FUEL DELIVERY, 6.7L DIESEL

DESCRIPTION

DESCRIPTION

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 180, 000 kpa (26, 107 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.

The fuel system used on the Cummins engine is an electronically controlled, Bosch HPCR (High-Pressure Common Rail) system. The HPCR system consists of five main components:

- Electric Fuel Transfer (lift) Pump Located in the Fuel Tank
- Fuel Pump/Gear Pump (attached to fuel injection pump)
- High-Pressure Fuel Injection Pump
- Fuel Injection Rail
- Fuel Injectors

Also to be considered as part of the overall fuel system are:

- Accelerator Pedal
- Air Cleaner Housing/Element
- Check Valve Banjo Fitting at Rear of Cylinder Head
- Fuel Connector Tubes
- Fuel Drain Manifold (passage)
- Fuel Drain Valve (at filter)
- Fuel Filter/Water Separator
- Fuel Heater
- Fuel Heater Relay
- Fuel Transfer Pump Relay
- Fuel Level (gauge) Sending Unit
- Fuel Pressure Limiting Valve
- Fuel Tank
- Fuel Tank Module (containing a fuel gauge sending unit, separate fuel filter located at bottom of tank

module, and fuel transfer pump)
- Fuel Tank Filler/Vent Tube Assembly
- Fuel Tank Filler Tube Cap
- Fuel Tubes/Lines/Hoses
- High-Pressure Fuel Injector Lines
- In-Tank Fuel Filter (at bottom of fuel tank module)
- Low-Pressure Fuel Supply Lines
- Low-Pressure Fuel Return Lines
- Overflow Valve
- Quick-Connect Fuel Line Fittings
- Accelerator Pedal Position Sensor (APPS) Located in Cab
- Water Draining (maintenance)
- Water-In-Fuel (WIF) Sensor
- Screened Banjo Bolt (22)

The fuel injection pump supplies high pressure to the fuel rail independent of engine speed. This high pressure fuel is then accumulated in the fuel rail. High pressure fuel is constantly supplied to the injectors by the fuel rail. The Engine Control Module (ECM) controls the fueling and timing of the engine by actuating the injectors.

Fuel enters the system from the electric fuel transfer (lift) pump, which is located inside of the fuel tank and attached to the fuel tank module (the fuel transfer pump is no longer attached to the engine). Fuel is forced through the fuel filter element and then enters the Fuel Pump/Gear Pump, which is attached to the rear of the fuel injection pump. The Fuel Pump/Gear Pump is a low-pressure pump and produce pressures ranging from 551.5 kpa (80 psi) to 1241 kpa (180) psi. Fuel then enters the fuel injection pump. Low pressure fuel is then supplied to the FCA (Fuel Control Actuator).

The FCA is an electronically controlled solenoid valve. The ECM controls the amount of fuel that enters the high-pressure pumping chambers by opening and closing the FCA based on a demanded fuel pressure. The FPS (Fuel Pressure Sensor) on the fuel rail monitors the actual fuel pressure and provides it as an input to the ECM. When the actuator is opened, the maximum amount of fuel is being supplied to the fuel injection pump. Any fuel that does not enter the injection pump is directed to the overflow valve. The overflow valve regulates how much excess fuel is used for lubrication of the pump and how much is returned to the tank through the drain manifold.

Fuel entering the injection pump is pressurized to between 200-1800 bar (2900-26107 psi) by three radial pumping chambers. The pressurized fuel is then supplied to the fuel rail.

STANDARD PROCEDURE

WATER DRAINING AT FUEL FILTER HOUSING

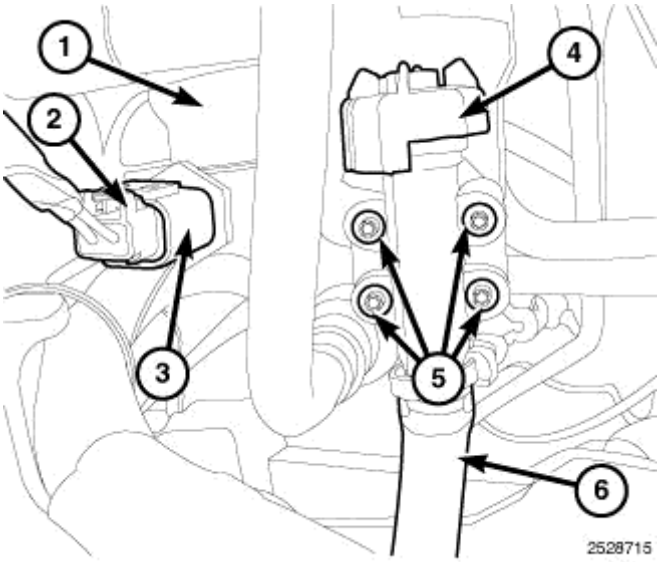

Fig. 1: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

The housing drain valve (4) serves two purposes. One is to **partially** drain the filter housing of excess water. The other is to drain the housing for fuel filter or Water In Fuel (WIF) sensor replacement.

The filter housing (1) should be partially drained whenever the WIF 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 drain hose (6) is located at the bottom of drain valve. Place drain pan under drain hose.
2. **With engine not running,** Route the fuel drain hose to an appropriate container and rotate drain valve (4) one quarter turn counter clockwise to open it. Also loosen the fuel filter housing cover a 1/2 turn and allow the fuel to drain from the fuel filter housing for two minutes. Rotate the drain valve (4) clockwise one quarter turn to close it.

DIESEL FUEL SYSTEM CLEANING PROCEDURE

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.

NOTE: Do not use any chemical cleaners or solvents on any fuel system lines or metal components. Metal lines, rails and tubes have a coating that will be damaged by these cleaners.

NOTE: Before cleaning the fuel system, perform the Lift Pump Flow test to determine if the Lift Pump was damaged and will require replacement while the Fuel Tank is out of the vehicle. Refer to DIAGNOSIS AND TESTING, 6.7L .

1. Remove all of the steel fuel lines from the vehicle.
2. Flush tank to engine compartment bundle lines, supply and return, both directions.
3. Remove the fuel rail and remove the Pressure Limiting Valve (PLV) and pressure switch.
4. Submerge and soak all removed parts in clean diesel fuel.
5. Remove components from the diesel fuel and clean the inside and outside with compressed air.
6. Flush fuel rail with clean diesel and air. Both directions, multiple times.
7. Clean the PLV and pressure switch with compressed air.
8. Remove and flush out the Fuel Tank with clean diesel fuel. Wipe out the inside of the tank with a clean cloth. Use an appropriate fuel container. Dispose of the contaminated fuel using the proper procedures. Refer to **TANK, FUEL, REMOVAL**.

CAUTION: Dispose of petroleum based products in a manner consistent with all applicable Local, State, Federal, and Provincial regulations.

9. Inspect the Lift Pump Module screen for extreme dirt accumulation. Clean/flush the Lift Pump Module. Replace if necessary. (Most can be cleaned).
10. Install vent tubes on the rollover valves on the Fuel Tank to prevent water/dirt intrusion.
11. Reinstall the tank and 10 to 15 gallons of clean diesel fuel. Flash any controllers to the latest available software version (PCM/TIPM/CCN). Refer to **TANK, FUEL, INSTALLATION**.
12. Clean fuel filter housing and install new (latest number available) Mopar Fuel Filter.
13. Pour half a bottle (approximately 15 ounces) of CRC #05232 Diesel Fuel Therapy or equivalent diesel fuel injector cleaner into the Fuel Tank with the clean fuel.
14. Warm engine while checking for leaks or running concerns. Correct concerns as necessary.
15. Drive the truck a short distance (parking lot) and stop several times to agitate the cleaner/fuel mixture in the fuel tank. (Slosh fuel mixture in tank).
16. Monitor the scan tool and validate engine has reached operating temperature of 180°F (82°C).
17. Enable "Injector High Pressure Override" 3 times. This will stress the injectors and High Pressure Delivery Pump and circulate the cleaner/fuel mixture through the entire system.
18. Safely drive truck somewhat aggressively. Perform three times, wide open throttle 0 to 60 hard accelerations in a safe area to circulate cleaner and allow fuel to flush/clean injectors.
19. Verify repair by performing the Diesel Aftertreatment Validation - 6.7L procedure. Refer to **STANDARD PROCEDURE** or **STANDARD PROCEDURE** . .

FUEL SYSTEM PRIMING - DIESEL

A certain amount of air becomes trapped in the fuel system when fuel system components on the supply and/or high-pressure side are serviced or replaced. Fuel system priming is accomplished using the electric fuel transfer (lift) pump.

Servicing or replacing fuel system components will not require fuel system priming.

The fuel transfer (lift) pump is self-priming: When the key is first turned on (without cranking engine), the pump operates for approximately 1 to 2 second and then shuts off (Note: When ambient temperatures are cold enough to cause the intake air heaters to operate, the fuel lift pump will operate during the entire intake air pre-heat cycle). The pump will also operate for up to 25 seconds after the starter is quickly engaged, and then disengaged without allowing the engine to start. The pump shuts off immediately if the key is on and the engine stops running.

1. Turn key to CRANK position and quickly release key to ON position before engine starts. This will operate fuel transfer pump for approximately 25 seconds.
2. Crank engine. If the engine does not start after 25 seconds, turn key to OFF position, and leave it off for at least 5 seconds. Repeat previous step until engine starts.
3. Fuel system priming is now completed.
4. Attempt to start engine. If engine will not start, proceed to following steps. **When engine does start, it may run erratically and be noisy for a few minutes. This is a normal condition.**

CAUTION: Do not engage the starter motor for more than 30 seconds at a time. Allow two minutes between cranking intervals.

5. Perform previous fuel priming procedure steps using fuel transfer pump. Be sure fuel is present at fuel tank.
6. Crank the engine for 30 seconds at a time to allow fuel system to prime.

WARNING: The fuel injection pump supplies extremely high fuel pressure to each individual injector through the high-pressure lines. Fuel under this amount of pressure can penetrate the skin and cause personal injury. Wear safety goggles and adequate protective clothing. Do not loosen fuel fittings while engine is running.

WARNING: Engine may start while cranking starter motor.

DRAINING FUEL TANK

NOTE: Two different procedures may be used to drain fuel tank: using a diagnostic scan tool to activate the fuel pump relay and drain the fuel tank, or remove the fuel pump. Due to a one-way check valve installed into the fuel fill opening fitting at the tank, the tank cannot be drained conventionally at the fill cap.

CONVENTIONAL PROCEDURE

1. Disconnect the fuel supply line quick-connect fitting at the fuel filter. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .
2. Install the appropriate Fuel Line Adapters / Fitting from the (special tool #8978A, Decay Tool, Fuel). Route the opposite end of this hose to an diesel fuel draining station. Using a scan tool, activate the fuel pump and drain the tank until empty.

ALTERNATIVE PROCEDURE

NOTE: If electric fuel pump is not operating, fuel must be drained through fuel fill fitting at tank. Refer to following procedures.

1. Disconnect the negative battery cable.
2. Remove the fuel pump module. Refer to **MODULE, FUEL PUMP, REMOVAL**.
3. After the fuel pump module has been removed, drain fuel tank into an approved diesel fuel draining station.

DIESEL FUEL CONTAMINATION TESTING PROCEDURE

OVERVIEW

This procedure explains the proper method for extracting a fuel sample and specific methods to inspect for contamination of any kind. The contamination we are looking for on the clean side of the Fuel Filter is very small. We don't say dirt because it may be metal, water, plastic or any other contamination, other than clean diesel fuel. The smallest we can see with naked eye is about 30 Microns. Our Fuel Filters have 5 Micron rating. The only way we can see this size of contamination is to properly collect it and view it. The fuel sample needs to be taken from the clean side of the system. In order to get a good clean side sample to inspect, perform the following procedure exactly.

Required Equipment
ONE LITER GLASS MEASURING CUP
FOUR FEET OF CLEAR, FLEXIBLE TUBING, 5/16 ID (available at the local hardware)
MULTI-BULB LED FLASHLIGHT HPDP FUEL RETURN HOSE
BRAKE CLEANER SPRAY SELF LIGHTING MAGNIFIER (Optional)
All items used for collecting fuel MUST be cleaned with clean diesel fuel, brake clean, and air ONLY. Failure to clean these items will contaminate the fuel sample. Do Not use towels to wipe out the measuring cup.

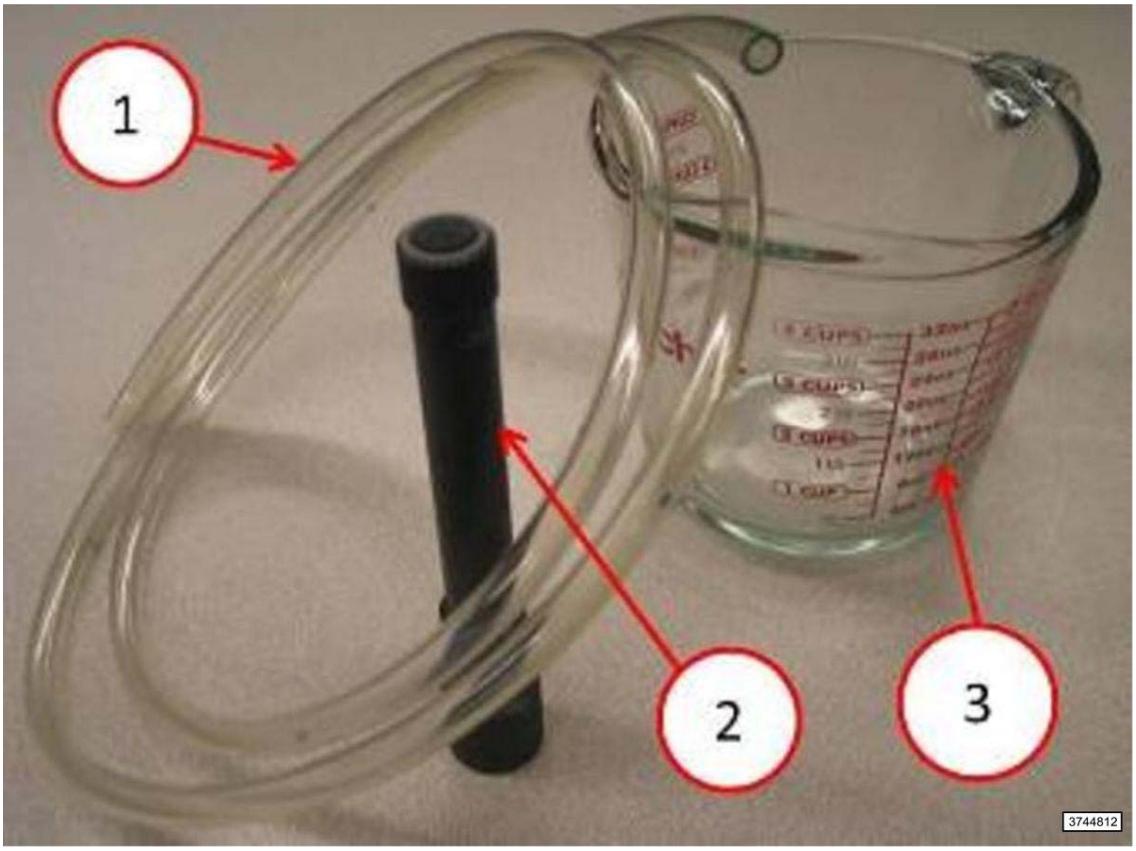

Fig. 2: Clear Tubing, Flashlight & Measuring Cup
Courtesy of CHRYSLER GROUP, LLC

1. 5/16" CLEAR TUBING (20' Length)
2. MULTI-BULB LED FLASHLIGHT
3. 4 CUP (1 LITER) "PYREX" STYLE MEASURING CUP

Fig. 3: Locating Return Flow Quick Disconnect & Engine Fuel Drain Tube Connection
Courtesy of CHRYSLER GROUP, LLC

A. HPDP return flow quick disconnect (at front of Fuel Filter mount)
B. Engine fuel drain tube connection - All return flow to tank

DIAGNOSTIC TEST

1. **CLEAN SIDE DIESEL FUEL SAMPLE COLLECTION AND INSPECTION**

NOTE: **The three photos in this test step illustrate the steps in this test procedure for clarification.**

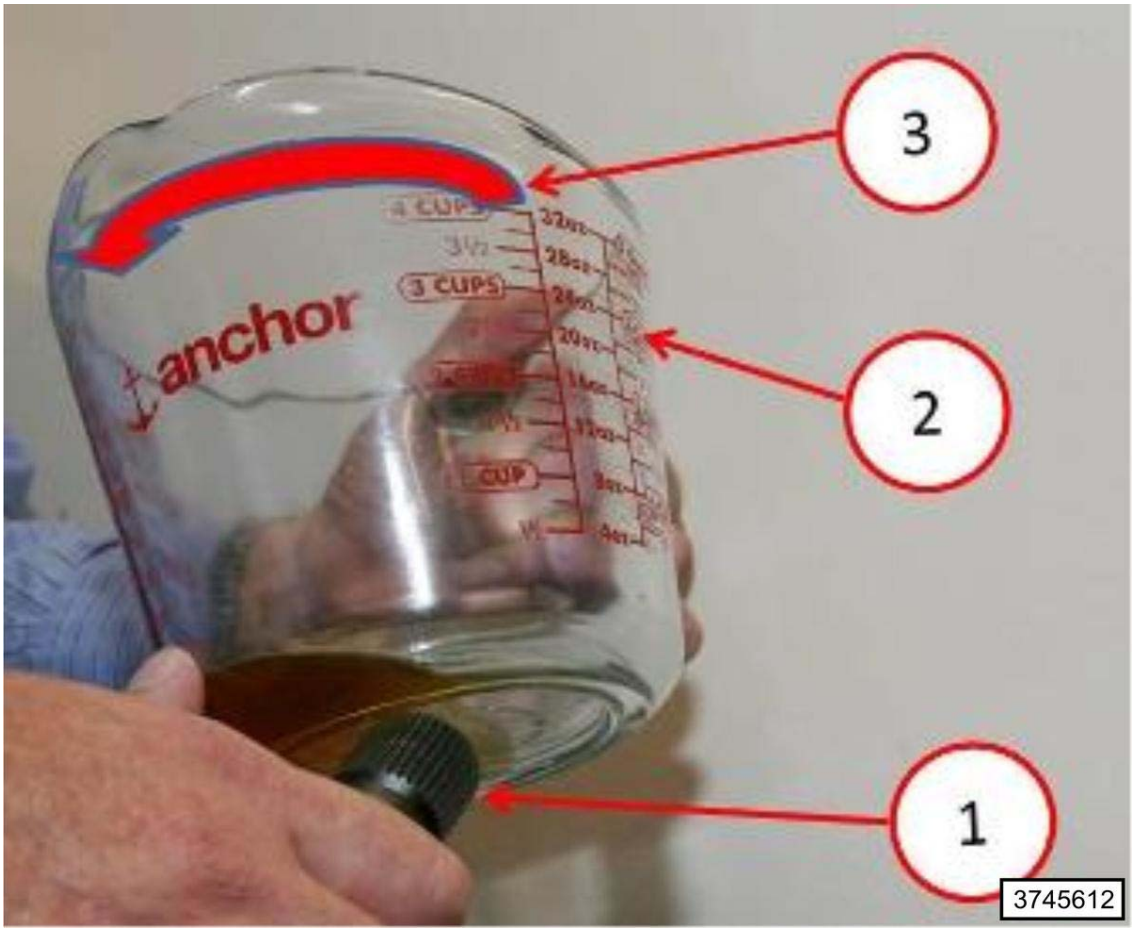

Fig. 4: Tilting Measuring Cup & Positioning Flashlight On Bottom Of Cup
Courtesy of CHRYSLER GROUP, LLC

1. LED FLASHLIGHT
2. MEASURING CUP
3. SLOWLY TILT THE CUP TOWARD YOU

NOTE: The fuel filter MUST NOT be removed or replaced prior to taking sample in order to get accurate results.

NOTE: Warm the engine before collecting the fuel sample.

1. Start the engine and using a scan tool, monitor the Coolant Temperature Sensor reading in Data Display.
2. While the engine is warming up, clean the clear tubing with clean diesel fuel and the glass measuring cup using brake clean and compressed air only. Do not use a towel.

NOTE: Do not use brake clean or other chemicals on any vehicle parts for the fuel handling system such as lines, pumps or fittings.

3. Monitor the scan tool until the vehicle has reached an operating temperature of 180°F (82°C).
4. Turn the engine off.
5. Remove the HPDP return line quick disconnect from the fitting located at the front of the Fuel Filter housing at the banjo bolt joining the Pressure Limiting Valve return (Connection A in the fuel system connections figure above).

NOTE: **The fuel flowing from the return of the High Pressure Delivery Pump (HPDP) MUST NOT be part of our sample. We are looking primarily for injector return fuel. The easiest way is to eliminate the HPDP return line and pull the injector return flow sample from the filter mount, on the front side.**

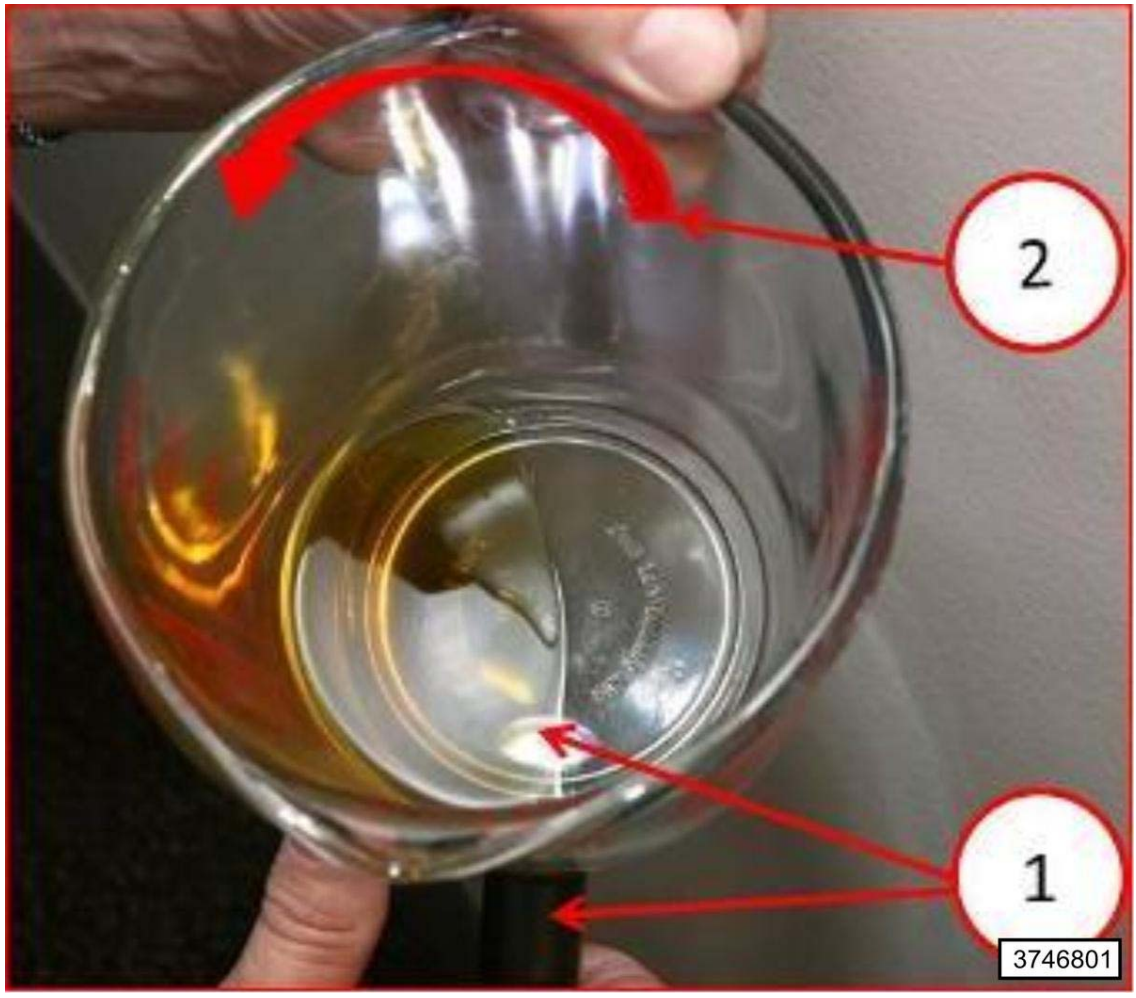

Fig. 5: Shining Flashlight Through Bottom Of Measuring Cup While Tilting Cup
Courtesy of CHRYSLER GROUP, LLC

1. LED FLASHLIGHT POINTING THROUGH BOTTOM OF CUP (Shine Toward the Handle)
2. SLOWLY TILT THE CUP TOWARD YOU

6. Cap off the male fitting that the HPDP return line was disconnected from.
7. Disconnect the quick connect fitting for the fuel return line located on the back side of the Fuel Filter housing (Connection B in the fuel system connections figure above).
8. Attach the four foot length of 5/16" clear tubing to this exposed male fitting and orientate it on a downhill angle in to a drain pan. This will be your sample source hose.
9. Using a hose with two male fittings, attach one end to the HPDP return line disconnected in step 5. Connect the other end to the fuel return line disconnected in step 7. This will return the High Pressure Pump return flow back to the tank while collecting the sample.
10. Start the engine, and continue monitoring the coolant temperature to maintain the 180°F (82°C).
11. Using the scan tool, navigate to PCM > System Tests > Fuel Pressure Override Test and select start.
12. Initiate the Fuel Pressure Override Test two consecutive times to further warm the fuel and allow the tubing to be thoroughly rinsed clean.
13. Start the Fuel Pressure Override Test a third time. At mid stream of the test move the clear tube to the measuring cup. Collect a sample of approximately 1/4 inch of fuel in the measuring cup.
14. Turn the engine off.

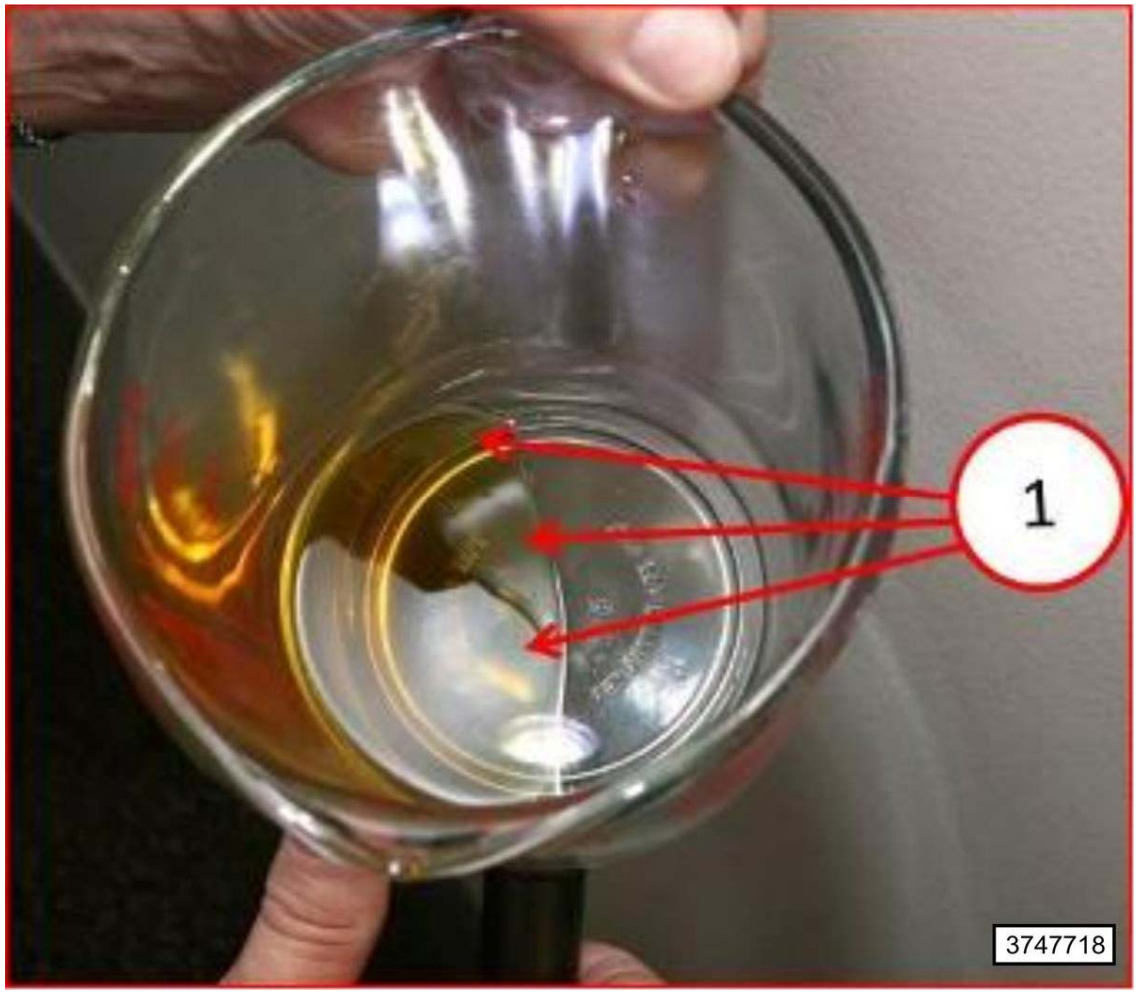

Fig. 6: Locating Fuel Contamination In Measuring Cup

Courtesy of CHRYSLER GROUP, LLC

1. Contamination will gather at the trailing edge of fuel.
VIEW CAREFULLY, LOOKING FOR VERY SMALL PARTICULATE MATTER (May Look Cloudy)

NOTE: Follow these next steps exactly to inspect the sample for contamination.

15. Allow the sample to sit for 10 minutes in a dust free environment to allow the debris to settle to the bottom. **It is important to not allow any air born contaminates to get into the fuel sample. Do not shake, swirl, or agitate the fuel in any way. The contamination should settle to the bottom.**
16. Hold the measuring cup (2) by the handle in one hand and shine the LED flashlight (1) through the bottom of the container toward the handle of the cup.
17. Slowly tilt the measuring cup (2) toward you and keep the LED flashlight (1) at the **trailing edge** of the fuel as it comes down the bottom of the cup and inspect for contamination.
    - Any dirt in the fuel will collect and be pulled by this trailing edge of fuel **(Number one in the last figure)** . It may be any color and sometimes looks as though the fuel is cloudy. **This is the contamination.** .
    - If you see **ANYTHING AT ALL** , the fuel is contaminated.

View the following repair options:

The fuel sample is found to be contaminated:

- To ensure that the In Tank Lift Pump is operating properly, perform the Lift Pump Flow Test. For instruction and specifications on this procedure, refer to **DIAGNOSIS AND TESTING, 6.7L** . After checking the In Tank Lift Pump operation, refer to **DIESEL FUEL SYSTEM CLEANING PROCEDURE**. .
- Go To 2.

The Fuel sample is clean:

- Install new fuel filter and Mopar (CRC) fuel injector cleaner into the fuel tank at a ratio four times the recommend concentration.
- Go To 2.

2. **DIAGNOSTIC PATH**

Were you instructed to inspect for Fuel Contamination from the MIL LIGHT ON PRETEST PROCEDURE?

Yes

- Perform the diagnostic trouble code test that was found to be present. Refer to the appropriate Electrical Diagnostic article. .

No

- Go To 3.

3. **DIAGNOSTIC PATH CONTINUED**

   Were you instructed to inspect for Fuel Contamination from a Non-DTC TEST PROCEDURE?

   Yes

   - Perform the DIESEL AFTERTREATMENT VALIDATION 6.7L procedure. Refer to **STANDARD PROCEDURE** or **STANDARD PROCEDURE** . .

   No

   - Return to Diagnostic Test that directed you to inspect for fuel contamination.

SPECIFICATIONS

FUEL INJECTOR FIRING ORDER - DIESEL

The firing order for the Cummins turbo-diesel engine is **1-5-3-6-2-4** .

TORQUE SPECIFICATIONS - 6.7L

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Air Intake Heater	24	18	-
Crankshaft Position Sensor	10	-	89
Engine Coolant Temperature Sensor	18	-	159
Fuel Connector Nut at Cylinder Head	55	41	-
Fuel Control Actuator	24	18	-
Fuel Filler Hose Clamp at Tank	3	-	27
Fuel Filter Housing Cover	31	23	-
Fuel Filler Housing-to-Body Screws	2	-	18
Fuel Heater Element	2	-	18
Fuel Injector Bolts	5	-	44
Step 2	10	-	89
Fuel Injector Solenoid Nuts	1.25	-	11
Fuel Injection Pump Drive Gear Access Cover	8	-	71
Fuel Injection Pump			

Mounting Nuts	24	18	-
Fuel Injection Pump-to-Gear Shaft Nut	105	77	-
Fuel Line Banjo Fitting Bolts	24	18	-
Fuel Line Banjo Fitting Bolts at Fuel Filter Housing	24	18	-
Fuel Line Brace-to-Intake Manifold Cover Bolt (High-Pressure)	24	18	-
Fuel Line Fittings (High-Pressure - Pump to Rail)	40	30	-
Fuel Line Fittings (High-Pressure - Cylinder Head to Rail)	40	30	-
Fuel Pressure Limiting Valve (Banjo Bolt)	24	18	-
Fuel Pressure Limiting Valve (In Fuel Rail)	101	74	-
Fuel Pressure Sensor	70	52	-
Fuel Rail Mounting Bolts	24	18	-
Fuel Tank Mounting Straps (Mid-Ship)	41	30	-
High Pressure Connector Retaining Nut	15	-	133
Step 2	50	37	-
Intake Air Temperature Sensor	1	-	9
Intake Manifold Bolts	24	18	-
Mass Air Flow Sensor	1	-	9
Map Sensor Screws	1	-	9
No. 6 Fuel Line Shield Bolts	43	32	-
Oxygen Sensor	41	30	-
Oxygen Sensor Module	6	-	53
Rear Engine Lift Bracket Bolts	77	57	-
Rear Fuel Tank Straps	55	41	-
Screened Quick Connect	27	20	-

SPECIAL TOOLS

SPECIAL TOOLS

	8978A - Decay Tool, Fuel 9340 - SAE Fuel Pump Lock Ring Wrench (Originally Shipped In Kit Number(s) 9327, 9327CC, 9397, 9575.) L-4407A - Puller, Gear

FILTER, FUEL

REMOVAL

REMOVAL

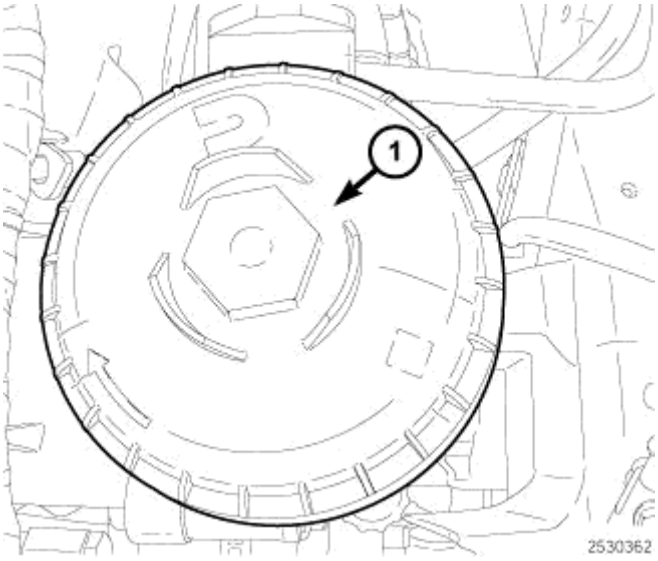

Fig. 7: Fuel Filter Housing Cover
Courtesy of CHRYSLER GROUP, LLC

NOTE: Refer to MAINTENANCE SCHEDULES or the Owner's Manual for recommended fuel filter replacement intervals.

1. Clean all debris from around filter canister (1) and canister cover.
2. Using a socket, rotate the fuel filter housing cover (1) counter clockwise and remove cover (1).

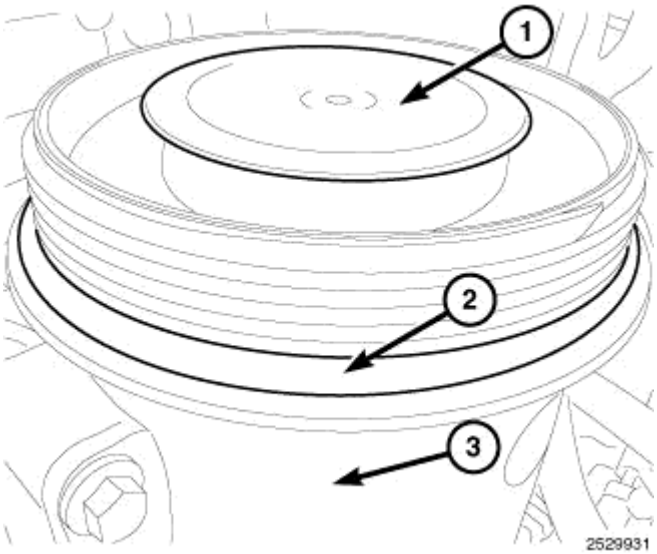

Fig. 8: Fuel Filter Element & O-Ring
Courtesy of CHRYSLER GROUP, LLC

3. Remove and discard the O-ring (2).
4. Remove fuel filter element (1).

INSTALLATION

INSTALLATION

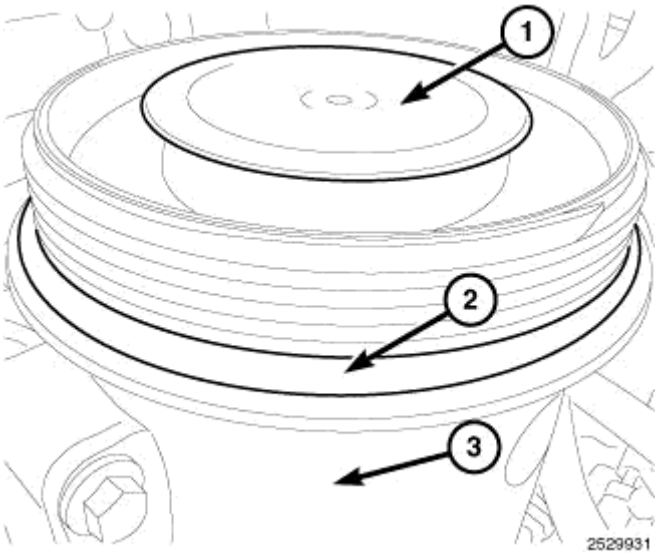

Fig. 9: Fuel Filter Element & O-Ring
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not pre-fill the fuel filter with fuel. Severe damage to fuel system and injection system components may result.

NOTE: **The engine has a self-priming low-pressure fuel system. Refer to FUEL SYSTEM PRIMING - DIESEL. .**

NOTE: **DO NOT USE brake cleaner, carburetor cleaner, or similar harsh solvents for cleaning the internal housing walls.**

1. Ensure that the internal housing wall is clean of debris before installing a new fuel filter cartridge.
2. Install fuel filter element (1).
3. Lubricate with clean engine oil and install the new O-ring (2).

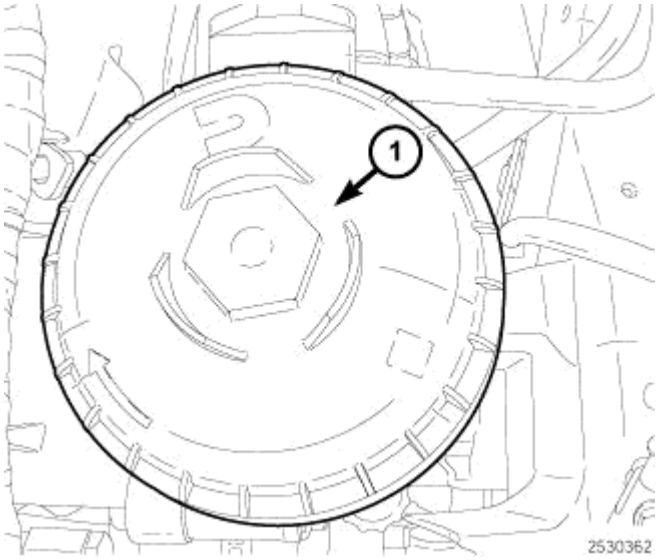

Fig. 10: Fuel Filter Housing Cover
Courtesy of CHRYSLER GROUP, LLC

4. Install the fuel filter housing cover (1) and tighten to 31 N.m (23 ft. lbs.).

FITTING, QUICK CONNECT

DESCRIPTION

DESCRIPTION

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. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .

CAUTION: Before separating a Quick-Connect fitting, pay attention to what type of fitting is being used. Refer to STANDARD PROCEDURE - QUICK-CONNECT FITTINGS. . 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

STANDARD PROCEDURE - QUICK-CONNECT FITTINGS

Different types of quick-connect fittings are used to attach the various fuel system components, lines and tubes. Some quick-connect fittings require the use of a special tool for disconnection and removal.

These are the quick-connect fittings:

- Redundant Latch Single Button Type Fitting
- Single Button Type Fitting
- Pinch Type Fitting
- Single Tab Type Fitting
- Two Tab Type Fitting
- Plastic Retainer Ring Type Fitting
- Latch Clip Type 1 Fitting
- Latch Clip Type 2 Fitting
- Wing Type Fitting

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. .

CAUTION: Before separating a Quick-Connect fitting, pay attention to what type of fitting is being used. Refer to STANDARD PROCEDURE - QUICK-CONNECT FITTINGS. . 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.

REDUNDANT LATCH SINGLE BUTTON TYPE FITTING:

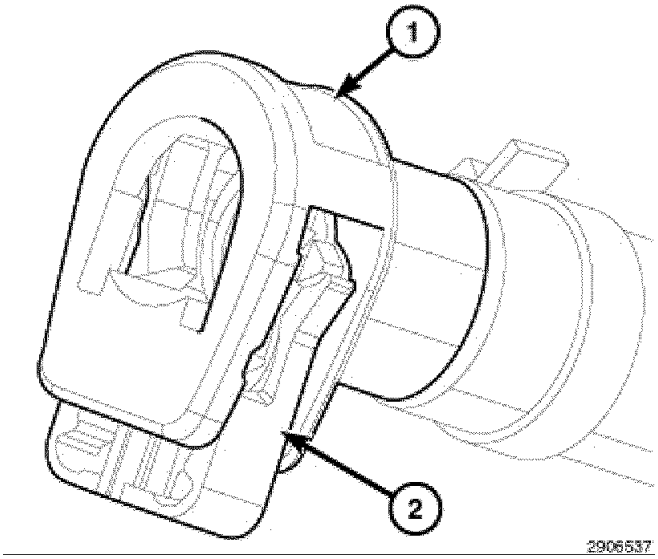

Fig. 11: Redundant Latch & Push Button
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting is equipped with a redundant latch (2) and a single push button (1) that releases two internal latches located in the quick-connect fitting. Special tools are not required for removal.

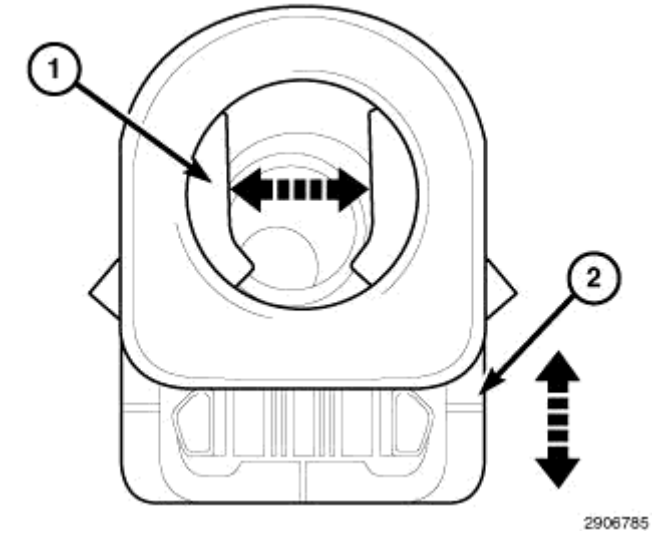

Fig. 12: Redundant Latch & Internal Latches
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not pry or pull up on the push button as damage to the latches of the quick-connect fitting will occur.

1. Pull the redundant latch (2) out away from the quick-connect fitting.
2. Press on the push button with your thumb, release the internal latches (1) and remove the quick-connect fitting from the fuel system component.

SINGLE BUTTON TYPE FITTING:

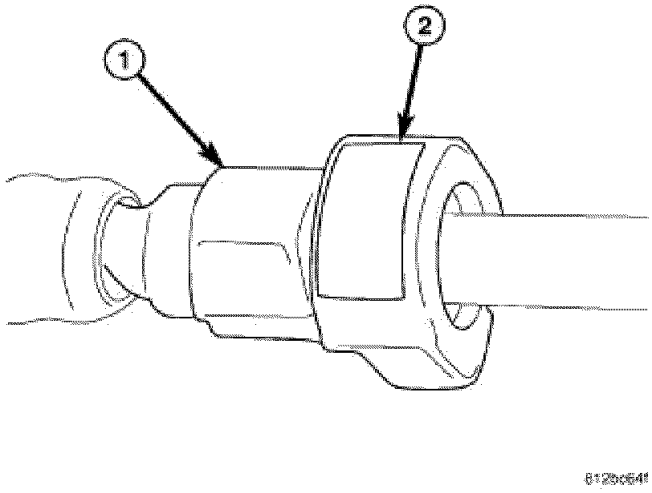

Fig. 13: Single Button Fitting
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not pry or pull up on the push button as damage to the latches of the quick-connect fitting will occur.

This type of quick-connect fitting is equipped with a single push button (2) that releases two internal latches located in the quick-connect fitting. Special tools are not required for removal.

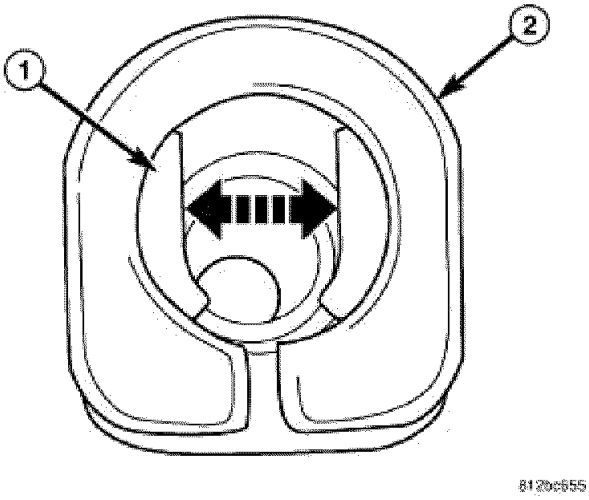

Fig. 14: Ouick-Connect Fitting Latches
Courtesy of CHRYSLER GROUP, LLC

1. Press on the push button with your thumb, release the internal latches (1).
2. Remove the quick-connect fitting from the fuel system component.

2 BUTTON TYPE FITTING

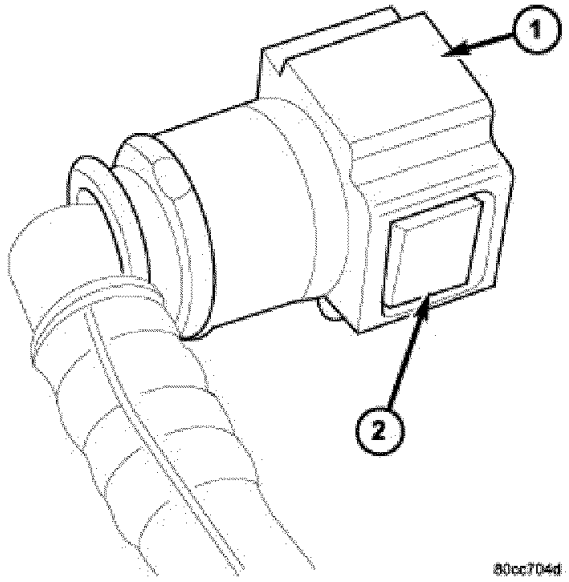

Fig. 15: View Of 2-Button Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (1) is equipped with two push buttons (2) that releases two internal latches located in the quick-connect fitting. Special tools are not required for removal.

1. Press on both push buttons with your thumb, release the internal latches.
2. While holding the two push buttons simultaneously, remove the quick-connect fitting from the fuel system component.

PINCH TYPE FITTING

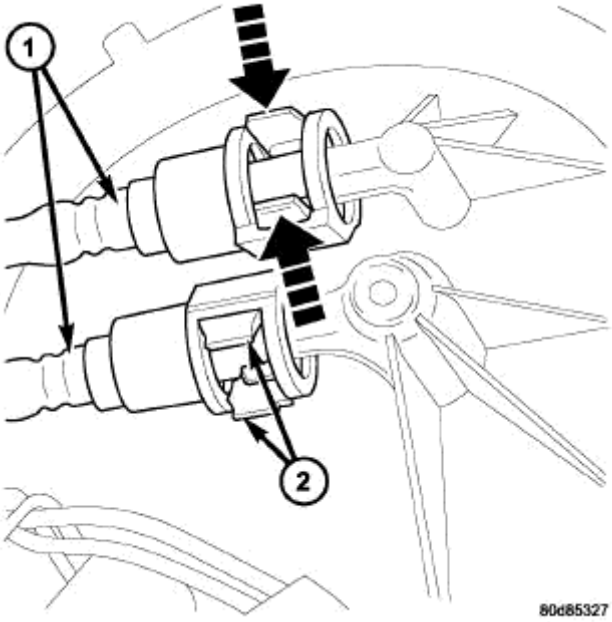

Fig. 16: View Of Pinch Type Quick-Connect Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (1) is equipped with two finger tabs (2). Special tools are not required for removal.

1. Pinch both tabs (2) together and release the quick-connect fitting.
2. Remove the quick-connect fitting from the fuel system component.

SINGLE TAB TYPE FITTING

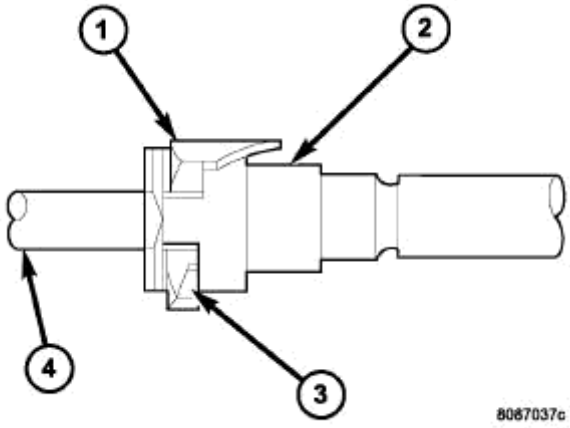

Fig. 17: View Of Single-Tab Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (3) is equipped with a single pull tab (1). The tab is removable. After tab is removed the quick-connect fitting can be separated from the fuel system component. Special tools are not required for removal.

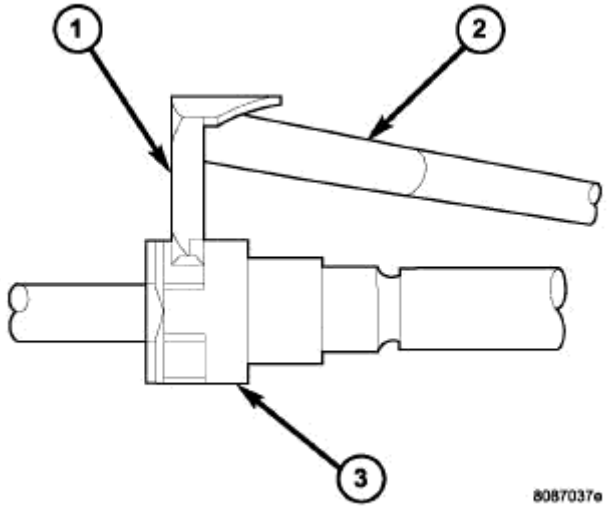

Fig. 18: Disconnecting Single-Tab Type Fitting
Courtesy of CHRYSLER GROUP, LLC

1. 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.**
2. While pressing the release tab on the side of the quick-connect fitting use a screwdriver (2) to pry up the pull tab.
3. Raise the pull tab until it separates from the quick-connect fitting.
4. Remove the quick-connect fitting from the fuel system component.

TWO TAB TYPE FITTING

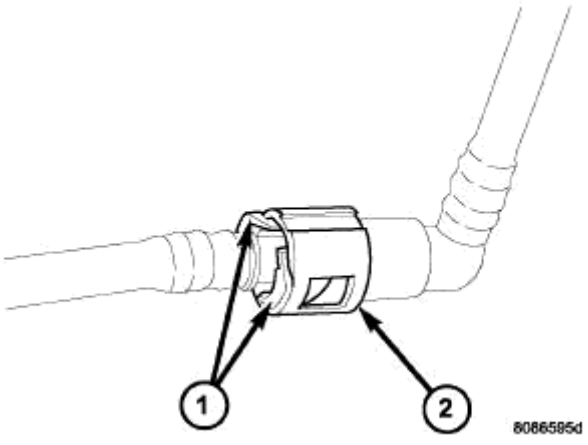

Fig. 19: Identifying Typical 2-Tab Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (2) is equipped with tabs located on both sides of the fitting (1). These tabs are integral to the fuel system component. The plastic tabs will remain on the component being serviced after the quick-connect fitting is removed. The O-ring and spacer will remain in the quick-connect fitting. Special tools are not required for removal.

1. Squeeze the plastic tabs (1) against the sides of component being serviced with your fingers.
2. Remove the quick-connect fitting from the fuel system component.

PLASTIC RETAINER RING TYPE FITTING

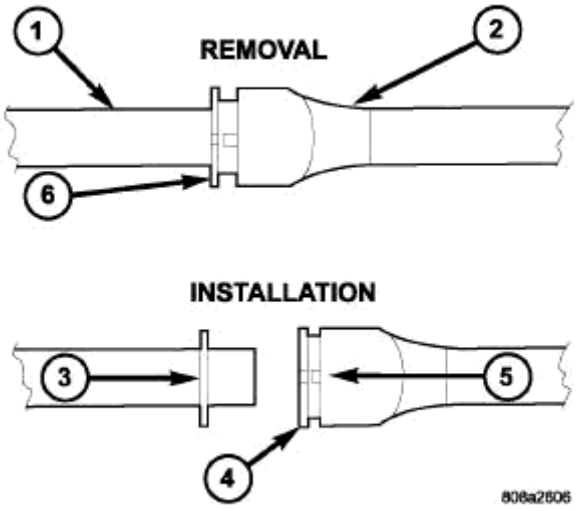

Fig. 20: Plastic Retainer Ring Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of fitting can be identified by the use of a round plastic retainer ring (4) usually black in color. Special tools are not required for removal.

NOTE: The round plastic retainer ring must be pressed squarely into the quick-connect fitting body. If this retainer is cocked during removal it will be difficult to disconnect the quick-connect fitting. Use an open-end wrench on the shoulder of the plastic retainer ring to aid in disconnection.

1. Firmly push the quick-connect fitting (5) towards the component being serviced while firmly pushing the round plastic retainer ring into the quick-connect fitting (6). With the round plastic ring depressed, remove the quick-connect fitting from the fuel system component.
2. After removal the plastic retainer ring will remain with the quick-connect fitting.

LATCH CLIP TYPE 1 FITTING

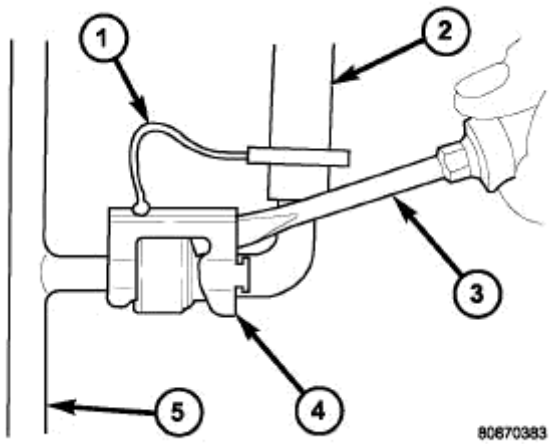

Fig. 21: Latch Clip Type 1
Courtesy of CHRYSLER GROUP, LLC

Depending on vehicle model and engine, 2 different types of safety latch clips are used. One is tethered (1) to fuel line and the other is not. A special tool will be necessary to disconnect the fuel line after latch clip is removed. The latch clip may be used on certain fuel line and fuel rail connections or to join fuel lines together.

1. Pry up on the latch clip (4) with a screwdriver (3).
2. Slide the latch clip away from the quick-connect fitting while lifting the screwdriver and position aside.

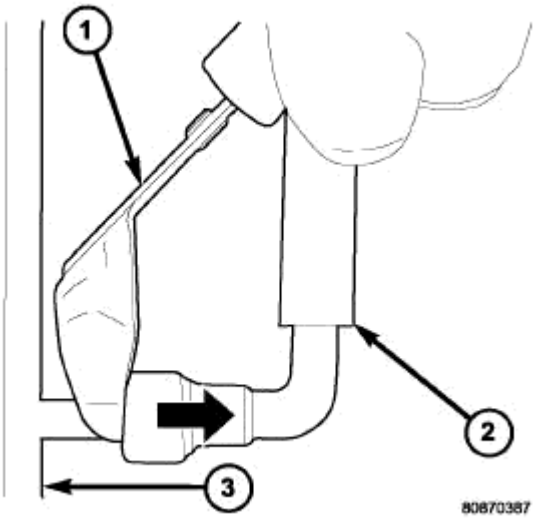

Fig. 22: Fuel Line Disconnection Using Special Tool
Courtesy of CHRYSLER GROUP, LLC

3. Insert the commercially available fuel line removal tool (1) into the quick-connect fitting and release the internal latches.

NOTE: After removal the internal latches will remain in the quick-connect fitting.

4. With the commercially available fuel line removal tool (1) still inserted, remove the quick-connect fitting from the fuel system component.

LATCH CLIP TYPE 2 FITTING

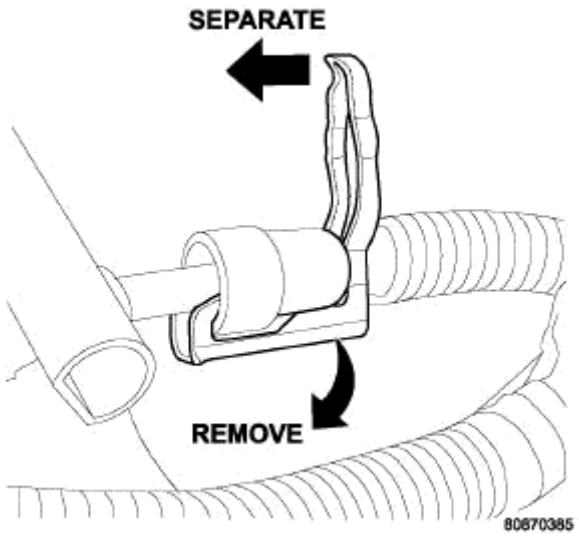

Fig. 23: Latch Clip Type 2
Courtesy of CHRYSLER GROUP, LLC

Depending on vehicle model and engine, 2 different types of safety latch clips are used. One is tethered to the fuel line and the other is not. A special tool will be necessary to disconnect the fuel line after the latch clip is removed. The latch clip may be used on certain fuel line and fuel rail connections or to join fuel lines together.

1. Unlatch the small arms on the end of clip, swing away and separate from the fuel system component.
2. Slide the latch clip away from the quick-connect fitting while lifting with a screwdriver and position aside.

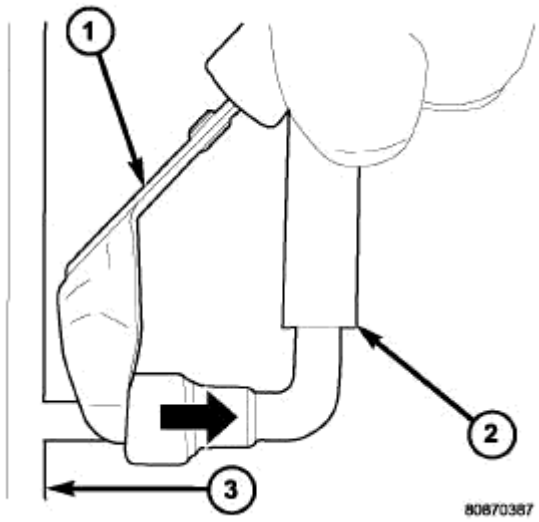

Fig. 24: Fuel Line Disconnection Using Special Tool
Courtesy of CHRYSLER GROUP, LLC

3. Insert the commercially available fuel line removal tool (1) into the quick-connect fitting and release the internal latches.

NOTE: After removal the internal latches will remain in the quick-connect fitting.

4. With the commercially available fuel line removal tool (1) inserted, remove the quick-connect fitting from the fuel system component.

WING TYPE FITTING

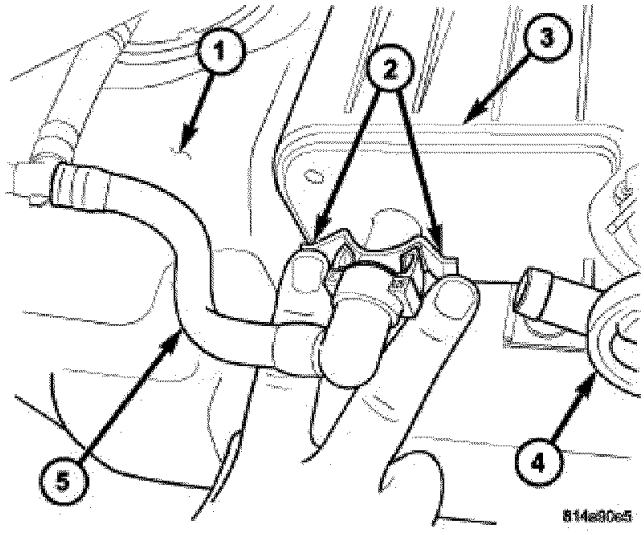

Fig. 25: Wing Type Fitting

Courtesy of CHRYSLER GROUP, LLC

The wing type fitting is used on fuel system and emission components. The wing type fitting is most commonly used on the EVAP canister (3). Special tools are not required for removal.

1. Using two fingers, press both wings (2) and release the locking tabs.

NOTE: After removal the locking tabs will remain with the quick-connect fitting.

2. While holding the wings, remove the quick-connect fitting from the fuel system component.

CONNECTING

1. Inspect the quick-connect fitting body and fuel system components for damage. Replace as necessary.
2. Prior to connecting any quick-connect fitting to components, check condition of fitting and components. Clean parts with a lint-free cloth. Lubricate with clean engine oil.
3. Insert the quick-connect fitting onto the fuel tube or fuel system component until the built-in stop on the fuel tube or component rests against the back of fitting.
4. Continue pushing until a click is felt.
5. If Equipped:
   - **Redundant Latch Single Button Type Fitting:** Push redundant latch until it locks into position in the quick-connect fitting.
   - **Single Tab Type Fitting:** Push new tab down until it locks into position in the quick-connect fitting.
   - **Latch Clip Type Fitting:** Install latch clip (snaps into position). **If latch clip will not snap into position, this indicates the quick-connect fitting is not properly installed onto fuel system component, recheck the connection.**
6. Verify a locked condition by firmly pulling on the quick-connect fitting connection of the fuel system component.

HEATER, FUEL

OPERATION

OPERATION

The fuel heater is used to prevent diesel fuel from waxing during cold weather operation.

When the fuel temperature is below 32° F (0° C), the temperature sensor allows current to flow to the heater element warming the fuel. When the fuel temperature is above 64° F (18° C), the sensor stops current flow to the heater element.

Battery voltage to operate the fuel heater element is supplied from the ignition switch and through a solid stated device in the TIPM. **The fuel heater element and "solid state device in TIPM" are not computer controlled.** The heater element operates on 12 volts, 300 watts at 0° F (-18° C).

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - FUEL HEATER

The fuel heater is used to prevent diesel fuel from waxing during cold weather operation.

NOTE: The fuel heater element, "solid state device in TIPM" is not controlled by the Powertrain Control Module (PCM).

A malfunctioning fuel heater can cause a wax build-up in the fuel filter/water separator. Wax build-up in the filter/separator can cause engine starting problems and prevent the engine from revving up. It can also cause blue or white fog-like exhaust. If the heater is not operating in cold temperatures, the engine may not operate due to fuel waxing.

The fuel heater assembly is located on the side of fuel filter housing and internal to the fuel filter housing.

The heater assembly is equipped with a built-in fuel temperature sensor (thermostat) that senses fuel temperature. When fuel temperature drops below 32° F (0° C), the sensor allows current to flow to built-in heater element to warm fuel. When fuel temperature rises above 64° F (18° C), the sensor stops current flow to heater element (circuit is open).

Voltage to operate fuel heater element is supplied from ignition switch, through "solid state device in TIPM", to fuel temperature sensor and on to fuel heater element.

The heater element operates on 12 volts, 300 watts at 0 °F (-18° C). As temperature increases, power requirements decrease.

A minimum of 7 volts is required to operate the fuel heater. The resistance value of the heater element is less than 1 ohm (cold) and up to 1000 ohms warm.

