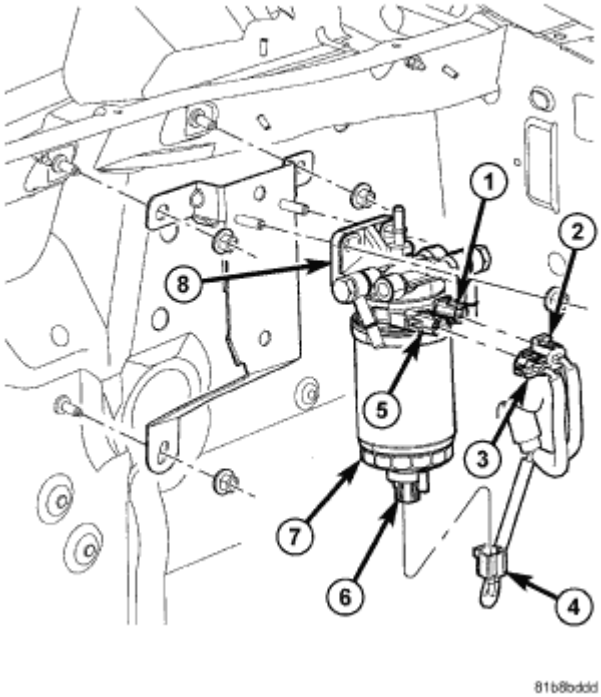

Fig. 49: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

17. **FUEL TEMPERATURE SENSOR REPLACEMENT:** The fuel temperature sensor (5) is located in the fuel filter housing (8). To replace sensor, the entire housing assembly must be replaced.
18. Drain fuel filter. See previous steps.
19. Disconnect electrical connectors (2), (3) and (4).

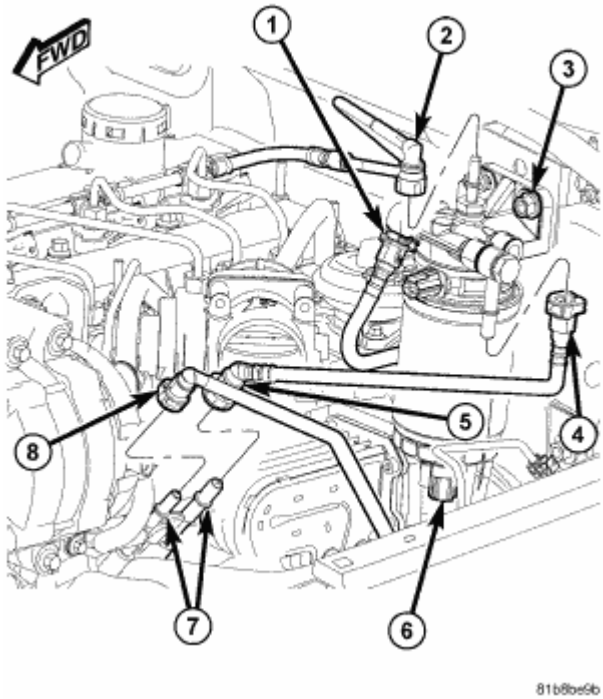

Fig. 50: Disconnecting/Connecting Quick-Connect Fittings At Housing & Removing/Installing Housing Assembly
Courtesy of CHRYSLER LLC

20. Disconnect quick-connect fittings (1), (2) and (4) at housing.
21. Remove housing mounting nuts (3).
22. Remove housing assembly.
23. **DRAIN VALVE REPLACEMENT:** The Drain Valve is located on the bottom of the fuel filter. This is not a separately serviceable item. If replacement is necessary, replace the entire filter/filter canister assembly.

INSTALLATION

FUEL FILTER/WATER SEPARATOR

Refer to maintenance schedules for recommended fuel filter replacement intervals.

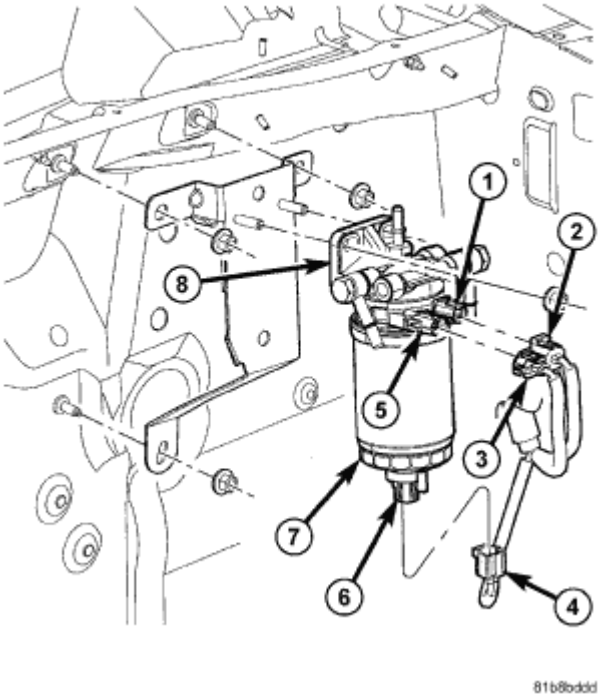

Fig. 51: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

1. **FUEL FILTER:**
2. Lubricate new fuel filter O-ring with clean engine oil.
3. Position new fuel filter/canister assembly (7) to housing.
4. Rotate fuel filter/canister assembly until it comes to a hard stop.
5. Tighten the filter element an additional half-inch of rotation.
6. Connect WIF sensor electrical connector (4).
7. Be sure drain valve (6) is tight.
8. **FUEL HEATER ELEMENT OR FUEL TEMPERATURE SENSOR:**

   Both the fuel heater element and fuel temperature sensor are attached to the fuel filter housing. To replace either of these components, the entire housing assembly must be replaced.

9. Position housing/canister assembly to body.

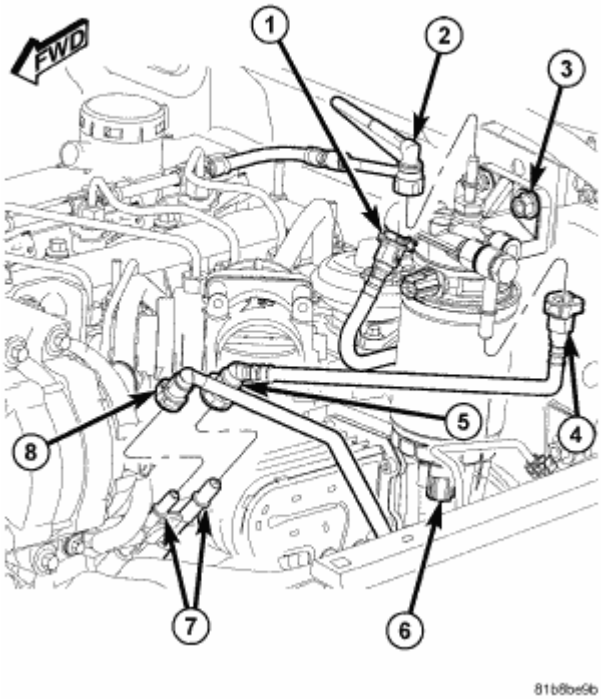

Fig. 52: Disconnecting/Connecting Quick-Connect Fittings At Housing & Removing/Installing Housing Assembly
Courtesy of CHRYSLER LLC

10. Install housing mounting nuts (3).
11. Connect quick-connect fittings (1), (2) and (4) to housing fittings.

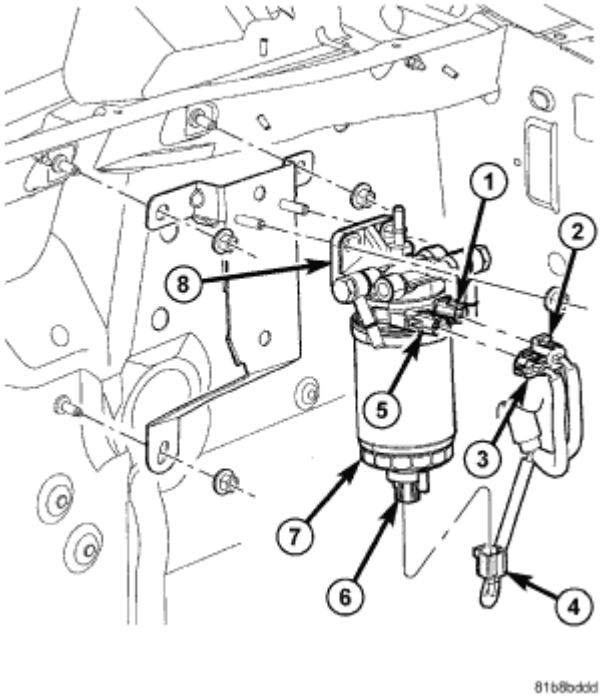

Fig. 53: Fuel Filter/Water Separator Components
Courtesy of CHRYSLER LLC

12. Connect electrical connectors (2), (3) and (4).
13. **WATER-IN-FUEL (WIF) SENSOR REPLACEMENT:** The combination fuel drain valve/WIF sensor is located on the bottom of the fuel filter housing.

    The WIF sensor is not a separately serviceable item. If diagnostics have led you to replace this sensor, then the whole fuel filter assembly needs to be changed.

SENSOR-WATER IN FUEL

DESCRIPTION

WATER-IN-FUEL (WIF) SENSOR - ECM INPUT

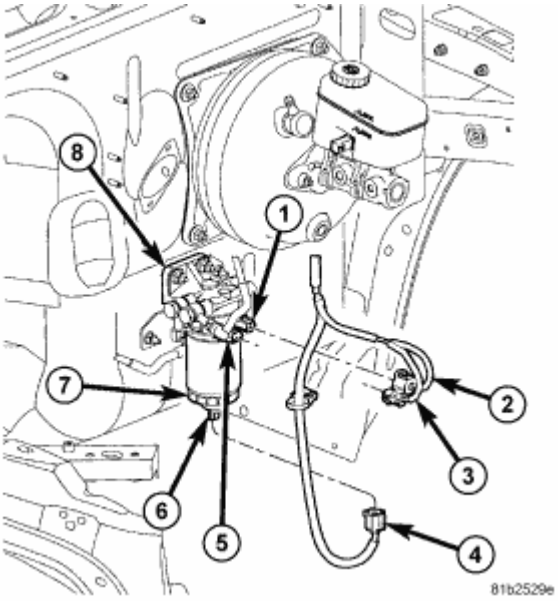

Fig. 54: Water-In-Fuel (WIF) Sensor components
Courtesy of CHRYSLER LLC

The combination drain valve/Water-In-Fuel (WIF) sensor (6) is located on the bottom of the fuel filter/water separator filter canister.

OPERATION

WATER-IN-FUEL (WIF) SENSOR - ECM INPUT

The sensor sends an input to the Engine Control Module (ECM) when it senses water in the fuel filter/water separator. As the water level in the filter/separator increases, the resistance across the WIF sensor decreases. This decrease in resistance is sent as a signal to the ECM and compared to a high water standard value. Once the value reaches 30 to 40 kilohms, the ECM will activate the water-in-fuel warning lamp through CAN bus circuits. This all takes place when the ignition key is initially put in the ON position. The ECM continues to monitor the input while the engine is running.

REMOVAL

WATER-IN-FUEL (WIF) SENSOR

The Water-In-Fuel (WIF) sensor is located at the bottom of fuel filter/water separator canister. Refer to **SEPARATOR-FUEL FILTER/WATER** for removal and installation procedures.

HEATER - FUEL

REMOVAL

WATER-IN-FUEL (WIF) SENSOR

The fuel heater is located in the fuel filter/water separator canister housing. Refer to **SEPARATOR-FUEL**

FILTER/WATER for removal and installation procedures.

RELAY - FUEL HEATER

REMOVAL

REMOVAL

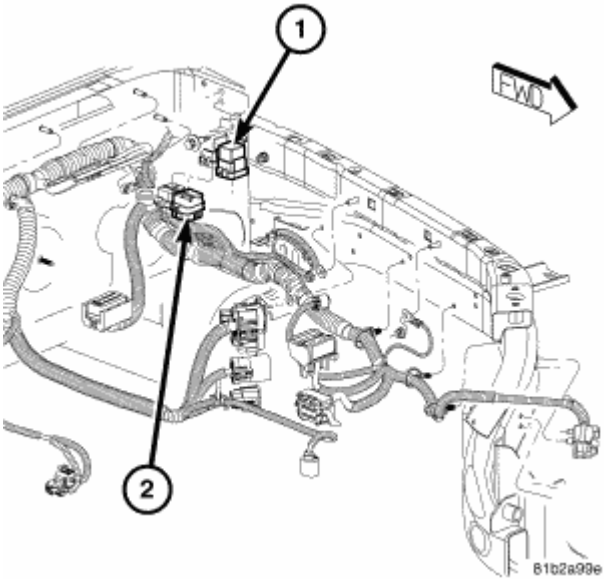

Fig. 55: Identifying Fuel Heater Relay & Electrical Connector
Courtesy of CHRYSLER LLC

The fuel heater relay (1) is located in the left/rear of the engine compartment.

1. Disconnect negative battery cable.
2. Disconnect electrical connector (2) from relay.
3. Remove relay mounting bolt and remove relay.
4. Check condition of relay connector pins for corrosion, etc.

INSTALLATION

INSTALLATION

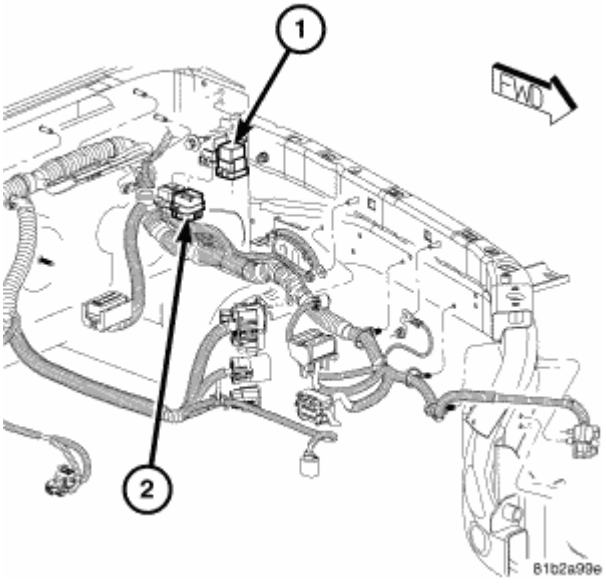

Fig. 56: Identifying Fuel Heater Relay & Electrical Connector
Courtesy of CHRYSLER LLC

The fuel heater relay (1) is located in the left/rear of the engine compartment.

1. Check condition of relay connector pins for corrosion, etc.
2. Position relay and install mounting bolt.
3. Connect electrical connector (2) to relay.
4. Connect negative battery cable to battery.

SENSOR - FUEL TEMPERATURE

REMOVAL

WATER-IN-FUEL (WIF) SENSOR

The fuel temperature sensor is located in the fuel filter/water separator canister housing. Refer to **SEPARATOR-FUEL FILTER/WATER** for removal and installation procedures.

RAIL - FUEL

REMOVAL

REMOVAL

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and

possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

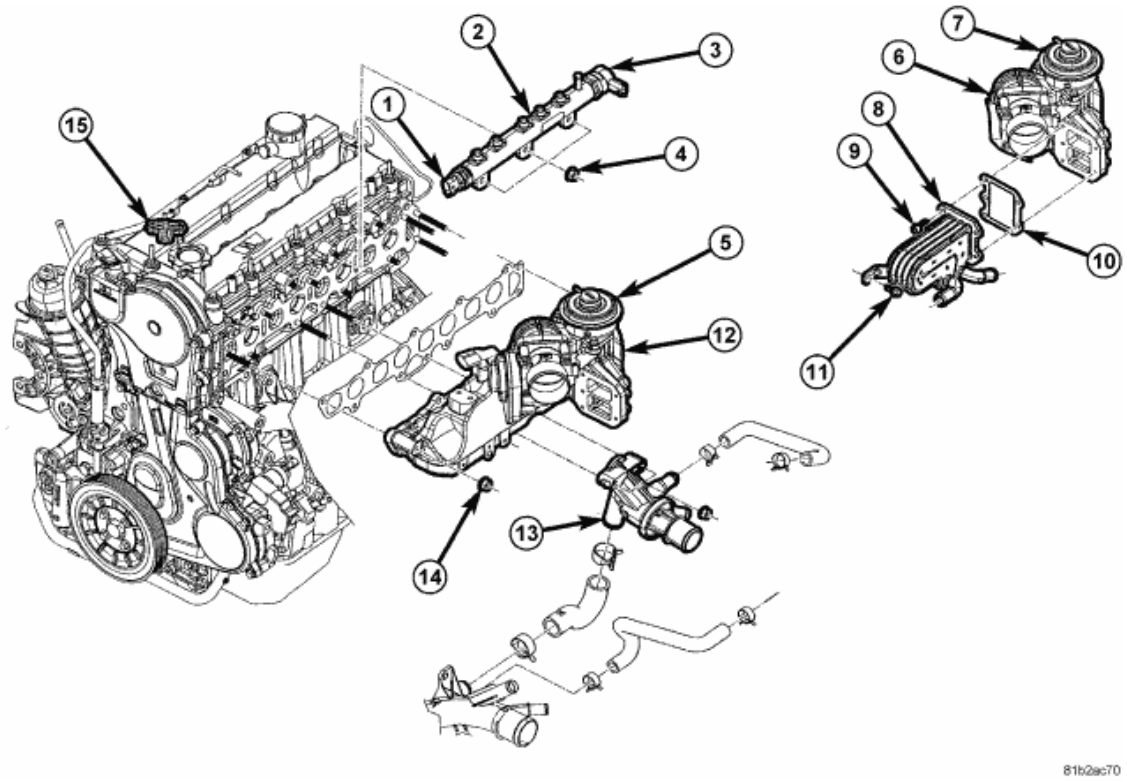

Fig. 57: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable at battery. Isolate end of cable.
2. Remove dress-up cover from top of engine.
3. Disconnect electrical connector at fuel pressure sensor (1).
4. Disconnect electrical connector at fuel pressure solenoid (3).

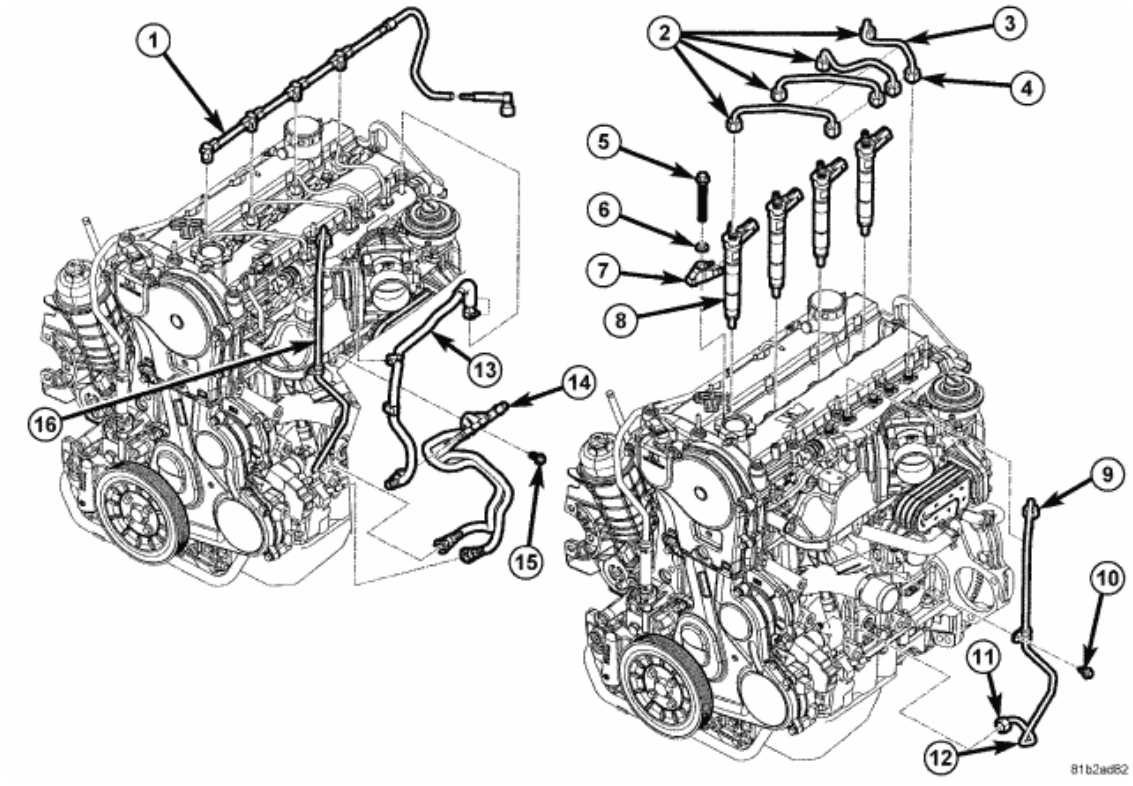

Fig. 58: Fuel Injectors - 2.8L Diesel
Courtesy of CHRYSLER LLC

CAUTION: WHEN LOOSENING OR TIGHTENING HIGH-PRESSURE LINE FITTINGS ATTACHED TO A SEPARATE FITTING, USE A BACK-UP WRENCH ON FITTING. DO NOT ALLOW FITTING TO ROTATE. DAMAGE TO BOTH FUEL LINE AND FITTING WILL RESULT.

5. Disconnect fuel line fittings (2) and (4) and remove four fuel lines (3). Note and mark position of each fuel line while removing.
6. Remove fuel line clamp bolt (10).
7. Disconnect rail-to-injection pump high-pressure fuel line fittings (9) and (11) and remove fuel line (12). Note and mark position of fuel line while removing.

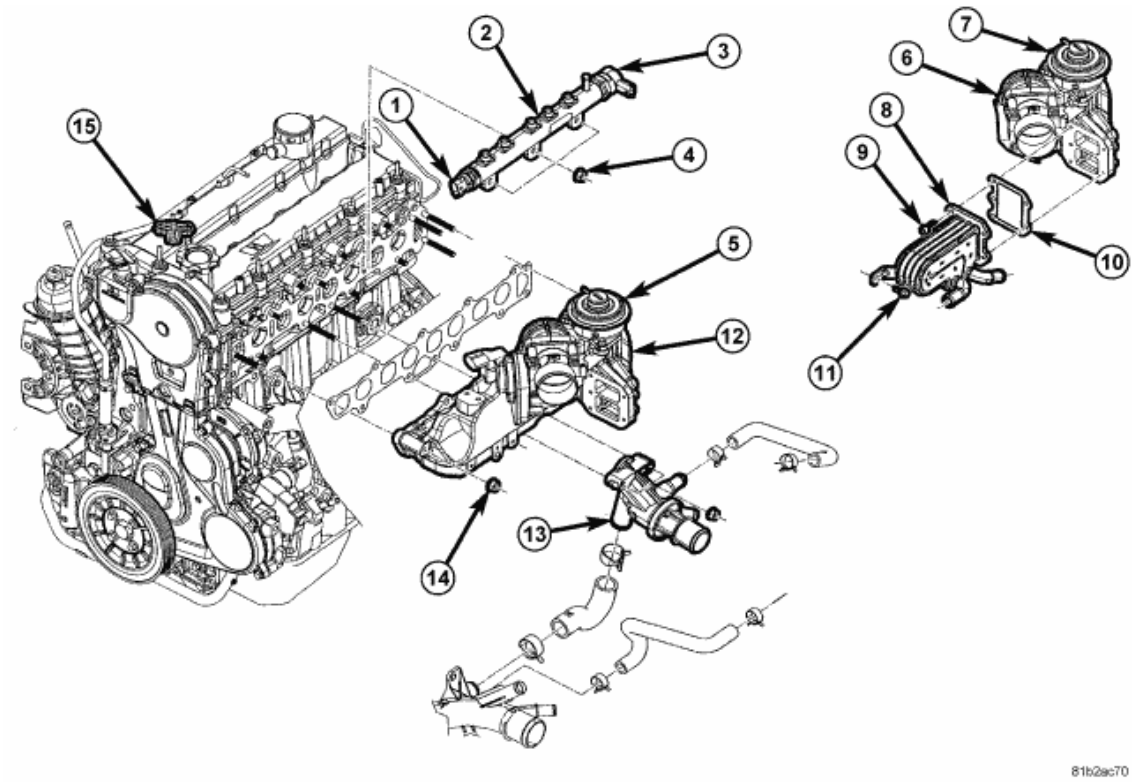

Fig. 59: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

8. Remove three fuel rail mounting nuts (4).
9. Remove rail (2) from cylinder head.

INSTALLATION

INSTALLATION

NOTE: New High Pressure Fuel Line must be used any time the High Pressure Fuel Lines have been removed.

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

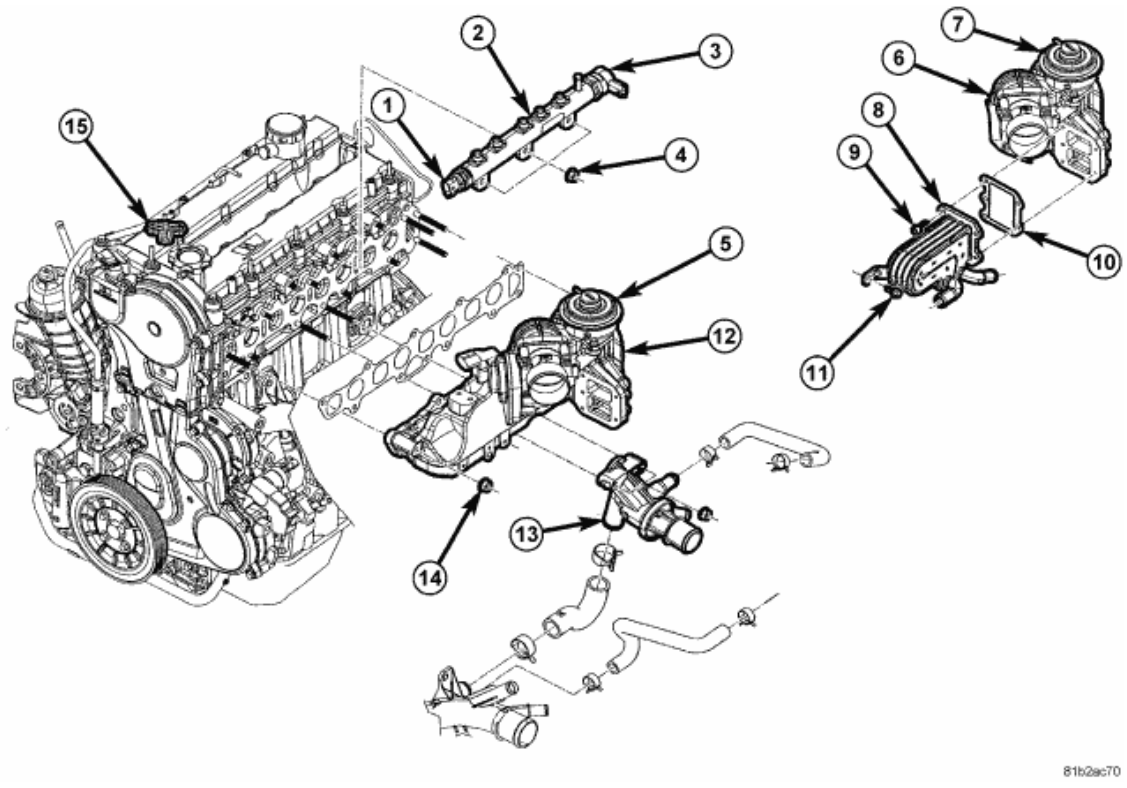

Fig. 60: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

1. Position fuel rail (2) to cylinder head.
2. Install three fuel rail mounting nuts (4). Tighten nuts (alternately) to 24 N.m (18 ft. lbs.) torque.

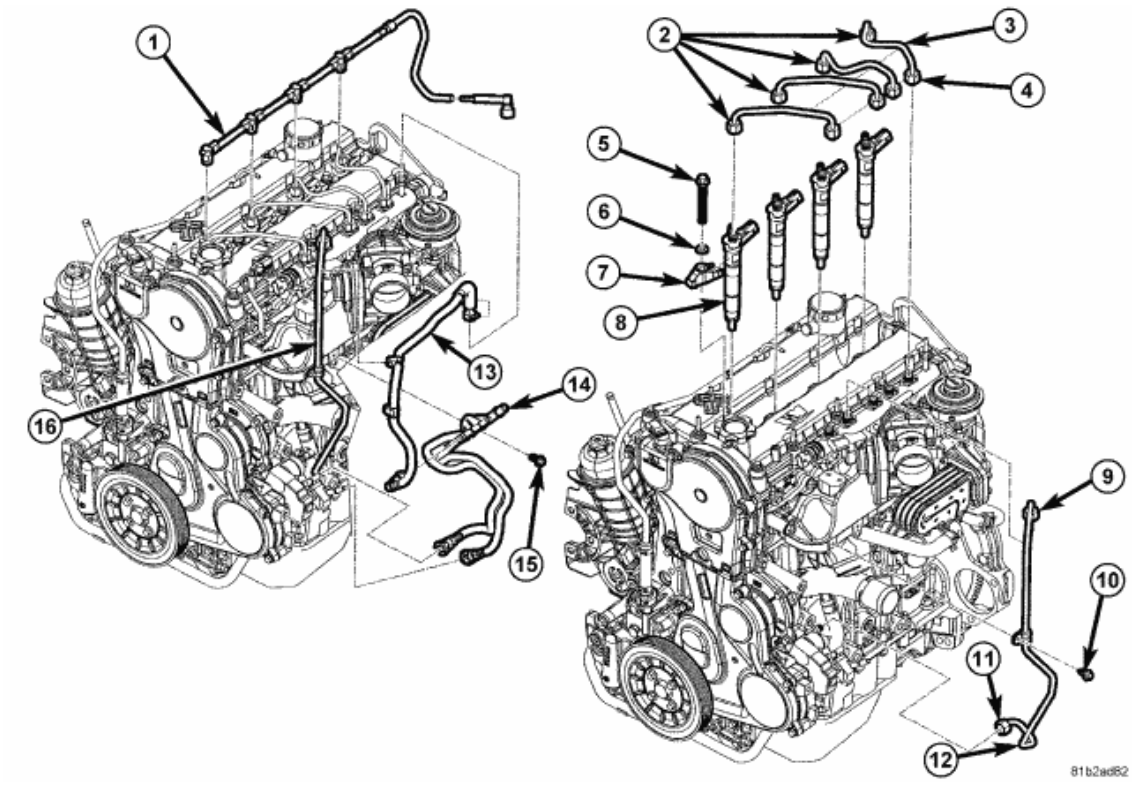

Fig. 61: Fuel Injectors - 2.8L Diesel
Courtesy of CHRYSLER LLC

CAUTION: WHEN LOOSENING OR TIGHTENING HIGH-PRESSURE LINE FITTINGS ATTACHED TO A SEPARATE FITTING, USE A BACK-UP WRENCH ON FITTING. DO NOT ALLOW FITTING TO ROTATE. DAMAGE TO BOTH FUEL LINE AND FITTING WILL RESULT.

