DESCRIPTION

DESCRIPTION

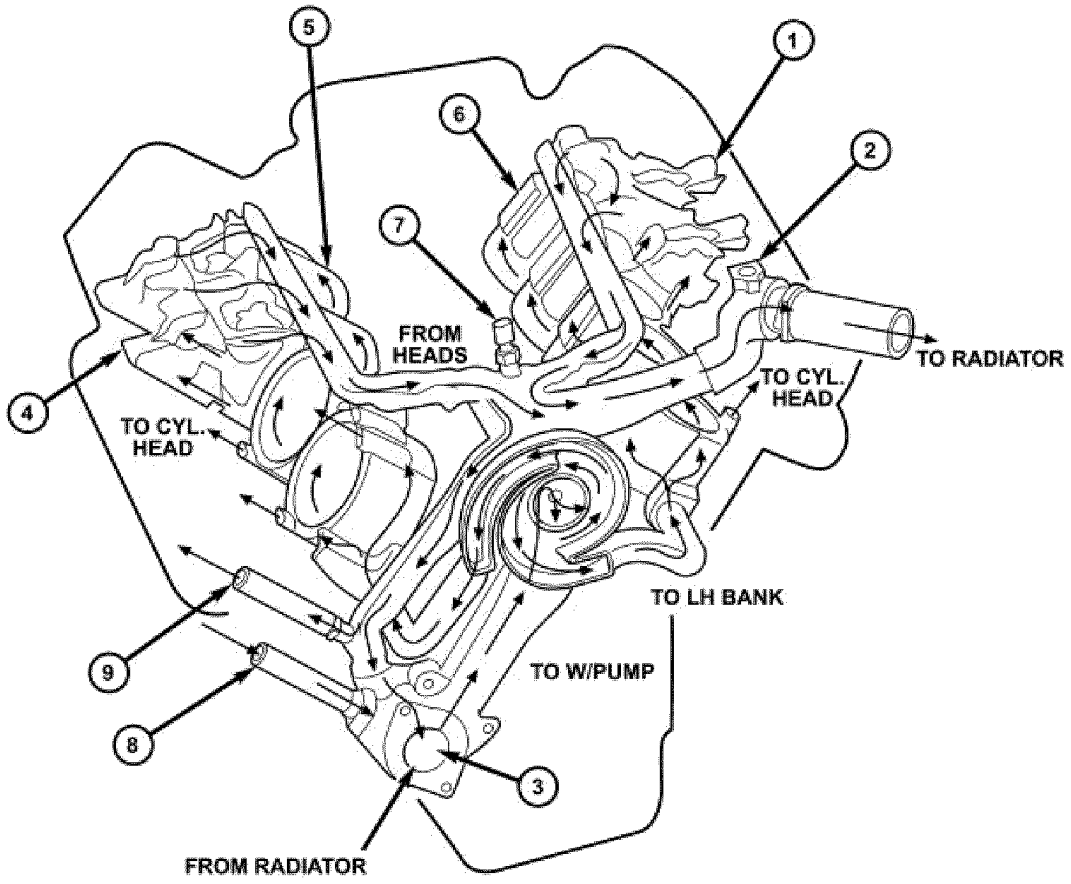

Fig. 1: Engine Cooling System Flow - 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - LH CYL. HEAD	6 - LH BANK CYL. BLOCK
2 - BLEED	7 - COOLANT TEMP. SENSOR
3 - THERMOSTAT LOCATION	8 - FROM HEATER CORE
4 - RH CYL. HEAD	9 - TO HEATER CORE
5 - RH BANK CYL. BLOCK	

The 3.7L/4.7L engine cooling system consists of :

- LH Cylinder Head (1)
- Bleed (2)
- Thermostat location (3)
- RH Cylinder Head (4)
- RH Bank Cyl. Block (5)
- LH Bank Cyl. Block (6)
- Coolant Temp Sensor (7)
- From Heater Core (8)
- To Heater Core (9)

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible. It also maintains normal operating temperature and prevents overheating.

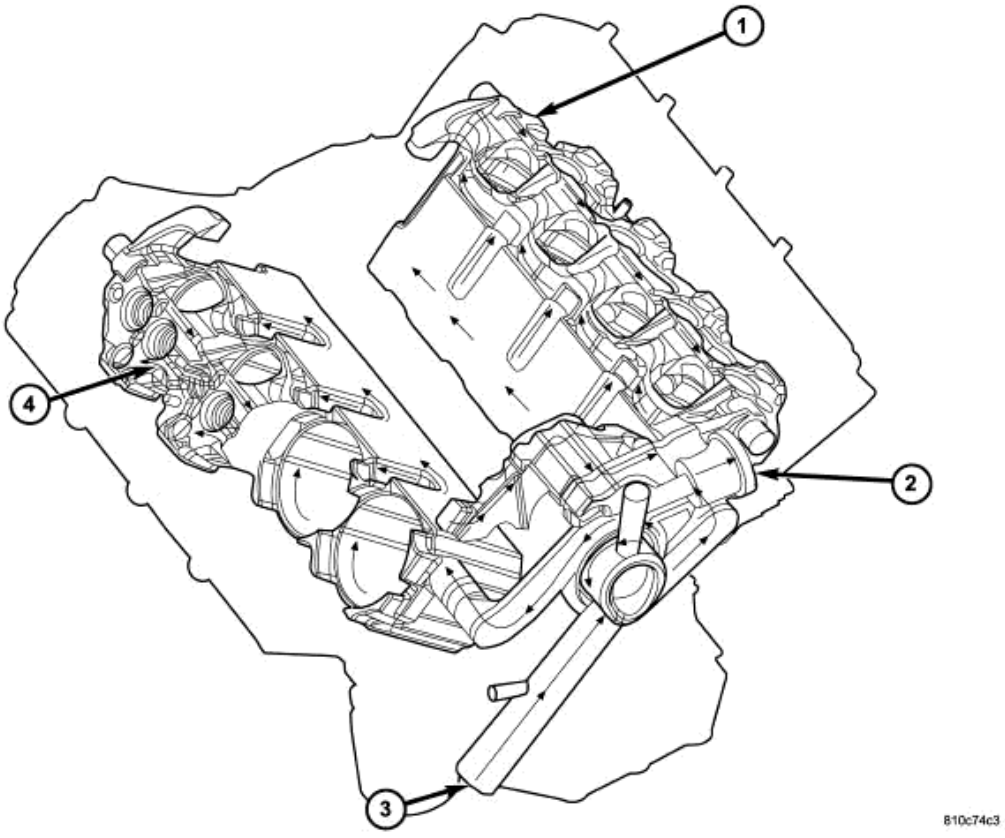

Fig. 2: 5.7L Engine Coolant System Flow
Courtesy of CHRYSLER GROUP, LLC

1 - LH CYLINDER HEAD	3 - FROM RADIATOR
2 - TO RADIATOR	4 - TO RH CYLINDER HEAD

The 5.7L engine cooling system consists of :

- LH Cylinder Head (1)
- To Radiator (2)
- From Radiator (3)
- To RH Cylinder Head (4)

The cooling system provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant through the system. The coolant recovery/reserve system utilizes an ambient overflow bottle.

DIESEL ENGINE

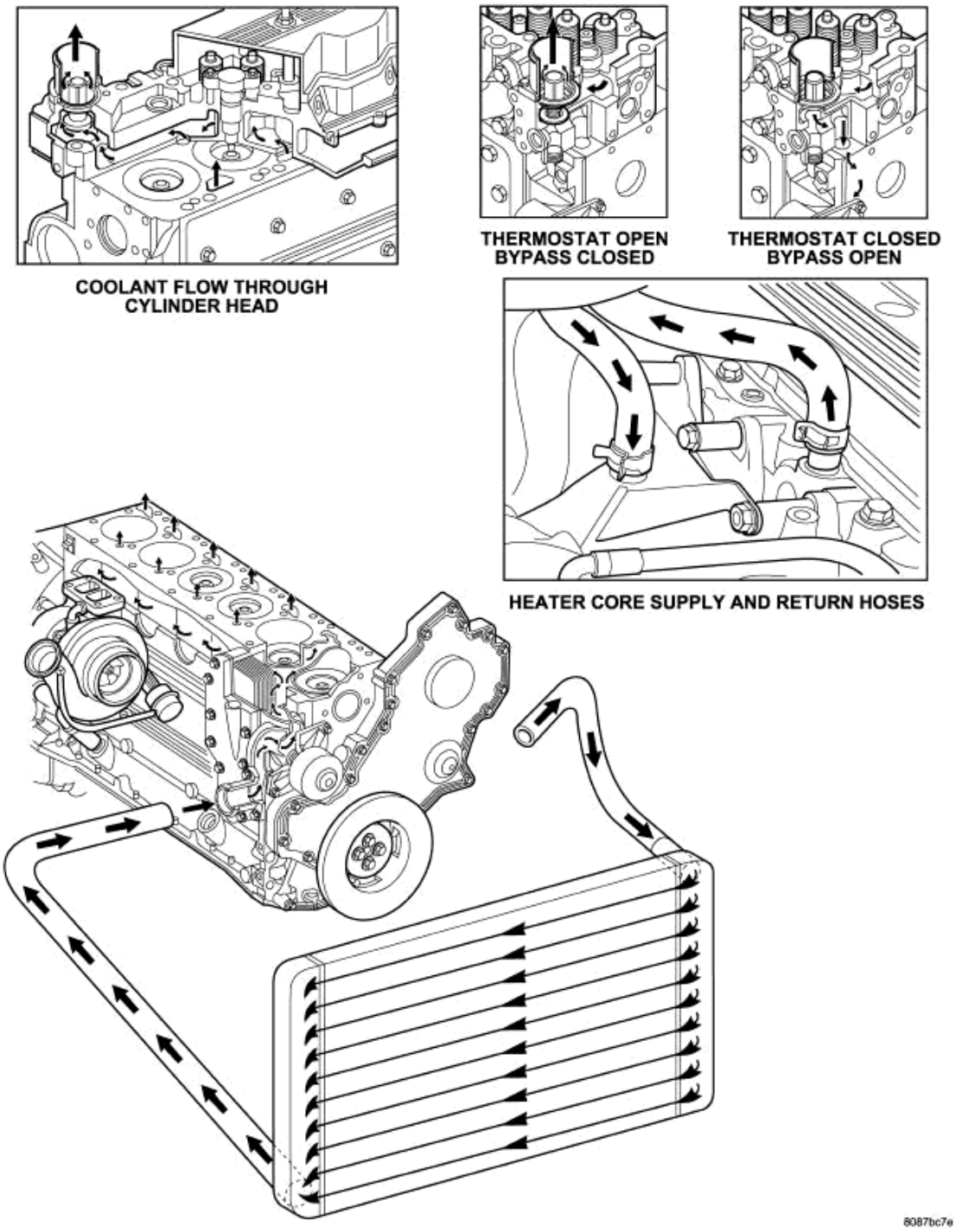

Fig. 3: Cooling System Circulation - Diesel Engine
Courtesy of CHRYSLER GROUP, LLC