TESTING

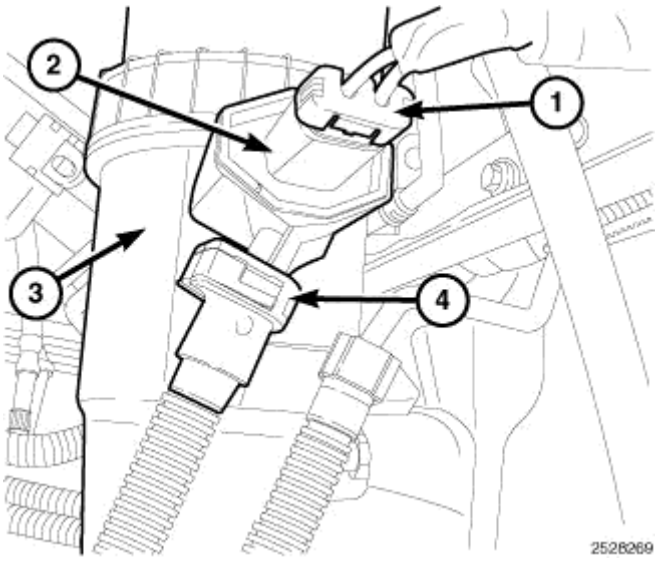

Fig. 26: Fuel Filter Housing Assembly & Harness Connector
Courtesy of CHRYSLER GROUP, LLC

NOTE: The Fuel Heater is not a separately serviceable item. If diagnostics have led you to replace this sensor, then the whole fuel filter housing assembly (3) needs to be changed.

1. Disconnect harness connector (1) from heater element.

   Ambient temperature must be below the circuit close temperature. If necessary, induce this ambient temperature by placing ice packs on thermostat to produce an effective ambient temperature below circuit close temperature.

   Measure resistance across two pins. Operating range is 0.3 - 0.45 Ohms.

2. If resistance is out of range, replace the fuel filter housing.

REMOVAL

REMOVAL

NOTE: The Fuel Heater is not a separately serviceable item. If diagnostics have led you to replace this sensor, then the whole fuel filter housing assembly needs to be changed. Refer to SEPARATOR AND FILTER, FUEL AND WATER, REMOVAL.

MANIFOLD, FUEL DRAIN

OPERATION

OPERATION

The Fuel Drain Circuit incorporates several sources of fuel return. Fuel travels from the fuel tank (via the fuel transfer pump) and is forced through the fuel filter. This fuel then travels into the fuel injection pump. It then goes to a fuel drain line and returns back to the fuel tank.

The fuel that flows to the fuel pump is pressurized by a gear pump and internally transferred to the fuel injection pump. At this point the fuel is channeled into two passages. One passage sends fuel to the FCA (Fuel Control Actuator). The other passage sends fuel to the cascade overflow valve. The overflow valve sends some fuel to a lubrication passage. The rest of the fuel is sent to a drain passage which connects to an external fuel line.

Fuel that travels through the FCA is pressurized by the fuel injection pump and sent through an external high pressure fuel line to the fuel rail. At the fuel rail, fuel is sent to the fuel injectors. If fuel pressure in the fuel rail becomes excessive, the pressure limiting valve opens and sends fuel through an external fuel line.

At the fuel injector, fuel that is not injected is used for lubrication of the fuel injectors. This fuel then travels through an internal passage that is connected to the rear of the cylinder head, an then into an external fuel line. This line is connected to the vehicles fuel return line, and returns excess fuel back and into the fuel tank.

REMOVAL

REMOVAL

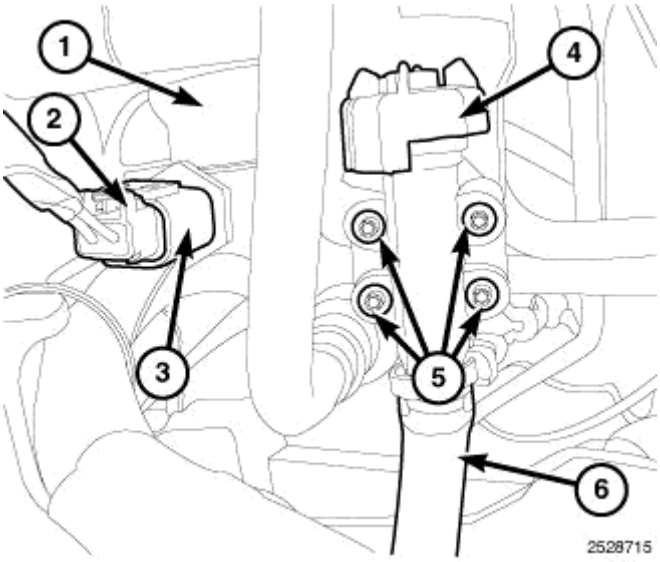

Fig. 27: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

1. **With engine not running,** Route the fuel drain hose to an appropriate container and rotate drain valve (4) one quarter turn counter clockwise to open it. Turn the key to the "ON" position. This will cycle the fuel pump for 2 seconds and drain the fluid from the fuel filter housing. Turn the key to the "OFF" position and rotate the drain valve (4) clockwise one quarter turn to close it.
2. Disconnect drain hose (6) from the fuel drain valve.
3. Remove four drain valve mounting screws (5) and the drain valve (4) from filter housing (1).

INSTALLATION

INSTALLATION

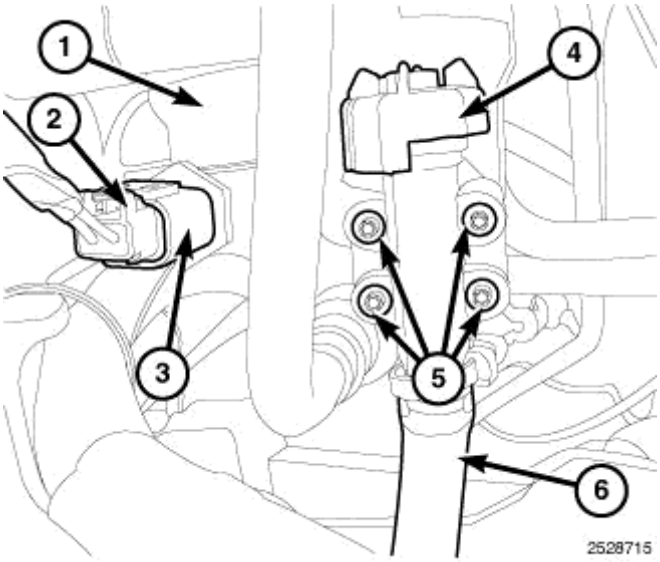

Fig. 28: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

NOTE: The engine has a self-priming low-pressure fuel system. Refer to FUEL SYSTEM PRIMING - DIESEL. .

1. Install the drain valve (4) to filter housing (1) and securely tighten the four drain valve mounting screws.
2. Connect drain hose (6) from the fuel drain valve.
3. Start the engine and check for leaks.

MODULE, FUEL PUMP

DESCRIPTION

DESCRIPTION

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The fuel tank module is installed in the top of the fuel tank. The fuel tank module contains the following components:

- An electric fuel transfer (lift) pump
- Fuel reservoir
- A separate in-tank fuel filter
- Fuel gauge sending unit (fuel level sensor)
- Fuel supply line connection
- A special lock ring to retain module to fuel tank
- Fuel return line connection

REMOVAL

REMOVAL

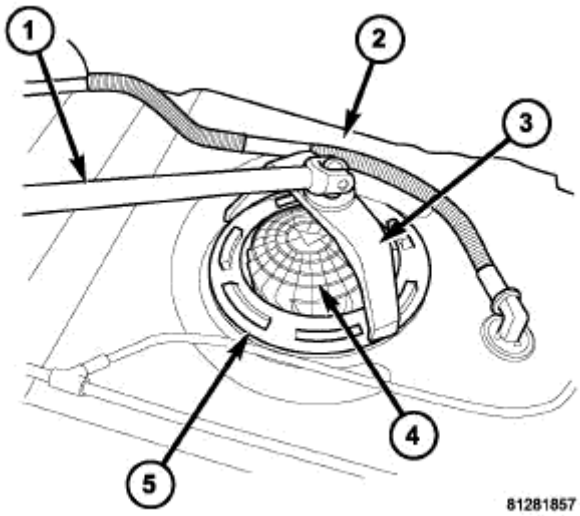


Fig. 29: Fuel Pump Module Location
Courtesy of CHRYSLER GROUP, LLC

1. Drain the fuel tank. Refer to **DRAINING FUEL TANK**. .
2. Remove fuel tank. Refer to **TANK, FUEL, REMOVAL**.
3. Note rotational position of module before attempting removal. An indexing arrow is located on top of module for this purpose.
4. Position SAE Fuel Pump Lock Ring Wrench (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3) into notches on outside edge of lock ring (5).
5. Install 1/2 inch drive breaker bar (1) to SAE Fuel Pump Lock Ring Wrench (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3).
6. Rotate breaker bar counterclockwise to remove lock ring.
7. Remove lock ring. The module will spring up slightly when lock ring is removed.
8. Remove module from fuel tank. Be careful not to bend float arm while removing.

INSTALLATION

INSTALLATION

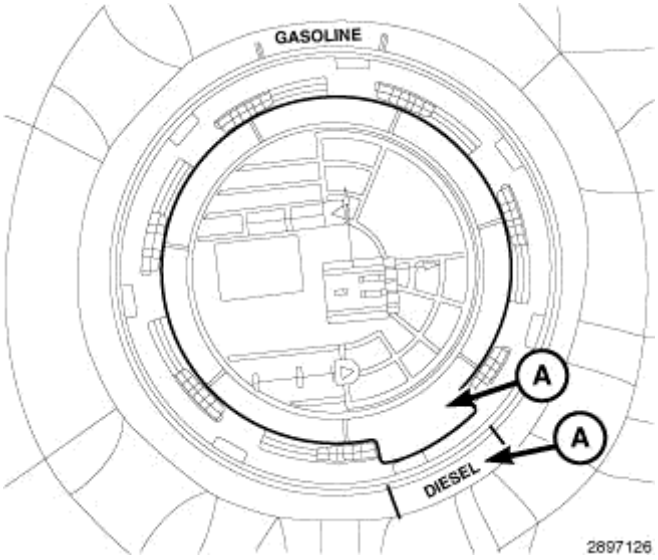


Fig. 30: Aligning Locator Tab With Index Mark
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Whenever the fuel pump module is serviced, the rubber O-ring seal must be replaced.

1. Using a new O-ring seal (gasket), position fuel pump module into opening in fuel tank and align the locator tab (A) with index mark (A) on fuel tank.

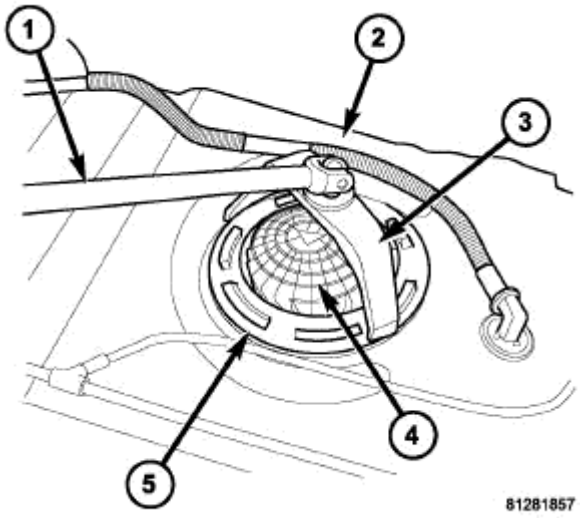


Fig. 31: Fuel Pump Module Location
Courtesy of CHRYSLER GROUP, LLC

2. Position lock ring (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. Also be sure fuel fitting on top of pump module is pointed to drivers side of vehicle.

4. Install SAE Fuel Pump Lock Ring Wrench (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3) to lock ring.
5. Install 1/2 inch drive breaker (1) into SAE Fuel Pump Lock Ring Wrench (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3).
6. Tighten lock ring (clockwise) until all seven notches have engaged.
7. Install fuel tank. Refer to **TANK, FUEL, INSTALLATION**.

PUMP, FUEL INJECTION

DESCRIPTION

DESCRIPTION

A Robert Bosch high-pressure fuel injection pump is used. The pump is attached to the back of the timing gear housing at the left /front side of the engine.

OPERATION

OPERATION

The fuel injection pump supplies high pressure to the fuel rail independent of engine speed. This high pressure is then accumulated in the fuel rail. High pressure fuel is constantly supplied to the injectors by the fuel rail. The Powertrain Control Module (PCM) controls the fueling and timing of the engine by actuating the injectors.

Fuel enters the system from the electric fuel transfer (lift) pump, which is located in the fuel tank. Fuel is forced through the fuel filter element and then enters the Fuel Pump/Gear Pump, which is attached to the rear of the fuel injection pump. The Fuel Pump/Gear Pump is a low-pressure pump and produce a minimum pressure of 440 kpa (64 psi). Fuel then enters the fuel injection pump. Low pressure fuel is then supplied to the Fuel Control Actuator (FCA).

The FCA is an electronically controlled solenoid valve. The PCM controls the amount of fuel that enters the high-pressure pumping chambers by opening and closing the FCA based on a demanded fuel pressure. The Fuel Pressure Sensor (FPS) on the fuel rail provides the actual fuel pressure. When the actuator is opened, the maximum amount of fuel is being supplied to the fuel injection pump. Any fuel that does not enter the injection pump is directed to the cascade overflow valve. The cascade overflow valve regulates how much excess fuel is used for lubrication of the pump and how much is returned to the tank through the drain manifold.

Fuel entering the injection pump is pressurized to between 200 -1800 bar (2901 - 26107 psi) by three radial pumping chambers. The pressurized fuel is then supplied to the fuel rail.

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.

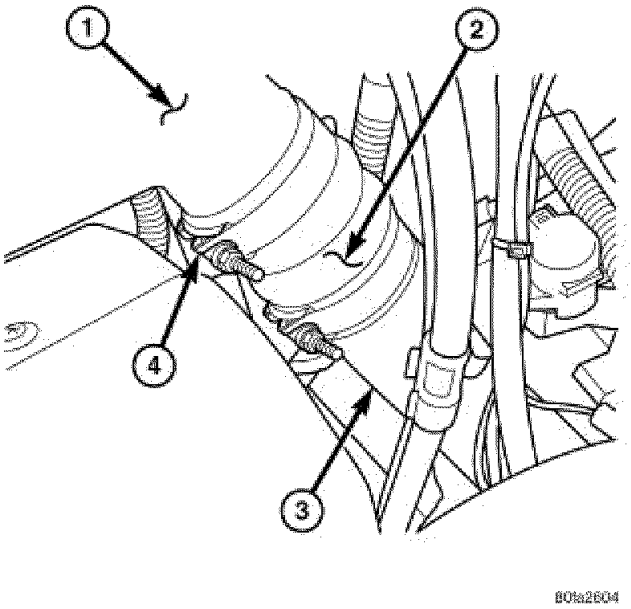


Fig. 32: Intake Tube & Connecting Hose
Courtesy of CHRYSLER GROUP, LLC

1 - MANIFOLD ABOVE HEATERS
2 - RUBBER CONNECTING HOSE
3 - METAL INTAKE TUBE
4 - CLAMPS (2)

1. Disconnect both negative battery cables at both batteries. Cover and isolate ends of both cables.
2. Remove intake manifold air intake tube (above injection pump) and its rubber connector hose (2).
3. Remove accessory drive belt.

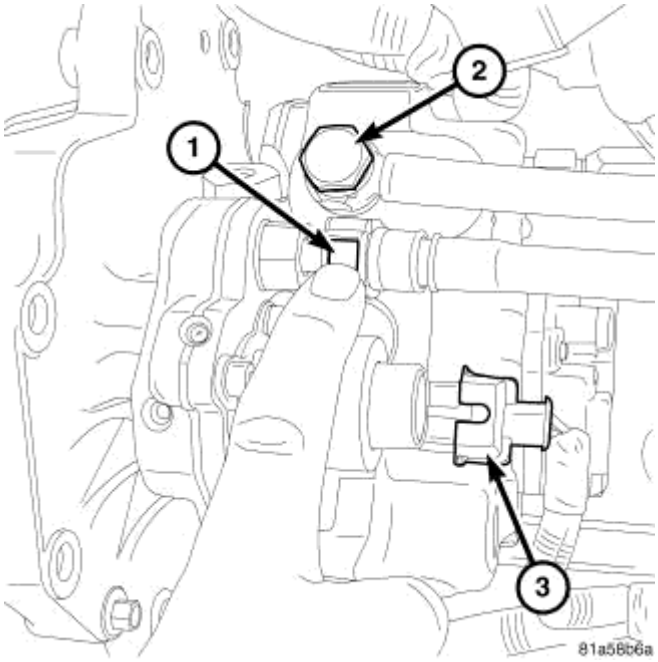


Fig. 33: Injection Pump Quick-Connect Fitting & Fuel Control Actuator
Courtesy of CHRYSLER GROUP, LLC

4. Thoroughly clean rear of injection pump, and attachment points for its fuel lines. Also clean the opposite ends of these same lines at their attachment points.
5. Disconnect quick-connect fitting by pressing on button (1).

CAUTION: Whenever a fuel line fitting is connected to a secondary fitting, always use a back-up wrench on the secondary fitting. Do not allow the secondary fitting to rotate.

6. Remove high-pressure fuel line to fuel rail.
7. Remove banjo bolt (2).
8. Disconnect FCA (Fuel Control Actuator) electrical connector (3).

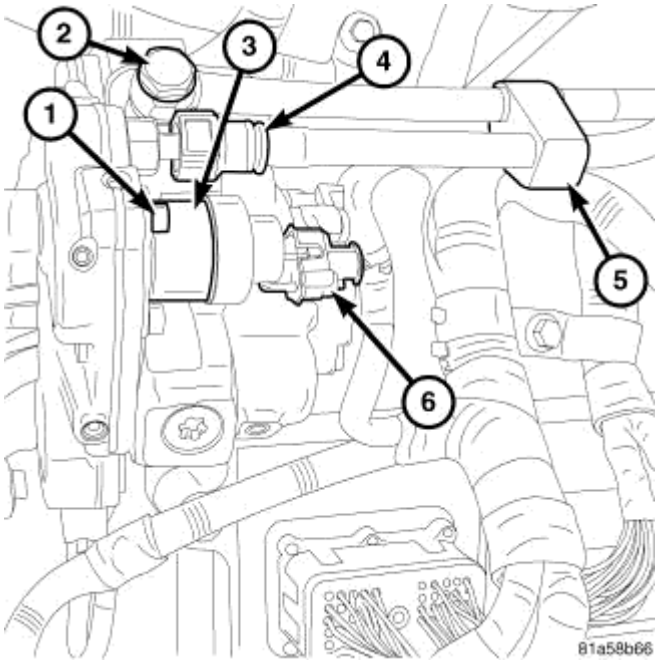


Fig. 34: Fuel Injection Pump Components
Courtesy of CHRYSLER GROUP, LLC

9. Remove line clamp (5).

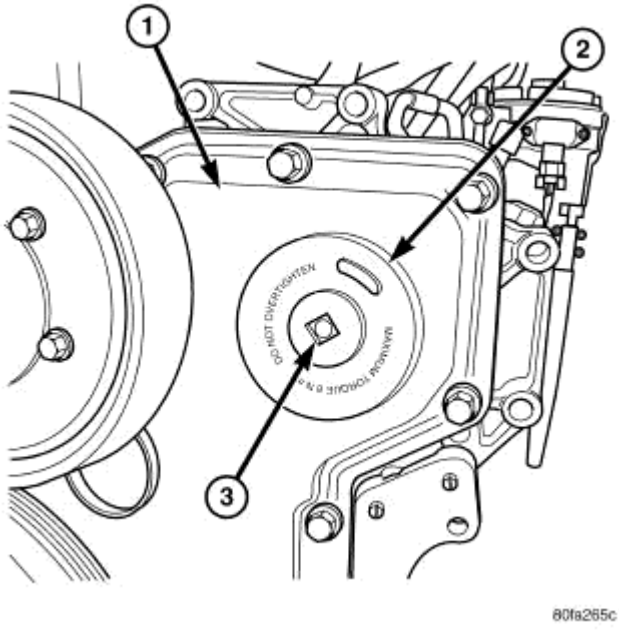


Fig. 35: Pump Drive Gear Access Cover
Courtesy of CHRYSLER GROUP, LLC

1 - FRONT TIMING GEAR COVER

2 - GEAR ACCESS PLATE (COVER)
3 - SQUARE DRIVE (FOR COVER REMOVAL/INSTALLATION)

10. Remove fuel pump drive gear access cover with a 3/8" drive ratchet. Access cover (2) is threaded to timing gear cover.
11. Remove fuel pump drive gear mounting nut and washer.

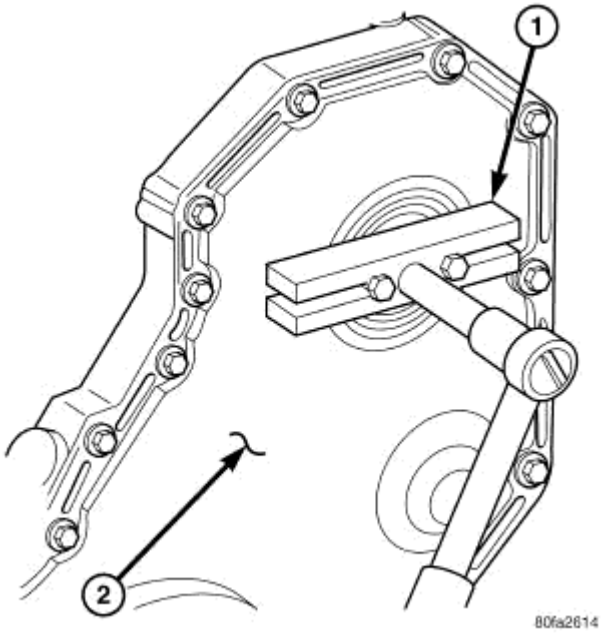


Fig. 36: Removing Pump Drive Gear
Courtesy of CHRYSLER GROUP, LLC

1 - FRONT TIMING GEAR COVER
2 - GEAR PULLER TOOL

12. Attach C3428B, or (special tool #L-4407A, Puller, Gear) (or equivalent) gear puller (1) to pump drive gear with 2 bolts, and separate gear from pump (a keyway is not used on this particular injection pump). Leave drive gear hanging loose within timing gear cover.

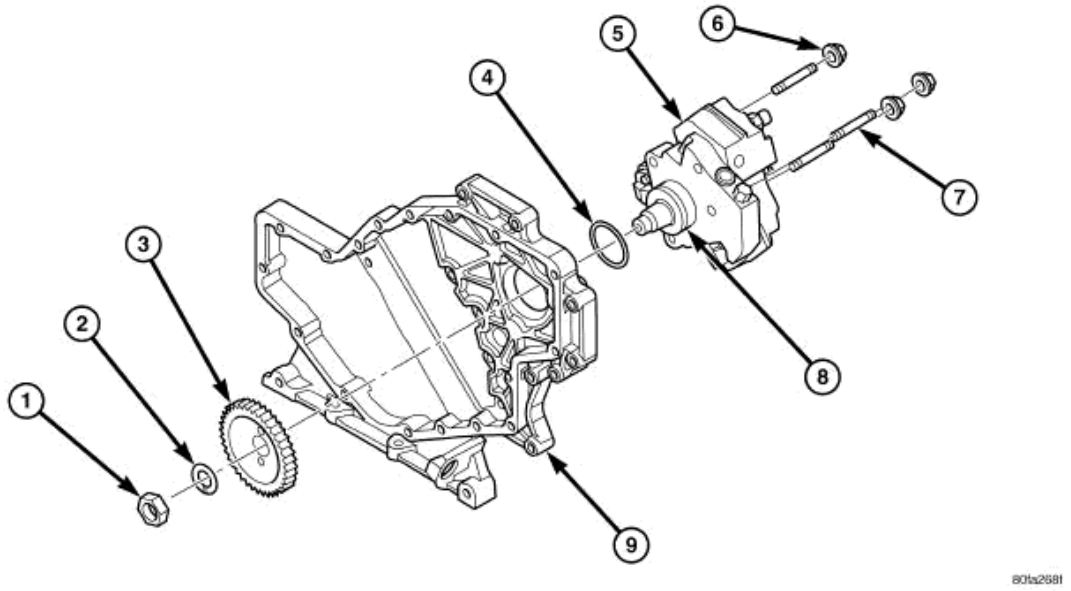


Fig. 37: Fuel Injection Pump & Mounting Components
Courtesy of CHRYSLER GROUP, LLC

1 - PUMP DRIVE GEAR NUT
2 - WASHER
3 - PUMP DRIVE GEAR
4 - RUBBER O-RING
5 - FUEL INJECTION PUMP
6 - PUMP MOUNTING NUTS (3)
7 - PUMP MOUNTING STUDS (3)
8 - O-RING MACHINED GROOVE
9 - FRONT TIMING GEAR HOUSING

13. Remove three injection pump mounting nuts (6), and remove pump from engine.

INSTALLATION

INSTALLATION

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.

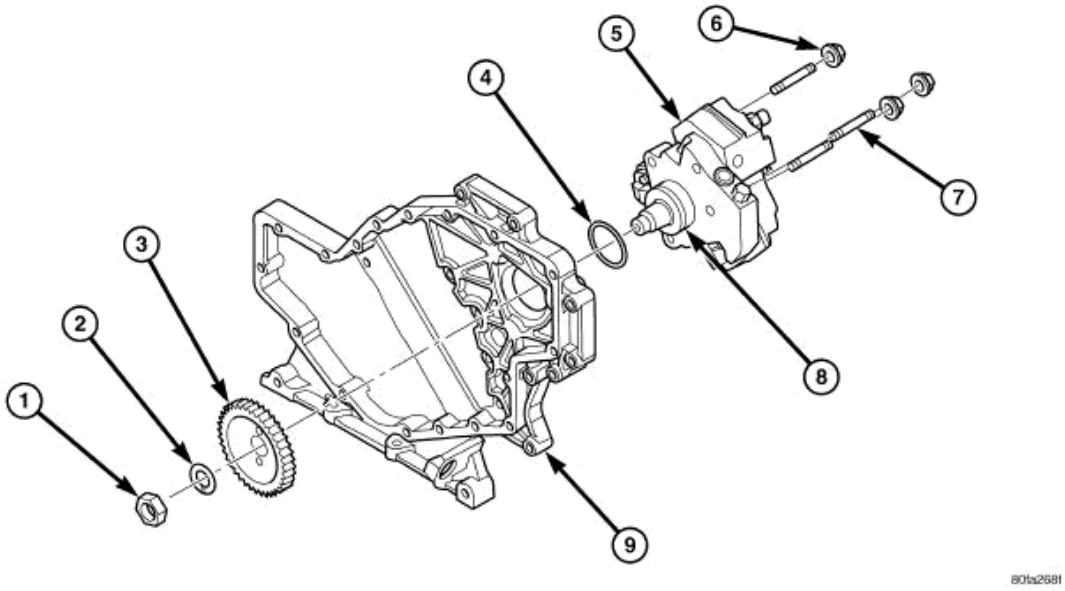


Fig. 38: Fuel Injection Pump & Mounting Components
Courtesy of CHRYSLER GROUP, LLC

1 - PUMP DRIVE GEAR NUT
2 - WASHER
3 - PUMP DRIVE GEAR
4 - RUBBER O-RING
5 - FUEL INJECTION PUMP
6 - PUMP MOUNTING NUTS (3)
7 - PUMP MOUNTING STUDS (3)
8 - O-RING MACHINED GROOVE
9 - FRONT TIMING GEAR HOUSING

1. Inspect pump mounting surfaces at pump and mounting flange and pilot bore for nicks, cuts or damage. Inspect O-ring surfaces for nicks, cuts or damage.
2. Clean injection pump mounting flange and pilot bore at gear housing. Also clean front of injection pump.
3. Install new rubber O-ring (square) (4) into machined groove at pump mounting area.
4. Apply clean engine oil **to injection pump O-ring and pilot bore only.**

   The machined tapers on both injection pump shaft and injection pump gear must be absolutely dry, clean and free of any dirt or oil film. This will ensure proper gear-to-shaft tightening.

5. Clean pump gear and pump shaft at machined tapers with an evaporative type cleaner such as brake cleaner.

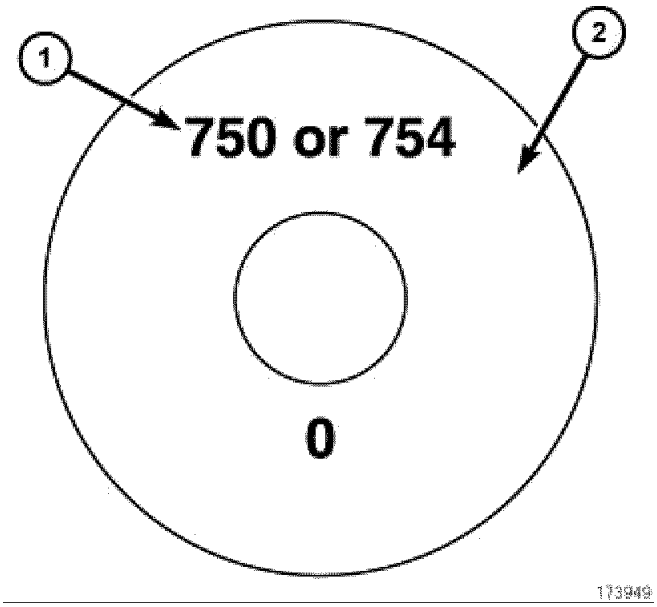


Fig. 39: Injection Pump Shaft Phasing Marks
Courtesy of CHRYSLER GROUP, LLC

6. **FUEL INJECTION PUMP PHASING:** Perform the following phasing procedure anytime the injection pump has been removed and reinstalled.
7. Locate the end of the fuel injection pump shaft (2). Two numbers (750 or 754 and 0) are stamped into the end of the shaft.

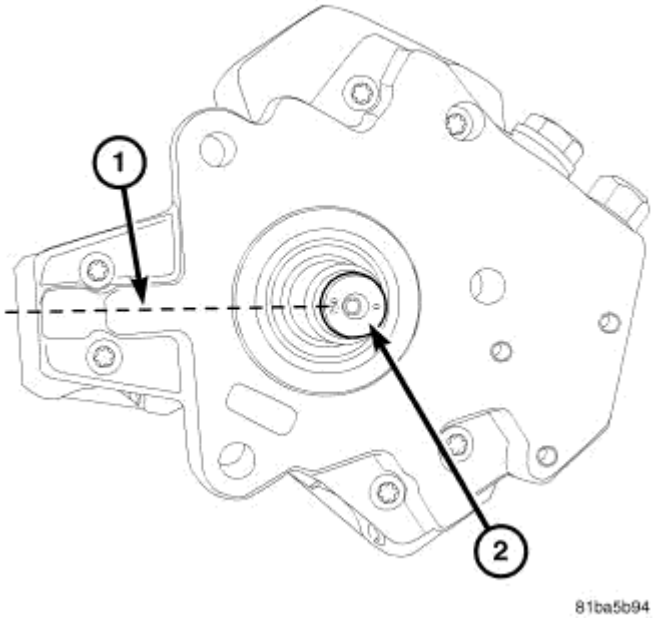


Fig. 40: Injection Pump Shaft Position
Courtesy of CHRYSLER GROUP, LLC

NOTE: Fuel Injection Pump used for illustration has number 750.

8. Rotate the injection pump shaft until the number 5 (located in the center of number 750 or 754) is positioned at 9 o'clock (1).
9. Position injection pump to mounting flange on gear housing while aligning injection pump shaft through back of injection pump gear. Be sure the number 5 is still at the 9 o'clock position (1).
10. Bring the engine to TDC position. Do this by rotating the crankshaft until the TDC mark on the crankshaft damper is at 12 o'clock position. It does not matter if cylinder No. 1 or No. 6 is at TDC. Again, check to be sure the number 5 is still at the 9 o'clock position (1). Rotate pump shaft accordingly.

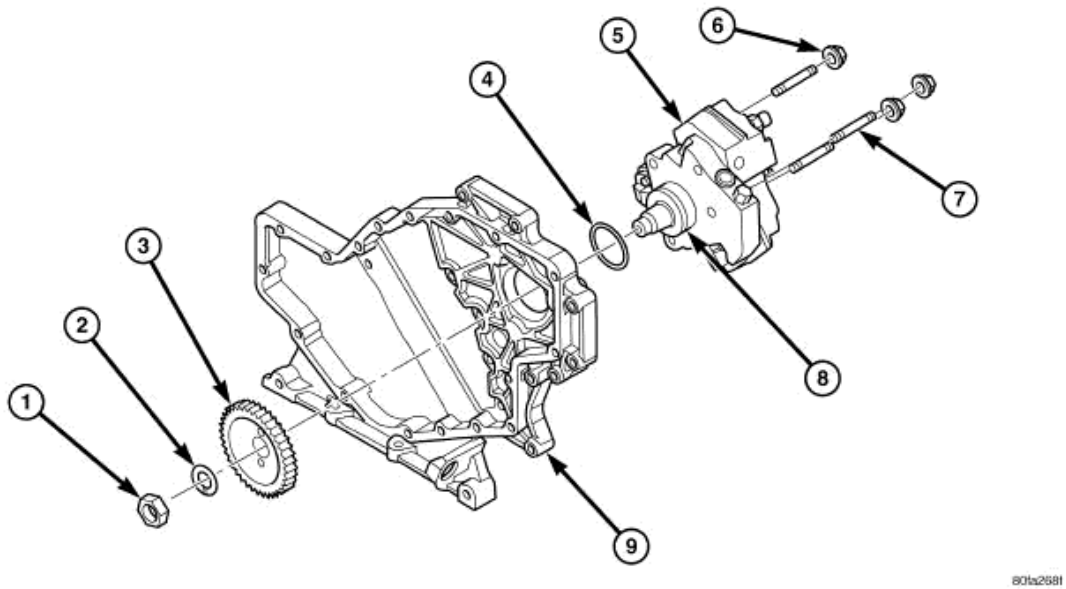


Fig. 41: Fuel Injection Pump & Mounting Components
Courtesy of CHRYSLER GROUP, LLC

1 - PUMP DRIVE GEAR NUT
2 - WASHER
3 - PUMP DRIVE GEAR
4 - RUBBER O-RING
5 - FUEL INJECTION PUMP
6 - PUMP MOUNTING NUTS (3)
7 - PUMP MOUNTING STUDS (3)
8 - O-RING MACHINED GROOVE
9 - FRONT TIMING GEAR HOUSING

11. After pump is positioned flat to mounting flange, install three pump mounting nuts (6) and tighten **finger tight only.** Do not attempt a final tightening at this time. **Do not attempt to tighten (pull) pump to gear housing using mounting nuts. Damage to pump or gear housing may occur. The pump must be positioned flat to its mounting flange before attempting to tighten three mounting nuts.**
12. To prevent damage or cracking of components, install and tighten nuts in the following sequence:
    1. Install injection pump shaft washer and nut to pump shaft. Tighten nut **finger tight only.**

2. Do preliminary (light) tightening of injection pump shaft nut (1).
3. Tighten three injection pump mounting nuts to 24 N.m (18 ft. lbs.).
4. Do a final tightening of pump shaft nut (1) to 105 N.m (77 ft. lbs.).

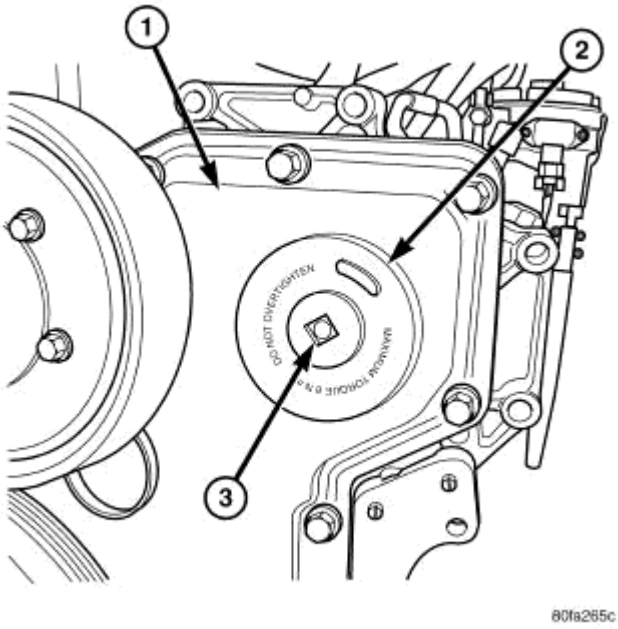


Fig. 42: Pump Drive Gear Access Cover
Courtesy of CHRYSLER GROUP, LLC

1 - FRONT TIMING GEAR COVER
2 - GEAR ACCESS PLATE (COVER)
3 - SQUARE DRIVE (FOR COVER REMOVAL/INSTALLATION)

13. Install drive gear access cover (2) using a 3/8" drive ratchet. Access cover is threaded to timing gear cover. Tighten to 8 N.m (71 in. lbs.).

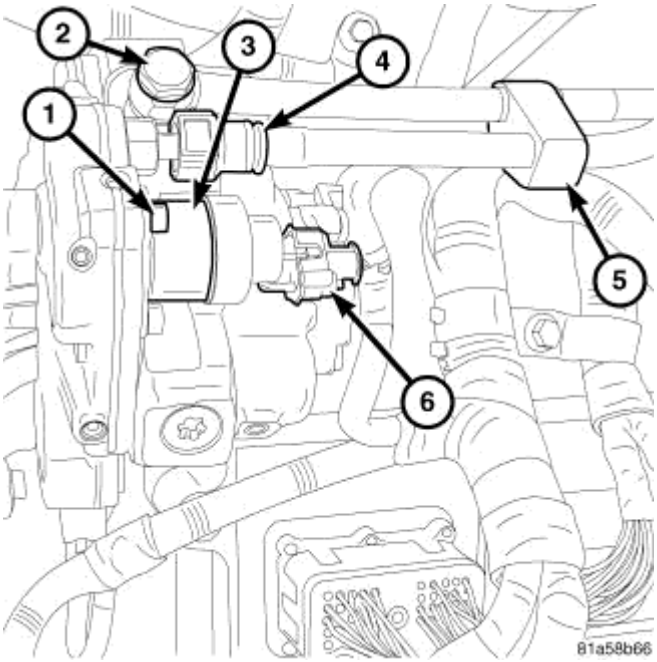


Fig. 43: Fuel Injection Pump Components
Courtesy of CHRYSLER GROUP, LLC

14. Install fuel return line. Tighten banjo bolt (2) to 24 N.m (18 ft. lbs.).
15. Install quick-connect fitting (4).
16. Install fuel line (injection pump-to-fuel rail). Using a back up wrench, tighten fitting at fuel pump to 40 N.m (30 ft. lbs.). Tighten fitting at fuel rail to 40 N.m (30 ft. lbs.).
17. Install clamp (5).
18. Connect Fuel Control Actuator (FCA) electrical connector (6) to rear of injection pump.

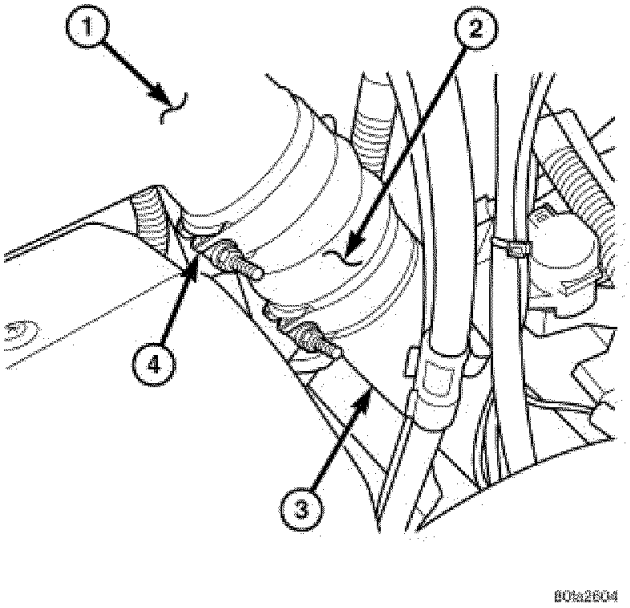


Fig. 44: Intake Tube & Connecting Hose
Courtesy of CHRYSLER GROUP, LLC

1 - MANIFOLD ABOVE HEATERS
2 - RUBBER CONNECTING HOSE
3 - METAL INTAKE TUBE
4 - CLAMPS (2)

19. Install rubber intake manifold air intake tube (2). Tighten clamps (4).
20. Install accessory drive belt.
21. Connect both negative battery cables.
22. Check system for fuel or engine oil leaks.

PUMP, FUEL TRANSFER

DESCRIPTION

DESCRIPTION

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 Powertrain Control Module (PCM). The PCM controls a relay in the Intelligent Power Module (IPM) for transfer pump operation.

OPERATION

OPERATION

The purpose of the fuel transfer pump is to supply (transfer) a low-pressure fuel source: **from** the fuel tank, **through** the fuel filter/water separator and **to** the fuel injection pump. Here, the low-pressure is raised to a high-pressure by the fuel injection pump for operation of the high-pressure fuel injectors. Check valves within the pump, control direction of fuel flow and prevent fuel bleed-back during engine shut down.

Maximum current flow to the pump is 5 amperes.

With the engine running, the pump has a 100 percent duty-cycle.

The transfer pump is self-priming: When the key is first turned on (without cranking engine), the pump will operate for approximately 2 seconds and then shut off (Note: When ambient temperatures are cold enough to cause the intake air heaters to operate, the fuel lift pump will operate during the entire intake air pre-heat cycle). The pump will also operate for up to 25 seconds after the starter is engaged, and then disengaged and the engine is not running. The pump shuts off immediately if the key is on and the engine stops running.

The fuel volume of the transfer pump will always provide more fuel than the fuel injection pump requires. Excess fuel is returned from the injection pump through an overflow valve, and then back to the fuel tank.

REMOVAL

REMOVAL

The fuel transfer pump (fuel lift pump) is a part of the fuel tank module. It is not serviced separately. For procedures, refer to **MODULE, FUEL PUMP, REMOVAL**

INSTALLATION

INSTALLATION

The fuel transfer pump (fuel lift pump) is a part of the fuel tank module. It is not serviced separately. Refer to **MODULE, FUEL PUMP, INSTALLATION**.

RAIL, FUEL

OPERATION

OPERATION

The fuel rail is used as a distribution device to supply high-pressure fuel to the high-pressure fuel lines.

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.

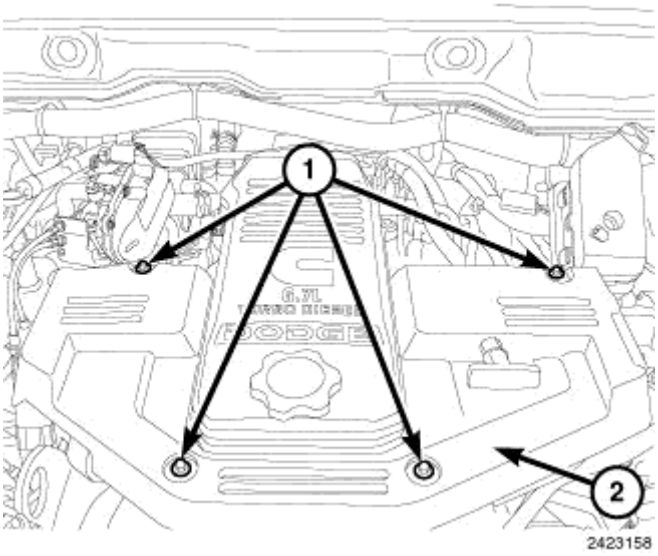


Fig. 45: EGR Crossover Tube Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the oil dipstick tube.
3. Remove bolts (1), and EGR crossover tube cover (2).

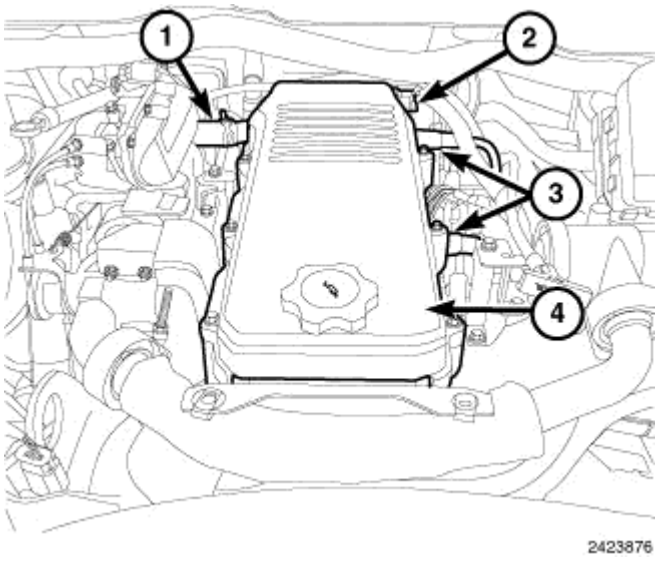


Fig. 46: CCV Oil Drain Hoses, Cylinder Head Cover & Crankcase Pressure Sensor Connector
Courtesy of CHRYSLER GROUP, LLC

4. Remove the CCV oil drain hoses (3) from cylinder head cover.
5. Disconnect the crankcase pressure sensor connector (2).
6. Disconnect both fuel injector harness connectors.

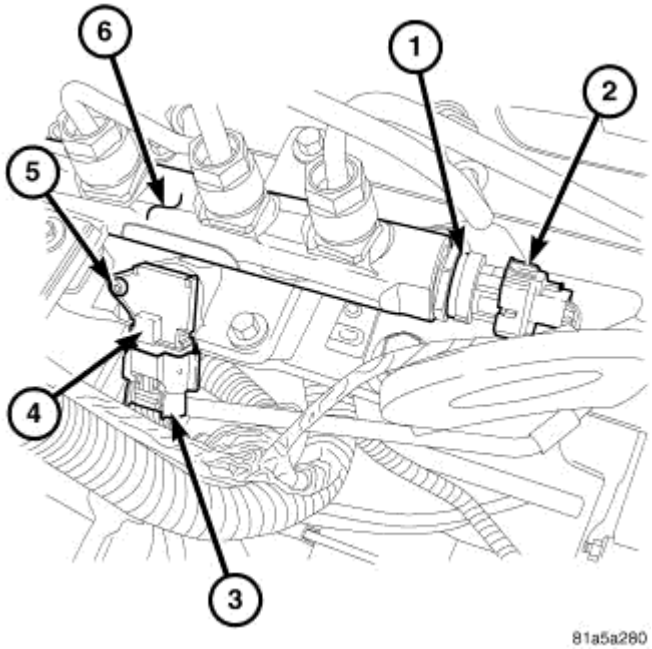


Fig. 47: Fuel Rail, Fuel Pressure Sensor & Connector, IAT/MAP Sensor, IAT/MAP Electrical Connector & Mounting Screw
Courtesy of CHRYSLER GROUP, LLC

7. Disconnect the fuel pressure sensor harness connector (2).
8. Disconnect necessary wiring harness retention clips from intake manifold.
9. Remove bolt and nut securing the oil dipstick tube.

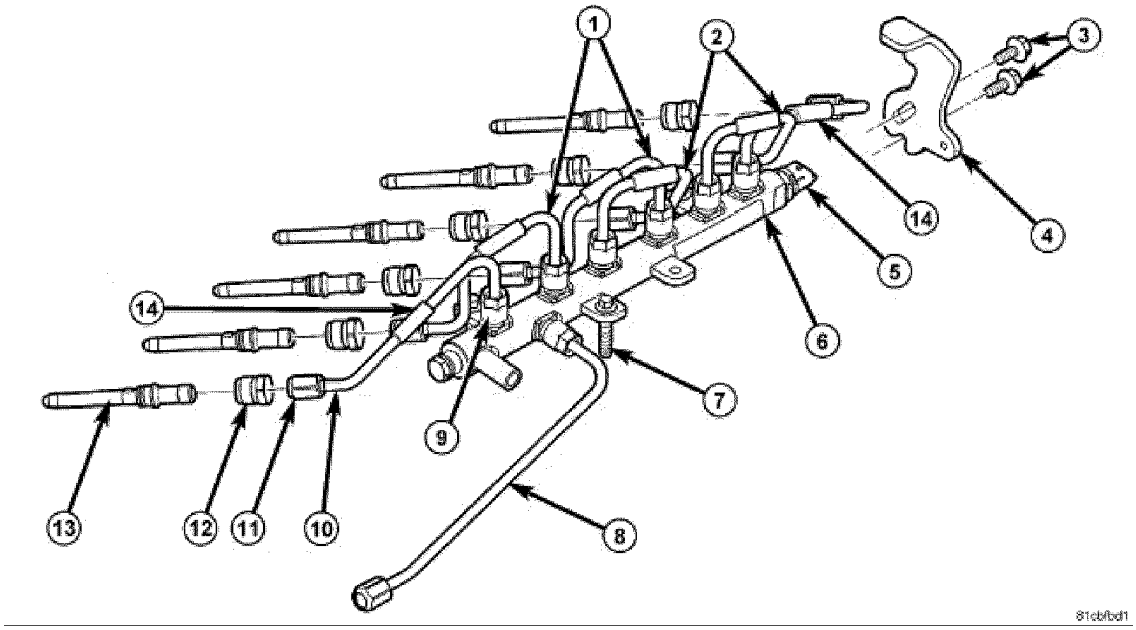


Fig. 48: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

CAUTION: WHEN LOOSENING OR TIGHTENING HIGH-PRESSURE LINE FITTINGS (11) ATTACHED TO A SEPARATE FITTING (12), USE A BACK-UP WRENCH ON FITTING (12). DO NOT ALLOW FITTING (12) TO ROTATE. DAMAGE TO BOTH FUEL LINE AND FITTING WILL RESULT.

10. Remove the fuel tubes (8).
11. Loosen fittings (9) for all fuel tubes at fuel rail.

NOTE: Clean any dirt/debris from around fuel injector area.

12. If removing fuel tube at No. 6 cylinder, a bracket (4) is located above fuel tube connection at cylinder head. Two bolts (3) secure this bracket to rear of cylinder head. The upper bolt hole is slotted. Loosen (but do not remove) these two bracket bolts. Tilt bracket down to gain access to No. 6 fuel line connection.
13. Loosen fittings (11) and remove all fuel tubes (1). Note and mark position of each fuel tube while removing.
14. Remove the fuel return line banjo bolt at fuel rail and discard sealing washers.
15. Remove bolts (7) and the fuel rail (6).

INSTALLATION

INSTALLATION

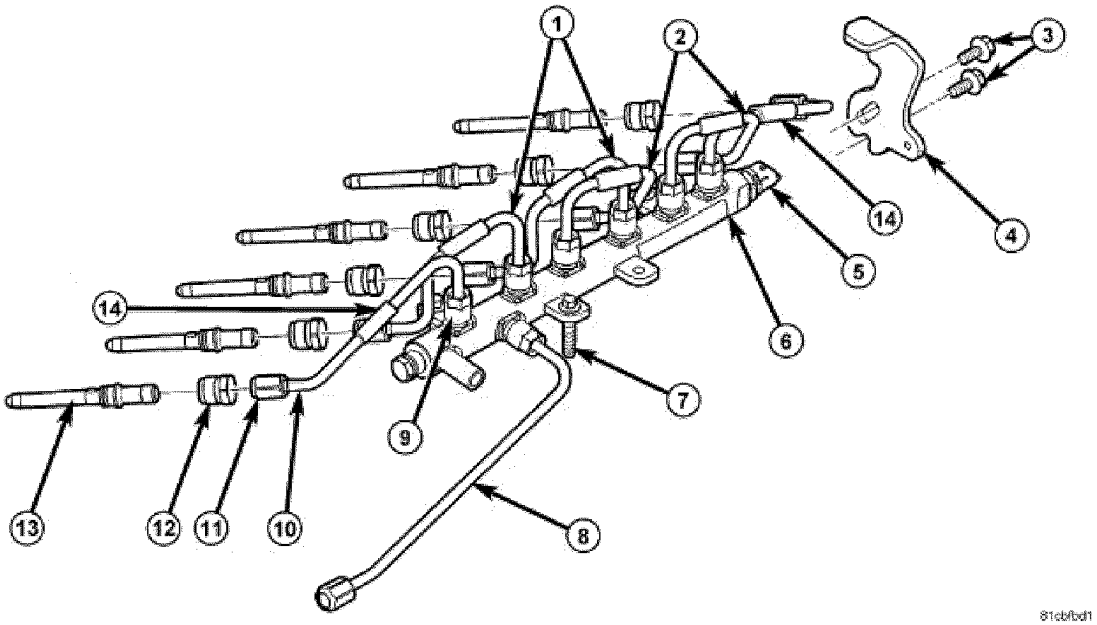


Fig. 49: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

1. Clean any dirt/debris from top of intake manifold and bottom of fuel rail.
2. Install fuel rail (6). Tighten bolts (7) to 24 N.m (18 ft. lbs.).
3. Install two new sealing washers to fuel line banjo bolt connecting injection pump to fuel rail. Tighten to 24 N.m (18 ft. lbs.).

CAUTION: WHEN LOOSENING OR TIGHTENING HIGH-PRESSURE LINE FITTINGS (11) ATTACHED TO A SEPARATE FITTING (12), USE A BACK-UP WRENCH ON FITTING (12). DO NOT ALLOW FITTING (12) TO ROTATE. DAMAGE TO BOTH FUEL LINE AND FITTING WILL RESULT.

NOTE: Noise isolators (14) are used on the six high-pressure fuel lines. They should be positioned in the middle of the horizontal or longest straight section of each fuel line. The split on each isolator should be facing downward. Be sure the noise isolator is not touching another isolator or any other components.

4. If fuel tube at No. 6 cylinder has been replaced, tilt metal bracket (4) upward to install the No. 6 fuel tube.
5. Install all high-pressure tubes to rail and fuel injectors. Tighten fittings (9 and 11) to 40 N.m (30 ft. lbs.).
6. Position the metal bracket (4) at the rear of cylinder head back and tighten bolts (3) to 43 N.m (32 ft. lbs.).

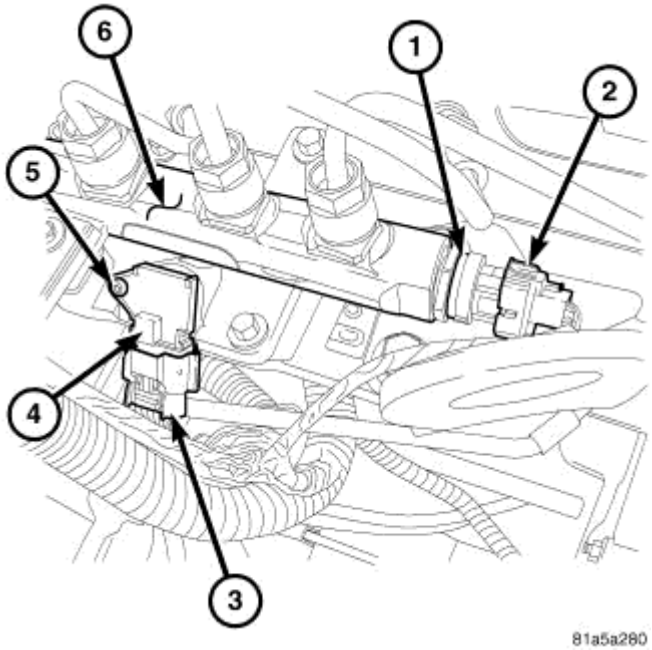


Fig. 50: Fuel Rail, Fuel Pressure Sensor & Connector, IAT/MAP Sensor, IAT/MAP Electrical Connector & Mounting Screw
Courtesy of CHRYSLER GROUP, LLC

7. Install the oil dipstick nut and tighten to 9 N.m (80 in. lbs).
8. Install the oil dipstick bolt and tighten to 24 N.m (18 ft. lbs).
9. Connect necessary wiring harness retention clips to the intake manifold.
10. Connect the fuel pressure sensor (2) harness connector.

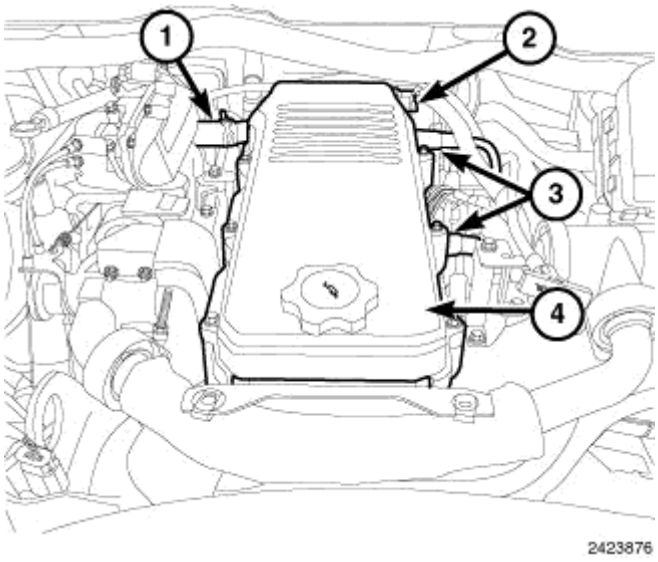


Fig. 51: CCV Oil Drain Hoses, Cylinder Head Cover & Crankcase Pressure Sensor Connector
Courtesy of CHRYSLER GROUP, LLC

11. Connect both fuel injector harness connectors.

12. Connect the crankcase pressure sensor connector (2).
13. Install the CCV oil drains hoses (3) to cylinder head cover.

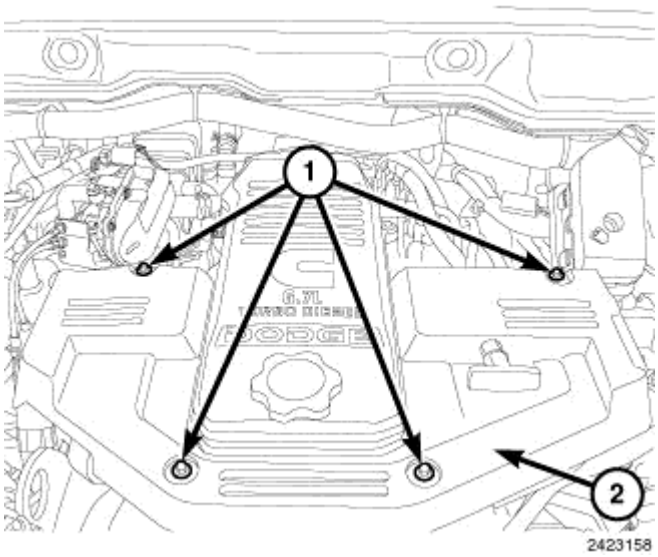


Fig. 52: EGR Crossover Tube Cover
Courtesy of CHRYSLER GROUP, LLC

14. Install the EGR crossover tube cover (2). Tighten bolts (1) to 10 N.m (89 in. lbs).
15. Install the oil dipstick tube.
16. Connect both negative battery cables.
17. Start engine and check for leaks.

SENDING UNIT AND SENSOR, FUEL LEVEL

REMOVAL

REMOVAL

For diesel removal and installation procedures, refer to **REMOVAL**.

SENSOR, FUEL PRESSURE

OPERATION

OPERATION

The fuel pressure sensor monitors actual high-pressure within the fuel rail. An output signal from this sensor (relating to fuel pressure) is sent to the Powertrain Control Module (PCM).

REMOVAL

REMOVAL

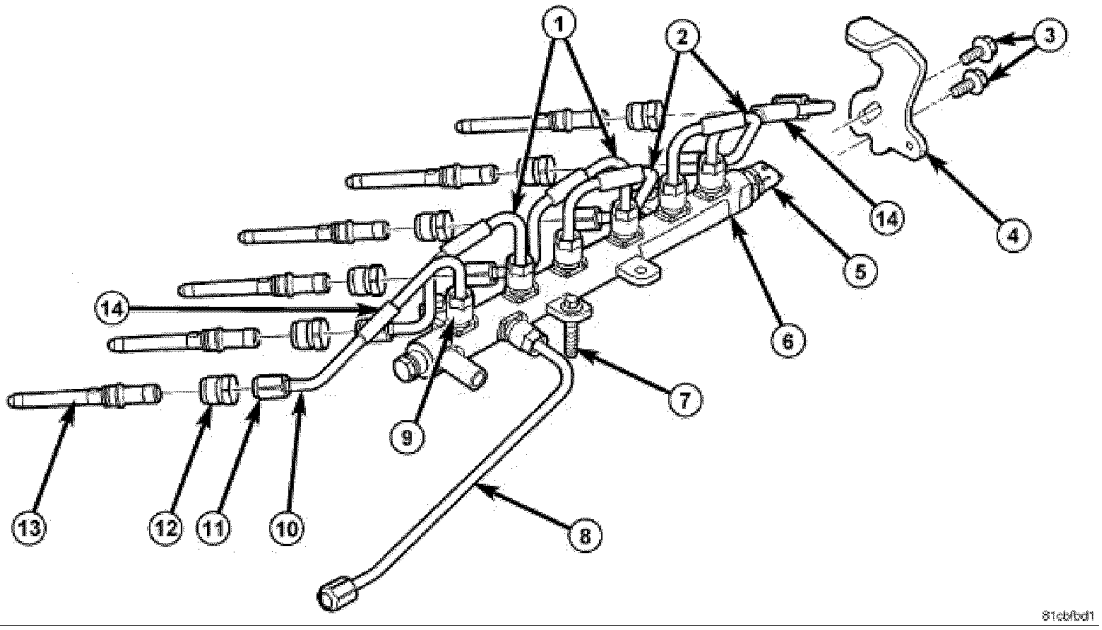


Fig. 53: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

1. Remove two bolts (3) and bracket (4) at rear of cylinder head.
2. Remove cylinder No. 5 and No. 6 fuel lines (1).

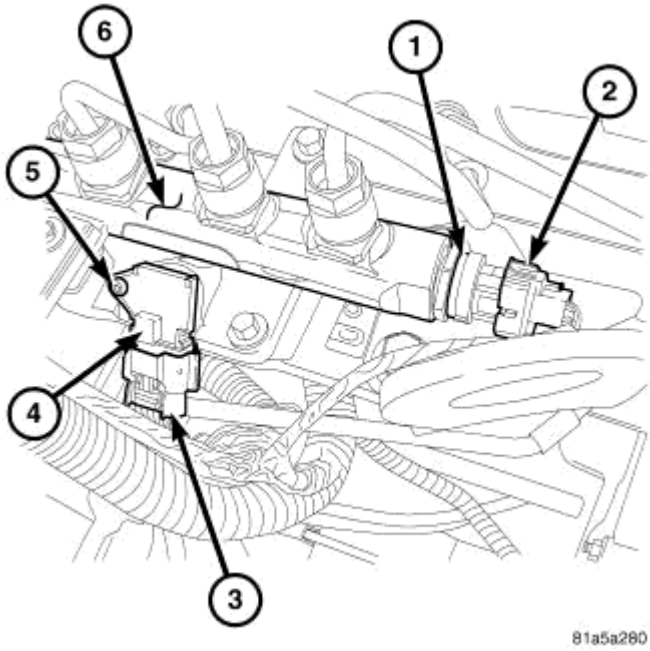


Fig. 54: Fuel Rail, Fuel Pressure Sensor & Connector, IAT/MAP Sensor, IAT/MAP Electrical Connector & Mounting Screw
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the fuel pressure sensor harness connector (2).

4. Remove fuel pressure sensor (1).

INSTALLATION

INSTALLATION

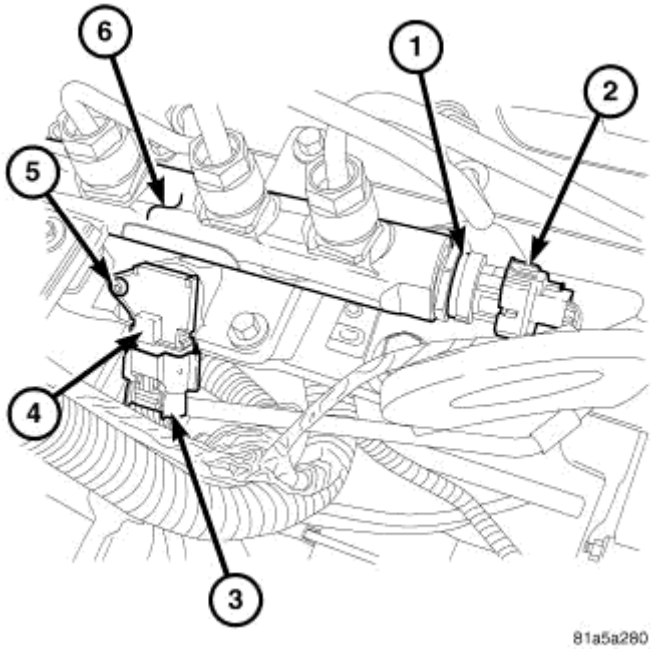


Fig. 55: Fuel Rail, Fuel Pressure Sensor & Connector, IAT/MAP Sensor, IAT/MAP Electrical Connector & Mounting Screw
Courtesy of CHRYSLER GROUP, LLC

1. Inspect fuel pressure sensor sealing surface.
2. Lubricate sensor threads with clean diesel fuel.
3. Install fuel pressure sensor (1). Tighten to 70 N.m (52 ft. lbs.).
4. Connect fuel pressure sensor harness connector (2).