3. Install the injectors (8), the injector clamps (7) and washers (6).
4. Install the injector bolts (5). Do not tighten at this time.
5. Position and connect the high pressure line (12) between the high pressure injection pump and the fuel rail. Do not tighten at this time.
6. Torque injector clamp bolts to 32.4 Nm (23 ft. lbs.).
7. Torque the rail side (4) of the high pressure lines between the injectors and the fuel rail to 5 Nm (44 in. lbs.) plus an additional 75°.
8. Torque the injector side (2) of the high pressure lines between the injectors and the fuel rail to 28 Nm (20 ft. lbs.).
9. Torque the rail side (9) of the high pressure fuel line between the high pressure injection pump and the fuel rail to 5 Nm (44 in. lbs.) plus an additional 75°.
10. Torque the high pressure pump side (11) of the high pressure fuel line between the high pressure injection pump and the fuel rail to 28 Nm (20 ft. lbs.).
11. Install fuel line clamp bolt (10). Tighten bolt to 15 N.m (11 ft. lbs.) torque.

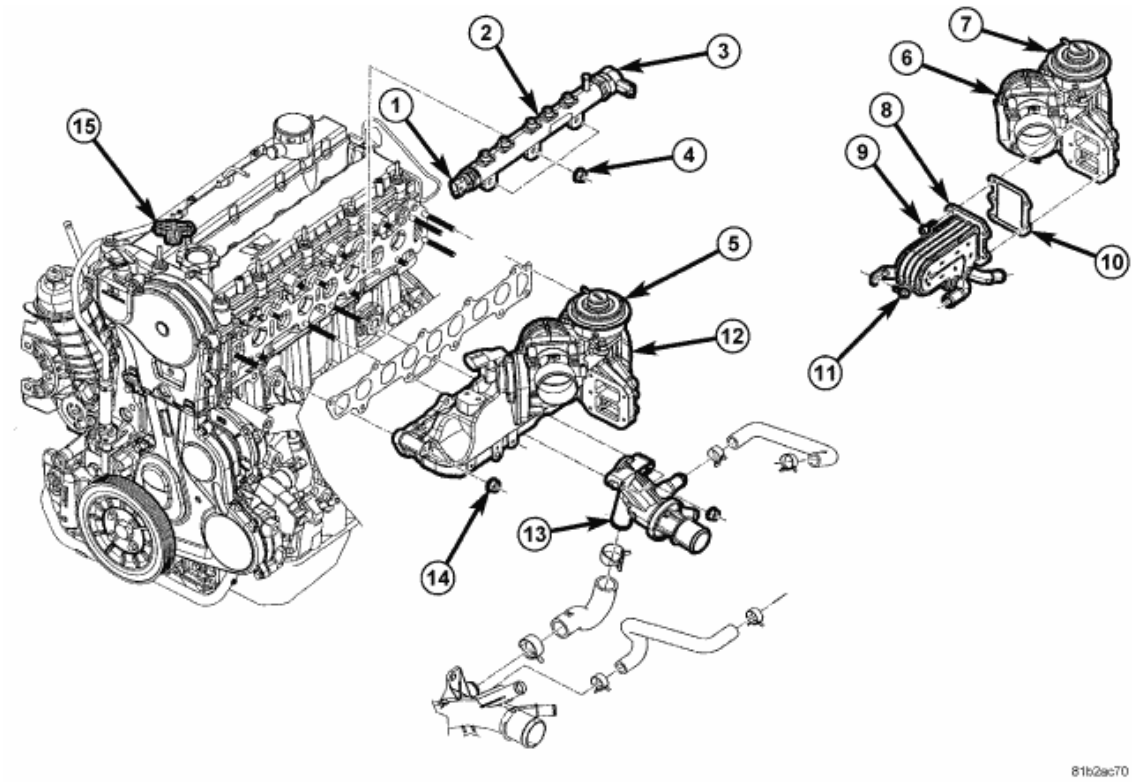

Fig. 62: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

12. Connect electrical connectors to fuel injectors.
13. Connect electrical connector to fuel pressure solenoid (3).
14. Connect electrical connector to fuel pressure sensor (1).
15. Install the engine cover.
16. Connect negative battery cable to battery.

LINES-FUEL

DESCRIPTION

DESCRIPTION

Low-Pressure Lines Are:

The fuel supply line from fuel tank to fuel filter housing.
The fuel return line back to fuel tank.
The fuel drain line from each fuel injector.
The fuel supply line from fuel filter to fuel injection pump.
The fuel injection pump return line.

High-Pressure Lines Are:

The fuel line from fuel injection pump to fuel rail.

The four fuel lines from fuel rail up to the fuel injectors

WARNING: High-pressure fuel lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 160,000 kpa (23,206 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Inspect for high-pressure fuel leaks with a sheet of cardboard. High fuel injection pressure can cause personal injury if contact is made with the skin.

OPERATION

HIGH-PRESSURE FUEL LINES

High-Pressure Lines

CAUTION: The high-pressure fuel lines cannot contact each other or other components. Do not attempt to weld high-pressure fuel lines or to repair lines that are damaged. If lines are ever kinked or bent, they must be replaced. Use only the recommended lines when replacement of high-pressure fuel line is necessary.

High-pressure fuel lines deliver fuel (under pressure) of up to approximately 160,000 kpa (23,206 psi) from the injection pump to the fuel injectors. The lines expand and contract from the high-pressure fuel pulses generated during the injection process. All high-pressure fuel lines are of the same length and inside diameter. Correct high-pressure fuel line usage and installation is critical to smooth engine operation.

WARNING: Use extreme caution when inspecting for high-pressure fuel leaks. Inspect for high-pressure fuel leaks with a sheet of cardboard. High fuel injection pressure can cause personal injury if contact is made with the skin.

DIAGNOSIS AND TESTING

HIGH-PRESSURE FUEL LINE LEAK TEST

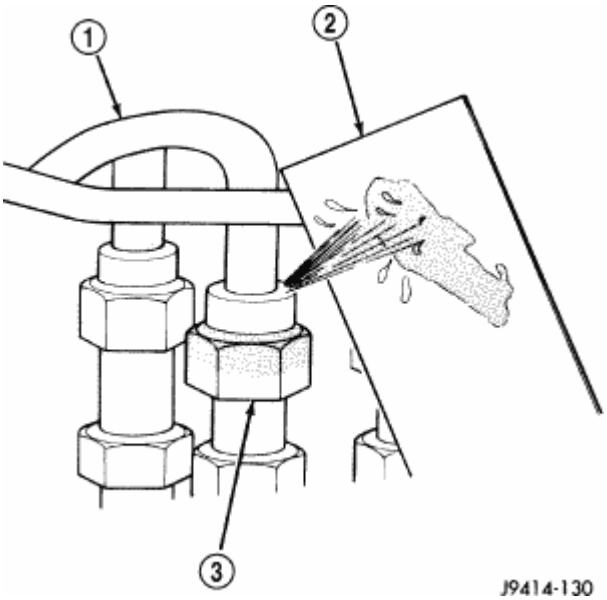

Fig. 63: High-Pressure Fuel Line Leak Test
Courtesy of CHRYSLER LLC

1 - HIGH-PRESSURE LINE 2 - CARDBOARD 3 - TYPICAL HIGH-PRESSURE FITTING

High-pressure fuel line leaks can cause starting problems and poor engine performance.

WARNING: Due to extreme fuel pressures of up to 160,000 kpa (23,207 psi), use extreme caution when inspecting for high-pressure fuel leaks. Do not get your hand or a finger near a suspected leak. Inspect for high-pressure fuel leaks with a sheet of cardboard (2) (typical picture). High fuel injection pressure can cause personal injury if contact is made with the skin.

Start the engine. Move the cardboard (2) over the suspected high-pressure fuel line leak, and check for fuel spray onto the cardboard. If line is leaking, retorque line while engine is shutdown. Replace damaged, restricted or leaking high-pressure fuel lines with the correct replacement line.

CAUTION: The high-pressure fuel lines cannot contact each other or other components. Do not attempt to weld high-pressure fuel lines or to repair lines that are damaged. Only use the recommended lines when replacement of high-pressure fuel line is necessary.

REMOVAL

HIGH-PRESSURE FUEL LINES

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

1. Disconnect negative battery cable at battery. Isolate end of cable.
2. Remove dress-up cover from top of engine.

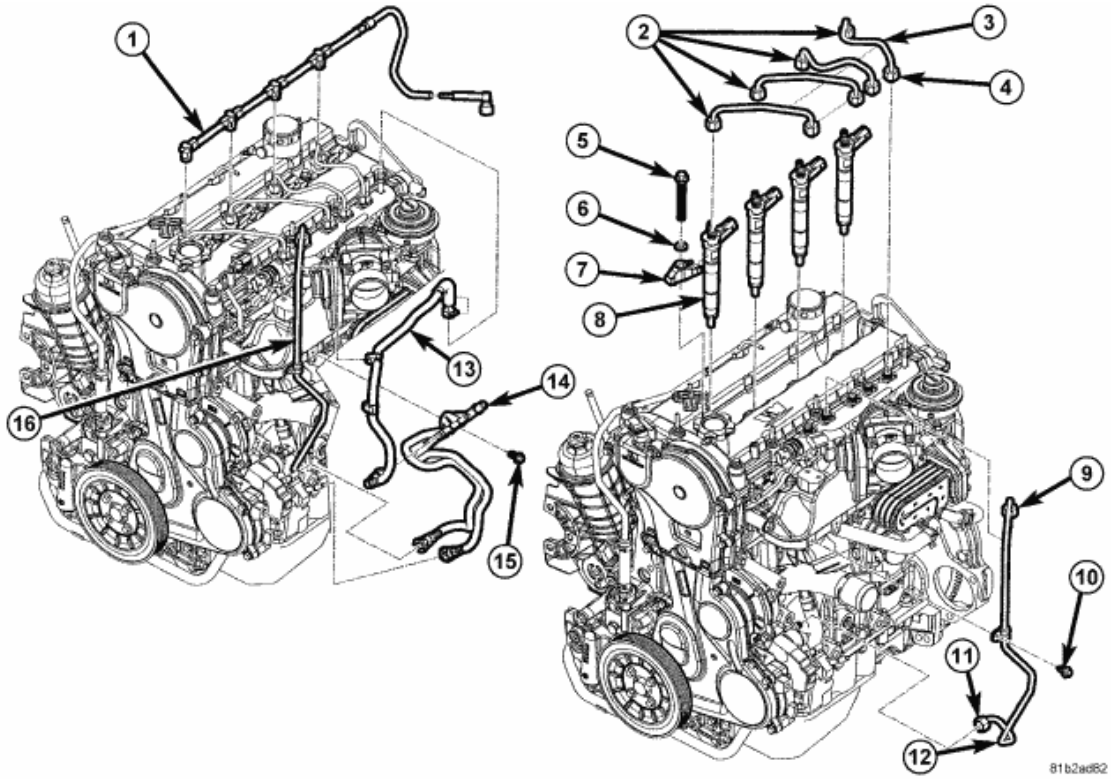

Fig. 64: Fuel Injectors - 2.8L Diesel
Courtesy of CHRYSLER LLC

CAUTION: WHEN LOOSENING OR TIGHTENING HIGH-PRESSURE LINE FITTINGS ATTACHED TO A SEPARATE FITTING, USE A BACK-UP WRENCH ON FITTING. DO NOT ALLOW FITTING TO ROTATE. DAMAGE TO BOTH FUEL LINE AND FITTING WILL RESULT.

3. Disconnect fuel line fittings (2) and (4) and remove four fuel lines (3). Note and mark position of each fuel line while removing.

4. Remove fuel line clamp bolt (10).
5. Disconnect rail-to-injection pump high-pressure fuel line fittings (9) and (11) and remove fuel line (12). Note and mark position of fuel line while removing.

INSTALLATION

HIGH-PRESSURE FUEL LINES

All high-pressure fuel lines are of the same length and inside diameter. Correct high-pressure fuel line usage and installation is critical to smooth engine operation.

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

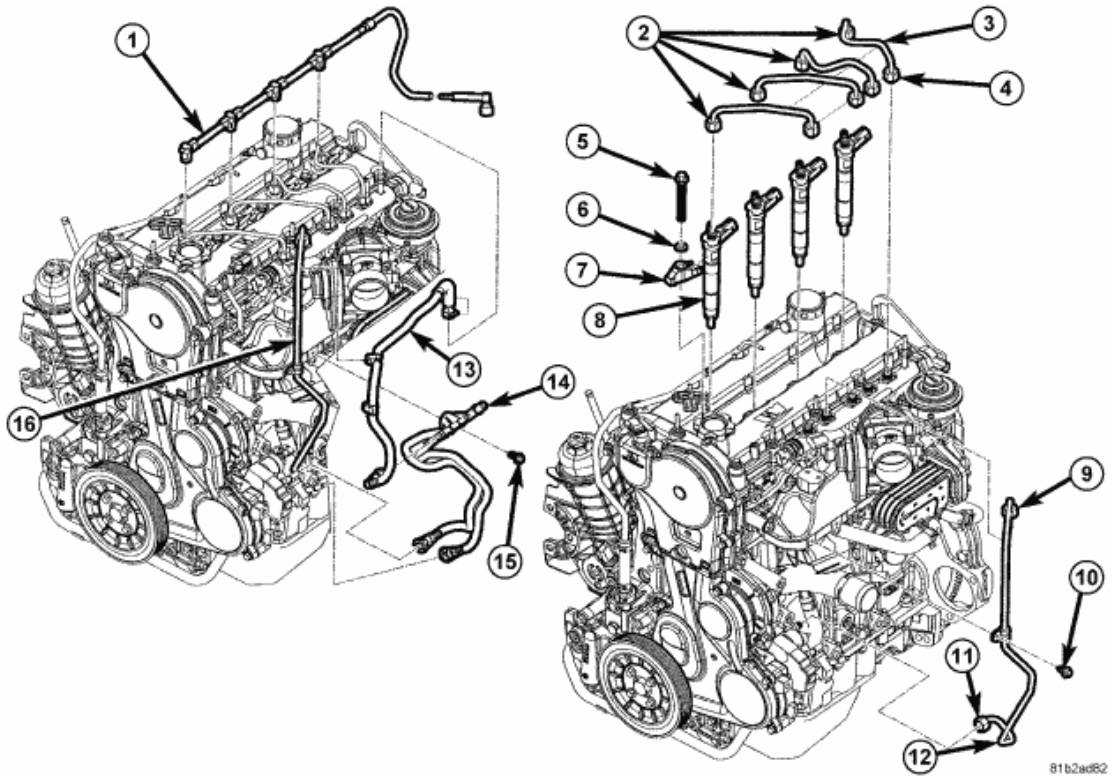

Fig. 65: Fuel Injectors - 2.8L Diesel
Courtesy of CHRYSLER LLC

CAUTION: WHEN LOOSENING OR TIGHTENING HIGH-PRESSURE LINE FITTINGS ATTACHED TO A SEPARATE FITTING, USE A BACK-UP WRENCH ON FITTING. DO NOT ALLOW FITTING TO ROTATE. DAMAGE TO BOTH FUEL LINE AND FITTING WILL RESULT.

1. Position the injectors with the clamp and washer into the cylinder head seat.
2. Hand tighten the injector clamp bolts.
3. Install the high pressure fuel line.
4. Hand tighten the high pressure fuel line.
5. Torque the fuel injector clamp bolts to 32 Nm (23 ft. lbs.).
6. Torque the high pressure fuel rail nuts to 25 Nm (221 in. lbs.).
7. Torque the high pressure fuel line on the fuel injector to 28 Nm (247 in. lbs.).
8. Torque the high pressure fuel line on the fuel rail to 5 Nm (44 in. lbs) +75 degrees.

MOTOR - FUEL PUMP

DESCRIPTION

DESCRIPTION

An engine mounted, low-pressure mechanical fuel pump is **not used** with the 2.8L diesel engine.

An electric fuel pump is mounted to the fuel pump module. The pump supplies a low-pressure fuel supply to the engine.

Fuel is drawn in through a filter at the bottom of the module and pushed through the electric motor gearset to the pump outlet.

The electric fuel pump is not a separate, serviceable component. The entire fuel pump module must be replaced.

MODULE - FUEL PUMP

REMOVAL

REMOVAL

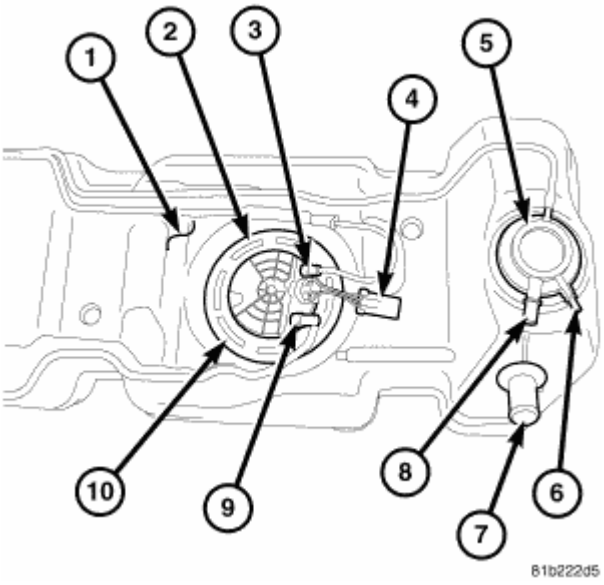

Fig. 66: Locating 2.8L Diesel Fuel Pump Module
Courtesy of CHRYSLER LLC

1. The 2.8L diesel fuel pump module (2) is located on the top of fuel tank.

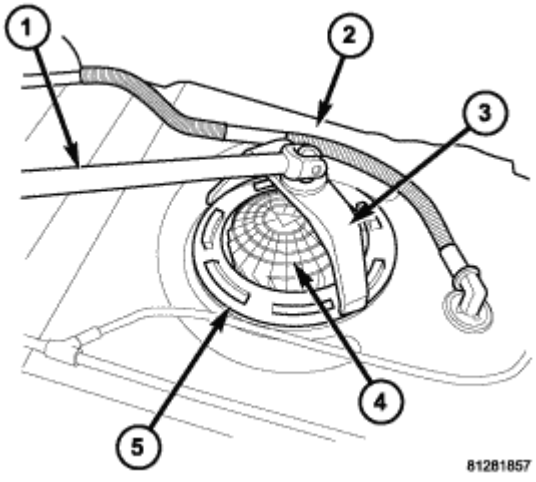

Fig. 67: Identifying Drive Breaker Bar, Lockring Remover/Installer Tool 9340 & Lockring
Courtesy of CHRYSLER LLC

2. Drain and remove fuel tank.
3. Note rotational position of module before attempting removal. An indexing arrow is located on top of module for this purpose.
4. Position special Lockring Remover/Installer tool 9340 (3) into notches on outside edge of lockring (5).
5. Install 1/2 inch drive breaker bar (1) to special Lockring Remover/Installer tool 9340 (3).
6. Rotate breaker bar counter-clockwise to remove lockring.

7. Remove lockring. The module will spring up slightly when lockring is removed.
8. Remove module from fuel tank. Be careful not to bend float arm while removing.

INSTALLATION

INSTALLATION

CAUTION: Whenever the fuel pump module is serviced, the rubber seal (gasket) must be replaced.

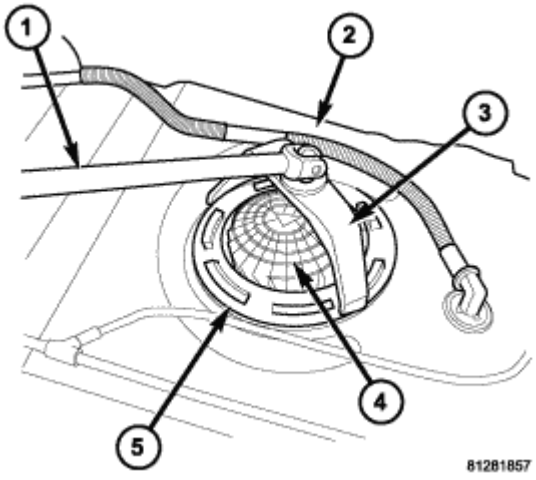

Fig. 68: Identifying Drive Breaker, Lockring Remover/Installer 9340 & Lockring
Courtesy of CHRYSLER LLC

1. Using a new seal (gasket), position fuel pump module into opening in fuel tank.
2. Position lockring (5) over top of fuel pump module.
3. Rotate module until embossed alignment arrow points to center alignment mark. This step must be performed to prevent float from contacting side of fuel tank.
4. Install Lockring Remover/Installer 9340 (3) to lockring.
5. Install 1/2 inch drive breaker (1) into Lockring Remover/Installer 9340 (3).
6. Tighten lockring (clockwise) until all seven notches have engaged.
7. Install fuel tank.

PUMP-FUEL INJECTION

DESCRIPTION

FUEL INJECTION PUMP

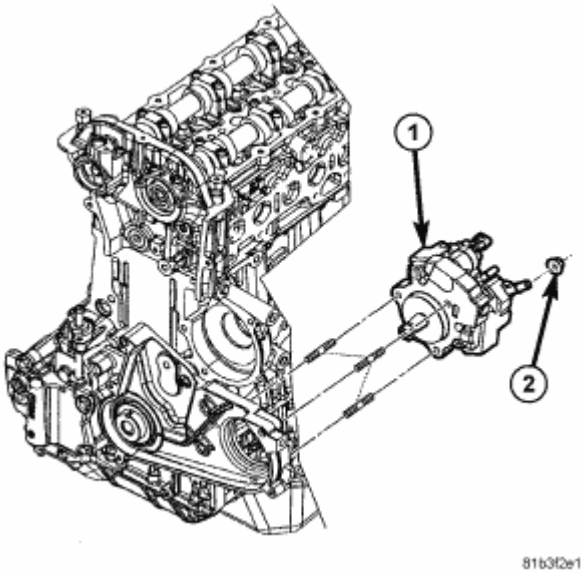

Fig. 69: Identifying Fuel Injection Pump & Fuel Quantity Solenoid
Courtesy of CHRYSLER LLC

1 - FUEL INJECTION PUMP 2 - FUEL QUANTITY SOLENOID

A radial, 3 piston pump (1) mounted to the timing belt cover, is used to deliver fuel under high pressure to the fuel rail. See **WARNING**.

The pump is driven by the timing belt. Pressure is generated independently of the injection process. The pump is lubricated with diesel fuel and is not responsible for fuel injection timing. However, there is a mark on the high pressure fuel pump sprocket that must be aligned with a mark on the timing belt cover whenever the high pressure pump, sprocket, or timing belt have been removed.

OPERATION

FUEL INJECTION PUMP

High Pressure Pumping Plungers

The fuel quantity solenoid supples three high pressure pumping chambers. The pumping chambers have one way inlet valves that allow fuel to flow into the chambers. The valves then close during compression of the fuel and cause the high pressure fuel to overcome a ball and angled seat outlet valve.

All three pumping chambers are tied together in one circuit internal to the pump and provide high pressure fuel up to 1600 bar (23,000 psi) through a steel line, to the fuel rail.

The pump is driven at 1:1 engine speed and is not responsible for injection timing. The pump is only responsible for providing high pressure fuel while the ECM controls the injection timing.

REMOVAL

FUEL INJECTION PUMP

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

WARNING: High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

1. Disconnect negative battery cable.
2. Drain engine coolant. Refer to **COOLING** article .
3. Raise and support vehicle.
4. Disconnect and reposition engine coolant hose near rear of injection pump.
5. Remove timing belt.

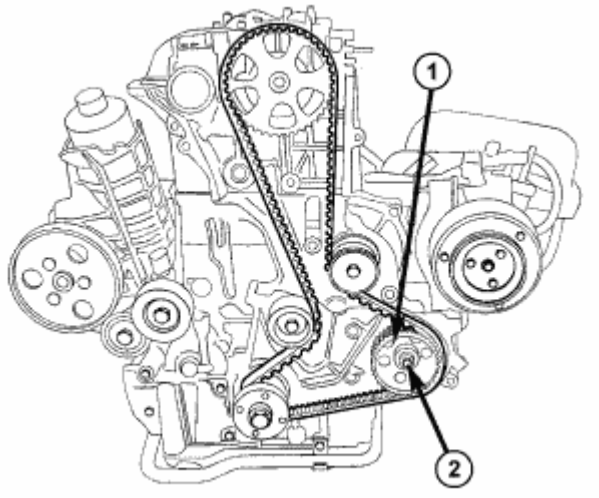

Fig. 70: Identifying Injection Pump Sprocket Mounting Nut & Sprocket

Courtesy of CHRYSLER LLC

6. Remove injection pump sprocket mounting nut (2). Attach a typical 3-jaw gear/sprocket puller such as special tool 1023 and remove sprocket (1) from pump.

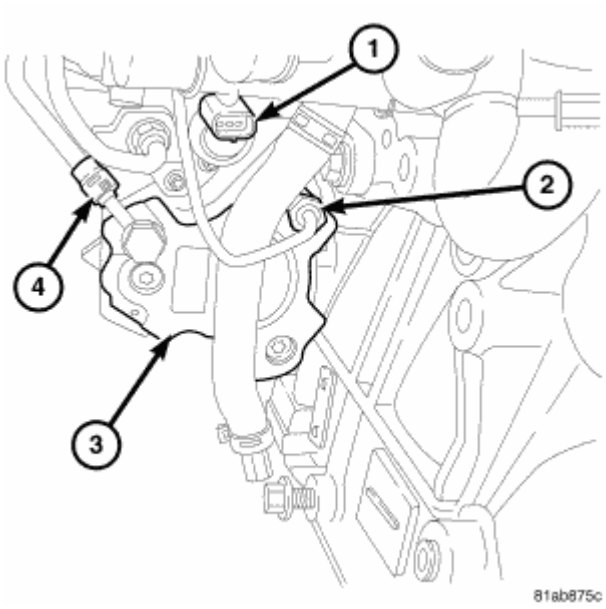

Fig. 71: Identifying High-Pressure Fuel Sensor, Electrical Connector & Fuel Lines
Courtesy of CHRYSLER LLC

7. Disconnect high-pressure fuel line (4) at rear of pump by removing banjo bolt.
8. Disconnect high-pressure fuel line (2) at rear of pump by removing fitting at end of line.
9. Disconnect electrical connector at high-pressure fuel sensor (1).

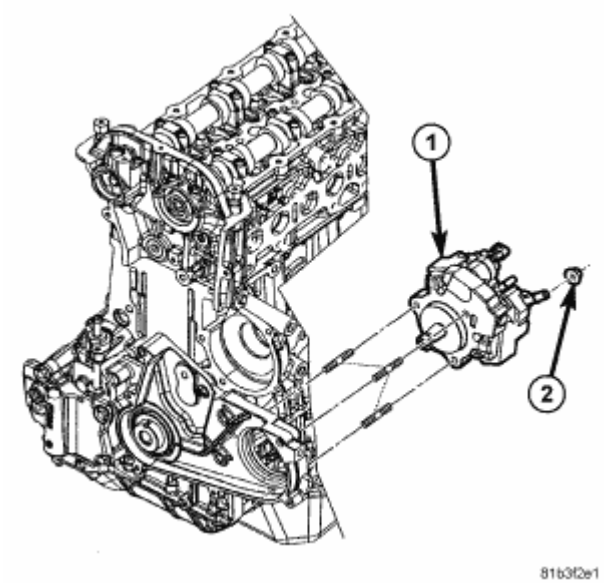

Fig. 72: Identifying Fuel Injection Pump & Fuel Quantity Solenoid

Courtesy of CHRYSLER LLC

1 - FUEL INJECTION PUMP 2 - FUEL QUANTITY SOLENOID

10. Remove fuel injection pump mounting nuts (2).
11. Slide pump rearward from mounting studs.

INSTALLATION

FUEL INJECTION PUMP

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

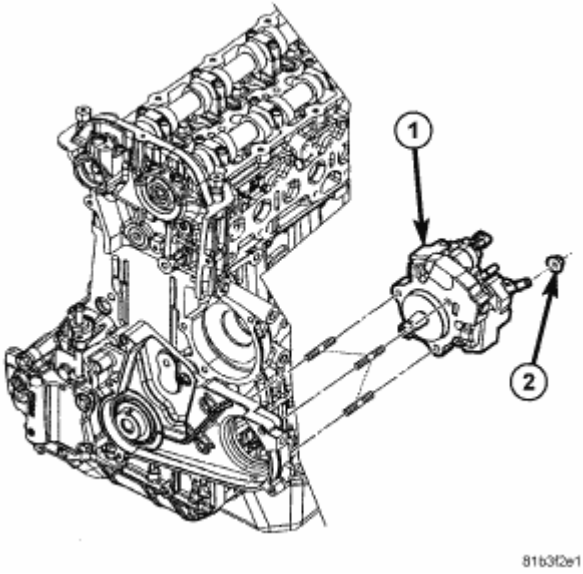

Fig. 73: Identifying Fuel Injection Pump & Fuel Quantity Solenoid
Courtesy of CHRYSLER LLC

1 - FUEL INJECTION PUMP 2 - FUEL QUANTITY SOLENOID

1. Slip pump (1) over mounting studs.
2. **Be sure pump is fully seated before tightening mounting nuts.** Tighten injection pump mounting nuts (2) to 24 N.m (18 ft. lbs.) torque.