The diesel engine cooling system consists of :

- Cross-flow radiator
- Belt driven water pump

- Belt driven Electronically Controlled Viscous fan drive (Diesel Engine)
- Engine mounted fan shroud
- Radiator pressure cap
- Vertically mounted thermostat
- Coolant reserve/recovery system
- Transmission Oil Cooler (Automatic Transmission Only)
- Engine mounted Transmission oil cooler
- Radiator mounted fan shroud
- EGR Cooler
- Turbocharger Actuator

OPERATION

OPERATION

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible. It also maintains normal operating temperature and prevents overheating.

The cooling system also provides a source of hot coolant for heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

- When engine is cold the thermostat is closed. The cooling system has no flow through the radiator. The coolant flows through the engine, water pump, and heater.
- When engine is warm the thermostat is full open. One the gas engine coolant flows through the engine, radiator, heater, and water pump.

All engines utilize an ambient overflow bottle for coolant recovery/reserve.

An optional factory installed maximum duty cooling package is available on most models. This package will provide additional cooling capacity for vehicles used under extreme conditions such as trailer towing in high ambient temperatures.

DIAGNOSIS AND TESTING

PRELIMINARY CHECKS

ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause:

- Prolonged idle
- Very high ambient temperature

- Overloaded Truck
- Slow traffic
- Traffic jams
- High speed or steep grades
- Snow Plow restricting airflow through cooling module
- Debris on front of the grill or the cooling module that is restricting airflow

Driving techniques that avoid overheating are:

- Idle with A/C off when temperature gauge is at end of normal range.
- Increasing engine speed up to 2000 rpm with transmission in park or neutral for more airflow is recommended.
- If equipped with a snow plow. Activate the **snow plow** mode.

TRAILER TOWING:

Consult Trailer Towing section of the owners manual. Do not exceed the limits.

RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may affect the cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).
- Service to electrically controlled viscous fan clutch

NOTE: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to COOLING SYSTEM DIAGNOSIS CHART.

These charts are to be used as a quick-reference only.

COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW **NOTE:** **Information on dash cluster is displayed based on broadcast data from PCM. DTC will be set for engine sensor circuit issues.**	1. Vehicle is equipped with a heavy duty cooling system.	1. None. System operating normally.

	2. Thermostat stuck open	2. Inspect and test thermostat. Refer to **THERMOSTAT, DIAGNOSIS AND TESTING**.
	3. Coolant level low.	3. Fill cooling system. Refer to **STANDARD PROCEDURE**.
	4. Temperature gauge not functioning correctly.	4. Check cluster. Refer to **DIAGNOSIS AND TESTING** .
	5. Engine sensor stuck in range	5. Monitor sensor with scan tool to verify sensor reading changes with increasing temperature.
	6. Engine sensor failed out of range.	6. A DTC will be set.
	7. Electronically Controlled Viscous Fan Drive/mechanical viscous fan not operating properly.	7. Check Electronically Controlled Viscous Fan Drive.
TEMPERATURE GAUGE READS HIGH. COOLANT MAY OR MAY NOT BE LEAKING FROM SYSTEM **NOTE:** **Temperature information displayed on dash cluster and EVIC are based on broadcast data from PCM. If engine temperatures exceed thresholds, power is reduced and a message of 'Oil Temp High - Speed May be Reduced' is displayed on the EVIC.** **NOTE:** **Beginning in MY2010, a 200 F thermostat is used in the Ram 2500 / 3500 pickup with the Cummins Turbo Diesel. It is normal for the coolant temperature gauge to read higher than in previous model years.**	1. Vehicle overloaded, high ambient (outside) temperatures with A/C turned on, stop and go driving or prolonged operation at idle speeds.	1. Temporary condition, repair not required. Notify customer of vehicle operation instructions located in Owners Manual.
	2. Electronically-controlled viscous fan clutch not functioning correctly.	2. Troubleshoot and if necessary repair the electronic viscous fan clutch.
	3. Temperature gauge not functioning correctly.	3. Check cluster. Refer to **DIAGNOSIS AND TESTING** .
	4. Air trapped in cooling system	4. Drain and refill cooling system. Refer to **STANDARD**

		PROCEDURE.
	5. Radiator cap faulty.	5. Replace radiator cap.
	6. Plugged A/C or radiator cooling fins.	6. Clean all debris away from A/C and radiator cooling fins.
	7. Coolant mixture incorrect.	7. Drain cooling system and refill with correct mixture. Refer to **STANDARD PROCEDURE**.
	8. Thermostat stuck shut.	8. Inspect and test thermostat. Refer to **THERMOSTAT, DIAGNOSIS AND TESTING**.
	9. Bug screen or winter front being used.	9. Remove bug screen or winter front.
	10. Electronically controlled viscous fan drive not operating properly.	10. Check viscous fan.
	11. Cylinder head gasket leaking.	11. Check for leaking head gaskets. Refer to **LEAK TESTING**.
	12. Heater core leaking.	12. Replace heater core. Refer to **CORE, HEATER, REMOVAL** .
	13. Cooling system hoses leaking.	13. Tighten clamps or Replace hoses.
	14. Brakes dragging.	14. Check brakes. Refer to **DIAGNOSIS AND TESTING** .
	15. Accessory drive belt.	15. Inspect and replace as necessary. Refer to **BELT, SERPENTINE, DIAGNOSIS AND TESTING**.
	16. Water Pump.	16. Inspect and replace as necessary.
	17. Engine sensor stuck in range.	17. Monitor sensor with scan tool to verify sensor reading changes increase in temperature.
	18. Temperature sensor failed - Too High	18. Clear the existing overheat fault. Drive the vehicle until thermostat opens. Verify that fault code does not return and coolant does not reach threshold of 230 degrees F.
TEMPERATURE GAUGE READING INCONSISTENT (ERRATIC, CYCLES OR FLUCTUATES) **NOTE:**	1. Heavy duty cooling system, extreme cold ambient (outside) temperature or heater blower motor in high position.	1. None. System operating normally.

Information on dash cluster is displayed based on broadcast data from PCM. DTC will be set for engine sensor circuit issues.		
	2. Temperature gauge or sensor defective.	2. Check cluster or engine coolant temp sensor. Refer to **DIAGNOSIS AND TESTING** .
	3. Temporary heavy usage or load.	3. None. Normal condition.
	4. Air trapped in cooling system.	4. Fill cooling system. Refer to **STANDARD PROCEDURE**.
	5. Water pump.	5. Replace water pump.
	6. Air leak on suction side of water pump.	6. Check for leak. Refer to **LEAK TESTING**.
RADIATOR CAP LEAKING STEAM AND OR COOLANT INTO RESERVOIR BOTTLE. (TEMPERATURE GAUGE MAY READ HIGH)	1. Radiator cap defective.	1. Replace radiator cap.
	2. Radiator neck surface damaged.	2. Replace radiator. Refer to **REMOVAL**.
HOSE OR HOSES COLLAPSE WHEN ENGINE IS COOLING.	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reservoir/overflow system.	1. Replace radiator cap, check vent hose between radiator and reservoir bottle for blockage also check reservoir bottle vent for blockage.
NOISY FAN	1. Fan blade(s) loose, damaged.	1. Replace fan blade assembly.
	2. Electronically controlled viscous fan drive/mechanical viscous fan.	2. None. Normal condition.
	3. Fan blades striking surrounding objects.	3. Locate contact point and repair as necessary.
	4. Electronically controlled viscous fan drive/mechanical viscous fan bearing concern.	4. Check viscous fan drive.
	5. Electronically controlled viscous fan/mechanical viscous fan stuck on.	5. Check viscous fan drive.
	6. Obstructed air flow through radiator.	6. Remove obstruction.
INADEQUATE AIR CONDITIONER PERFORMANCE (COOLING SYSTEM SUSPECTED)	1. Radiator and/or A/C condenser air flow obstructed.	1. Remove obstruction and/or clean.
	2. Electronically controlled viscous fan drive/ /mechanical viscous fan not working.	2. Check viscous fan drive.
	3. Air seals around radiator damaged or missing.	3. Inspect air seals, repair or replace as necessary.
INADEQUATE HEATER	1. Heavy duty cooling system, and	1. None. Normal condition.

PERFORMANCE. GAUGE MAY OR MAY NOT READ LOW.	cooler ambient temperatures.	
	2. Obstruction in heater hoses.	2. Remove hoses, remove obstruction.
	3. Electronically controlled viscous fan/ /mechanical viscous fan stuck on.	Check viscous fan drive.
	4. Water pump damaged.	4. Replace water pump.
HEAT ODOR	1. Damaged or missing exhaust system heat shields.	1. Repair or replace damaged or missing exhaust system heat shields. Refer to **SHIELD, HEAT, DESCRIPTION** .
	2. Electronically controlled viscous fan drive//mechanical viscous fan damaged.	2. Check viscous fan drive.