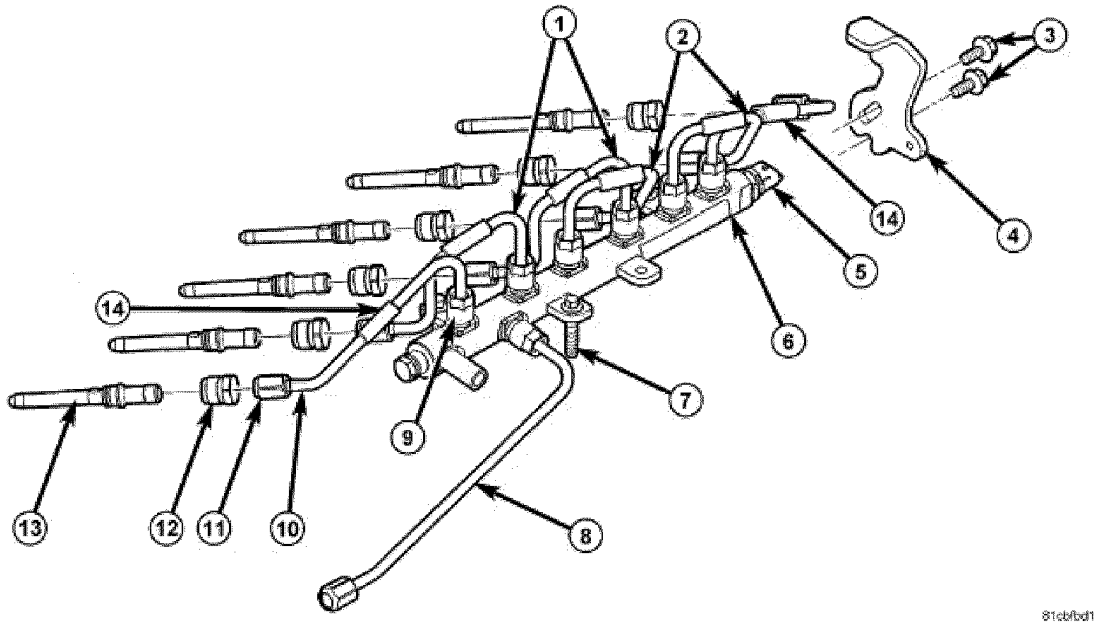


Fig. 56: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Anytime a high-pressure line is removed from the engine, its fuel connector nut (12) at the cylinder head must first be retorqued.

5. Tighten nuts (12) at high pressure injector connector nut at the cylinder head to 50 N.m (37 ft. lbs.).
6. Install cylinder No. 5 and No. 6 fuel lines (1).
7. Tighten fuel line at cylinder head to 40 N.m (30 ft. lbs.).
8. Tighten fuel line nuts at fuel rail to 40 N.m (30 ft. lbs.).
9. Install rear engine lift bracket (4). Tighten bolts (3) to 43 N.m (32 ft. lbs.).

   Noise isolators (14) are used on the six high-pressure fuel lines. They should be positioned in the middle of the horizontal or longest straight section of each fuel line. The split on each isolator should be facing downward. Be sure the noise isolator is not touching another isolator or any other components.

10. Start engine and check for fuel leaks.

SENSOR, WATER IN FUEL

DESCRIPTION

DESCRIPTION

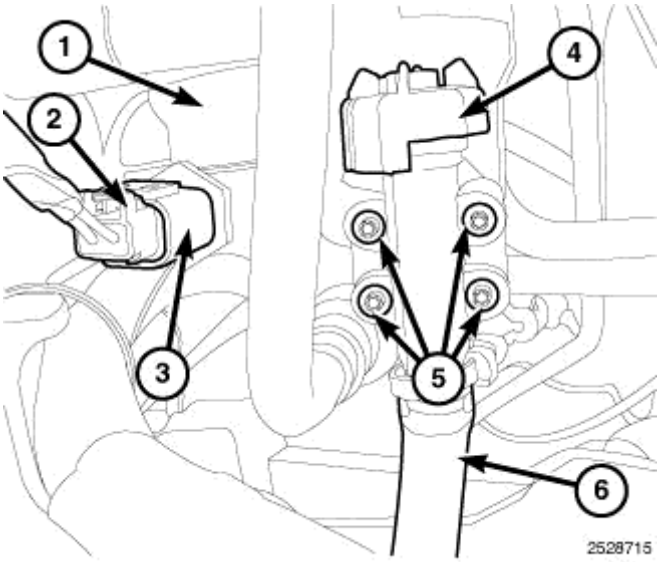


Fig. 57: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

The Water-In-Fuel (WIF) sensor (3) is located on the bottom of the fuel filter/water separator housing (1).

OPERATION

OPERATION

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

REMOVAL

REMOVAL

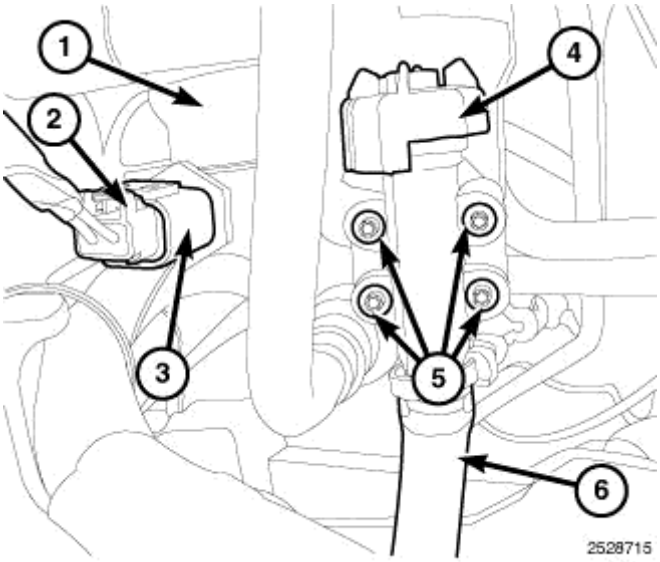


Fig. 58: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

1. **With engine not running,** Route the fuel drain hose to an appropriate container and rotate drain valve (4) one quarter turn counter clockwise to open it. Also, loosen the fuel filter housing cover a 1/2 turn and allow the fuel drain from the fuel filter housing for two minutes. Rotate the drain valve (4) clockwise one quarter turn to close it.
2. Disconnect the Water In Fuel (WIF) sensor harness connector (2).
3. Remove the WIF sensor (3).

INSTALLATION

INSTALLATION

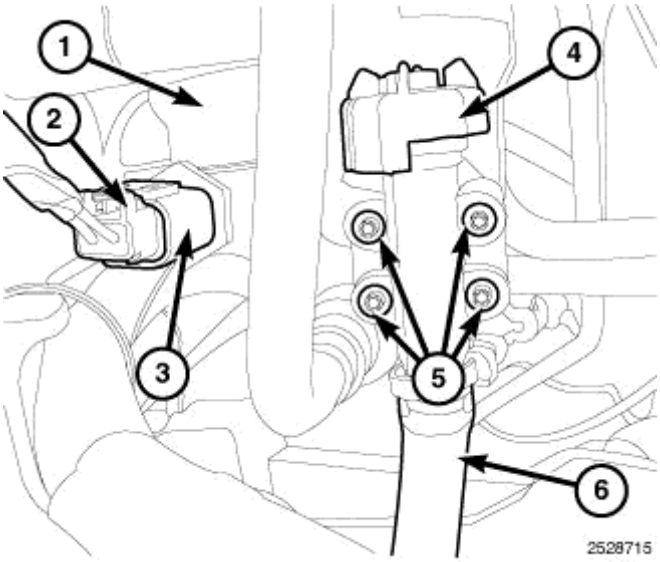


Fig. 59: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

NOTE: The engine has a self-priming low-pressure fuel system. To prim the fuel system. Refer to FUEL SYSTEM PRIMING - DIESEL. .

1. Using a new O-ring, install the Water in Fuel (WIF) sensor (3) and securely tighten the WIF sensor.
2. Connect the WIF sensor harness connector (2).
3. Start engine and check for leaks.

SEPARATOR AND FILTER, FUEL AND WATER

DESCRIPTION

DESCRIPTION

The fuel filter/water separator assembly is located on left side of engine above the starter motor. The assembly also includes the fuel heater, water drain valve, Water-In-Fuel (WIF) sensor.

OPERATION

OPERATION

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 **REMOVAL**.

A Water-In-Fuel (WIF) sensor is attached to the bottom of fuel filter element. Refer to **SENSOR, WATER IN FUEL**.

The fuel heater is installed into the side of the filter/separator housing. Refer to **HEATER, FUEL**.

REMOVAL

REMOVAL

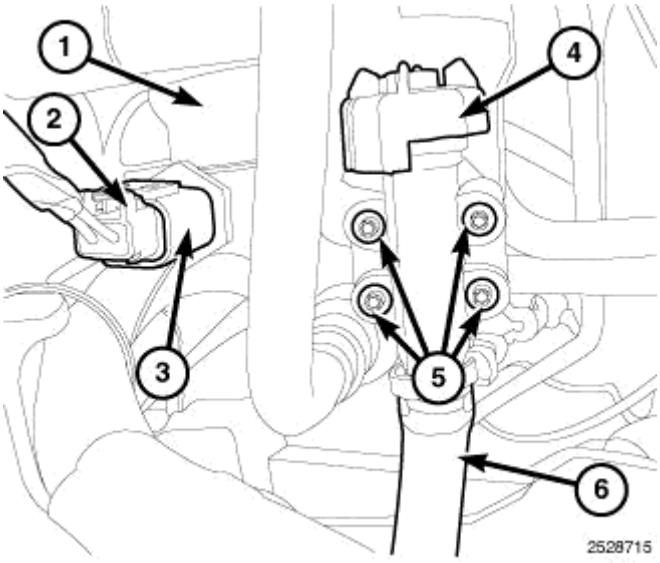


Fig. 60: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

1. Remove all low-pressure fuel lines at filter housing.
2. Disconnect the Water In Fuel (WIF) sensor harness connector (2).

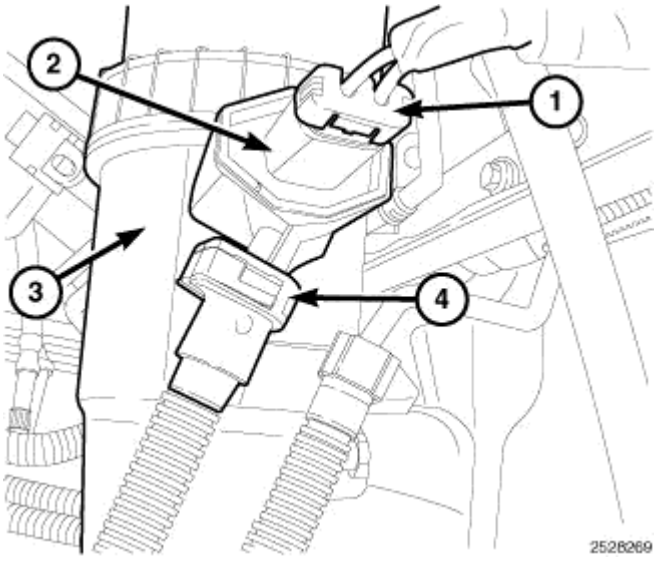


Fig. 61: Fuel Filter Housing Assembly & Harness Connector
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the fuel heater harness connector (1).

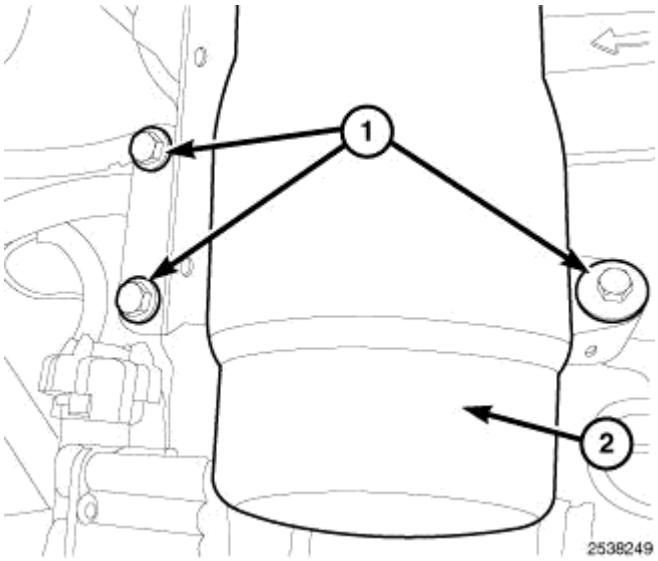


Fig. 62: Fuel Filter Housing & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts (1) and the fuel filter housing (2) from engine block.

INSTALLATION

INSTALLATION

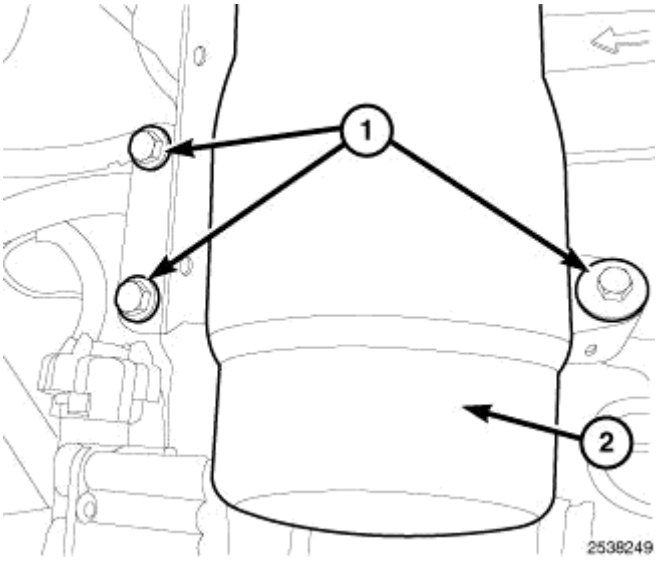


Fig. 63: Fuel Filter Housing & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: **The engine has a self-priming low-pressure fuel system. Refer to FUEL SYSTEM PRIMING - DIESEL. .**

1. Install fuel filter housing (2) to engine block. Tighten bolts (1) to 32 N.m (24 ft. lbs.).

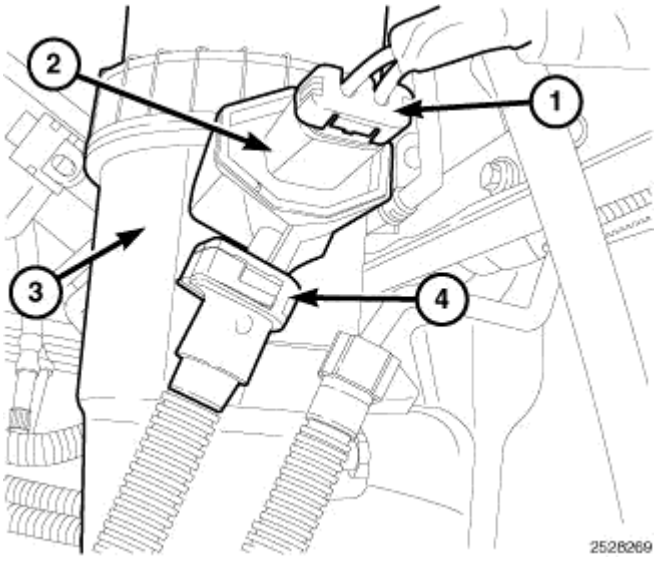


Fig. 64: Fuel Filter Housing Assembly & Harness Connector
Courtesy of CHRYSLER GROUP, LLC

2. Connect the fuel heater harness connector (1).

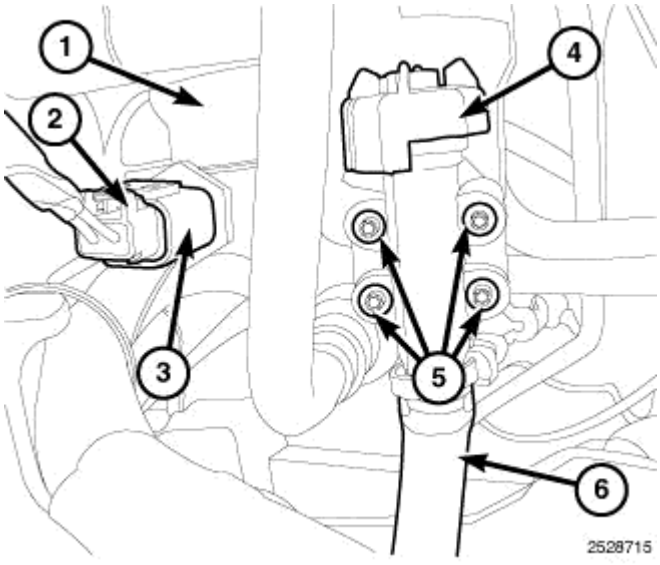


Fig. 65: Identifying Drain Valve, Drain Hose, Mounting Screws, Sensor Harness Connector & Filter Housing
Courtesy of CHRYSLER GROUP, LLC

3. Connect the Water In Fuel (WIF) sensor harness connector (2).

4. Install all low-pressure fuel lines at filter housing.

TANK, FUEL

REMOVAL

REMOVAL

REAR MOUNTED FUEL TANK

1. Release fuel system pressure. Refer to **FUEL SYSTEM PRESSURE RELEASE**. .
2. Raise and support vehicle.
3. Drain fuel tank. Refer to **DRAINING FUEL TANK**.

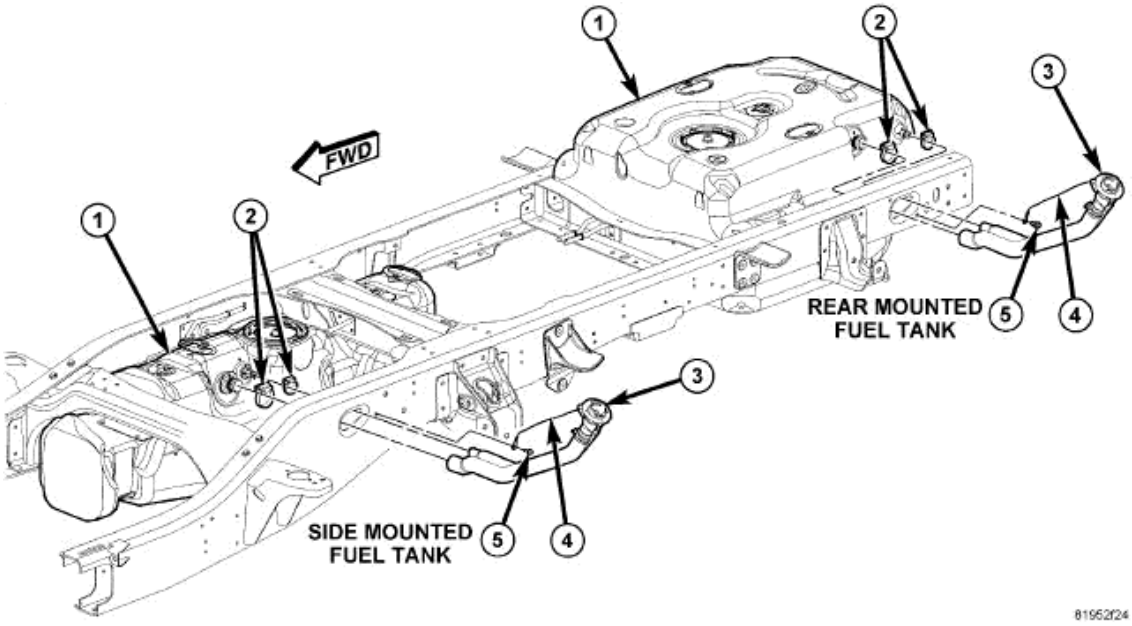


Fig. 66: Fuel Fill Hoses - Rear & Side Mounted Tanks
Courtesy of CHRYSLER GROUP, LLC

4. Remove both clamps (2).
5. Remove ground wire screw (5) and disconnect ground wire (4).
6. Remove fuel fill hose assembly (3).

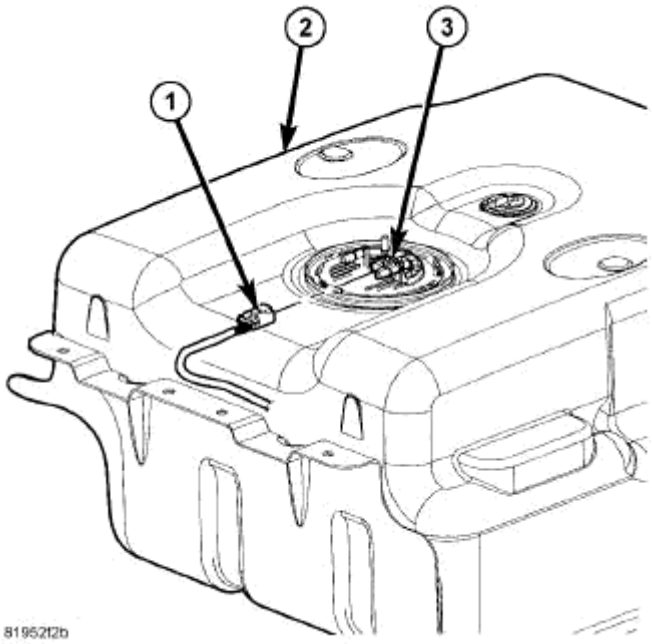


Fig. 67: Electrical Connector - Rear Tank
Courtesy of CHRYSLER GROUP, LLC

7. Disconnect electrical connector (1) from module (3).

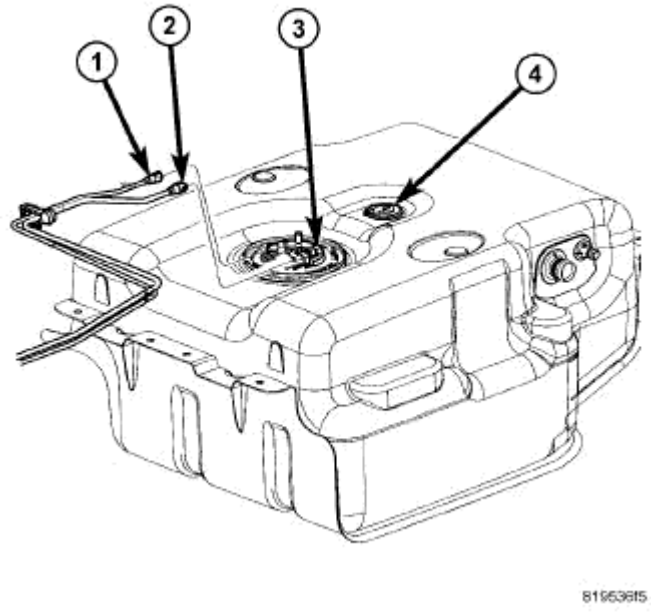


Fig. 68: Diesel Fuel Line Connection - Rear Tank
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect fuel return and supply line quick-connect fittings (1) and (2).
9. Support tank with a hydraulic jack.

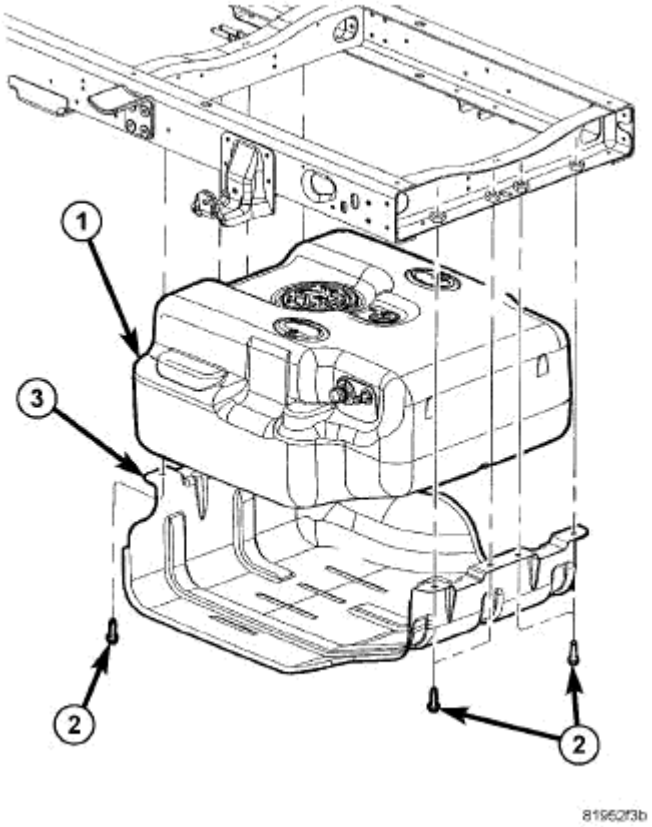


Fig. 69: Mounting - Rear Tank
Courtesy of CHRYSLER GROUP, LLC

10. Certain models may have an optional fuel tank skid plate (3). The same mounting bolts (2) are used to retain both the skid plate and fuel tank. Remove bolts (2).
11. Lower the tank assembly from vehicle and lift tank from skid plate.
12. If fuel tank module (diesel) is being removed, refer to **MODULE, FUEL PUMP, REMOVAL**.

SIDE (MID-SHIP) MOUNTED FUEL TANK

1. Release fuel system pressure. Refer to **FUEL SYSTEM PRESSURE RELEASE**. .
2. Raise and support vehicle.
3. Drain fuel tank. Refer to **DRAINING FUEL TANK**.

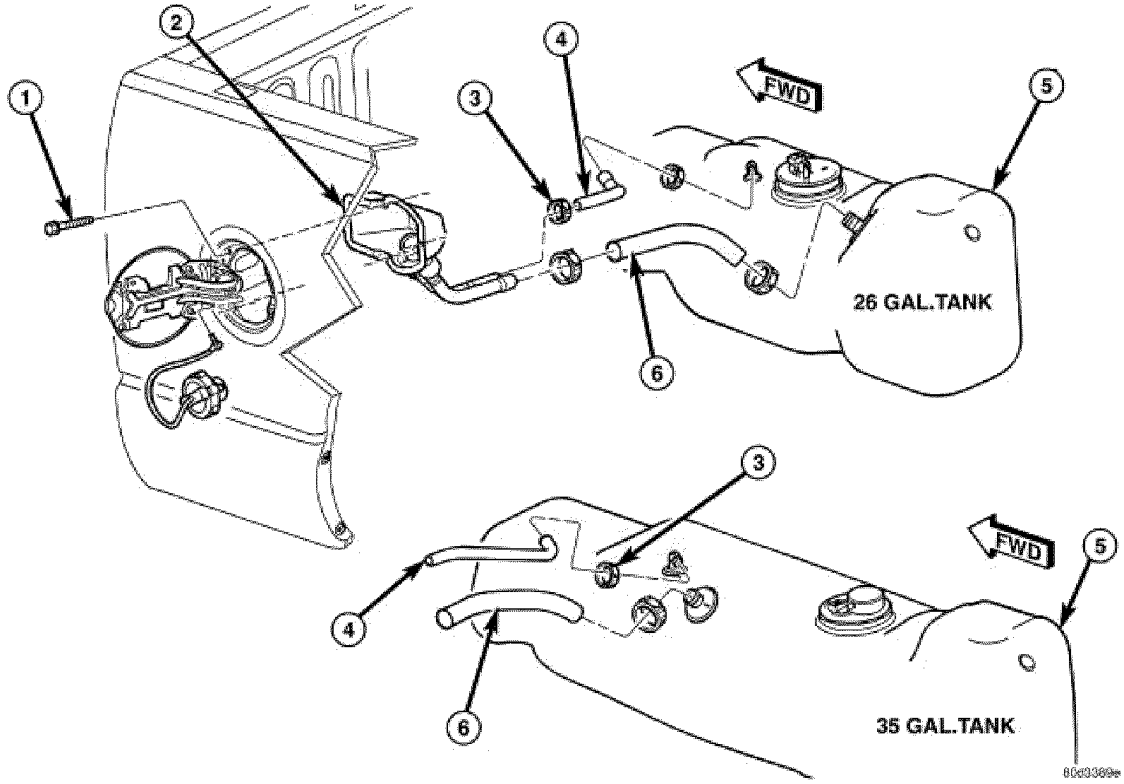


Fig. 70: Fuel Tank Fill/Vent Hoses - Mid Tank
Courtesy of CHRYSLER GROUP, LLC

4. Loosen clamps (3).
5. Remove hoses (4) and (6) from tank.

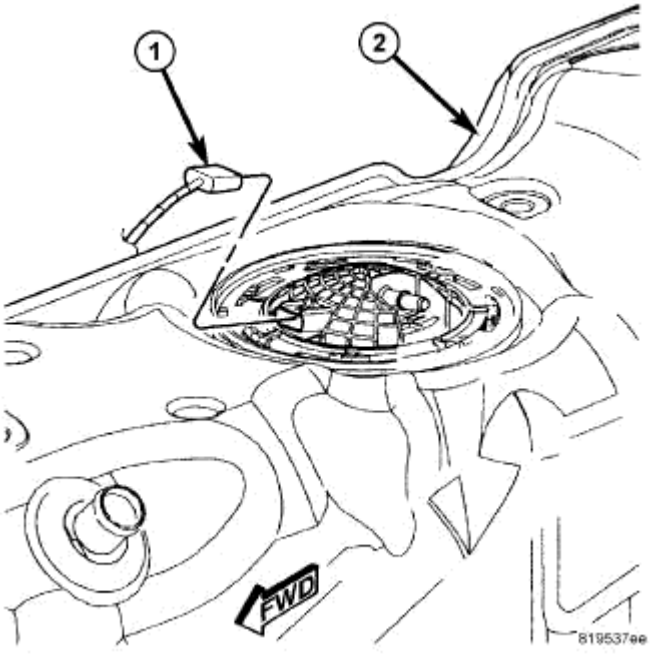


Fig. 71: Electrical Connector - Mid Tank
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect electrical connector (1) at top of module.

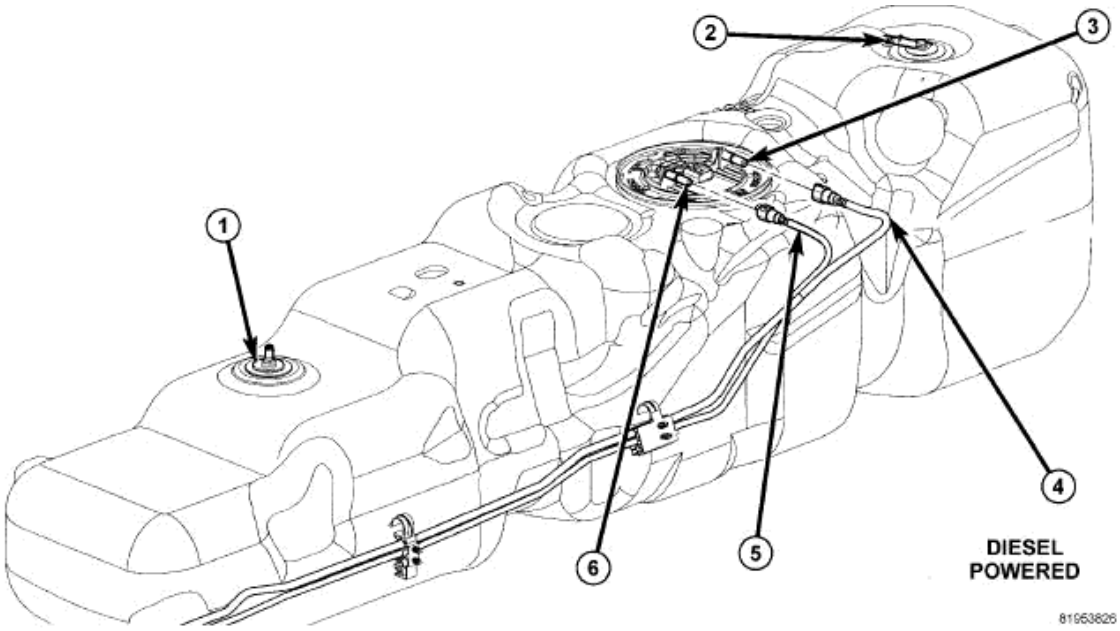


Fig. 72: Fuel Line Connections - Diesel Mid Tank
Courtesy of CHRYSLER GROUP, LLC

7. Disconnect fuel return and supply line quick-connect fittings (4) and (5).
8. Support tank with a hydraulic jack.

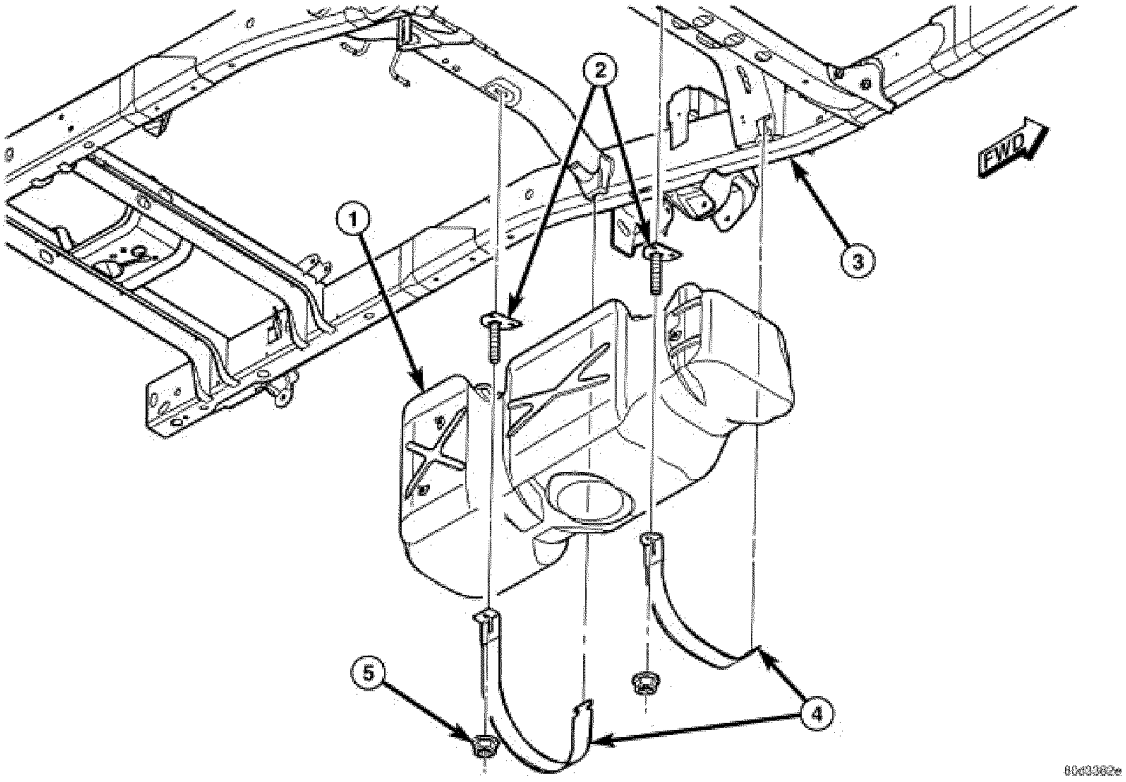


Fig. 73: Fuel Tank Mounting - Mid Tank
Courtesy of CHRYSLER GROUP, LLC

9. Remove nuts (5).
10. Remove both tank straps (4).
11. Lower tank and remove from hydraulic jack.
12. If fuel pump module (diesel) is being removed, refer to **MODULE, FUEL PUMP, REMOVAL**.

INSTALLATION

INSTALLATION

REAR MOUNTED FUEL TANK

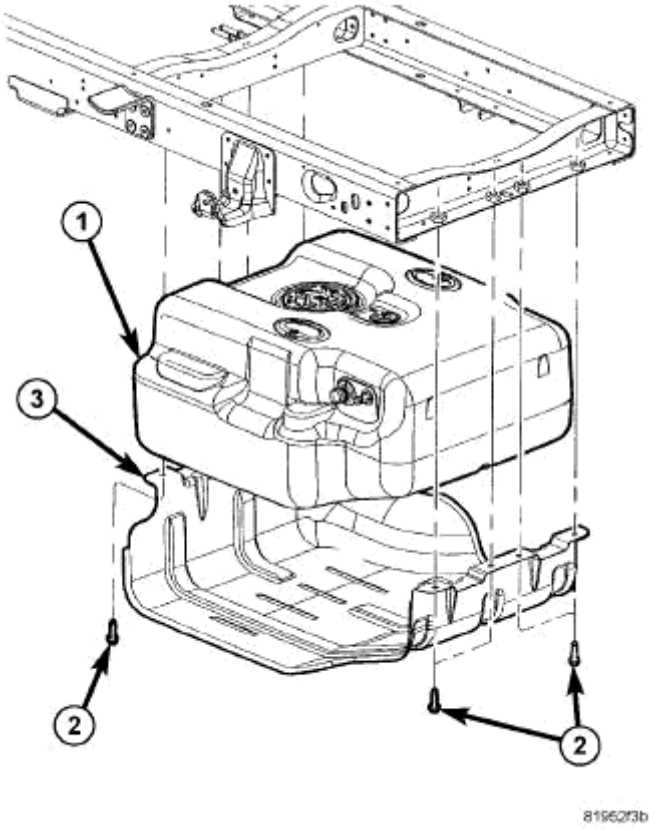


Fig. 74: Mounting - Rear Tank
Courtesy of CHRYSLER GROUP, LLC

1. If fuel pump module is being installed, refer to **MODULE, FUEL PUMP, INSTALLATION**.
2. Position fuel tank into fuel tank skid plate.
3. Place assembly to a hydraulic jack.
4. Raise assembly up to frame.
5. Install bolts (2) and tighten to 55 N.m (41 ft. lbs.).

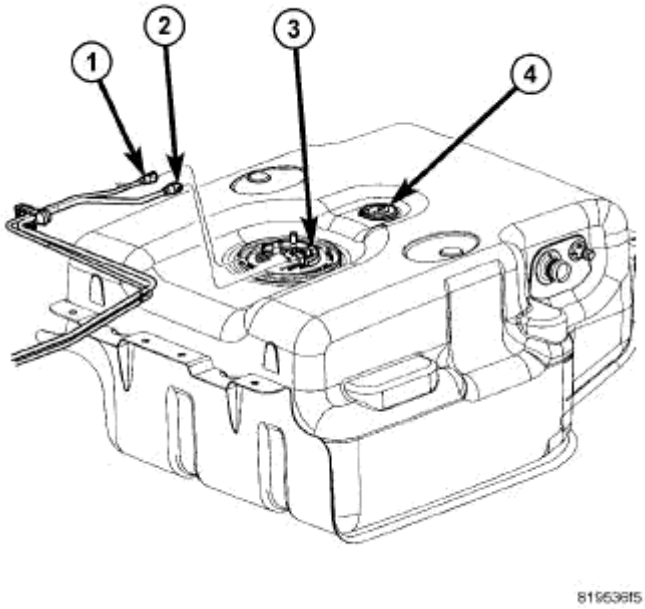


Fig. 75: Diesel Fuel Line Connection - Rear Tank
Courtesy of CHRYSLER GROUP, LLC

6. Connect fuel return and supply line quick-connect fittings (1 and 2).

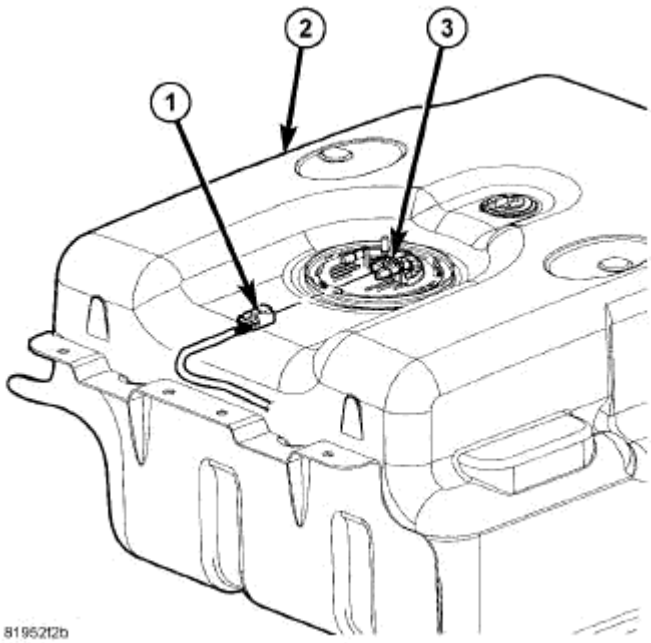


Fig. 76: Electrical Connector - Rear Tank
Courtesy of CHRYSLER GROUP, LLC

7. Connect harness connector (1) to module (3).

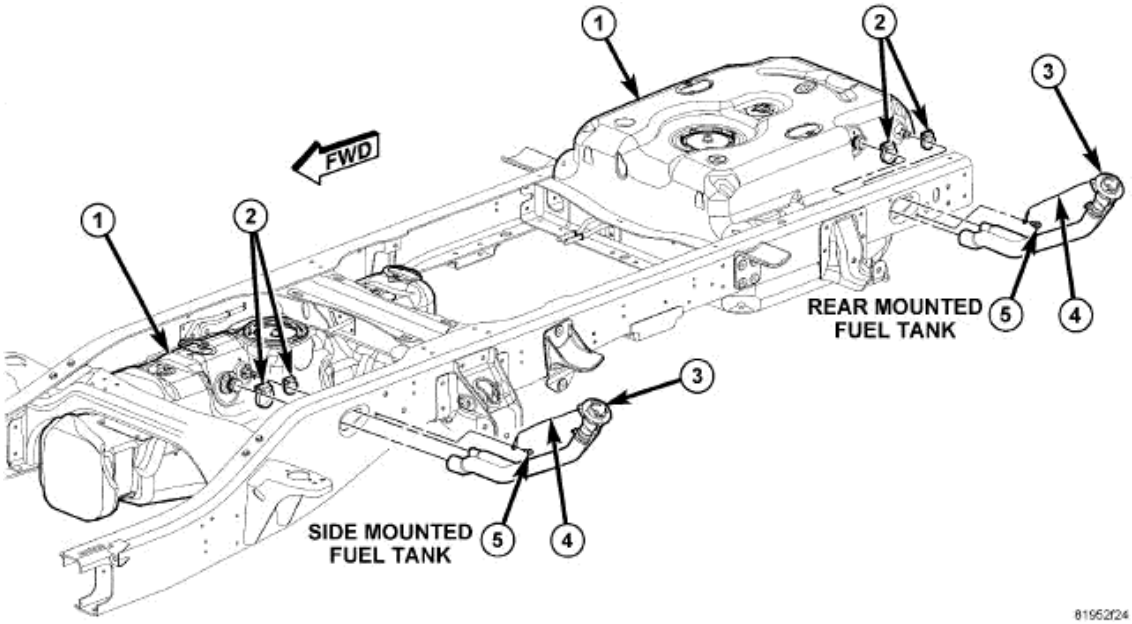


Fig. 77: Fuel Fill Hoses - Rear & Side Mounted Tanks
Courtesy of CHRYSLER GROUP, LLC

8. Fit fuel fill hose assembly (3) to tank fittings.
9. Install both clamps (2).
10. Install ground wire screw (5) and ground wire (4).
11. Fill tank and check for leaks.

SIDE (MID-SHIP) MOUNTED FUEL TANK

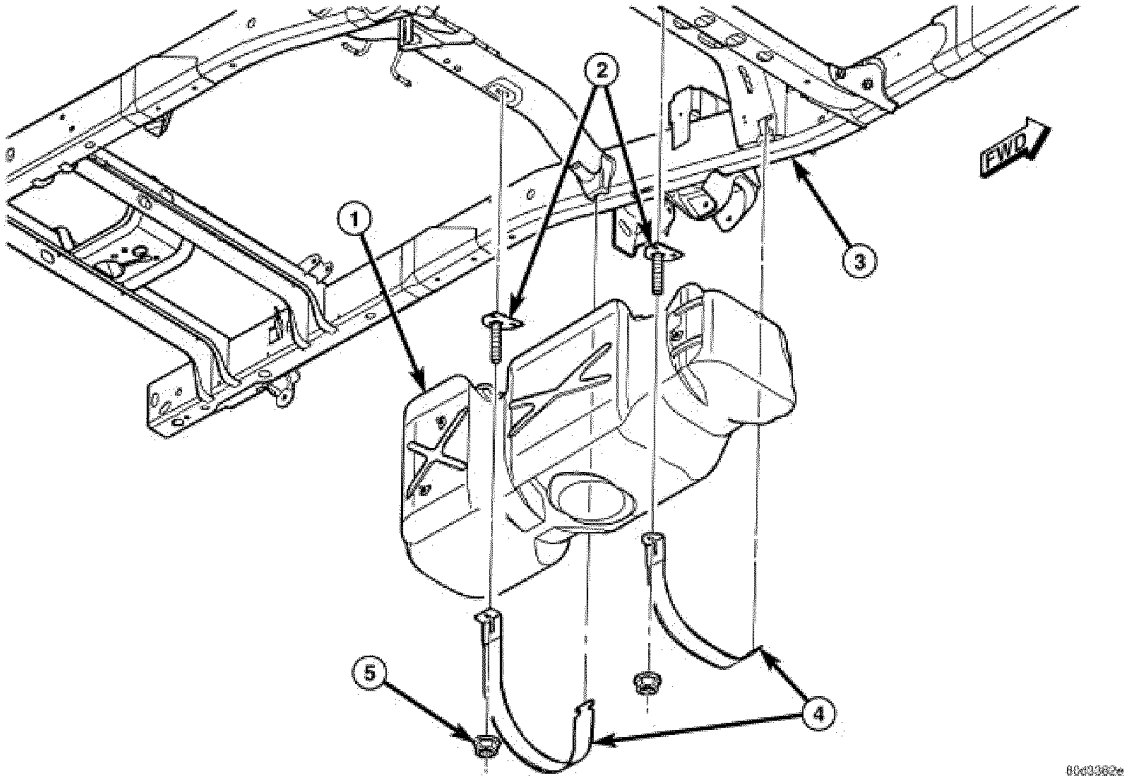


Fig. 78: Fuel Tank Mounting - Mid Tank
Courtesy of CHRYSLER GROUP, LLC

1. If fuel pump module is being installed, refer to **MODULE, FUEL PUMP, INSTALLATION**.
2. Place assembly to a hydraulic jack.
3. Raise assembly up to frame.
4. Install fuel tank straps (4). Tighten nuts (5) to 41 N.m (30 ft. lbs.).

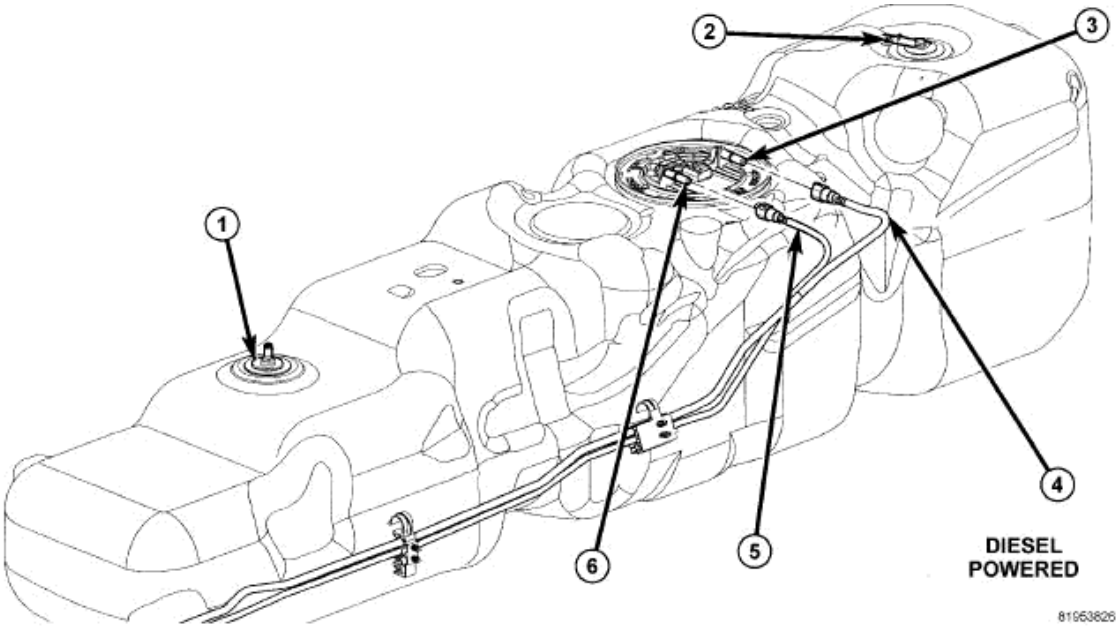


Fig. 79: Fuel Line Connections - Diesel Mid Tank
Courtesy of CHRYSLER GROUP, LLC

5. Connect fuel return and supply line quick-connect fittings (4 and 5).

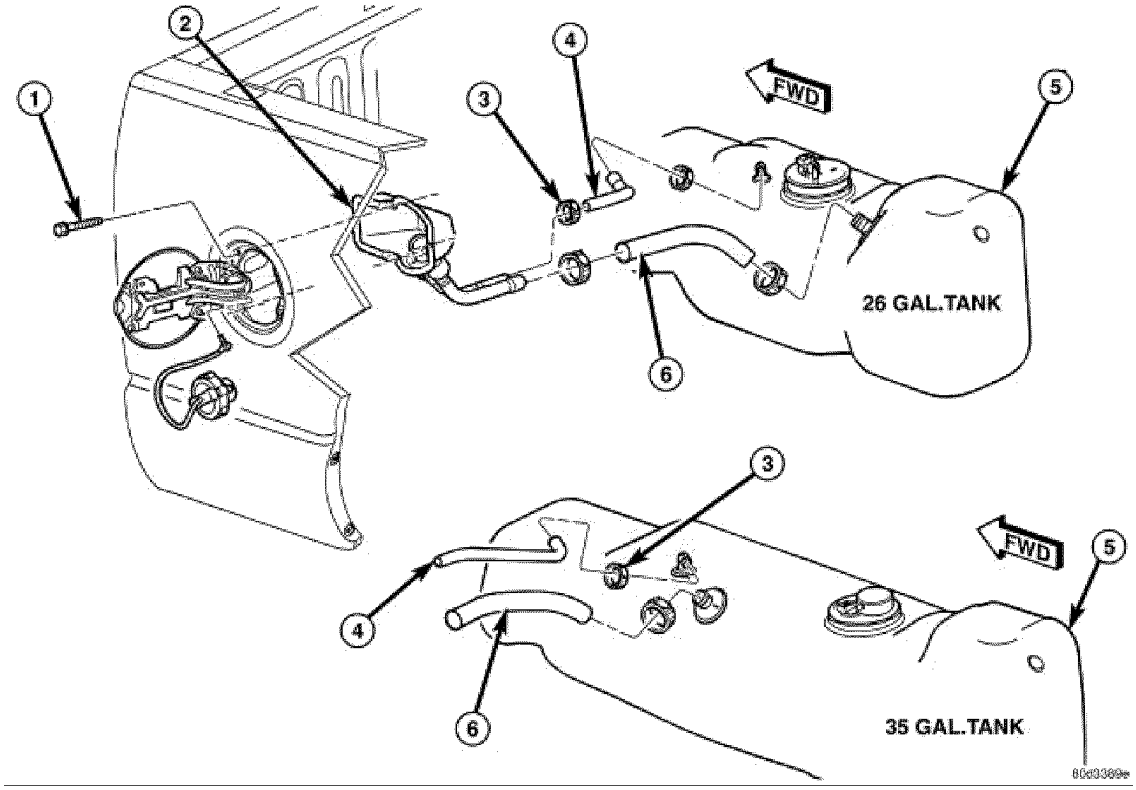


Fig. 80: Fuel Tank Fill/Vent Hoses - Mid Tank
Courtesy of CHRYSLER GROUP, LLC

6. Position hoses (4 and 6) to tank fittings.
7. Tighten clamps (3).

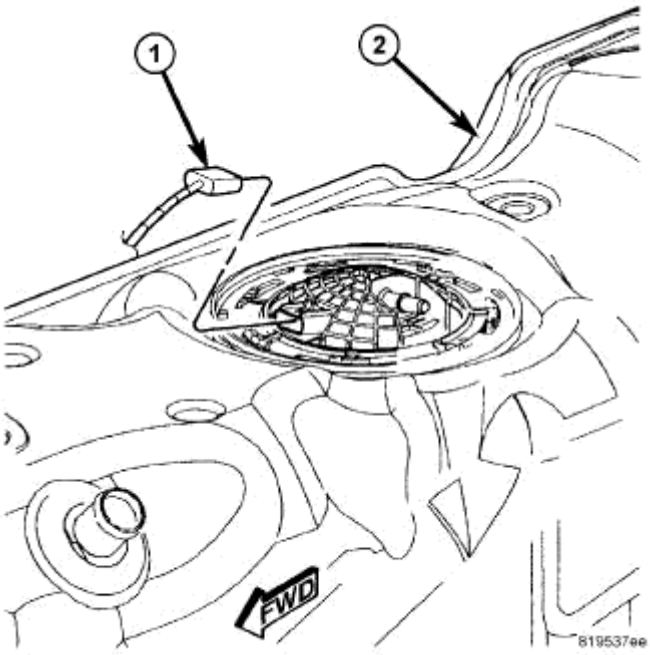


Fig. 81: Electrical Connector - Mid Tank
Courtesy of CHRYSLER GROUP, LLC

8. Connect harness connector (1) at top of module.
9. Fill tank and check for leaks.

TUBE(S), 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 (manifold) line at rear of cylinder head.
- 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 six fuel lines from fuel rail up to injector connector tubes

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 180, 000

kpa (26, 107 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

OPERATION

HIGH-PRESSURE LINES

CAUTION: The high-pressure fuel lines must be held securely in the brace. The 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.

CAUTION: Do not squeeze low pressure fuel lines with pliers, vice grips, or similar tools as this will damage to the fuel line.

High-pressure fuel lines deliver fuel (under pressure) of up to approximately 180, 000 kPa (26, 107 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

DIAGNOSIS AND TESTING - HIGH - PRESSURE FUEL LINE LEAKS

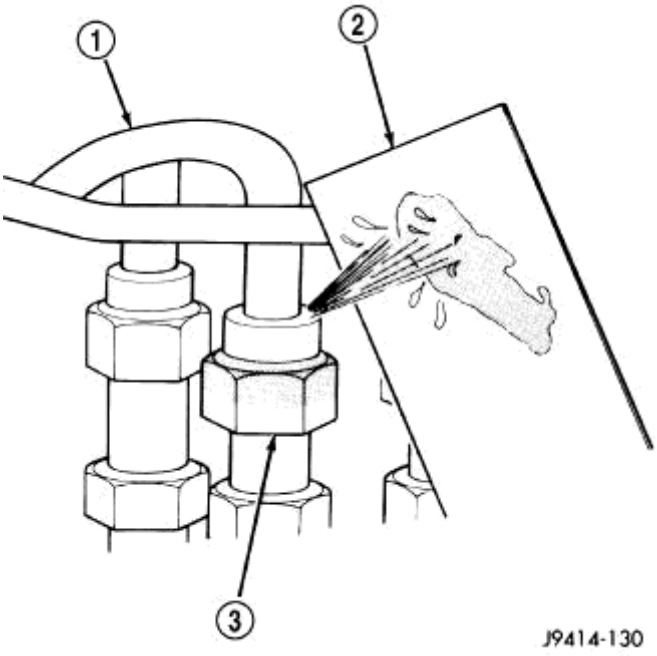


Fig. 82: Checking For Fuel Spray
Courtesy of CHRYSLER GROUP, LLC

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 180, 000 kpa (26, 107 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 must be clamped securely in place in the brace. The 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.

NOISE ISOLATORS

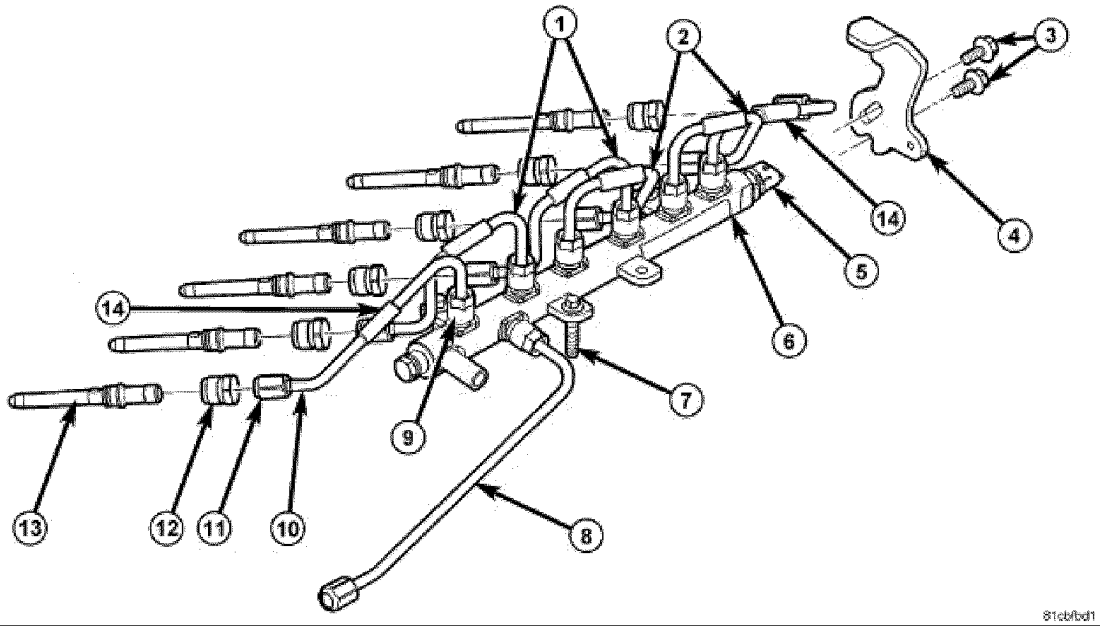


Fig. 83: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

Noise isolators (14) are used on the six high-pressure fuel lines. They should be positioned in the middle of the horizontal or longest straight section of each fuel line. The split on each isolator should be facing downward. Be sure the noise isolator is not touching another isolator or any other components.

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.

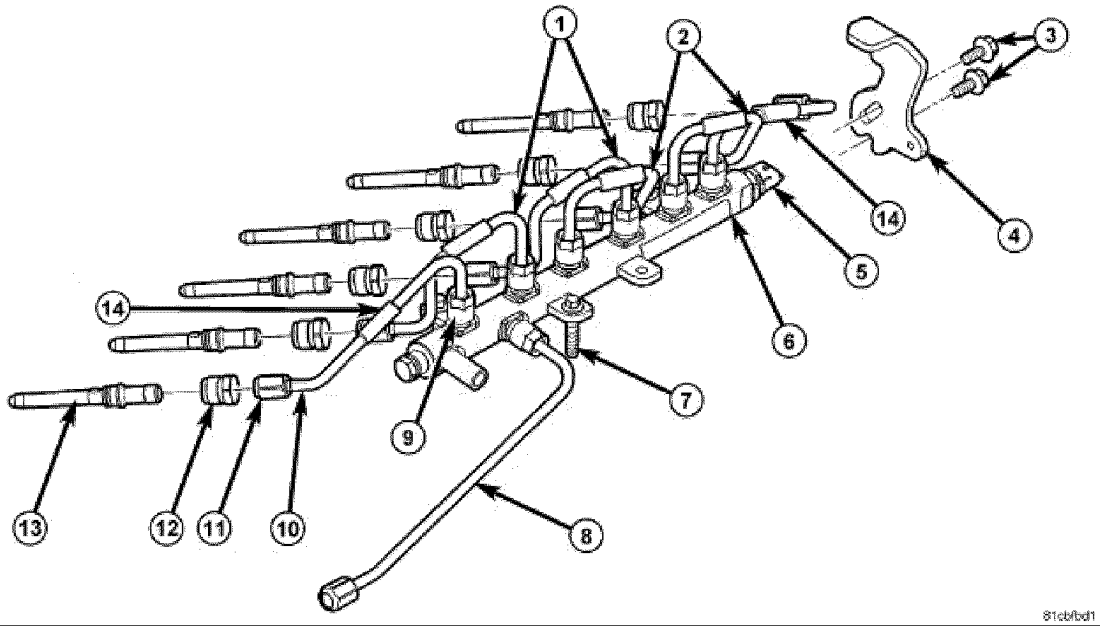


Fig. 84: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Thoroughly clean fuel tubes at both ends.

CAUTION: When loosening or tightening high-pressure lines attached to a separate fitting (11), use a back-up wrench on fitting (12). Do not allow fittings (12) to rotate. Damage to both fuel line and fitting will result.

3. If removing fuel tube at No. 6 cylinder, a bracket (4) is located above fuel tube connection at cylinder head. Two bolts (3) secure this bracket to rear of cylinder head. The upper bolt hole is slotted. Loosen (but do not remove) these two bracket bolts. Tilt bracket down to gain access to No. 6 fuel line connection.

NOTE: Before fuel tubes No. 1 or No. 2 can be removed the intake manifold need to be removed first. Refer to MANIFOLD, INTAKE, REMOVAL, 6.7L .

4. If removing fuel tube at either No. 1 or No. 2 cylinder.
5. Place shop towels around fuel tubes at fuel rail and injectors. If possible, do not allow fuel to drip down side of engine.
6. Carefully remove each fuel tube from engine. Note position of each while removing. **Do not bend lines while removing.**

INSTALLATION

INSTALLATION

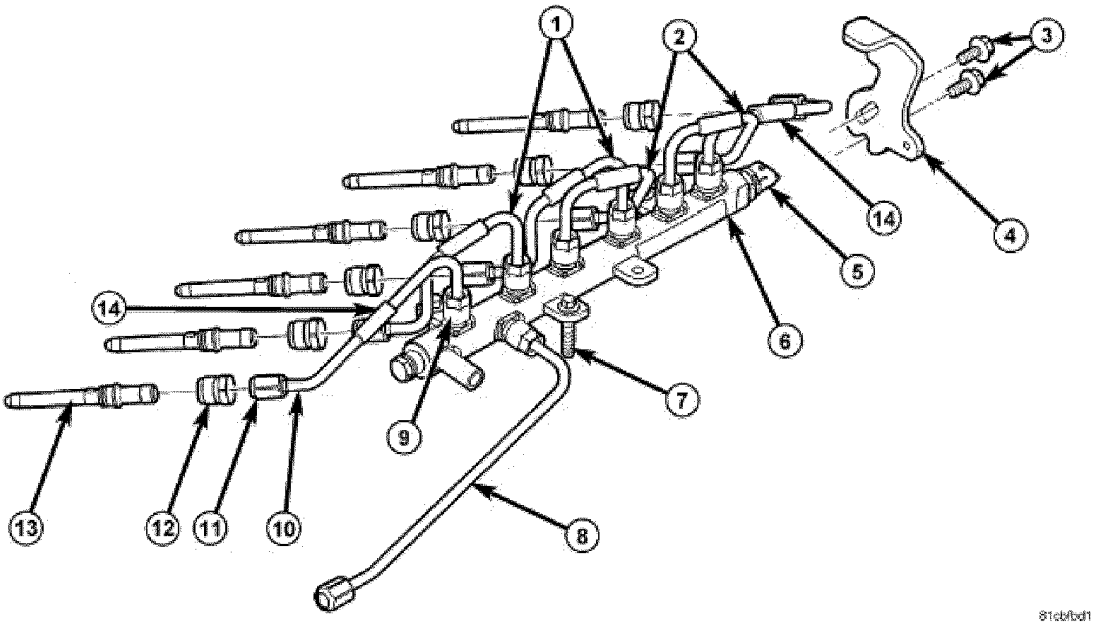


Fig. 85: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Anytime a high-pressure line is removed from the engine, its fuel connector nut (12) at the cylinder head must first be retorqued.

1. Tighten nuts (12) at high pressure injector connector nut at the cylinder head to 50 N.m (37 ft. lbs.).

NOTE: Use care not to bend fuel tubs when installing.

2. Install proper fuel tube to proper injector on engine. Tighten fittings hand tight at both ends of line.
3. Tighten fuel tube nut at cylinder head to 40 N.m (30 ft. lbs.).
4. Tighten fuel tube nuts at fuel rail to 40 N.m (30 ft. lbs.).
5. If fuel tube at No. 6 cylinder has been replaced, tilt metal bracket (4) upward and tighten two bolts (3) at rear of cylinder head. Tighten to 43 N.m (32 ft. lbs.).
6. If necessary, install intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION, 6.7L** .
7. **Noise isolators (14)** are used on the six high-pressure fuel lines. They should be positioned in the middle of the horizontal or longest straight section of each fuel tube. The split on each isolator should be facing downward. Be sure the noise isolator is not touching another isolator or any other components.
8. Connect both negative battery cables.
9. Prime fuel system. Refer to **FUEL SYSTEM PRIMING - DIESEL**. .
10. Check lines/fittings for leaks.

VALVE, FUEL PRESSURE LIMITING

OPERATION

OPERATION

Fuel pressure at the fuel rail is monitored by the fuel rail pressure sensor. If fuel pressure becomes excessive, the pressure limiting valve opens and vents excess fuel pressure vents through the fuel pressure limiting valve drain port.

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.

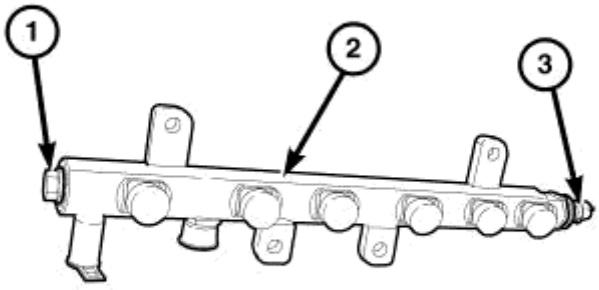


Fig. 86: Fuel Pressure Limiting Valve & Fuel Rail
Courtesy of CHRYSLER GROUP, LLC

The fuel pressure limiting valve (1) is screwed into the front of the fuel rail (2).

The fuel pressure limiting valve drain port is located on the side of the fuel rail next to the limiting valve. The drain port is not serviceable.