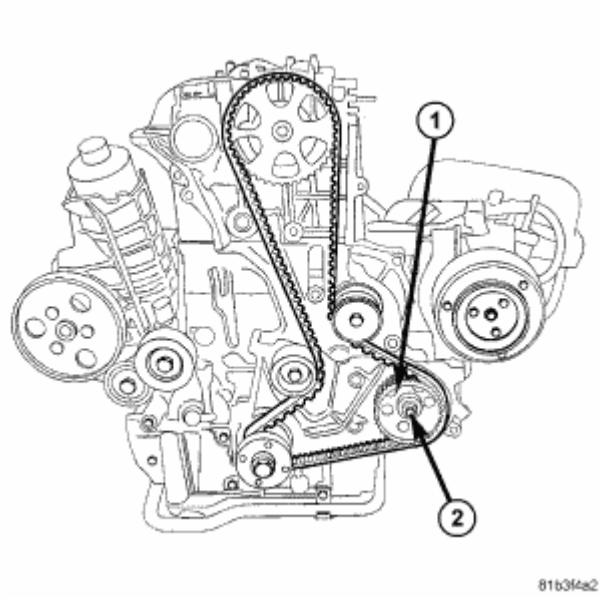

Fig. 74: Identifying Injection Pump Sprocket Mounting Nut & Sprocket
Courtesy of CHRYSLER LLC

3. Position sprocket (1) to pump shaft and install nut (2) finger tight.

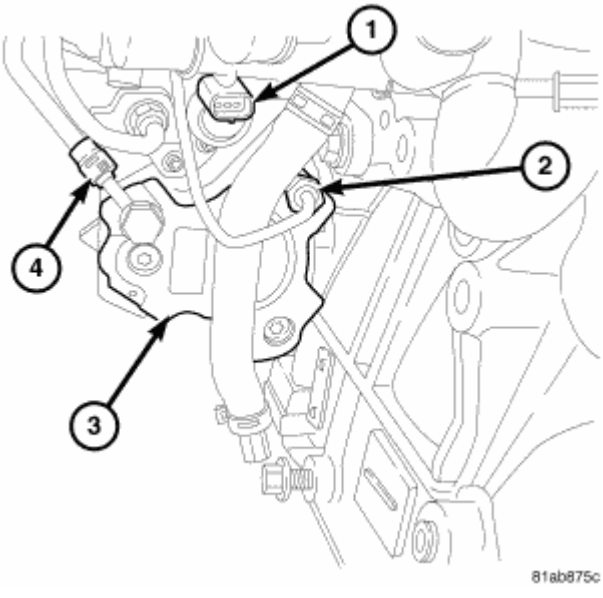

Fig. 75: Identifying High-Pressure Fuel Sensor, Electrical Connector & Fuel Lines
Courtesy of CHRYSLER LLC

4. Install banjo bolt for fuel line (4) at rear of injection pump. Tighten bolt to 28 N.m (20 ft. lbs.) torque.

5. Install fuel line (2) and fitting to rear of injection pump. Tighten fitting to 28 N.m (20 ft. lbs.) torque.
6. Connect electrical connector to high-pressure fuel sensor (1).

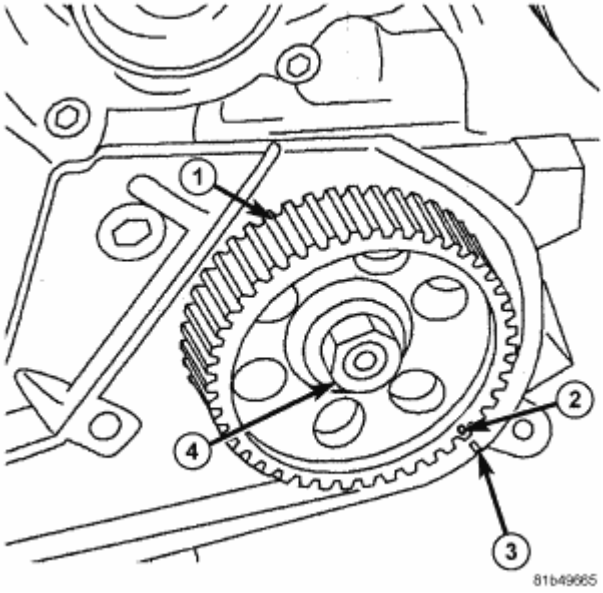

Fig. 76: Fuel Injection Pump Timing Marks
Courtesy of CHRYSLER LLC

7. Tighten injection pump sprocket nut (4) to 88 N.m (65 ft. lbs.) torque.
8. **PUMP ALIGNMENT MARKS:** Rotate pump gear (1) until marks (2) and (3) are aligned.
9. Install timing belt.
10. Connect engine coolant hose near rear of injection pump.
11. Fill engine cooling system. Refer to **COOLING** article.
12. Lower vehicle.
13. Connect negative battery cable.
14. Start engine and check for fuel leaks.

PUMP-FUEL TRANSFER

DESCRIPTION

FUEL TRANSFER (LIFT) PUMP

The fuel transfer pump (fuel lift pump) is part of the fuel pump module. The fuel pump module is located in the fuel tank. The 12-volt electric pump is operated and controlled by the Engine Control Module (ECM).

REMOVAL

FUEL TRANSFER PUMP

The fuel transfer pump (fuel lift pump) is a part of the fuel tank module. It is not serviced separately. Refer to Fuel Tank Module Removal or Installation for procedures.

SENSOR-FUEL PRESSURE

DESCRIPTION

FUEL PRESSURE SENSOR

WARNING: High - pressure fuel line deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 1600 bar (23,200 psi). Use extreme caution when inspecting for high - pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high - pressure leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

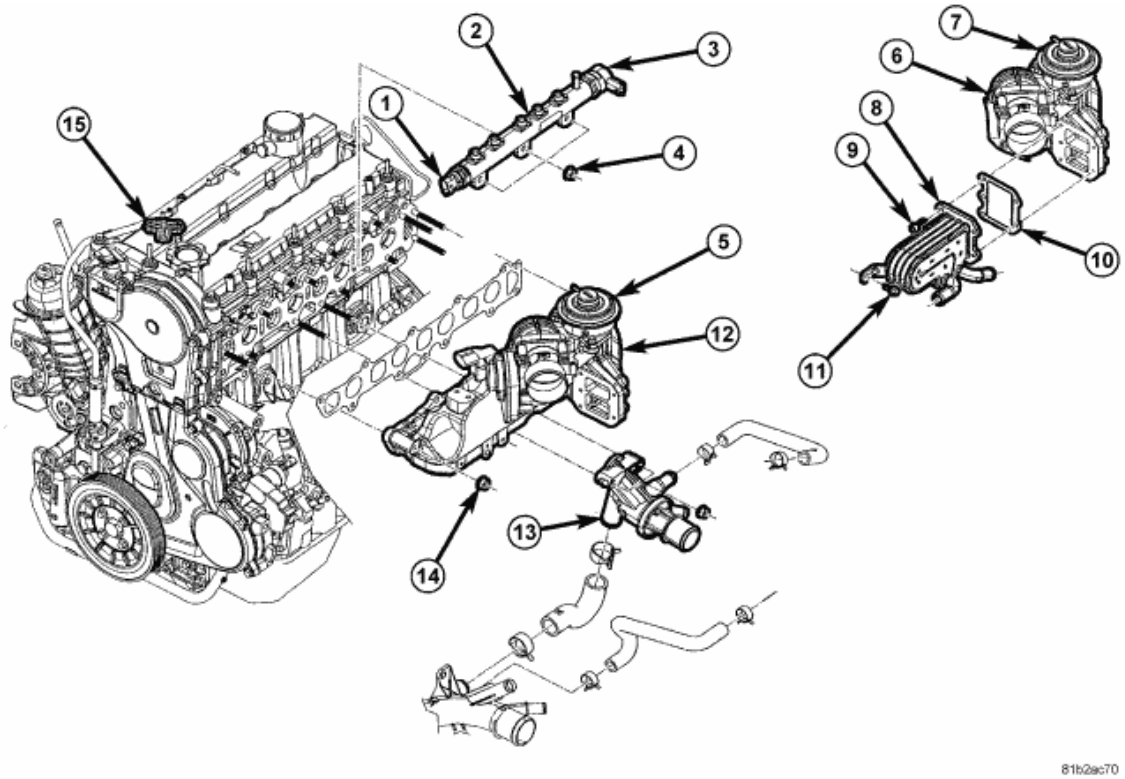

Fig. 77: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

The fuel rail pressure sensor (1) screws into the fuel rail (2) at the top of the engine. The ECM uses this sensor to monitor the fuel rail pressure.

OPERATION

FUEL PRESSURE SENSOR

Review the high pressure fuel system warning. See **WARNING**.

The fuel flows to the fuel pressure sensor through an opening in the rail, the end of which is sealed off by the sensor diaphragm. Pressurized fuel reaches the sensor's diaphragm through a blind hole. The sensor element (semiconductor device) converts the pressure to an electric signal is mounted on this diaphragm. The signal generated by the sensor is monitored by the ECM.

REMOVAL

FUEL PRESSURE SENSOR

1. Disconnect negative battery cable.
2. Remove engine cover.

WARNING: High pressure fuel spray can cause severe cuts, and is extremely flammable. Before opening any part of the high pressure fuel system, wait for a minimum of 30 seconds after turning off the engine to allow pressure to bleed down from the high pressure side of the fuel system. Otherwise severe personal injury can result when the high pressure fuel system is opened.

WARNING: No sparks, open flames or smoking. Risk of poisoning from inhaling and swallowing fuel. Risk of injury to eyes and skin from contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing.

NOTE: Do allow cleaning solvent or debris to enter the fuel pressure sensor harness connector.

3. Clean the area around the fuel pressure sensor with Mopar® Throttle Body Cleaner P/N 04897156AA or equivalent degreasing solvent and compressed air.
4. Disconnect fuel pressure sensor electrical connector.

WARNING: When working with parts on the high side of the fuel injection system such as the fuel rail and high pressure injector lines, slowly loosen the part to allow any residual pressure to bleed down from the high pressure side of the system.

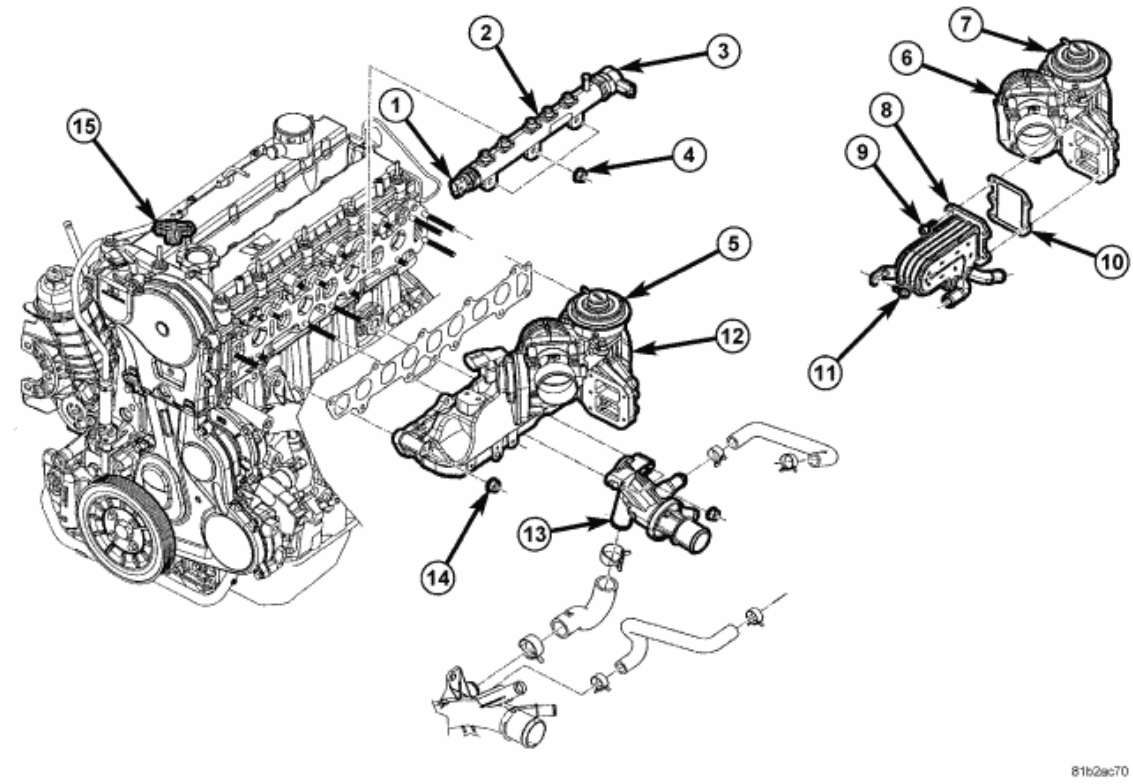

Fig. 78: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

NOTE: Do not touch the connector terminals of the fuel rail pressure sensor. The internal electronic components of the sensor can be damaged.

5. Remove fuel pressure sensor (1) from fuel rail.
6. If the sensor is to be reused, remove the fuel rail pressure sensor sealing ring. Do not damage or gouge the fuel rail pressure sensor threads. If any gouges or cuts are present in the fuel rail pressure sensor threads, the sensor must be replaced. Otherwise, fuel leaks can occur.

NOTE: Do not allow dirt or debris to enter the fuel rail and fuel rail solenoid threads after the fuel pressure solenoid has been removed from the fuel rail.

7. Clean the thread and fuel pressure sensor sealing surface of the fuel rail.
8. Use a clean plug to close off the fuel rail pressure sensor opening if the fuel pressure solenoid will not be immediately re-installed.

INSTALLATION

FUEL PRESSURE SENSOR

WARNING: Diesel fuel is under extreme pressure in the high pressure side of the fuel

injection system between the fuel injectors and the high pressure fuel pump. This may be as high as 1600 bar (23,200 psi.). Use extreme caution when inspecting for leaks in the high pressure side of the fuel injection system. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing the high pressure side of the fuel system.

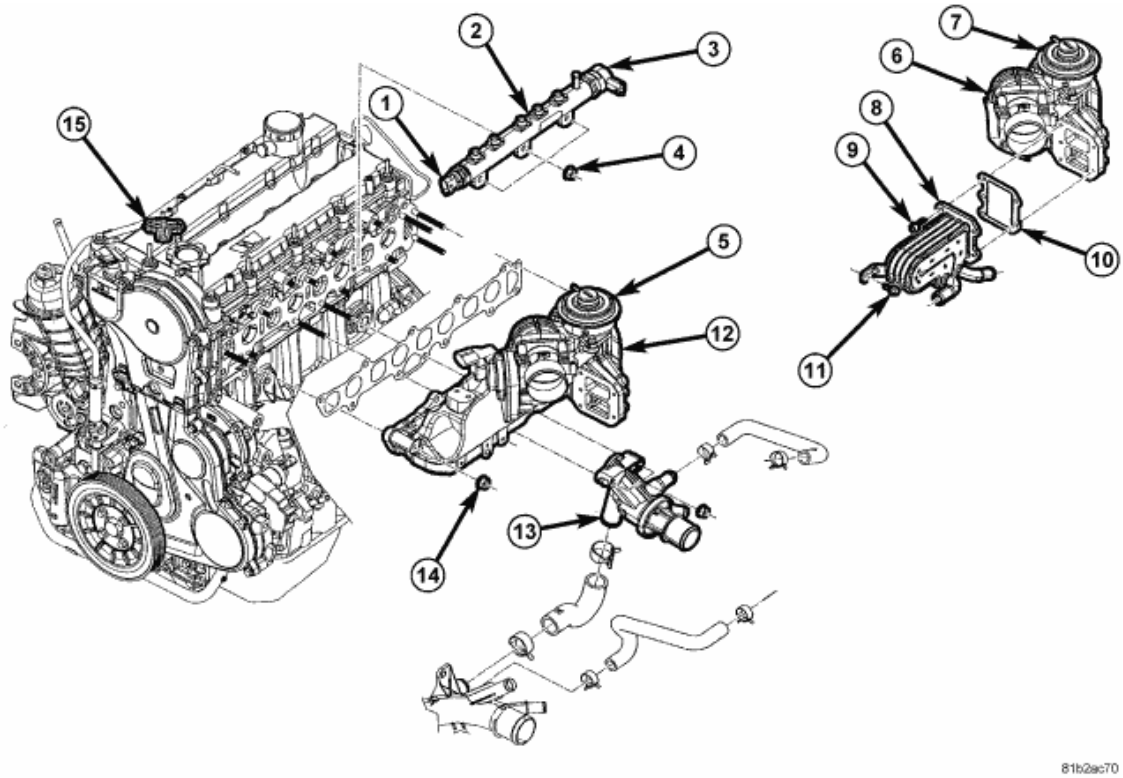

Fig. 79: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

1. If reusing an existing fuel pressure sensor, install a new fuel pressure sensor sealing ring.
2. Lubricate the fuel pressure sensor threads and sealing ring with clean diesel fuel.
3. Install fuel pressure sensor (1) in fuel rail (2). Position the fuel rail pressure sensor so the harness connector is not stretched or under tension. Tighten sensor to 100 N.m (73 ft. lbs.).
4. Connect fuel pressure sensor electrical connector.
5. Install engine cover.
6. Connect negative battery cable.

SOLENOID-FUEL PRESSURE

DESCRIPTION

FUEL PRESSURE SOLENOID

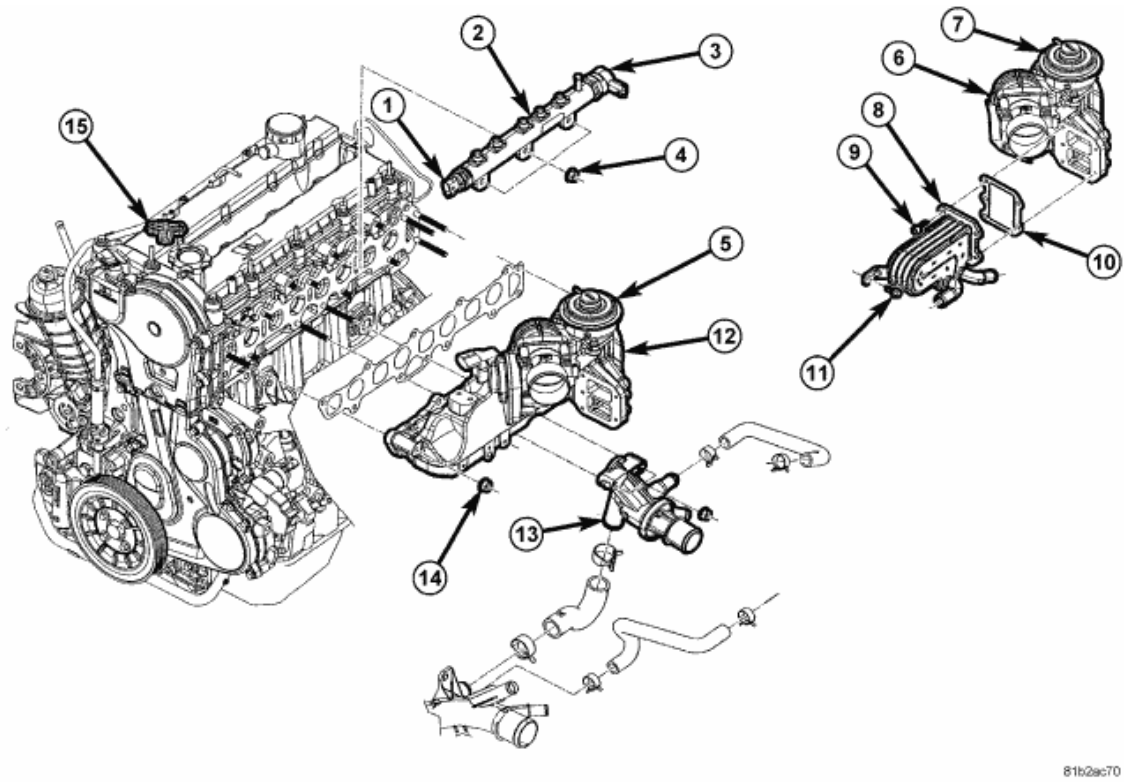

Fig. 80: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

The fuel pressure solenoid (3) is attached to the rear of the fuel rail (2). The tip of the fuel pressure solenoid (3) uses a knife edge, for metal to metal sealing. The knife edge actually deforms the metal in the fuel rail in order to seal the surfaces. The solenoid must be replaced when ever it is removed from the rail. The solenoid controls and maintains constant rail pressure with a control current transmitted by the engine control module (ECM).

OPERATION

FUEL PRESSURE SOLENOID

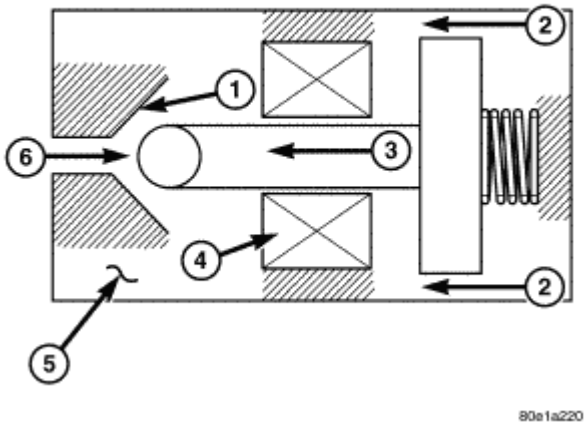

Fig. 81: Fuel Pressure Solenoid Operation
Courtesy of CHRYSLER LLC

1 - BALL SEAT
2 - SPRING FORCE
3 - MAGNETIC FORCE
4 - COIL
5 - FUEL PRESSURE SOLENOID
6 - HIGH PRESSURE SUPPLY

High pressure which is present in the fuel rail flows to the ball seat (1) of the pressure solenoid. The specified pressure required by the system is built up in the rail by the fuel pressure solenoid building up a magnetic force which corresponds to this specific pressure by means of a control current from the Electronic Control Module (ECM). This magnetic force equals a certain outlet cross section at the ball seat of the valve. The rail pressure is altered as a result of the quantity of fuel which flows off. The current fuel pressure is signaled by the fuel rail pressure sensor to the engine control module (ECM). The controlled fuel flows back along the return fuel line, into the tank.

In a de-energized state, the fuel pressure solenoid is closed as the spring force (2) presses the ball into the ball seat. When driving, the fuel pressure solenoid is constantly open. When engine is started, the fuel pressure solenoid is held closed by magnetic force. When driving, the pressure of the fluid counteracts the magnetic force of the coil and the slight spring force.

REMOVAL

FUEL PRESSURE SOLENOID

Review the high pressure fuel system warning before beginning repair. See WARNING.

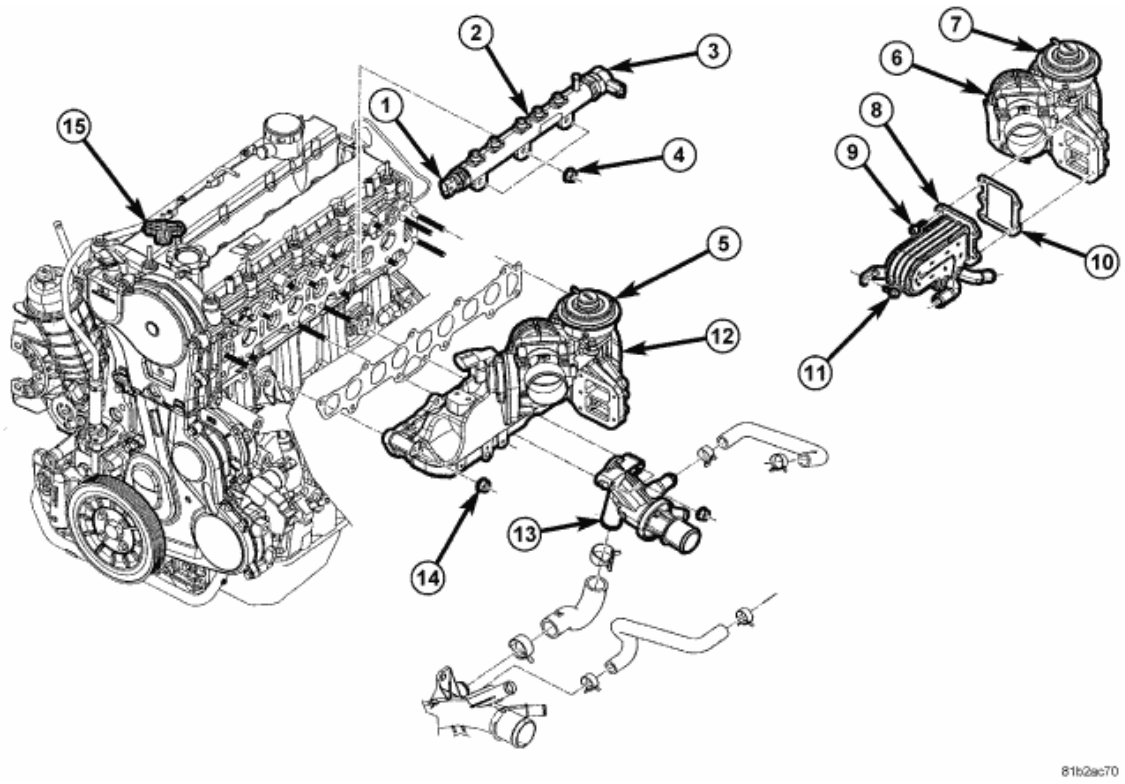

Fig. 82: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

WARNING: High pressure fuel spray can cause severe cuts, and is extremely flammable. Before opening any part of the high pressure fuel system, wait for a minimum of 30 seconds after turning off the engine to allow pressure to bleed down from the high pressure side of the fuel system. Otherwise severe personal injury can result when the high pressure fuel system is opened.

WARNING: No sparks, open flames or smoking. Risk of poisoning from inhaling and swallowing fuel. Risk of injury to eyes and skin from contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing.

1. Disconnect negative battery cable.

NOTE: Do allow cleaning solvent or debris to enter the fuel pressure solenoid harness connector.

2. Clean the area around the fuel pressure solenoid with Mopar® Throttle Body Cleaner P/N 04897156AA or equivalent degreasing solvent and compressed air.
3. Disconnect the fuel pressure solenoid harness connector.

WARNING: When working with parts on the high side of the fuel injection system such as the fuel rail and high pressure injector lines, slowly loosen the part to allow any residual pressure to bleed down from the high pressure side of the system.

4. Remove fuel rail. See **REMOVAL**.
5. Clamp fuel rail (2) securely in vise with protective jaws.

CAUTION: Once removed, the solenoid must always be replaced. Do not re-use a fuel pressure solenoid that has been installed in the fuel rail.

6. Counterhold the fuel rail and unscrew the fuel pressure solenoid (3).

NOTE: Do not allow dirt or debris to enter the fuel rail and fuel rail solenoid threads after the fuel pressure solenoid has been removed from the fuel rail.

7. Use a clean plug to close off the fuel rail pressure solenoid opening if the fuel pressure solenoid will not be immediately re-installed.

INSTALLATION

FUEL PRESSURE SOLENOID

Review the high pressure fuel system warning before beginning repair. See WARNING.