LEAK TESTING

ULTRAVIOLET LIGHT METHOD

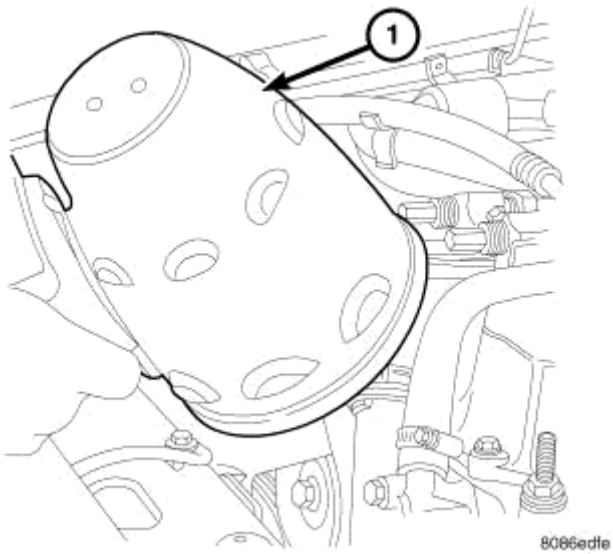

Fig. 4: Identifying Ultraviolet Light Method
Courtesy of CHRYSLER GROUP, LLC

1 - TYPICAL BLACK LIGHT TOOL

A leak detection additive is available through the parts department that can be added to cooling system. The additive is highly visible under ultraviolet light (black light) (1). Pour one ounce of additive into cooling system. Place heater control unit in HEAT position. Start and operate the engine until the radiator upper hose is warm to the touch. Aim the commercially available black light tool at the components to be checked. If leaks are present, the black light will cause the additive to glow a bright green color.

The black light can be used in conjunction with a pressure tester to determine if any external leaks exist.

PRESSURE TESTER METHOD

The engine should be at normal operating temperature. Recheck the system cold if the cause of coolant loss is not located during the warm engine examination.

WARNING: Hot, pressurized coolant can cause injury by scalding.

Carefully remove the radiator pressure cap from the filler neck and check the coolant level. Push down on the cap to disengage it from the stop tabs. Wipe the inside of the filler neck and examine the lower inside sealing seat for nicks, cracks, paint, dirt and solder residue. Inspect the radiator-to- reserve/overflow tank hose for internal obstructions. Insert a wire through the hose to be sure it is not obstructed.

Inspect the cams on the outside of the filler neck. If the cams are damaged, seating of the pressure cap valve and tester seal will be affected.

Attach pressure tester ((special tool #7700, Tester, Cooling System) or an equivalent) to radiator filler neck.

Operate the tester pump to apply 103.4 kPa (15 psi) pressure to the system. If the hoses enlarge excessively or bulges while testing, replace as necessary. Observe the gauge pointer and determine the condition of the cooling system according to following criteria:

Holds Steady: If the pointer remains steady for two minutes, serious coolant leaks are not present in system. However, there could be an internal leak that does not appear with normal system test pressure. If it is certain that coolant is being lost and leaks cannot be detected, inspect for interior leakage or perform Internal Leakage Test. Refer to **INTERNAL LEAKAGE INSPECTION**.

Drops Slowly: Indicates a small leak or seepage is occurring. Examine all of the connections for seepage or slight leakage with a flashlight. Inspect the radiator, hoses, gasket edges and heater. Seal the small leak holes with a Sealer Lubricant (or equivalent). Repair the leak holes and inspect the system again with pressure applied.

Drops Quickly: Indicates that serious leakage is occurring. Examine the system for external leakage. Block side panels are embossed to highlight core plugs. Remove embossed noise panels to inspect and or repair core plugs. If leaks are not visible, inspect for internal leakage.

INTERNAL LEAKAGE INSPECTION

Remove the engine oil pan drain plug and drain a small amount of engine oil. If coolant is present in the pan, it will drain first because it is heavier than oil. An alternative method is to operate engine for a short period to churn the oil. After this is done, remove the engine dipstick and inspect for water globules. Also inspect the transmission dipstick for water globules and transmission fluid cooler for leakage.

WARNING: With radiator pressure tester tool installed on radiator, do not allow pressure to exceed 145 kpa (21 psi). Pressure will build up quickly if a combustion leak is present. To release pressure, rock tester from side to side. When removing tester, do not turn tester more than 1/2 turn if

system is under pressure.

Operate the engine without the pressure cap on the radiator until the thermostat opens. Attach a Pressure Tester to the filler neck. If pressure builds up quickly it indicates a combustion leak exists. This is usually the result of a cylinder head gasket leak or crack in engine. Repair as necessary.

If there is not an immediate pressure increase, pump the Pressure Tester. Do this until indicated pressure is within system range of 110 kPa (16 psi). Fluctuation of the gauge pointer indicates compression or combustion leakage into cooling system.

Because the vehicle is equipped with a catalytic converter, **do not** short out cylinders to isolate compression leak.

If the needle on dial of the pressure tester does not fluctuate, race engine a few times to check for an abnormal amount of coolant or steam. This would be emitting from exhaust pipe. Coolant or steam from exhaust pipe may indicate a faulty cylinder head gasket, cracked engine cylinder block or cylinder head.

COMBUSTION LEAKAGE TEST - WITHOUT PRESSURE TESTER

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: Do not remove cylinder block drain plugs or loosen radiator draincock with system hot and under pressure. Serious burns from coolant can occur.

Drain sufficient coolant to allow thermostat removal. Refer to **THERMOSTAT, REMOVAL**. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL**.

Add coolant to radiator to bring level to within 6.3 mm (1/4 in) of the top of the thermostat housing.

CAUTION: Avoid overheating. Do not operate engine for an excessive period of time. Open draincock immediately after test to eliminate boil over.

Start engine and accelerate rapidly three times, to approximately 3000 rpm while observing coolant. If internal engine combustion gases are leaking into cooling system, bubbles will appear in coolant. If bubbles do not appear, internal combustion gas leakage is not present.

STANDARD PROCEDURE

CLEANING/REVERSE FLUSHING

CLEANING

Drain the cooling system and refill with water. Run the engine with the radiator cap installed until the upper radiator hose is hot. Stop the engine and drain the water from system. If the water is dirty, fill the system with water, run the engine and drain the system. Repeat this procedure until the water drains clean.

REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator inlet and outlet. Attach a section of the radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: Internal radiator pressure must not exceed 138 kPa (20 psi) as damage to radiator may result.

Allow the radiator to fill with water. When the radiator is filled, apply air in short blasts. Allow the radiator to refill between blasts. Continue this reverse flushing until clean water flows out through the rear of the radiator cooling tube passages.

REVERSE FLUSHING ENGINE

Drain the cooling system. Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump and attach a lead-away hose to the water pump inlet fitting.

CAUTION: On vehicles equipped with a heater water control valve, be sure the heater control valve is closed (heat off). This will prevent coolant flow with scale and other deposits from entering the heater core.

Connect the water supply hose and air supply hose to flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing and install the thermostat. Install the thermostat housing with a replacement gasket. Refer to **INSTALLATION**. Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION** .

CHEMICAL CLEANING

In some instances, use a radiator cleaner (Mopar® Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid flushing operation.

CAUTION: Follow manufacturers instructions when using these products.

DRAINING

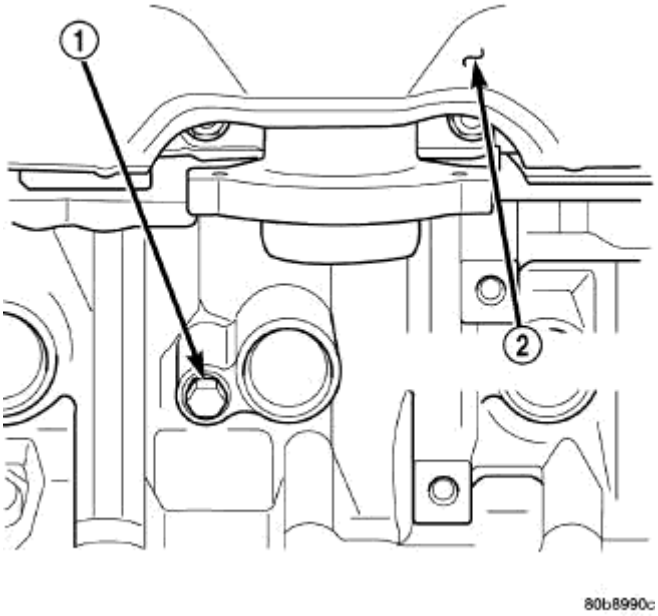

Fig. 5: Identifying Cylinder Block Drain Plugs
Courtesy of CHRYSLER GROUP, LLC

1 - CYLINDER BLOCK DRAIN PLUG
2 - EXHAUST MANIFOLD AND HEAT SHIELD

WARNING: Do not remove cylinder block drain plugs or loosen radiator draincock with system hot and under pressure. Serious burns from coolant can occur.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

1. Attach one end of a hose to the draincock. Put the other end into a clean container.
2. **DO NOT REMOVE THE RADIATOR CAP** when draining the coolant from the reservoir/overflow tank. Open radiator draincock and when the tank is empty, remove the radiator cap and continue draining the cooling system.
3. If draining the entire engine, remove the cylinder block drain plugs (1).