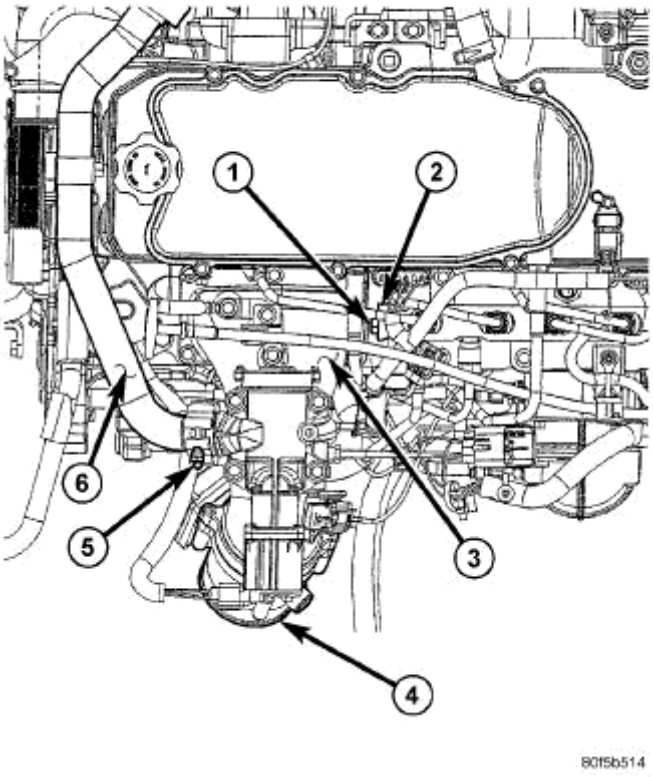


Fig. 87: Engine Fuel Pressure Limiting Valve System Components -- Top View
Courtesy of CHRYSLER GROUP, LLC

1. Thoroughly clean area at pressure limiting valve (1).
2. Remove the EGR crossover tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, REMOVAL** .

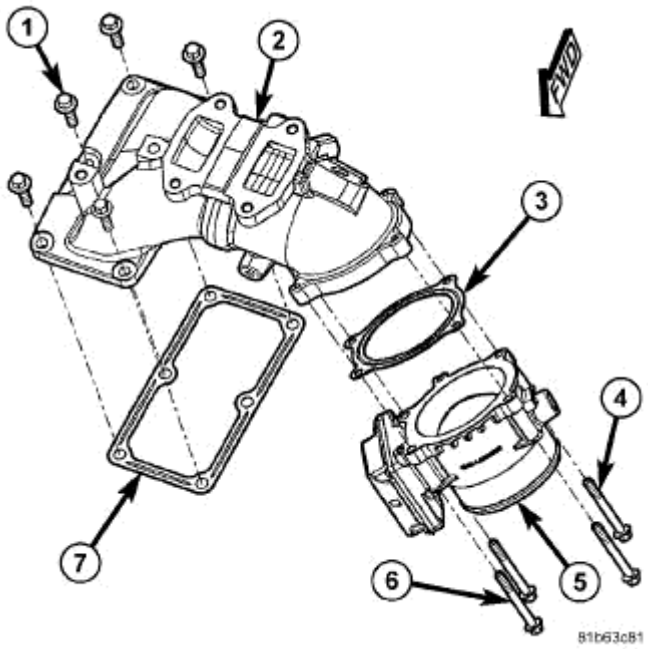


Fig. 88: EGR Air Flow Control - Exploded View
Courtesy of CHRYSLER GROUP, LLC

3. Remove six bolts (1) and the intake manifold (2).
4. Discard gasket (7).

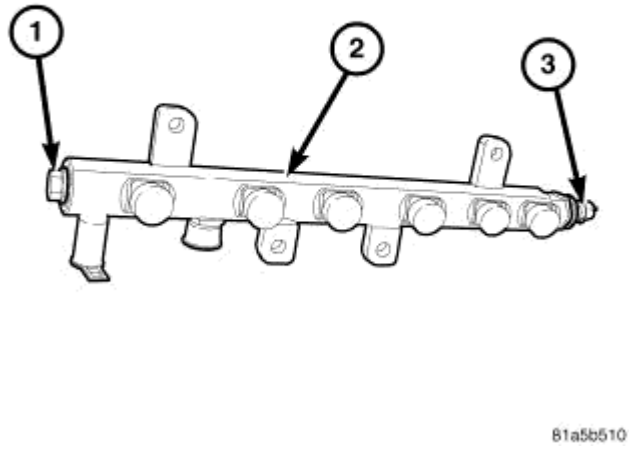


Fig. 89: Fuel Pressure Limiting Valve & Fuel Rail
Courtesy of CHRYSLER GROUP, LLC

5. Remove pressure limiting valve (1) from fuel rail (2).

INSTALLATION

INSTALLATION

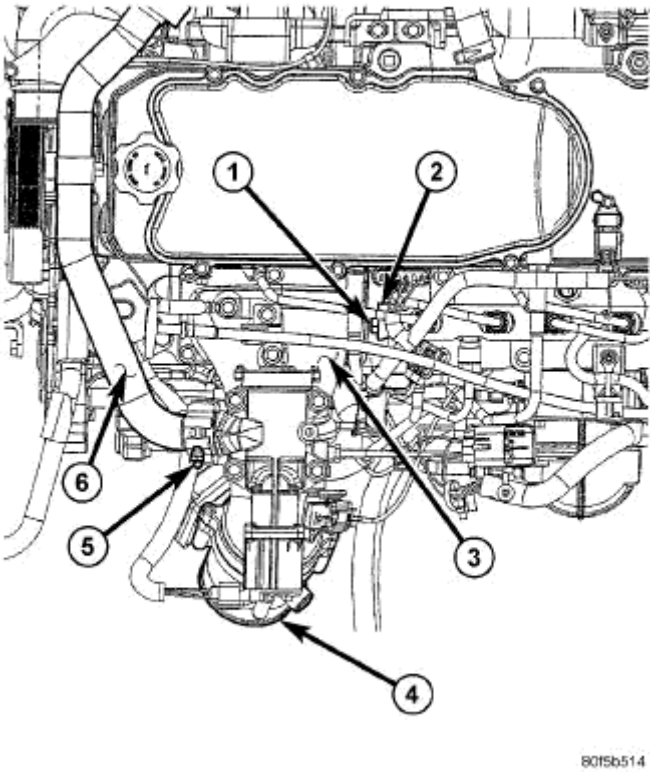


Fig. 90: Engine Fuel Pressure Limiting Valve System Components -- Top View
Courtesy of CHRYSLER GROUP, LLC

1. Be sure both end of manifold and limiting valve mounting area are clean.
2. Lubricate O-ring on limiting valve with fresh diesel oil. Also lubricate limiting valve threads with fresh diesel oil.
3. Install the limiting valve (1). Tighten to 100 N.m (74 ft. lbs.).

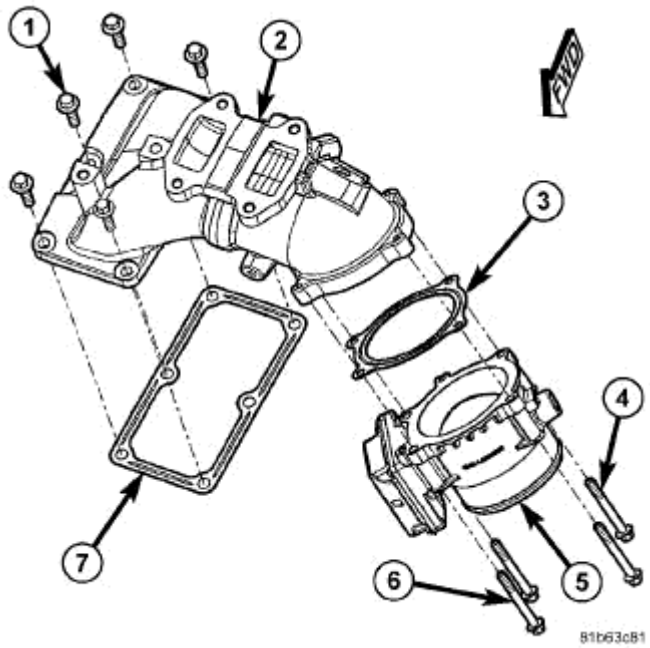


Fig. 91: EGR Air Flow Control - Exploded View
Courtesy of CHRYSLER GROUP, LLC

4. Using a new gasket (7), install the intake manifold (2). Tighten bolts (1) to 24 N.m (18 ft. lbs.).
5. Install the EGR crossover tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, INSTALLATION** .
6. **Using a diagnostic scan tool, reset vale life by using the "Reset Two-Stage Dump Valve Accumulator" function in the PCM portion of the diagnostic tool.**
7. Start engine and check for leaks.

VALVE, OVERFLOW

DESCRIPTION

DESCRIPTION

NOTE: The cascade overflow valve is not serviced separately.

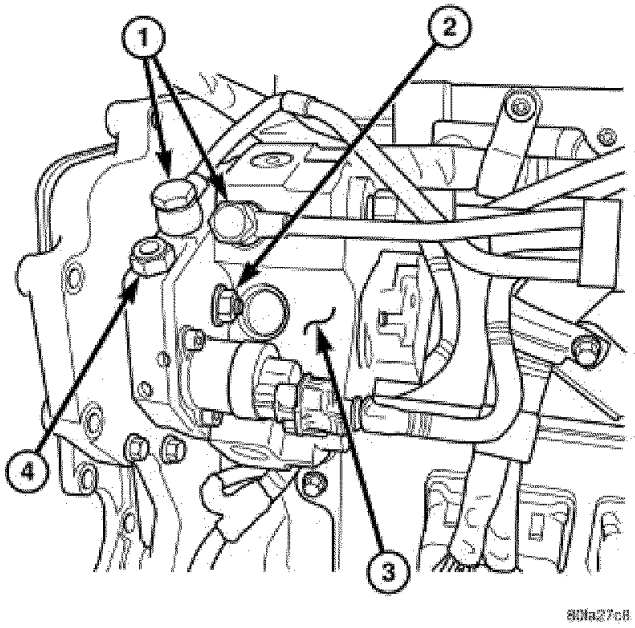


Fig. 92: Overflow Valve
Courtesy of CHRYSLER GROUP, LLC

1 - BANJO BOLTS
2 - PUMP MOUNTING NUTS (3)
3 - FUEL INJECTION PUMP
4 - CASCADE OVERFLOW VALVE

The cascade overflow valve (4) is located on the top/rear side of the fuel injection pump. Refer to **Fig. 92**.

OPERATION

OPERATION

When the fuel control actuator (FCA) is opened, the maximum amount of fuel is being delivered to the fuel injection pump. The cascade valve regulates how much excess fuel is used for lubrication of the injection pump, and is also used to route excess fuel through the drain circuit and back into the fuel tank.

FUEL INJECTION, 6.7L DIESEL

OPERATION

FUEL ECONOMY AND MAINTENANCE

A vehicle that is not properly tuned and maintained cannot be expected to perform at its maximum efficiency and can have an adverse effect on fuel economy. The following recommendations will ensure that the vehicle is performing at its maximum efficiency:

- **Use the recommended motor oil grade.** Using the manufacturer's recommended grade of Mopar® motor oil can improve fuel mileage by 1-2%. Mopar® motor oil labeled "Energy Conserving" contains friction-reducing additives.
- **Check and replace air filters.** Replacing a clogged air filter with a new Mopar® air filter can improve fuel mileage by as much as 10%.
- **Keep the engine tuned.** Repairing a vehicle that is noticeably out of tune can improve fuel mileage by an average of 4%. Maintaining a vehicle and repairing problems, such as a faulty oxygen sensor, can improve mileage by as much as 40%.
- **Keep tires properly inflated.** Underinflated tires can lower fuel mileage by 0.4% for every 1 psi drop in pressure of all four tires.

SPECIAL TOOLS

SPECIAL TOOLS

	9010A - Remover/Installer, Fuel Injector (Originally Shipped In Kit Number(s) 8848, 8849.) 9015 - Remover, High Pressure Connector (Originally Shipped In Kit Number(s) 8848, 8849, 8849CC.)

ACTUATOR, FUEL CONTROL

DESCRIPTION

DESCRIPTION

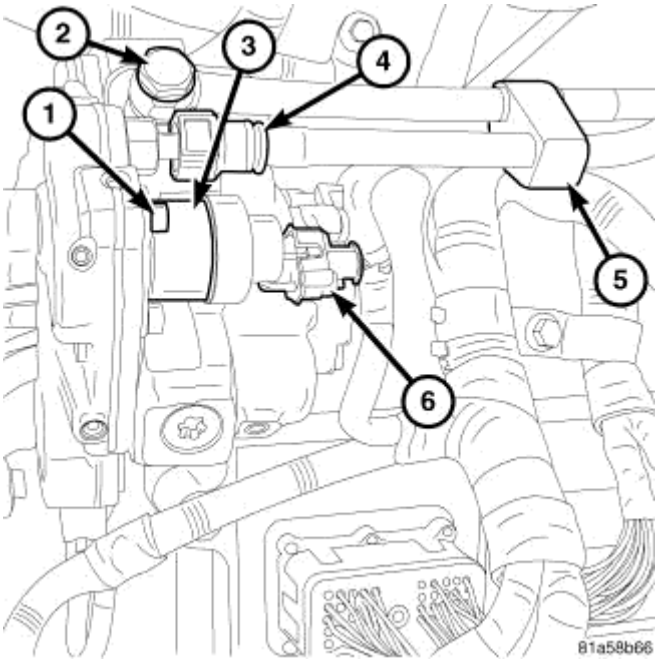


Fig. 93: Fuel Injection Pump Components
Courtesy of CHRYSLER GROUP, LLC

The Fuel Control Actuator (FCA) (3) is located at the rear of the high-pressure, fuel injection pump.

OPERATION

OPERATION

The Fuel Control Actuator (FCA) is an electronically controlled solenoid valve. The Powertrain Control Module (PCM) controls the amount of fuel that enters the high-pressure pumping chambers by opening and closing the FCA based on a demanded fuel pressure. When the FCA is opened, the maximum amount of fuel is being supplied to the fuel injection pump. Any fuel that does not enter the injection pump is directed to the cascade overflow valve. The cascade overflow valve regulates how much excess fuel is used for lubrication of the pump and how much is returned to the fuel tank through the drain manifold.

An audible click from the FCA is normal when operating the key from the ON to the OFF position.

REMOVAL

REMOVAL

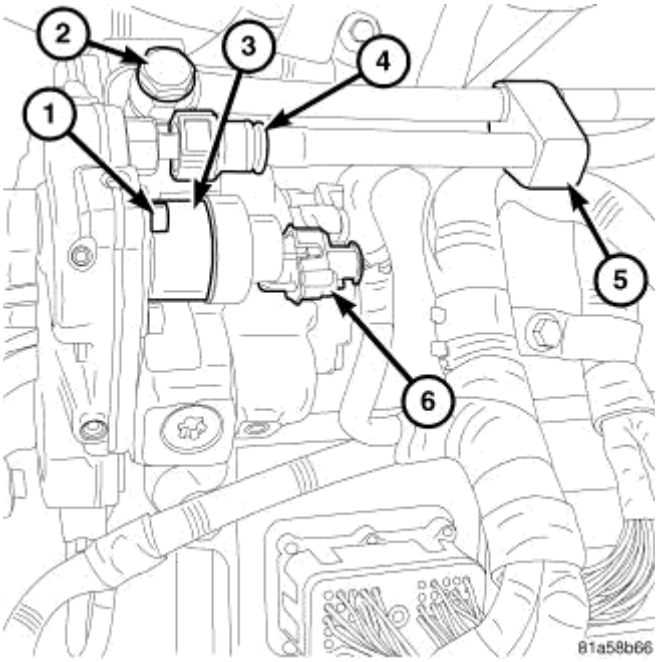


Fig. 94: Fuel Injection Pump Components
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the Fuel Control Actuator (FCA) harness connector (6).
2. Remove screws (1) and the FCA from injection pump.

INSTALLATION

INSTALLATION

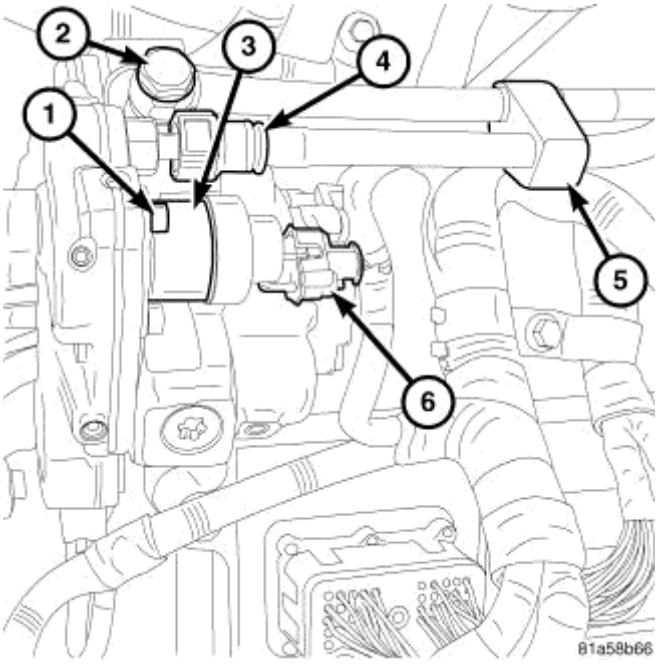


Fig. 95: Fuel Injection Pump Components
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate new Fuel Control Actuator (FCA) O-ring with clean oil.
2. Install FCA into the injection pump. Tighten screws (1) to 7 N.m (62 in. lbs).

HEATER, AIR INTAKE

OPERATION

OPERATION

The air heater element is used to heat incoming air to the intake manifold. This is done to help engine starting and improve driveability with cool or cold outside temperatures.

Electrical supply for the air heater element is controlled by the Powertrain Control Module (PCM) through the air heater relay. Refer to appropriate Electrical Diagnostic article for more information.

A heavy-duty cable connects the air heater element to the air heater relay. This cable will supply 12-volts to an individual heating element within the heater block assembly.

The following chart displays the pre-heat, or turn-on times (in seconds) of the wait-to-start lamp. If the intake manifold temperature is above 66.09 degrees Fahrenheit, the wait-to-start lamp will not illuminate. Consequently, the intake air heater element will not be activated.

WAIT-TO-START LAMP TURN-ON TIMES

PRE-HEAT TIME WITH INTAKE MANIFOLD TEMPERATURE AT: (IN	PRE-HEAT TIME WITH BARO AT: (IN. HG.)				
	19.99 IN.	23.00 IN.	25.00 IN.	26.99	29.00 IN.

DEGREES ° F)	HG	HG.	HG.	IN.HG.	HG.
-40.09° F	30.0 seconds	30.0 seconds	30.0 seconds	30.0 seconds	30.0 seconds
-20.00° F	30.0 seconds	30.0 seconds	30.0 seconds	30.0 seconds	30.0 seconds
0.00° F	30.0 seconds	30.0 seconds	30.0 seconds	30.0 seconds	30.0 seconds
0.09° F	15.0 seconds	15.0 seconds	15.0 seconds	15.0 seconds	15.0 seconds
15.00° F	15.0 seconds	15.0 seconds	15.0 seconds	15.0 seconds	15.0 seconds
15.09° F	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds
32.00° F	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds
50.00° F	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds
66.00° F	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds	10.0 seconds
66.09° F	00.0 seconds	00.0 seconds	00.0 seconds	00.0 seconds	00.0 seconds

REMOVAL

REMOVAL

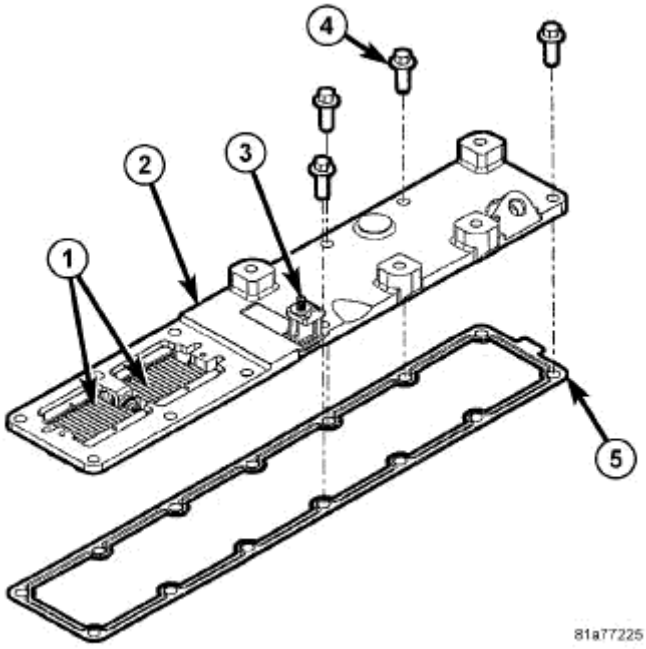


Fig. 96: Air Intake Heater Assembly
Courtesy of CHRYSLER GROUP, LLC

NOTE: If servicing the heater element (1) is required, the entire air intake heater assembly (2) must be replaced.

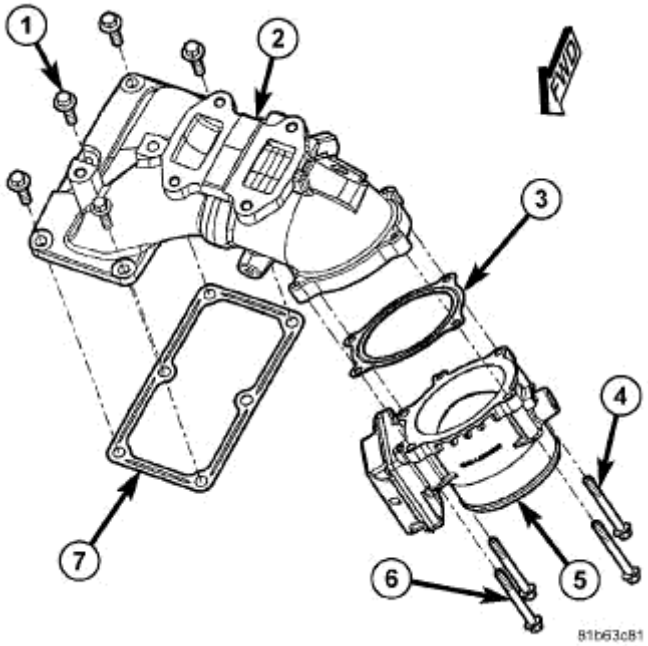


Fig. 97: EGR Air Flow Control - Exploded View
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the intake manifold (2). Refer to **MANIFOLD, INTAKE, REMOVAL, 6.7L** .
3. Remove fuel rail. Refer to **RAIL, FUEL, REMOVAL**.

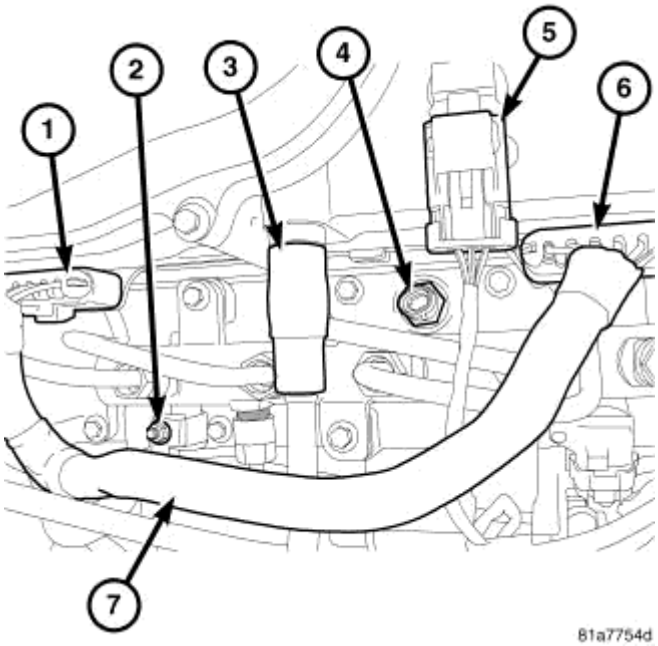


Fig. 98: Identifying Intake Heater Cable Connection
Courtesy of CHRYSLER GROUP, LLC

4. Remove heater cable nut (2) and the heater cable from stud.
5. Disconnect fuel injector harness connectors (1) and (6).
6. Disconnect crankcase vent line (3) at top of valve cover.
7. Disconnect crankcase pressure sensor harness connector (5).

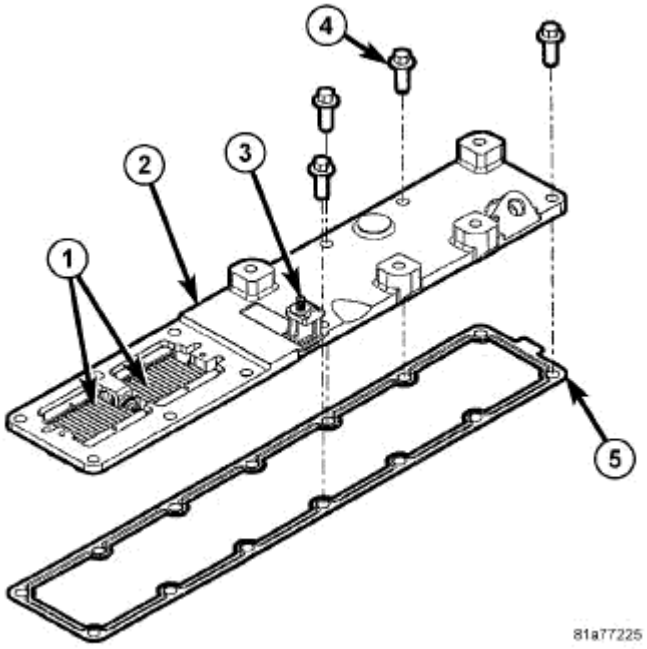


Fig. 99: Air Intake Heater Assembly
Courtesy of CHRYSLER GROUP, LLC

8. Remove bolts (4) and the air intake heater assembly (2).
9. Remove and discard gasket (5).

INSTALLATION

INSTALLATION

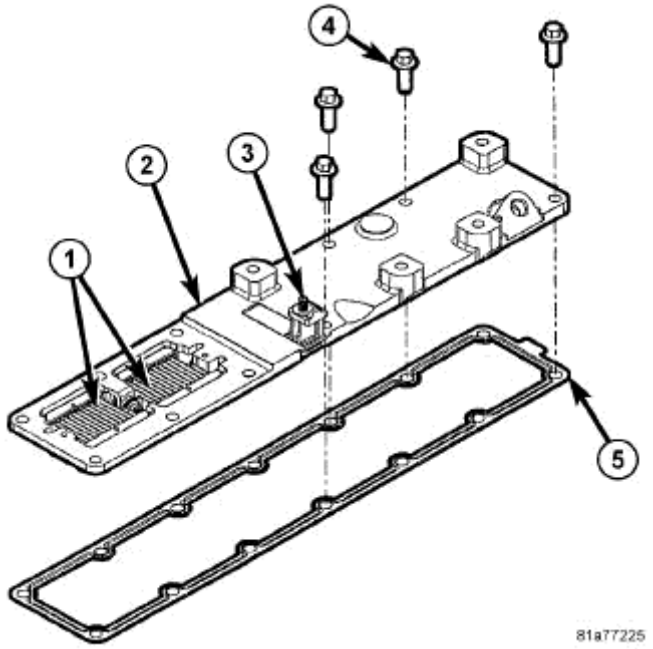


Fig. 100: Air Intake Heater Assembly
Courtesy of CHRYSLER GROUP, LLC

1. Clean all gasket mating surfaces.
2. Using a new gasket (5), install the air intake heater (2). Tighten bolts (4) to 24 N.m (18 ft. lbs.).

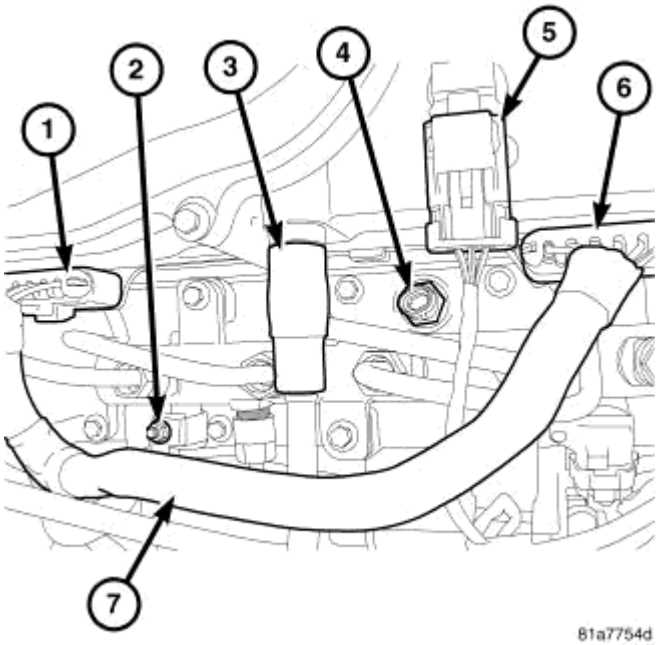


Fig. 101: Identifying Intake Heater Cable Connection
Courtesy of CHRYSLER GROUP, LLC

3. Connect crankcase pressure sensor harness connector (5).
4. Connect crankcase vent line (3) at top of valve cover.
5. Connect the fuel injector harness connectors (1) and (6).
6. Install heater cable to stud. Tighten nut (2) 10 N.m (89 in. lbs.).

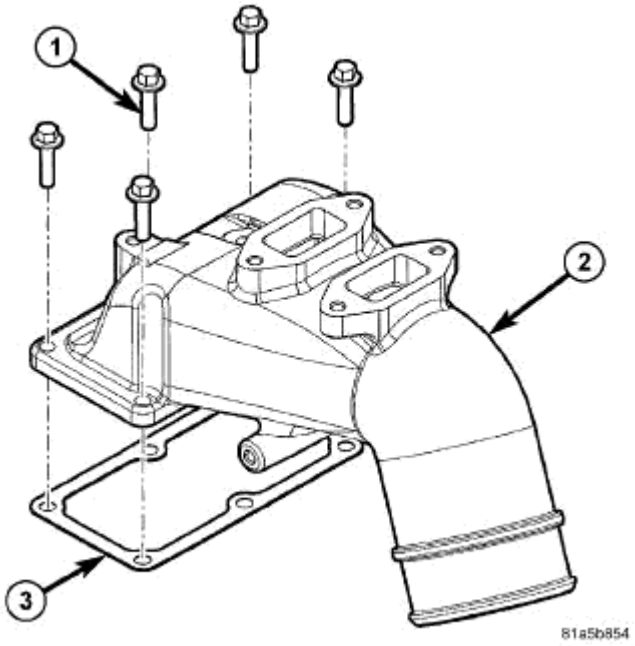


Fig. 102: Air Intake Manifold
Courtesy of CHRYSLER GROUP, LLC

7. Install fuel rail. Refer to **RAIL, FUEL, INSTALLATION**.
8. Install intake manifold (2). Refer to **MANIFOLD, INTAKE, INSTALLATION, 6.7L** .
9. Connect both negative battery cables.

INJECTOR(S), FUEL

DESCRIPTION

DESCRIPTION

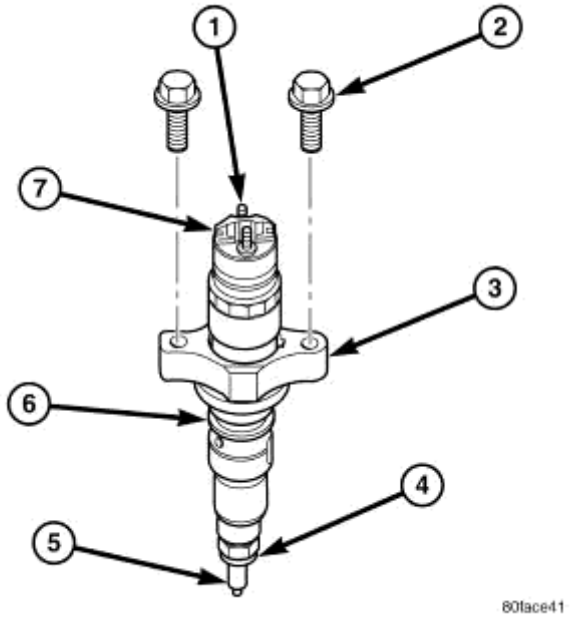


Fig. 103: Fuel Injector - Diesel
Courtesy of CHRYSLER GROUP, LLC

1 - SOLENOID ELECTRICAL CONNECTOR STUDS
2 - MOUNTING BOLTS
3 - MOUNTING PLATES
4- COPPER SEALING WASHER
5 - INJECTOR TIP
6 - INJECTOR O-RING
7 - INJECTOR ELECTRICAL SOLENOID

Six individual, solenoid actuated high-pressure fuel injectors are used (6). The injectors are vertically mounted into a bored hole in the top of the cylinder head. This bored hole is located between the intake/exhaust valves.

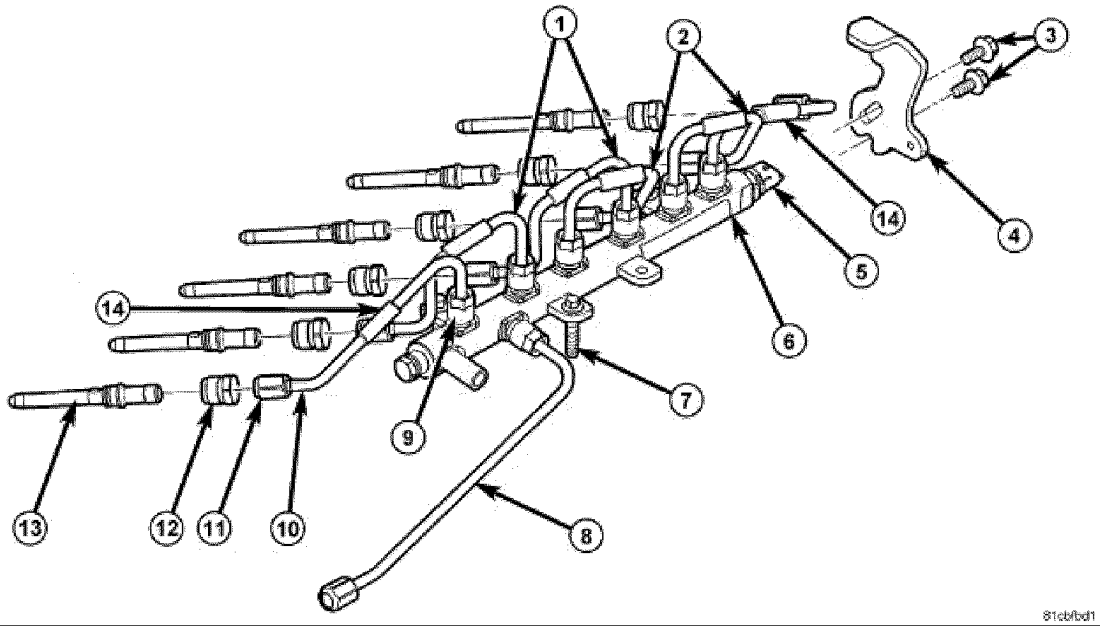


Fig. 104: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

High-pressure connectors (13), mounted into the side of the cylinder head, connect each fuel injector to each high-pressure fuel line (1).

FUEL INJECTOR ID CORRECTION CODES

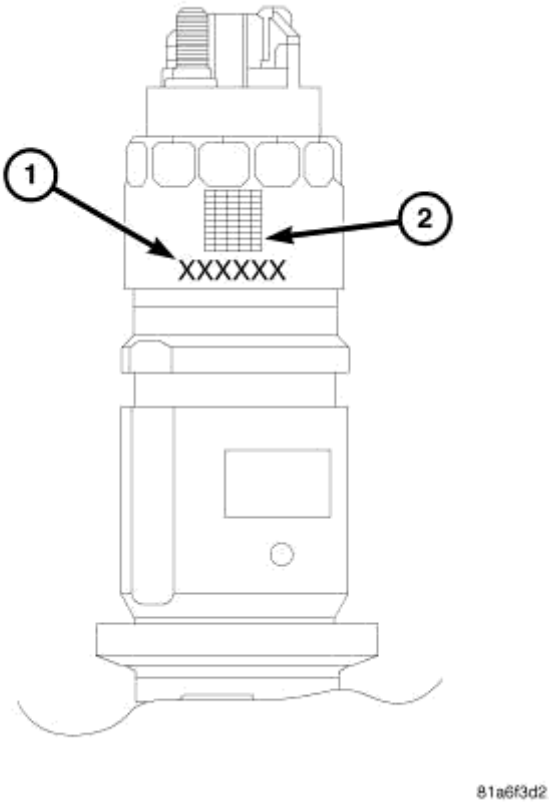


Fig. 105: Fuel Injector ID Correction Code
Courtesy of CHRYSLER GROUP, LLC

Each fuel injector has a six-digit alphanumeric correction code. The correction code is printed on the intake side of the fuel injector (1) and is used to identify injector calibration. When replacing any fuel injectors, this code must be entered into the vehicles Powertrain Control Module (PCM) using a diagnostic scan tool. In addition, if a new PCM is installed, use a diagnostic scan tool to program all six of the injector codes from the original fuel injectors into the new PCM.

The valve cover and valve cover gasket will need to be removed in order to manually record the values from the original injectors. Contact cleaner or brake cleaner may be used to clean the fuel injector.

OPERATION

OPERATION

High-pressure fuel is supplied from the injection pump, through a high-pressure fuel line, into a fuel rail, through high-pressure lines, through steel connectors and into the solenoid actuated fuel injector. The Powertrain Control Module (PCM) actuates the solenoid causing the needle valve to rise and fuel flows through the spray holes in the nozzle tip into the combustion chamber.

Each fuel injector is connected to the fuel rail by a high-pressure fuel line and a steel connector. This steel connector is positioned into the cylinder head and sealed with an O-ring. The connector is retained in the cylinder head by a nut (fitting) that is threaded into the cylinder head.

The torquing force of this threaded nut (fitting) provides a sealing pressure between the fuel line connector and the fuel injector. **Retaining nut torque is very critical.** If the nut (fitting) is under torqued, the mating surfaces will not seal and a high-pressure fuel leak will result. If the fitting is over torqued, the connector and injector will deform and also cause a high-pressure fuel leak. This leak will be inside the cylinder head and will not be visible. The result will be a possible fuel injector miss-fire and low power, or a no-start condition.

The fuel injectors use hole type nozzles. High-pressure flows into the side of the injector, the PCM activates the solenoid causing the injector needle to lift and fuel to be injected. The clearances in the nozzle bore are extremely small and any dirt or contaminants will cause the injector to stick. Because of this, it is very important to do a thorough cleaning of any lines before opening up any fuel system component. Always cover or cap any open fuel connections before a fuel system repair is performed.

Each fuel injector connector tube contains an edge filter that is designed to break up small contaminants before entering the fuel injector. **The edge filters are not a substitute for proper cleaning and covering of all fuel system components during repair.**

The bottom of each fuel injector is sealed to the cylinder head with a **1.5 mm** thick copper shim (gasket). The correct thickness shim must always be re-installed after removing an injector.

Fuel pressure in the injector circuit decreases after injection. The injector needle valve is immediately closed and fuel flow into the combustion chamber is stopped. Exhaust gases are prevented from entering the injector nozzle by the needle valve.

REMOVAL

REMOVAL

CAUTION: Refer to DIESEL FUEL SYSTEM CLEANING PROCEDURE.

NOTE: Six individual, solenoid actuated high-pressure fuel injectors are used. The injectors are vertically mounted into a bored hole in the top of the cylinder head. This bored hole is located between the intake/exhaust valves. High-pressure connectors, mounted into the side of the cylinder head, connect each fuel injector to each high-pressure fuel line.

NOTE: Each fuel injector has a six-digit alphanumeric correction code. The correction code is printed on the intake side of the fuel injector and is used to identify injector calibration. When replacing any fuel injectors, this code must be entered into the vehicles Powertrain Control Module (PCM) using a scan tool. In addition, if a new PCM is installed, use a scan tool to program all six of the injector codes from the original fuel injectors into the new PCM.

NOTE: If the fuel injectors are being removed such as for engine tear down or diagnostic purposes, be sure to mark each injector with its corresponding cylinder number. The fuel injectors MUST be reinstalled into the original (same)

cylinder due to the fuel injector correction code.

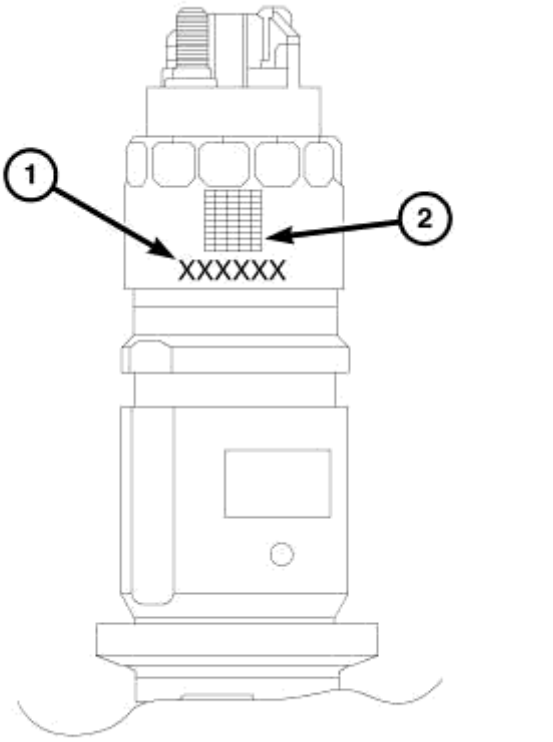


Fig. 106: Fuel Injector ID Correction Code
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove engine cover.
3. Remove breather assembly and tubes.
4. Remove cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L** .

NOTE: Each fuel injector has a six-digit alphanumeric correction code. The correction code is printed on the intake side of the fuel injector and is used to identify injector calibration.

5. Mark each injector (2) with its corresponding cylinder number. If required, make note of each fuel injector six-digit alphanumeric correction code (1).

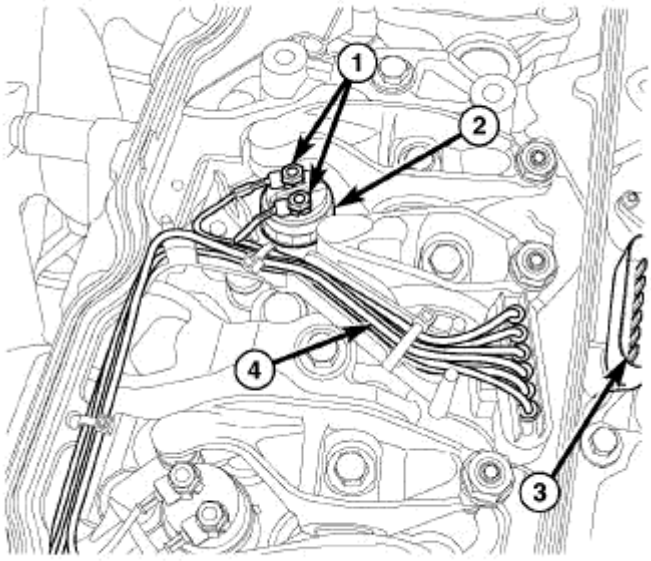


Fig. 107: Fuel Injector Wiring Harness Components
Courtesy of CHRYSLER GROUP, LLC

1 - FUEL INJECTOR WIRE HARNESS NUTS
2 - FUEL INJECTOR
3 - FUEL INJECTOR HARNESS CONNECTOR (OUTSIDE OF VALVE COVER)
4 - INTEGRATED WIRING HARNESS

6. Remove all 12 fuel injector wire harness nuts (1) securing integrated wiring harness to all 6 fuel injectors.

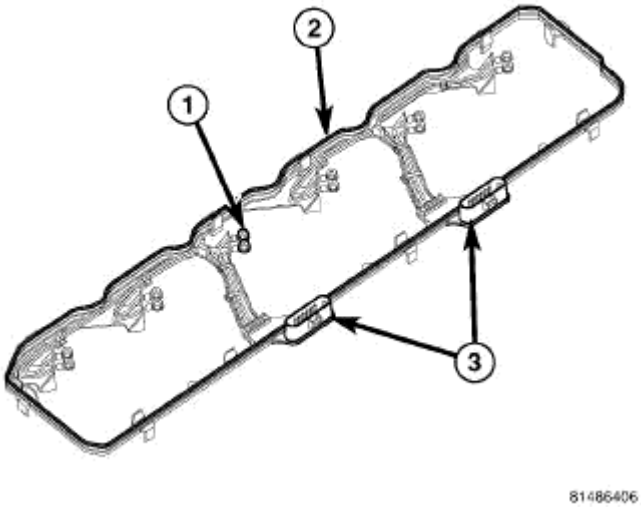


Fig. 108: Fuel Injector Harness Connectors & Gasket
Courtesy of CHRYSLER GROUP, LLC

7. Disconnect both fuel injector harness connectors (3) and remove the integrated gasket.

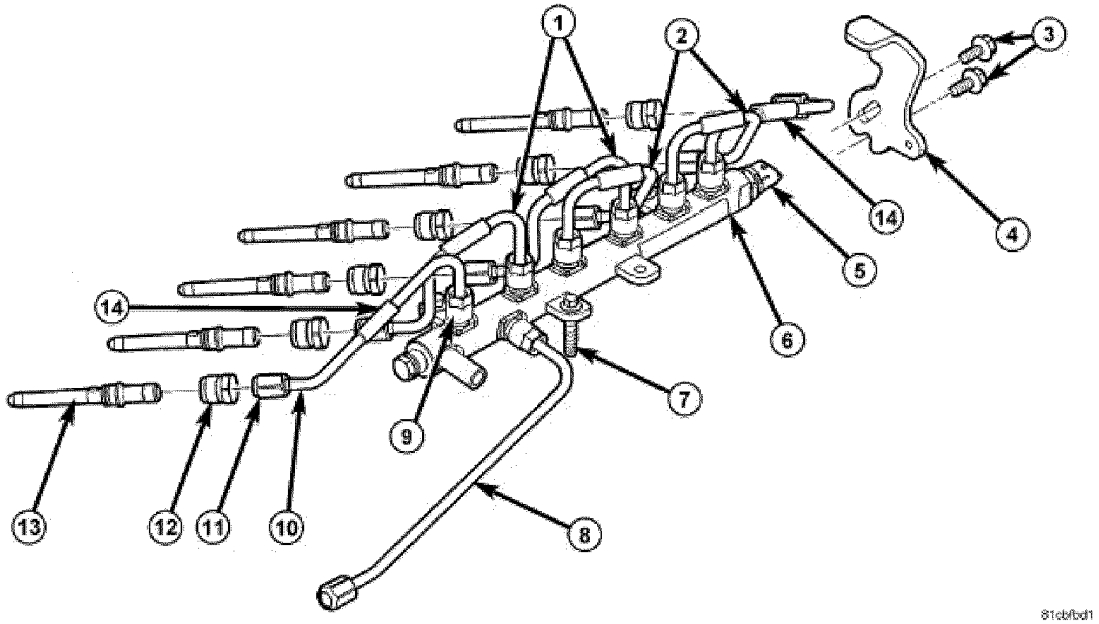


Fig. 109: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

8. Remove the high pressure fuel tubes. Refer to **TUBE(S), FUEL, REMOVAL**.
9. Remove connector retainer nuts (12).

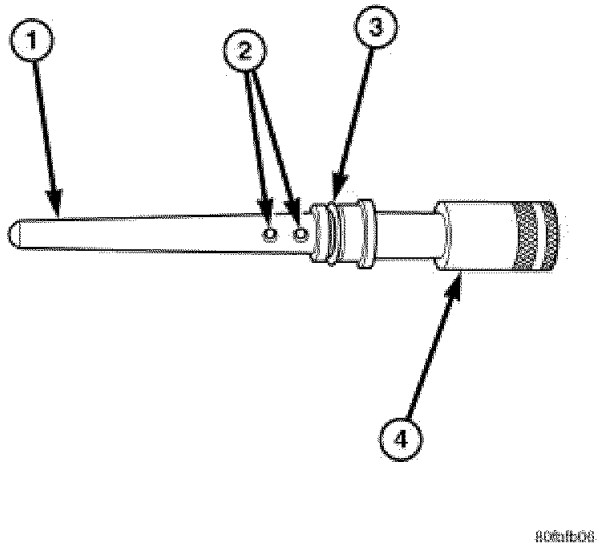


Fig. 110: Tool #9015 & Connector Tube
Courtesy of CHRYSLER GROUP, LLC

1 - CONNECTOR TUBE
2 - LOCATING PINS
3 - RUBBER O-RING
4 - TOOL #9015

10. Install the High Pressure Connector Remover (special tool #9015, Remover, High Pressure Connector) (4) onto high-pressure connector tube located in cylinder head.

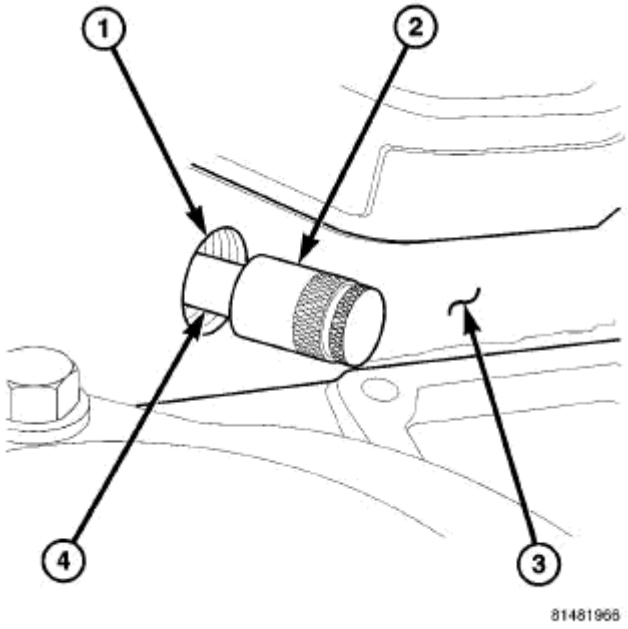


Fig. 111: Removing High Pressure Connector Tube
Courtesy of CHRYSLER GROUP, LLC

11. Using Thread High Pressure Connector Remover (special tool #9015, Remover, High Pressure Connector) (2), pry and remove the high-pressure connector tube(s) (4) from the cylinder head.

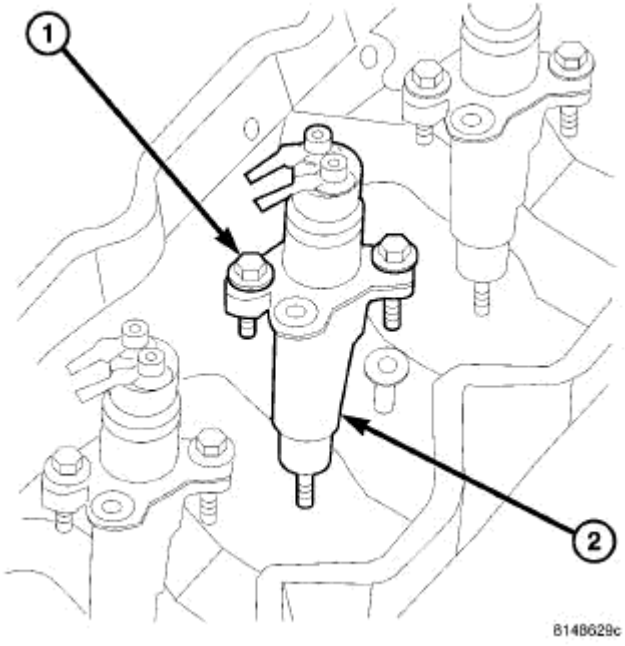


Fig. 112: Fuel Injector & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Remove fuel injector hold-down clamp bolts (1)
13. Remove necessary intake and exhaust rocker arm assembly(s).

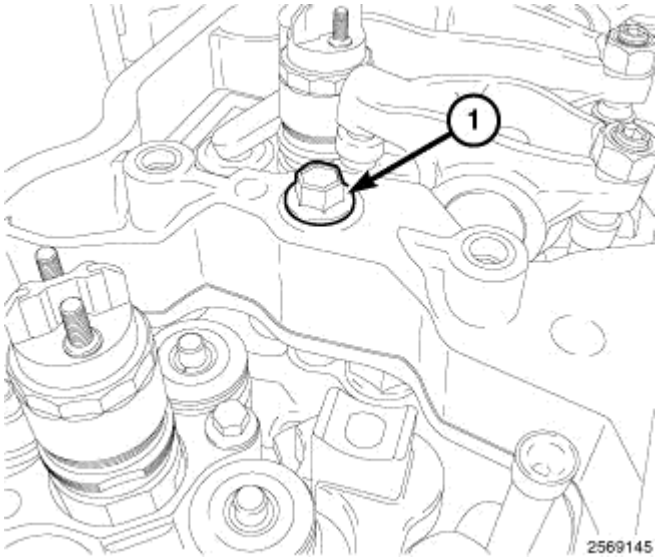


Fig. 113: Rocker Housing Mounting Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: The rocker housing support bridge is bolted to the top of cylinder head. The mounting stud from Fuel Injector Removal/Installer (special tool #9010A, Remover/Installer, Fuel Injector) was meant to temporarily replace a rocker housing mounting bolt.

14. Remove the necessary rocker housing mounting bolt.

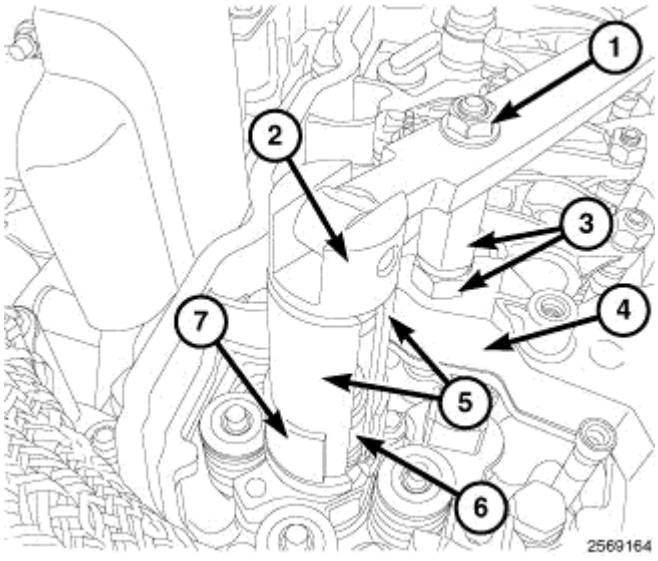
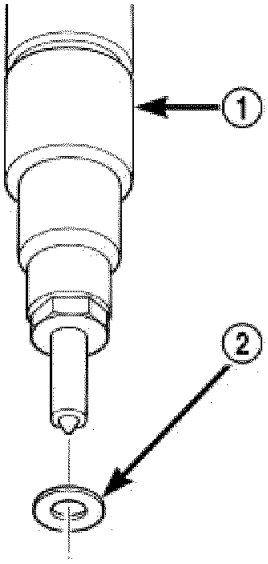


Fig. 114: Removing Fuel Injector
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Fuel Injector Removal/Installer (special tool #9010A, Remover/Installer, Fuel Injector) is equipped with 2 clamshell clamps, a sliding retainer sleeve to retain the clamshell clamps, a 2-piece mounting stud and a pivoting handle. Do not attempt to remove the fuel injectors with any other device. Damage to injector will occur.

15. Install and tighten 2-piece mounting stud (3) of Fuel Injector Removal/Installer (special tool #9010A, Remover/Installer, Fuel Injector), to rocker housing (4). If removing the No. 6 fuel injector, separate the 2-piece mounting stud (3). Install lower half of mounting stud (3) to center of rocker housing bridge (4) and upper half of mounting stud to lower half.
16. Position tool handle (2) to mounting stud (3) and install handle nut (1). Leave handle nut (1) loose to allow a pivoting action.
17. Position lower part of clamshell halves (5) to sides of fuel injector (6) (wider shoulder to bottom). The upper part of clamshell halves should also be positioned into machined shoulder on the handles (2) pivoting head.
18. Slide the retainer sleeve (7) over pivoting handle head (2) to lock clamshell halves (5) together. Be sure handle pivot nut (1) is loose.
19. Depress handle of Fuel Injector Removal/Installer (special tool #9010A, Remover/Installer, Fuel Injector) (2) downward to remove fuel injector straight up from cylinder head bore.



80b4b3b1

Fig. 115: Fuel Injector & Sealing Washer (Shim)
Courtesy of CHRYSLER GROUP, LLC

1 - FUEL INJECTOR
2 - COPPER SEALING WASHER (SHIM)

NOTE: If the fuel injectors are being removed such as for engine tear down or diagnostic purposes, be sure to mark each injector with its corresponding cylinder number. The fuel injectors MUST be reinstalled into the original

(same) cylinder due to the fuel injector correction code.

20. Remove and discard injector sealing washer (2). This washer should be located on tip of injector (1), or may have remained in the injector bore.

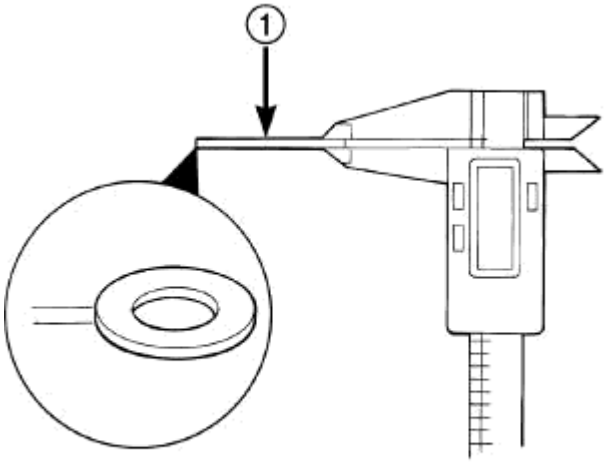


Fig. 116: Measuring Injector Sealing Washer (Shim)
Courtesy of CHRYSLER GROUP, LLC

1 - SHIM

NOTE: Do not install new fuel injectors unless the alphanumeric codes have been recorded.

21. Measure injector sealing washer (1).

INSTALLATION

INSTALLATION

1. **Inspect fuel injector :**
    1. Look for burrs on injector inlet.
    2. Check nozzle holes for hole erosion or plugging.
    3. Inspect end of nozzle for burrs or rough machine marks.
    4. Look for cracks at nozzle end.
    5. If any of these conditions occur, replace injector.
2. Record six-digit alphanumeric correction code located on the side of injector.
3. **Inspect high-pressure fuel injector connector for :**
    1. Damaged tip.

2. Loose of missing alignment pin.
3. Cut or missing O-ring.

4. Thoroughly clean fuel injector cylinder head bore. Blow out bore hole with compressed air.

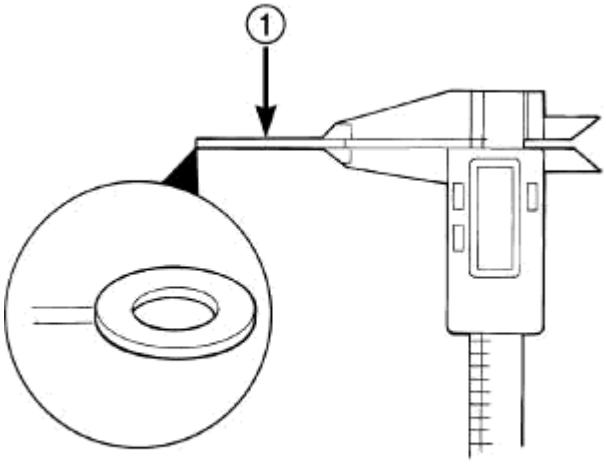


Fig. 117: Measuring Injector Sealing Washer (Shim)
Courtesy of CHRYSLER GROUP, LLC

1 - SHIM

5. The bottom of fuel injector is sealed to cylinder head bore with a copper sealing washer (shim) (1) of a certain thickness. A new shim (1) with correct thickness must always be re-installed after removing injector. Measure thickness of injector shim (1). **Shim Thickness: 1.5 mm (.060")**
6. Install new shim (1) (washer) to bottom of injector. Apply light coating of clean engine oil to washer. This will keep washer in place during installation.
7. Install new O-ring to fuel injector. Apply small amount of clean engine oil to O-ring and injector bore.

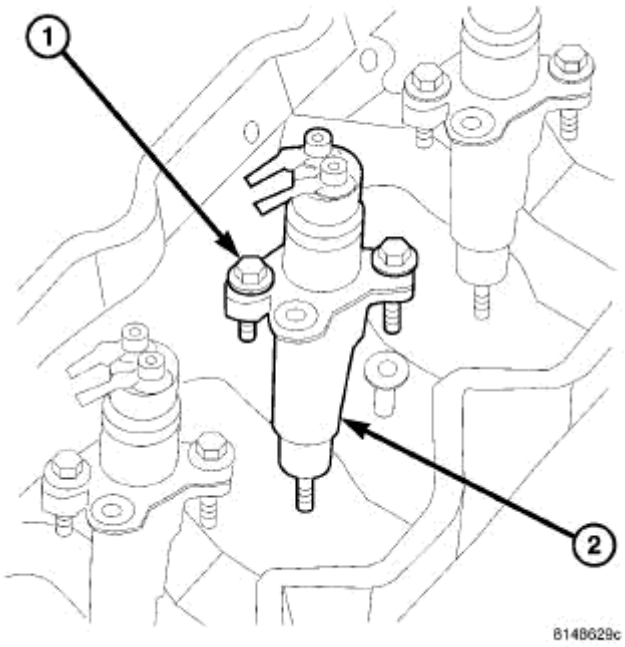


Fig. 118: Fuel Injector & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Install injector into cylinder head with male (high-pressure) connector port facing the intake manifold. Push down on fuel injector mounting flange to engage O-ring and seat injector.

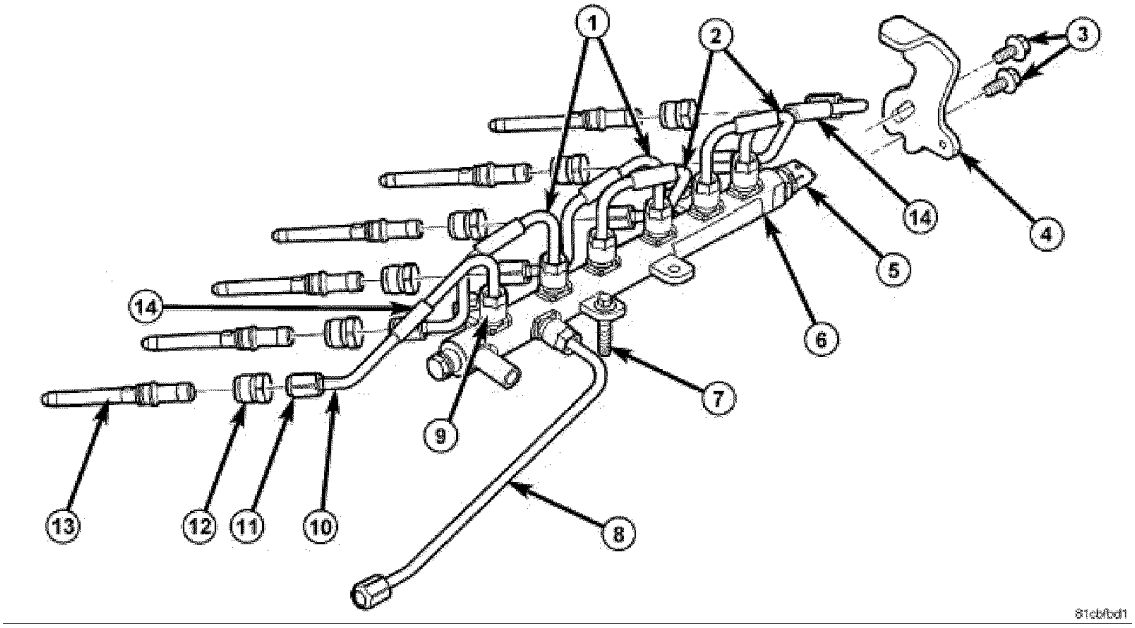


Fig. 119: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

9. Tightening Sequence:

1. Install fuel injector hold-down clamp (mounting flange) bolts. Be sure the clamp is perpendicular to the injector body. **Do a preliminary tightening of these bolts to 5 N.m (44 in. lbs.) torque. This preliminary tightening insures the fuel injector is seated and centered.**
2. After tightening, relieve bolt torque, but leave both bolts threaded in place.
3. Install high-pressure connector (13) and retaining nut (12). Do a preliminary tightening of nut (12) to 15 N.m (133 in. lbs.).
4. Alternately tighten injector hold-down bolts to 10 N.m (89 in. lbs.).
5. Do a final tightening of the high-pressure connector and retaining nut (12). Tighten to 50 N.m (37 ft. lbs.).

10. **Noise isolators (14)** are used on the six high-pressure fuel lines. They should be positioned in the middle of the horizontal or longest straight section of each fuel line. The split on each isolator should be facing downward. Be sure the noise isolator is not touching another isolator or any other components.