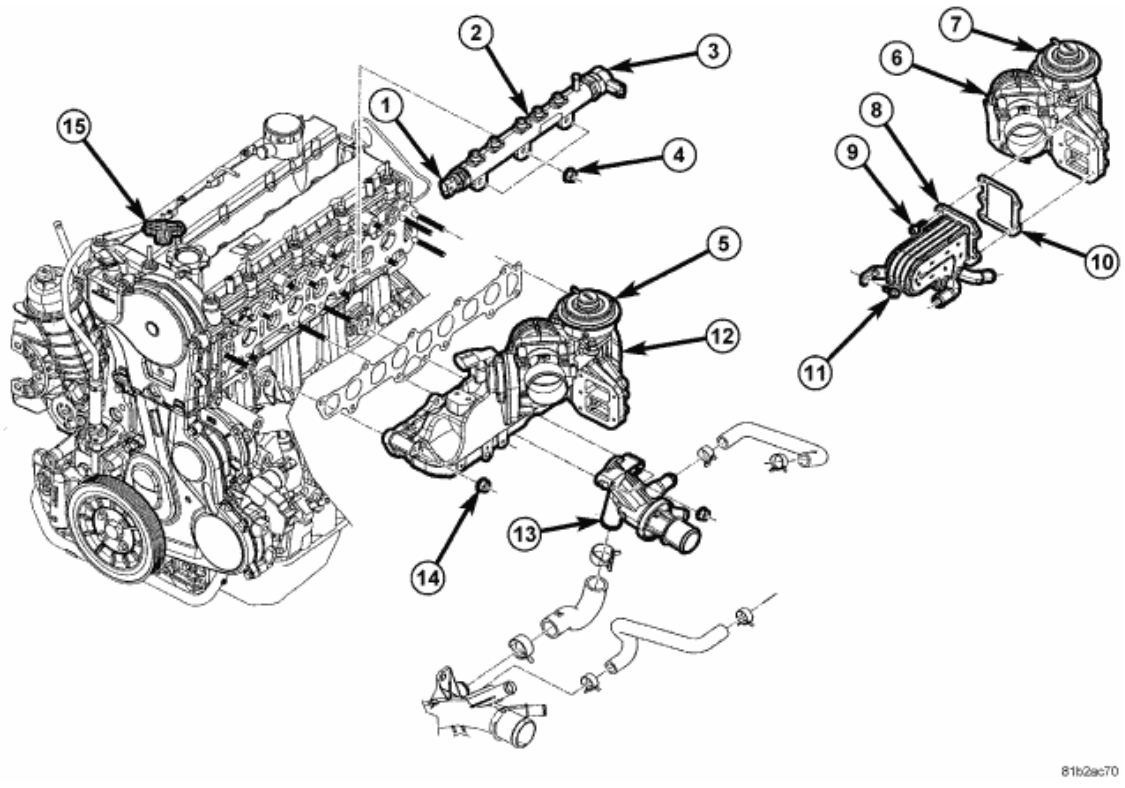

Fig. 83: Exploded View Of Fuel Rail - 2.8L Diesel
Courtesy of CHRYSLER LLC

WARNING: Before working on an open fuel system, eliminate any source of sparks or open flames near the work area, and do not smoke. Wash diesel fuel off skin as soon as possible to avoid the risk of poisoning from inhaling and swallowing fuel. Do not allow diesel fuel to come in contact with eyes, otherwise, severe injury can result from contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing whenever possible to avoid injury.

CAUTION: There is a special tightening procedure for the fuel rail solenoid that must be followed along with the proper use of a torque wrench. Therefore the fuel rail must be removed before installing the fuel pressure solenoid.

CAUTION: Do not reuse an existing fuel pressure solenoid. A new fuel pressure solenoid must be installed any time the existing solenoid has been removed from the fuel rail.

1. Position the fuel rail (2) into a soft jawed vise.
2. Inspect the sealing surfaces of the fuel pressure solenoid opening in the fuel rail. If any cuts or gouges are present in the fuel rail pressure solenoid opening, replace the fuel rail.
3. Lubricate the fuel pressure solenoid sealing rings with clean diesel fuel. Do not allow dirt or debris to come in contact with the fuel rail solenoid or the threads in the fuel rail.

4. Manually thread the fuel pressure solenoid (3) into the fuel rail until hand tight.
5. Position the fuel pressure solenoid electrical socket so the fuel pressure solenoid harness connector is not under stress. Otherwise, the connector or harness can be damaged.
6. Counterhold the fuel rail, and tighten the fuel rail solenoid (3) as follows:
   - Tighten the fuel pressure solenoid to 60 N.m (44 ft. lbs.)
   - Loosen the fuel pressure solenoid 90 degrees.
   - Retighten the fuel pressure solenoid to 85 N.m (62 ft. lbs.).
7. Install fuel rail. See **INSTALLATION**.
8. Connect negative battery cable.
9. Start engine, allow to warm, turn engine off and inspect for leaks. See **DIAGNOSIS AND TESTING**.

SOLENOID - FUEL QUANTITY

DESCRIPTION

FUEL QUANTITY SOLENOID

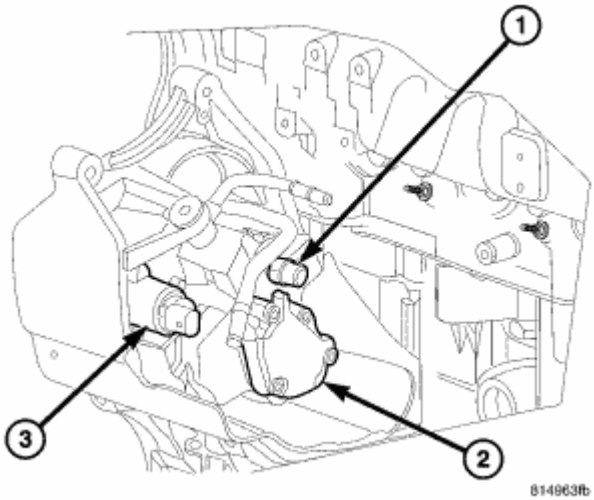

Fig. 84: Identifying Fuel Supply To Fuel Rail, High Pressure Fuel Pump & Fuel Quantity Solenoid
Courtesy of CHRYSLER LLC

1 - FUEL SUPPLY TO FUEL RAIL
2 - HIGH PRESSURE FUEL PUMP
3 - FUEL QUANTITY SOLENOID

The fuel quantity solenoid is located in the back of the high pressure pump. The solenoid is pulse width modulated by the ECM and meters the amount of fuel that flows into the high pressure elements inside of the high pressure pump. The solenoid is also inactive during the first 30 seconds to allow maximum fuel pressure to the fuel rail during start up. See **Fig. 84**.

OPERATION

FUEL QUANTITY SOLENOID

The fuel quantity solenoid is a pulse width modulated valve that controls the amount of fuel sent or delayed to the high pressure pump elements inside of the high pressure pump. The ECM determines the fuel pressure set point based on engine sensor inputs. If the actual fuel rail pressure is too low, the ECM commands the solenoid to allow more fuel to flow to the high pressure pump. This minimizes the difference between the actual fuel rail pressure reading and the set point. The ECM will also operate the solenoid, delaying fuel if the fuel rail pressure becomes to high.

The fuel quantity solenoid is commanded open by the ECM to allow the high pressure pump to build maximum pressure (1600 BAR, 23,200 PSI). See **WARNING** the solenoid also has fuel tank heat protection function that meters the exact amount of fuel to prevent excess heated fuel from returning to the fuel tank

REMOVAL

FUEL QUANTITY SOLENOID

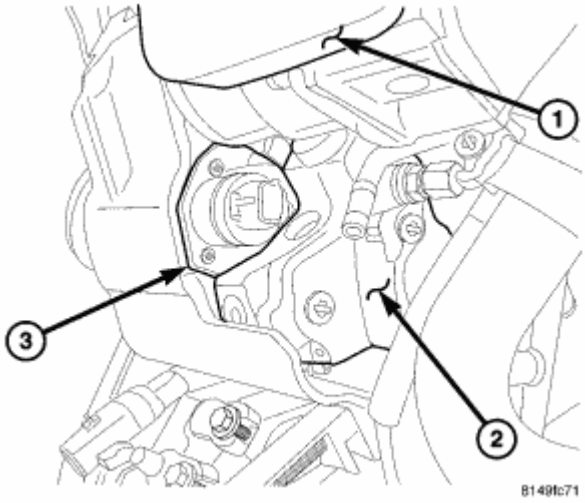

Fig. 85: Fuel Quantity Solenoid, Air Control Valve & Supply Pump
Courtesy of CHRYSLER LLC

1 - EGR AIR CONTROL VALVE
2 - GEAR SUPPLY PUMP
3 - FUEL QUANTITY SOLENOID

1. Disconnect the negative battery cable
2. Remove the charge air inlet hose.
3. Disconnect the fuel quantity solenoid wiring harness connector.
4. Remove the solenoid from the back of the high pressure pump. See **Fig. 85**.

NOTE: Inspect the fuel quantity solenoid and high pressure pump passage for contamination or corrosion. If contamination or corrosion is present

replace the high pressure pump.

5. Inspect solenoid and pump for corrosion.

INSTALLATION

FUEL QUANTITY SOLENOID

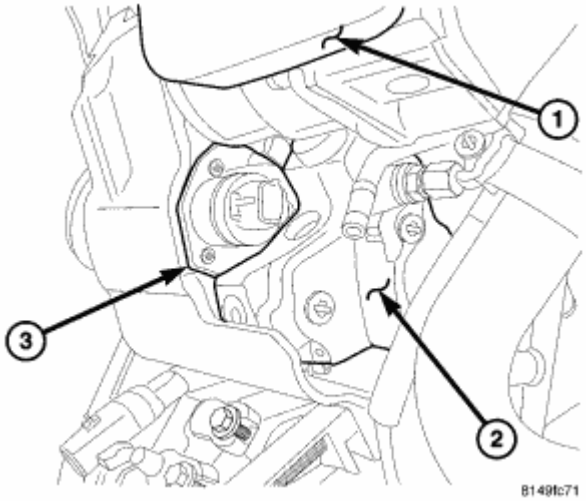

Fig. 86: Fuel Quantity Solenoid, Air Control Valve & Supply Pump
Courtesy of CHRYSLER LLC

1 - EGR AIR CONTROL VALVE
2 - GEAR SUPPLY PUMP
3 - FUEL QUANTITY SOLENOID

1. Review the high pressure fuel system warning. See **WARNING**.
2. Lubricate the fuel quantity solenoid and seal with clean diesel fuel.
3. Install the solenoid into the high pressure pump, hand tighten the fasteners. See **Fig. 86**.
4. Torque the solenoid fasteners to 10.8 N.m (96 in. lbs.).
5. Connect the wiring harness connector.
6. Install the charge air inlet hose.
7. Start engine, allow to warm, shut engine off and inspect for leaks.

FUEL INJECTION - GAS

PEDAL - ACCELERATOR

REMOVAL

ACCELERATOR PEDAL - WITHOUT ACCELERATOR PEDAL POSITION SENSOR

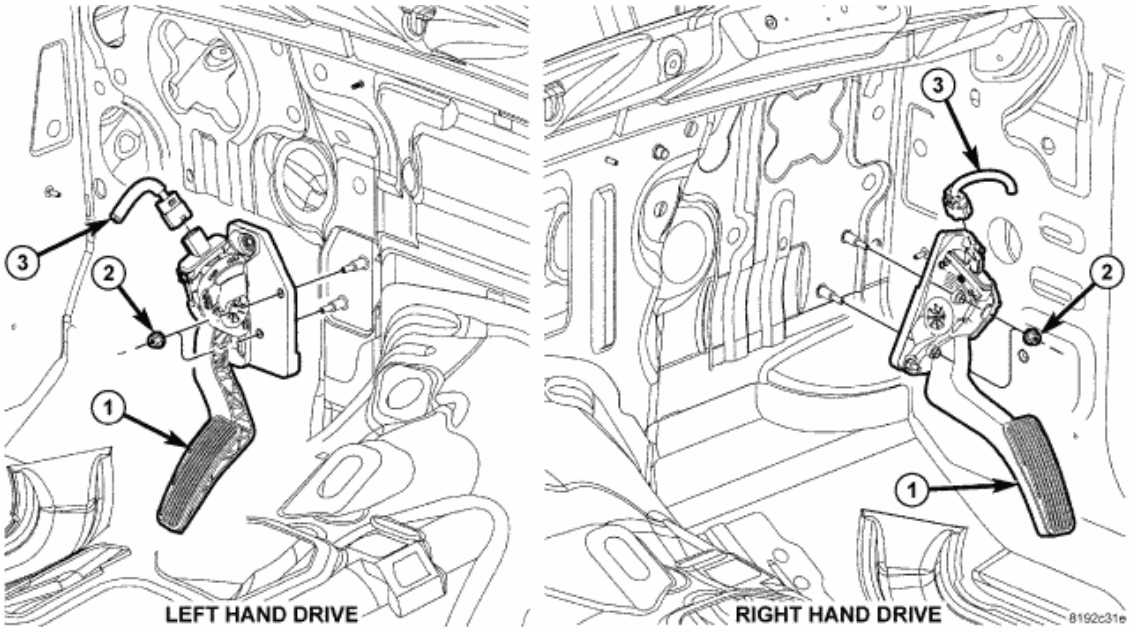

Fig. 87: Accelerator Pedal - Without Accelerator Pedal Position Sensor
Courtesy of CHRYSLER LLC

The accelerator pedal and APPS (Accelerator Pedal Position Sensor) are serviced as a complete assembly including the bracket.

1. Disconnect electrical connector (3) at APPS.
2. Remove two accelerator pedal mounting bracket nuts (2).
3. Remove accelerator pedal/APPS assembly (1) from vehicle.

INSTALLATION

ACCELERATOR PEDAL - WITHOUT ACCELERATOR PEDAL POSITION SENSOR

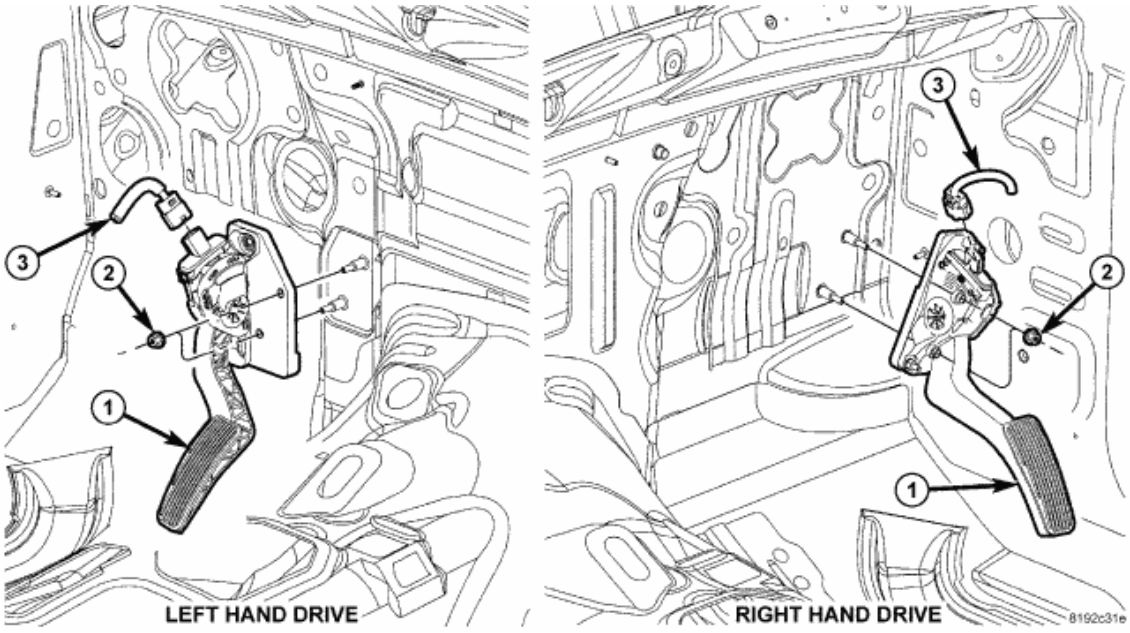

Fig. 88: Accelerator Pedal - Without Accelerator Pedal Position Sensor
Courtesy of CHRYSLER LLC

The accelerator pedal and APPS (Accelerator Pedal Position Sensor) are serviced as a complete assembly including the bracket.

1. Position accelerator pedal/APPS assembly over two mounting studs.
2. Install two accelerator pedal mounting bracket nuts (2).
3. Connect electrical connector (3) at APPS.
4. Before starting engine, operate accelerator pedal to check for any binding.

SENSOR - ACCELERATOR PEDAL POSITION

DESCRIPTION

DESCRIPTION

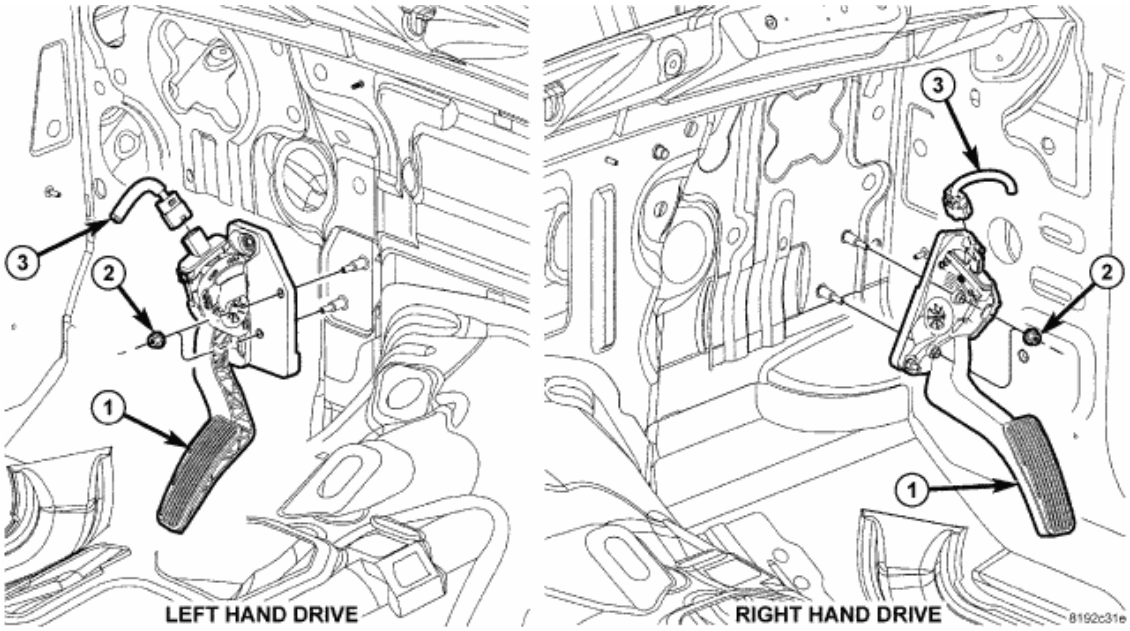

Fig. 89: Accelerator Pedal - Without Accelerator Pedal Position Sensor
Courtesy of CHRYSLER LLC

The accelerator pedal and APPS (Accelerator Pedal Position Sensor) are serviced as a complete assembly including the bracket. Refer to Accelerator Pedal Removal and Installation procedures.

SENSOR-CRANKSHAFT POSITION

REMOVAL

CRANKSHAFT POSITION (CKP) SENSOR-3.7L

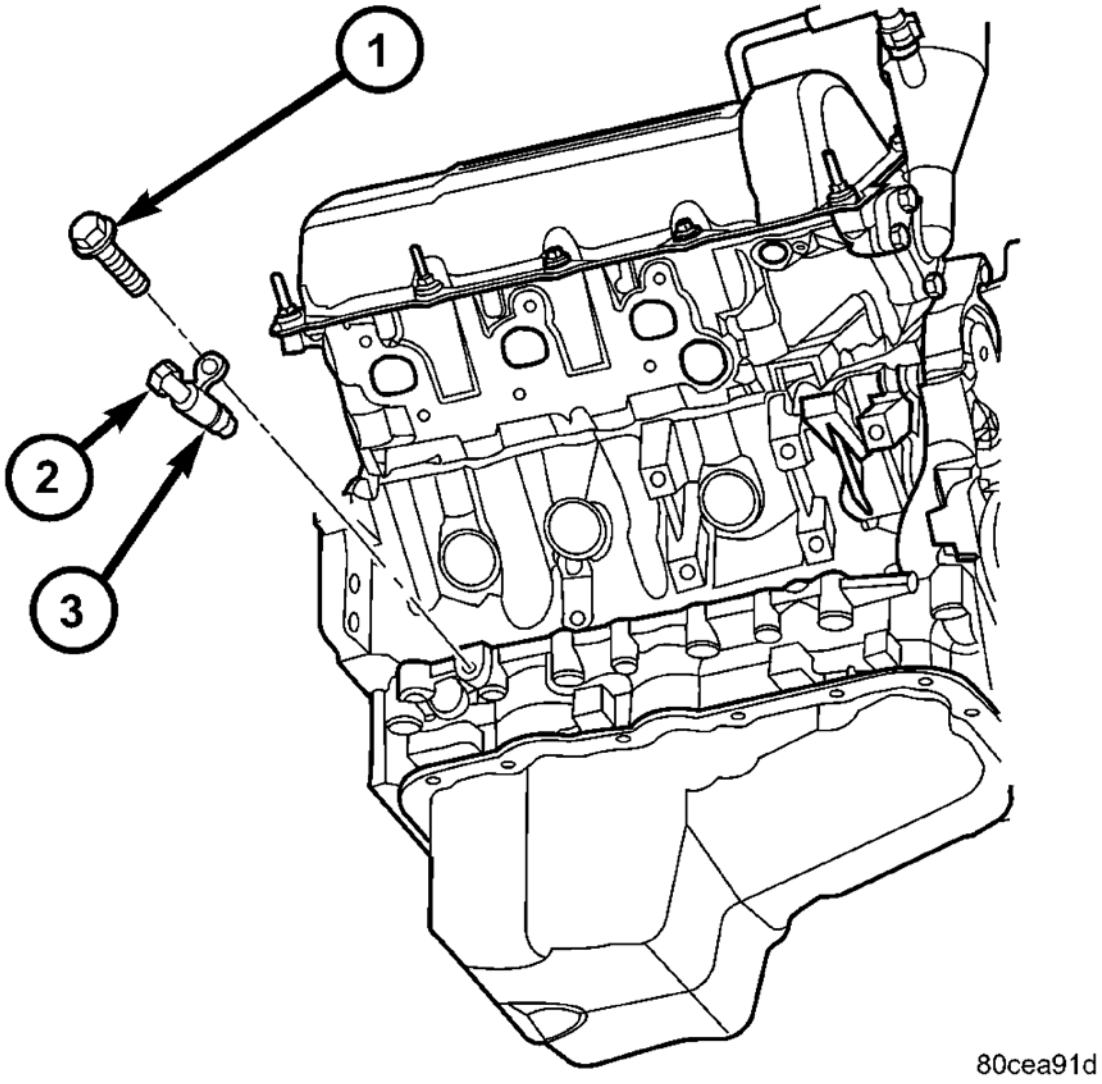

Fig. 90: Identifying CKP Sensor, O-Ring & Mounting Bolt
Courtesy of CHRYSLER LLC

1 - MOUNTING BOLT
2 - CKP SENSOR
3 - O-RING

The Crankshaft Position (CKP) sensor (2) is mounted into the right rear side of the cylinder block. It is positioned and bolted into a machined hole.

1. Raise vehicle.
2. Disconnect sensor electrical connector.
3. Remove sensor mounting bolt (1).

4. Carefully twist sensor from cylinder block.
5. Check condition of sensor o-ring (3).

REMOVAL - 4.0L

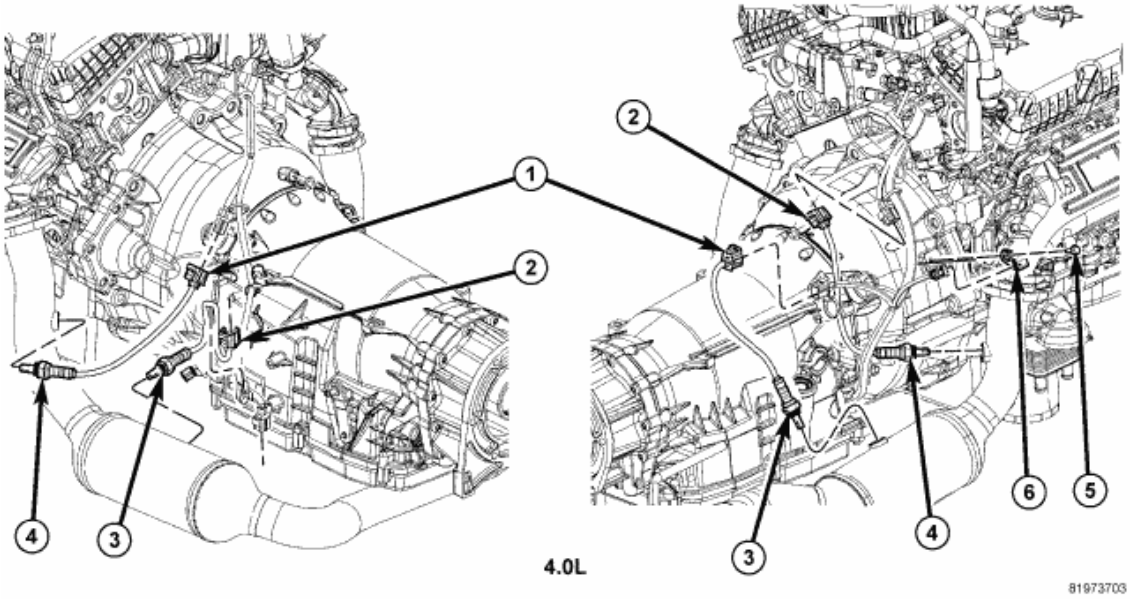

Fig. 91: Identifying CKP/Oxygen Sensors - 4.0L
Courtesy of CHRYSLER LLC

The Crankshaft Position (CKP) sensor (6) is mounted into the right side of the transmission bellhousing. It is positioned and bolted into a machined hole.

1. Raise vehicle.
2. Disconnect sensor electrical connector.
3. Remove sensor mounting bolt (5).
4. Carefully twist sensor from transmission.

INSTALLATION

CRANKSHAFT POSITION (CKP) SENSOR-3.7L

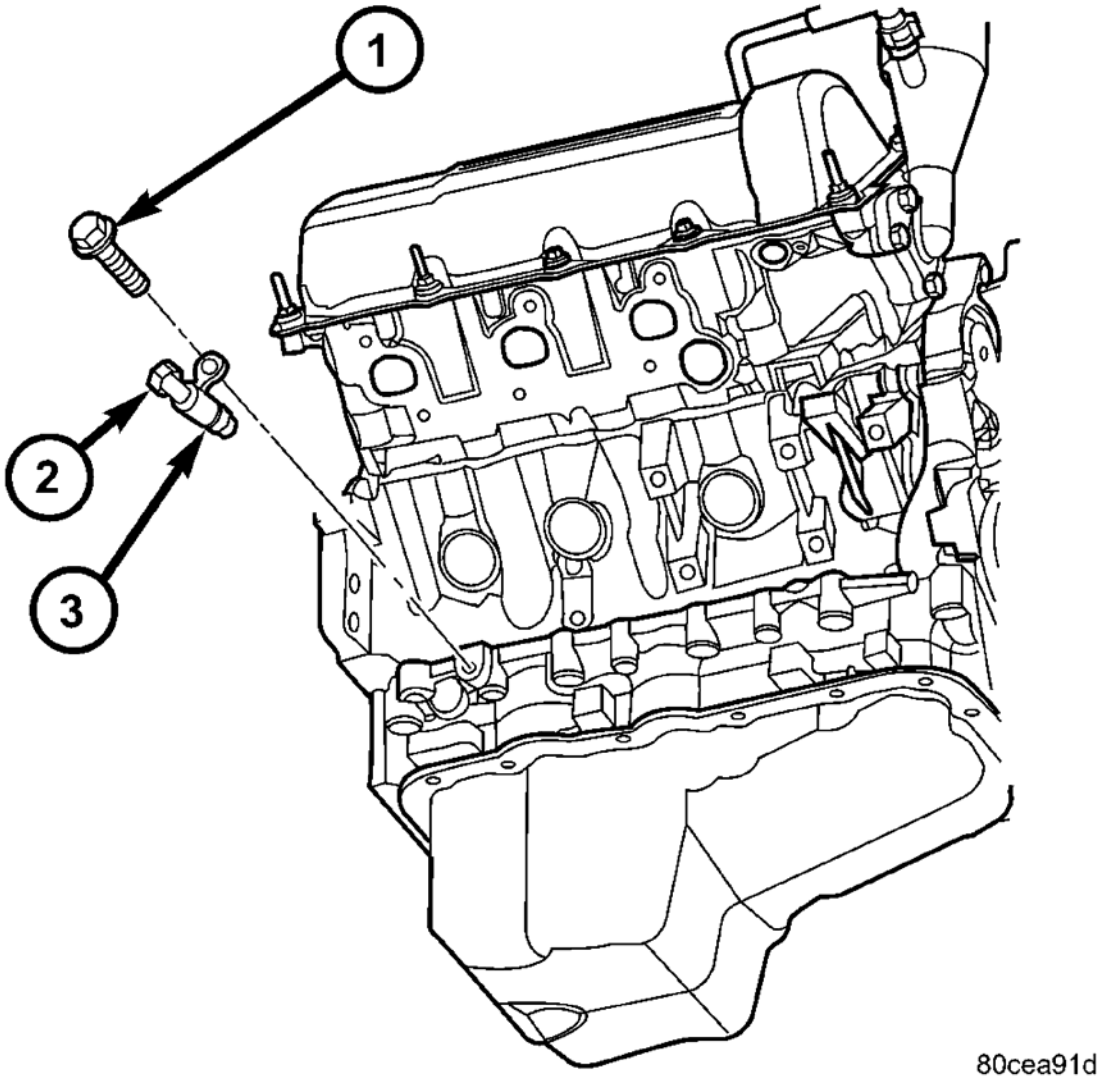

Fig. 92: Identifying CKP Sensor, O-Ring & Mounting Bolt
Courtesy of CHRYSLER LLC

1 - MOUNTING BOLT
2 - CKP SENSOR
3 - O-RING

1. Clean out machined hole in engine block.
2. Apply a small amount of engine oil to sensor o-ring (3).
3. Install sensor (2) into engine block with a slight rocking and twisting action.

CAUTION: Before tightening sensor mounting bolt (1), be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to

sensor mounting tang may result.