STANDARD PROCEDURE - COOLANT AIR EVACUATION

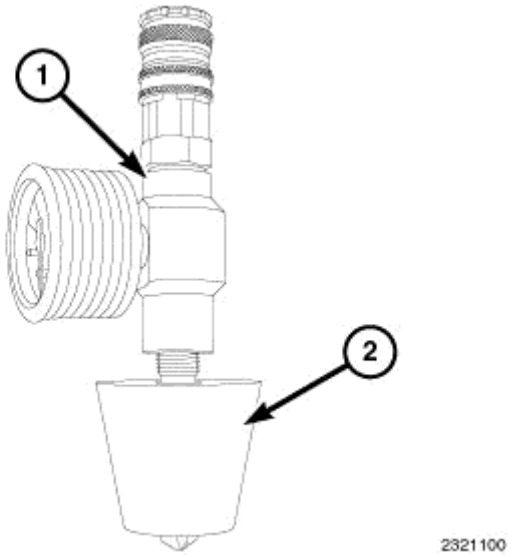

Fig. 6: Pressurized Air Operated Vacuum Generator
Courtesy of CHRYSLER GROUP, LLC

Evacuating or purging air from the cooling system involves the use of a pressurized air operated vacuum generator. The vacuum created allows for a quick and complete coolant refilling while removing any airlocks present in the system components.

NOTE: To avoid damage to the cooling system, ensure that no component would be susceptible to damage when a vacuum is drawn on the system.

WARNING: ANTIFREEZE IS AN ETHYLENE GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASED COOLANT PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE; PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED; PERSONAL INJURY CAN RESULT.

WARNING: WEAR APPROPRIATE EYE AND HAND PROTECTION WHEN PERFORMING THIS PROCEDURE.

NOTE: The service area where this procedure is performed should have a minimum shop air requirement of 80 PSI (5.5 bar) and should be equipped with an air

dryer system.

NOTE: For best results, the radiator should be empty. The vehicle's heater control should be set to the heat position (ignition may need to be turned to the on position but do not start the motor).

1. Refer to the Chrysler Pentastar Service Equipment (Chrysler PSE) Coolant Refiller #85-15-0650 or equivalent tool's operating manual for specific assembly steps.
2. Choose an appropriate adapter cone that will fit the vehicle's radiator filler neck or reservoir tank.
3. Attach the adapter cone (2) to the vacuum gauge (1).

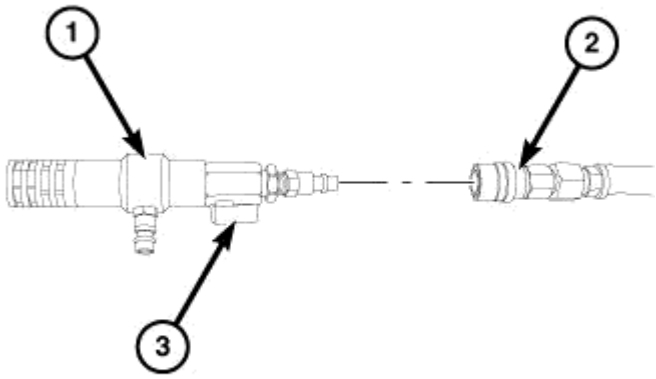

Fig. 7: Vacuum Generator/Venturi Ball Valve
Courtesy of CHRYSLER GROUP, LLC

4. Make sure the vacuum generator/venturi ball valve (3) is closed and attach an airline hose (2) (minimum shop air requirement of 80 PSI/5.5 bar) to the vacuum generator/venturi (1).
5. Position the adaptor cone/vacuum gauge assembly into the radiator filler neck or reservoir tank. Ensure that the adapter cone is sealed properly.

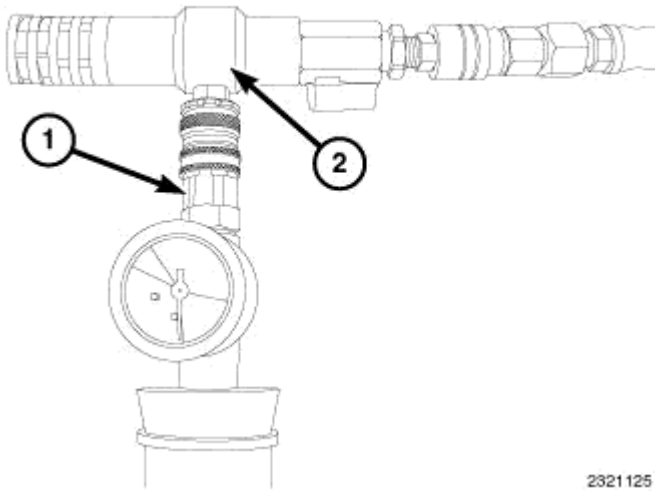

Fig. 8: Vacuum Generator/Venturi
Courtesy of CHRYSLER GROUP, LLC

6. Connect the vacuum generator/venturi (2) to the positioned adaptor cone/vacuum gauge assembly (1).
7. Open the vacuum generator/venturi ball valve.

NOTE: Do not bump or move the assembly as it may result in loss of vacuum. Some radiator overflow hoses may need to be clamped off to obtain vacuum.

8. Let the system run until the vacuum gauge shows a good vacuum through the cooling system. Refer to the tool's operating manual for appropriate pressure readings.

NOTE: If a strong vacuum is being created in the system, it is normal to see the radiator hoses to collapse.

9. Close the vacuum generator/venturi ball valve.

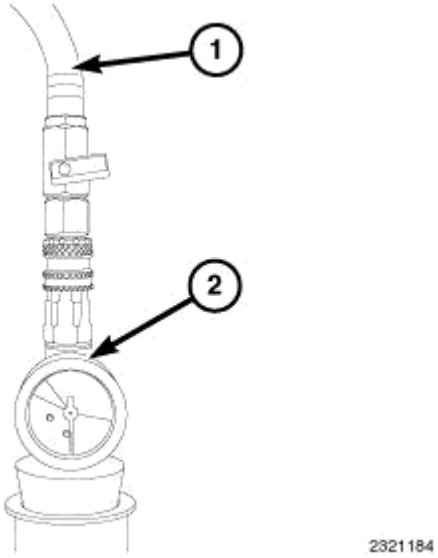

Fig. 9: Vacuum Generator/Venturi & Air Line
Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the vacuum generator/venturi and airline from the adaptor cone/vacuum gauge assembly.
11. Wait approximately 20 seconds, if the pressure readings do not move, the system has no leaks. If the pressure readings move, a leak could be present in the system and the cooling system should be checked for leaks and the procedure should be repeated.
12. Place the tool's suction hose into the coolant's container.

NOTE: Ensure there is a sufficient amount of coolant, mixed to the required strength/protection level available for use. For best results and to assist the refilling procedure, place the coolant container at the same height as the radiator filler neck. Always draw more coolant than required. If the coolant level is too low, it will pull air into the cooling system which could result in airlocks in the system.

13. Connect the tool's suction hose (1) to the adaptor cone/vacuum gauge assembly (2).

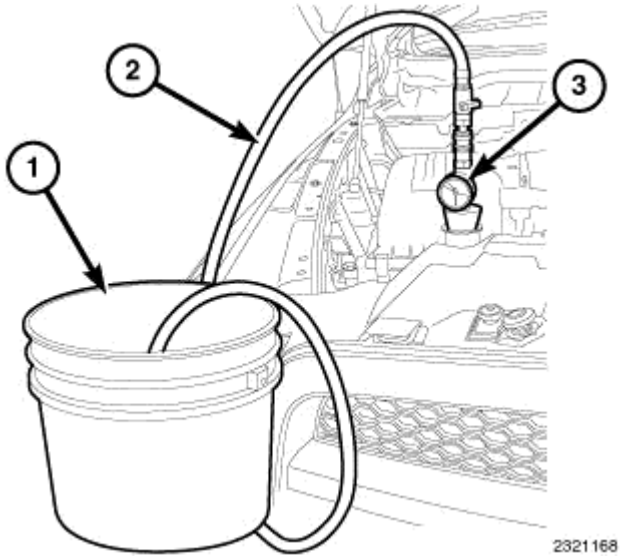

Fig. 10: Refilling Cooling System
Courtesy of CHRYSLER GROUP, LLC

14. Open the suction hose's ball valve to begin refilling the cooling system.
15. When the vacuum gauge reads zero, the system is filled.

NOTE: On some remote pressurized tanks, it is recommended to stop filling when the proper level is reached.

16. Close the suction hose's ball valve and remove the suction hose from the adaptor cone/vacuum gauge assembly.
17. Remove the adaptor cone/vacuum gauge assembly from the radiator filler neck or reservoir tank.
18. With heater control unit in the HEAT position, operate engine with container cap in place.
19. After engine has reached normal operating temperature, shut engine off and allow it to cool. When engine is cooling down, coolant will be drawn into the radiator from the pressure container.
20. Add coolant to the recovery bottle/container as necessary. **Only add coolant to the container when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.** Add necessary coolant to raise container level to the COLD MINIMUM mark after each cool down period.
21. Once the appropriate coolant level is achieved, attach the radiator cap or reservoir tank cap.

DRAINING - DIESEL ENGINE

WARNING: Do not remove the cylinder block drain plugs or loosen the radiator drain plug with system hot and under pressure. Serious burns from coolant can occur.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

1. Start the engine and place the heater control temperature selector in the Full-On position.

2. Turn the ignition off.
3. Do not remove radiator cap when draining coolant from coolant recovery container. Open radiator drain plug and when coolant recovery container is empty, remove radiator cap. If the coolant recovery container does not drain. Refer to **DIAGNOSIS AND TESTING**.
4. Remove radiator pressure cap.

STANDARD PROCEDURE - FILLING

WARNING: ANTIFREEZE COOLANT IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASED COOLANT PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE; PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN AND OTHER MOVING COMPONENTS WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED; PERSONAL INJURY CAN RESULT.

WARNING: WEAR APPROPRIATE EYE AND HAND PROTECTION WHEN PERFORMING THIS PROCEDURE.

CAUTION: Do not use well water or suspect water supply in cooling system. A 50/50 mixture of the recommended antifreeze coolant and distilled water is recommended.