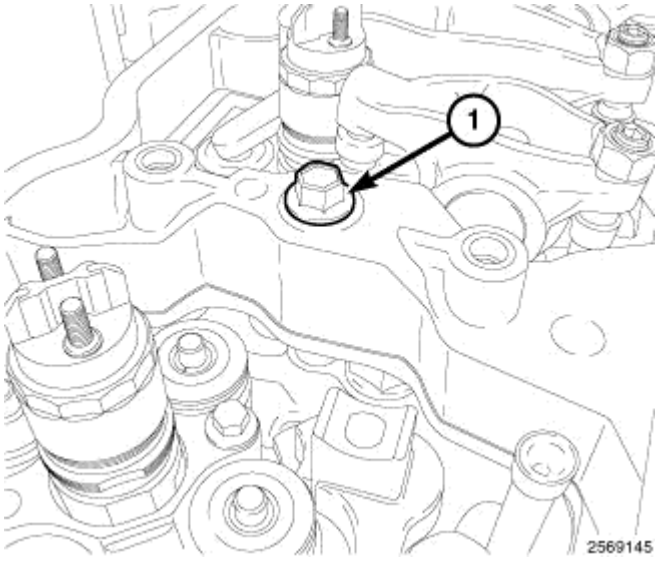


Fig. 120: Rocker Housing Mounting Bolt
Courtesy of CHRYSLER GROUP, LLC

11. Install the necessary rocker housing mounting bolt (1) and tighten to 24 N.m (18 ft. lbs).

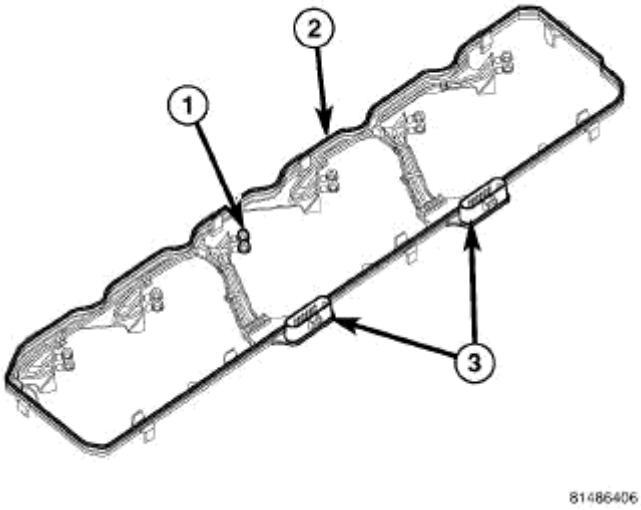


Fig. 121: Fuel Injector Harness Connectors & Gasket
Courtesy of CHRYSLER GROUP, LLC

12. Install integrated gasket (2).

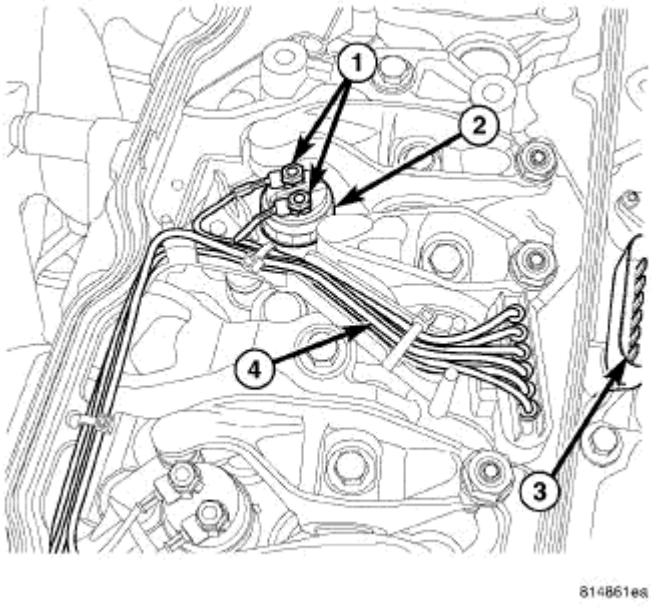


Fig. 122: Fuel Injector Wiring Harness Components
Courtesy of CHRYSLER GROUP, LLC

1 - FUEL INJECTOR WIRE HARNESS NUTS
2 - FUEL INJECTOR
3 - FUEL INJECTOR HARNESS CONNECTOR

(OUTSIDE OF VALVE COVER)
4 - INTEGRATED WIRING HARNESS

13. Connect fuel injector solenoid wires and nuts (1) to top of injectors. Tighten connector nuts to 1.25 N.m (11 in. lbs.). **Be very careful not to overtighten these nuts as damage to fuel injector will occur.**
14. Install the intake and exhaust rocker arm assembly. Refer to **ROCKER ARM, VALVE, INSTALLATION, 6.7L** .
15. Set exhaust valve lash. Refer to **VALVE LASH ADJUSTMENT AND VERIFICATION** .
16. Install fuel connector tube nut at cylinder head and tighten to 50 N.m (37 ft. lbs.). **Be sure to use a secondary back-up wrench on the connector nut (fitting) while torquing fuel line fitting.** Refer to **TUBE(S), FUEL, INSTALLATION**.
17. Install valve cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L** .
18. Install breather assembly.

FUEL INJECTOR ID CORRECTION CODES:

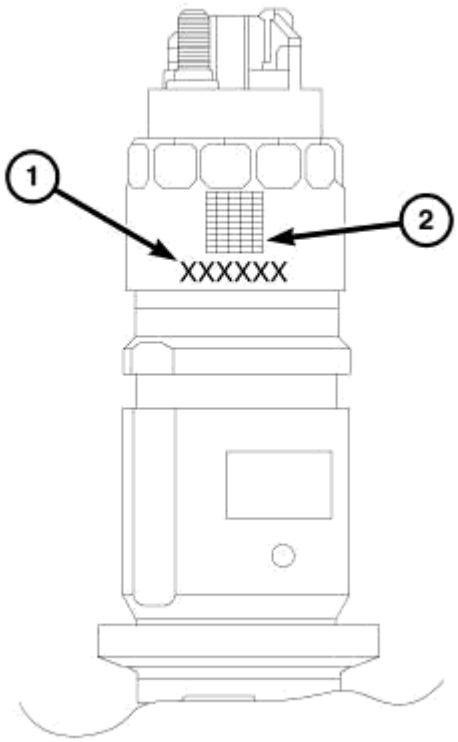


Fig. 123: Fuel Injector ID Correction Code
Courtesy of CHRYSLER GROUP, LLC

Each fuel injector has a six-digit alphanumeric correction code. The correction code is printed on the intake side of the fuel injector (1) and is used to identify injector calibration. When replacing any fuel injectors, this code must be entered into the vehicles Powertrain Control Module (PCM) using a

diagnostic scan tool. In addition, if a new PCM is installed, use a diagnostic scan tool to program all six of the injector codes from the original fuel injectors into the new PCM.

19. Connect negative battery cables to both batteries.
20. **Programming Fuel Injector Correction Code:**

- Turn ignition switch "ON".
- Using a diagnostic scan tool, select ECU View> PCM > MISCELLANEOUS FUNCTIONS.
- Select Injector Quantity Adjustments and click Start.
- Choose appropriate cylinder number and click next.
- Click on Show Keyboard. **NOTE: A fault code will be set if incorrect serialization codes have been inputted.**
- Input six-digit Injector Correction Code and click enter.
- Review code as it was typed, then click Next if correct, or edit if necessary.
- Repeat the preceding steps for other cylinders if necessary.
- Once all fuel injector correction codes are entered, cycle the ignition to complete.

RELAY, INTAKE AIR HEATER

DESCRIPTION

DESCRIPTION

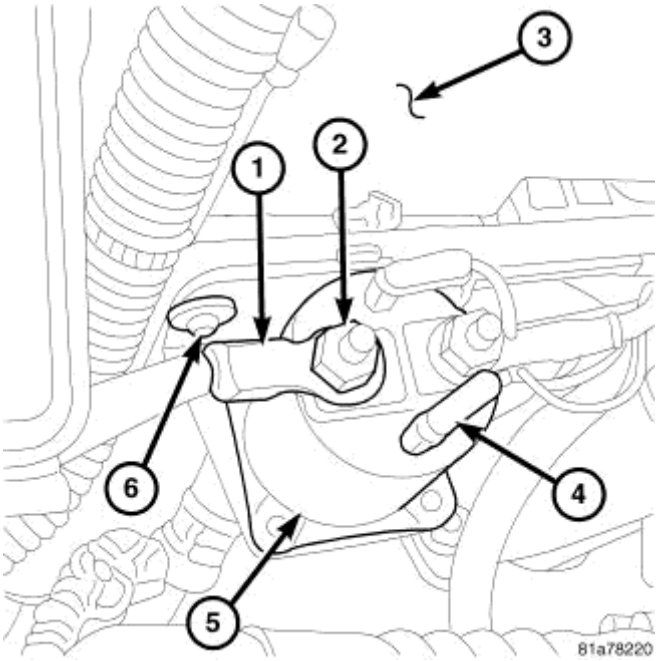


Fig. 124: Intake Heater Relay
Courtesy of CHRYSLER GROUP, LLC

The air intake heater relay (5) is located in the engine compartment. It attached to a bracket located to the right battery tray (3).

OPERATION

OPERATION

The Powertrain Control Module (PCM) operates the heating element through the intake manifold air heater relay. For an electrical operation and complete description of the intake heater, including pre-heat and post-heat cycles. Refer to the appropriate Electrical Diagnostic article.

REMOVAL

REMOVAL

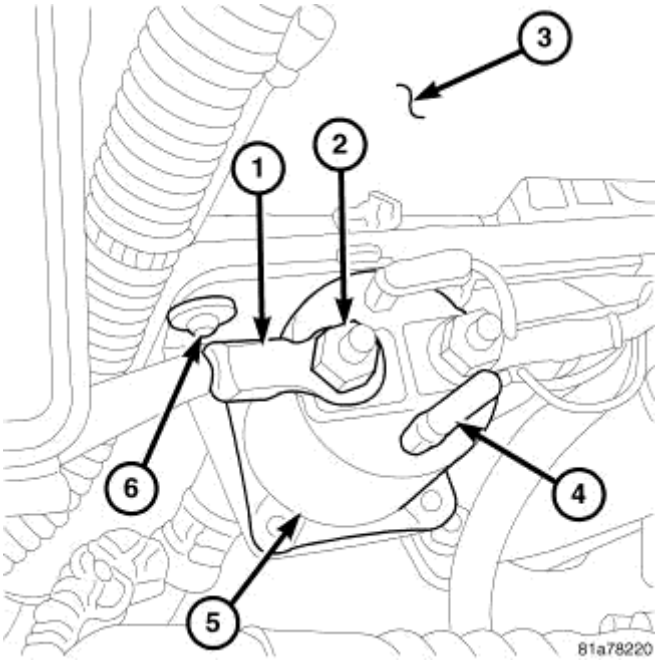


Fig. 125: Intake Heater Relay
Courtesy of CHRYSLER GROUP, LLC

The air intake heater relay (5) is located in the engine compartment. It attached to a bracket. This bracket is attached to the right battery tray (3).

The mounting bracket and relay is replaced as an assembly.

1. Disconnect both negative battery cables.
2. Disconnect relay trigger wires (4) at relays. Note position of wiring before removing.
3. Remove nuts (2) at cable connectors and disconnect cables (1) from mounting studs. Note position of cables before removing.
4. Remove two relay mounting bracket screws (6) and remove relay assembly.

INSTALLATION

INSTALLATION

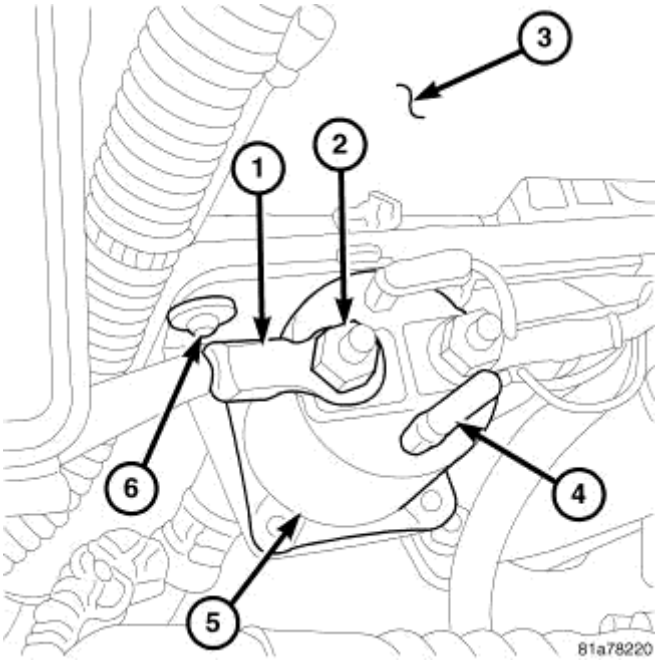


Fig. 126: Intake Heater Relay
Courtesy of CHRYSLER GROUP, LLC

NOTE: The mounting bracket and relay is replaced as an assembly.

1. Position relay and install two relay mounting bracket screws (6).
2. Install cables (1) to mounting studs. Tighten nuts (2) 10 N.m (89 in. lbs.).
3. Connect relay trigger wires (4) at relays.
4. Connect both negative battery cables.

SENSOR, PTO SWITCH

DESCRIPTION

DESCRIPTION

This Powertrain Control Module (PCM) input is used only on models equipped with aftermarket Power Take Off (PTO) units.

OPERATION

OPERATION

This input is used only to tell the Powertrain Control Module (PCM) that the aftermarket PTO (Power Take Off) unit has been engaged. The PCM will disable (temporarily shut down) certain OBD II diagnostic trouble codes when the PTO unit is engaged.

SENSOR, ACCELERATOR PEDAL POSITION

DESCRIPTION

DESCRIPTION

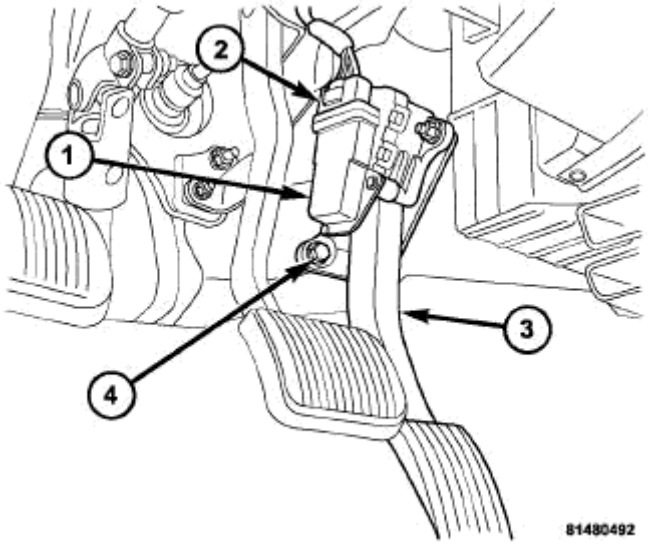


Fig. 127: Accelerator Pedal Position Sensor (APPS)
Courtesy of CHRYSLER GROUP, LLC

1 - APPS
2 - APPS 6-Way Electrical Connector
3 - Accelerator Pedal
4 - Mounting Bolts/Nuts

The Accelerator Pedal Position Sensor (APPS) (1) is located inside the vehicle. It is attached to the accelerator pedal assembly (3).

OPERATION

OPERATION

The Accelerator Pedal Position Sensor (APPS) provides the Powertrain Control Module (PCM) with two DC voltage signals which change as the position of the accelerator pedal changes. One of the DC voltage signals will be half the voltage of the other signal.

REMOVAL

REMOVAL

CAUTION: Do not attempt to separate or remove the Accelerator Pedal Position Sensor (APPS) from the accelerator pedal assembly. The APPS and the accelerator pedal is replaced as an assembly. If the sensor is removed

from the pedal, the electronic calibration may be destroyed.

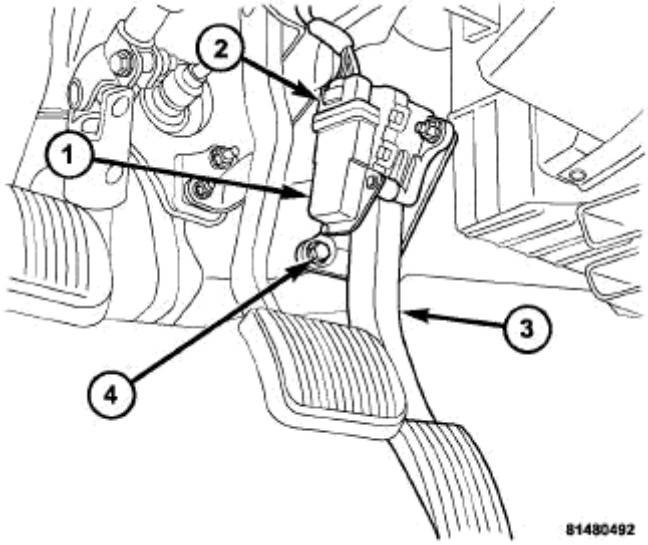


Fig. 128: Accelerator Pedal Position Sensor (APPS)
Courtesy of CHRYSLER GROUP, LLC

1 - APPS
2 - APPS 6-Way Electrical Connector
3 - Accelerator Pedal
4 - Mounting Bolts/Nuts

1. Disconnect 6-way electrical connector at top of APPS (2).
2. Remove APPS lower mounting bolt (4) and two mounting nuts.
3. Remove pedal and APPS assembly from vehicle.

INSTALLATION

INSTALLATION

CAUTION: Do not attempt to separate or remove the Accelerator Pedal Position Sensor (APPS) from the accelerator pedal assembly. The APPS and the accelerator pedal is replaced as an assembly. If the sensor is removed from the pedal, the electronic calibration may be destroyed.

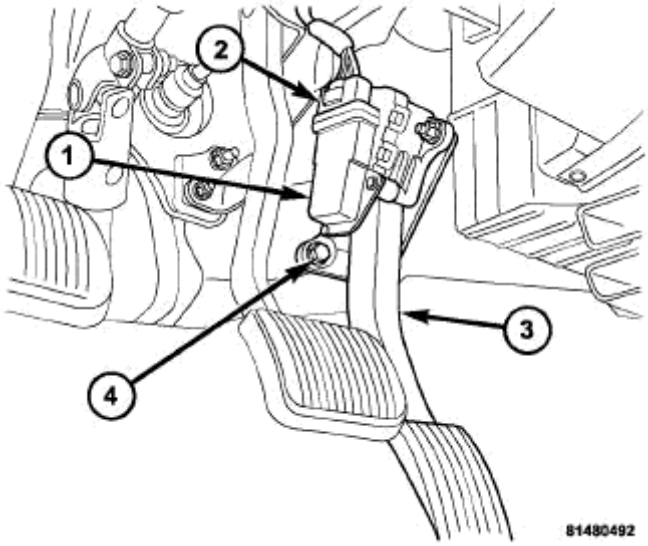


Fig. 129: Accelerator Pedal Position Sensor (APPS)
Courtesy of CHRYSLER GROUP, LLC

1 - APPS
2 - APPS 6-Way Electrical Connector
3 - Accelerator Pedal
4 - Mounting Bolts/Nuts

1. Position pedal and APPS assembly to its mounting bracket.
2. Connect 6-way electrical connector to top of APPS (2).
3. Install APPS lower mounting bolt (4) and two mounting nuts.
4. If necessary, use a Scan Tool to erase any Diagnostic Trouble Codes (DTC's).

SENSOR, AIR TEMPERATURE, INTAKE (INTAKE MANIFOLD AIR TEMPERATURE SENSOR/MAP SENSOR)

OPERATION

OPERATION

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

REMOVAL

CAB/CHASSIS MODELS

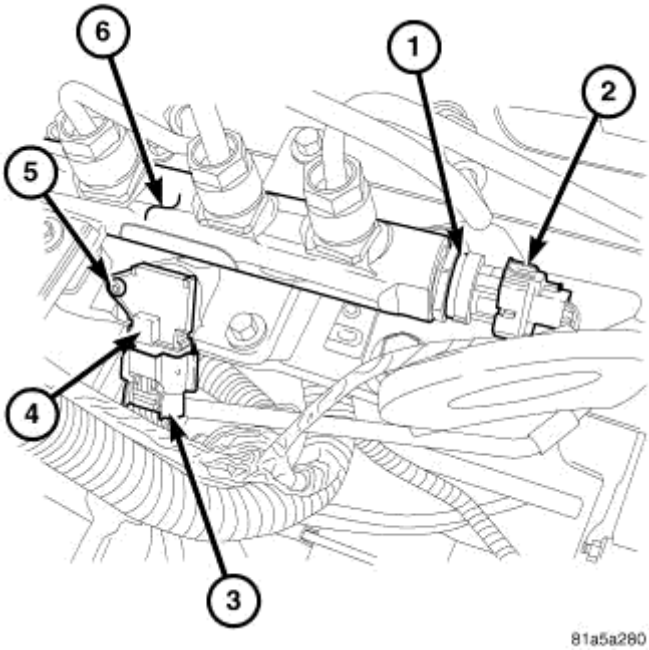


Fig. 130: Fuel Rail, Fuel Pressure Sensor & Connector, IAT/MAP Sensor, IAT/MAP Electrical Connector & Mounting Screw
Courtesy of CHRYSLER GROUP, LLC

The combination, dual function Intake Manifold Air Temperature Sensor/MAP (IAT/MAP) (4) sensor is installed into the top of the intake manifold.

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

PICK UP MODELS

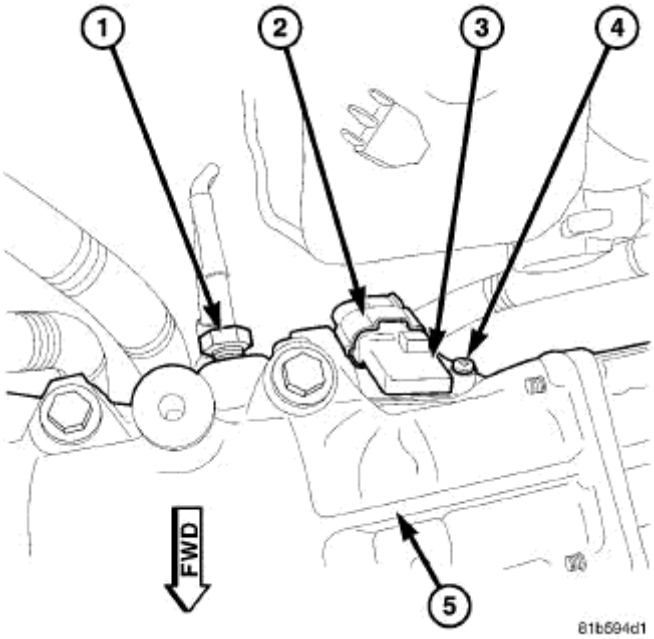


Fig. 131: Intake Manifold Air Temperature Sensor/MAP Sensor
Courtesy of CHRYSLER GROUP, LLC

The combination, dual function Intake Manifold Air Temperature Sensor/MAP (IAT/MAP) (3) sensor is installed into the intake air connection manifold, below, and to the rear of the EGR valve (5).

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

INSTALLATION

CAB/CHASSIS MODELS

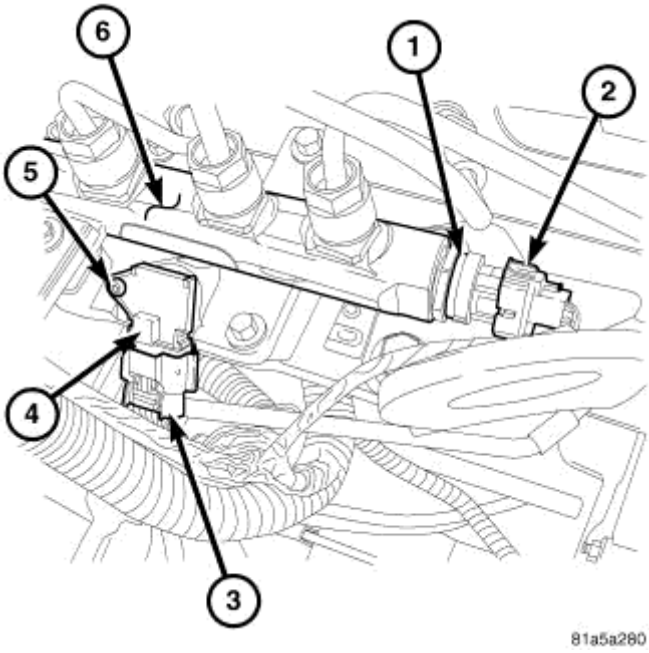


Fig. 132: Fuel Rail, Fuel Pressure Sensor & Connector, IAT/MAP Sensor, IAT/MAP Electrical Connector & Mounting Screw
Courtesy of CHRYSLER GROUP, LLC

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 oil.
4. Position sensor (4) into intake manifold.
5. Install and tighten sensor mounting screw (5) to 1 N.m (9 in. lbs.) torque.
6. Connect electrical connector (3) to sensor.

INSTALLATION

PICK UP MODELS

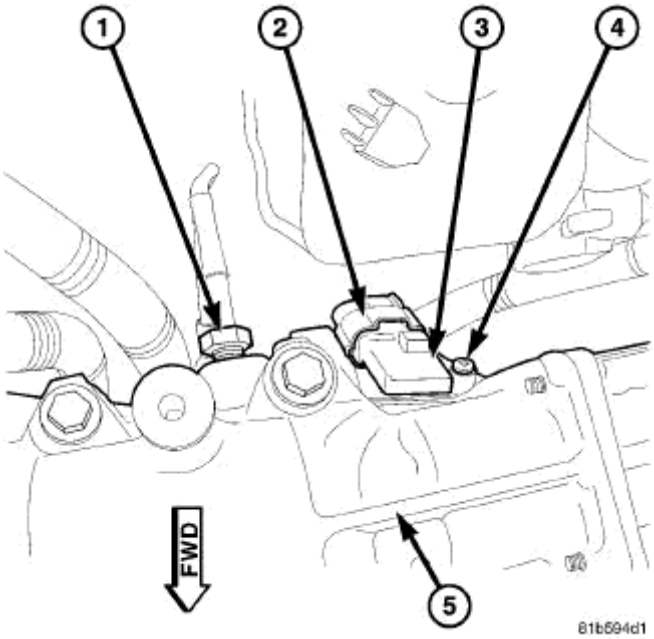


Fig. 133: Intake Manifold Air Temperature Sensor/MAP Sensor
Courtesy of CHRYSLER GROUP, LLC

The combination, dual function Intake Manifold Air Temperature Sensor/MAP (IAT/MAP) (3) sensor is installed into the intake air connection manifold, below, and to the rear of the EGR valve (5).

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 with clean engine oil.
4. Position sensor (3) into intake manifold.
5. Install and tighten sensor mounting screw (4) to 1 N.m (9 in. lbs.) torque.
6. Connect electrical connector (2) to sensor.

SENSOR, AIR TEMPERATURE, INTAKE (INLET AIR TEMPERATURE/PRESSURE SENSOR)

OPERATION

OPERATION

The Inlet Air Temperature/Pressure Sensor is a combination dual-function sensor. The sensor element extends into the intake air stream at the top of the air filter housing. Ambient air temperature as well as barometric pressure is monitored by this sensor. The Powertrain Control Module (PCM) monitors signals from this sensor.

REMOVAL

REMOVAL

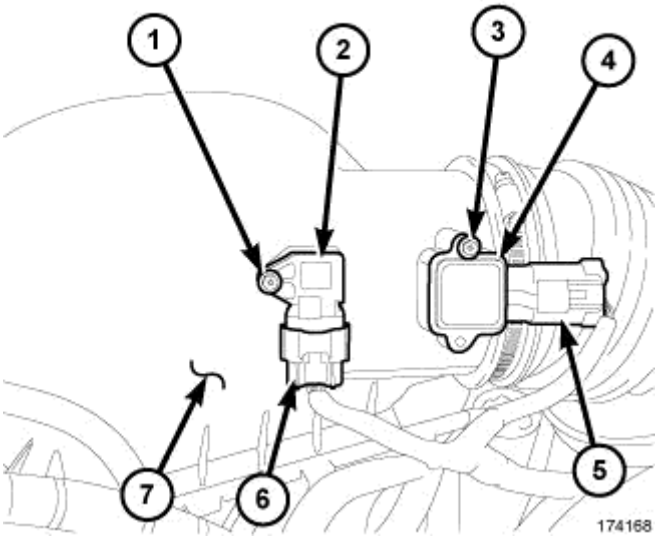


Fig. 134: Intake Air Temperature/Pressure Sensor & Mass Airflow Sensor
Courtesy of CHRYSLER GROUP, LLC

The Inlet Air Temperature/Pressure Sensor (2) is located on the air cleaner cover.

1. Disconnect electrical connector (6) at sensor.
2. Remove mounting screw (1).
3. Remove sensor from air cleaner cover.
4. Check condition of sensor O-ring.

INSTALLATION

INSTALLATION

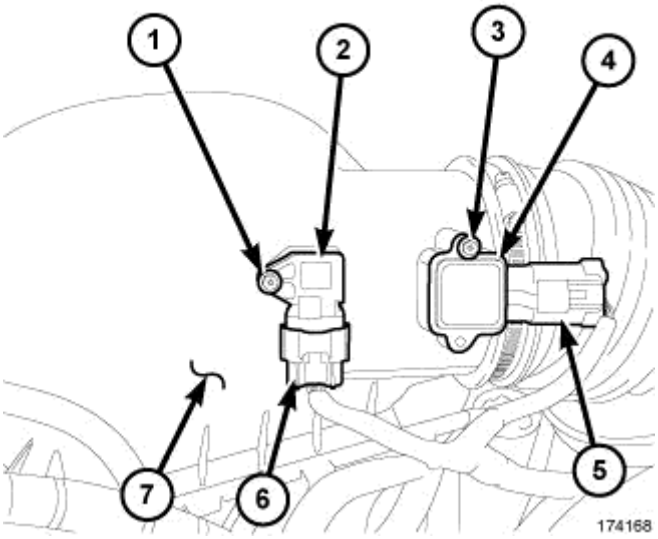


Fig. 135: Intake Air Temperature/Pressure Sensor & Mass Airflow Sensor
Courtesy of CHRYSLER GROUP, LLC

1. Check condition of sensor O-ring.
2. Position sensor (2) into top of air cleaner cover with a slight twisting action.
3. Install mounting screw (1).
4. Install electrical connector (6).

SENSOR, CRANKSHAFT POSITION

DESCRIPTION

DESCRIPTION

The Crankshaft Position Sensor (CKP) on the diesel engine is attached at the front / left side of the engine next to the engine harmonic balancer (crankshaft damper).

OPERATION

OPERATION

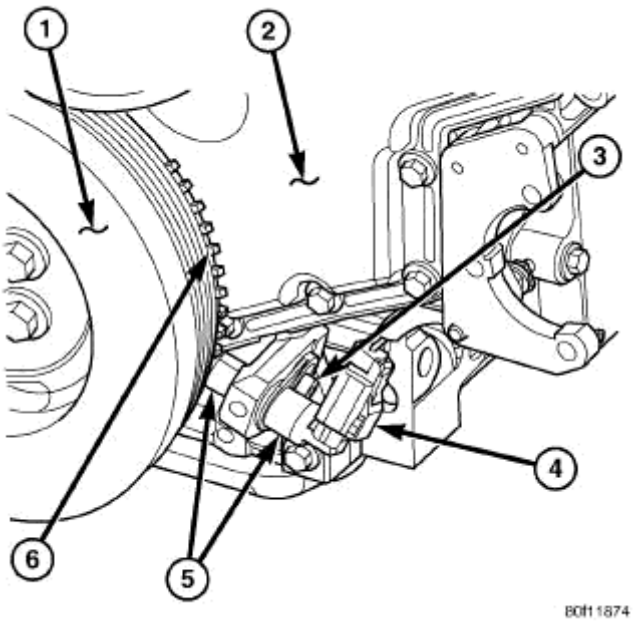


Fig. 136: Crankshaft Position Sensor Components
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE HARMONIC BALANCER
2 - FRONT OF TIMING GEAR COVER
3 - CKP MOUNTING BOLT
4 - ELEC. CONNECTOR
5 - CKP SENSOR
6 - NOTCHES

The Crankshaft Position Sensor (CKP) (5) is the primary engine speed indicator for the engine after the engine is running.

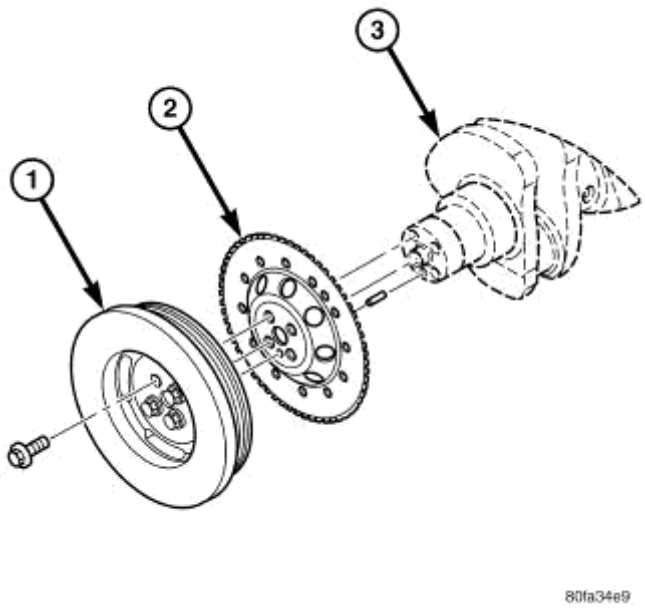


Fig. 137: Crankshaft Position Sensor Notched Tonewheel
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE HARMONIC BALANCER
2 - NOTCHED TONEWHEEL
3 - FRONT OF CRANKSHAFT

The CKP contains a hall effect device. A rotating, notched target wheel (tonewheel) for the CKP is located behind the engine harmonic balancer (2). This hall effect device detects notches located on the tonewheel. As the tonewheel rotates, the notches pass the tip of the CKP.

When the leading edge of the tonewheel notch passes the tip of the CKP, the following occurs: The interruption of magnetic field causes the voltage to switch high resulting in a signal of approximately 5 volts.

When the trailing edge of the tonewheel notch passes the tip of the CKP, the following occurs: The change of the magnetic field causes the signal voltage to switch low to 0 volts.

The Camshaft Position Sensor (CMP) also provides a signal to the Powertrain Control Module (PCM) at all times when the engine is running. The PCM uses this CMP information primarily on engine start-up. Once the engine is running, the PCM uses the CMP as a backup sensor for engine speed.

REMOVAL

REMOVAL

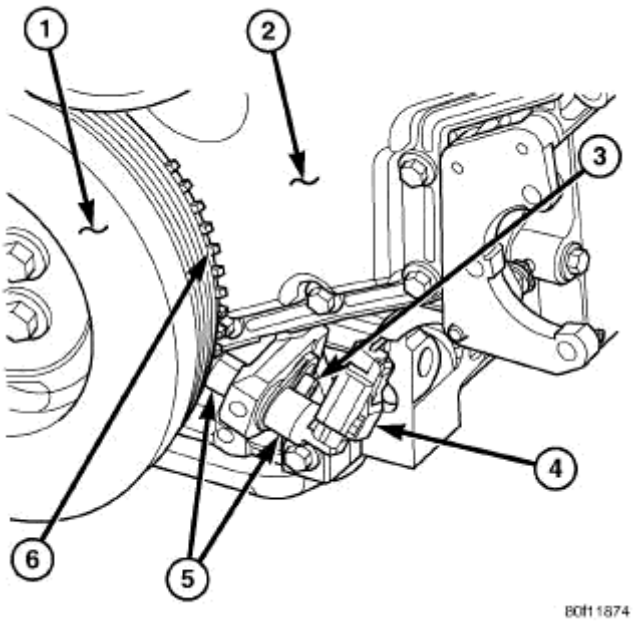


Fig. 138: Crankshaft Position Sensor Components
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE HARMONIC BALANCER
2 - FRONT OF TIMING GEAR COVER
3 - CKP MOUNTING BOLT
4 - ELEC. CONNECTOR
5 - CKP SENSOR
6 - NOTCHES

1. Disconnect both negative battery cables.
2. Disconnect Crankshaft Position (CKP) sensor harness connector (4).
3. Remove bolt (3) and the CKP sensor (5).

INSTALLATION

INSTALLATION

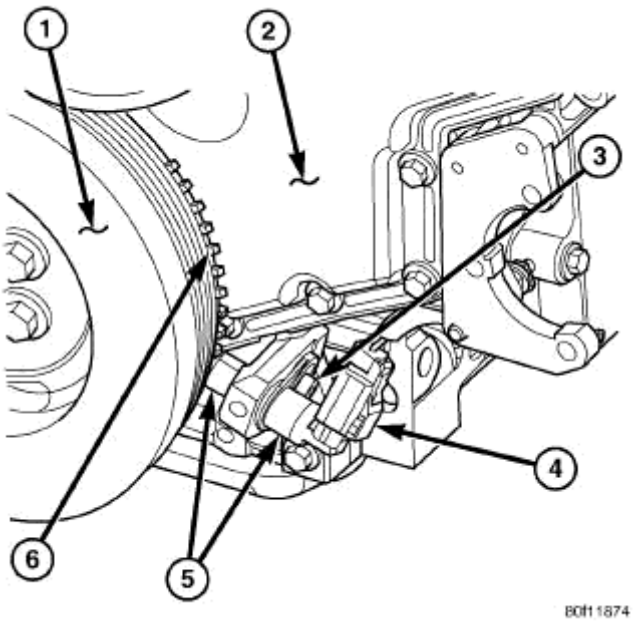


Fig. 139: Crankshaft Position Sensor Components
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE HARMONIC BALANCER
2 - FRONT OF TIMING GEAR COVER
3 - CKP MOUNTING BOLT
4 - ELEC. CONNECTOR
5 - CKP SENSOR
6 - NOTCHES

1. Install the Crankshaft Position (CKP) sensor (5). Tighten bolt to 10 N.m (89 in. lbs.).
2. Connect (CKP) sensor harness connector (4).
3. Connect both negative battery cables.

SENSOR, MANIFOLD AIR PRESSURE (MAP)

DESCRIPTION

DESCRIPTION

A combination, dual function Intake Manifold Air Temperature Sensor/MAP Sensor is used. For information, refer to **OPERATION**.

SENSOR, MASS AIRFLOW (MAF)

DESCRIPTION

DESCRIPTION

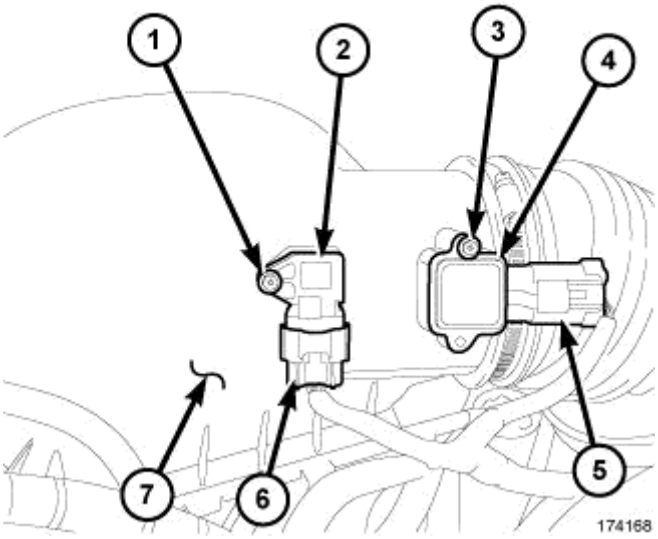


Fig. 140: Intake Air Temperature/Pressure Sensor & Mass Airflow Sensor
Courtesy of CHRYSLER GROUP, LLC

The Mass Airflow Sensor (4) is located on the air cleaner cover (7).

OPERATION

OPERATION

The Mass Airflow (MAF) sensor is a frequency based device. A constant voltage is applied to a heated wire on the sensor. This wire is positioned in the air cleaner air stream and is heated by the electrical current that the voltage produces. As air flows across it, it cools down. The heated wire or film is a positive temperature coefficient resistor. This means that its resistance drops when its temperature drops. The drop in resistance allows more current to flow through it in order to maintain the programmed temperature. This current is changed to a frequency which is sent to the Powertrain Control Module (PCM) and interpreted as air flow. Adjustments for air temperature and humidity are taken into consideration because they also affect the temperature of the heated wire or film.

REMOVAL

REMOVAL

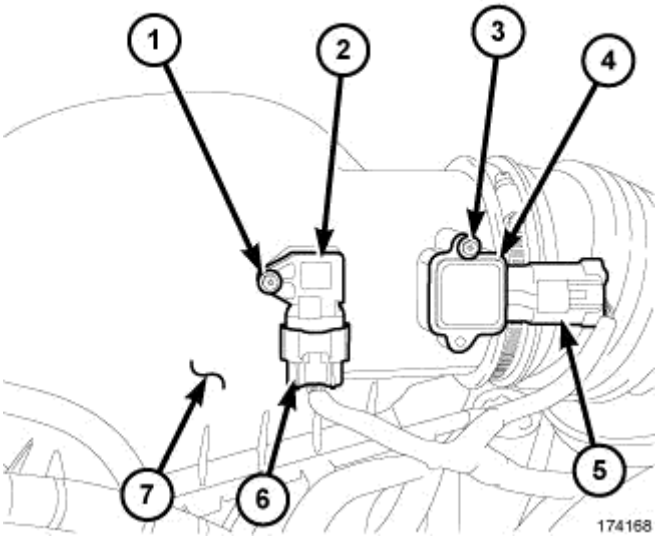


Fig. 141: Intake Air Temperature/Pressure Sensor & Mass Airflow Sensor
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Disconnect the Mass Air Flow (MAF) sensor harness connector (5).
3. Remove screws (3) and the MAF sensor (4) from the air cleaner cover (7).

INSTALLATION

INSTALLATION

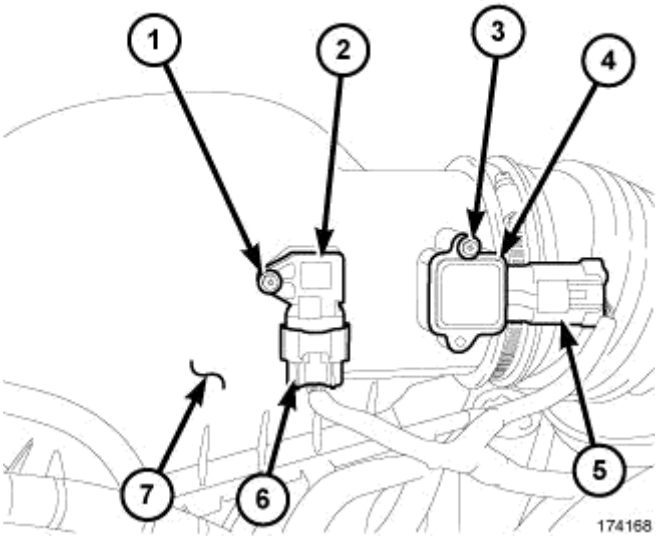


Fig. 142: Intake Air Temperature/Pressure Sensor & Mass Airflow Sensor
Courtesy of CHRYSLER GROUP, LLC

1. Check the condition of the sensor O-ring.
2. Install the Mass Air Flow (MAF) sensor (4) into top of the air cleaner (7). Tighten screw (3) to 1 N.m (9 in. lbs.).
3. Connect the MAF sensor harness connector (5).
4. Connect both negative battery cables.

SENSOR, OXYGEN

DESCRIPTION

DESCRIPTION

PICK UP MODELS

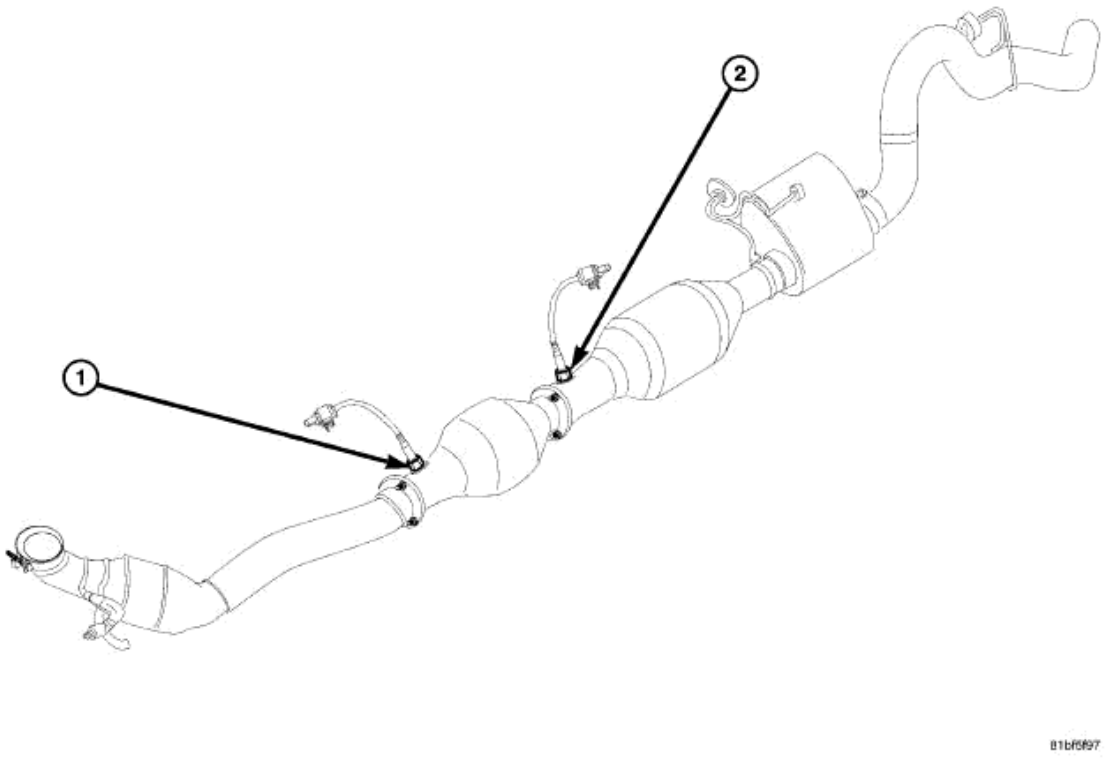


Fig. 143: O2 Sensors
Courtesy of CHRYSLER GROUP, LLC

Two different six-wire Oxygen (O2) Sensor are used. These sensors are titled 1/1 upstream (1), and 1/2 downstream (2). These (O2) sensors are located on each end of the No. 2 catalyst.

OPERATION

OPERATION

PICK UP MODELS

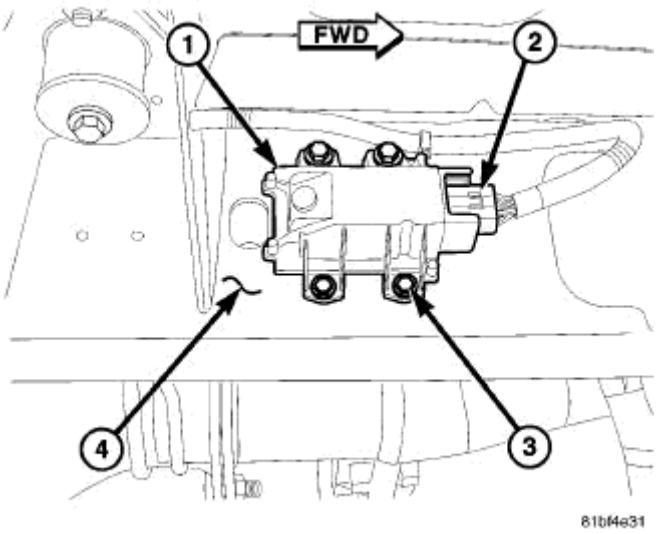


Fig. 144: O2 Sensor Module
Courtesy of CHRYSLER GROUP, LLC

A separate O2 Sensor Module (1) is also used.

The engine aftertreatment system monitors the O2 content in the diesel engine exhaust. The Powertrain Control Module (PCM) monitors the exhaust gases for oxygen content and varies the rich/lean fuel mixture of the intake air fuel mixture to adjust the system. This diagnostic monitors the status message broadcast by the O2 Sensor Module (1) for the upstream O2 sensor's internal heater circuit. The PCM will set the fault if it receives a FMI (Failure Mode Indicator) message from the O2 Sensor Module. The PCM will illuminate the MIL lamp immediately when the diagnostic runs and fails. The PCM will turn off the MIL lamp diagnostic runs and passes in four consecutive drive cycles.

REMOVAL

REMOVAL

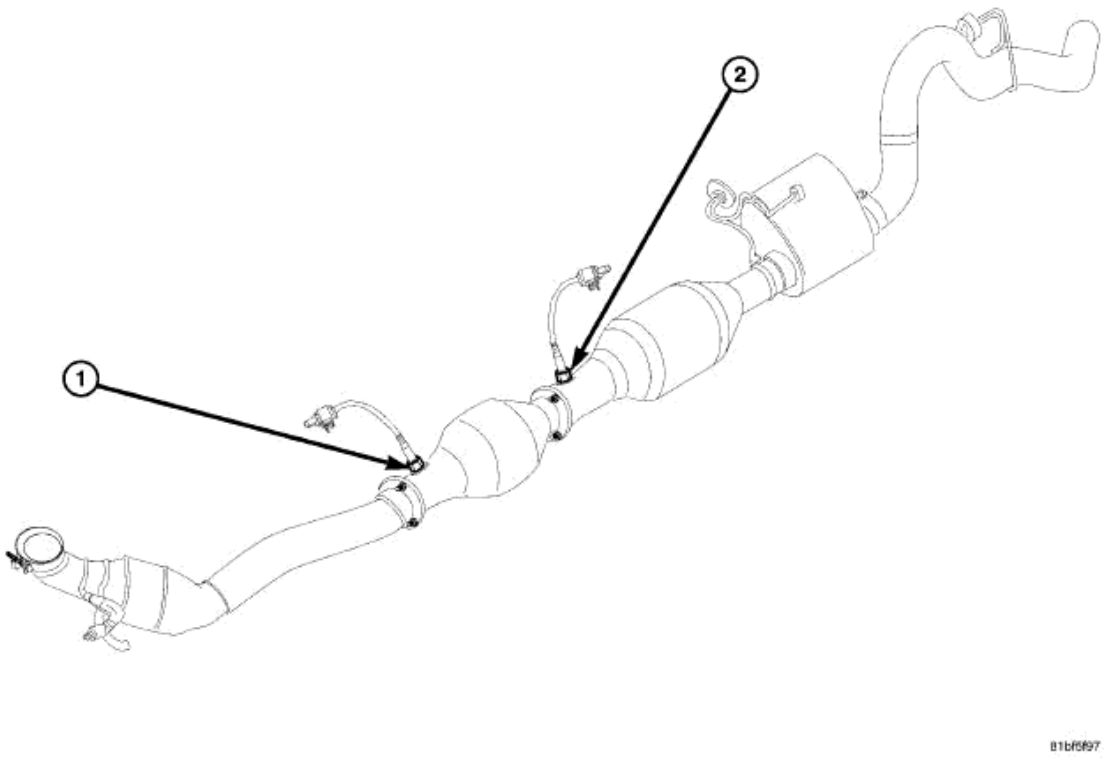


Fig. 145: O2 Sensors
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Never apply any type of grease to the Oxygen (O2) sensor harness connector, or attempt any soldering of the sensor wiring harness.

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

1. Disconnect both negative battery cables.
2. Raise and support the vehicle.

CAUTION: When disconnecting the O2 sensor harness connector, do not pull directly on the wire going into sensor.

3. Disconnect the O2 sensor harness connector.
4. Remove the O2 sensor.
5. Clean the threads in catalytic convertor using the appropriate tap.

INSTALLATION

INSTALLATION

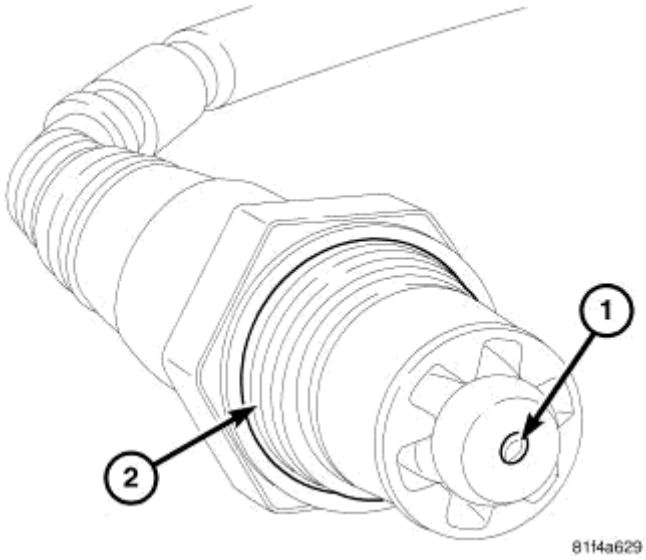


Fig. 146: O2S Sensor Center Hole & Threads
Courtesy of CHRYSLER GROUP, LLC

1 - CENTER HOLE
2 - THREADS

NOTE: Threads of NEW Oxygen (O2) 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. Be careful not to get anti-seize compound on sensor tip.

1. Inspect the O2 sensor wiring boot for cuts, tears or damage.
2. If the O2 sensor (2) is going to be reinstalled, apply pressurized shop air directly into center hole (1) of O2 sensor.
3. Wipe excess soot off the O2 sensor (2) with a soft cloth.

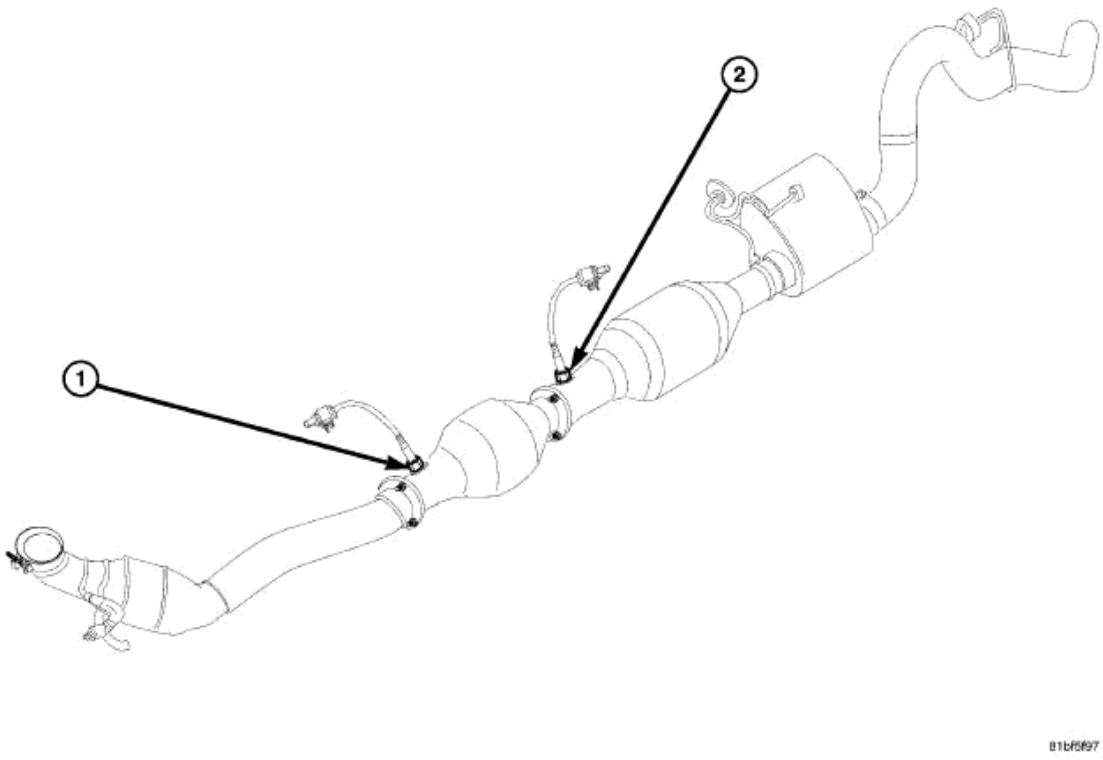


Fig. 147: O2 Sensors
Courtesy of CHRYSLER GROUP, LLC

4. Install the O2 sensor (2). Tighten to 50 N.m (37 ft. lbs.).
5. Connect the O2 sensor harness connector.
6. Lower vehicle.
7. Connect both negative battery cables.

FUEL DELIVERY, GAS

STANDARD PROCEDURE

FUEL SYSTEM PRESSURE RELEASE

Use this procedure whether or not the fuel rail is equipped with a fuel pressure test port.

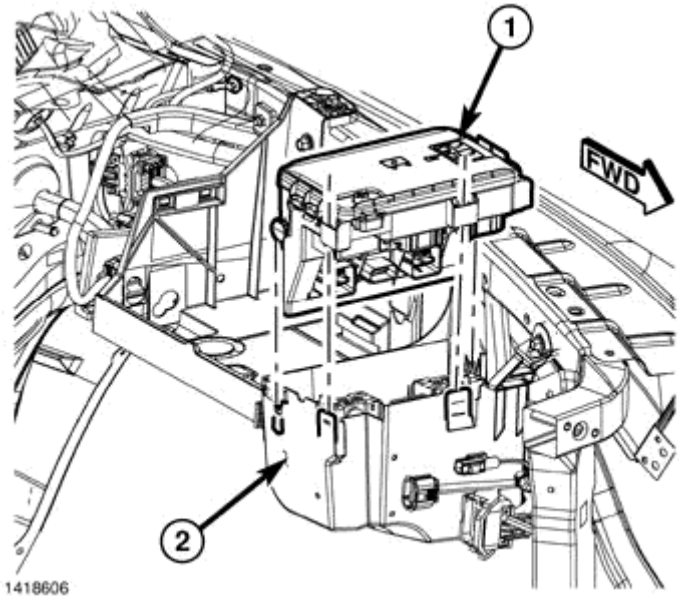


Fig. 148: Totally Integrated Power Module (TIPM)
Courtesy of CHRYSLER GROUP, LLC

A separate fuel pump relay is no longer used. A circuit within the Totally Integrated Power Module (TIPM) is used to control the electric fuel pump located within the fuel pump module. The TIPM (2) is located in the engine compartment in front of the battery.

1. Remove the fuel fill cap.
2. Remove the TIPM cover (1) from the TIPM housing base (2).

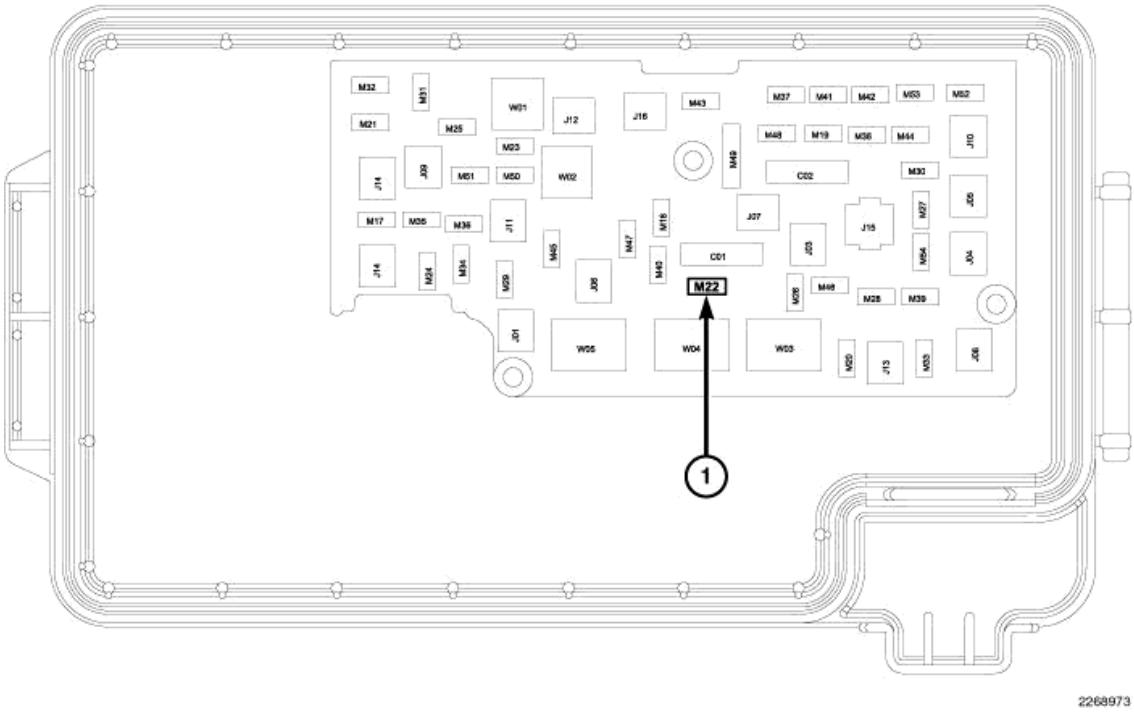


Fig. 149: Locating Fuse M22 In TIPM
Courtesy of CHRYSLER GROUP, LLC

3. Remove fuse M22 from the TIPM (1).
4. Start and run the engine until it stalls.
5. Attempt restarting the engine until it will no longer start.
6. Turn the ignition key to the OFF position.

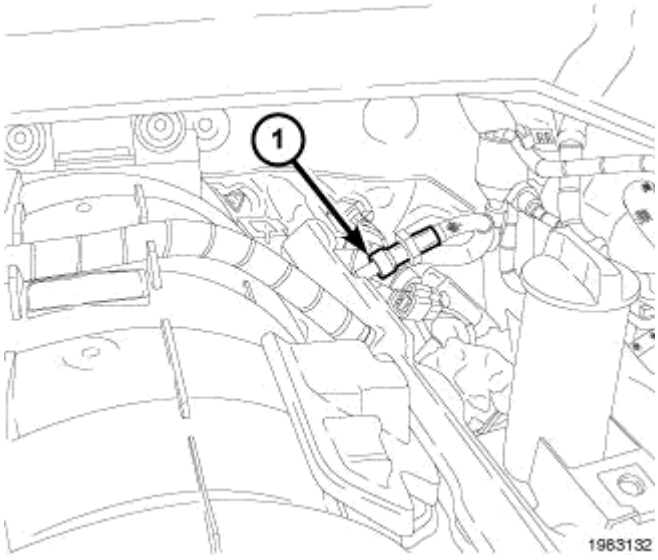


Fig. 150: Fuel Supply Line Quick Connect Fitting At Fuel Rail
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Before separating a Quick-Connect fitting, pay attention to what type of fitting is being used. Refer to STANDARD PROCEDURE - QUICK-CONNECT FITTINGS. . This will prevent unnecessary fitting or fitting latch breakage.

NOTE: Excessive fuel spillage onto the gaskets can cause gaskets to expand and dislodge from gasket groove.

7. Place a rag or towel below the fuel line quick-connect fitting at the fuel rail.
8. Disconnect the fuel line quick-connect fitting at the fuel rail (1) and plug with a shipping cap to prevent spillage. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .

NOTE: One or more Diagnostic Trouble Codes (DTC's) may have been stored in the PCM memory due to disconnecting fuel pump module circuit. A diagnostic scan tool must be used to erase a DTC.

DRAINING FUEL TANK

CONVENTIONAL PROCEDURE

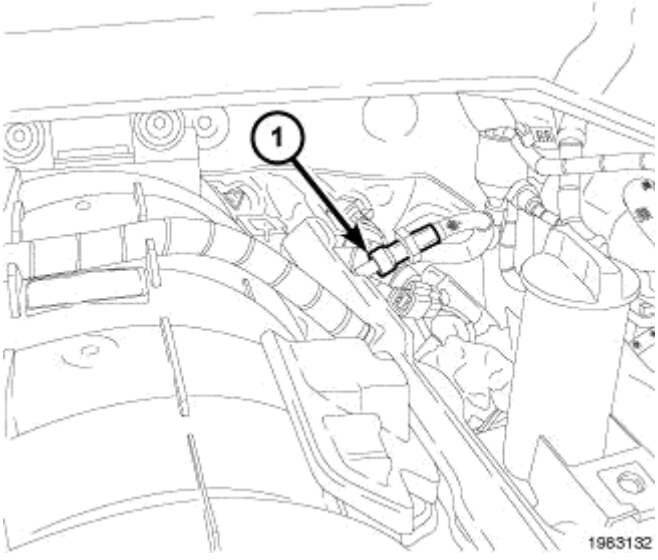


Fig. 151: Fuel Supply Line Quick Connect Fitting At Fuel Rail
Courtesy of CHRYSLER GROUP, LLC

WARNING: The fuel system may be under constant fuel pressure even with the engine off. This pressure must be released before servicing the fuel tank.

Due to a one-way check valve installed into the fuel fill fitting at the tank, the tank cannot be drained at the fuel fill cap.

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.

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2. Disconnect the fuel supply line (2) from the fuel rail. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .

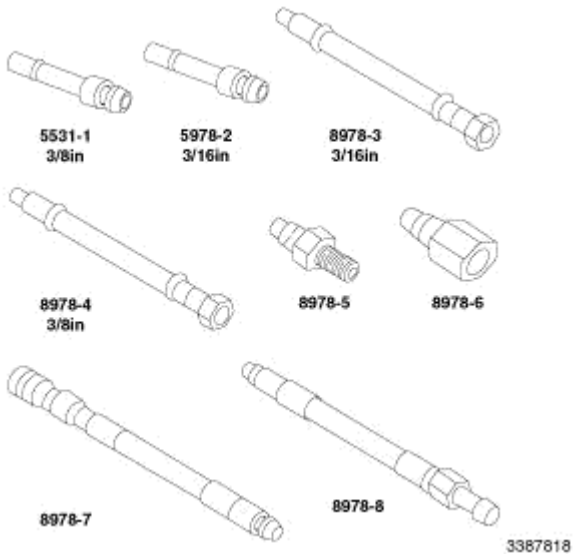

Fig. 152: Fuel Line Adapters
Courtesy of CHRYSLER GROUP, LLC

NOTE: Tool number 8978-2 is used on 5/16" fuel lines while tool number 8531-1 is used on 3/8" fuel lines.

3. Install the appropriate fuel line adapter fitting from the Decay Tool, Fuel 8978A to the fuel supply line. Route the opposite end of this hose to an OSHA approved fuel storage tank such as the John Dow Gas Caddy 320-FC-P30-A or equivalent.
4. Using a diagnostic scan tool, activate the fuel pump until the fuel tank has been evacuated.