4. Install mounting bolt (1).
5. Connect electrical connector to sensor.
6. Lower vehicle.

INSTALLATION - 4.0L

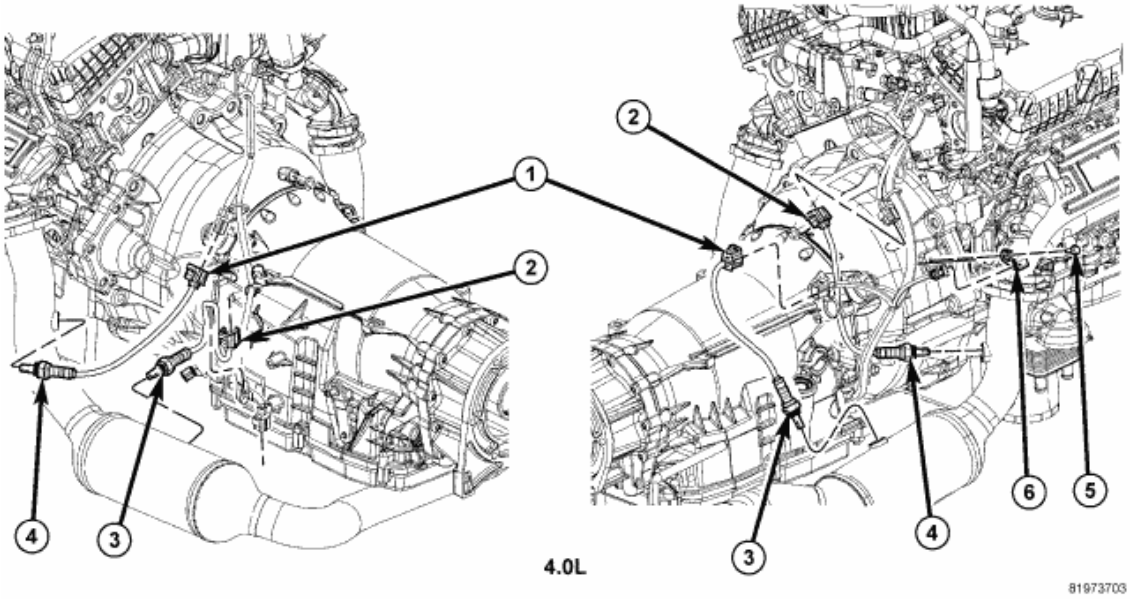

Fig. 93: Identifying CKP/Oxygen Sensors - 4.0L
Courtesy of CHRYSLER LLC

1. Clean out machined hole in transmission bellhousing.
2. Install sensor (6) into transmission.

CAUTION: Before tightening sensor mounting bolt (5), be sure sensor is completely flush to transmission. If sensor is not flush, damage to sensor mounting tang may result.

3. Install mounting bolt (5).
4. Connect electrical connector to sensor.
5. Lower vehicle.

INJECTOR-FUEL

DESCRIPTION

FUEL INJECTORS

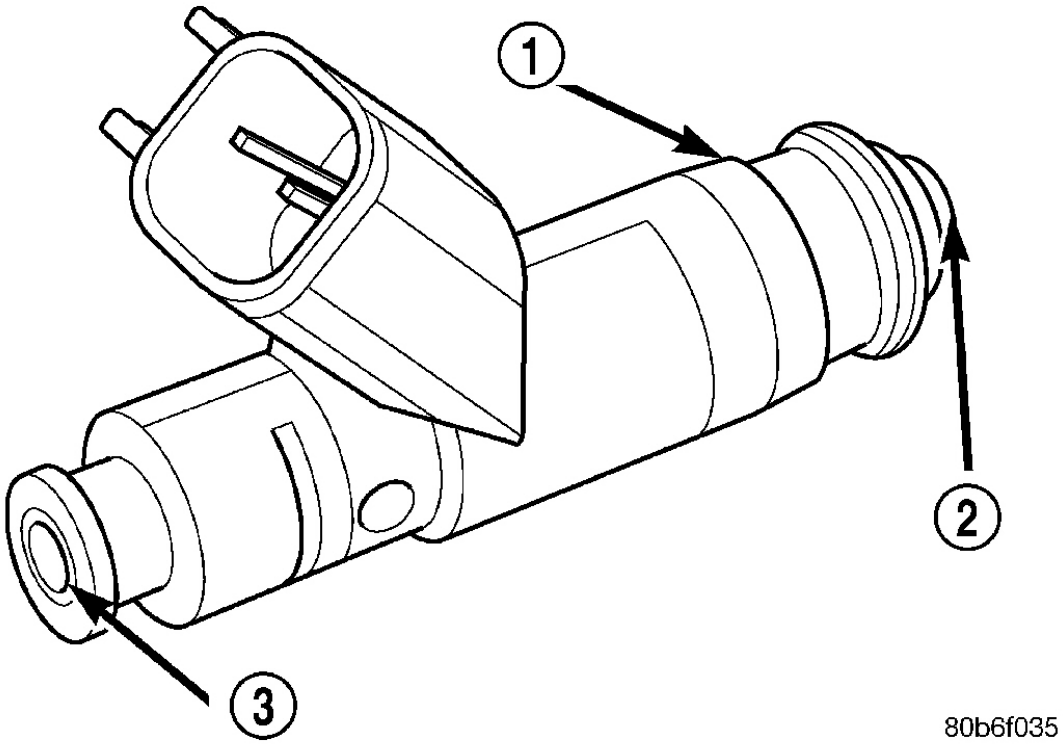

Fig. 94: Identifying Injector Body, Fuel Outlet Nozzle & Fuel Inlet Nozzle
Courtesy of CHRYSLER LLC

1 - INJECTOR BODY
2 - FUEL OUTLET NOZZLE
3 - FUEL INLET NOZZLE

An individual fuel injector (1) is used for each individual cylinder. See **Fig. 94**.

OPERATION

FUEL INJECTORS

The top (fuel entry) end of the injector is attached into an opening on the fuel rail. See **Fig. 94**.

The fuel injectors are electrical solenoids. The injector contains a pintle that closes off an orifice at the nozzle end. When electric current is supplied to the injector, the armature and needle move a short distance against a spring, allowing fuel to flow out the orifice. Because the fuel is under high pressure, a fine spray is developed in the shape of a pencil stream. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber.

The nozzle (outlet) ends of the injectors are positioned into openings in the intake manifold just above the

intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector.

The injectors are energized individually in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage is supplied to the injectors through the ASD relay.

The PCM determines injector pulse width based on various inputs.

FUEL INJECTORS - PCM OUTPUT

The nozzle ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector with its respective cylinder number.

The injectors are energized individually in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage (12 volts +) is supplied to the injectors through the ASD relay. The ASD relay will shut-down the 12 volt power source to the fuel injectors if the PCM senses the ignition is on, but the engine is not running. This occurs after the engine has not been running for approximately 1.8 seconds.

The PCM determines injector on-time (pulse width) based on various inputs.

REMOVAL

FUEL INJECTORS

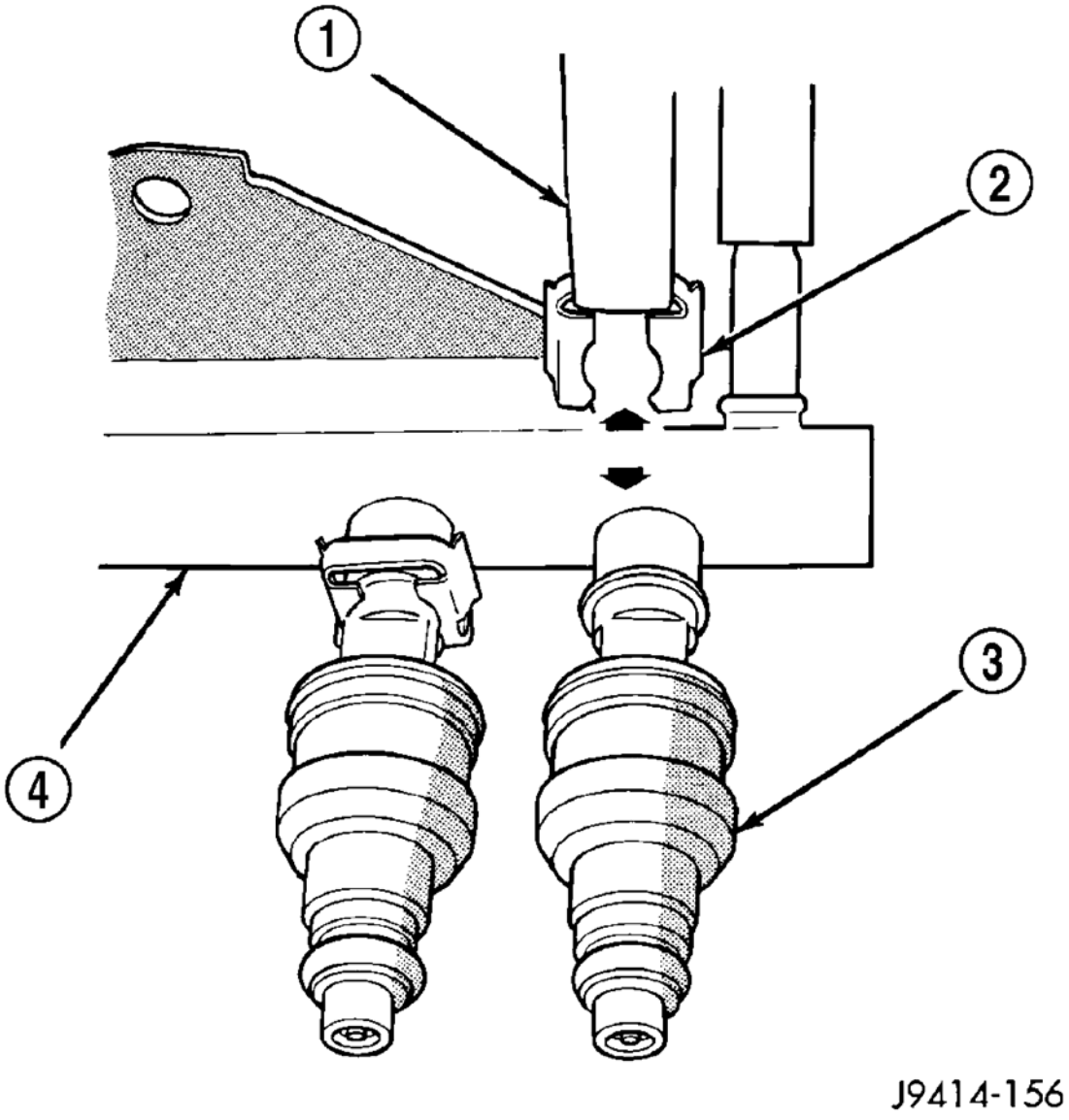

Fig. 95: Identifying Pliers, Injector Clip, Fuel Injector & Fuel Rail
Courtesy of CHRYSLER LLC

1 - PLIERS
2 - INJECTOR CLIP
3 - FUEL INJECTOR
4 - FUEL RAIL - TYPICAL

1. Remove fuel rail. See **REMOVAL**.
2. Disconnect clip(s) (2) that retain fuel injector(s) (3) to fuel rail (4). See **Fig. 95**.

INSTALLATION

FUEL INJECTORS

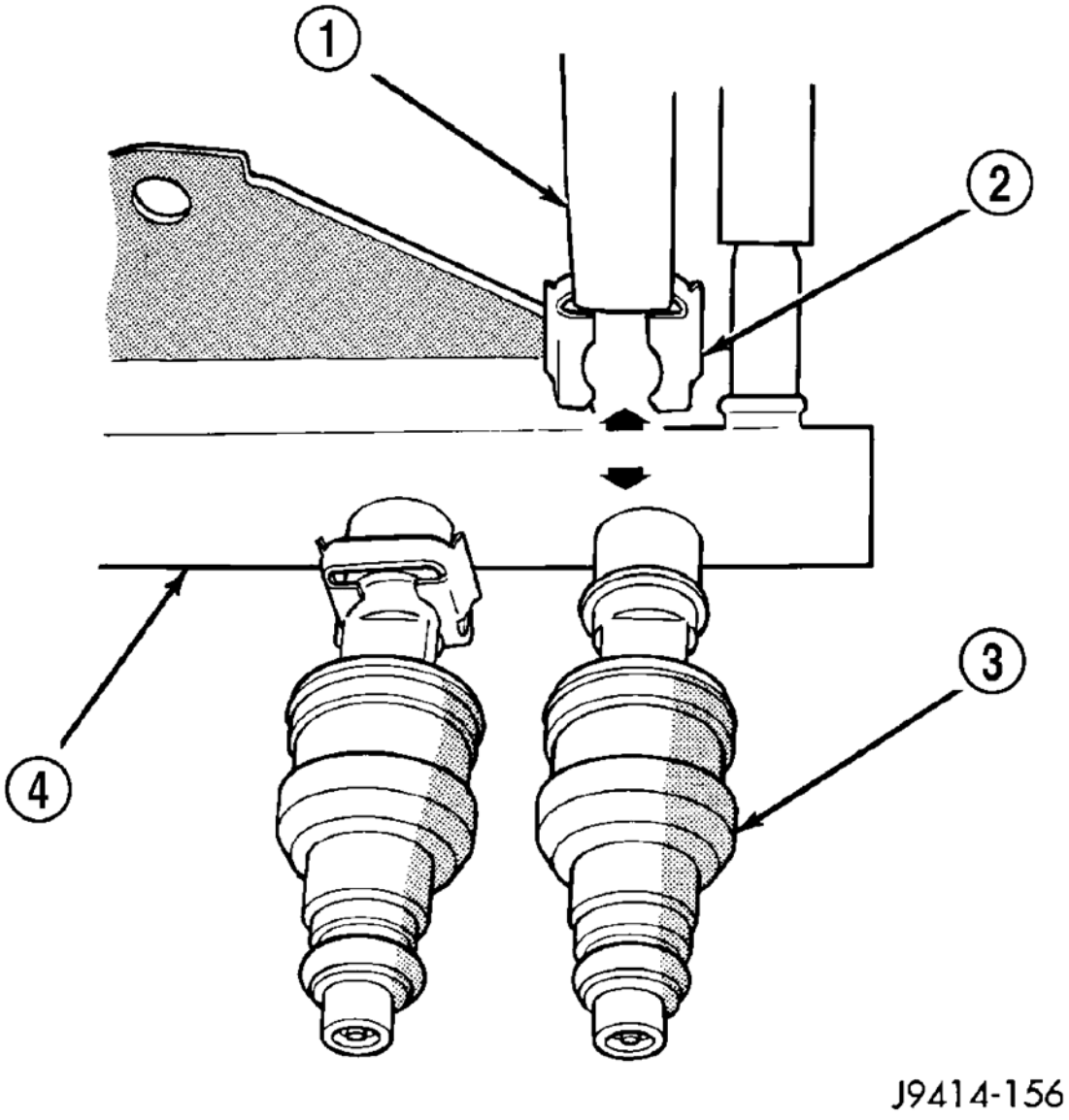

Fig. 96: Identifying Pliers, Injector Clip, Fuel Injector & Fuel Rail
Courtesy of CHRYSLER LLC

1 - PLIERS
2 - INJECTOR CLIP
3 - FUEL INJECTOR
4 - FUEL RAIL - TYPICAL

1. Install fuel injector(s) (3) into fuel rail assembly (4) and install retaining clip(s) (2).
2. If same injector(s) is being reinstalled, install new O-ring(s). Two different O-rings are being used. These

can be easily identified by color. Install black O-ring at intake manifold end of injector. Install red/rust colored O-ring at fuel rail end of injector.

3. Apply a small amount of clean engine oil to each injector O-ring. This will aid in installation.
4. Install fuel rail. See **INSTALLATION**.
5. Start engine and check for fuel leaks.

RELAY-FUEL PUMP

DESCRIPTION

FUEL PUMP RELAY

This vehicle is not equipped with a fuel pump relay. The fuel pump control is done through the TIPM. The TIPM receives an input signal from the PCM. Once the TIPM receives the signal, it will output a 12 volt supply to the fuel pump module turning the pump on.

SENSOR-INTAKE AIR TEMPERATURE

REMOVAL

REMOVAL - 3.7L

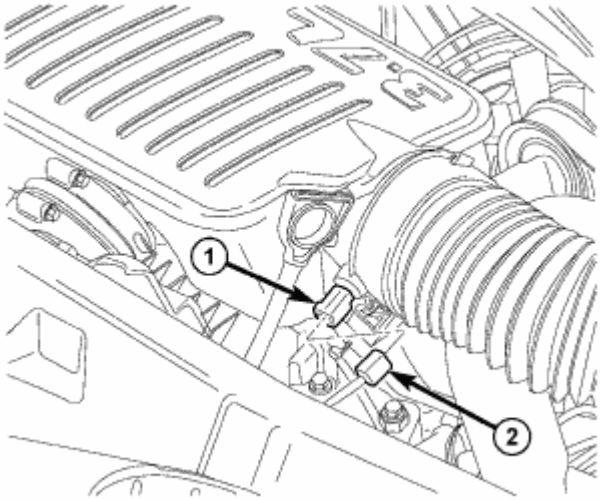

Fig. 97: Identifying Intake Manifold Air Temperature (IAT) Sensor & Electrical Connector
Courtesy of CHRYSLER LLC

The intake manifold air temperature (IAT) sensor (1) is installed into the rubber air intake tube near the throttle body.

1. Disconnect electrical connector (2) from IAT sensor.
2. Clean dirt from IAT sensor base.

3. Pull out on IAT sensor (1) while rotating for removal.
4. Check condition of sensor O-ring.

REMOVAL - 4.0L

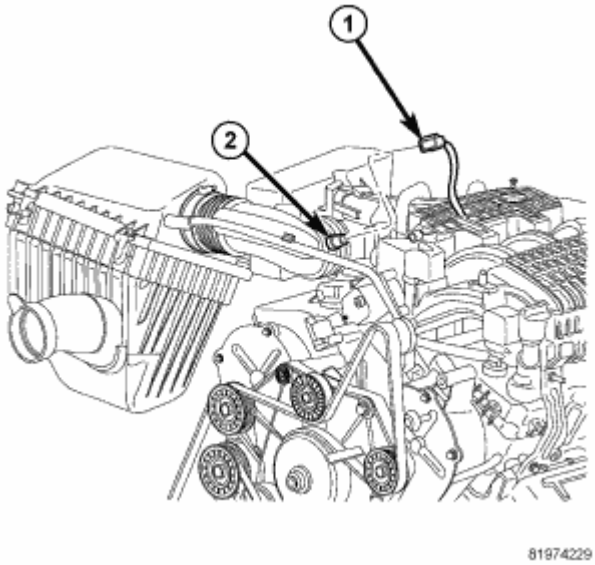

Fig. 98: Identifying Electrical Connector & IAT Sensor
Courtesy of CHRYSLER LLC

The intake manifold air temperature (IAT) sensor (2) is installed into the rubber air intake tube near the throttle body.

1. Disconnect electrical connector (1) from IAT sensor.
2. Clean dirt from IAT sensor base.
3. Pull out on IAT sensor (2) while rotating for removal.
4. Check condition of sensor O-ring.

INSTALLATION

INSTALLATION - 3.7L

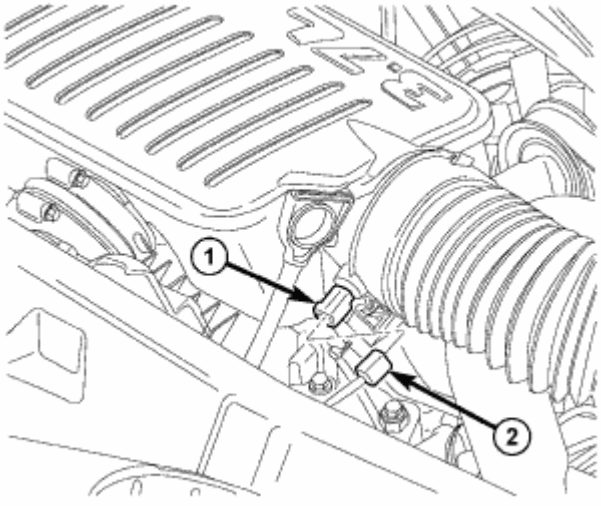

Fig. 99: Identifying Intake Manifold Air Temperature (IAT) Sensor & Electrical Connector
Courtesy of CHRYSLER LLC

The intake manifold air temperature (IAT) sensor (1) is installed into the rubber air intake tube near the throttle body.

1. Clean mounting hole.
2. Check condition of sensor O-ring.
3. Push IAT sensor (1) into rubber intake tube while rotating for installation.
4. Connect electrical connector (2) to IAT sensor.

INSTALLATION - 4.0L

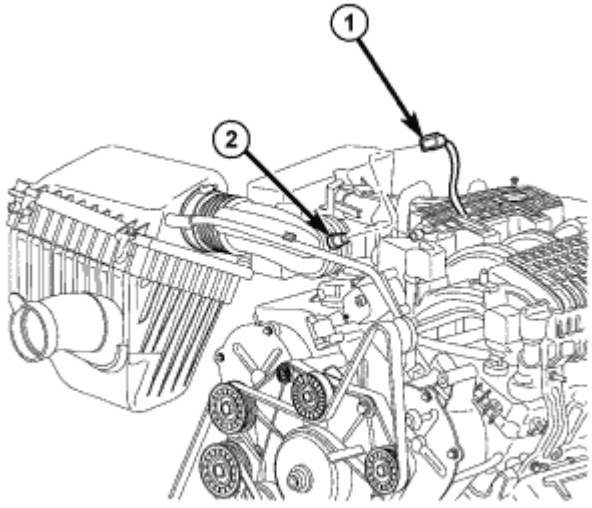

Fig. 100: Identifying Electrical Connector & IAT Sensor
Courtesy of CHRYSLER LLC

The intake manifold air temperature (IAT) sensor (2) is installed into the rubber air intake tube near the throttle body.

1. Clean mounting hole.
2. Check condition of sensor O-ring.
3. Push IAT sensor (2) into rubber intake tube while rotating for installation.
4. Connect electrical connector (1) to IAT sensor.

SENSOR-MANIFOLD AIR PRESSURE

OPERATION

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR - PCM INPUT

The MAP sensor is used as an input to the Powertrain Control Module (PCM). It contains a silicon based sensing unit to provide data on the manifold vacuum that draws the air/fuel mixture into the combustion chamber. The PCM requires this information to determine injector pulse width and spark advance. When manifold absolute pressure (MAP) equals Barometric pressure, the pulse width will be at maximum.

A 5 volt reference is supplied from the PCM and returns a voltage signal to the PCM that reflects manifold pressure. The zero pressure reading is 0.5V and full scale is 4.5V. For a pressure swing of 0-15 psi, the voltage changes 4.0V. To operate the sensor, it is supplied a regulated 4.8 to 5.1 volts. Ground is provided through the low-noise, sensor return circuit at the PCM.

The MAP sensor input is the number one contributor to fuel injector pulse width. The most important function of the MAP sensor is to determine barometric pressure. The PCM needs to know if the vehicle is at sea level or at a higher altitude, because the air density changes with altitude. It will also help to correct for varying barometric pressure. Barometric pressure and altitude have a direct inverse correlation; as altitude goes up, barometric goes down. At key-on, the PCM powers up and looks at MAP voltage, and based upon the voltage it sees, it knows the current barometric pressure (relative to altitude). Once the engine starts, the PCM looks at the voltage again, continuously every 12 milliseconds, and compares the current voltage to what it was at key-on. The difference between current voltage and what it was at key-on, is manifold vacuum.

During key-on (engine not running) the sensor reads (updates) barometric pressure. A normal range can be obtained by monitoring a known good sensor.

As the altitude increases, the air becomes thinner (less oxygen). If a vehicle is started and driven to a very different altitude than where it was at key-on, the barometric pressure needs to be updated. Any time the PCM sees Wide Open Throttle (WOT), and RPM, it will update barometric pressure in the MAP memory cell. With periodic updates, the PCM can make its calculations more effectively.

The PCM uses the MAP sensor input to aid in calculating the following:

- Manifold pressure

Barometric pressure
Engine load
Injector pulse-width
Spark-advance programs
Shift-point strategies (certain automatic transmissions only)
Idle speed
Decel fuel shutoff

The MAP sensor signal is provided from a single piezoresistive element located in the center of a diaphragm. The element and diaphragm are both made of silicone. As manifold pressure changes, the diaphragm moves causing the element to deflect, which stresses the silicone. When silicone is exposed to stress, its resistance changes. As manifold vacuum increases, the MAP sensor input voltage decreases proportionally. The sensor also contains electronics that condition the signal and provide temperature compensation.

The PCM recognizes a decrease in manifold pressure by monitoring a decrease in voltage from the reading stored in the barometric pressure memory cell. The MAP sensor is a linear sensor; meaning as pressure changes, voltage changes proportionately. The range of voltage output from the sensor is usually between 4.6 volts at sea level to as low as 0.3 volts at 26 in. of Hg. Barometric pressure is the pressure exerted by the atmosphere upon an object. At sea level on a standard day, no storm, barometric pressure is approximately 29.92 in Hg. For every 100 feet of altitude, barometric pressure drops 0.10 in. Hg. If a storm goes through, it can change barometric pressure from what should be present for that altitude. You should know what the average pressure and corresponding barometric pressure is for your area.

REMOVAL

REMOVAL

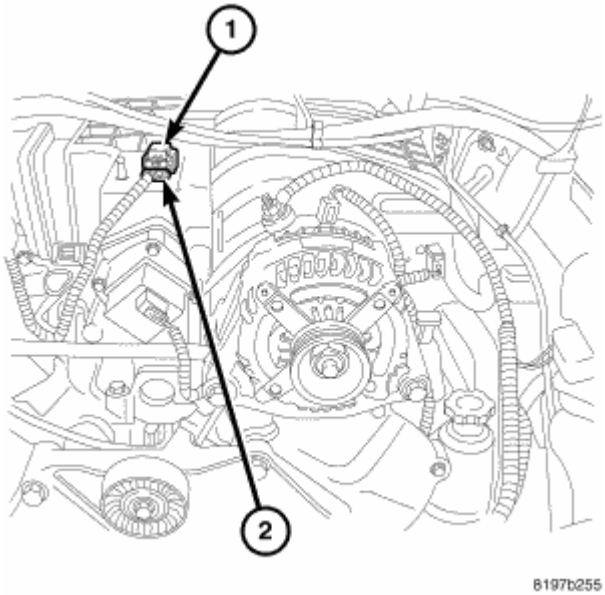

Fig. 101: Identifying MAP Sensor - 4.0L
Courtesy of CHRYSLER LLC

The Manifold Absolute Pressure (MAP) sensor (2) is mounted into the top/front of the upper half of the intake manifold.

An O-ring is used to seal the sensor to the intake manifold.

1. Disconnect electrical connector (1) at sensor (2).
2. Clean area around MAP sensor.
3. Rotate sensor 1/4 turn counter-clockwise until tangs align.
4. Pull MAP sensor from intake manifold.
5. Check condition of sensor O-ring.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

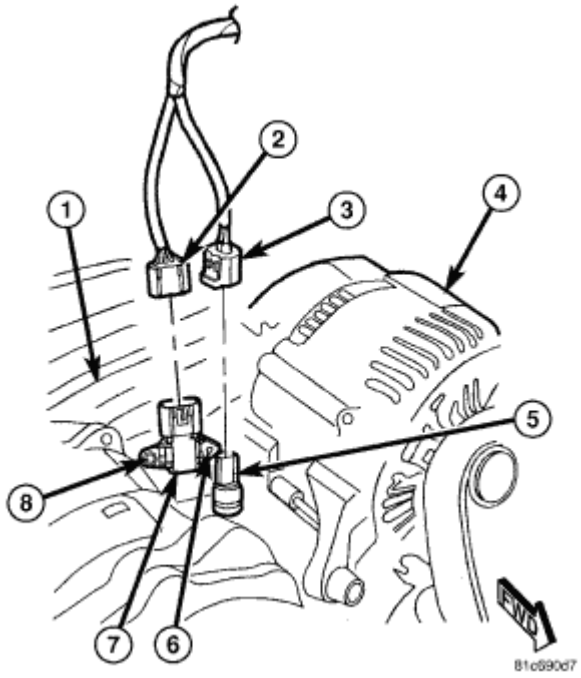

Fig. 102: Identifying MAP Sensor - 3.7L
Courtesy of CHRYSLER LLC

The Manifold Absolute Pressure (MAP) sensor (7) is mounted into the front of the intake manifold (1).

1. Disconnect electrical connector (2) at sensor.
2. Clean area around MAP sensor.
3. Remove one sensor mounting screw (8).
4. Remove MAP sensor from intake manifold by slipping it from locating pin (6).