NOTE: Cooling system fill procedure is critical to overall cooling system performance.

NOTE: Make sure all hoses are connected and radiator draincock is closed. Draincock should be hand tightened only.

6.7L

CAUTION: All air must be purged from the 6.7L engine when refilling the cooling system. Failure to do so can cause EGR Cooler cracking which can lead to catastrophic engine and exhaust system damage.

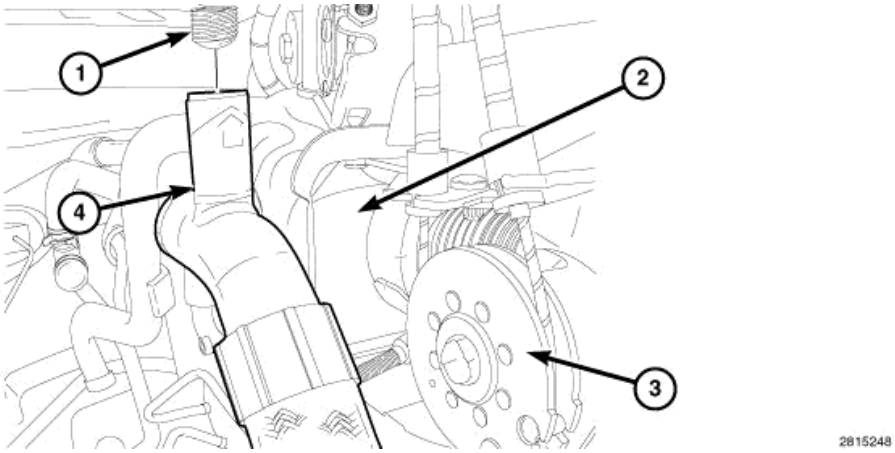

Fig. 11: Vent Fitting
Courtesy of CHRYSLER GROUP, LLC

1. Close radiator drain plug.
2. Remove the vent fitting (1) located near the EGR cooler (2).
3. If using funnel 8195:
    1. Remove cooling system pressure cap. Attach Filling Aid Funnel (special tool #8195, Funnel), to coolant pressure container filler neck.
    2. Use the supplied clip to pinch overflow hose.
    3. Pour coolant into the larger section of Filling Aid Funnel (the smaller section of funnel is to allow air to escape).
    4. Continue filling until a steady stream of coolant flows from the vent hole.
    5. Install vent fitting when coolant is free of bubbles.
    6. Tighten the bleed plug to 6 N.m (55 in. lbs.).
    7. Remove clip from overflow hose.
    8. Allow coolant in Filling Aid Funnel to drain into overflow chamber of pressure container.
    9. Remove Filling Aid Funnel. (special tool #8195, Funnel)
    10. Install the pressure cap.

NOTE: The diesel engine is equipped with two one-way check valves (jiggle pins). The check valves are used as a servicing feature and will vent air when the system is being filled. Water pressure (or flow) will hold the valves closed.

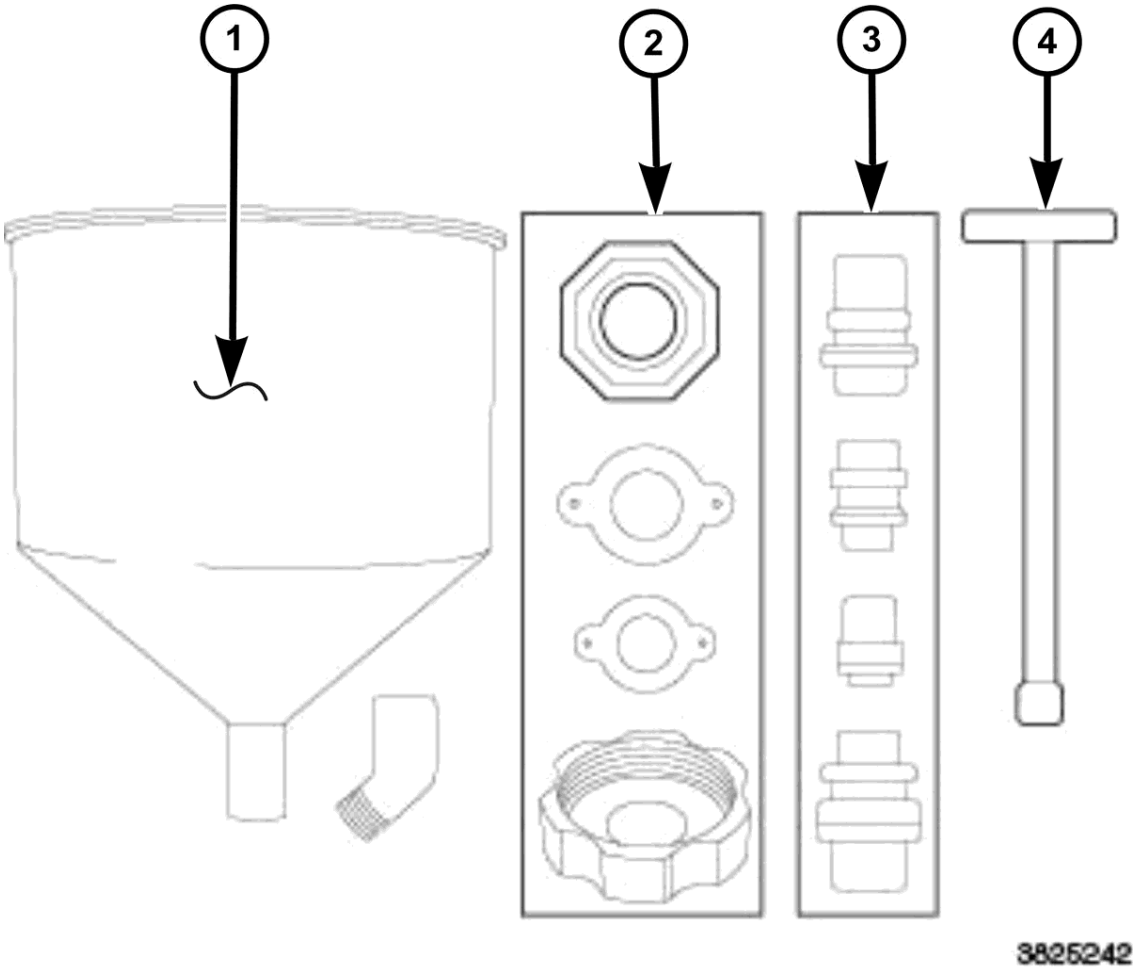

Fig. 12: Locating Funnel, Locking Ring, Fitting Extension & Stopper
Courtesy of CHRYSLER GROUP, LLC

NOTE: The 8195A does not require pinching off the overflow hose. The adapter seal prevents liquid from entering the overflow during coolant fill.

4. If using Special Tool 8195A:
    1. Select the appropriate fitting extension (3) and locking ring (2) and attach to the fill neck of the cooling system.
    2. Make sure the adapter seal fits firmly against the inside of the fill neck base to ensure a good seal. After the extension and locking ring are installed, make sure the extension can not be moved. This will confirm a good seal.
    3. Attach the funnel (1) to the extension (1) and fill with coolant.
    4. Add coolant to the funnel. Continue to add coolant until a steady stream of coolant flows from the vent hole.
    5. Install the vent fitting when coolant is free of bubbles.
    6. Tighten the vent fitting to 6 N.m (55 in. lbs.).
    7. Install the stopper (4) into the funnel base. The stopper will prevent the fluid that is left in the

funnel from spilling out when separated from the extension.

8. Remove the funnel, extension and locking ring and install the cap.

5. Start and operated the engine. Take the vehicle on a test drive till operating temperature is reached. Shut the engine down and wait till engine is cool.
6. Slowly loosen vent fitting (1) to purge any trapped air. If air is still present. Repeat step 3 - 5.
7. Check coolant level in coolant recovery container. Fill to FULL line.
8. The volume of coolant added to the engine must be within 1.5 quarts of the volume drained. If this requirement has not been met, repeat steps 2 - 9.
9. Remove Tool. Install radiator cap.

5.9L

NOTE: The diesel engine is equipped with two one-way check valves (jiggle pins). The check valves are used as a servicing feature and will vent air when the system is being filled. Water pressure (or flow) will hold the valves closed.

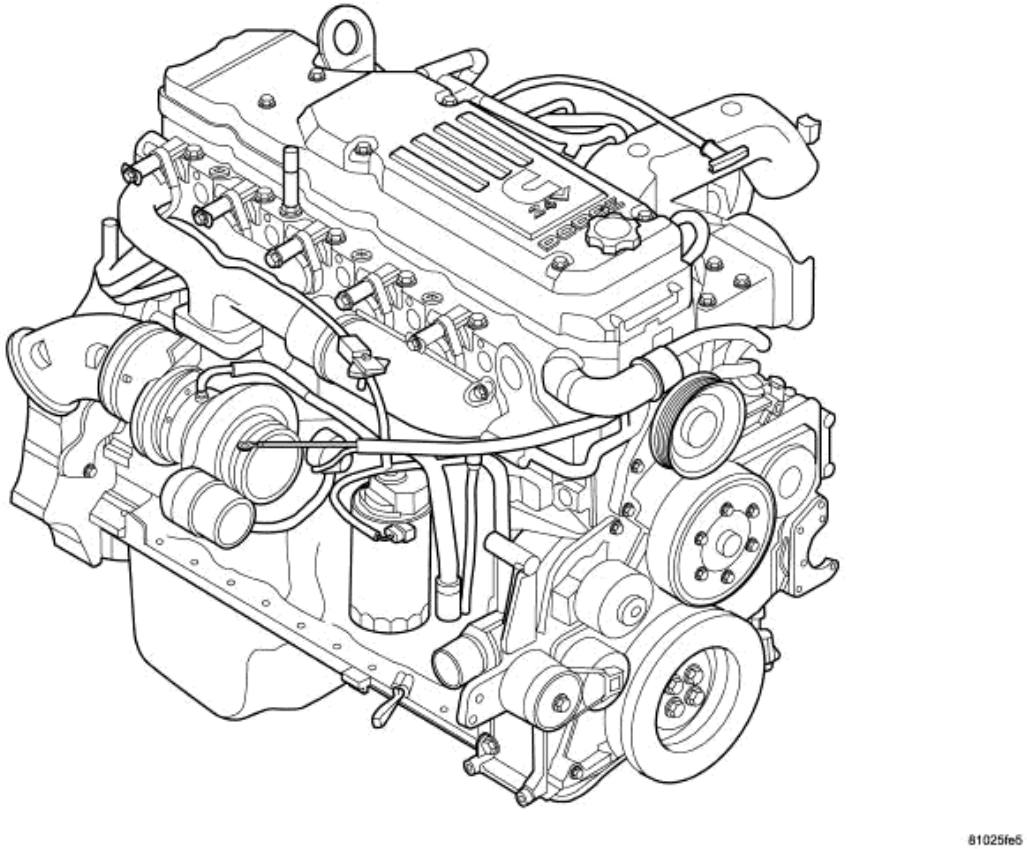

Fig. 13: Cummins(R) 24-Valve Turbo-Diesel Engine
Courtesy of CHRYSLER GROUP, LLC

Clean cooling system prior to refilling. Refer to **STANDARD PROCEDURE**.