ALTERNATIVE PROCEDURE

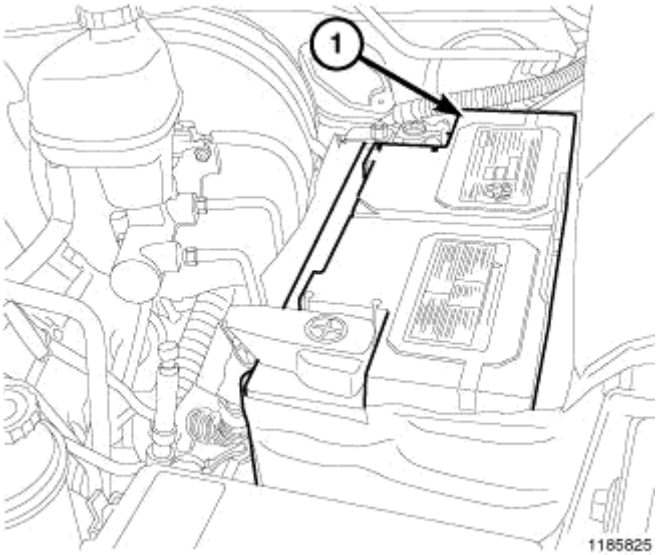

Fig. 153: Battery
Courtesy of CHRYSLER GROUP, LLC

NOTE: If the electric fuel pump is not operating, the fuel tank must be removed and drained through the fuel pump module opening of the fuel tank.

1. Perform the Fuel System Pressure Release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**. .
2. Disconnect and isolate the negative battery cable (1).
3. Raise and support the vehicle.
4. Remove the fuel tank. Refer to **TANK, FUEL, REMOVAL**.

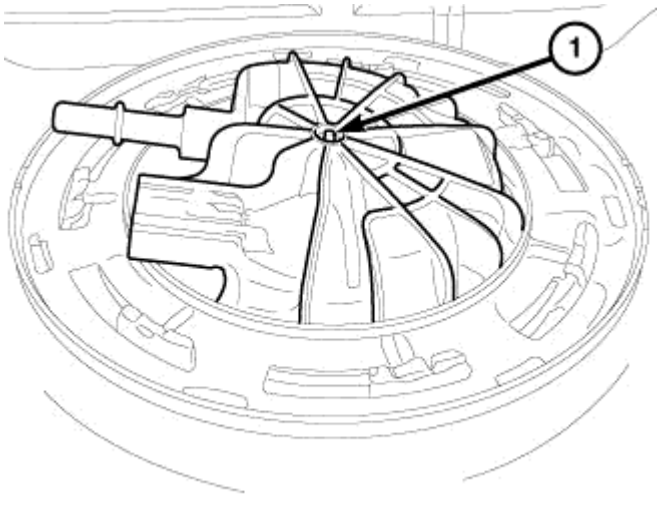

Fig. 154: Fuel Pump Module
Courtesy of CHRYSLER GROUP, LLC

5. Remove the fuel pump module (1). Refer to **MODULE, FUEL PUMP, REMOVAL**.
6. Position a 3/8" hose into the fuel pump module opening of the fuel tank.
7. Attach the opposite end of this hose to the Fuel Chief Gas Caddy 320-FC-P30-A or an OSHA approved gas caddy.
8. Using the gas caddy, evacuate the fuel tank.

SPECIFICATIONS

FUEL SYSTEM PRESSURE

58 psi +/- 2 psi

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. lbs.	In. lbs.
Accelerator Pedal Bracket Mounting	12	-	105
Accelerator Pedal Position Sensor Bracket-to-Battery Tray Bolts	3	-	30
Crankshaft Position Sensor - 3.7L	28	21	-
Crankshaft Position Sensor - 4.7L	28	21	-
Crankshaft Position Sensor - 5.7L	12	-	105 (+/-20)
Camshaft Position Sensor - 3.7L	12	-	106
Camshaft Position Sensor - 4.7L	12	-	106
Camshaft Position Sensor - 5.7L	12	9	105 (+/-) 20
EVAP Canister- to-Bracket Nuts	8.5	-	75
EVAP Canister-to-Frame Bolts	34	25	
Fuel Filler Hose Clamp at Tank	3	-	30
Fuel Filler Housing-to-Body Screws	2	-	17
Fuel Rail Mounting Bolts - 3.7L	11	-	100
Fuel Rail Mounting Bolts - 4.7L	11	-	100

Fuel Rail Mounting Bolts - 5.7L	11	-	100
Fuel Tank Mounting Straps	41	30	-
Fuel Tank Mounting Bolts - 52 Gallon Tank	55	41	-
Map Sensor Mounting Screws - 3.7L	3	-	25
Map Sensor Mounting Screws - 4.7L	3	-	25
PCM-to-Mounting Bracket Mounting Screws	4	-	35
Throttle Body Mounting Bolts - 3.7L	7.5	-	65
Throttle Body Mounting Bolts - 4.7L	7.5	-	65
Throttle Body Mounting Bolts - 5.7L	5.6	-	50
Oxygen Sensors	41	30	-
Ignition Coil Mounting Bolts	11	-	100

SPECIAL TOOLS

SPECIAL TOOLS

	9340 - SAE Fuel Pump Lock Ring Wrench (Originally Shipped In Kit Number(s) 9327, 9327CC, 9397, 9575.)

FITTING, QUICK CONNECT

DESCRIPTION

DESCRIPTION

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. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .

CAUTION: Before separating a Quick-Connect fitting, pay attention to what type of fitting is being used. Refer to STANDARD PROCEDURE - QUICK-CONNECT FITTINGS. . 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

STANDARD PROCEDURE - QUICK-CONNECT FITTINGS

Different types of quick-connect fittings are used to attach the various fuel system components, lines and tubes. Some quick-connect fittings require the use of a special tool for disconnection and removal.

These are the quick-connect fittings:

- Redundant Latch Single Button Type Fitting
- Single Button Type Fitting
- Pinch Type Fitting
- Single Tab Type Fitting
- Two Tab Type Fitting
- Plastic Retainer Ring Type Fitting
- Latch Clip Type 1 Fitting
- Latch Clip Type 2 Fitting
- Wing Type Fitting

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. .

CAUTION: Before separating a Quick-Connect fitting, pay attention to what type of fitting is being used. Refer to STANDARD PROCEDURE - QUICK-CONNECT FITTINGS. . 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.

REDUNDANT LATCH SINGLE BUTTON TYPE FITTING:

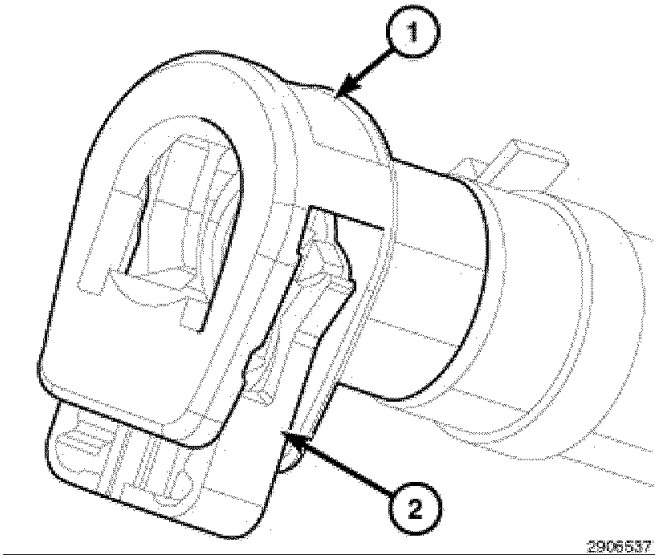

Fig. 155: Redundant Latch & Push Button
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting is equipped with a redundant latch (2) and a single push button (1) that releases two internal latches located in the quick-connect fitting. Special tools are not required for removal.

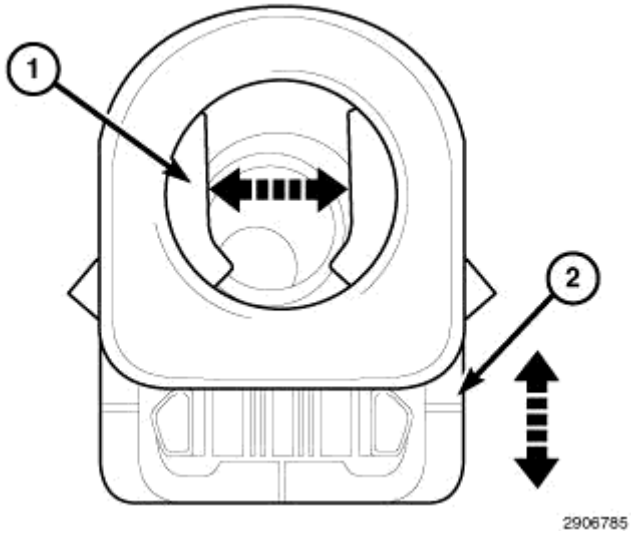

Fig. 156: Redundant Latch & Internal Latches
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not pry or pull up on the push button as damage to the latches of the quick-connect fitting will occur.

1. Pull the redundant latch (2) out away from the quick-connect fitting.
2. Press on the push button with your thumb, release the internal latches (1) and remove the quick-connect fitting from the fuel system component.

SINGLE BUTTON TYPE FITTING:

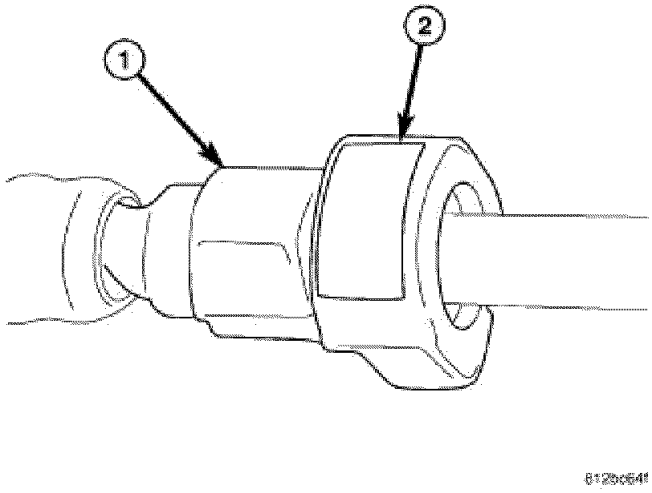

Fig. 157: Single Button Fitting
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not pry or pull up on the push button as damage to the latches of the quick-connect fitting will occur.

This type of quick-connect fitting is equipped with a single push button (2) that releases two internal latches located in the quick-connect fitting. Special tools are not required for removal.

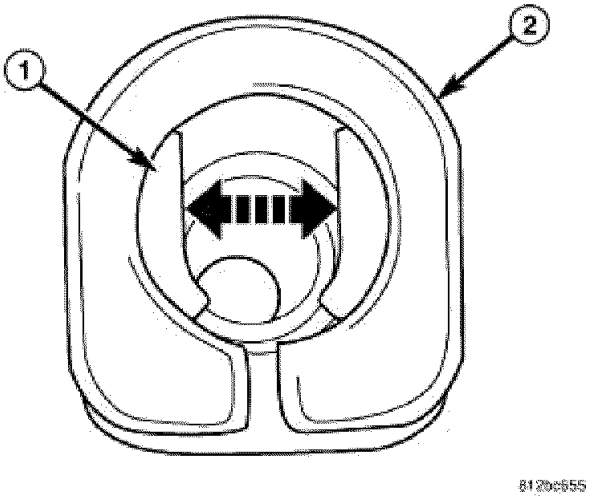

Fig. 158: Ouick-Connect Fitting Latches
Courtesy of CHRYSLER GROUP, LLC

1. Press on the push button with your thumb, release the internal latches (1).
2. Remove the quick-connect fitting from the fuel system component.

2 BUTTON TYPE FITTING

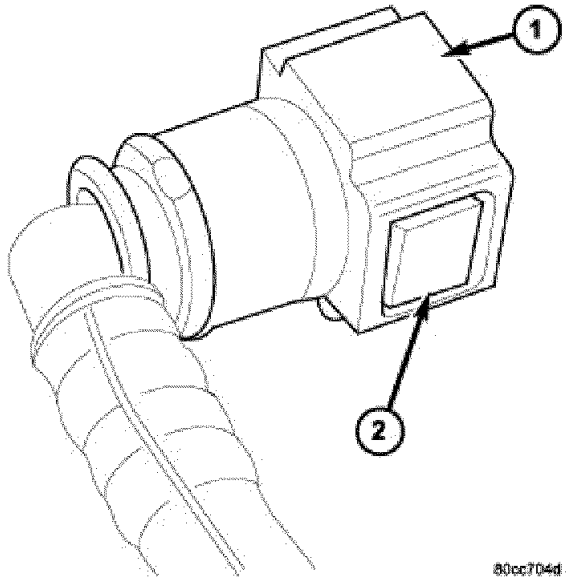

Fig. 159: View Of 2-Button Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (1) is equipped with two push buttons (2) that releases two internal latches located in the quick-connect fitting. Special tools are not required for removal.

1. Press on both push buttons with your thumb, release the internal latches.
2. While holding the two push buttons simultaneously, remove the quick-connect fitting from the fuel system component.

PINCH TYPE FITTING

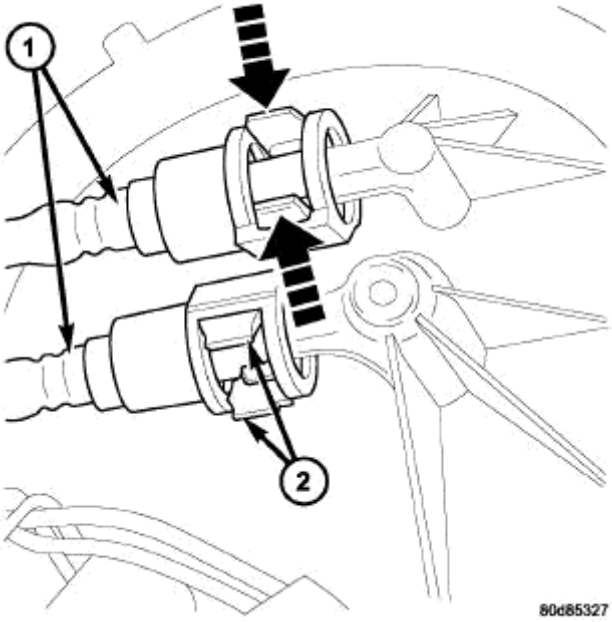

Fig. 160: View Of Pinch Type Quick-Connect Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (1) is equipped with two finger tabs (2). Special tools are not required for removal.

1. Pinch both tabs (2) together and release the quick-connect fitting.
2. Remove the quick-connect fitting from the fuel system component.

SINGLE TAB TYPE FITTING

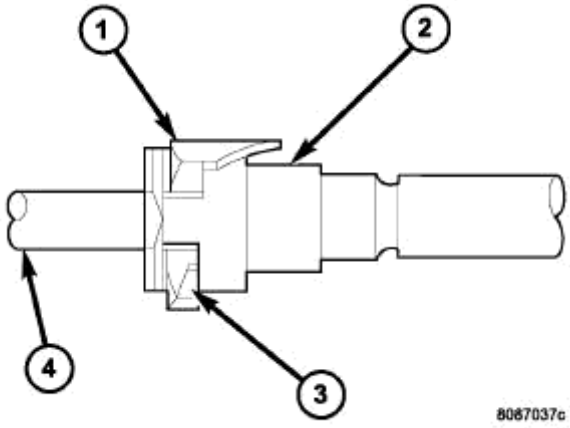

Fig. 161: View Of Single-Tab Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (3) is equipped with a single pull tab (1). The tab is removable. After tab is removed the quick-connect fitting can be separated from the fuel system component. Special tools are not required for removal.

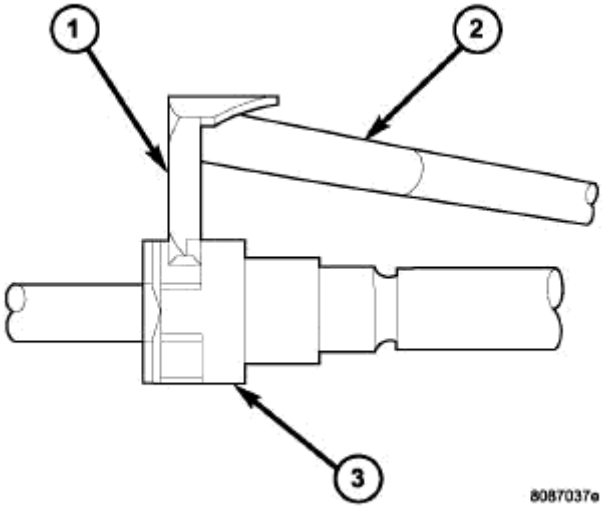

Fig. 162: Disconnecting Single-Tab Type Fitting
Courtesy of CHRYSLER GROUP, LLC

1. 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.**
2. While pressing the release tab on the side of the quick-connect fitting use a screwdriver (2) to pry up the pull tab.
3. Raise the pull tab until it separates from the quick-connect fitting.
4. Remove the quick-connect fitting from the fuel system component.

TWO TAB TYPE FITTING

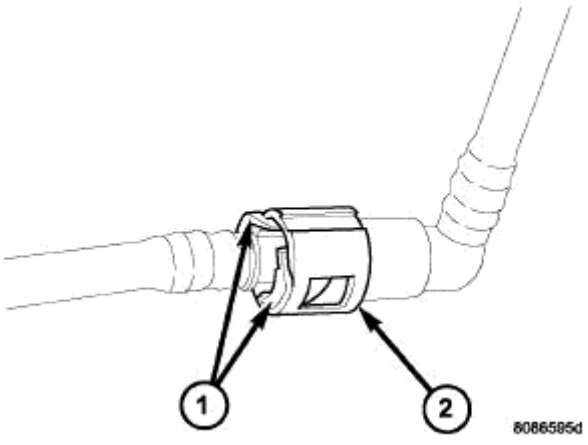

Fig. 163: Identifying Typical 2-Tab Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of quick-connect fitting (2) is equipped with tabs located on both sides of the fitting (1). These tabs are integral to the fuel system component. The plastic tabs will remain on the component being serviced after the quick-connect fitting is removed. The O-ring and spacer will remain in the quick-connect fitting. Special tools are not required for removal.

1. Squeeze the plastic tabs (1) against the sides of component being serviced with your fingers.
2. Remove the quick-connect fitting from the fuel system component.

PLASTIC RETAINER RING TYPE FITTING

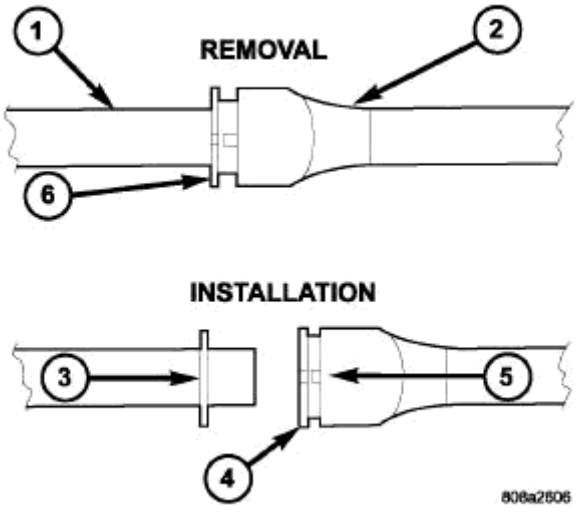

Fig. 164: Plastic Retainer Ring Type Fitting
Courtesy of CHRYSLER GROUP, LLC

This type of fitting can be identified by the use of a round plastic retainer ring (4) usually black in color. Special tools are not required for removal.

NOTE: The round plastic retainer ring must be pressed squarely into the quick-connect fitting body. If this retainer is cocked during removal it will be difficult to disconnect the quick-connect fitting. Use an open-end wrench on the shoulder of the plastic retainer ring to aid in disconnection.

1. Firmly push the quick-connect fitting (5) towards the component being serviced while firmly pushing the round plastic retainer ring into the quick-connect fitting (6). With the round plastic ring depressed, remove the quick-connect fitting from the fuel system component.
2. After removal the plastic retainer ring will remain with the quick-connect fitting.

LATCH CLIP TYPE 1 FITTING

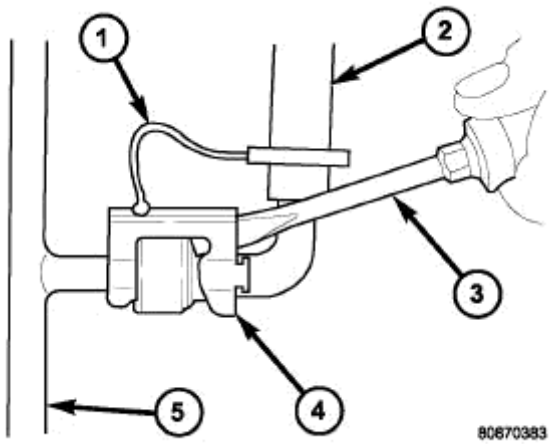

Fig. 165: Latch Clip Type 1
Courtesy of CHRYSLER GROUP, LLC

Depending on vehicle model and engine, 2 different types of safety latch clips are used. One is tethered (1) to fuel line and the other is not. A special tool will be necessary to disconnect the fuel line after latch clip is removed. The latch clip may be used on certain fuel line and fuel rail connections or to join fuel lines together.

1. Pry up on the latch clip (4) with a screwdriver (3).
2. Slide the latch clip away from the quick-connect fitting while lifting the screwdriver and position aside.

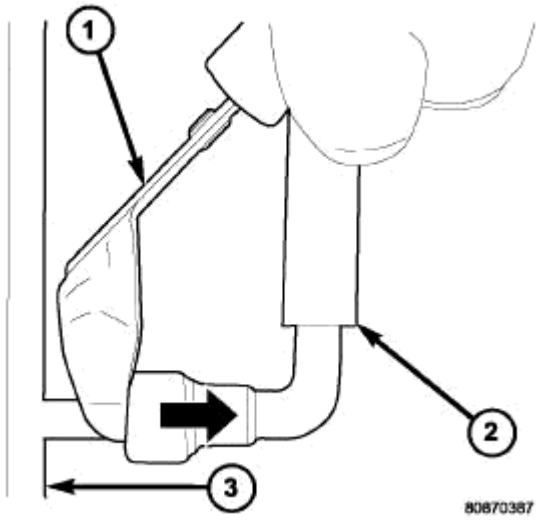

Fig. 166: Fuel Line Disconnection Using Special Tool
Courtesy of CHRYSLER GROUP, LLC

3. Insert the commercially available fuel line removal tool (1) into the quick-connect fitting and release the internal latches.

NOTE: After removal the internal latches will remain in the quick-connect fitting.

4. With the commercially available fuel line removal tool (1) still inserted, remove the quick-connect fitting from the fuel system component.

LATCH CLIP TYPE 2 FITTING

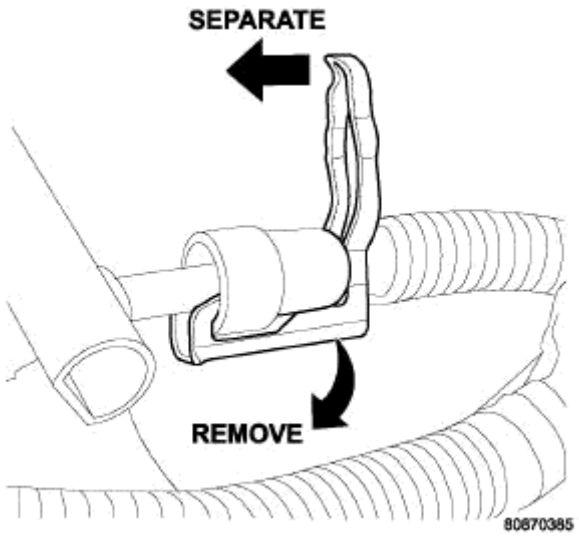

Fig. 167: Latch Clip Type 2
Courtesy of CHRYSLER GROUP, LLC

Depending on vehicle model and engine, 2 different types of safety latch clips are used. One is tethered to the fuel line and the other is not. A special tool will be necessary to disconnect the fuel line after the latch clip is removed. The latch clip may be used on certain fuel line and fuel rail connections or to join fuel lines together.

1. Unlatch the small arms on the end of clip, swing away and separate from the fuel system component.
2. Slide the latch clip away from the quick-connect fitting while lifting with a screwdriver and position aside.

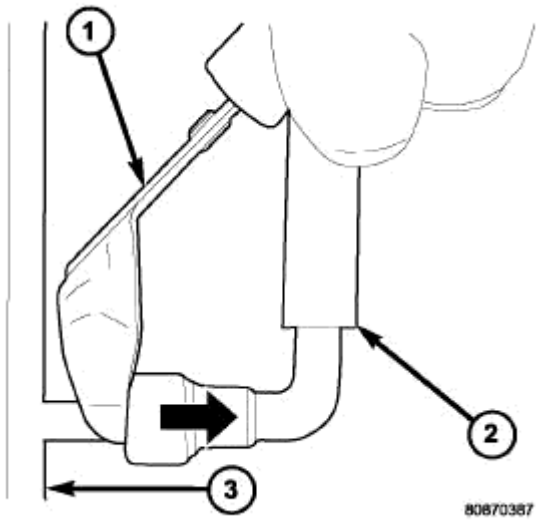

Fig. 168: Fuel Line Disconnection Using Special Tool
Courtesy of CHRYSLER GROUP, LLC

3. Insert the commercially available fuel line removal tool (1) into the quick-connect fitting and release the internal latches.

NOTE: After removal the internal latches will remain in the quick-connect fitting.

4. With the commercially available fuel line removal tool (1) inserted, remove the quick-connect fitting from the fuel system component.

WING TYPE FITTING

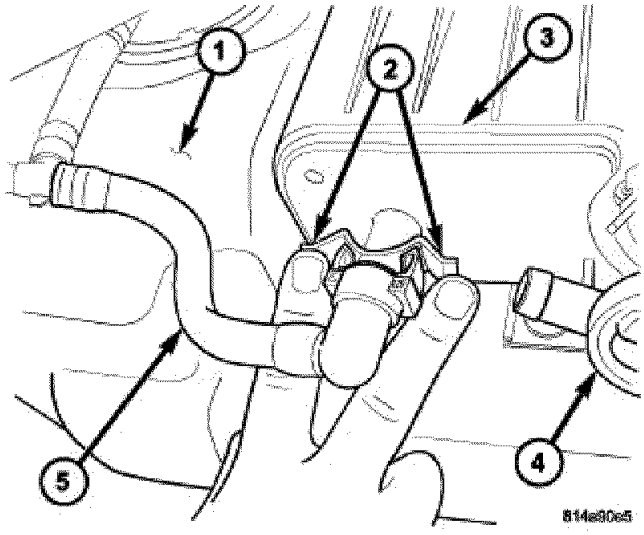

Fig. 169: Wing Type Fitting

Courtesy of CHRYSLER GROUP, LLC

The wing type fitting is used on fuel system and emission components. The wing type fitting is most commonly used on the EVAP canister (3). Special tools are not required for removal.

1. Using two fingers, press both wings (2) and release the locking tabs.

NOTE: After removal the locking tabs will remain with the quick-connect fitting.

2. While holding the wings, remove the quick-connect fitting from the fuel system component.

CONNECTING

1. Inspect the quick-connect fitting body and fuel system components for damage. Replace as necessary.
2. Prior to connecting any quick-connect fitting to components, check condition of fitting and components. Clean parts with a lint-free cloth. Lubricate with clean engine oil.
3. Insert the quick-connect fitting onto the fuel tube or fuel system component until the built-in stop on the fuel tube or component rests against the back of fitting.
4. Continue pushing until a click is felt.
5. If Equipped:
   - **Redundant Latch Single Button Type Fitting:** Push redundant latch until it locks into position in the quick-connect fitting.
   - **Single Tab Type Fitting:** Push new tab down until it locks into position in the quick-connect fitting.
   - **Latch Clip Type Fitting:** Install latch clip (snaps into position). **If latch clip will not snap into position, this indicates the quick-connect fitting is not properly installed onto fuel system component, recheck the connection.**
6. Verify a locked condition by firmly pulling on the quick-connect fitting connection of the fuel system component.

MODULE, FUEL PUMP, ELECTRIC

DESCRIPTION

DESCRIPTION

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

ELECTRIC 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 bottom section of 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

DESCRIPTION

FUEL PUMP MODULE

The fuel pump module assembly is located on the top of the fuel tank . The complete assembly contains the following components:

- A combination fuel filter/fuel pressure regulator
- A separate fuel pick-up, or inlet filter
- An electric fuel pump
- A lock ring to retain pump module to tank
- A soft gasket between tank flange and module
- A fuel gauge sending unit (fuel level sensor)
- Fuel line connection

The fuel gauge sending unit may be serviced separately. If the electrical fuel pump, primary inlet filter, fuel filter or fuel pressure regulator require service, the fuel pump module must be replaced.

OPERATION

OPERATION

Refer to **REGULATOR, FUEL PRESSURE** and **SENDING UNIT AND SENSOR, FUEL LEVEL**.

REMOVAL

REMOVAL

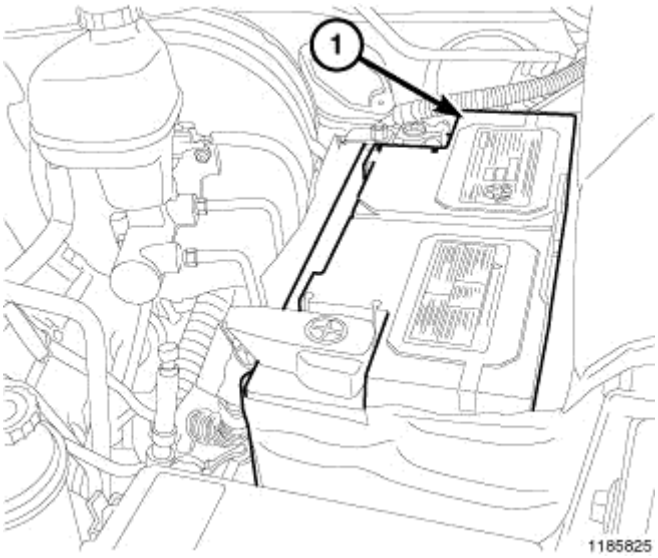

Fig. 170: Battery
Courtesy of CHRYSLER GROUP, LLC

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

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.
   .
2. Disconnect and isolate the negative battery cable (1).
3. Remove the fuel tank. Refer to **TANK, FUEL, REMOVAL**.

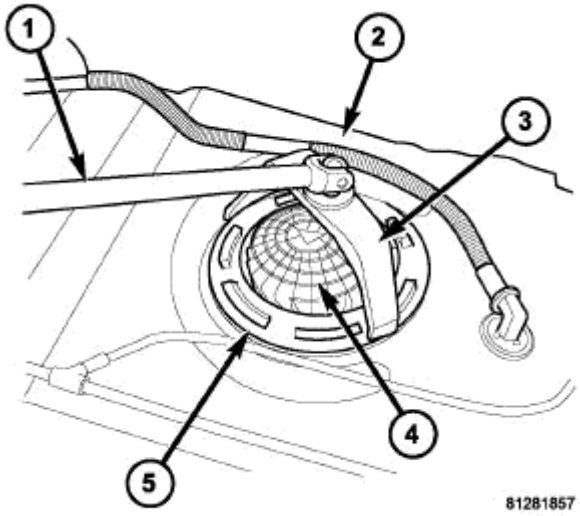

Fig. 171: Fuel Pump Module Lock Ring
Courtesy of CHRYSLER GROUP, LLC

NOTE: Prior to removing the fuel pump module, use compressed air to remove any accumulated dirt and debris from around fuel tank opening.

CAUTION: An indexing arrow is located on top of the main fuel pump module to clock it's position into the fuel tank, note it's location for reassembly.

4. Position the lock ring remover/installer (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3) into the notches on the outside edge of the lock ring (5).
5. Install a 1/2 inch drive breaker bar (1) into the lock ring remover/installer (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3).
6. Rotate the breaker bar counterclockwise and remove the lock ring.

CAUTION: Whenever the fuel pump module is serviced, the rubber O-ring seal must be replaced.

7. Remove the fuel pump module (4) from the fuel tank. Be careful not to bend float arm during removal.
8. Remove and discard the rubber O-ring seal.

INSTALLATION

INSTALLATION

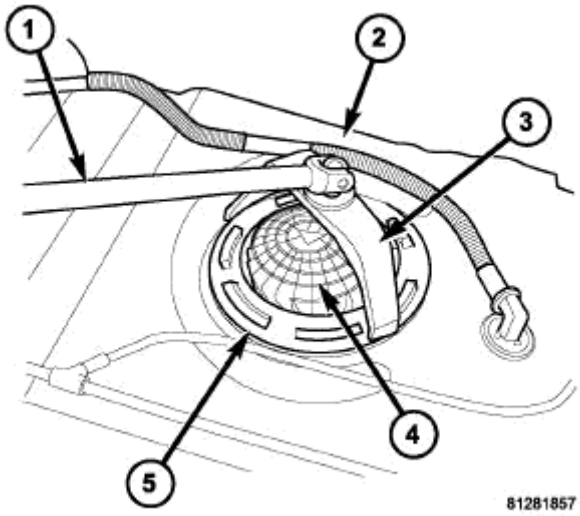

Fig. 172: Fuel Pump Module Lock Ring
Courtesy of CHRYSLER GROUP, LLC

CAUTION: An indexing arrow is located on top of the main fuel pump module to clock it's position into the fuel tank. The fuel pump module must be installed in the same position as removed.

1. Using a new rubber O-ring seal, position the fuel pump module into the fuel tank opening.
2. Position the lock ring (5) over top of the fuel pump module.
3. Rotate the fuel pump module until the embossed alignment arrow points to the center alignment mark or the same position as noted during removal. This step must be performed to prevent the float from contacting the side of the fuel tank.
4. Install the lock ring remover/installer (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3) into the notches on the outside edge of the lock ring (5).
5. Install a 1/2 inch drive breaker bar (1) into the lock ring remover/installer (special tool #9340, SAE Fuel Pump Lock Ring Wrench) (3).
6. Rotate the breaker bar clockwise until all seven notches of the lock ring have engaged.
7. Install the fuel tank. Refer to **TANK, FUEL, INSTALLATION**.

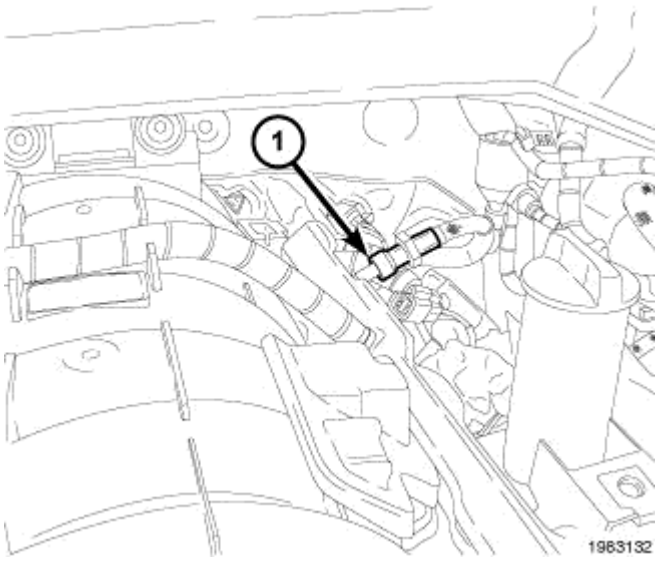

Fig. 173: Fuel Supply Line Quick Connect Fitting At Fuel Rail
Courtesy of CHRYSLER GROUP, LLC

8. Connect the fuel line quick-connect fitting at the fuel rail (1).

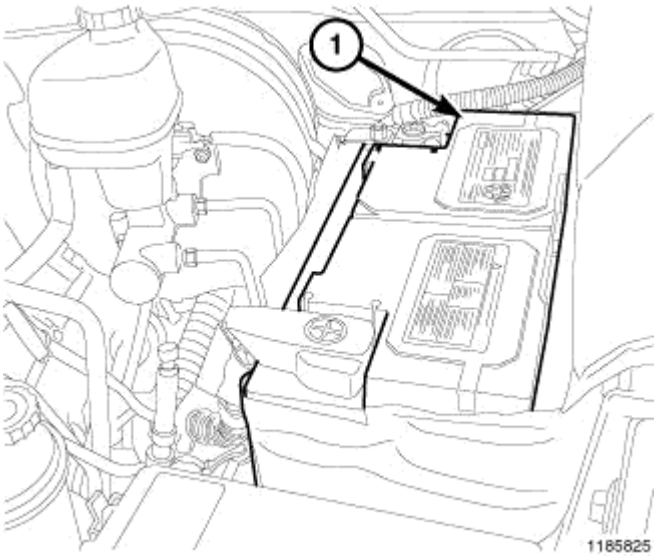

Fig. 174: Battery
Courtesy of CHRYSLER GROUP, LLC

9. Connect the negative battery cable (1).
10. Fill the fuel tank.
11. Start the engine and check for leaks at all fuel tank connections.

RAIL, FUEL

DESCRIPTION

DESCRIPTION

The fuel injector rail is used to mount the fuel injectors to the engine.

OPERATION

OPERATION

High pressure from the fuel pump is routed to the fuel rail. The fuel rail then supplies the necessary fuel to each individual fuel injector.

A quick-connect fitting with a safety latch clip is used to attach the fuel line to the fuel rail.

The fuel rail is not repairable.

CAUTION: The left and right sections of the fuel rail are connected with either a flexible connecting hose, or joints. Do not attempt to separate the rail halves at these connecting hose or joints. Due to the design of the connecting hose or joint, it does not use any clamps. Never attempt to install a clamping device of any kind to the hose or joint. When removing the fuel rail assembly for any reason, be careful not to bend or kink the

connecting hose or joint.

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.

CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tubes. Refer to Fig. 176. Due to design of tubes, it does not use any clamps. Never attempt to install a clamping device of any kind to tubes. When removing fuel rail assembly for any reason, be careful not to bend or kink tubes.

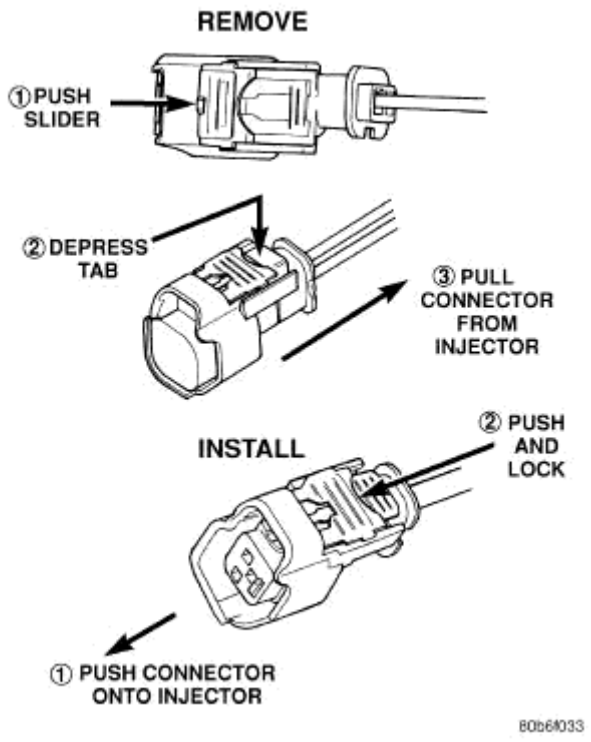

Fig. 175: Removing/Installing Injector Connector
Courtesy of CHRYSLER GROUP, LLC

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**. .
3. Remove negative battery cable at battery.
4. Remove air duct at throttle body air box.
5. Remove air box at throttle body.

6. Remove air resonator mounting bracket at front of throttle body (2 bolts).
7. Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .
8. Remove necessary vacuum lines at throttle body.
9. Disconnect electrical connectors at all 6 fuel injectors. To remove connector. Refer to **Fig. 175**. 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.
10. Disconnect electrical connectors at all throttle body sensors.
11. Remove 6 ignition coils. Refer to **COIL, IGNITION, REMOVAL** .

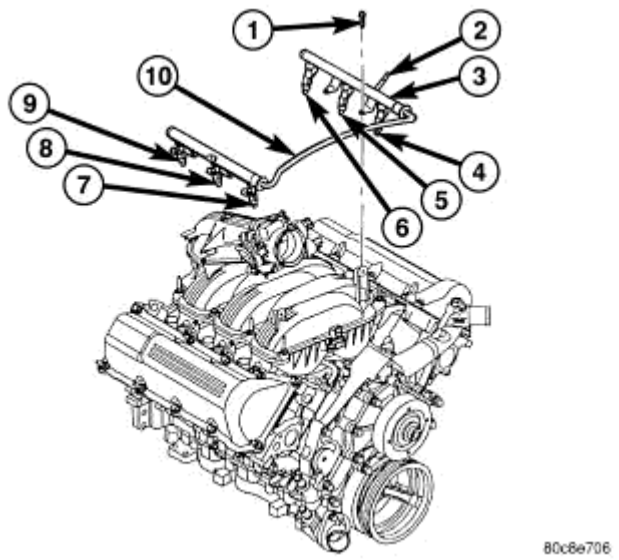

Fig. 176: Fuel Rail - 3.7L V-6
Courtesy of CHRYSLER GROUP, LLC

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

12. Remove 4 fuel rail mounting bolts (1). Refer to **Fig. 176**.
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 **INJECTOR(S), FUEL, REMOVAL**.

4.7L

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

CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tubes. Refer to Fig. 178. Due to design of tubes, it does not use any clamps. Never attempt to install a clamping device of any kind to tubes. When removing fuel rail assembly for any reason, be careful not to bend or kink tubes.

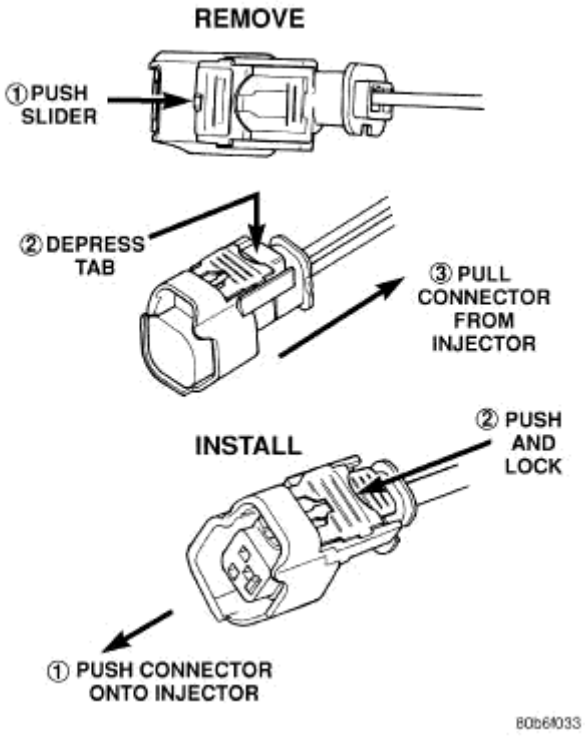

Fig. 177: Removing/Installing Injector Connector
Courtesy of CHRYSLER GROUP, LLC

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**. .
3. Remove negative battery cable at battery.
4. Remove air duct at throttle body air box.

5. Remove air box at throttle body.
6. Remove air resonator mounting bracket at front of throttle body (2 bolts).
7. Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .
8. Remove necessary vacuum lines at throttle body.
9. Disconnect electrical connectors at all 8 fuel injectors. To remove connector. Refer to **Fig. 177**. 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.
10. Disconnect electrical connectors at all throttle body sensors.
11. Remove 8 ignition coils. Refer to **COIL, IGNITION, REMOVAL** .

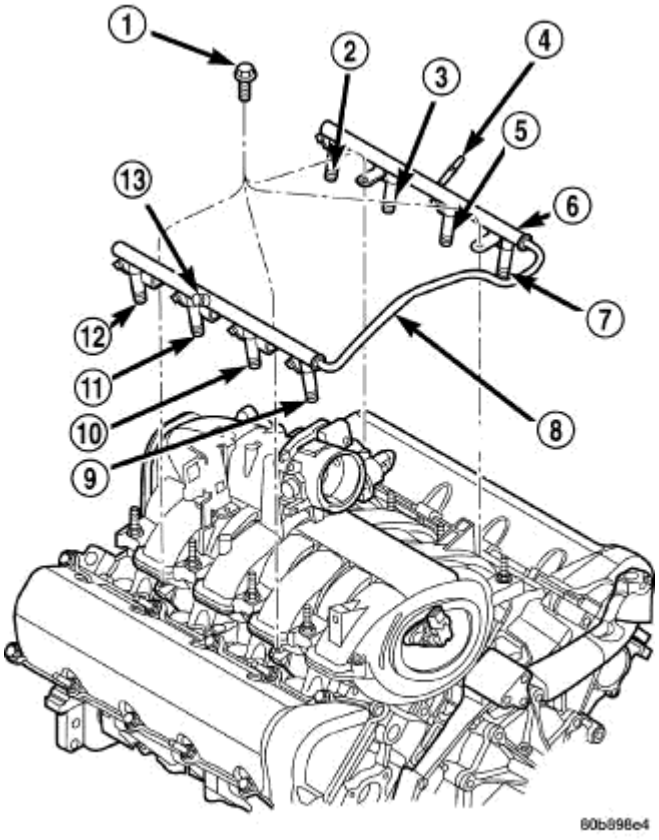

Fig. 178: Fuel Rail - 4.7L V-8
Courtesy of CHRYSLER GROUP, LLC

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

6 - FUEL INJECTOR RAIL
7 - INJ.#1
8 - CONNECTOR TUBE
9 - INJ.#2
10 - INJ.#4
11 - INJ.#6
12 - INJ.#8
13 - PRESSURE TEST PORT CAP

12. Remove 4 fuel rail mounting bolts (1). Refer to **Fig. 178**.
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 **INJECTOR(S), FUEL, REMOVAL**.

5.7L

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

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.
.
2. Remove the negative battery cable.

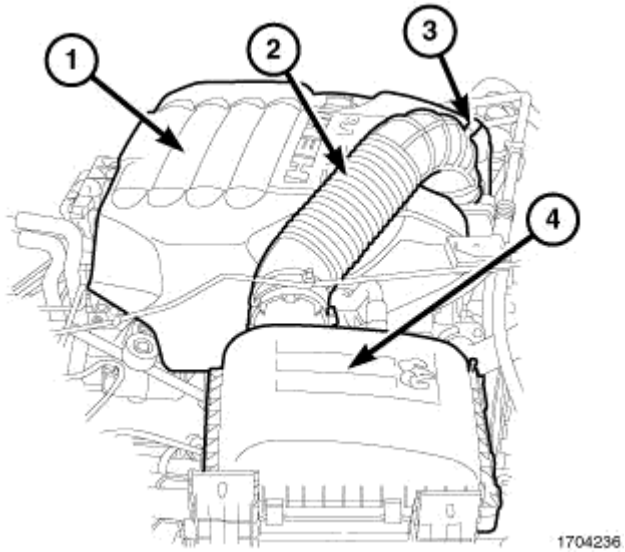

Fig. 179: Engine Cover, Clean Air Hose, Intake Air Temperature (IAT) Sensor Electrical Connector & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the IAT sensor electrical connector (3).
4. Remove the clean air tube (2) from the air cleaner housing (4) and the throttle body.

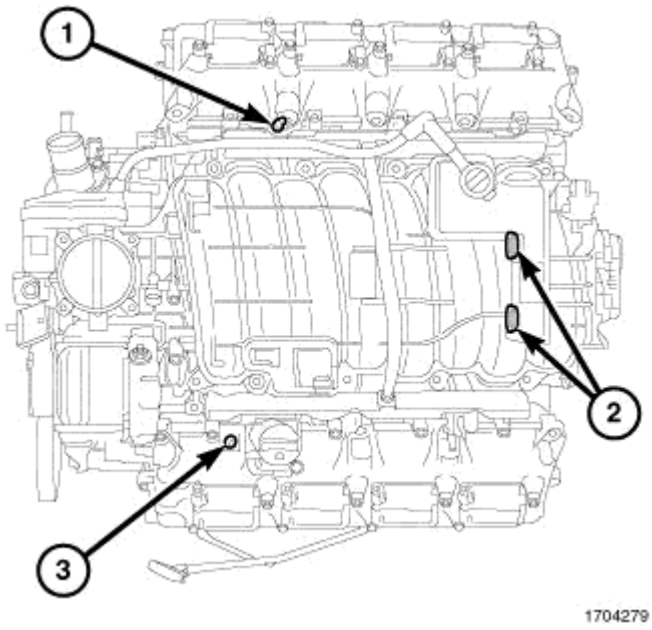

Fig. 180: Engine Cover Mounts
Courtesy of CHRYSLER GROUP, LLC

NOTE: The front grommets (1, 3) are a ball stud type mount and the rear grommets (2) are a sliding peg design.

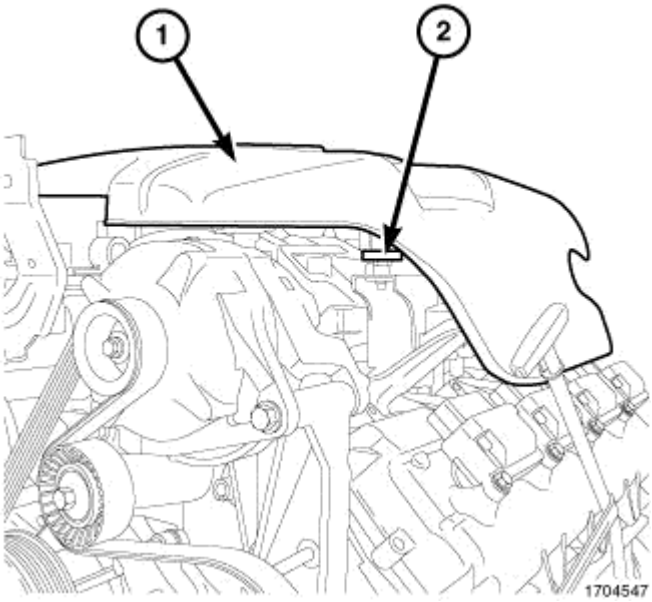

Fig. 181: Engine Cover & Grommets

Courtesy of CHRYSLER GROUP, LLC

5. Lift up the front of the engine cover (1) and separate the engine cover front grommets (2) from the ball studs on the intake manifold.

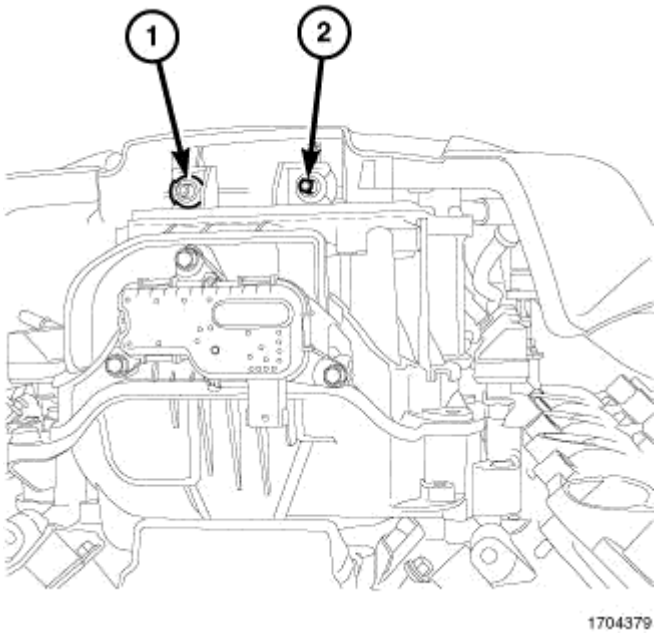

Fig. 182: Engine Cover Pegs & Grommets
Courtesy of CHRYSLER GROUP, LLC

6. Slightly raise the front of the engine cover and slide forward to remove the rear engine cover pegs (2) from the grommets (1) located on the rear of the intake manifold and remove the engine cover.

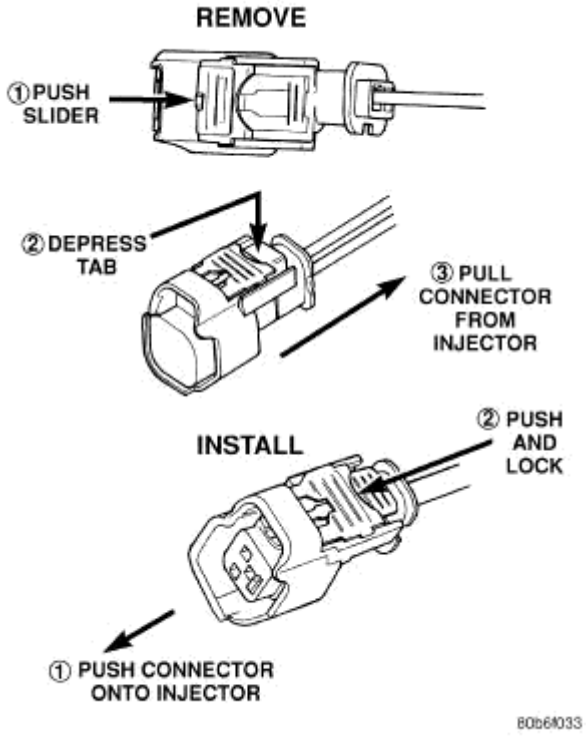

Fig. 183: Removing/Installing Fuel Injector Connector
Courtesy of CHRYSLER GROUP, LLC

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

NOTE: The factory fuel injection electrical harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If the electrical harness is not tagged, note the injector position before electrical harness removal.

7. Disconnect the electrical connectors at all eight fuel injectors. Push the red colored slider away from the injector (1) while pushing slider, depress tab (2) and remove the electrical connector (3) from the injector.

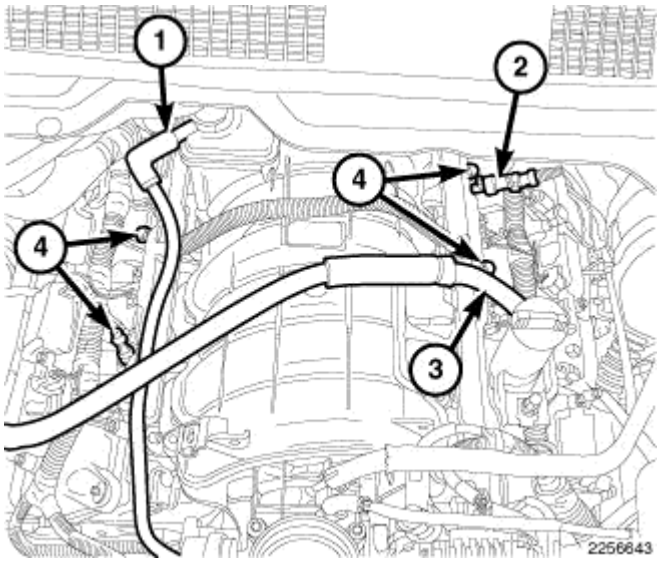

Fig. 184: PCV Hose & Fuel Line Quick Connect Fitting
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the PCV hose (1) and position aside to gain access to the fuel rail.
9. Disconnect the fuel line quick connect fitting (2) at the fuel rail. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .
10. Disconnect the make up air hose (3) and position aside to gain access to the fuel rail.
11. Remove the four fuel rail mounting bolts (4) from both the left and right fuel rails.
12. Using a side to side motion, gently rock the left fuel rail while pulling up until all four left side fuel injectors just start to clear the machined holes in the intake manifold.
13. Using a side to side motion, gently rock the right fuel rail while pulling up until all four right side fuel injectors just start to clear the machined holes in the intake manifold.

NOTE: Make sure the O-rings are still attached to the fuel injectors during removal.

14. Remove the left and right fuel rails (with injectors attached) as an assembly from the engine.

NOTE: If the same fuel injectors are to be reinstalled, install new O-rings.

15. If the fuel injectors are to be removed from the fuel rail. Refer to **INJECTOR(S), FUEL, REMOVAL**.

INSTALLATION

3.7L

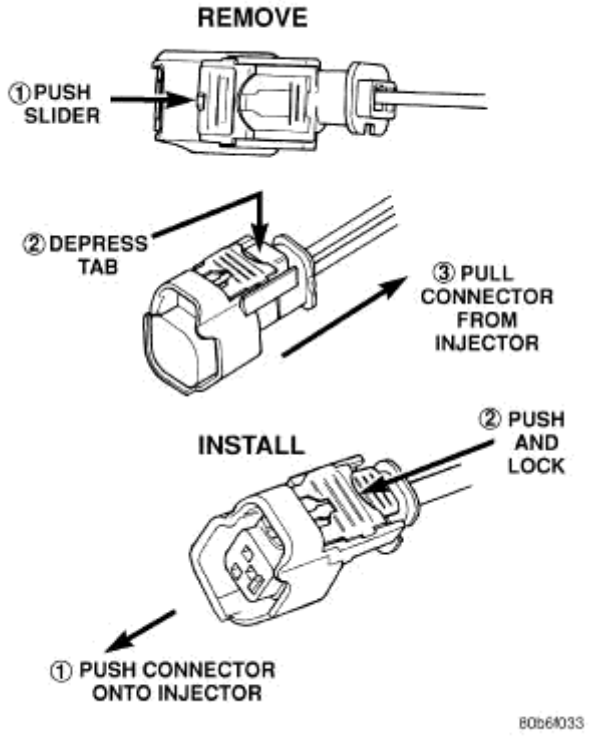

Fig. 185: Removing/Installing Injector Connector
Courtesy of CHRYSLER GROUP, LLC

1. If fuel injectors are to be installed. Refer to **INJECTOR(S), FUEL, 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 4 fuel rail mounting bolts and tighten. Refer to **SPECIFICATIONS**. .
8. Install 6 ignition coils. Refer to **COIL, IGNITION, INSTALLATION** .
9. Connect electrical connectors to throttle body.
10. Connect electrical connectors at all fuel injectors. To install connector. Refer to **Fig. 185**. 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 lines to throttle body.
12. Install air resonator mounting bracket near front of throttle body (2 bolts).
13. Connect fuel line latch clip and fuel line to fuel rail. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .
14. Install air box to throttle body.
15. Install air duct to air box.

16. Connect battery cable to battery.
17. Start engine and check for leaks.

4.7L

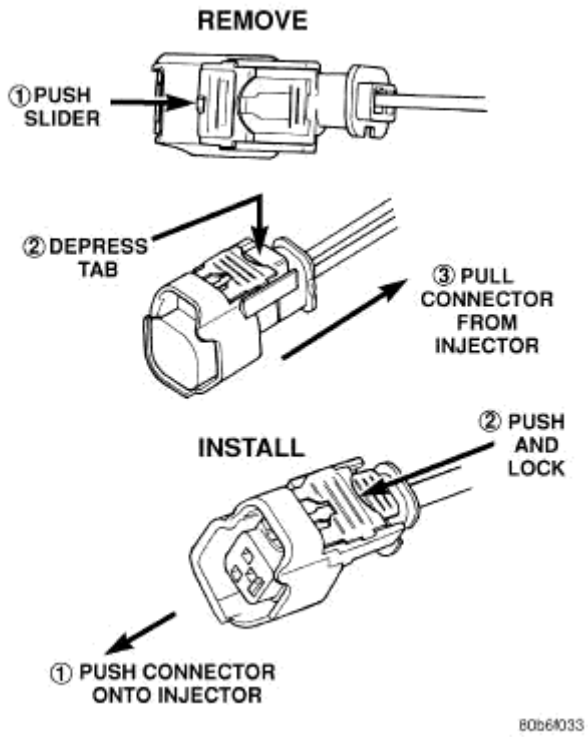

Fig. 186: Removing/Installing Injector Connector
Courtesy of CHRYSLER GROUP, LLC

1. If fuel injectors are to be installed. Refer to **INJECTOR(S), FUEL, 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 4 fuel rail mounting bolts and tighten. Refer to **SPECIFICATIONS**. .
8. Install 8 ignition coils. Refer to **COIL, IGNITION, INSTALLATION** .
9. Connect electrical connectors to throttle body.
10. Connect electrical connectors at all fuel injectors. To install connector. Refer to **Fig. 186**. 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 lines to throttle body.

12. Install air resonator mounting bracket near front of throttle body (2 bolts).
13. Connect fuel line latch clip and fuel line to fuel rail. Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .
14. Install air box to throttle body.
15. Install air duct to air box.
16. Connect battery cable to battery.
17. Start engine and check for leaks.

5.7L

1. If the fuel injectors are to be installed into the fuel rail. Refer to **INJECTOR(S), FUEL, INSTALLATION**.
2. Clean out the fuel injector machined holes in the intake manifold.

NOTE: If the same fuel injectors are to be reinstalled, install new O-rings.

3. Apply a small amount of engine oil to each fuel injector O-ring. This will help in the fuel rail installation.
4. Position the fuel rail assembly while aligning the injectors into the machined holes in the intake manifold.
5. Guide each injector into the intake manifold using care not to tear the injector O-rings.
6. Using a side to side motion, gently rock the left fuel rail while pushing down until all four left side fuel injectors have completely seated into the machined holes in the intake manifold.
7. Using a side to side motion, gently rock the right fuel rail while pushing down until all four right side fuel injectors have completely seated into the machined holes in the intake manifold.

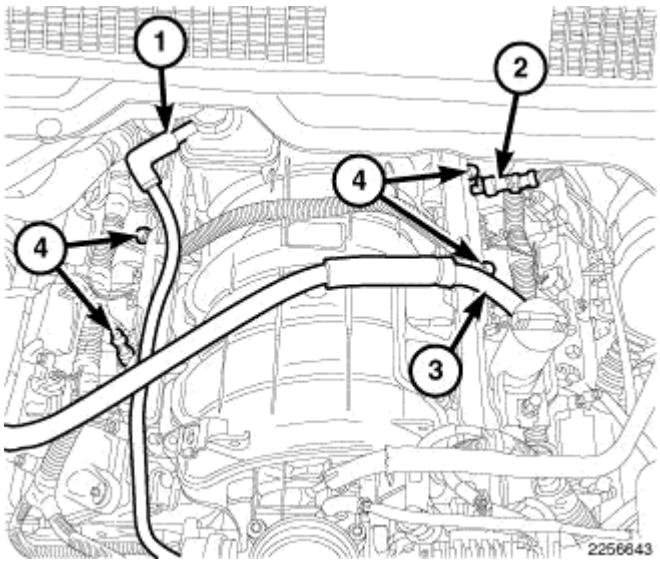

Fig. 187: PCV Hose & Fuel Line Quick Connect Fitting
Courtesy of CHRYSLER GROUP, LLC

8. Install the four fuel rail mounting bolts (4) and tighten to 11 N.m (8 ft. lbs.).
9. Connect the make up air hose (3).

10. Connect the fuel line quick connect fitting to the fuel rail (2). Refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**. .
11. Connect the PCV hose (1).

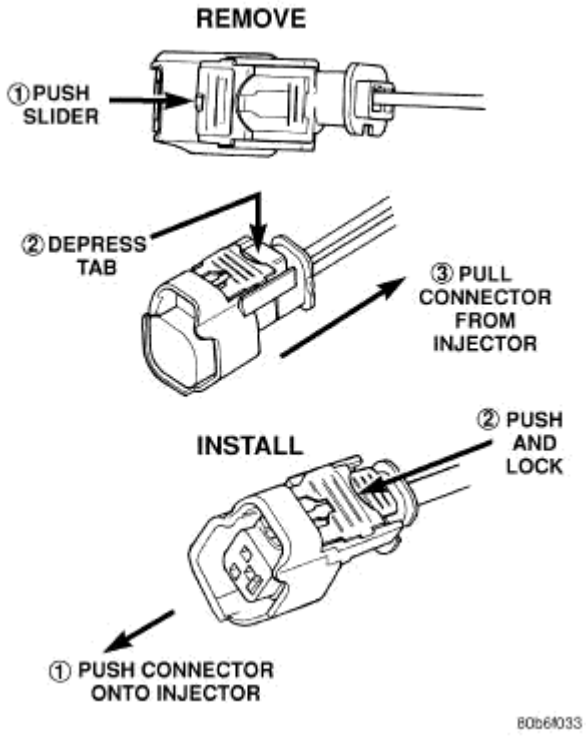

Fig. 188: Removing/Installing Fuel Injector Connector
Courtesy of CHRYSLER GROUP, LLC

12. Connect the electrical connectors to all eight fuel injectors. Push the connector onto the injector (1) and then push and lock the red colored slider (2). Verify the connector is locked to the injector by lightly tugging on the connector.

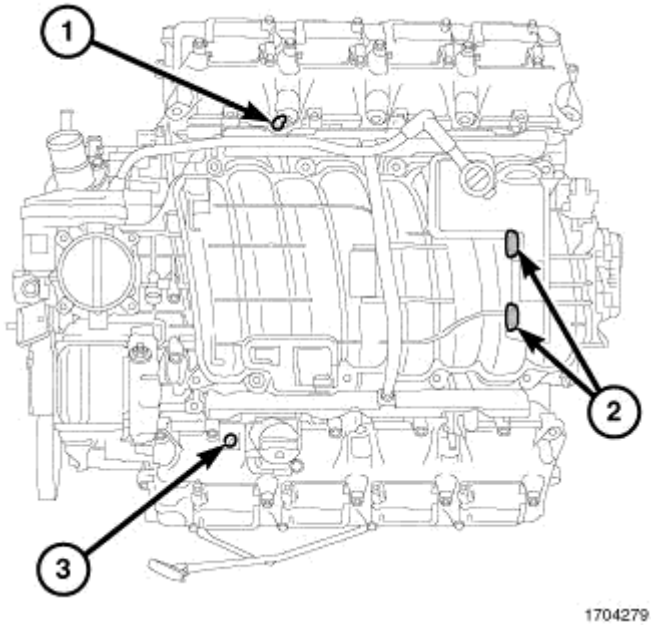

Fig. 189: Engine Cover Mounts
Courtesy of CHRYSLER GROUP, LLC

NOTE: The front grommets (1, 3) are a ball stud type mount and the rear grommets (2) are a sliding peg design.