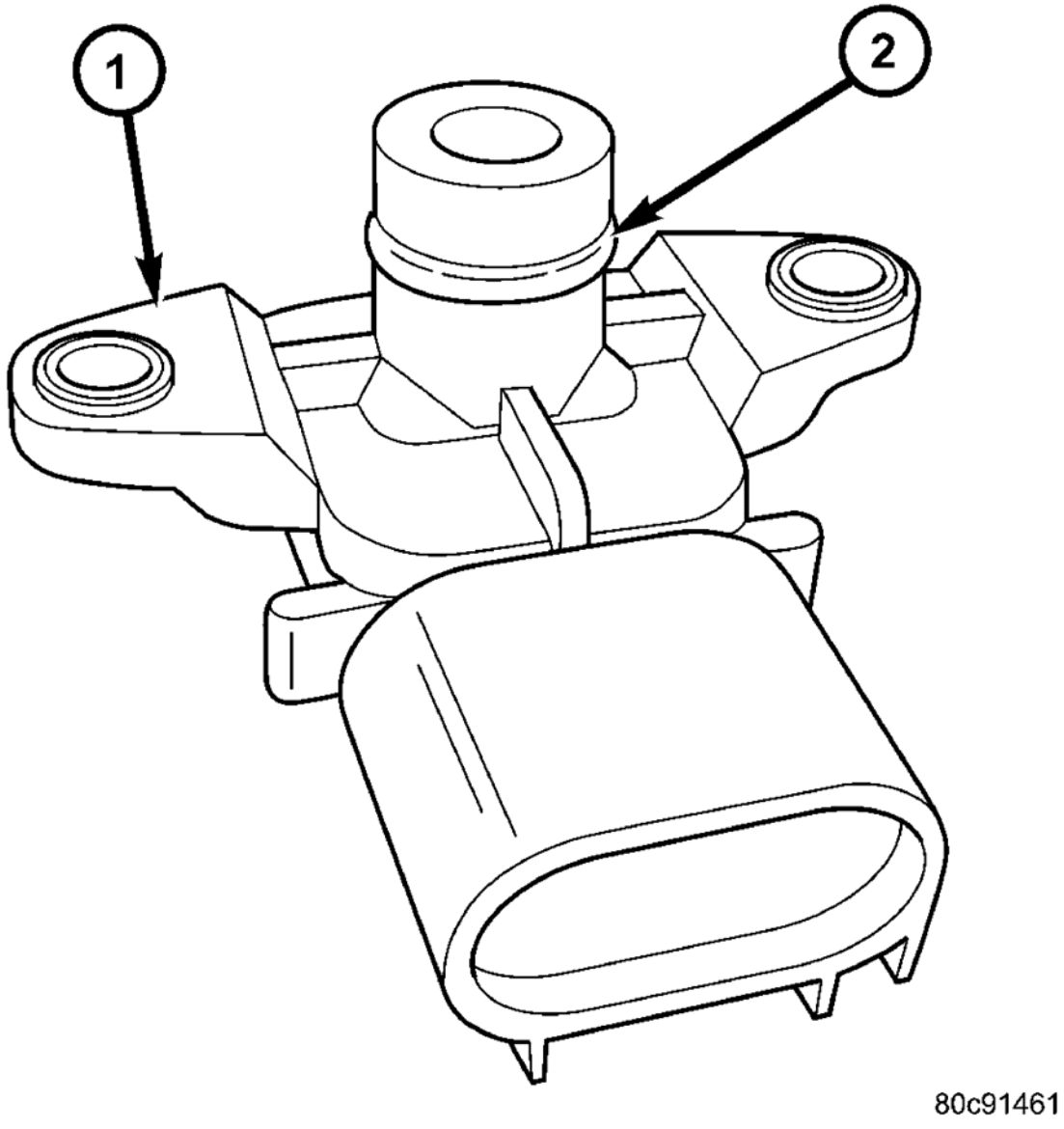

Fig. 103: Identifying MAP Sensor & O-ring
Courtesy of CHRYSLER LLC

1 - MAP SENSOR
2 - O-RING

5. Check condition of sensor o-ring (2)

INSTALLATION

INSTALLATION

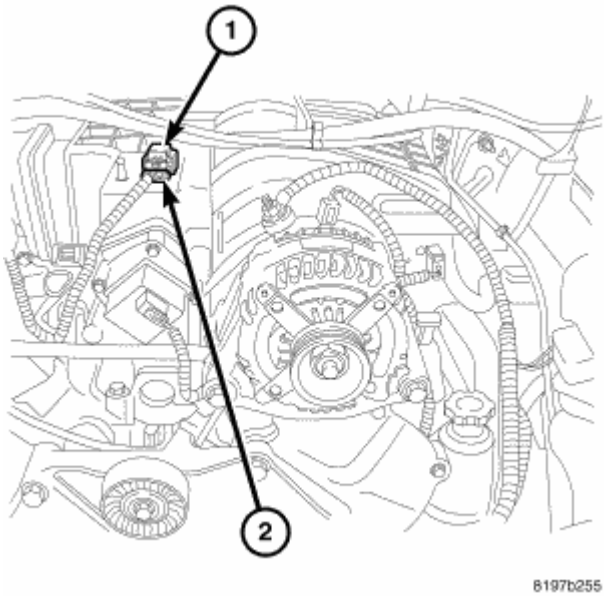

Fig. 104: Identifying MAP Sensor - 4.0L
Courtesy of CHRYSLER LLC

The Manifold Absolute Pressure (MAP) sensor (2) is mounted into the top/front of the upper half of the intake manifold.

An O-ring is used to seal the sensor to the intake manifold.

1. Check condition of sensor O-ring.
2. Position MAP sensor into intake manifold. Note locating tangs.
3. Rotate sensor 1/4 turn clockwise.
4. Connect electrical connector (1) at sensor (2).

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

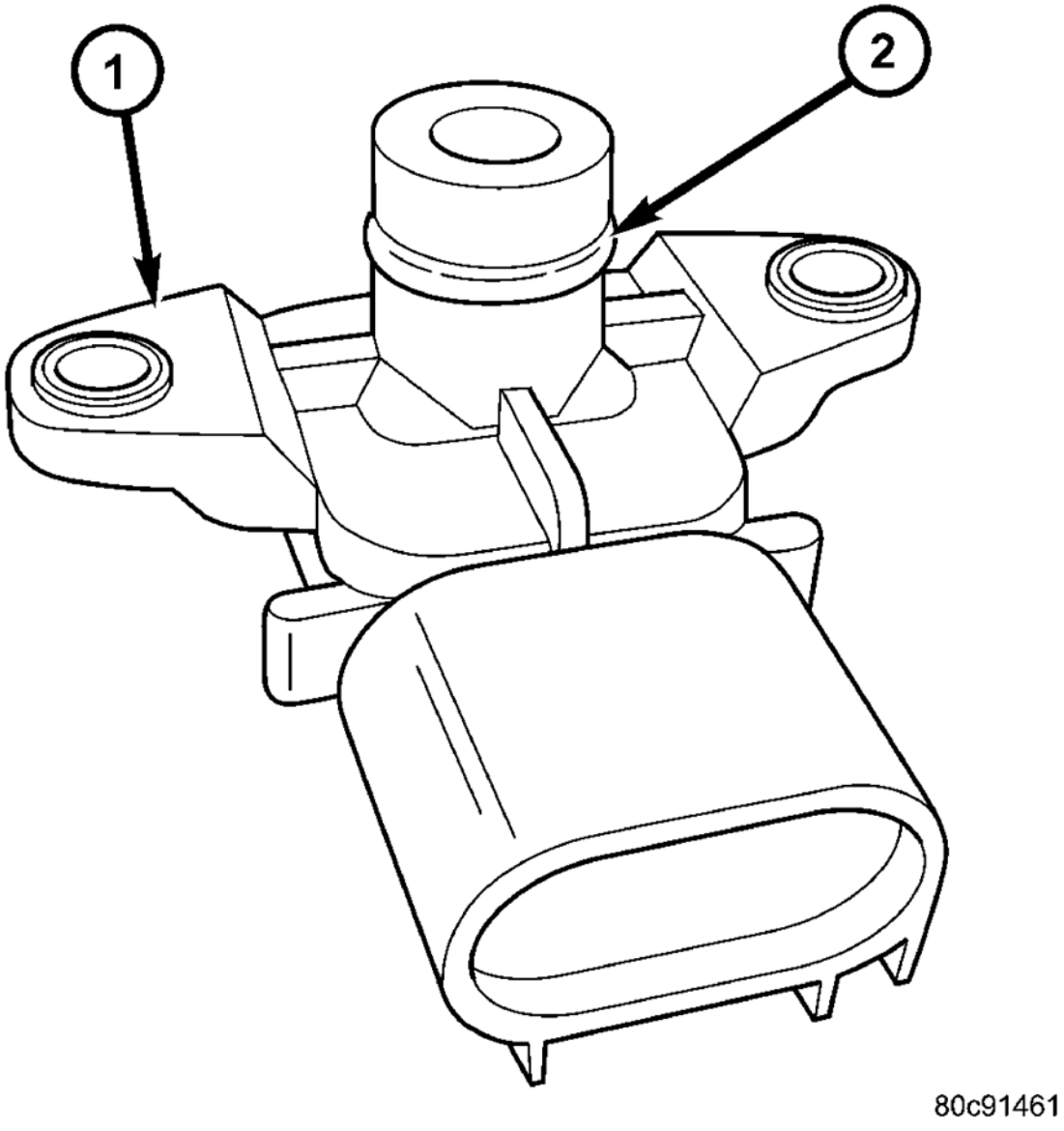

Fig. 105: Identifying MAP Sensor & O-ring
Courtesy of CHRYSLER LLC

1 - MAP SENSOR 2 - O-RING

1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor o-ring seal (2) for cuts or tears.

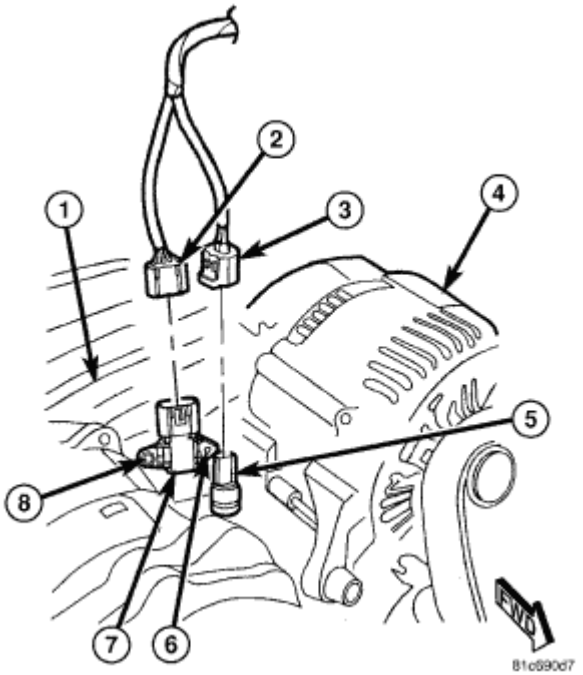

Fig. 106: Identifying MAP Sensor - 3.7L
Courtesy of CHRYSLER LLC

3. Position MAP sensor into manifold by sliding sensor over locating pin (6).
4. Install mounting bolt (8). Tighten to 3 N.m (25 in. lbs.) torque.
5. Connect electrical connector (2).

SENSOR - OXYGEN

REMOVAL

REMOVAL - 3.7L

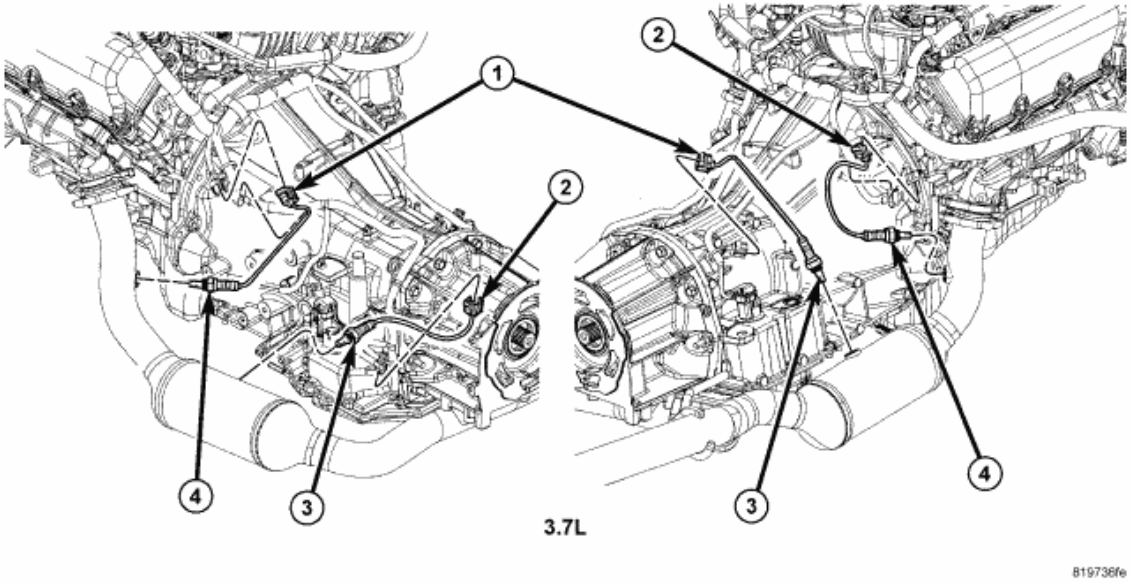

Fig. 107: Identifying Oxygen Sensors - 3.7L
Courtesy of CHRYSLER LLC

CAUTION: Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

WARNING: The exhaust manifold, exhaust pipes and catalytic converter become very hot during engine operation. Allow engine to cool before removing oxygen sensor.

1. Raise and support vehicle.
2. Disconnect wire connector from O2S sensor.

CAUTION: When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

3. Remove O2S sensor (3) or (4) with an oxygen sensor removal and installation tool.
4. Clean threads in exhaust pipe using appropriate tap.

REMOVAL - 4.0L

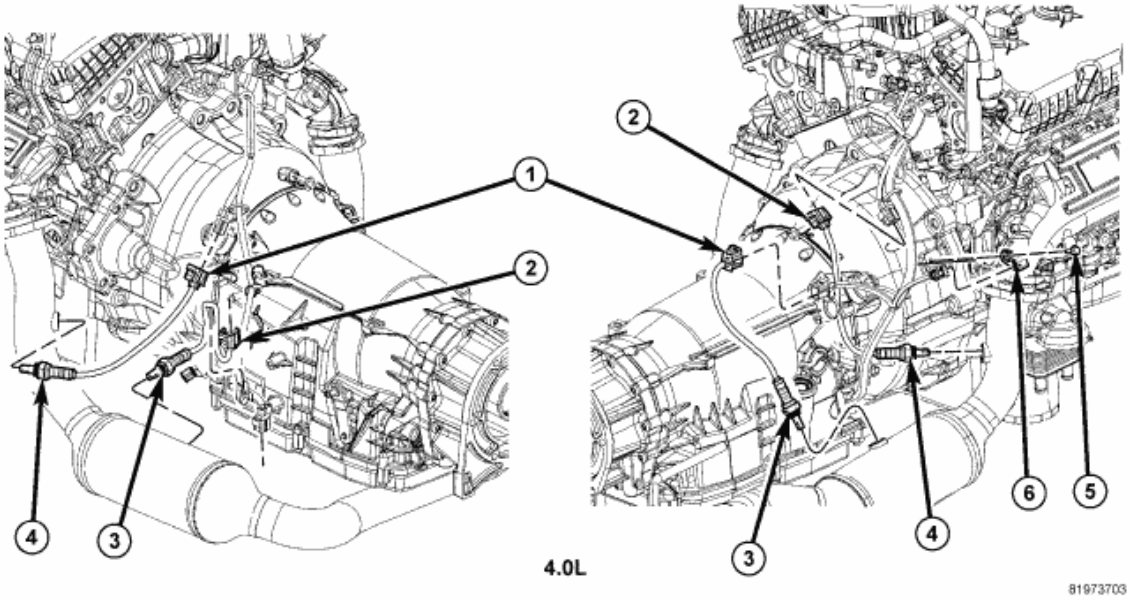

Fig. 108: Identifying CKP/Oxygen Sensors - 4.0L
Courtesy of CHRYSLER LLC

CAUTION: Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

WARNING: The exhaust manifold, exhaust pipes and catalytic converter become very hot during engine operation. Allow engine to cool before removing oxygen sensor.

1. Raise and support vehicle.
2. Disconnect wire connector from O2S sensor.

CAUTION: When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

3. Remove O2S sensor (3) or (4) with an oxygen sensor removal and installation tool.
4. Clean threads in exhaust pipe using appropriate tap.

INSTALLATION

INSTALLATION - 4.0L

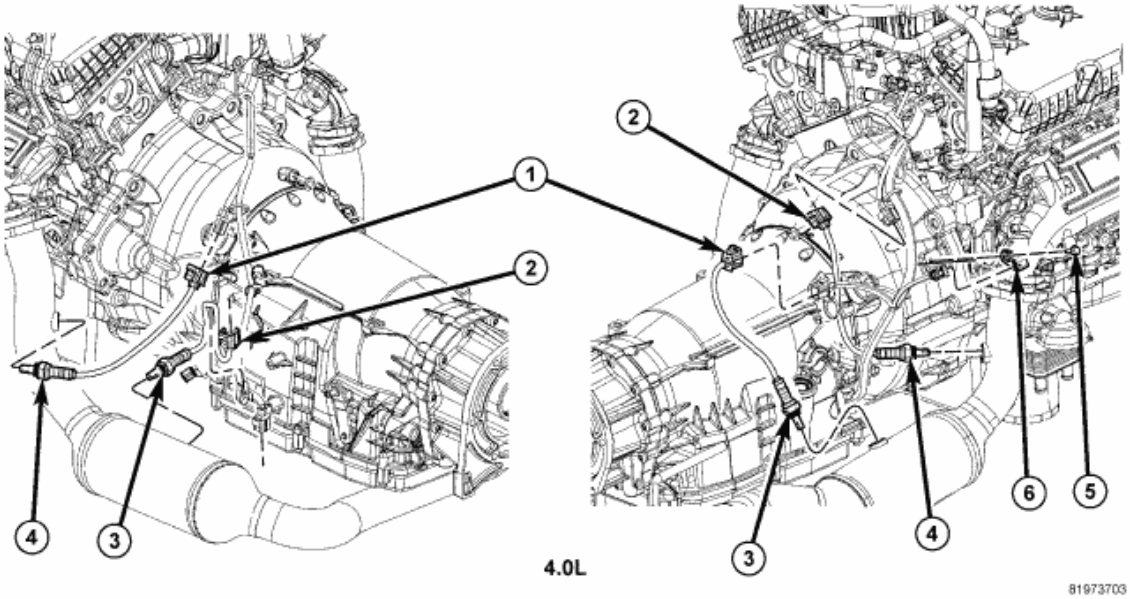

Fig. 109: Identifying CKP/Oxygen Sensors - 4.0L
Courtesy of CHRYSLER LLC

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal.**DO NOT add any additional anti-seize compound to threads of a new oxygen sensor.**

1. Install O2S sensor (3) or (4). Tighten to 41 N.m (30 ft. lbs.).
2. Connect O2S sensor wire connector.
3. Lower vehicle.

INSTALLATION - 3.7L

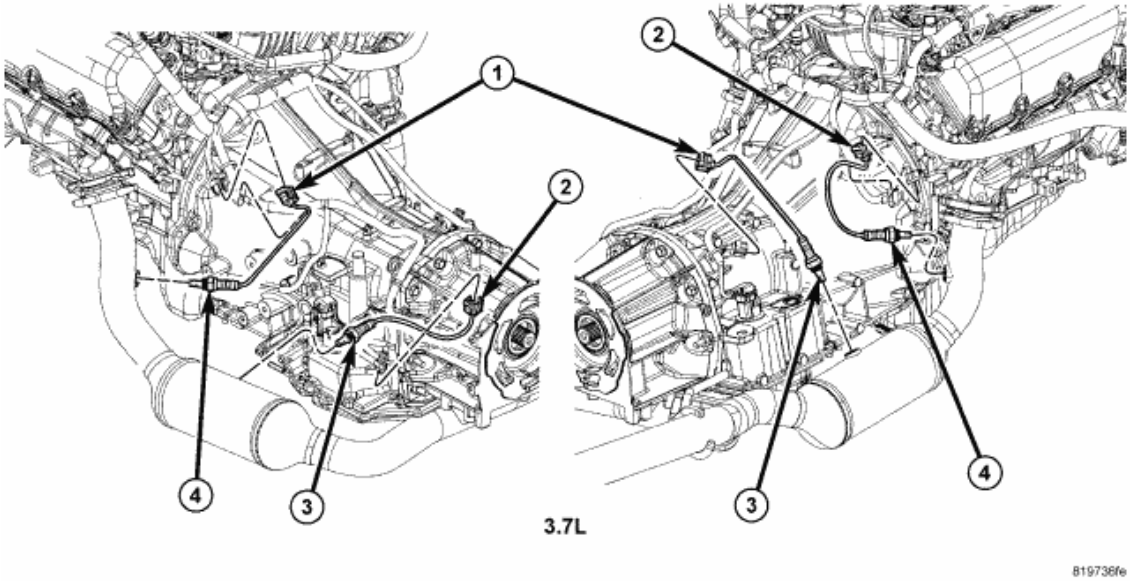

Fig. 110: Identifying Oxygen Sensors - 3.7L
Courtesy of CHRYSLER LLC

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to threads of a new oxygen sensor.**

1. Install O2S sensor (3) or (4). Tighten to 41 N.m (30 ft. lbs.).
2. Connect O2S sensor wire connector.
3. Lower vehicle.

BODY-THROTTLE

REMOVAL

THROTTLE BODY - 3.7L

CAUTION: Using a diagnostic scan tool, record any previous DTC's (Diagnostic Trouble Codes).

CAUTION: Never have the ignition key in the ON position when/if checking the throttle body shaft for a binding condition. This may set DTC's.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

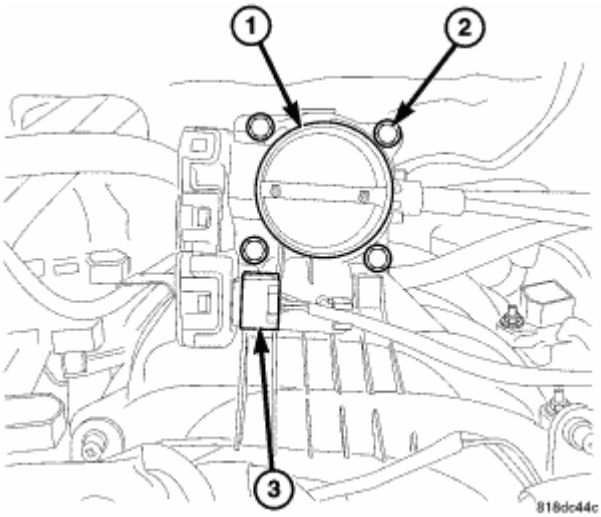

Fig. 111: Identifying Throttle Body Flange, Mounting Bolts & Electrical Connector - 3.7L
Courtesy of CHRYSLER LLC

1. Disconnect and isolate negative battery cable at battery.

2. Remove air intake tube at throttle body flange (1).
3. Disconnect throttle body electrical connector (3).
4. Disconnect necessary vacuum lines at throttle body.
5. Remove four throttle body mounting bolts (2).
6. Remove throttle body from intake manifold.
7. Check condition of old throttle body-to-intake manifold o-ring.

REMOVAL - 4.0L

CAUTION: Using a diagnostic scan tool, record any previous DTC's (Diagnostic Trouble Codes).

CAUTION: Never have the ignition key in the ON position when/if checking the throttle body shaft for a binding condition. This may set DTC's.

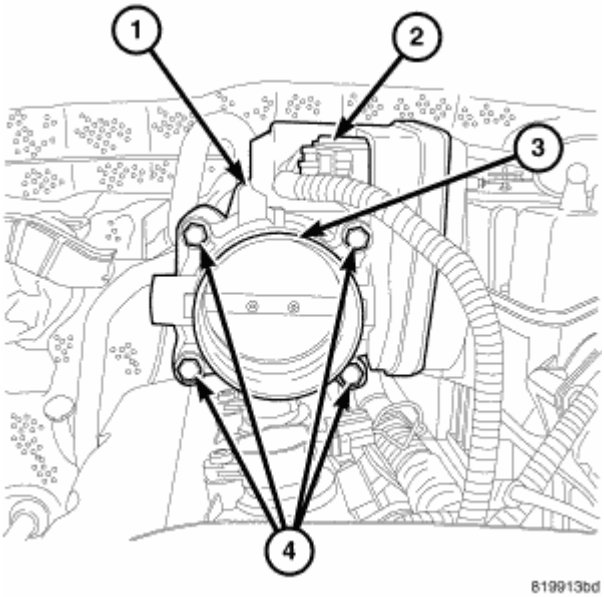

Fig. 112: Identifying Throttle Body Flange, Mounting Bolts & Electrical Connector - 4.0L
Courtesy of CHRYSLER LLC

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

1. Disconnect and isolate negative battery cable at battery.
2. Remove air intake tube at throttle body flange (3).
3. Disconnect throttle body electrical connector (2).
4. Disconnect necessary vacuum lines at throttle body.

5. Remove four throttle body mounting bolts (4).
6. Remove throttle body from intake manifold.
7. Check condition of old throttle body-to-intake manifold O-ring.

INSTALLATION

THROTTLE BODY - 3.7L

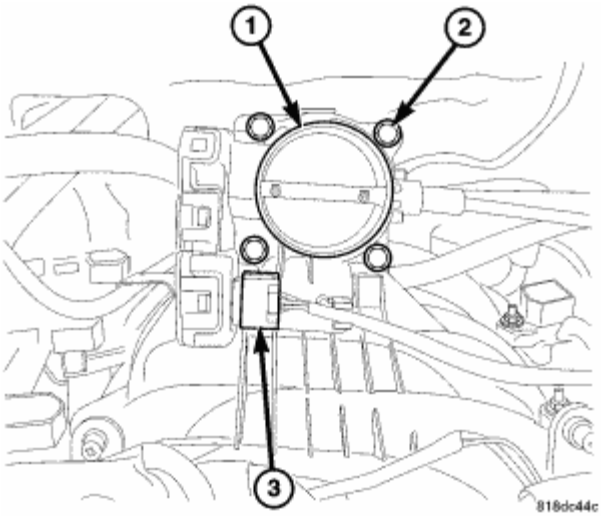

Fig. 113: Identifying Throttle Body Flange, Mounting Bolts & Electrical Connector (3.7L)
Courtesy of CHRYSLER LLC

1. Check condition of throttle body-to-intake manifold O-ring. Replace as necessary.
2. Clean mating surfaces of throttle body and intake manifold.
3. Install O-ring between throttle body and intake manifold.
4. Position throttle body (1) to intake manifold.
5. Install all throttle body mounting bolts (2) finger tight.

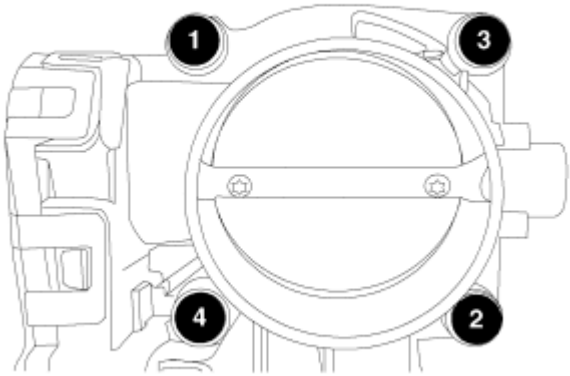

Fig. 114: Throttle Body Mounting Bolts Tightening Sequence
Courtesy of CHRYSLER LLC

CAUTION: The throttle body mounting bolts MUST be torqued to specifications. DO NOT OVER TIGHTEN MOUNTING BOLTS. Over tightening can cause damage to the throttle body, throttle plate, gaskets, bolts and/or the intake manifold. Proper torque of the mounting bolts is critical to normal operation.

6. Obtain a torque wrench. Tighten mounting bolts (as shown) in a mandatory torque criss-cross pattern sequence to 7.5 N.m (65 in. lbs.).

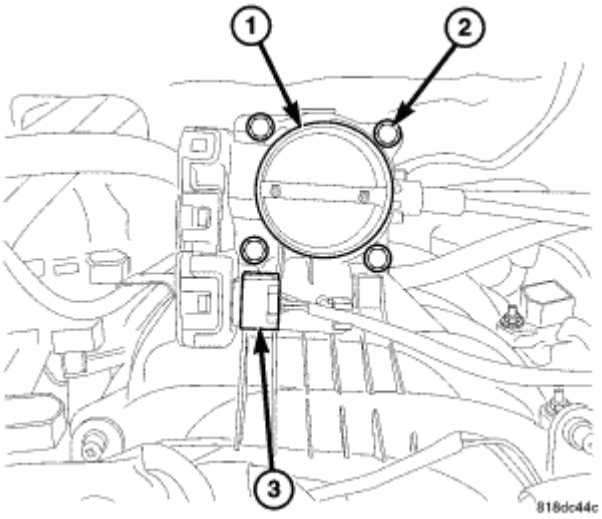

Fig. 115: Identifying Throttle Body Flange, Mounting Bolts & Electrical Connector (3.7L)
Courtesy of CHRYSLER LLC

7. Install electrical connector (3).
8. Install necessary vacuum lines.
9. Install air cleaner duct at throttle body.
10. Connect negative battery cable.
11. Using the diagnostic scan tool, erase all previous DTC's and perform the ETC Relearn function.

INSTALLATION - 4.0L

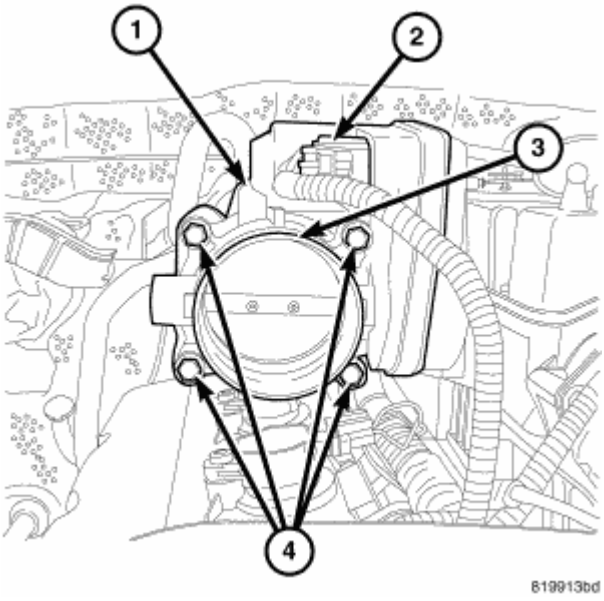

Fig. 116: Identifying Throttle Body Flange, Mounting Bolts & Electrical Connector - 4.0L
Courtesy of CHRYSLER LLC

1. Check condition of throttle body-to-intake manifold O-ring. Replace as necessary.
2. Clean mating surfaces of throttle body and intake manifold.
3. Install O-ring between throttle body and intake manifold.
4. Position throttle body to intake manifold.
5. Install all throttle body mounting bolts (4) finger tight.