1. Close radiator drain plug.

2. If using funnel 8195:
    1. Remove cooling system pressure cap. Attach Filling Aid Funnel (special tool #8195, Funnel), to coolant pressure container filler neck.
    2. Use the supplied clip to pinch overflow hose.
    3. Pour coolant into the larger section of Filling Aid Funnel (the smaller section of funnel is to allow air to escape).
    4. Add coolant until some coolant remains in the funnel and no more air bubbles appear in the fluid.
    5. Remove clip from overflow hose.
    6. Allow coolant in Filling Aid Funnel to drain into overflow chamber of pressure container.
    7. Remove Filling Aid Funnel. (special tool #8195, Funnel)
    8. Install the pressure cap.

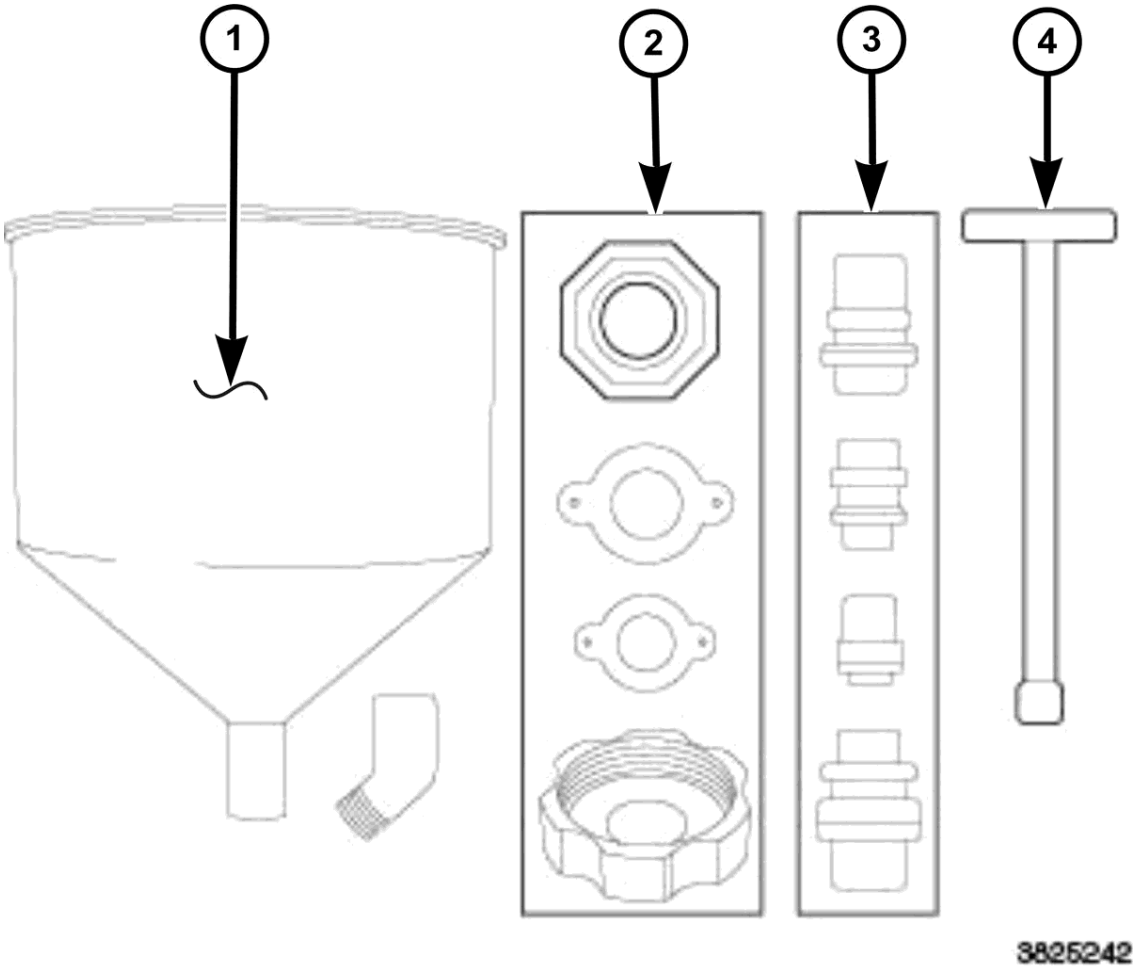

Fig. 14: Locating Funnel, Locking Ring, Fitting Extension & Stopper
Courtesy of CHRYSLER GROUP, LLC

NOTE: The 8195A does not require pinching off the overflow hose. The adapter seal prevents liquid from entering the overflow during coolant fill.

3. If using Special Tool 8195A:
    1. Select the appropriate fitting extension (3) and locking ring (2) and attach to the fill neck of the cooling system.
    2. Make sure the adapter seal fits firmly against the inside of the fill neck base to ensure a good seal. After the extension and locking ring are installed, make sure the extension can not be moved. This will confirm a good seal.
    3. Attach the funnel (1) to the extension (3) and fill with coolant.
    4. Add coolant to the funnel.

       Continue to add coolant until it is free of bubbles.

    5. Install the stopper (4) into the funnel base. The stopper will prevent the fluid that is left in the funnel from spilling out when separated from the extension.
    6. Remove the funnel, extension and locking ring and install the cap.
4. Fill coolant recovery container to the FULL mark.
5. Start and operate engine until thermostat opens. Upper radiator hose should be warm to touch.
6. Accelerate engine from idle to 2500 RPM five times.
7. Shut off engine. Allowing cooling system to settle. Fill coolant recovery container to FULL line.
8. Start and operate engine. Take vehicle for a test drive till operating temperature is reached.
9. Shut off engine. Allow engine to cool. Fill coolant recovery container to FULL line.
10. The volume of coolant added to the engine must be within 1.5 quarts of the volume drained. If this requirement has not been met, repeat steps 1 - 13.
11. Install radiator cap.

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Bolt - Automatic Belt Tensioner to Block	41	30	-
Bolt - Automatic Belt Tensioner Pulley	61	45	-
Engine Mounted Fan Shroud Brackets (Upper and Lower)	24	18	-
Fan Shroud Ring to Fan Shroud Brackets	12	9	106
Bolt - Block Heater	2	-	18
Bolts - Generator Mounting Bracket			
Front horizontal mounting bolts	54	40	-
Rear vertical mounting bolt	40	30	-
Bolts - Fan Shroud to Radiator Mounting	10	7	89
Bolts - Radiator to Support	8	-	71
Bolts - Fan Blade to Viscous Fan Drive	24	18	-
Fan Drive	50	37	-

Bolts - Thermostat Housing	13	10	115
Bolts - Power Steering Oil Cooler	8	-	71
Bolts - Transmission Auxiliary Oil Cooler	6	-	53
Nuts - Transmission Oil Cooler Tube	31	23	-
Bolts - Coolant Recovery Container	10	7	89
Tube Nut - Fan Motor - Pressure Line	47	35	-
Tube Nut - Fan Motor - Return Line	29	21	-
Plug - Bleed	6	-	53
Tube Nuts - Transmission Oil Cooler to Transmission	20	15	-
Bolts - Water Pump - 5.7L	24	18	-
Bolts - Water Pump - 3.7L/4.7L	58	43	-

TORQUE SPECIFICATIONS - DIESEL ENGINE

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Bolt - Automatic Belt Tensioner to Block	41	30	-
Bolt - Automatic Belt Tensioner Pulley - Diesel	43	32	-
Engine Mounted Fan Shroud Brackets (Upper and Lower)	24	18	-
Fan Shroud Ring to Fan Shroud Brackets	12	-	108
Bolt - Block Heater	2	-	17
Bolts - Generator/Compressor Mounting Bracket			
# 1 and 2	54	40	-
# 3	40	30	-
Bolts - Generator/Compressor Mounting Bracket - Diesel (4 mounting holes)	24	18	-
Bolts - Fan Shroud to Radiator Mounting	12	-	105
Bolts - Radiator to Support	8	-	75
Bolts - Fan Blade to Viscous Fan Drive	24	18	-
Fan Drive -Diesel	115	85	-
Bolt - Idler Pulley - Diesel	43	32	-
Bolts - Thermostat Housing - Diesel	10	-	89
Bolts - Power Steering Oil Cooler	8	-	75
Bolts - Transmission Auxiliary Oil Cooler	6	-	55
Nuts - Transmission Oil Cooler Tube	31	24	-
Bolts - Coolant Recovery Container	10	-	89
Tube Nut - Fan Motor - Pressure Line	47	35	-
Tube Nut - Fan Motor - Return Line	29	21	-
Plug - Bleed	6	-	55
Tube Nuts - Transmission Oil Cooler to Transmission			
6.7L/46RE	31	24	-
Bolts - Water Pump - Diesel	24	18	-

Turbocharger Coolant Supply Line - Diesel	24	18	-
Block Heater - Diesel	75	55	-

FILL VOLUMES

DESCRIPTION	SPECIFICATION	
	Metric	**US**
3.7L Engine	13 L	13.7qts
4.7L Engine	13 L	13.7qts.
5.7L Engine	15.3 L	16 qts.
6.7L Diesel Engine	21.4 L	22.6 qts.