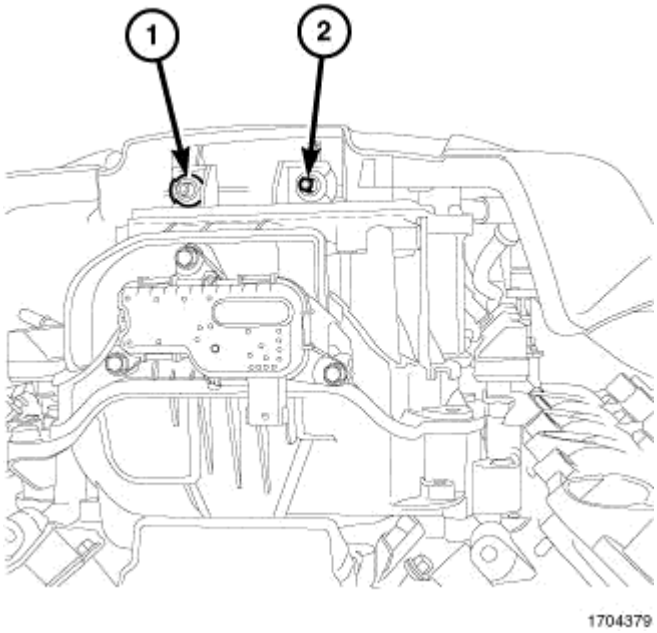

Fig. 190: Engine Cover Pegs & Grommets
Courtesy of CHRYSLER GROUP, LLC

13. Slightly tilt the rear of the engine cover and slide the rear engine cover pegs (2) into the grommets (1) on

the rear of the intake manifold until the cover stops.

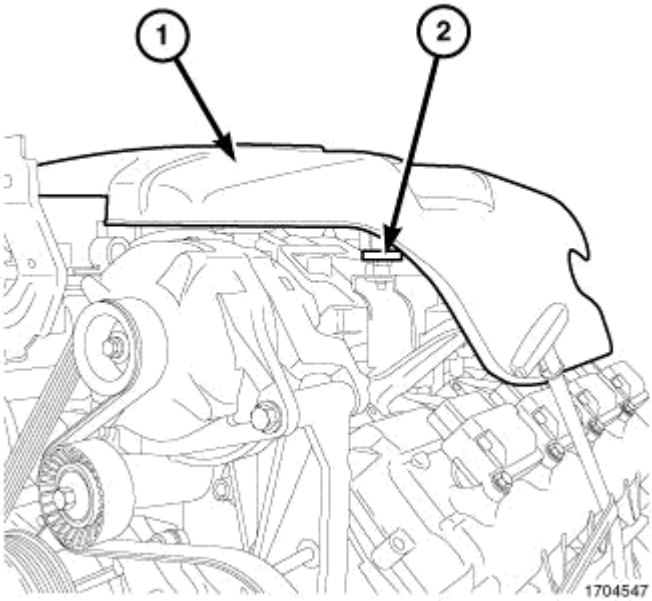

Fig. 191: Engine Cover & Grommets
Courtesy of CHRYSLER GROUP, LLC

NOTE: While installing the engine cover, the front ball studs will make a popping or suction sound as the ball studs are inserted into the front grommets.

14. Lower the front of the engine cover (1) and line up the front ball studs with the grommets (2) on the front of the intake manifold and with a downward motion push the engine cover front grommets onto the ball studs.
15. Lightly lift the front of the engine cover to insure the front the front grommets are seated onto the ball studs correctly.

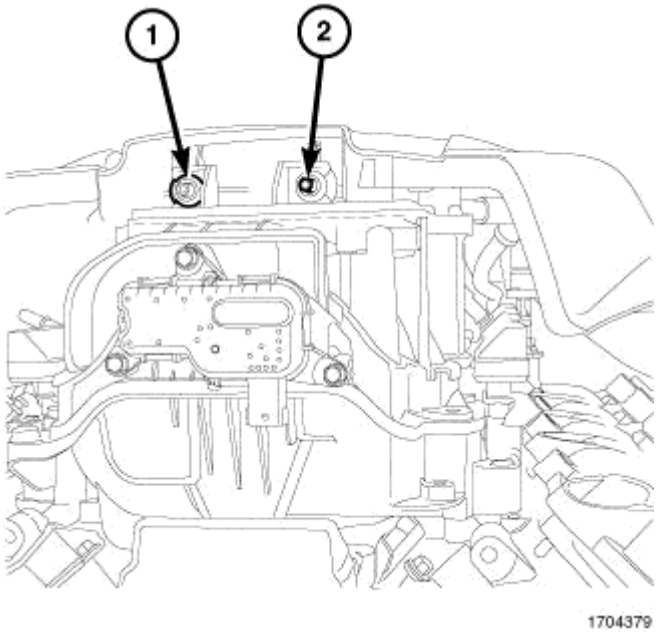

Fig. 192: Engine Cover Pegs & Grommets
Courtesy of CHRYSLER GROUP, LLC

16. Check to insure the engine cover is installed properly by reaching behind the left side of the cover to verify that the pegs (2) are located in the grommets (1).

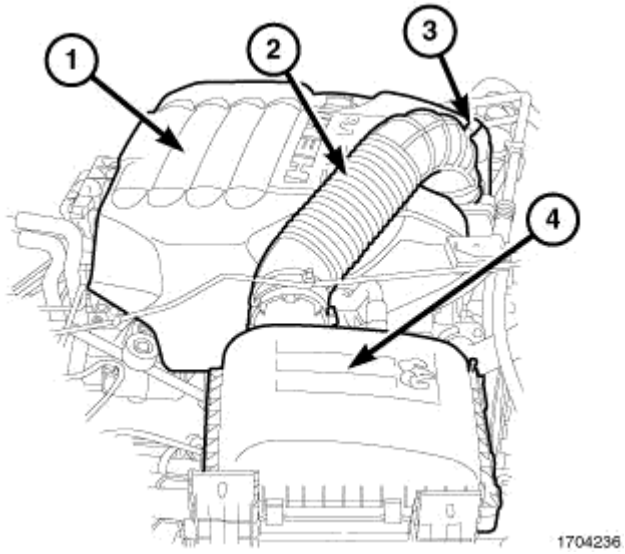

Fig. 193: Engine Cover, Clean Air Hose, Intake Air Temperature (IAT) Sensor Electrical Connector & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

17. Install the clean air tube (2) onto the air cleaner housing (4) and the throttle body.
18. Connect the IAT sensor electrical connector (3).
19. Connect the negative battery cable.

20. Start the engine and check for leaks.

REGULATOR, FUEL PRESSURE

DESCRIPTION

DESCRIPTION

The fuel pressure regulator is located in the fuel pump module assembly and is non-serviceable.

SENDING UNIT AND SENSOR, FUEL LEVEL

DESCRIPTION

DESCRIPTION

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 non-servicable. If replacement is necessary, the fuel pump module assembly must be replaced.

TANK, FUEL

REMOVAL

REMOVAL

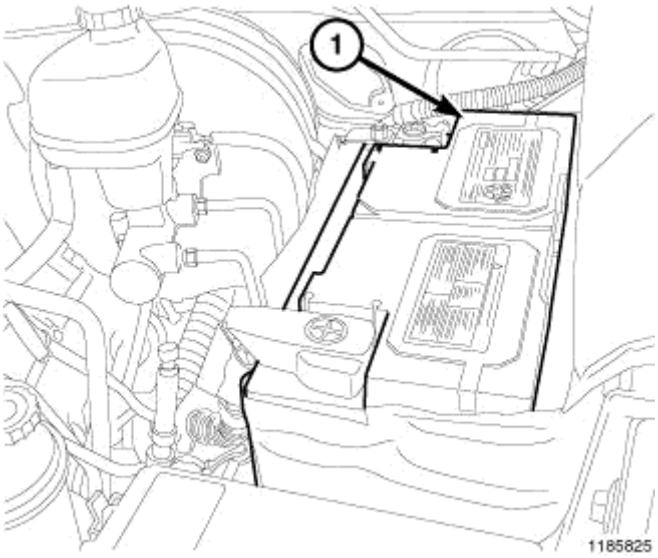

Fig. 194: Battery
Courtesy of CHRYSLER GROUP, LLC

WARNING: The fuel system may be under a constant pressure (even with the engine off). Before servicing the fuel pump module, the fuel system pressure

must be released.

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**. .
2. Disconnect and isolate the negative battery cable (1).

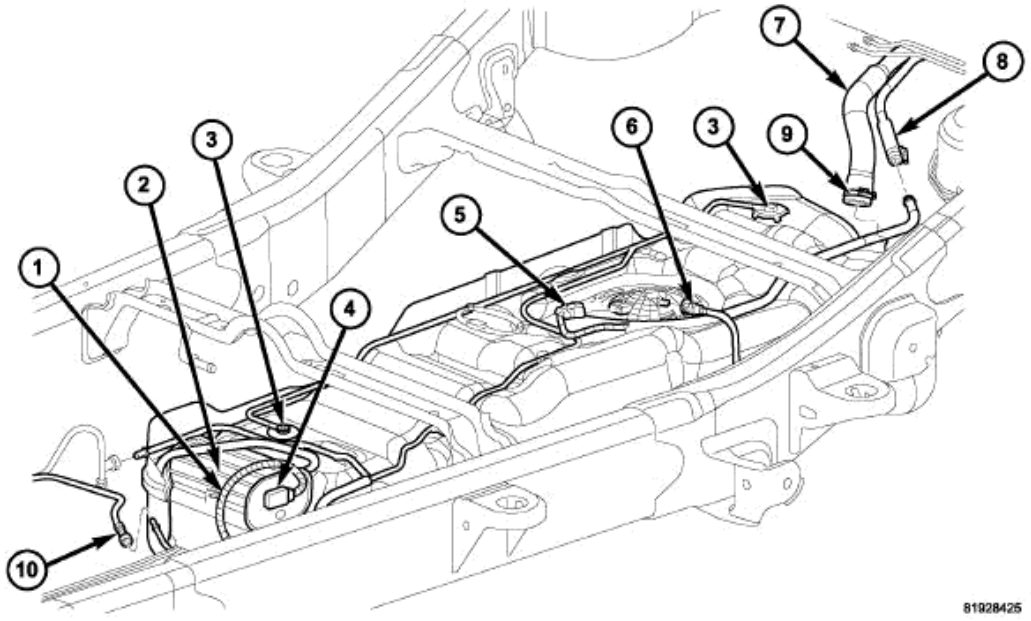

Fig. 195: Fuel Tank, Connectors, Fittings, Hoses & Clamps
Courtesy of CHRYSLER GROUP, LLC

3. Raise and support vehicle.
4. Perform the fuel tank draining procedure. Refer to **DRAINING FUEL TANK**. .
5. Disconnect the electrical connector from ESIM switch (4).
6. Disconnect the quick-connect fitting at the front of the fuel tank (10).
7. Disconnect the quick-connect fitting (8) at the rear of the fuel tank.
8. Loosen the fill hose retaining clamp (9) at the rear of the fuel tank and disconnect the fill hose.
9. Using a suitable hydraulic jack with a fuel tank adapter, support the fuel tank.

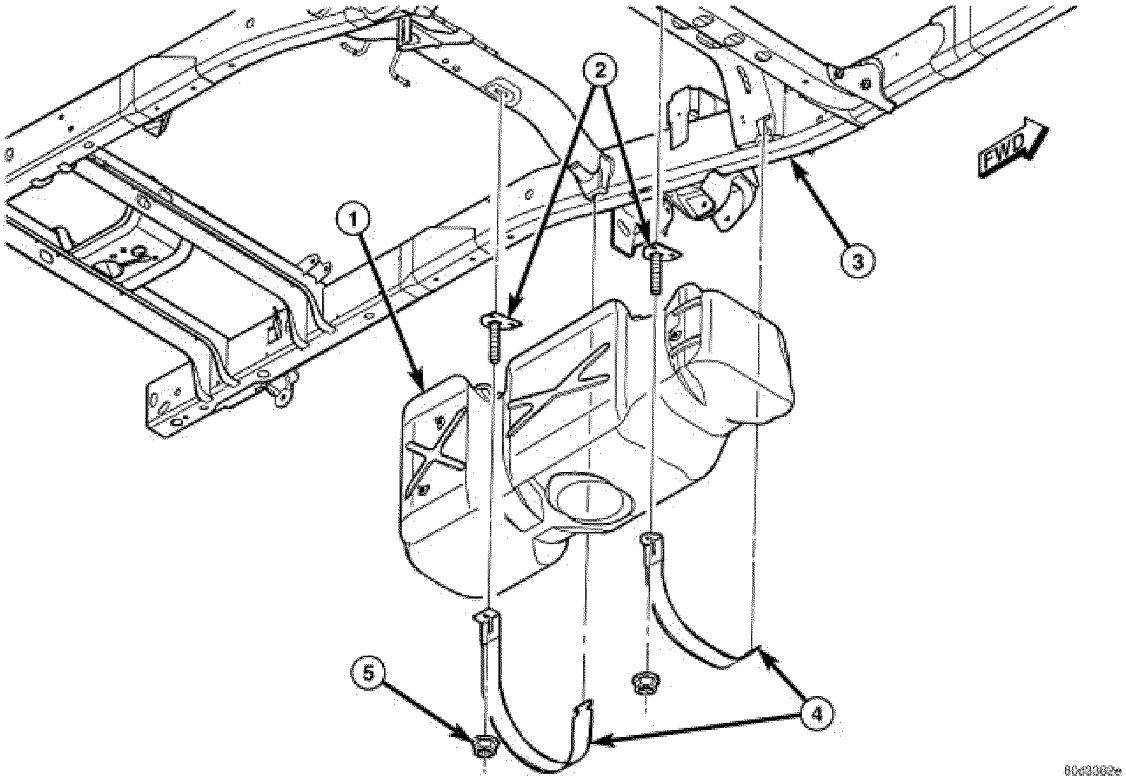

Fig. 196: Fuel Tank Mounting
Courtesy of CHRYSLER GROUP, LLC

10. Remove the two fuel tank support strap retaining nuts (5) and remove both fuel tank support straps (4).
11. Carefully lower the fuel tank a few inches and disconnect the fuel pump module electrical connector.
12. Disconnect the fuel line quick-connect fitting at the fuel pump module.
13. Lower the fuel tank and remove from hydraulic jack.
14. If fuel pump module removal is necessary, refer to **MODULE, FUEL PUMP, REMOVAL**.

INSTALLATION

INSTALLATION

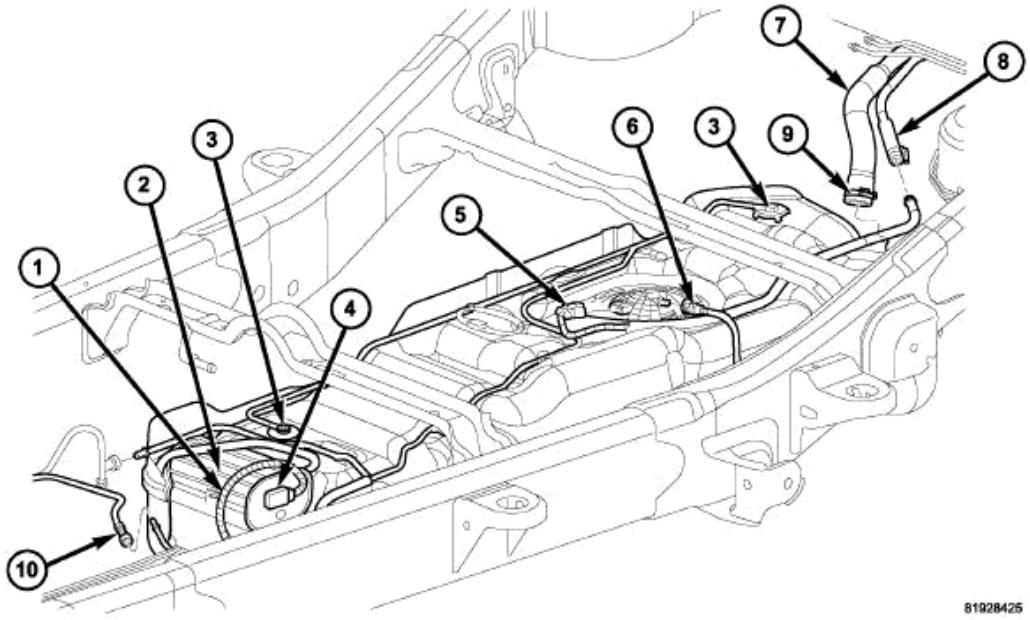

Fig. 197: Fuel Tank, Connectors, Fittings, Hoses & Clamps
Courtesy of CHRYSLER GROUP, LLC

1. If fuel pump module installation is necessary, refer to **MODULE, FUEL PUMP, INSTALLATION**.
2. Secure the fuel tank onto a suitable hydraulic jack with a fuel tank adapter.
3. Raise and position the fuel tank leaving room to make the connections at the top of the fuel tank.
4. Connect the fuel supply line (6) to the fuel pump module.
5. Connect the electrical connector (5) to the fuel pump module.

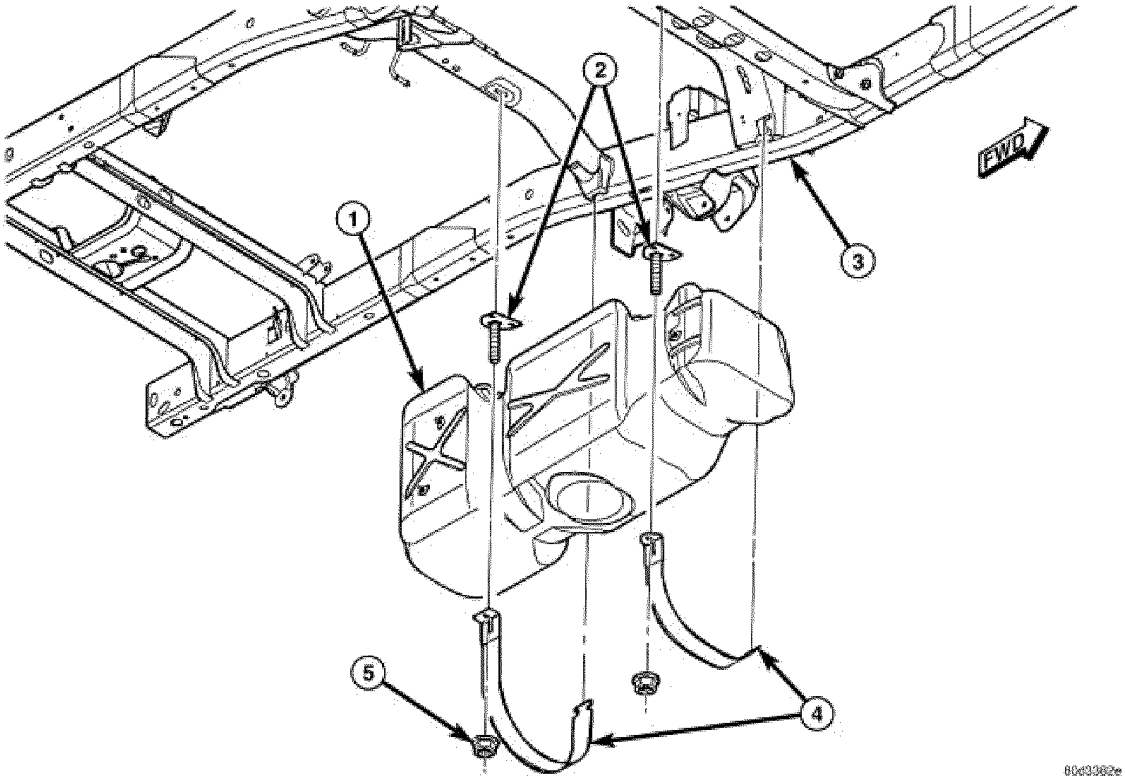

Fig. 198: Fuel Tank Mounting
Courtesy of CHRYSLER GROUP, LLC

6. Raise the fuel tank (1) until snug to the body.
7. Install the fuel tank straps (4).
8. Install the strap nuts (5) and tighten to 41 N.m (30 ft. lbs.).
9. Remove the hydraulic jack.

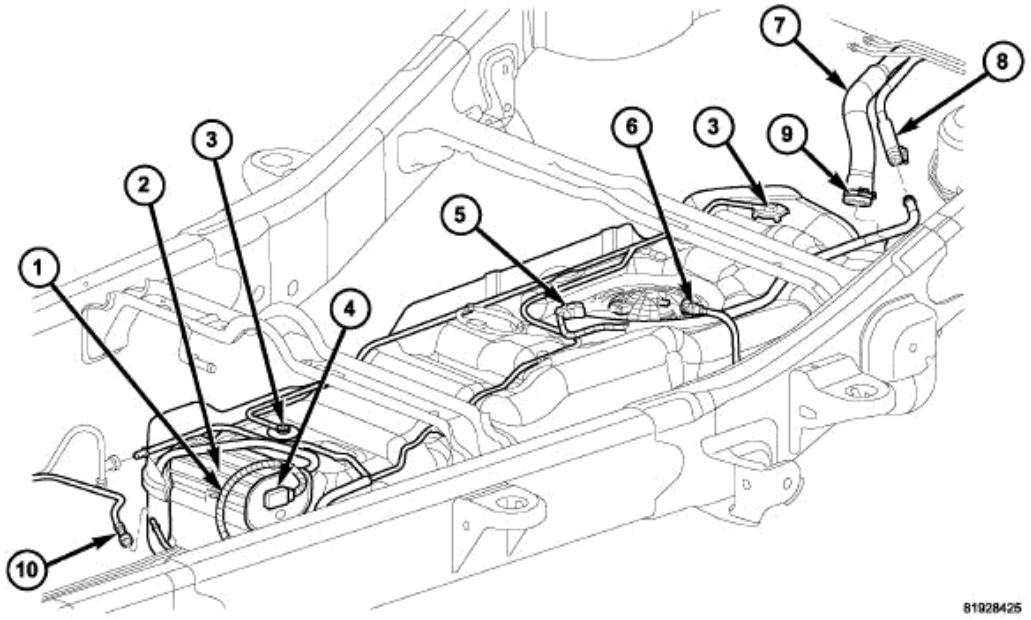

Fig. 199: Fuel Tank, Connectors, Fittings, Hoses & Clamps
Courtesy of CHRYSLER GROUP, LLC

10. Connect the electrical connector to the ESIM switch (4).
11. Connect the quick-connect fitting at the front of the fuel tank (10).
12. Connect the quick-connect fitting (8) at the rear of the fuel tank.
13. Connect the fill hose (7) at the rear of the fuel tank and securely tighten the fill hose retaining clamp (9).

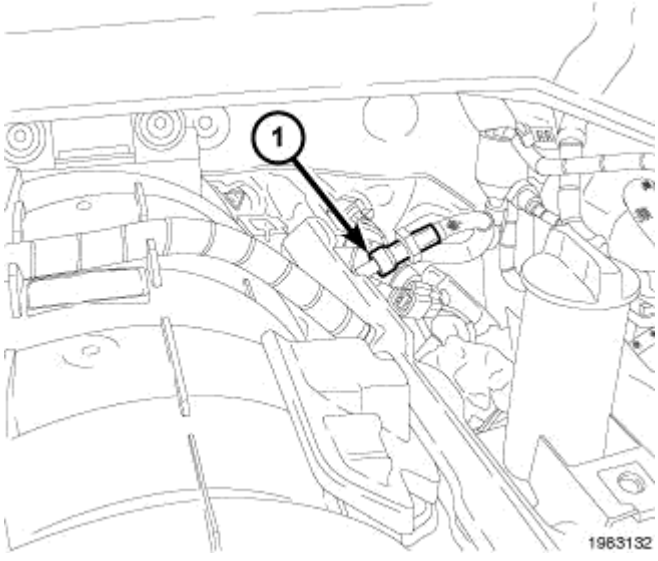

Fig. 200: Fuel Supply Line Quick Connect Fitting At Fuel Rail
Courtesy of CHRYSLER GROUP, LLC

14. Connect the fuel line quick-connect fitting at the fuel rail (1).

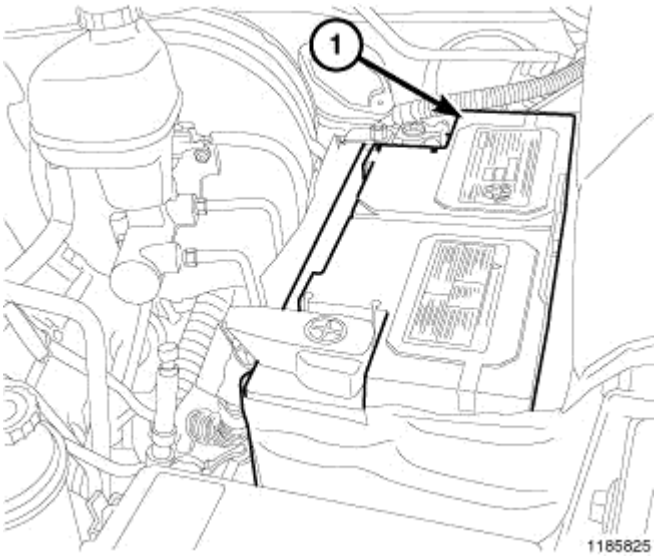

Fig. 201: Battery
Courtesy of CHRYSLER GROUP, LLC

15. Connect the negative battery cable (1).
16. Fill the fuel tank.
17. Start the engine and check for leaks at all fuel tank connections.

TUBE(S), FUEL

DESCRIPTION

DESCRIPTION

Also, refer to **STANDARD PROCEDURE - QUICK-CONNECT FITTINGS**.

> **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 FUEL SYSTEM PRESSURE RELEASE.**

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.

FUEL INJECTION, GAS

OPERATION

FUEL ECONOMY AND MAINTENANCE

A vehicle that is not properly tuned and maintained cannot be expected to perform at its maximum efficiency and can have an adverse effect on fuel economy. The following recommendations will ensure that the vehicle is performing at its maximum efficiency:

- **Use the recommended motor oil grade.** Using the manufacturer's recommended grade of Mopar® motor oil can improve fuel mileage by 1-2%. Mopar® motor oil labeled "Energy Conserving" contains friction-reducing additives.
- **Check and replace air filters.** Replacing a clogged air filter with a new Mopar® air filter can improve fuel mileage by as much as 10%.
- **Keep the engine tuned.** Repairing a vehicle that is noticeably out of tune can improve fuel mileage by an average of 4%. Maintaining a vehicle and repairing problems, such as a faulty oxygen sensor, can improve mileage by as much as 40%.
- **Keep tires properly inflated.** Underinflated tires can lower fuel mileage by 0.4% for every 1 psi drop in pressure of all four tires.

INJECTOR(S), FUEL

DESCRIPTION

DESCRIPTION

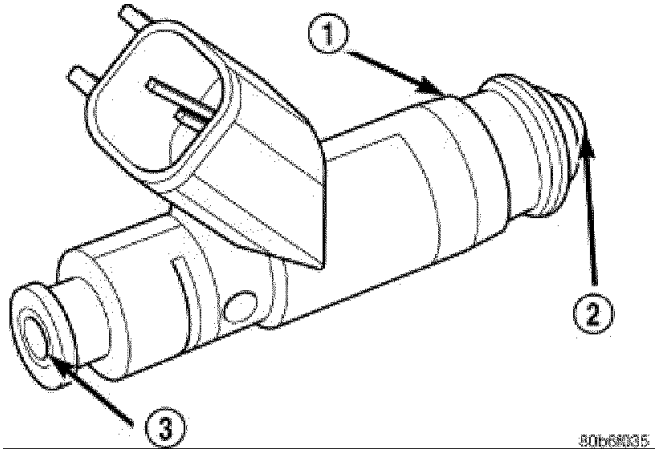

Fig. 202: Fuel Injector
Courtesy of CHRYSLER GROUP, LLC

1 - FUEL INJECTOR
2 - NOZZLE

3 - TOP (FUEL ENTRY)

An individual fuel injector (1) is used for each individual cylinder. Refer to **Fig. 202**.

OPERATION

FUEL INJECTOR

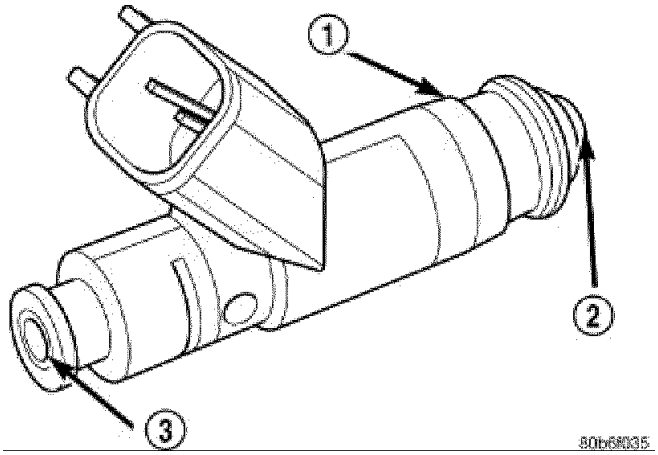

Fig. 203: Fuel Injector
Courtesy of CHRYSLER GROUP, LLC

1 - FUEL INJECTOR
2 - NOZZLE
3 - TOP (FUEL ENTRY)

The top (fuel entry) end of the injector (1) is attached into an opening on the fuel rail. Refer to **Fig. 203**.

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.

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

3.7L/4.7L

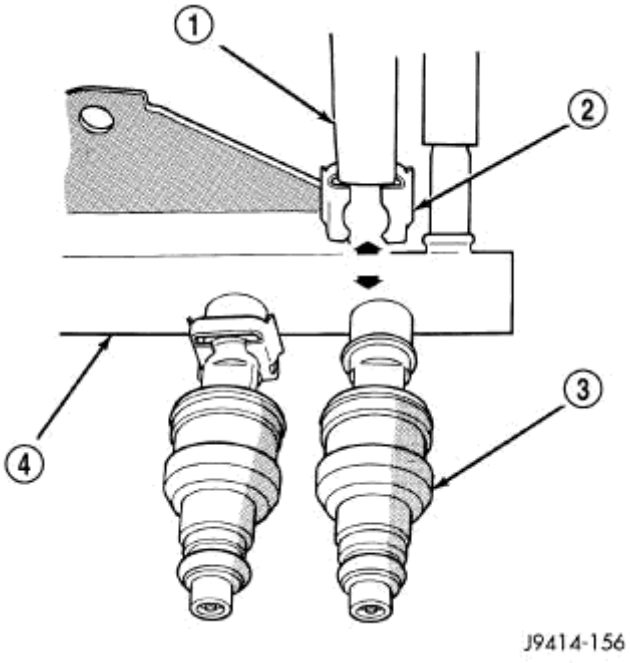

Fig. 204: Injector Retaining Clip
Courtesy of CHRYSLER GROUP, LLC

1 - PLIERS

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

1. Remove the fuel rail assembly. Refer to **RAIL, FUEL, REMOVAL**.
2. Using suitable pliers (1), remove the fuel injector retaining clip (2).
3. Remove the fuel injector (3) from the fuel rail (4) using a side to side motion while pulling the injector out of the fuel rail assembly.

5.7L

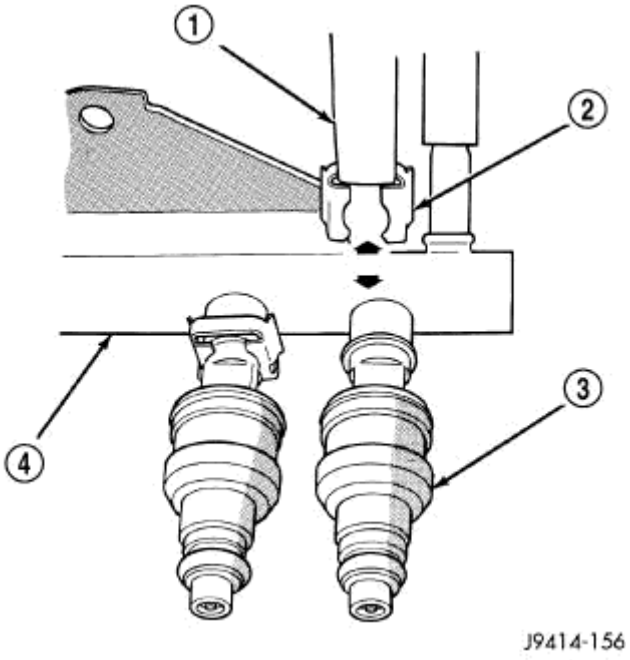

Fig. 205: Injector Retaining Clip
Courtesy of CHRYSLER GROUP, LLC

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

1. Remove the fuel rail assembly. Refer to **RAIL, FUEL, REMOVAL**.
2. Using suitable pliers (1), remove the fuel injector retaining clip (2).
3. Remove the fuel injector (3) from the fuel rail (4) using a side to side motion while pulling the injector out of the fuel rail assembly.

INSTALLATION

3.7L/4.7L

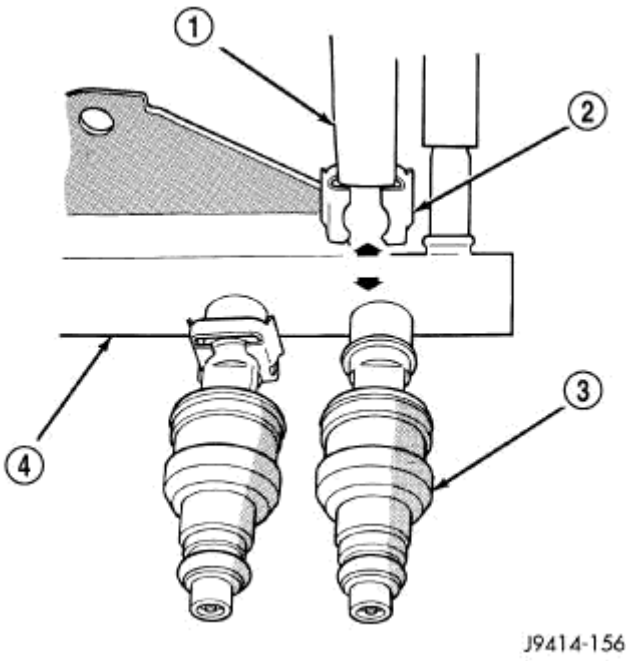

Fig. 206: Injector Retaining Clip
Courtesy of CHRYSLER GROUP, LLC

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

NOTE: If the same fuel injector is to be reinstalled, install new O-rings.

NOTE: Apply a small amount of clean engine oil to each injector O-ring. This will aid in the installation.

1. Install the fuel injector (3) into the fuel rail (4) using a side to side motion while pushing injector into the fuel rail assembly.
2. Using suitable pliers (1), install the fuel injector retaining clip (2).
3. Install the fuel rail assembly. Refer to **RAIL, FUEL, INSTALLATION**.
4. Start the engine and check for fuel leaks.

5.7L

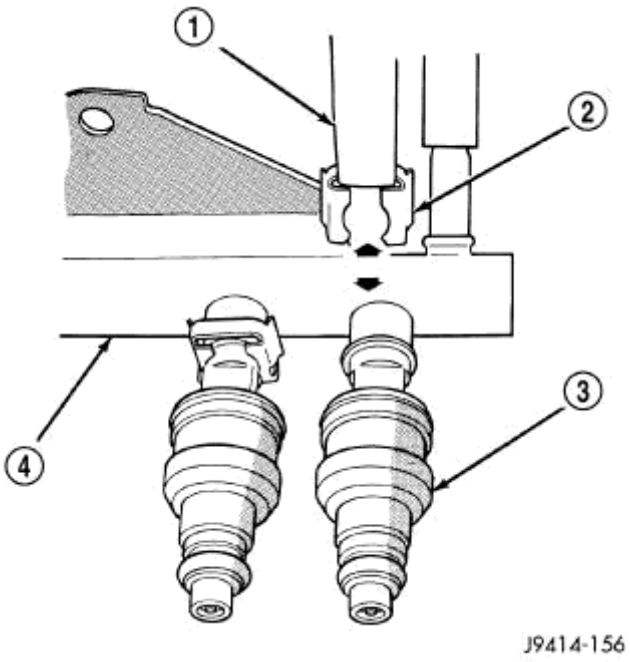

Fig. 207: Injector Retaining Clip
Courtesy of CHRYSLER GROUP, LLC

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

NOTE: If the same fuel injector is to be reinstalled, install new O-rings.

NOTE: Apply a small amount of clean engine oil to each injector O-ring. This will aid in the installation.

1. Install the fuel injector (3) into the fuel rail (4) using a side to side motion while pushing injector into the fuel rail assembly.
2. Using suitable pliers (1), install the fuel injector retaining clip (2).
3. Install the fuel rail assembly. Refer to **RAIL, FUEL, INSTALLATION**.
4. Start the engine and check for fuel leaks.

PEDAL, ACCELERATOR

REMOVAL

REMOVAL

CAUTION: Do not attempt to separate or remove the Accelerator Pedal Position

Sensor (APPS) from the accelerator pedal assembly. The APPS and the accelerator pedal is replaced as an assembly. If the sensor is removed from the pedal, the electronic calibration may be destroyed.

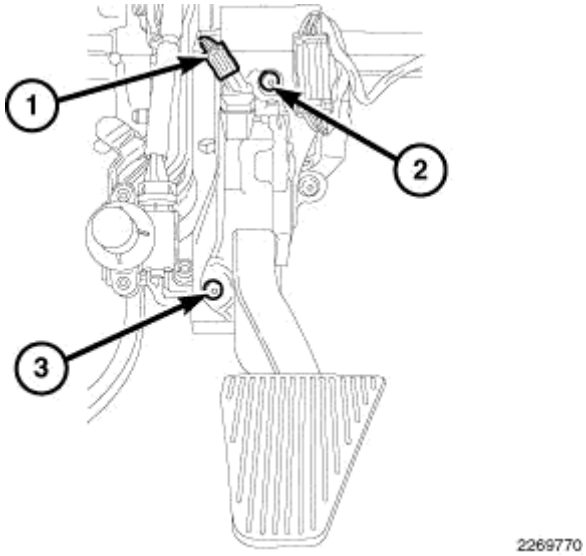

Fig. 208: Accelerator Pedal Position Sensor (APPS)
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the 6-way electrical connector at the APPS (1).
2. Remove the upper accelerator pedal mounting bolt (2).
3. Remove the lower accelerator pedal mounting bolt (3).
4. Remove the accelerator pedal assembly from the vehicle.

INSTALLATION

INSTALLATION

CAUTION: Do not attempt to separate or remove the Accelerator Pedal Position Sensor (APPS) from the accelerator pedal assembly. The APPS and the accelerator pedal is replaced as an assembly. If the sensor is removed from the pedal, the electronic calibration may be destroyed.

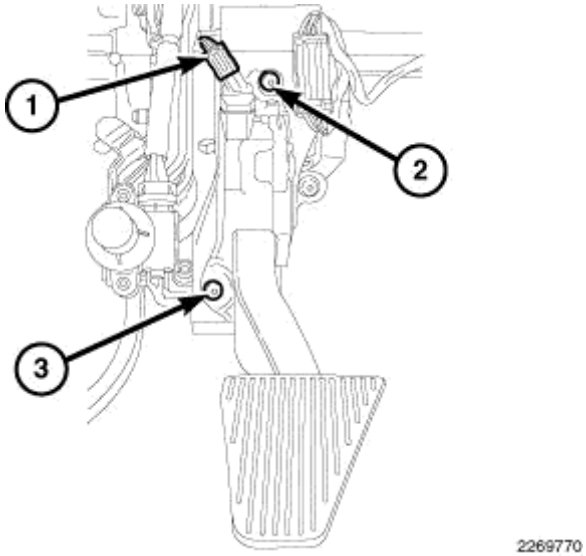

Fig. 209: Accelerator Pedal Position Sensor (APPS)
Courtesy of CHRYSLER GROUP, LLC

1. Position the accelerator pedal assembly on the pedal sled.
2. Install the lower accelerator pedal mounting bolt (3) and tighten to 7 N.m (5 ft. lbs.).
3. Install the upper accelerator pedal mounting bolt (2) 7 N.m (5 ft. lbs.).
4. Connect the 6-way electrical connector at the APPS (1).
5. If necessary, use a Scan Tool to erase any Diagnostic Trouble Codes (DTC's).

RELAY, FUEL PUMP

DESCRIPTION

DESCRIPTION

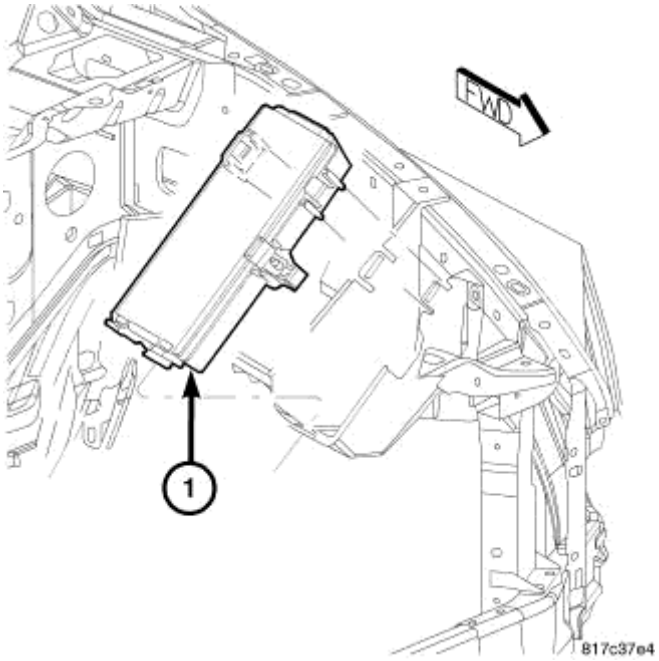

Fig. 210: TIPM Location
Courtesy of CHRYSLER GROUP, LLC

1 - TIPM Location

A separate fuel pump relay is no longer used. A circuit within the TIPM (Totally Integrated Power Module) is used to control the electric fuel pump located within the fuel pump module. The TIPM (1) is located in the engine compartment in front of the battery.

OPERATION

OPERATION

The Powertrain Control Module (PCM) energizes the electric fuel pump through the fuel pump relay. The fuel pump relay is energized by first applying battery voltage to it when the ignition key is turned ON, and then applying a ground signal to the relay from the PCM.

Whenever the ignition key is turned ON, the electric fuel pump will operate. But, the PCM will shut-down the ground circuit to the fuel pump relay in approximately 1-3 seconds unless the engine is operating or the starter motor is engaged.

SENSOR, ACCELERATOR PEDAL POSITION

DESCRIPTION

DESCRIPTION

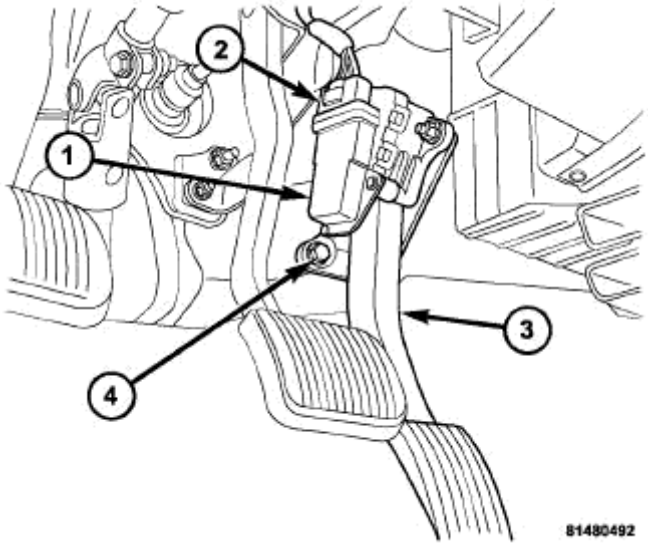

Fig. 211: Accelerator Pedal Position Sensor
Courtesy of CHRYSLER GROUP, LLC

1 - APPS
2 - APPS 6-Way Electrical Connector
3 - Accelerator Pedal
4 - Mounting Bolts/Nuts

The Accelerator Pedal Position Sensor (APPS) (1) is located inside the vehicle. It is attached to the accelerator pedal assembly (3). It is used only with 3.7L V-6 and 5.7L V-8 gas engines.

OPERATION

OPERATION

The Accelerator Pedal Position Sensor (APPS) provides the Powertrain Control Module (PCM) with two DC voltage signals which change as the position of the accelerator pedal changes. One of the DC voltage signals will be half the voltage of the other signal.

REMOVAL

REMOVAL

CAUTION: Do not attempt to separate or remove the Accelerator Pedal Position Sensor (APPS) from the accelerator pedal assembly. The APPS and the accelerator pedal is replaced as an assembly. If the sensor is removed from the pedal, the electronic calibration may be destroyed.

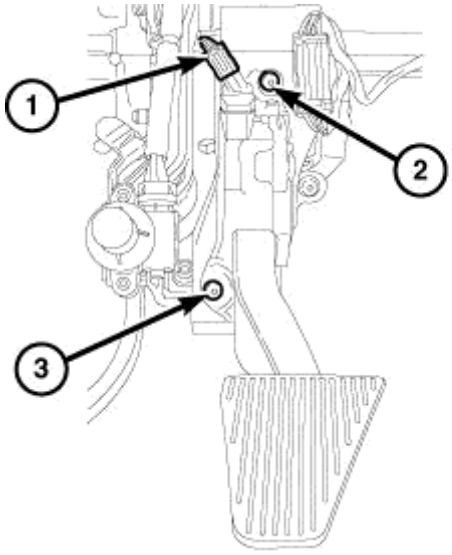

Fig. 212: Accelerator Pedal Position Sensor (APPS)
Courtesy of CHRYSLER GROUP, LLC

1. Remove the accelerator pedal assembly. Refer to **PEDAL, ACCELERATOR, REMOVAL**.

INSTALLATION

INSTALLATION

CAUTION: Do not attempt to separate or remove the Accelerator Pedal Position Sensor (APPS) from the accelerator pedal assembly. The APPS and the accelerator pedal is replaced as an assembly. If the sensor is removed from the pedal, the electronic calibration may be destroyed.

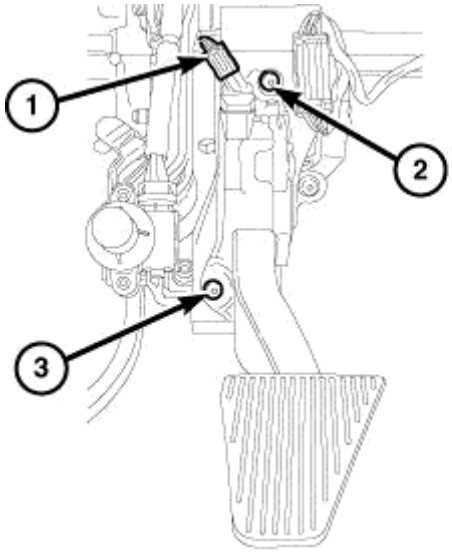

Fig. 213: Accelerator Pedal Position Sensor (APPS)
Courtesy of CHRYSLER GROUP, LLC

1. Install the accelerator pedal assembly. Refer to **PEDAL, ACCELERATOR, INSTALLATION**.
2. If necessary, use a Scan Tool to erase any Diagnostic Trouble Codes (DTC's).

SENSOR, AIR TEMPERATURE, INTAKE

OPERATION

OPERATION

The IAT sensor provides an input voltage to the Powertrain Control Module (PCM) indicating the density of the air entering the intake manifold based upon intake manifold temperature. At key-on, a 5-volt power circuit is supplied to the sensor from the PCM. The sensor is grounded at the PCM through a low-noise, sensor-return circuit.

The PCM uses this input to calculate the following:

- Injector pulse-width
- Adjustment of spark timing (to help prevent spark knock with high intake manifold air-charge temperatures)

The resistance values of the IAT sensor is the same as for the Engine Coolant Temperature (ECT) sensor.

REMOVAL

3.7L

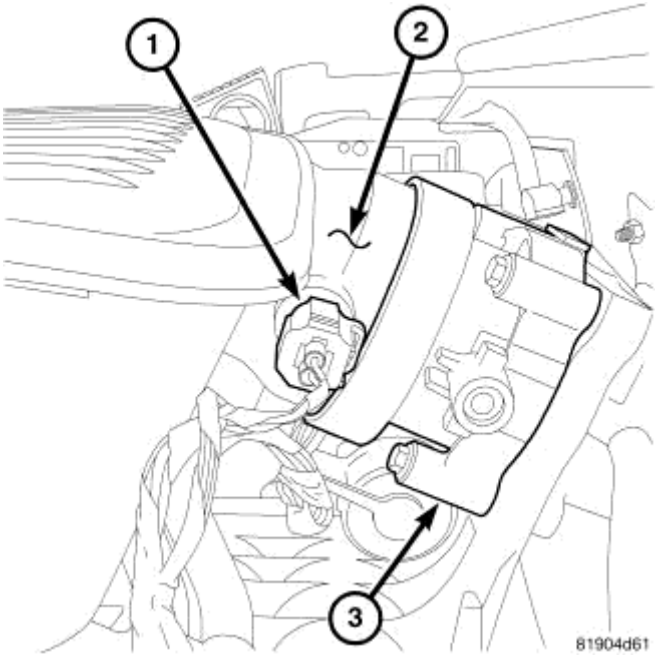

Fig. 214: IAT Sensor - 3.7L
Courtesy of CHRYSLER GROUP, LLC

The intake manifold air temperature (IAT) sensor (1) is installed into the air intake tube near the throttle body (2).

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

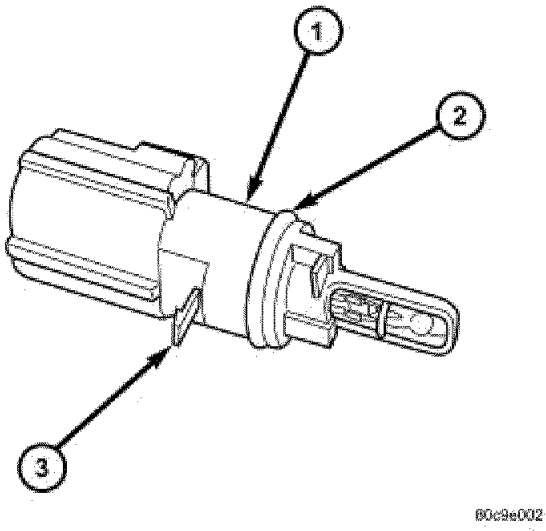

Fig. 215: IAT Sensor Tab/O-Ring
Courtesy of CHRYSLER GROUP, LLC

1 - IAT SENSOR
2 - SENSOR O-RING
3 - RELEASE TAB

3. Gently lift on small plastic release tab (3) and rotate sensor about 1/4 turn counter-clockwise for removal.
4. Check condition of sensor o-ring (2).

4.7L

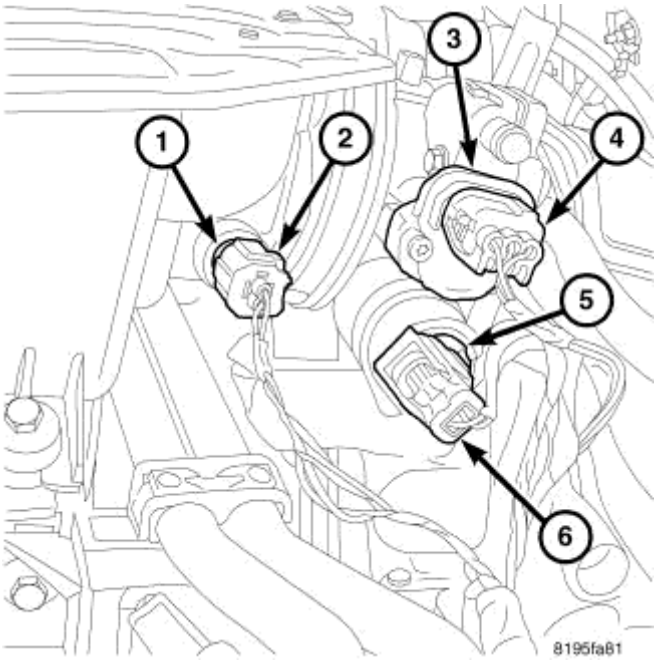

Fig. 216: IAT Sensor - 4.7L
Courtesy of CHRYSLER GROUP, LLC

The intake manifold air temperature (IAT) sensor (1) is located near the throttle body.

1. Disconnect electrical connector (2) from IAT sensor.

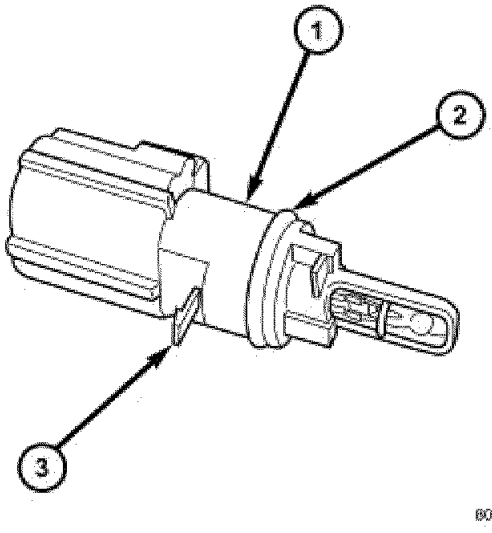

Fig. 217: IAT Sensor Tab/O-Ring
Courtesy of CHRYSLER GROUP, LLC

1 - IAT SENSOR
2 - SENSOR O-RING

3 - RELEASE TAB

2. Clean dirt from sensor base.
3. Gently lift on small plastic release tab (3) and rotate sensor about 1/4 turn counter-clockwise for removal.
4. Check condition of sensor o-ring (2).

5.7L

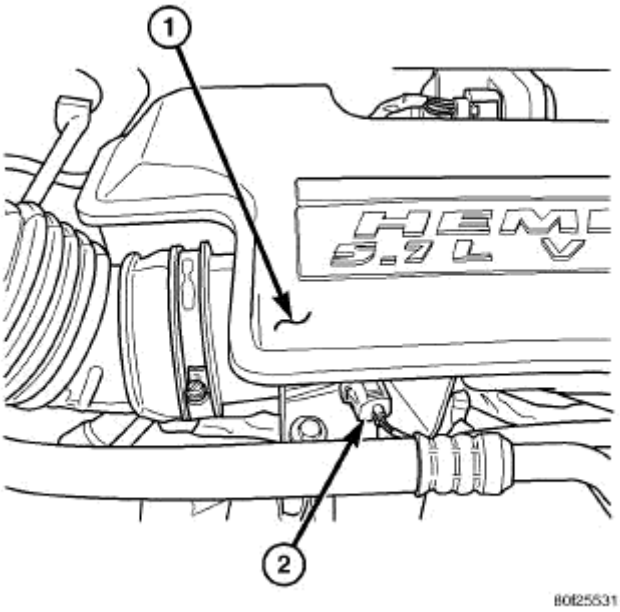

Fig. 218: IAT Sensor - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - FRONT OF INTAKE MANIFOLD PLENUM
2 - IAT ELECTRICAL CONNECTOR

The intake manifold air temperature (IAT) sensor (2) is installed into the front of the intake manifold air box plenum. Refer to **Fig. 218**.

1. Disconnect electrical connector (2) from IAT sensor. Refer to **Fig. 218**.
2. Clean dirt from intake manifold at sensor base.

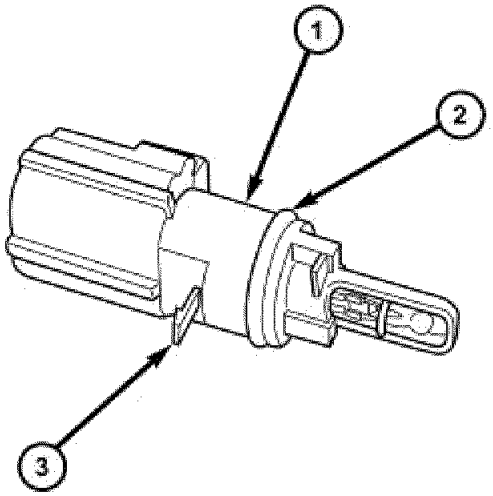

Fig. 219: IAT Sensor Tab/O-Ring
Courtesy of CHRYSLER GROUP, LLC

1 - IAT SENSOR
2 - SENSOR O-RING
3 - RELEASE TAB

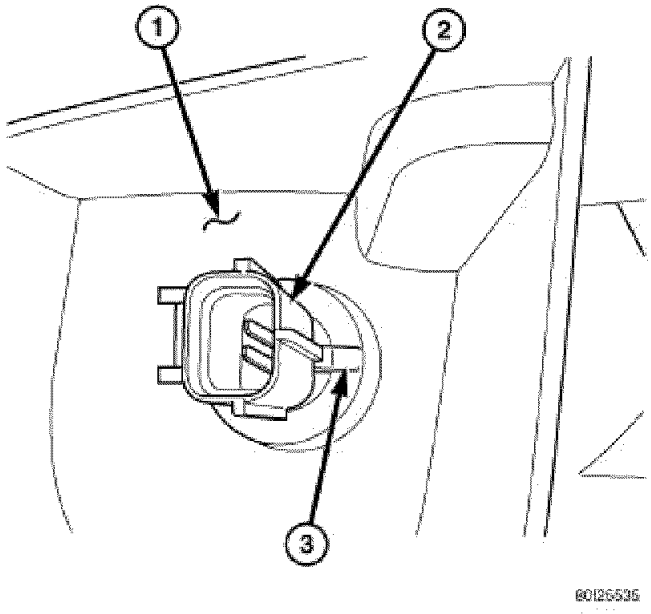

Fig. 220: Identifying IAT Sensor - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - FRONT OF INTAKE MANIFOLD PLENUM
2 - IAT SENSOR
3 - RELEASE TAB

3. Gently lift on small plastic release tab (3) and rotate sensor about 1/4 turn counterclockwise for removal. Refer to **Fig. 220**.
4. Check condition of sensor O-ring.

INSTALLATION

3.7L

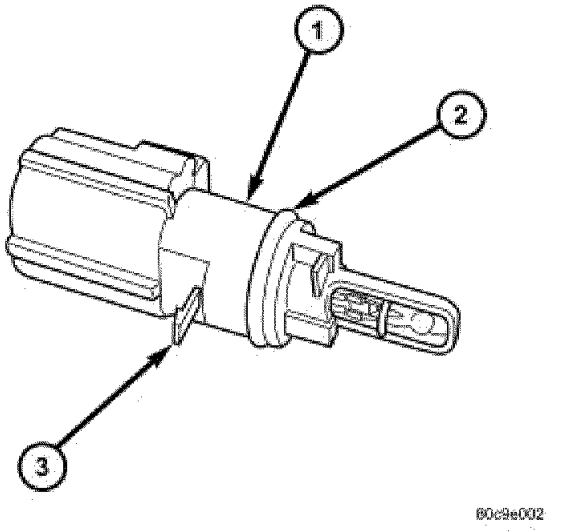

Fig. 221: IAT Sensor Tab/O-Ring
Courtesy of CHRYSLER GROUP, LLC

1 - IAT SENSOR
2 - SENSOR O-RING
3 - RELEASE TAB

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

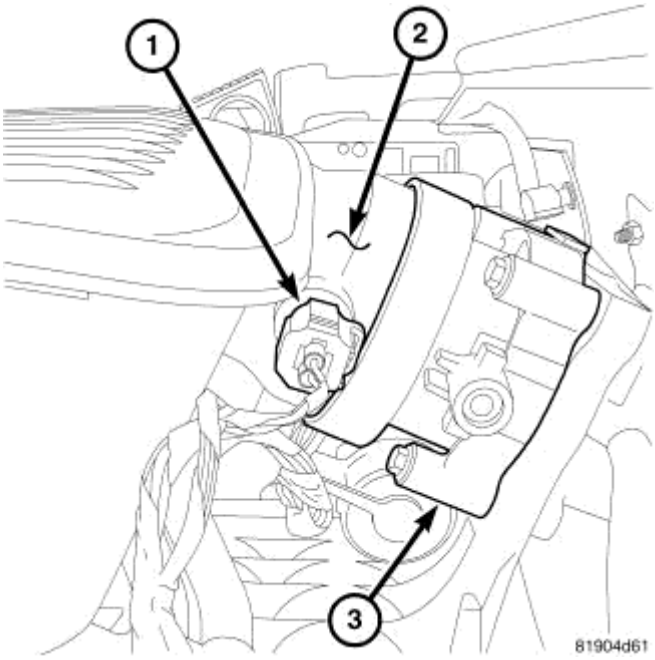

Fig. 222: IAT Sensor - 3.7L
Courtesy of CHRYSLER GROUP, LLC

2. Clean sensor mounting hole in air intake tube.
3. Position sensor into air intake tube and rotate clockwise until past release tab.
4. Install electrical connector (1).

4.7L

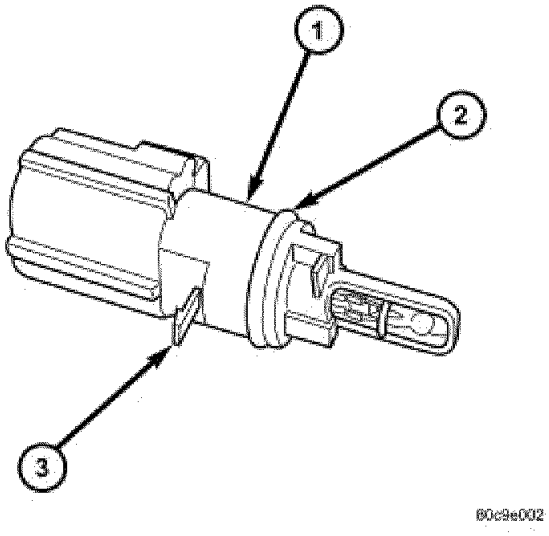

Fig. 223: IAT Sensor Tab/O-Ring
Courtesy of CHRYSLER GROUP, LLC

1 - IAT SENSOR
2 - SENSOR O-RING
3 - RELEASE TAB

1. Check condition of sensor o-ring (2).
2. Clean sensor mounting hole.
3. Position sensor (1) into base and rotate clockwise until past release tab (3).

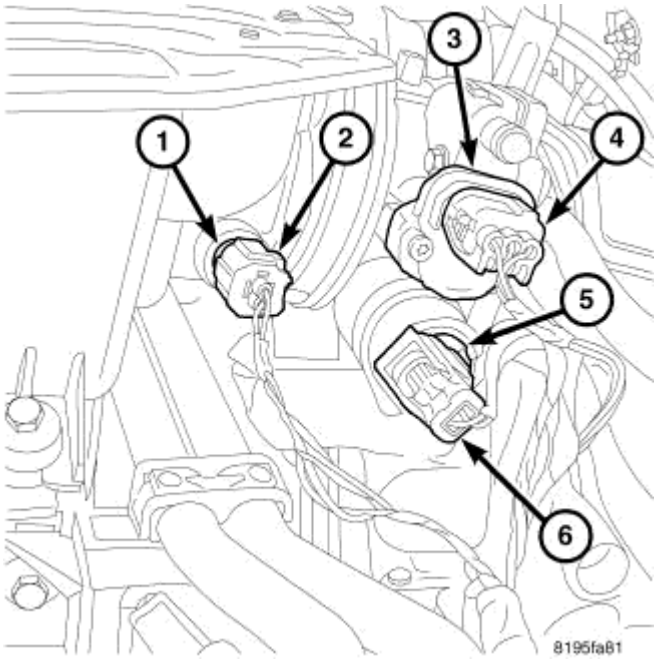

Fig. 224: IAT Sensor - 4.7L
Courtesy of CHRYSLER GROUP, LLC

4. Install electrical connector (2).

5.7L

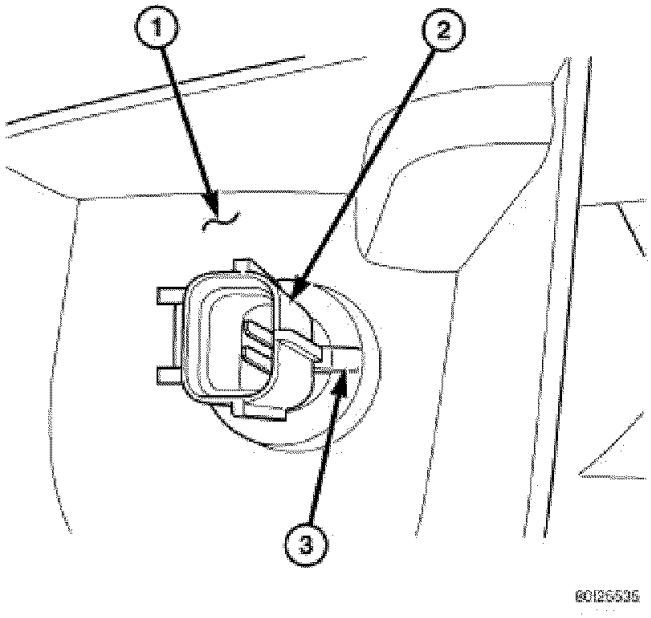

Fig. 225: Identifying IAT Sensor - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - FRONT OF INTAKE MANIFOLD PLENUM
2 - IAT SENSOR
3 - RELEASE TAB

The intake manifold air temperature (IAT) sensor (2) is installed into the front of the intake manifold air box plenum. Refer to **Fig. 225**.