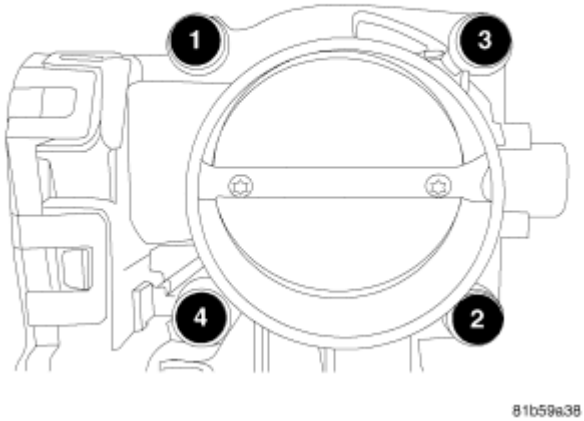

Fig. 117: Throttle Body Mounting Bolts Tightening Sequence
Courtesy of CHRYSLER LLC

CAUTION: The throttle body mounting bolts MUST be torqued to specifications. DO NOT OVER TIGHTEN MOUNTING BOLTS. Over tightening can

cause damage to the throttle body, throttle plate, gaskets, bolts and/or the intake manifold. Proper torque of the mounting bolts is critical to normal operation.

6. Obtain a torque wrench. Tighten mounting bolts (as shown) in a mandatory torque criss-cross pattern sequence to 7.5 N.m (65 in. lbs.).

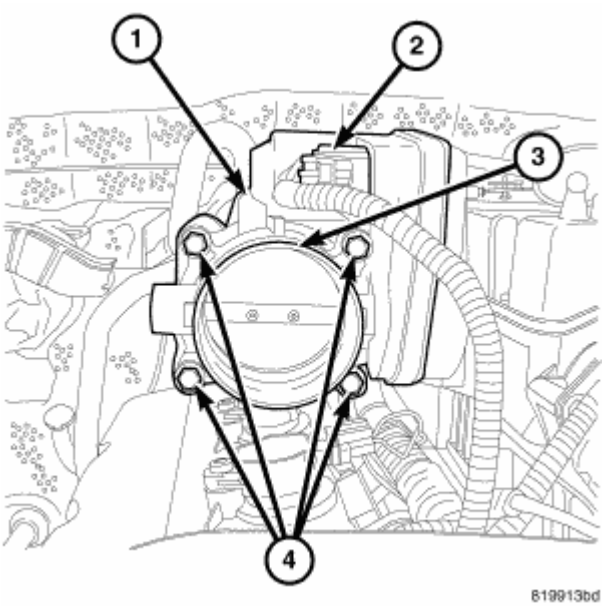

Fig. 118: Identifying Throttle Body Flange, Mounting Bolts & Electrical Connector - 4.0L
Courtesy of CHRYSLER LLC

7. Install electrical connector (2).
8. Install necessary vacuum lines.
9. Install air cleaner duct to throttle body flange (3).
10. Connect negative battery cable to battery.
11. Using the diagnostic scan tool, erase all previous DTC's and perform the ETC Relearn function.

MANIFOLD TUNE VALVE

REMOVAL

REMOVAL - 4.0L

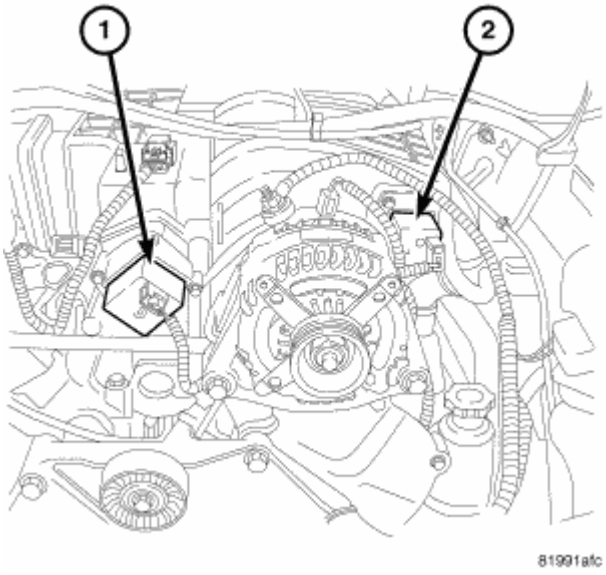

Fig. 119: SRV (Short Runner Valve) & MTV (Manifold Tuning Valve)
Courtesy of CHRYSLER LLC

The MTV (Manifold Tuning Valve) (2) is located on the left/front side of the intake manifold.

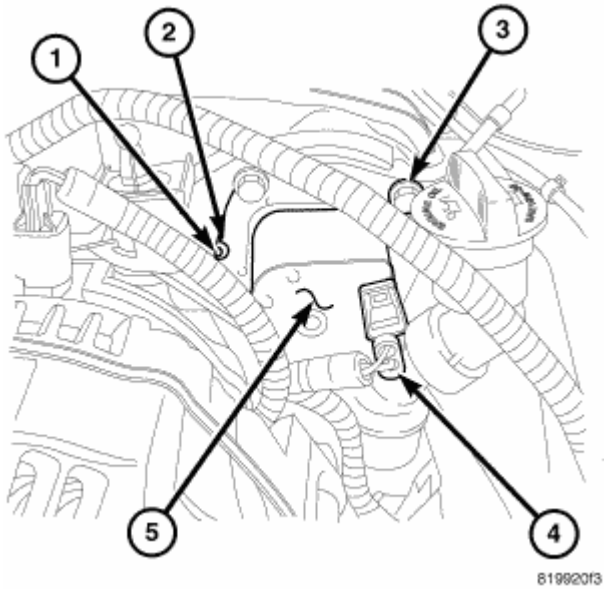

Fig. 120: Identifying Tang, Notch, Mounting Bolts, Electrical Connector & MTV Assembly
Courtesy of CHRYSLER LLC

1. Disconnect electrical connector (4).
2. Remove mounting bolts (3).
3. Carefully pull the MTV assembly (5) straight forward from the intake manifold.

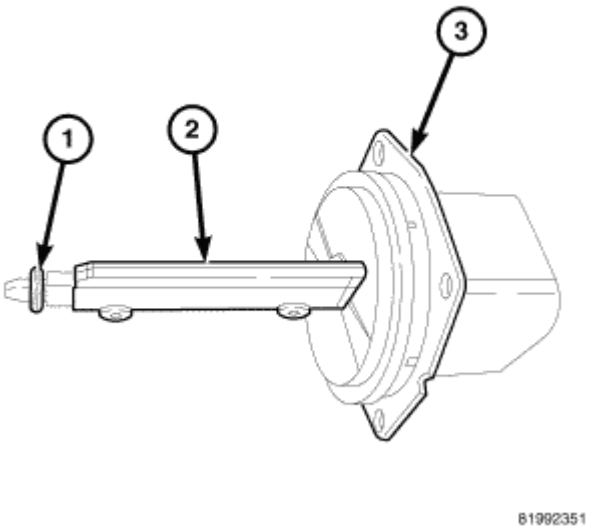

Fig. 121: MTV Assembly
Courtesy of CHRYSLER LLC

4. Be sure the O-ring (1) is still in place on the MTV shaft. If not, refer to the following step.

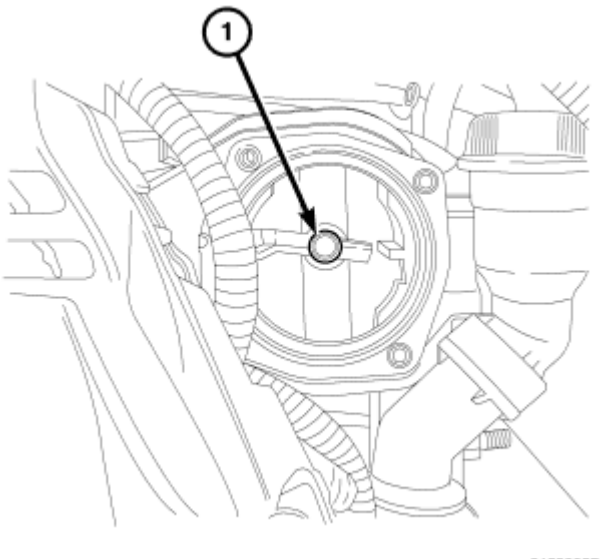

Fig. 122: MTV O-Ring
Courtesy of CHRYSLER LLC

5. If O-ring is not on MTV shaft (from previous step), gently pry it (1) from intake manifold.

INSTALLATION

INSTALLATION - 4.0L

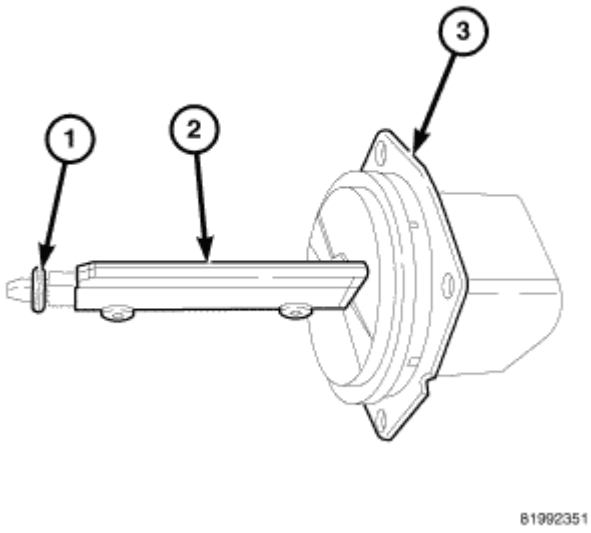

Fig. 123: MTV Assembly
Courtesy of CHRYSLER LLC

1. Be sure the O-ring (1) is still in place on the MTV shaft. If not, refer to the following step.

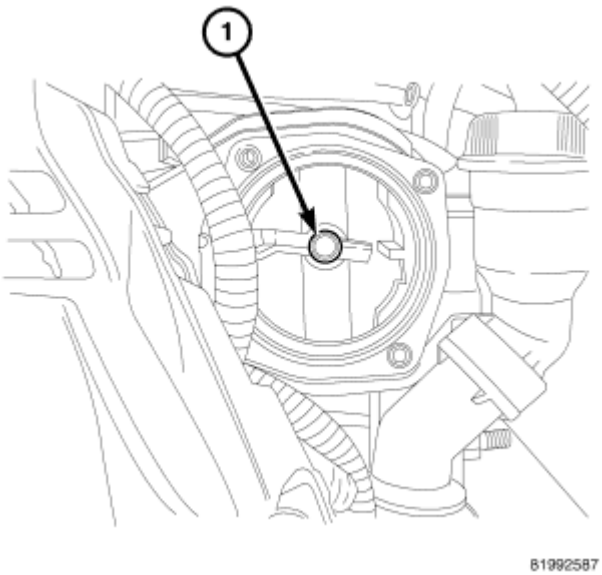

Fig. 124: MTV O-Ring
Courtesy of CHRYSLER LLC

2. If O-ring is not on MTV shaft (from previous step), gently pry it (1) from intake manifold.

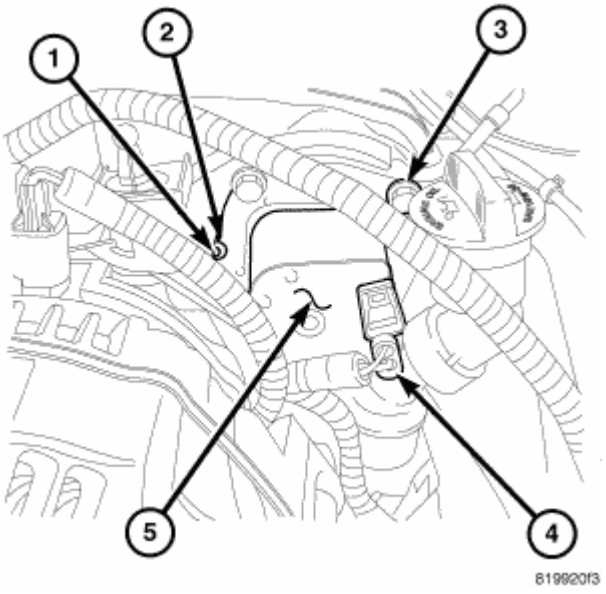

Fig. 125: Identifying Tang, Notch, Mounting Bolts, Electrical Connector & MTV Assembly
Courtesy of CHRYSLER LLC

3. Carefully position the MTV assembly (5) straight rearward into the intake manifold. Align notch (2) on MTV assembly to locating tang (1) on intake manifold.
4. Install mounting bolts (3).
5. Connect electrical connector (4).

SHORT RUNNER VALVE

REMOVAL

REMOVAL - 4.0L

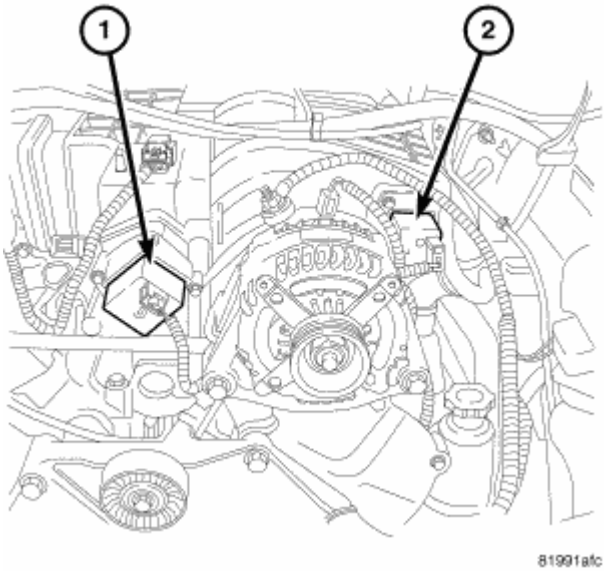

Fig. 126: SRV (Short Runner Valve) & MTV (Manifold Tuning Valve)
Courtesy of CHRYSLER LLC

1. The SRV (Short Runner Valve) (1) is located on the right/front side of the intake manifold.

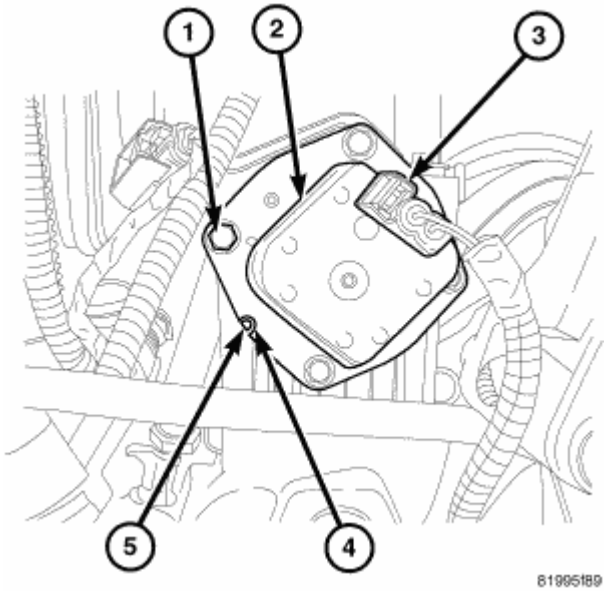

Fig. 127: Identifying SRV, Mounting Bolt, Electrical Connector & Intake Manifold Notches
Courtesy of CHRYSLER LLC

2. Disconnect electrical connector (3).
3. Remove SRV mounting bolts (1).
4. Carefully pull the SRV assembly (2) straight forward from the intake manifold.

INSTALLATION

INSTALLATION - 4.0L

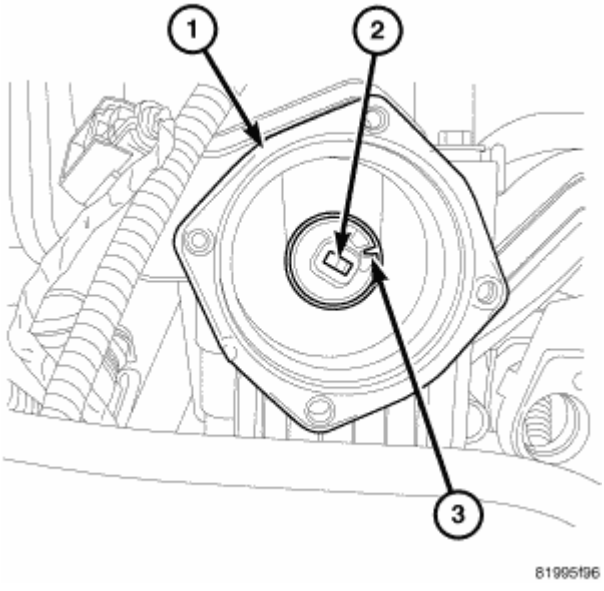

Fig. 128: Positioning SRV (Short Runner Valve) Into Intake Manifold
Courtesy of CHRYSLER LLC

1. Position SRV (Short Runner Valve) into intake manifold. Align SRV shaft into notch (2).

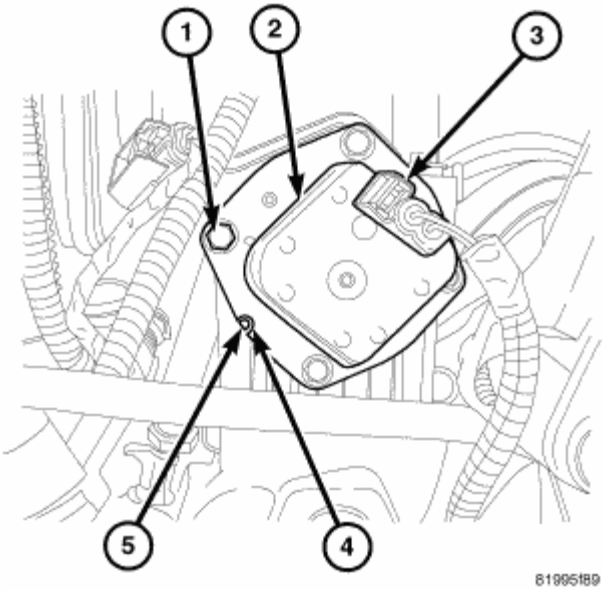

Fig. 129: Identifying SRV, Mounting Bolt, Electrical Connector & Intake Manifold Notches
Courtesy of CHRYSLER LLC

2. Rotate SRV assembly until aligned to intake manifold notches (4) and (5).
3. Install SRV mounting bolts (1).
4. Connect electrical connector (3).

FUEL INJECTION - 2.8L DIESEL

OPERATION

SYSTEM DIAGNOSIS

OPERATION

A leaking fuel injector can cause excessive pre-ignition knock, poor engine performance, excessive black smoke in the exhaust, poor fuel economy and rough engine idle. If the fuel injector needle valve does not operate properly, the engine may misfire and produce low power.

The Fuel Injection System is controlled by the Engine Control Module (ECM). If the ECM senses a fault in a monitored fuel system circuit, the ECM will store a Diagnostic Trouble Code (DTC), which can retrieved with a Scan Tool. The On-Board Diagnostic functions of the ECM must be used to test the system when diagnosing mechanical or electrical problems with the Fuel Injection System. In addition to diagnosing electrical faults, the Scan Tool has the following functions to test the mechanical operation of the injectors:

- Compression Test
- Fuel Correction Test
- Balance Test
- Kill Test

For Fuel System DTC information see refer to the appropriate Diagnostic Tests in **DIAGNOSTIC CODE INDEX** .

SENSOR-ACCELERATOR PEDAL POSITION

REMOVAL

ACCELERATOR PEDAL - WITHOUT ACCELERATOR PEDAL POSITION SENSOR

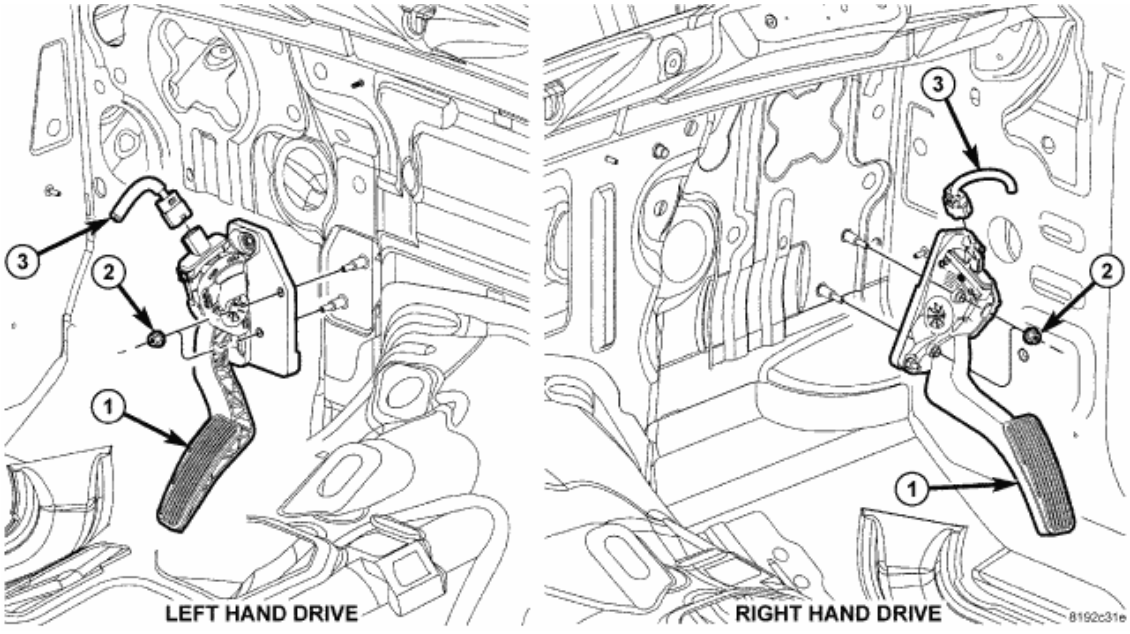

Fig. 130: Accelerator Pedal - Without Accelerator Pedal Position Sensor
Courtesy of CHRYSLER LLC

The accelerator pedal and APPS (Accelerator Pedal Position Sensor) are serviced as a complete assembly including the bracket.

1. Disconnect electrical connector (3) at APPS.
2. Remove two accelerator pedal mounting bracket nuts (2).
3. Remove accelerator pedal/APPS assembly (1) from vehicle.

INSTALLATION

ACCELERATOR PEDAL - WITHOUT ACCELERATOR PEDAL POSITION SENSOR

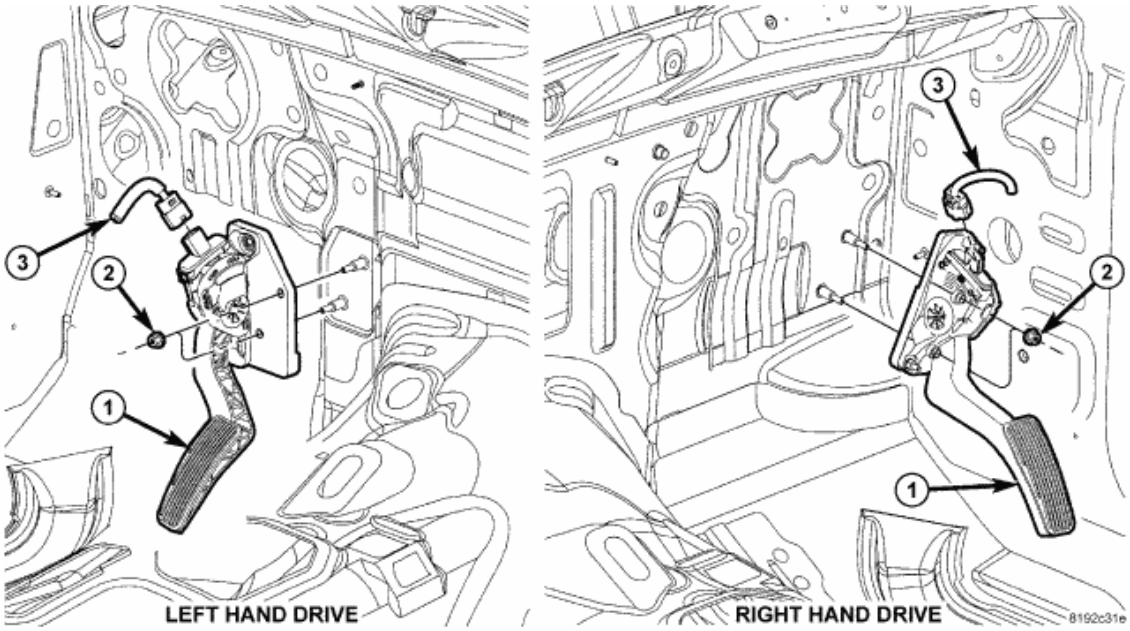

Fig. 131: Accelerator Pedal - Without Accelerator Pedal Position Sensor
Courtesy of CHRYSLER LLC

The accelerator pedal and APPS (Accelerator Pedal Position Sensor) are serviced as a complete assembly including the bracket.

1. Position accelerator pedal/APPS assembly over two mounting studs.
2. Install two accelerator pedal mounting bracket nuts (2).
3. Connect electrical connector (3) at APPS.
4. Before starting engine, operate accelerator pedal to check for any binding.

INJECTOR-FUEL

DESCRIPTION

FUEL INJECTOR

To control the injection valves, the new Common-Rail injectors use a rapid-action actuator made of piezo crystals, which opens and closes the injection valve. The piezo crystals expand when electrical current is applied to them, and contract when electrical current is turned off. The piezo actuator can switch up to five times faster than a standard solenoid, because the movement of the piezo crystals does not rely on mechanical components to transmit motion to the injection valve. This doubles the piezo injector's switching speed, and enables fuel to be delivered with greater precision, which leads to lower emissions and better engine performance.

STANDARD PROCEDURE

INJECTOR CLASSIFICATION

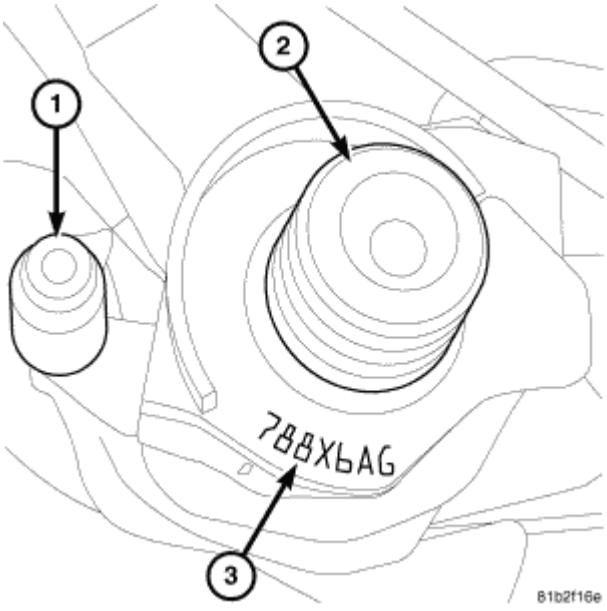

Fig. 132: Identifying Fuel Injector & ID Number
Courtesy of CHRYSLER LLC

Each fuel injector has a alphanumeric correction code number. This correction code is printed on the upper part of the fuel injector (3) and is used to identify injector calibration. When replacing any fuel injectors, this code must be entered into the vehicles Engine Control Module (ECM) using a diagnostic scan tool. In addition, if a new ECM is installed, use a diagnostic scan tool to program all of the injector codes from the original fuel injectors into the new ECM.

The classification of injectors describes the fuel flow quantity characteristic of the injector. This will make it possible in the future to match the engine software to the tolerances of the injector within a more narrowly graduated range. Classification can be clearly recognized, and assigned only by means of a scan tool.

These general conditions equally apply if, as a result of replacing an engine, carrying out repairs to the cylinder head etc., the cylinder selective assignment of the injectors or the engine control module assignment may have changed. If proper attention is not paid to the classification on these vehicles, driveability and smoking concerns could result.

If an injector is replaced, it is then necessary to assign the classification code to the corresponding cylinder in the ECM (Engine Control Module) with the appropriate scan tool.

INJECTOR CLASSIFICATION PROCEDURE

1. Turn ignition switch "ON".
2. Using the diagnostic scan tool, select ENGINE then MISCELLANEOUS.
3. Select LEARN INJECTORS.
4. Using the up and down arrows, scroll to the appropriate injector.
5. Using the right and left arrows, set injector to proper classification code.
6. Once injectors are classified, cycle ignition key to complete.

REMOVAL

REMOVAL

CAUTION: Due to the complexity of the fuel injection system used on this engine, refer to the Diesel Engine Diagnostics, and service any fuel system DTCs prior to replacing any fuel injectors. If no DTCs are present, refer to the Diesel Engine Diagnostic Test for Lack of Engine Power, and perform all steps as directed prior to replacing any fuel injectors.

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

1. Disconnect negative battery cable at battery. Isolate end of cable.
2. Remove dress-up cover from top of engine.
3. Remove the high-pressure fuel lines from fuel rail to fuel injectors. Refer to **REMOVAL** .