SPECIAL TOOLS

SPECIAL TOOLS

	7700 - Tester, Cooling System (Originally Shipped In Kit Number(s) 7700-A.) 8195 - Funnel (Originally Shipped In Kit Number(s) 8273, 8273CC.) 8286 - Refractometer 8875A - Disconnect, Transmission Cooler Line (Originally Shipped In Kit Number(s) 9202, 9328, 9328-CAN, 9329, 9516, 9575.) 9546 - Disconnect Tool (Originally Shipped In Kit Number(s) 9590.)

ACCESSORY DRIVE

BELT, SERPENTINE

DESCRIPTION

DESCRIPTION

The accessory drive belt is a serpentine type belt. Satisfactory performance of these belts depends on belt condition and proper belt tension.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - SERPENTINE BELT

VISUAL DIAGNOSIS

When diagnosing serpentine accessory drive belts, small cracks that run across the ribbed surface of the belt from rib to rib, are considered normal. These are not a reason to replace the belt. However, cracks running along

a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced. Also replace the belt if it has excessive wear, frayed cords or severe glazing.

for further belt diagnosis. Refer to **ACCESSORY DRIVE BELT DIAGNOSIS CHART**.

NOISE DIAGNOSIS

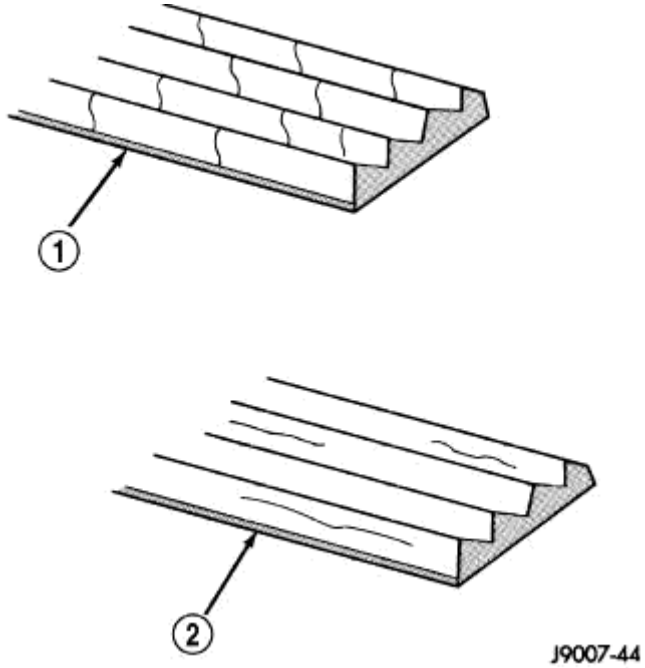

Fig. 15: Belt Wear Patterns
Courtesy of CHRYSLER GROUP, LLC

1 - NORMAL CRACKS BELT OK
2 - NOT NORMAL CRACKS REPLACE BELT

Noises generated by the accessory drive belt are most noticeable at idle. Before replacing a belt to resolve a noise condition, inspect all of the accessory drive pulleys for alignment, glazing, or excessive end play.

ACCESSORY DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (One or more ribs has separated from belt body)	1. Foreign objects imbedded in pulley grooves.	1. Remove foreign objects from pulley grooves. Replace belt.
	2. Installation damage.	2. Replace belt.
RIB OR BELT WEAR	1. Pulley misaligned.	1. Align pulley(s).
	2. Abrasive environment.	2. Clean pulley(s). Replace belt if necessary.
	3. Rusted pulley(s).	3. Clean rust from pulley(s).
	4. Sharp or jagged pulley groove tips.	4. Replace pulley. Inspect belt.

	5. Belt rubber deteriorated.	5. Replace belt.
BELT SLIPS	1. Belt slipping because of insufficient tension.	1. Inspect/Replace tensioner if necessary.
	2. Belt or pulley exposed to substance that has reduced friction (belt dressing, oil, ethylene glycol).	2. Replace belt and clean pulleys.
	3. Driven component bearing failure (seizure).	3. Replace faulty component or bearing.
	4. Belt glazed or hardened from heat and excessive slippage.	4. Replace belt.
LONGITUDAL BELT CRACKING	1. Belt has mistracked from pulley groove.	1. Replace belt.
	2. Pulley groove tip has worn away rubber to tensile member.	2. Replace belt.
"GROOVE JUMPING" (Belt does not maintain correct position on pulley)	1. Incorrect belt tension.	1. Inspect/Replace tensioner if necessary.
	2. Pulley(s) not within design tolerance.	2. Replace pulley(s).
	3. Foreign object(s) in grooves.	3. Remove foreign objects from grooves.
	4. Pulley misalignment.	4. Align component.
	5. Belt cordline is broken.	5. Replace belt.
BELT BROKEN (Note: Identify and correct problem before new belt is installed)	1. Incorrect belt tension.	1. Replace Inspect/Replace tensioner if necessary.
	2. Tensile member damaged during belt installation.	2. Replace belt.
	3. Severe misalignment.	3. Align pulley(s).
	4. Bracket, pulley, or bearing failure.	4. Replace defective component and belt.
NOISE (Objectionable squeal, squeak, or rumble is heard or felt while drive belt is in operation)	1. Incorrect belt tension.	1. Inspect/Replace tensioner if necessary.
	2. Bearing noise.	2. Locate and repair.
	3. Belt misalignment.	3. Align belt/pulley(s).
	4. Belt to pulley mismatch.	4. Install correct belt.
	5. Driven component induced vibration.	5. Locate defective driven component and repair.
TENSION SHEETING FABRIC FAILURE (Woven fabric on outside, circumference of belt has cracked or separated from body of belt)	1. Tension sheeting contacting stationary object.	1. Correct rubbing condition.
	2. Excessive heat causing woven fabric to age.	2. Replace belt
	3. Tension sheeting splice has fractured.	3. Replace belt.
CORD EDGE FAILURE	1. Incorrect belt tension.	1. Inspect/Replace tensioner if

(Tensile member exposed at edges of belt or separated from belt body)		necessary.
	2. Belt contacting stationary object.	2. Replace belt.
	3. Pulley(s) out of tolerance.	3. Replace pulley.
	4. Insufficient adhesion between tensile member and rubber matrix.	4. Replace belt.

REMOVAL

3.7L/4.7L ENGINE

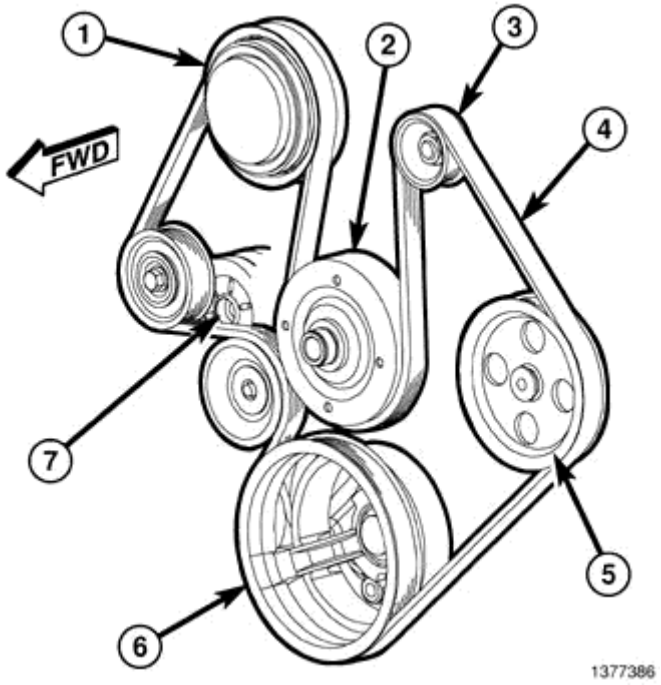

Fig. 16: Belt Routing (3.7L/4.7L Engine)
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not let tensioner arm snap back to the freearm position, severe damage may occur to the tensioner.

1. Disconnect negative battery cable from battery.
2. Rotate belt tensioner until it contacts it's stop. Remove belt, then slowly rotate the tensioner (7) into the freearm position.

5.7L ENGINE

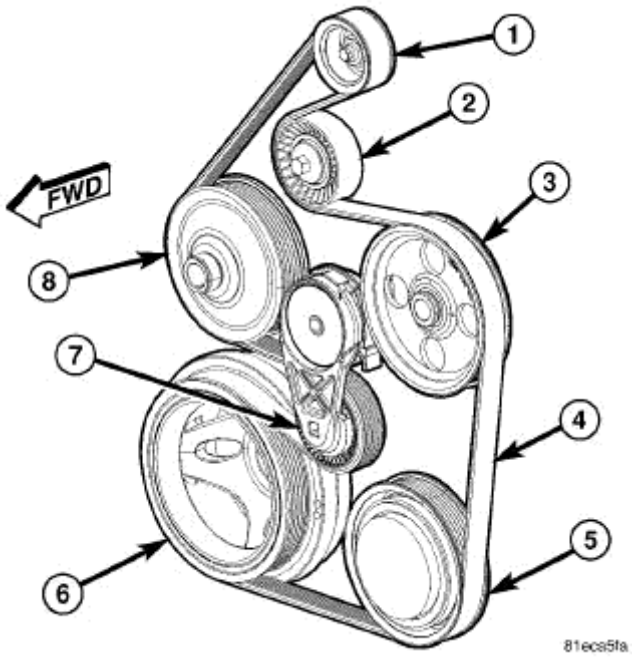

Fig. 17: Belt Routing (5.7L Engine)
Courtesy of CHRYSLER GROUP, LLC

1. Insert a suitable square drive ratchet into the square hole on belt tensioner arm (7).
2. Release the belt tension by rotating the tensioner (7)**clockwise** . Rotate the belt tensioner (7) until the accessory belt (4) can be removed from pulleys (1, 2, 3, 5, 6, 8).