1. Check condition of sensor O-ring.
2. Clean sensor mounting hole in intake manifold.
3. Position sensor into intake manifold and rotate clockwise until past release tab.
4. Install electrical connector.

SENSOR, CRANKSHAFT POSITION

DESCRIPTION

3.7L

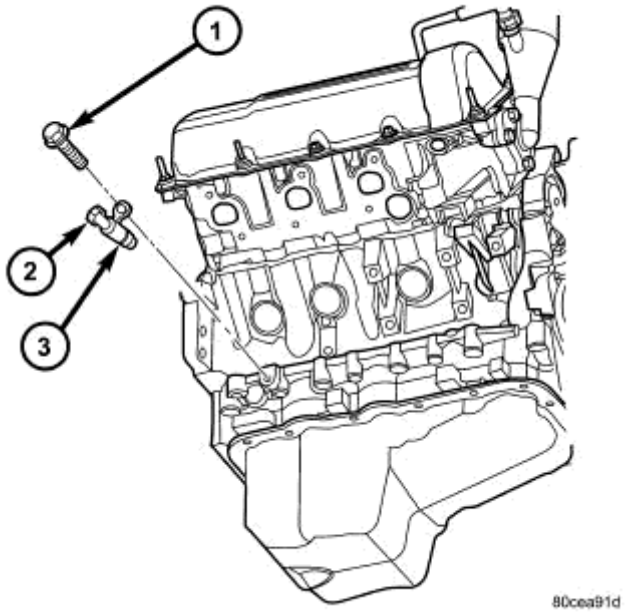

Fig. 226: CKP Sensor - 3.7L
Courtesy of CHRYSLER GROUP, LLC

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

The Crankshaft Position (CKP) (2) sensor is mounted into the right rear side of the cylinder block. Refer to **Fig. 226**. It is positioned and bolted into a machined hole.

4.7L

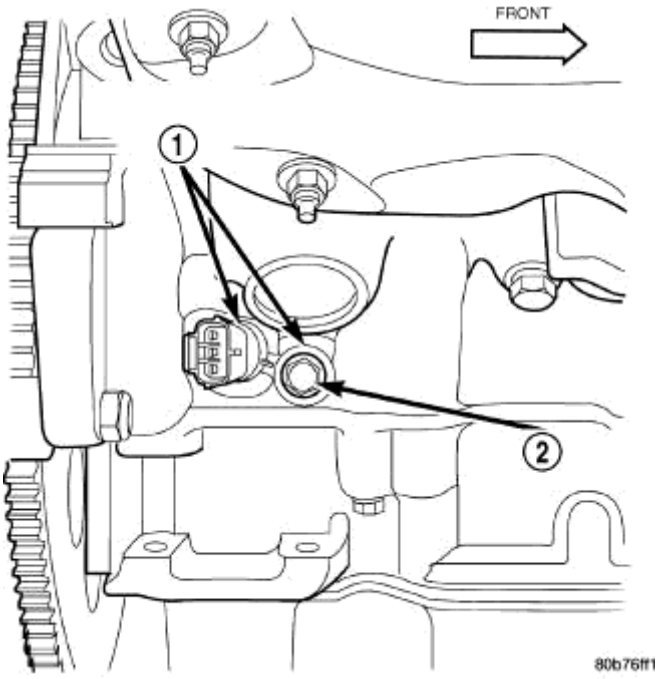

Fig. 227: CKP Sensor - 4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - CRANKSHAFT POSITION SENSOR
2 - MOUNTING BOLT

The Crankshaft Position (CKP) (1) sensor is mounted into the right rear side of the cylinder block. Refer to **Fig. 227**. It is positioned and bolted into a machined hole.

5.7L

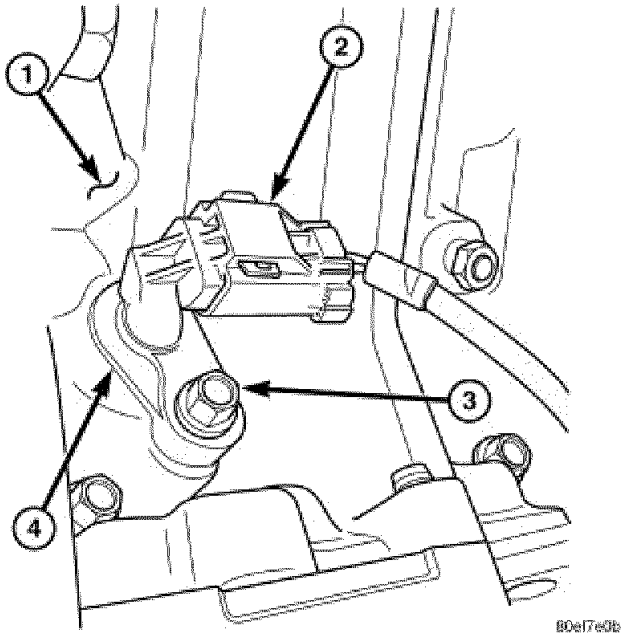

Fig. 228: CKP Sensor - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - CYLINDER BLOCK - RIGHT / REAR
2 - ELEC. CONNECTOR
3 - MOUNTING BOLT
4 - CKP SENSOR

The Crankshaft Position (CKP) (4) sensor is mounted into the right rear side of the cylinder block. Refer to **Fig. 228**. It is positioned and bolted into a machined hole.

OPERATION

3.7L

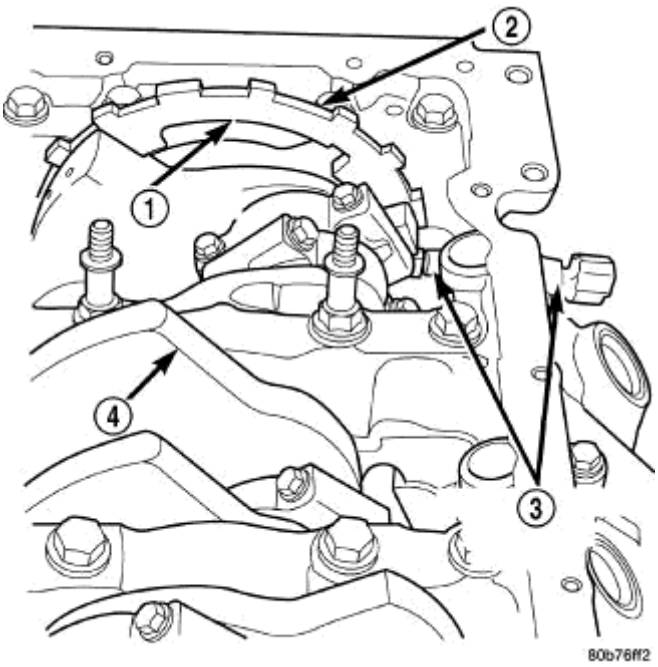

Fig. 229: Crankshaft Position Sensor, Engine Crankshaft, & Tonewheel Notches
Courtesy of CHRYSLER GROUP, LLC

1 - TONEWHEEL
2 - NOTCHES
3 - CRANKSHAFT POSITION SENSOR
4 - CRANKSHAFT

Engine speed and crankshaft position are provided through the CKP (Crankshaft Position) sensor. The sensor generates pulses that are the input sent to the Powertrain Control Module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

A tonewheel (targetwheel) (1) is bolted to the engine crankshaft. Refer to **Fig. 229**. This tonewheel has sets of notches (2) at its outer edge. Refer to **Fig. 229**.

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.

4.7L

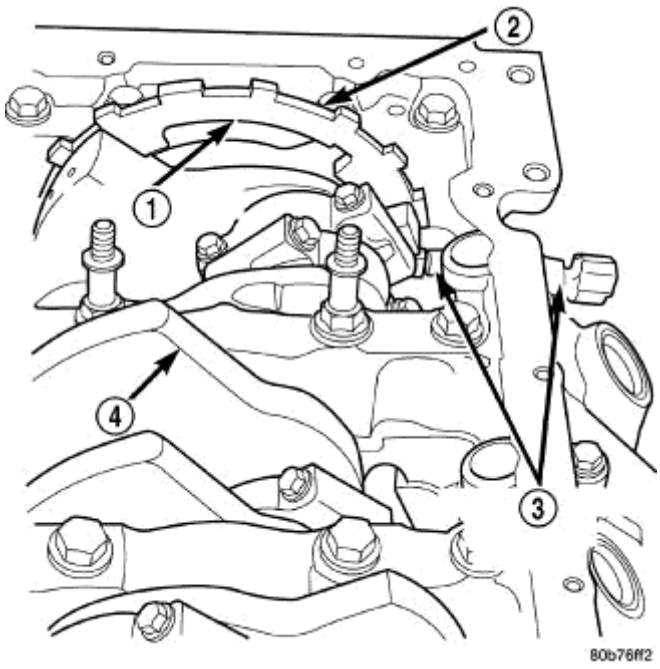

Fig. 230: Crankshaft Position Sensor, Engine Crankshaft, & Tonewheel Notches
Courtesy of CHRYSLER GROUP, LLC

1 - TONEWHEEL
2 - NOTCHES
3 - CRANKSHAFT POSITION SENSOR
4 - CRANKSHAFT

Engine speed and crankshaft position are provided through the CKP (Crankshaft Position) sensor. The sensor generates pulses that are the input sent to the Powertrain Control Module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

A tonewheel (1) is bolted to the engine crankshaft. Refer to **Fig. 230**. This tonewheel has sets of notches (2) at its outer edge. Refer to **Fig. 230**.

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.

5.7L

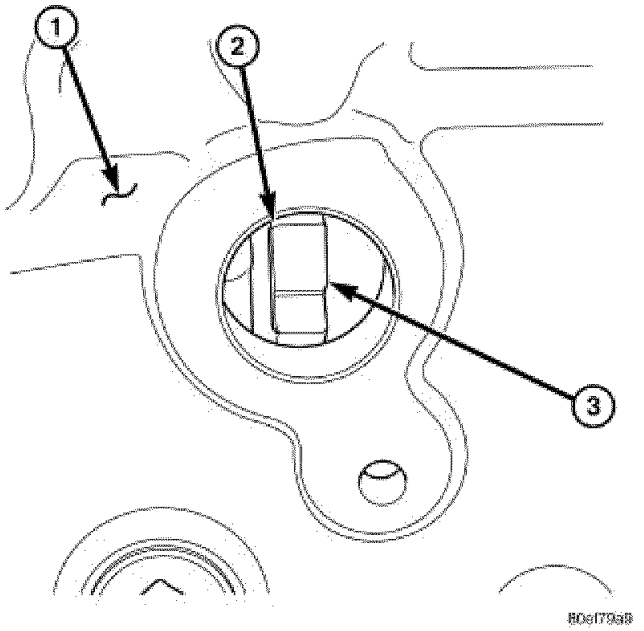

Fig. 231: Tonewheel Notches
Courtesy of CHRYSLER GROUP, LLC

1 - RIGHT / REAR SIDE OF CYLINDER BLOCK
2 - MACHINED HOLE
3 - NOTCHES

Engine speed and crankshaft position are provided through the CKP (Crankshaft Position) sensor. The sensor generates pulses that are the input sent to the Powertrain Control Module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

A tonewheel is bolted to the engine crankshaft. This tonewheel has sets of notches (3) at its outer edge. Refer to **Fig. 231**.

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.

REMOVAL

3.7L

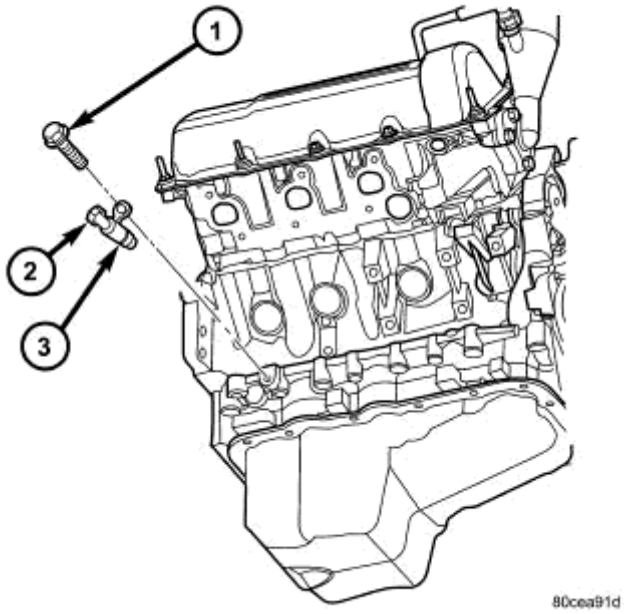

Fig. 232: CKP Sensor - 3.7L
Courtesy of CHRYSLER GROUP, LLC

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

The Crankshaft Position (CKP) sensor is mounted into the right rear side of the cylinder block. Refer to **Fig. 232**. It is positioned and bolted into a machined hole.

1. Raise vehicle.
2. Disconnect sensor electrical connector.
3. Remove sensor mounting bolt (1). Refer to **Fig. 232**.
4. Carefully twist sensor (2) from cylinder block.
5. Check condition of sensor O-ring (3).

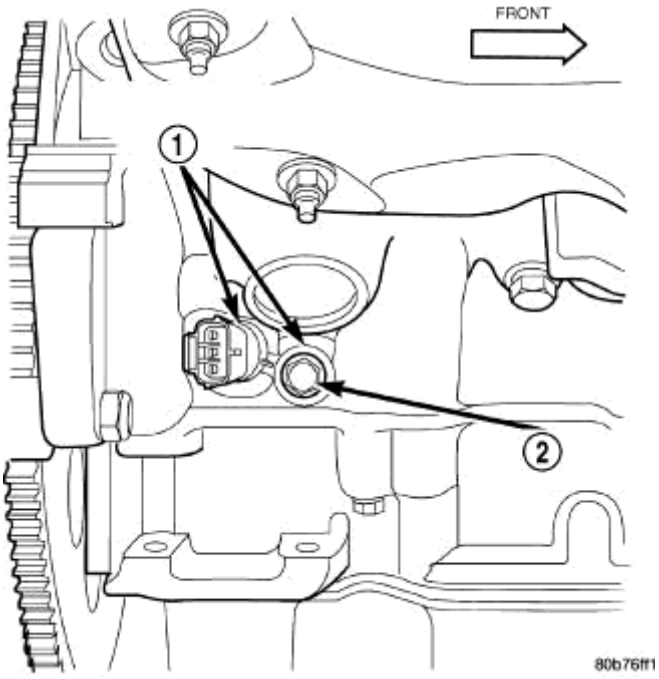

Fig. 233: CKP Sensor - 4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - CRANKSHAFT POSITION SENSOR
2 - MOUNTING BOLT

The Crankshaft Position (CKP) sensor is located at the right-rear side of the engine cylinder block. Refer to **Fig. 233**. It is positioned and bolted into a machined hole in the engine block.

1. Raise vehicle.
2. Disconnect CKP electrical connector at sensor.
3. Remove CKP mounting bolt (2). Refer to **Fig. 233**.
4. Carefully twist sensor (1) from cylinder block.
5. Remove sensor from vehicle.
6. Check condition of sensor O-ring.

5.7L

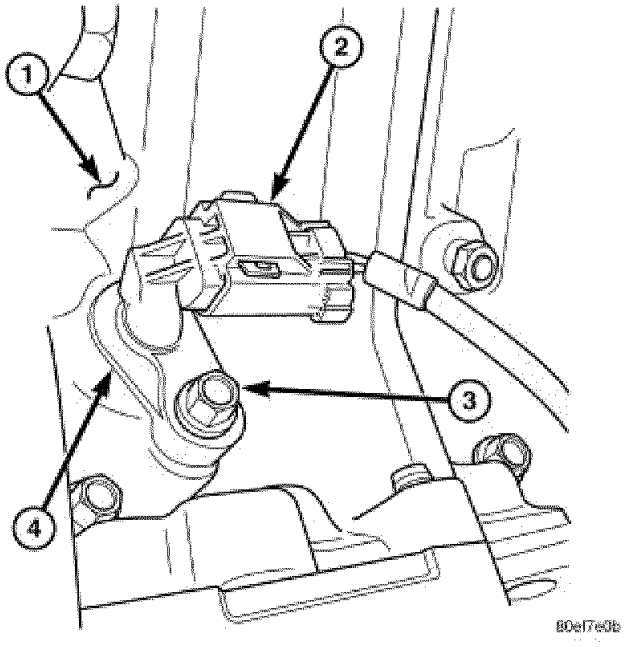

Fig. 234: CKP Sensor - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - CYLINDER BLOCK - RIGHT / REAR
2 - ELEC. CONNECTOR
3 - MOUNTING BOLT
4 - CKP SENSOR

The Crankshaft Position (CKP) sensor (4) is located at the right-rear side of the engine cylinder block. Refer to **Fig. 234**. It is positioned and bolted into a machined hole in the engine block.

1. Raise vehicle.
2. Disconnect CKP electrical connector at sensor. Refer to **Fig. 234**.
3. Remove CKP mounting bolt (3). Refer to **Fig. 234**.
4. Carefully twist sensor (4) from cylinder block.
5. Remove sensor from vehicle.
6. Check condition of sensor O-ring.

INSTALLATION

3.7L

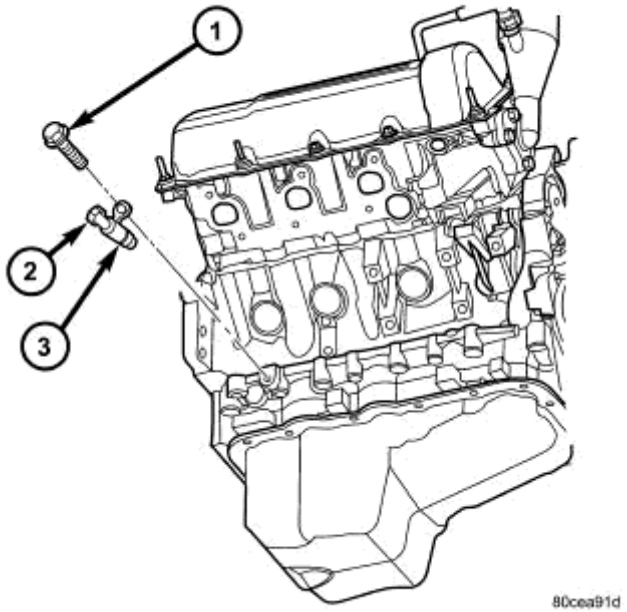

Fig. 235: CKP Sensor - 3.7L
Courtesy of CHRYSLER GROUP, LLC

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 into engine block with a slight rocking and twisting action. Refer to **Fig. 235**.

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

4. Install mounting bolt and tighten to 28 N.m (21 ft. lbs.) torque.
5. Connect electrical connector to sensor.
6. Lower vehicle.

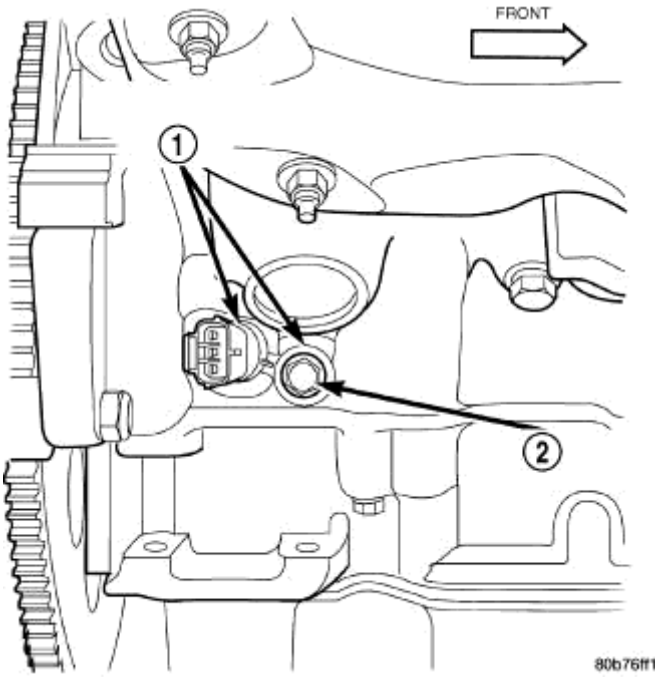

Fig. 236: CKP Sensor - 4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - CRANKSHAFT POSITION SENSOR
2 - MOUNTING BOLT

1. Clean out machined hole in engine block.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor (1) into engine block with a slight rocking and twisting action. Refer to **Fig. 236**.

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

4. Install mounting bolt and tighten to 28 N.m (21 ft. lbs.) torque.
5. Connect electrical connector to sensor.
6. Lower vehicle.

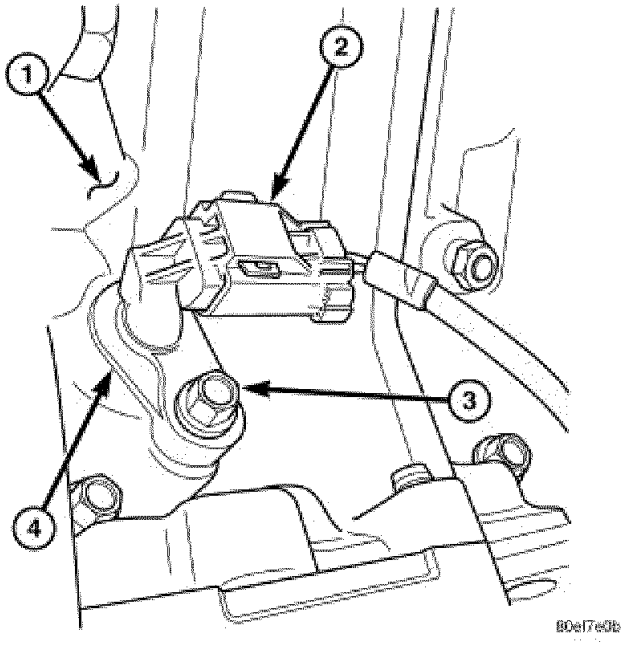

Fig. 237: CKP Sensor - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - CYLINDER BLOCK - RIGHT / REAR
2 - ELEC. CONNECTOR
3 - MOUNTING BOLT
4 - CKP SENSOR

1. Clean out machined hole in engine block.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor (4) into engine block with a slight rocking and twisting action. Refer to **Fig. 237**.

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

4. Install mounting bolt (3) and tighten to 28 N.m (21 ft. lbs.) torque.
5. Connect electrical connector to sensor.
6. Lower vehicle.

SENSOR, MANIFOLD AIR PRESSURE (MAP)

OPERATION

OPERATION

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), based upon Throttle Position Sensor (TPS) angle 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

3.7L/4.7L

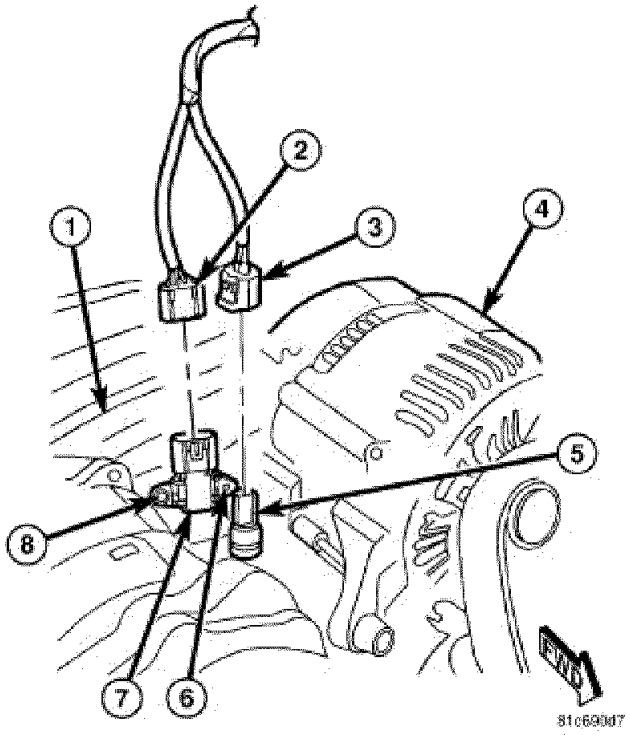

Fig. 238: MAP Sensor - 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

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).

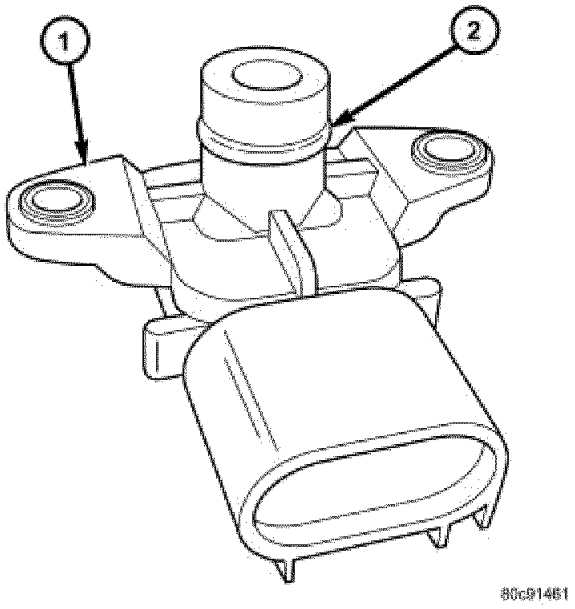

Fig. 239: MAP Sensor O-Ring 3.7L / 4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - MAP SENSOR
2 - O-RING

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

5.7L

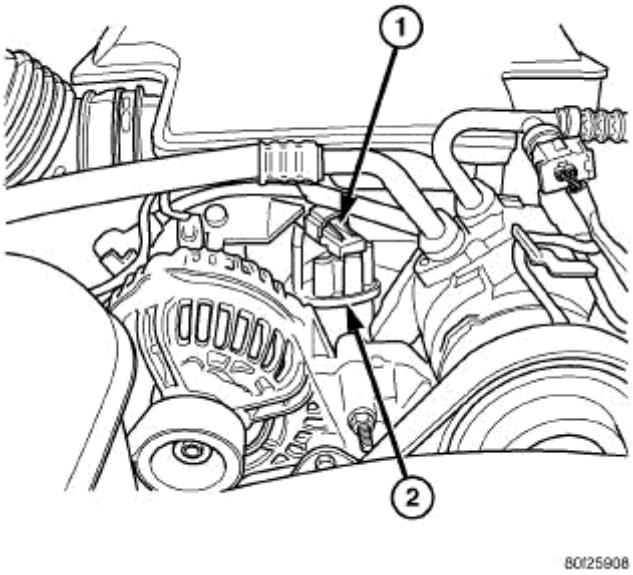

Fig. 240: MAP Sensor Location - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - MAP SENSOR
2 - FRONT OF INTAKE MANIFOLD

The Manifold Absolute Pressure (MAP) sensor is mounted to the front of the intake manifold air plenum box. Refer to **Fig. 240**.

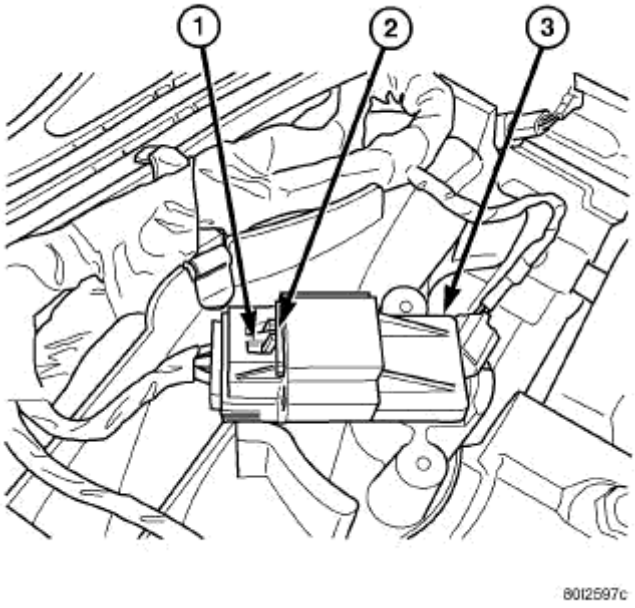

Fig. 241: 5.7L MAP Sensor Connector
Courtesy of CHRYSLER GROUP, LLC

1 - PRESS DOWN
2 - SLIDE RELEASE LOCK
3 - MAP SENSOR

1. Disconnect electrical connector at sensor by sliding release lock out. Refer to **Fig. 241**. Press down on lock tab for removal.
2. Rotate sensor (3) 1/4 turn counterclockwise for removal.
3. Check condition of sensor O-ring.

INSTALLATION

3.7L/4.7L

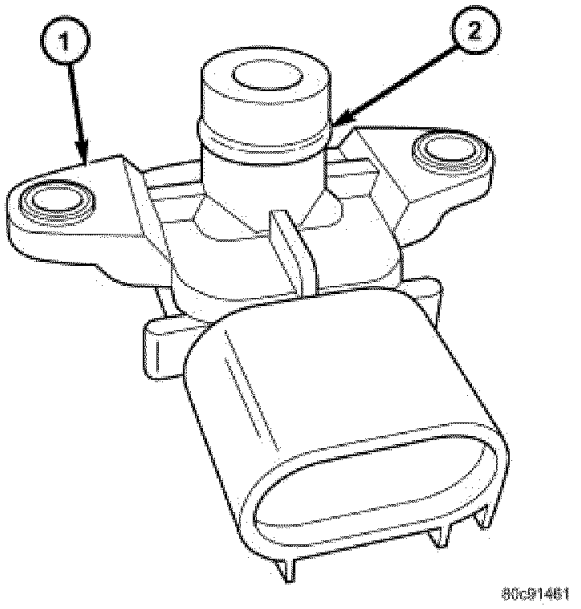

Fig. 242: MAP Sensor O-Ring 3.7L / 4.7L
Courtesy of CHRYSLER GROUP, LLC

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.

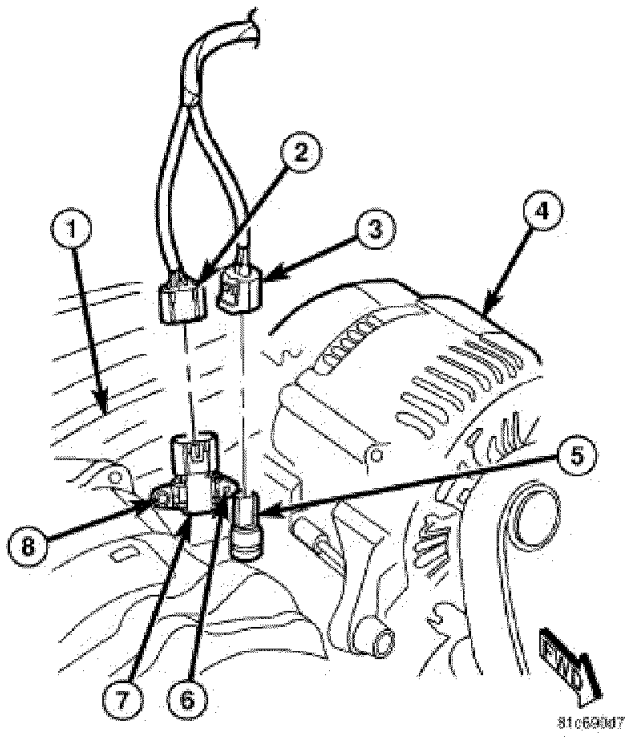

Fig. 243: MAP Sensor - 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

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).

5.7L

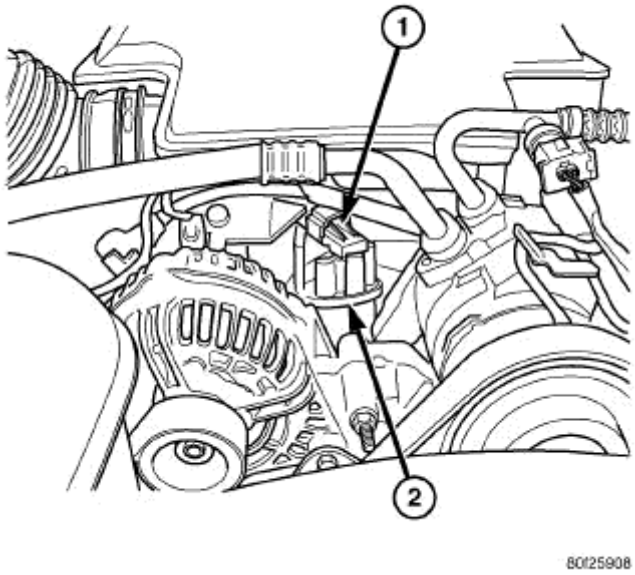

Fig. 244: MAP Sensor Location - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - MAP SENSOR
2 - FRONT OF INTAKE MANIFOLD

The Manifold Absolute Pressure (MAP) sensor (1) is mounted to the front of the intake manifold air plenum box. Refer to **Fig. 244**.

1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor O-ring seal for cuts or tears.
3. Position sensor into manifold.
4. Rotate sensor 1/4 turn clockwise for installation.
5. Connect electrical connector.

SENSOR, OXYGEN

DESCRIPTION

DESCRIPTION

The Oxygen Sensors (O2S) are attached to, and protrude into the vehicle exhaust system. Depending on the engine or emission package, the vehicle may use a total of either 2 or 4 sensors.

Federal Emission Packages : Two sensors are used: upstream (referred to as 1/1) and downstream (referred to as 1/2). With this emission package, the upstream sensor (1/1) is located just before the main catalytic convertor. The downstream sensor (1/2) is located just after the main catalytic convertor.

California Emission Packages: On this emissions package, 4 sensors are used: 2 upstream (referred to as 1/1 and 2/1) and 2 downstream (referred to as 1/2 and 2/2). With this emission package, the right upstream sensor (2/1) is located in the right exhaust downpipe just before the mini-catalytic convertor. The left upstream sensor (1/1) is located in the left exhaust downpipe just before the mini-catalytic convertor. The right downstream sensor (2/2) is located in the right exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor. The left downstream sensor (1/2) is located in the left exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor.

REMOVAL

REMOVAL

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

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

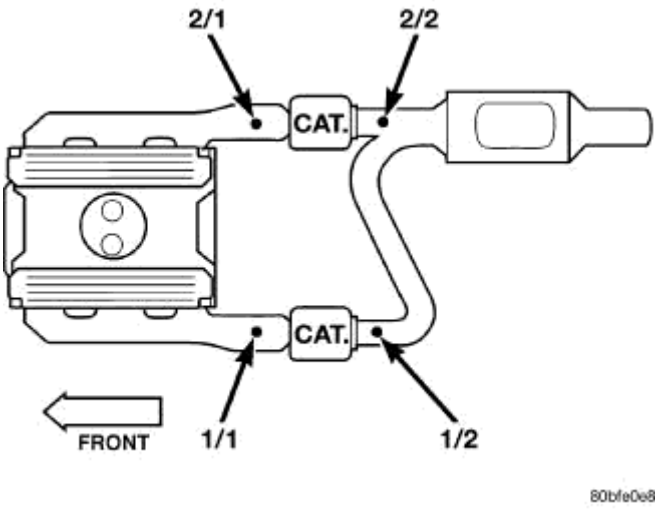

Fig. 245: Locating Oxygen Sensors (4 Sensors)
Courtesy of CHRYSLER GROUP, LLC

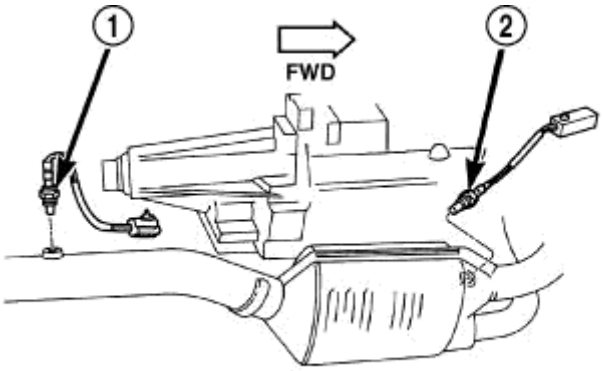

Fig. 246: Pre-Catalyst & Post Catalyst Oxygen Sensors
Courtesy of CHRYSLER GROUP, LLC

1 - POST CATALYST OXYGEN SENSOR (1/3)
2 - PRE-CATALYST OXYGEN SENSOR (1/2)

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

CAUTION: When disconnecting the oxygen sensor electrical connector, do not pull directly on the wire going into the sensor. The sensor wiring can be damaged resulting in sensor failure.

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

INSTALLATION

INSTALLATION

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

THROTTLE BODY

DESCRIPTION

DESCRIPTION

The throttle body is located on the intake manifold. Fuel does not enter the intake manifold through the throttle

body. Fuel is sprayed into the manifold by the fuel injectors.

REMOVAL

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 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).

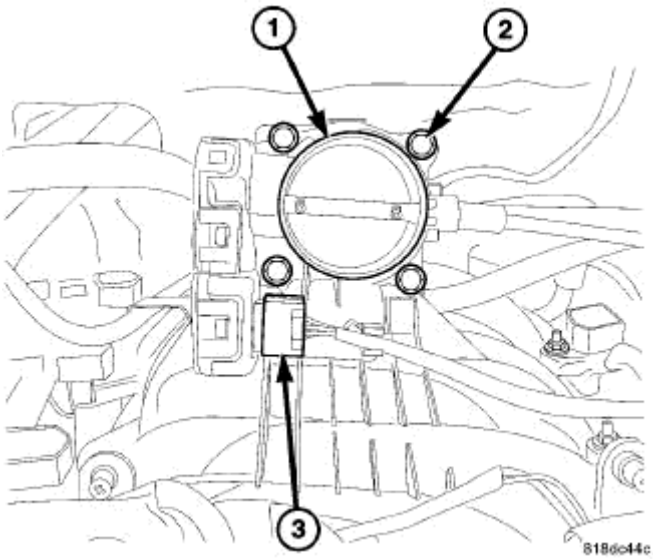

Fig. 247: Throttle Body 3.7L
Courtesy of CHRYSLER GROUP, LLC

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.

4.7L

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 checking the throttle body shaft for a binding condition. This may set DTC's.

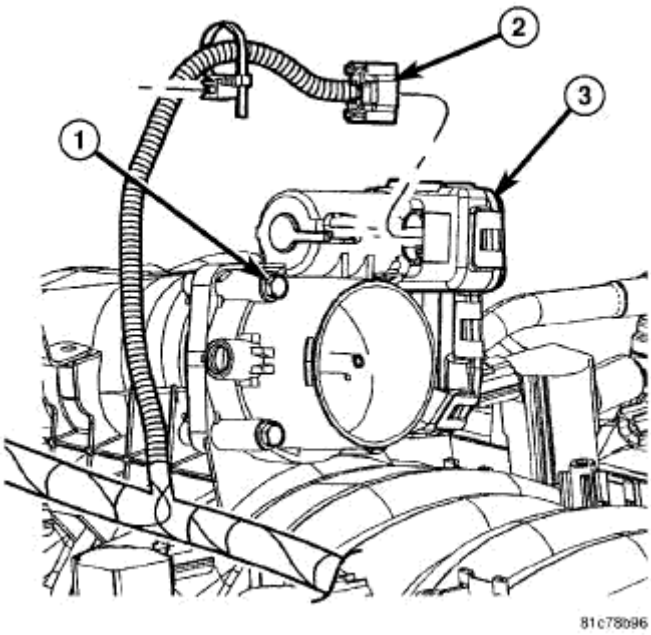

Fig. 248: Throttle Body - 4.7L
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate negative battery cable at battery.
2. Remove air duct and air resonator box at throttle body (3).
3. Disconnect throttle body electrical connector (2).
4. Disconnect necessary vacuum lines at throttle body.
5. Remove four throttle body mounting bolts (1).
6. Remove throttle body from intake manifold.
7. Check condition of old throttle body-to-intake manifold o-ring.

5.7L

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 checking the throttle body shaft for a binding condition. This may set DTC's.

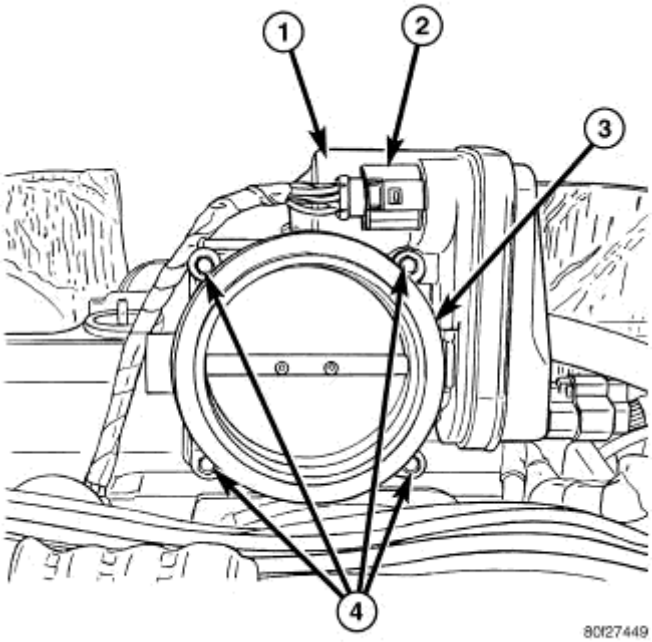

Fig. 249: Throttle Body - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate negative battery cable from battery.
2. Remove air duct and air resonator box at throttle body.
3. Disconnect electrical connector (2) at throttle body.
4. Remove four throttle body mounting bolts (4).
5. Remove throttle body from intake manifold.

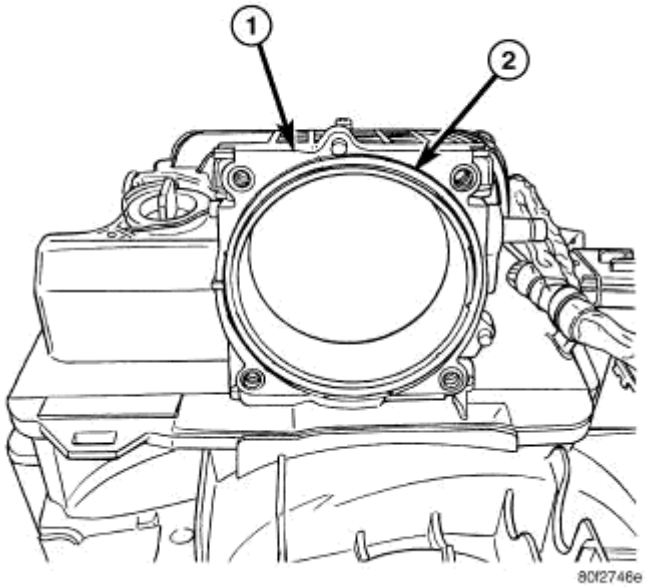

Fig. 250: Throttle Body O-Ring - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE MANIFOLD
2 - THROTTLE BODY O-RING

6. Check condition of throttle body O-ring (2).

INSTALLATION

3.7L

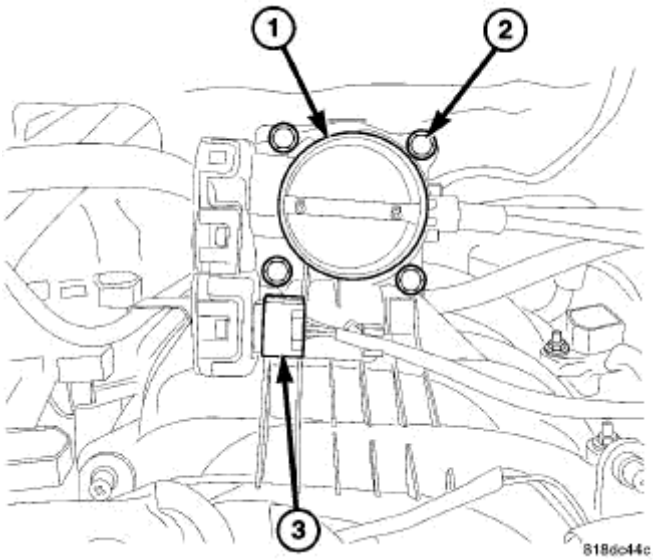

Fig. 251: Throttle Body 3.7L
Courtesy of CHRYSLER GROUP, LLC

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.

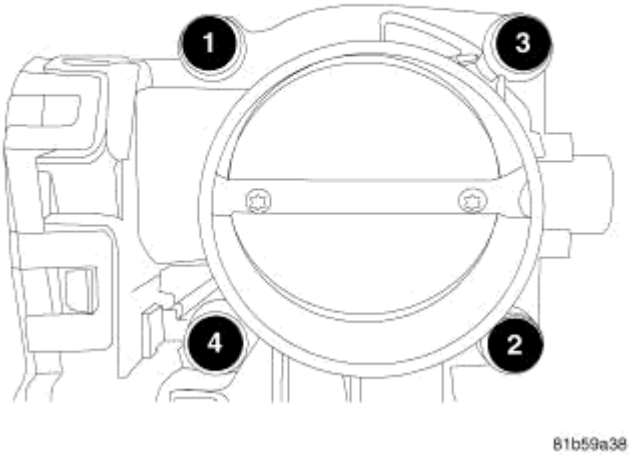

Fig. 252: Throttle Body Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The throttle body mounting bolts MUST be tightened to specifications. Over tightening can cause damage to the throttle

body or the intake manifold.

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

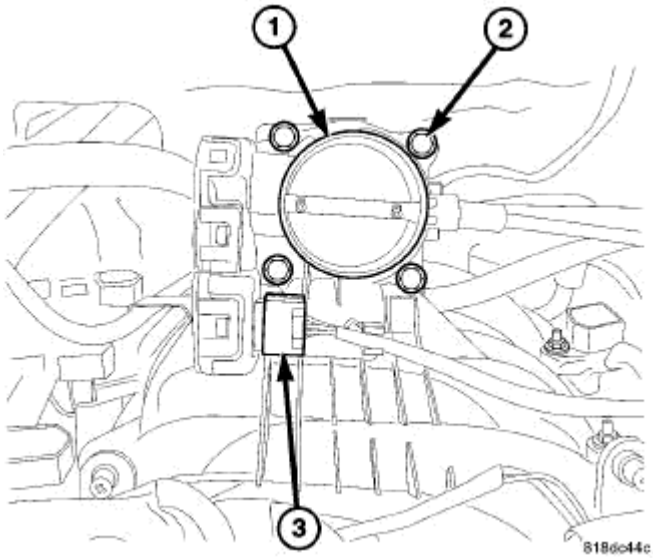

Fig. 253: Throttle Body 3.7L
Courtesy of CHRYSLER GROUP, LLC

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.

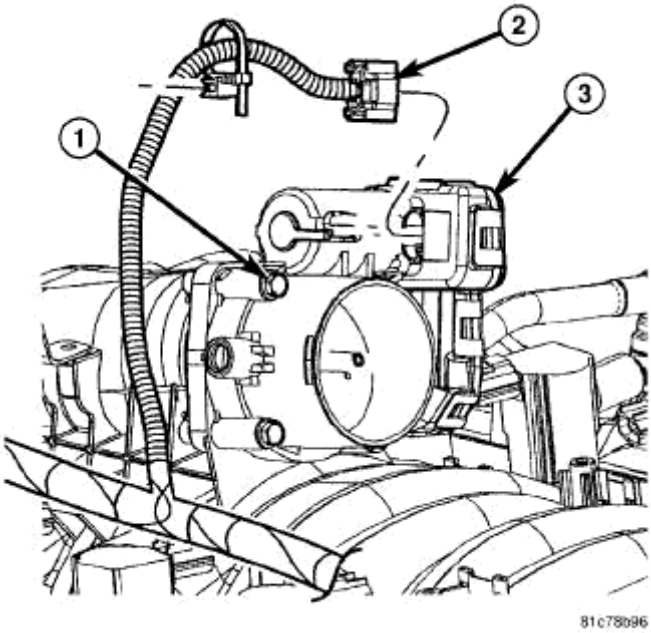

Fig. 254: Throttle Body - 4.7L
Courtesy of CHRYSLER GROUP, LLC

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 throttle body-to-intake manifold O-ring.
4. Install all throttle body mounting bolts (1) finger tight.

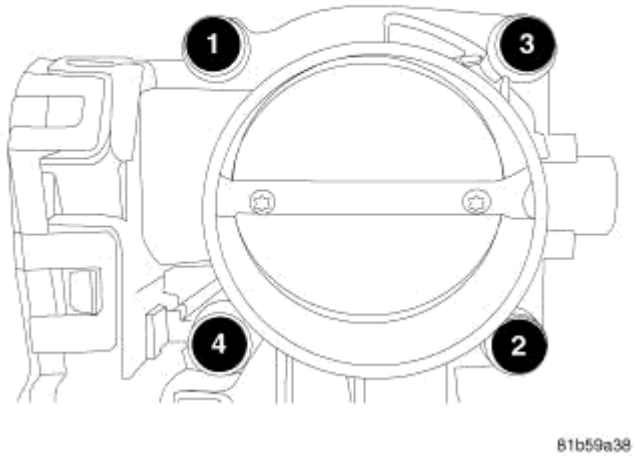

Fig. 255: Throttle Body Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The throttle body mounting bolts MUST be tightened to specifications. Over tightening can cause damage to the throttle body or the intake manifold.

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

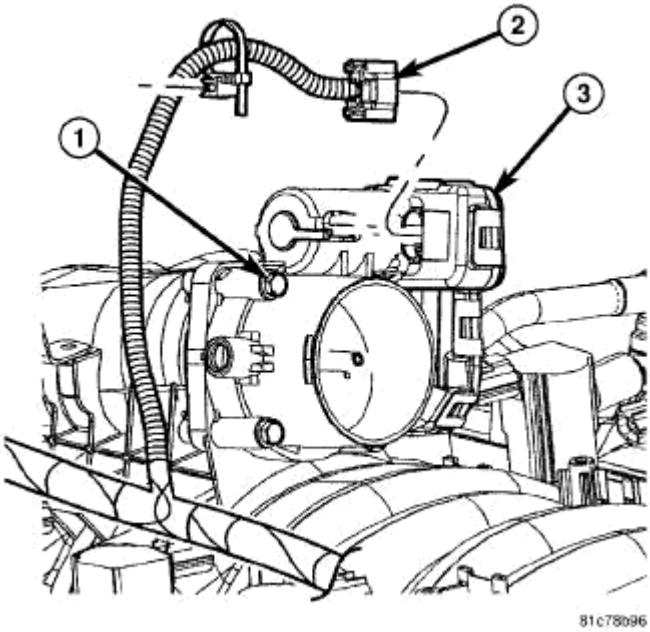

Fig. 256: Throttle Body - 4.7L
Courtesy of CHRYSLER GROUP, LLC

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

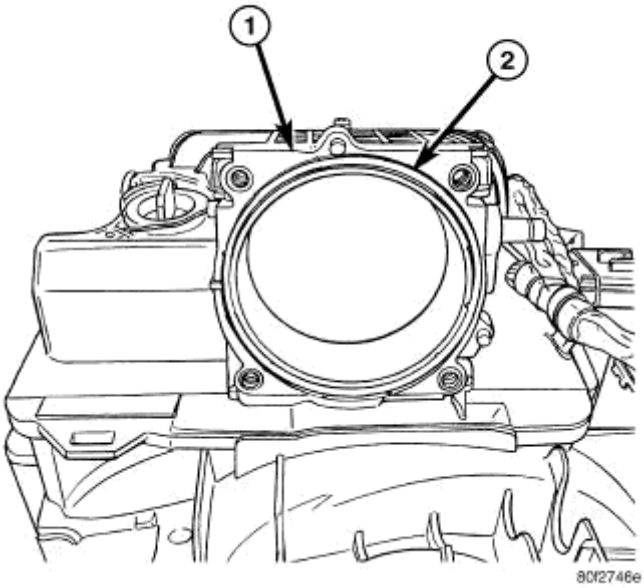

Fig. 257: Throttle Body O-Ring - 5.7L
Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE MANIFOLD
2 - THROTTLE BODY O-RING

1. Clean and check condition of throttle body-to-intake manifold O-ring (2).
2. Clean mating surfaces of throttle body and intake manifold.
3. Install O-ring (2) between throttle body and intake manifold.
4. Install throttle body to intake manifold by positioning throttle body to manifold alignment pins.
5. Install all throttle body mounting bolts finger tight.

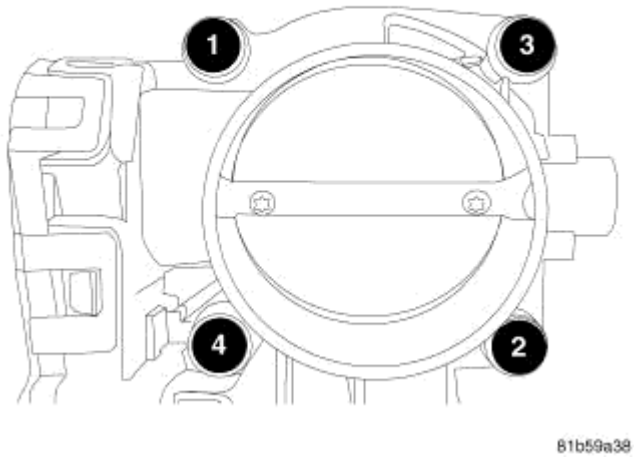

Fig. 258: Throttle Body Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The throttle body mounting bolts MUST be tightened to specifications. Over tightening can cause damage to the throttle body or the intake manifold.

6. Obtain a torque wrench. Tighten mounting bolts (as shown in illustration) in a mandatory torque criss-cross pattern sequence to 5.6 N.m (50 in. lbs.).

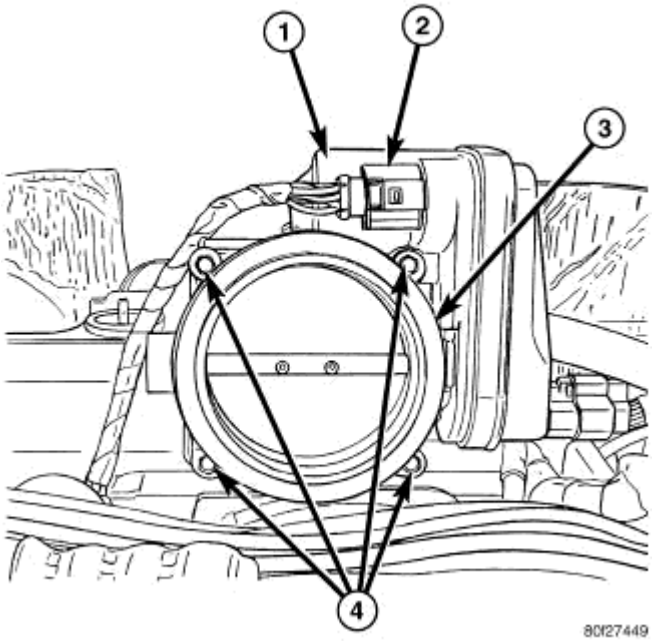

Fig. 259: Throttle Body - 5.7L
Courtesy of CHRYSLER GROUP, LLC

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

VALVE, SHORT RUNNER

DESCRIPTION

DESCRIPTION

The intake manifold features a dual shaft Short Runner Valve (SRV) system to maximize both low end torque and peak power. The SRV is bolted to the rear of the intake manifold and can be service separately from the manifold.

The SRV system operates under Wide Open Throttle conditions to maximize engine performance. When activated by the PCM, the SRV actuates a mechanical linkage to redirect the intake air flow to eight short runners. The PCM looks for a signal feedback when the actuator is activated. If the signal feedback is not present, the PCM sets the DTC.

REMOVAL

REMOVAL

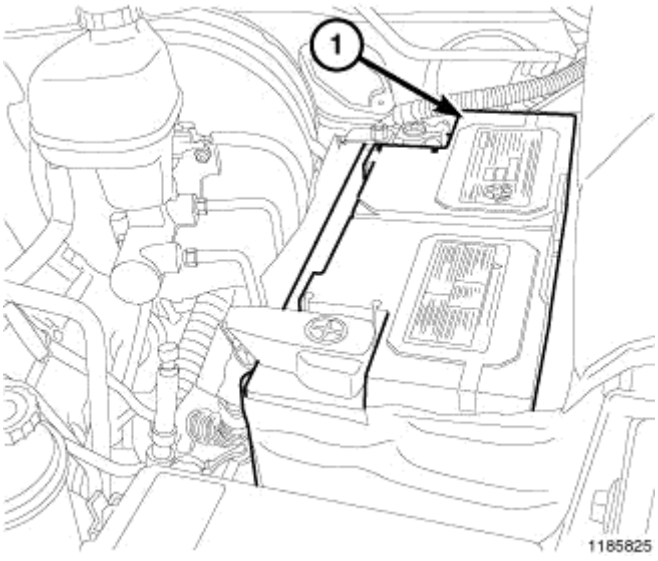

Fig. 260: Battery
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).

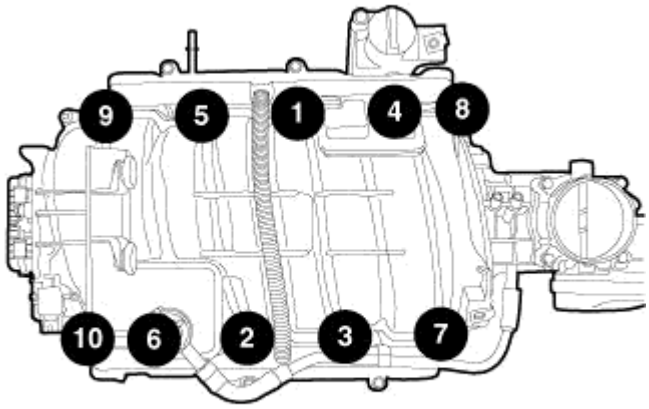

Fig. 261: Intake Manifold Retaining Bolt Removal & Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

2. Remove the intake manifold and throttle body as an assembly. Refer to **MANIFOLD, INTAKE, REMOVAL, 4.7L** or **MANIFOLD, INTAKE, REMOVAL, 5.7L** .

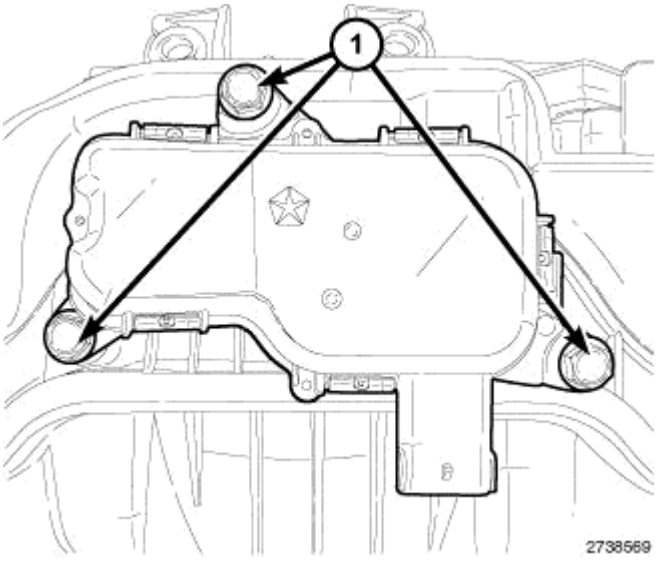

Fig. 262: Short Runner Valve Actuator Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Remove the short runner valve actuator retaining bolts (1) and remove valve.

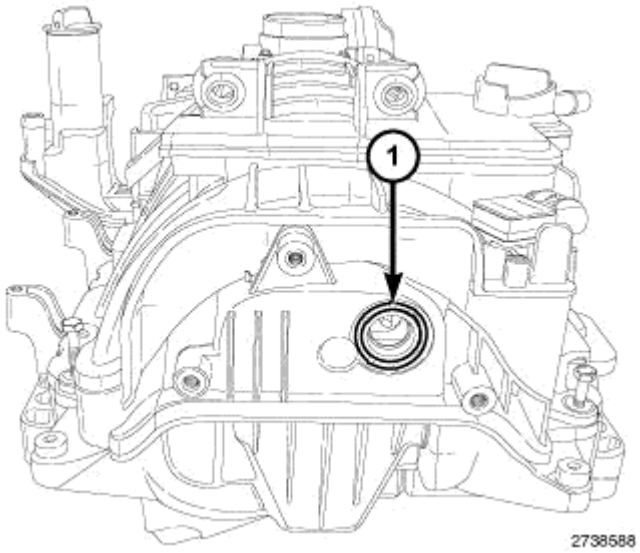

Fig. 263: Short Runner Valve Actuator Rubber O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

4. Remove and discard the short runner valve actuator rubber O-ring seal (1).

INSTALLATION

INSTALLATION

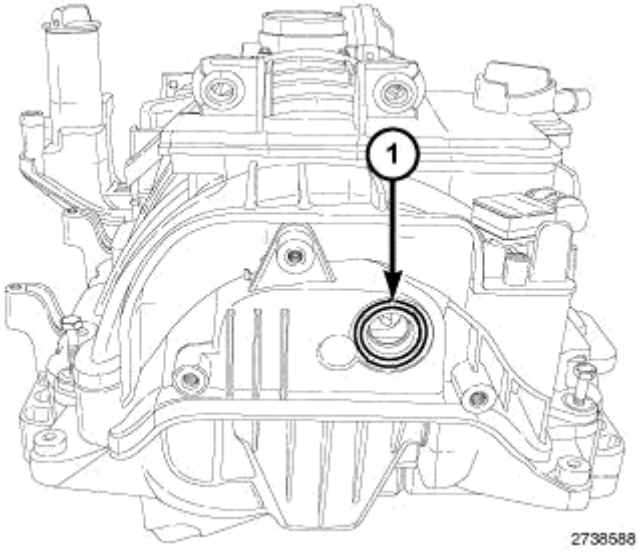

Fig. 264: Short Runner Valve Actuator Rubber O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

1. Install a new short runner valve actuator rubber O-ring seal (1).

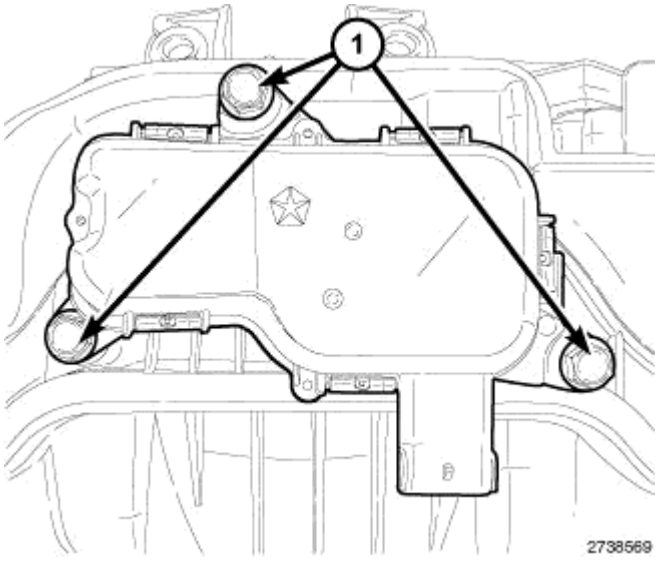

Fig. 265: Short Runner Valve Actuator Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Position the short runner valve actuator, install the retaining bolts (1) and tighten to 5 N.m (44 in. lb.).

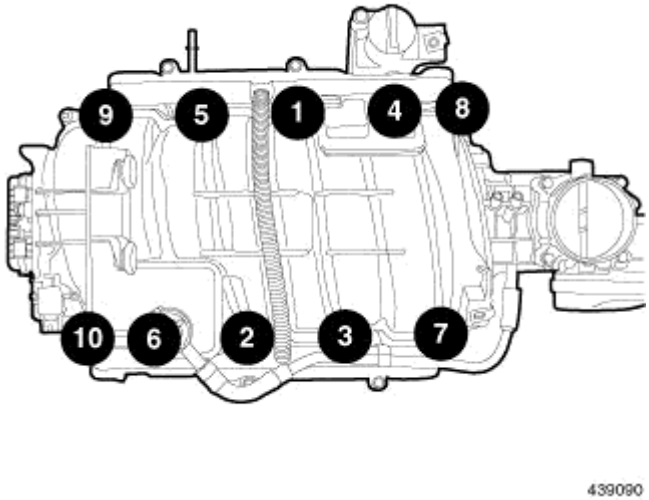

Fig. 266: Intake Manifold Retaining Bolt Removal & Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

3. Install the intake manifold and throttle body as an assembly. Refer to **MANIFOLD, INTAKE, INSTALLATION, 4.7L** or **MANIFOLD, INTAKE, INSTALLATION, 5.7L** .

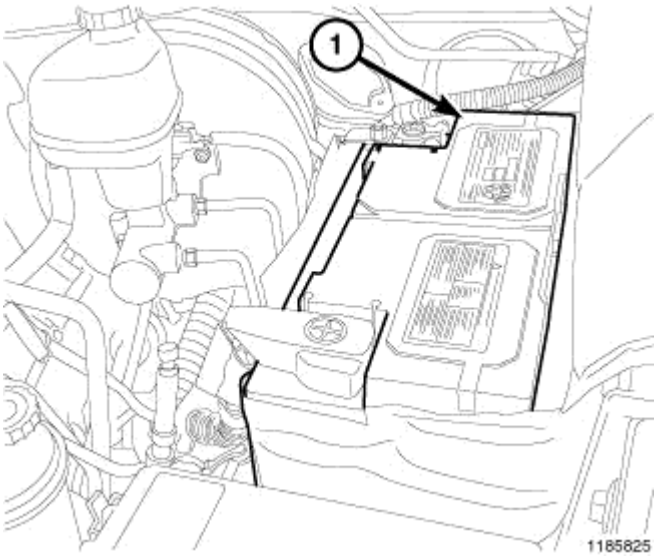

Fig. 267: Battery
Courtesy of CHRYSLER GROUP, LLC

4. Connect the negative battery cable (1).