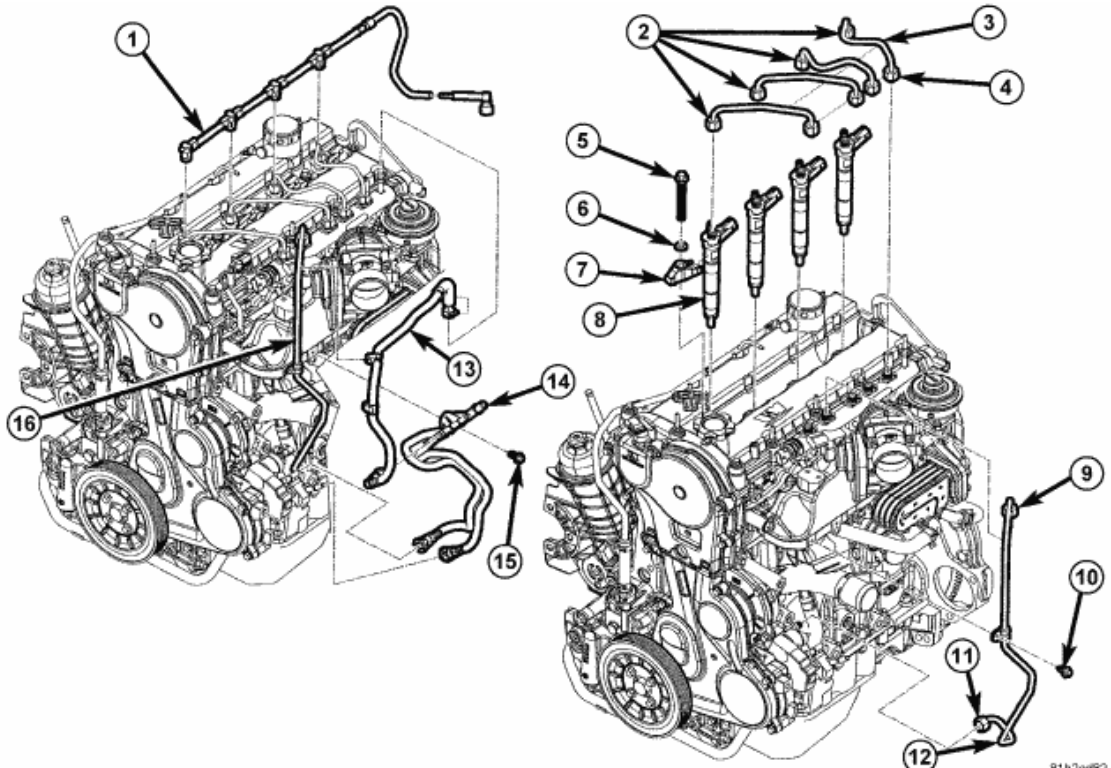

Fig. 133: Fuel Injectors - 2.8L Diesel
Courtesy of CHRYSLER LLC

4. Locate common fuel return line (1).

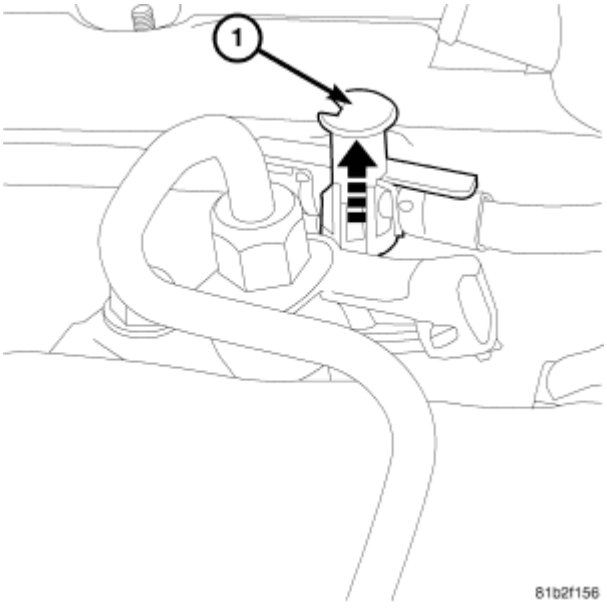

Fig. 134: Lifting Lock Buttons
Courtesy of CHRYSLER LLC

5. Disconnect electrical connector at top of injector(s).

NOTE: The injector common fuel return line is connected to the low pressure fuel circuit (5 bar/72 psi).

6. A lock button (1) is used to secure the common fuel return line to each fuel injector. Use your fingers to lift all four lock buttons (1) up. After unlocking all four buttons, lift fuel return line assembly up for removal.

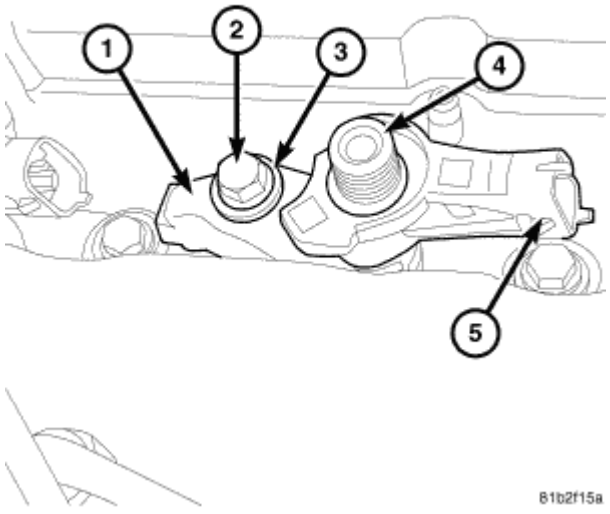

Fig. 135: Identifying Injector, Mounting Clamp, Mounting Bolt & Washer
Courtesy of CHRYSLER LLC

7. Remove injector mounting bolt (2) and washer (3).
8. Remove injector mounting clamp (1).
9. Using compressed air, thoroughly clean surface area in and around injector bore to prevent foreign material from falling into the injector bore after injector removal.
10. Using your hand, pull fuel injector straight up from cylinder head for removal.

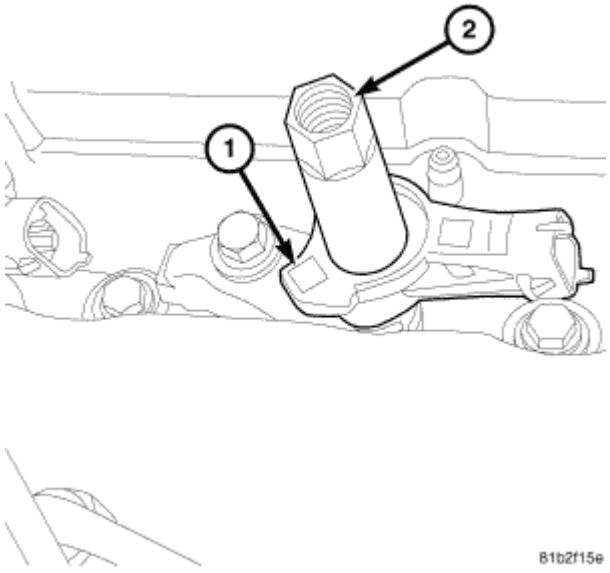

Fig. 136: Installing Special Fuel Injector Removal Tool #9552 To Top Of Fuel Injector
Courtesy of CHRYSLER LLC

11. If injector can't be removed by hand, install special fuel injector removal tool #9552 (2) to top of fuel injector.

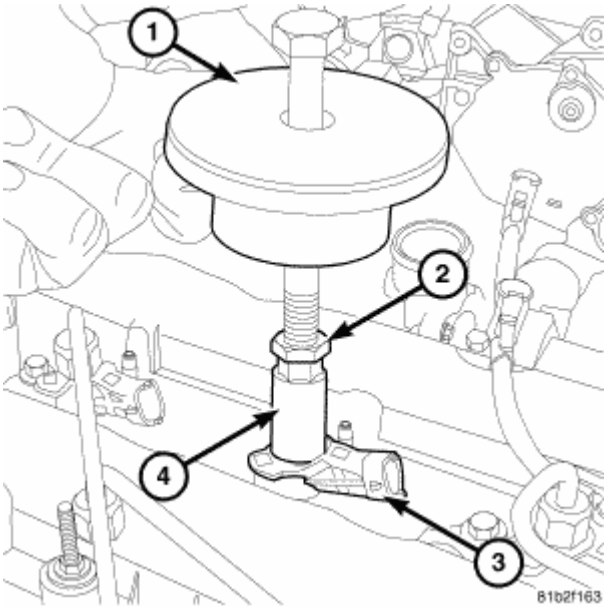

Fig. 137: Installing Special Slide Hammer Tool #8941 Onto Special Tool #9552, Tightening Lock Nut & Removing Injector From Cylinder Head
Courtesy of CHRYSLER LLC

12. Install special slide hammer tool #8941 (1) onto special tool #9552 (4). Tighten lock nut (2). Remove injector from cylinder head.

NOTE: DO NOT use a wire brush to clean the fuel injector or nozzle. Possible restriction of the injector needle may result.

INSTALLATION

INSTALLATION

CAUTION: Due to the complexity of the fuel injection system used on this engine, refer to the Diesel Engine Diagnostics, and service any fuel system DTCs prior to replacing any fuel injectors. If no DTCs are present, refer to the Diesel Engine Diagnostic Test for Lack of Engine Power, and perform all steps as directed prior to replacing any fuel injectors.

CAUTION: Cleanliness cannot be overemphasized when handling or replacing diesel fuel system components. This especially includes the fuel injectors, high-pressure fuel lines and fuel injection pump. Very tight tolerances are used with these parts. Dirt contamination could cause rapid part wear and possible plugging of fuel injector nozzle tip holes. This in turn could lead to possible engine misfire. Always wash/clean any fuel system component

thoroughly before disassembly and then air dry. Cap or cover any open part after disassembly. Before assembly, examine each part for dirt, grease or other contaminants and clean if necessary. When installing new parts, lubricate them with clean engine oil or clean diesel fuel only.

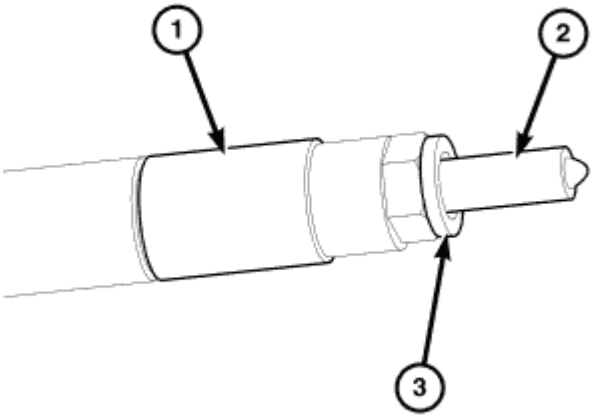

Fig. 138: Identifying Injector Nozzle & Copper Washer/Seal
Courtesy of CHRYSLER LLC

NOTE: DO NOT use a brush to clean around the injector nozzle (2). DO NOT lubricate area around injector nozzle. The injector may become restricted with debris.

NOTE: Be sure a new copper washer/seal (3) is installed on end of injector and the old seal is removed, before installing in cylinder head.

1. Install fuel injector into cylinder head with new seal.

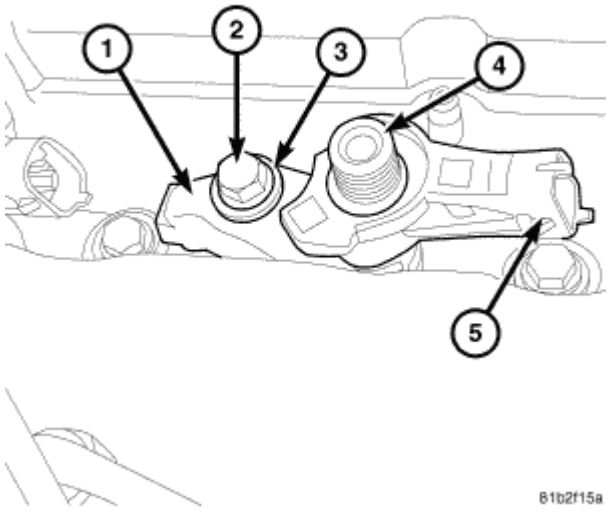

Fig. 139: Identifying Injector, Mounting Clamp, Mounting Bolt & Washer
Courtesy of CHRYSLER LLC

2. Install fuel injector retainer clamp (1), washer (3) and bolt (2). Tighten clamp bolt (2) to 33 N.m (24 ft. lbs.) torque.
3. Connect electrical connector to fuel injector.
4. Install fuel injector high-pressure lines. Refer to Fuel Line **INSTALLATION**.

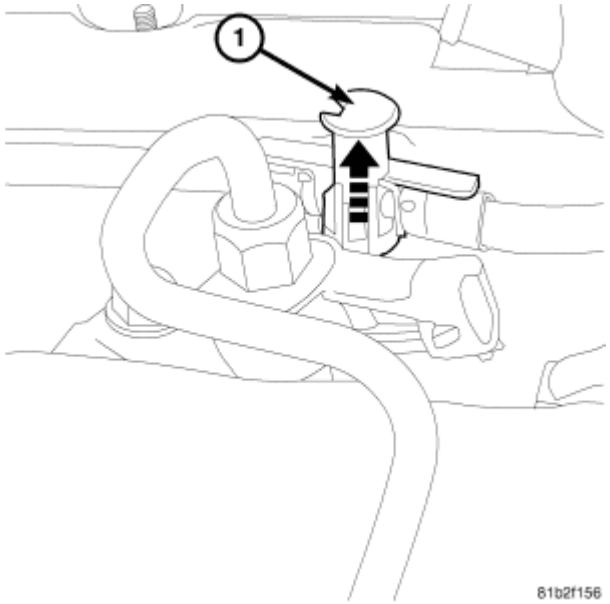

Fig. 140: Lifting Lock Buttons
Courtesy of CHRYSLER LLC

5. Position female fittings on fuel return line to male fittings at each fuel injector. **Be sure lock buttons (1) are in up position before positioning.**

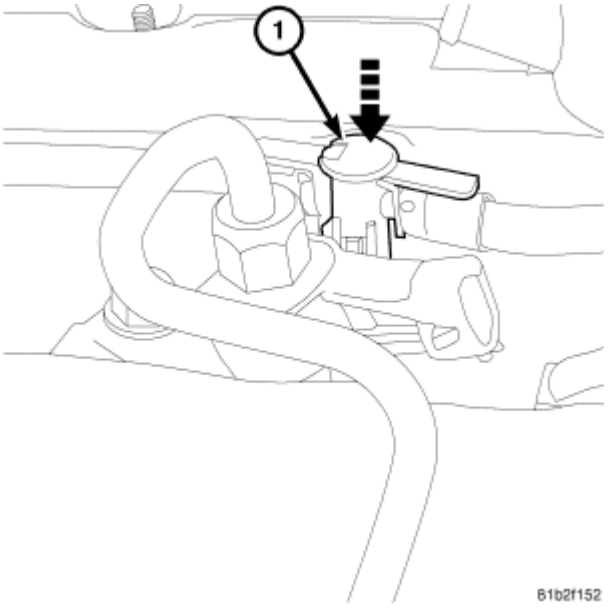

Fig. 141: Pushing Each Lock Button Down To Secure Fuel Return Line To Each Fuel Injector
Courtesy of CHRYSLER LLC

6. After positioning, push each lock button (1) down to secure fuel return line to each fuel injector.
7. Connect each fuel injector electrical connector.
8. Connect negative battery cable.
9. Perform the injector classification procedure with a diagnostic scan tool.
10. Start the engine and allow to warm. **Turn off the ignition switch** and inspect for fuel leaks.
11. Install engine dress-up cover.

SENSOR-CRANKSHAFT POSITION

REMOVAL

REMOVAL

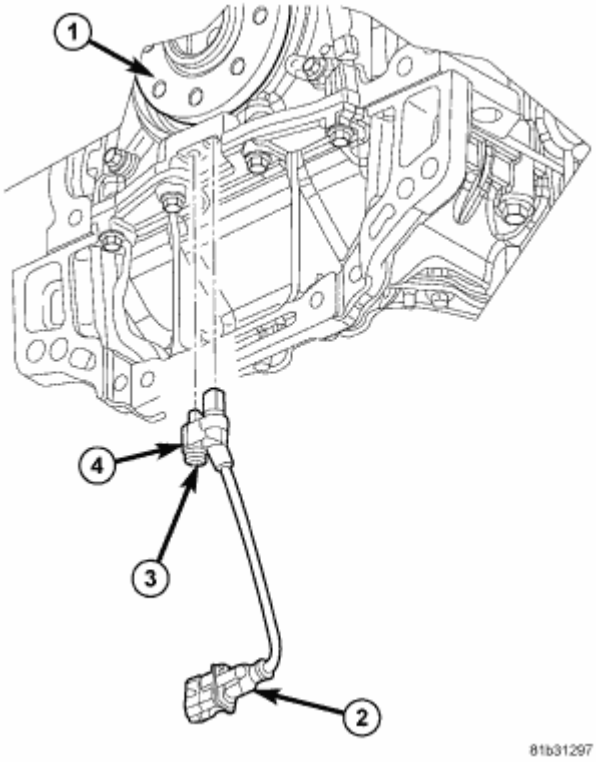

Fig. 142: Identifying Crankshaft Hub, CKP Electrical Connector, CKP Mounting Bolt & CKP Sensor
Courtesy of CHRYSLER LLC

The Crankshaft Position Sensor (CKP) (4) is located between the transmission and the rear of the engine block. It is bolted to the engine block below the crankshaft hub (1).

1. Raise and support vehicle.
2. Remove access cover.
3. Disconnect CKP electrical connector (2).
4. Remove CKP mounting bolt (3).
5. Remove CKP sensor (4).

INSTALLATION

INSTALLATION

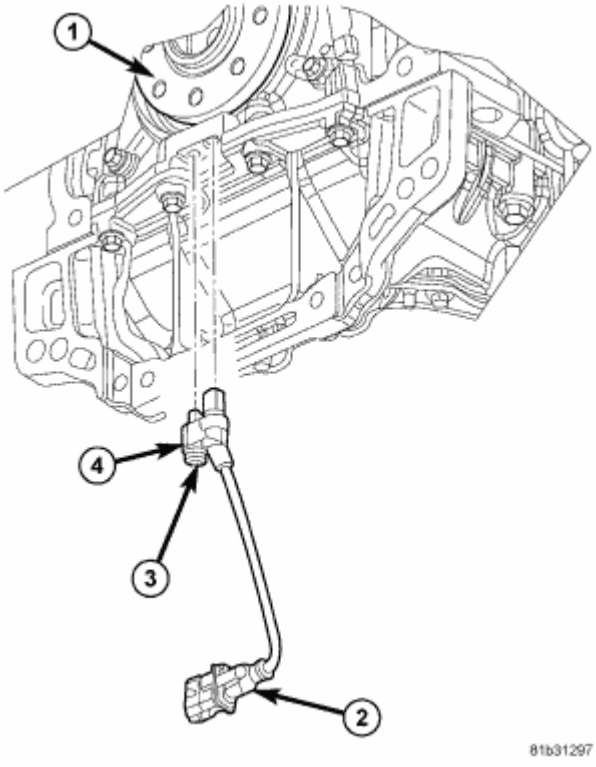

Fig. 143: Identifying Crankshaft Hub, CKP Electrical Connector, CKP Mounting Bolt & CKP Sensor
Courtesy of CHRYSLER LLC

The Crankshaft Position Sensor (CKP) (4) is located between the transmission and the rear of the engine block. It is bolted to the engine block below the crankshaft hub (1).

1. Position CKP sensor (4) into mounting hole.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

2. Install CKP mounting bolt (3). Tighten bolt to 11 N.m (8 ft. lbs.) torque.
3. Connect CKP electrical connector (2).
4. Position CKP access cover. Install bolts and tighten to 15 N.m (11 ft. lbs.) torque.
5. Lower vehicle.

SENSOR-INTAKE AIR PRESSURE

REMOVAL

REMOVAL

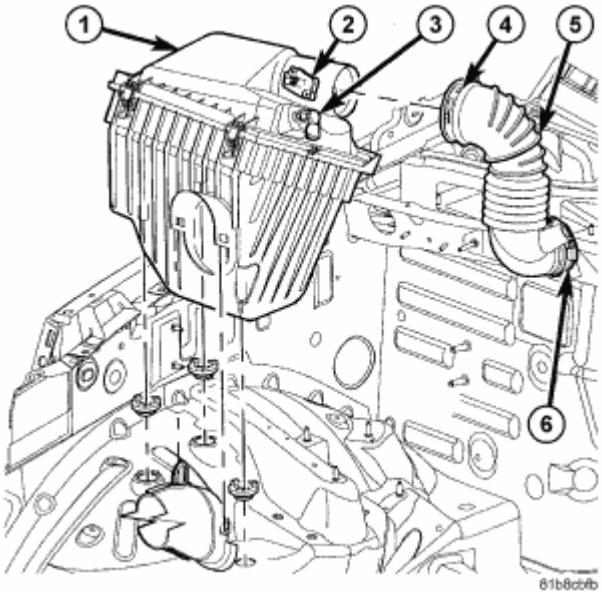

Fig. 144: Removing/Installing Intake Air Pressure & Mass Air Flow Sensor
Courtesy of CHRYSLER LLC

The Inlet Pressure Sensor (3) is located on the air cleaner cover (1).

1. Disconnect electrical connector at sensor.
2. Remove mounting screws.
3. Remove sensor from air cleaner cover.

INSTALLATION

INSTALLATION

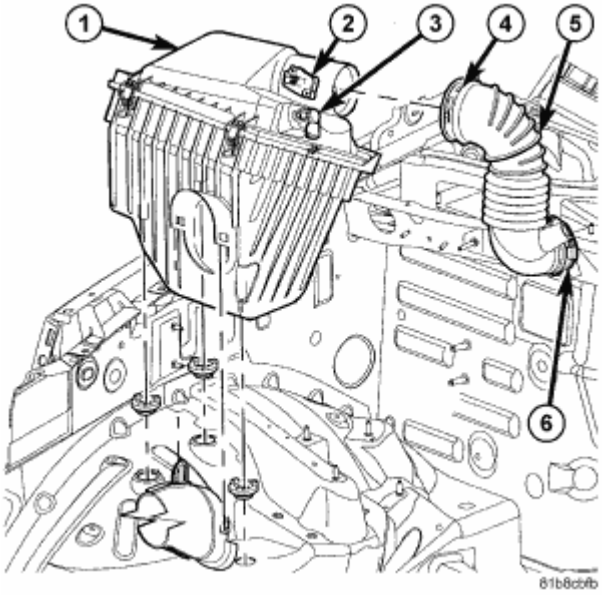

Fig. 145: Removing/Installing Intake Air Pressure & Mass Air Flow Sensor
Courtesy of CHRYSLER LLC

1. Check condition of sensor O-ring.
2. Position Inlet Pressure Sensor (3) into top of air cleaner cover (1) with a slight twisting action.
3. Install mounting screws.
4. Install Inlet Pressure Sensor electrical connector.

SENSOR-MASS AIR FLOW

REMOVAL

REMOVAL

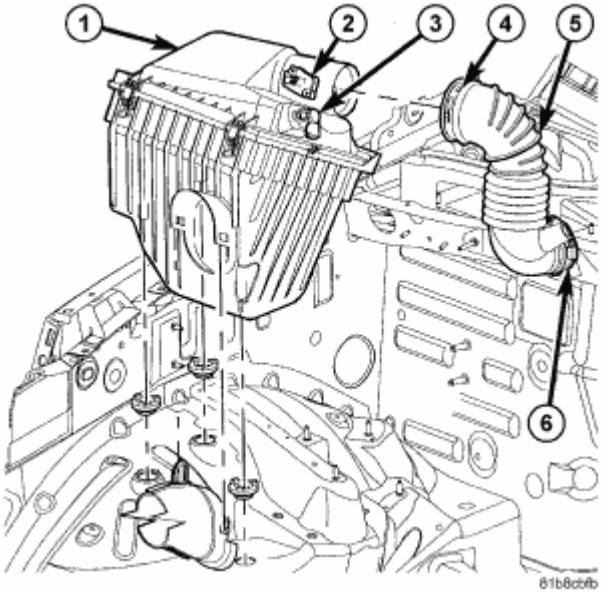

Fig. 146: Removing/Installing Intake Air Pressure & Mass Air Flow Sensor
Courtesy of CHRYSLER LLC

The Mass Airflow Sensor (2) is located on the air cleaner cover (1).

1. Disconnect electrical connector at sensor.
2. Remove mounting screws.
3. Remove sensor from air cleaner cover.

INSTALLATION

INSTALLATION

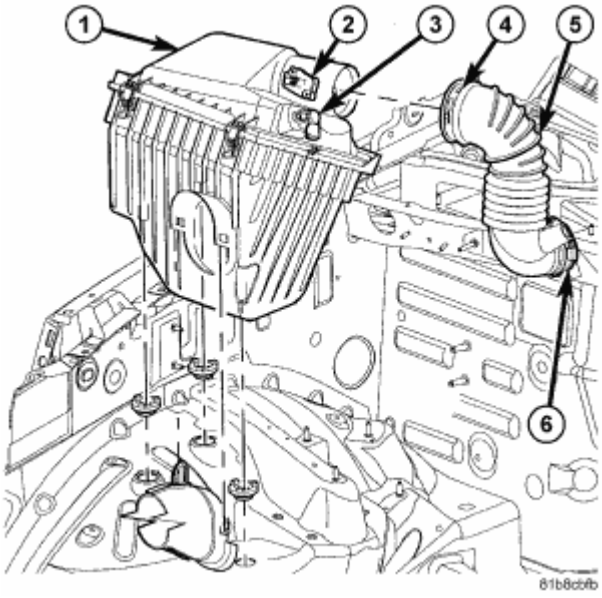

Fig. 147: Removing/Installing Intake Air Pressure & Mass Air Flow Sensor
Courtesy of CHRYSLER LLC

1. Check condition of sensor O-ring.
2. Position MAF sensor (2) into top of air cleaner cover (1) with a slight twisting action.
3. Install mounting screws.
4. Install MAF electrical connector.

SENSOR-TEMPERATURE/PRESSURE-MAP

OPERATION

INTAKE MANIFOLD AIR TEMPERATURE (IAT) SENSOR - ECM INPUT

The combination, dual function Intake Manifold Air Temperature Sensor/MAP Sensor is installed into the top of the intake manifold with the sensor element extending into the air stream.

The IAT portion of the sensor provides an input voltage to the Engine Control Module (ECM) indicating intake manifold air temperature. The MAP portion of the sensor provides an input voltage to the ECM indicating turbocharger boost pressure.

REMOVAL

INTAKE MANIFOLD AIR TEMPERATURE (IAT) SENSOR

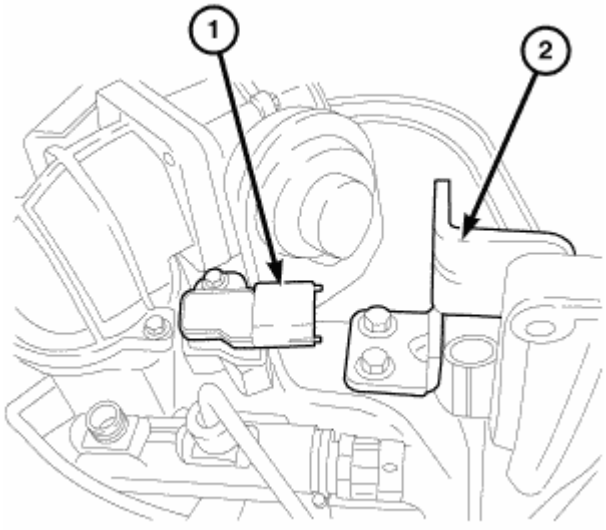

Fig. 148: Identifying Intake Manifold Air Temperature (IAT) Sensor
Courtesy of CHRYSLER LLC

The combination, dual function Intake Manifold Air Temperature Sensor/MAP (IAT/MAP) sensor (1) is installed into the top of the intake manifold near the fuel rail.

1. Clean area around sensor.
2. Disconnect electrical connector from IAT/MAP sensor.
3. Remove mounting screw.
4. Remove sensor from intake manifold by twisting.
5. Check condition of sensor O-ring.

INSTALLATION

INTAKE MANIFOLD AIR TEMPERATURE (IAT) SENSOR

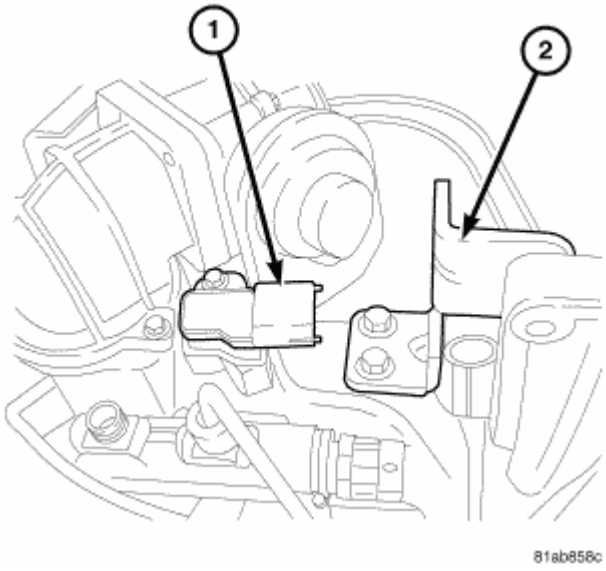

Fig. 149: Identifying Intake Manifold Air Temperature (IAT) Sensor
Courtesy of CHRYSLER LLC

1. Check condition of sensor O-ring.
2. Clean sensor mounting area at intake manifold.
3. Lubricate sensor O-ring and sensor mounting hole in intake manifold cover with clean engine or diesel oil.
4. Position sensor (1) into intake manifold.
5. Install and tighten sensor mounting screw to 1 N.m (9 in. lbs.) torque.
6. Connect electrical connector to sensor.