CAUTION: Do not let the tensioner arm snap back to the freearm position, severe damage may occur to the tensioner.

3. Remove the accessory belt (4).
4. Gently release the tensioner (7).

6.7L DIESEL ENGINE

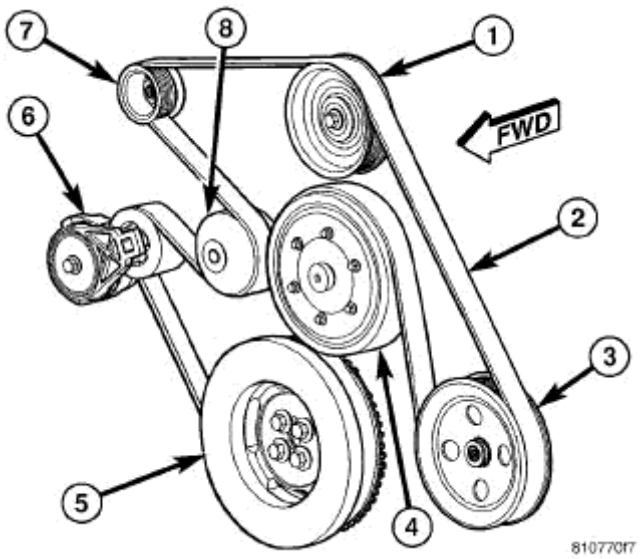

Fig. 18: Belt Routing-Diesel Engine Without A/C
Courtesy of CHRYSLER GROUP, LLC

1 - IDLER PULLEY
2 - ACCESSORY DRIVE BELT
3 - P/S PULLEY
4 - RADIATOR FAN PULLEY
5 - CRANKSHAFT PULLEY
6 - ACCESSORY DRIVE BELT TENSIONER
7 - GENERATOR
8 - WATER PUMP

1. A 1/2 inch square hole is provided in the automatic belt tensioner. Attach a suitable tool into this hole.

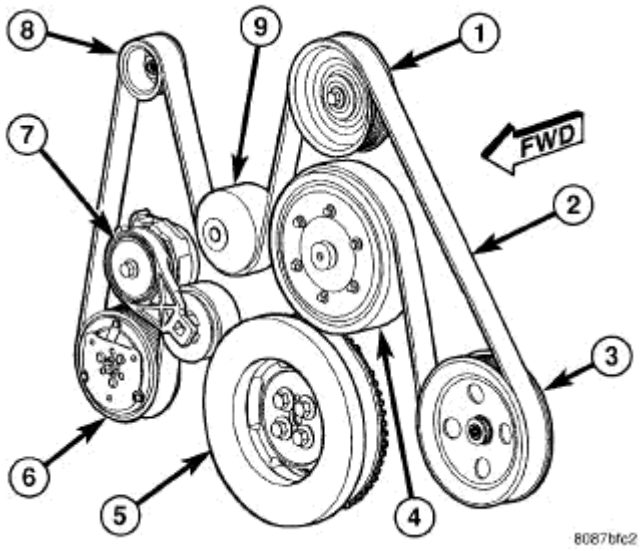

Fig. 19: Belt Routing-Diesel With A/C
Courtesy of CHRYSLER GROUP, LLC

1 - IDLER PULLEY
2 - ACCESSORY DRIVE BELT
3 - P/S PULLEY
4 - RADIATOR FAN PULLEY
5 - CRANKSHAFT PULLEY
6 - A/C COMPRESSOR PULLEY
7 - ACCESSORY DRIVE BELT TENSIONER
8 - GENERATOR
9 - WATER PUMP PULLEY

2. Rotate tensioner assembly clockwise (as viewed from front) until tension has been relieved from belt.
3. Remove belt from water pump pulley first.
4. Remove belt from vehicle.

INSTALLATION

3.7L/4.7L ENGINE

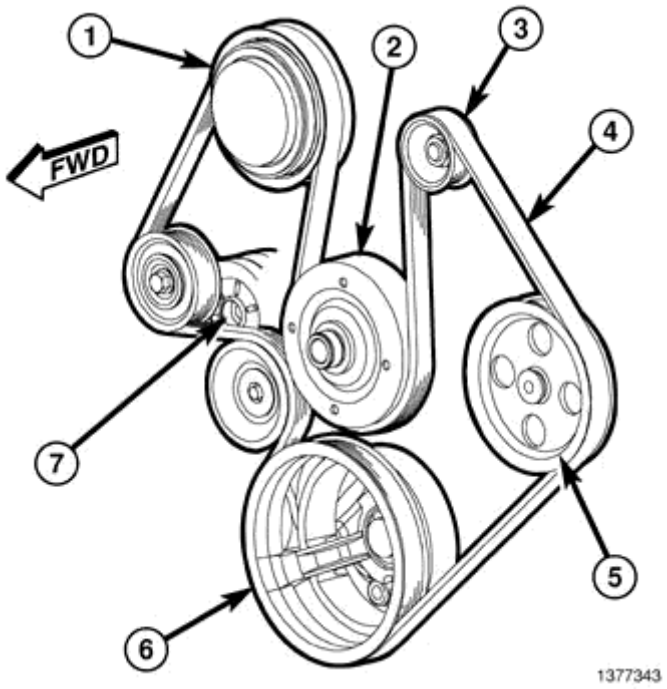

Fig. 20: Belt Routing (3.7L/4.7L Engine)
Courtesy of CHRYSLER GROUP, LLC

1. Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

NOTE: When installing accessory drive belt onto pulleys, make sure that belt is properly routed and all V-grooves make proper contact with pulleys.

2. Position accessory drive belt around all pulleys except the idler pulley.
3. Rotate the tensioner arm until it contacts it's stop position. Route the belt around the idler and slowly release tensioner rotate into accessory drive belt. Make sure the belt is seated onto all pulleys.

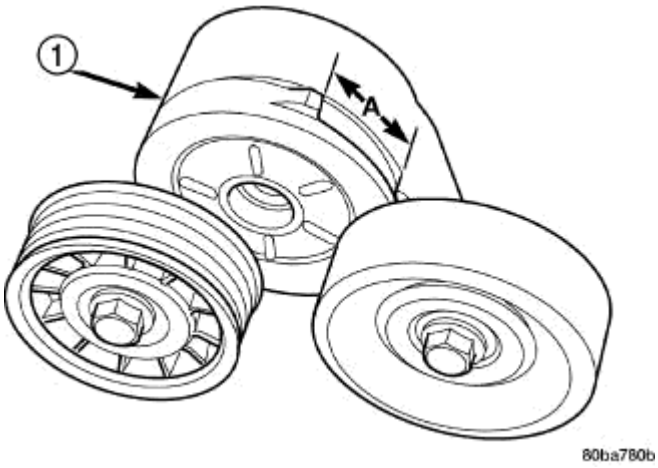

Fig. 21: Identifying Automatic Belt Tensioner
Courtesy of CHRYSLER GROUP, LLC

1 - AUTOMATIC TENSIONER ASSEMBLY

4. 4.7L Engines Only - With the drive belt installed, inspect the belt wear indicator. Gap between the tang and the housing stop (measurement A) must not exceed 24 mm (.94 inches). If the measurement exceeds this specification replace the accessory drive belt.

5.7L ENGINE

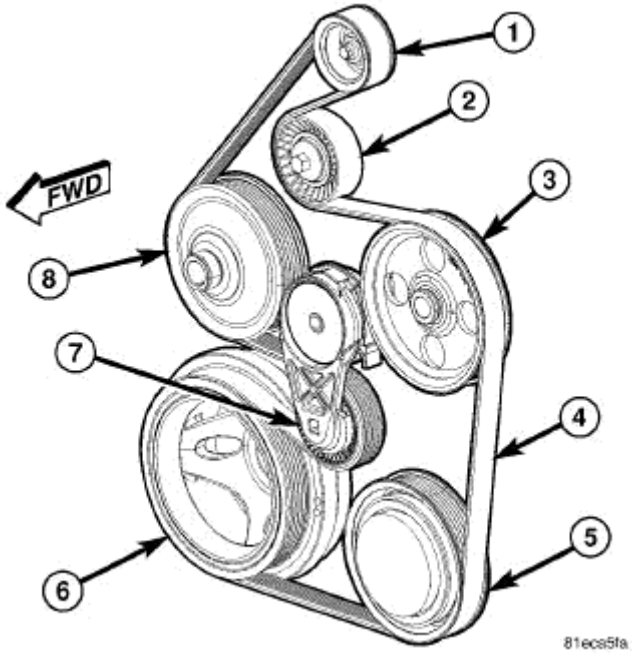

Fig. 22: Belt Routing (5.7L Engine)

Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing accessory drive belt onto pulleys, make sure that belt is properly routed and all V-grooves make proper contact with pulleys.

1. Position the accessory drive belt (4) over all pulleys (1, 2, 3, 5, 6) except for the water pump pulley (8).
2. Rotate the tensioner (7)**clockwise** and slip the belt over the water pump pulley (8).
3. Gently release the tensioner (7).

CAUTION: Do not let the tensioner arm snap back to the freearm position, severe damage may occur to the tensioner.

6.7L DIESEL ENGINE

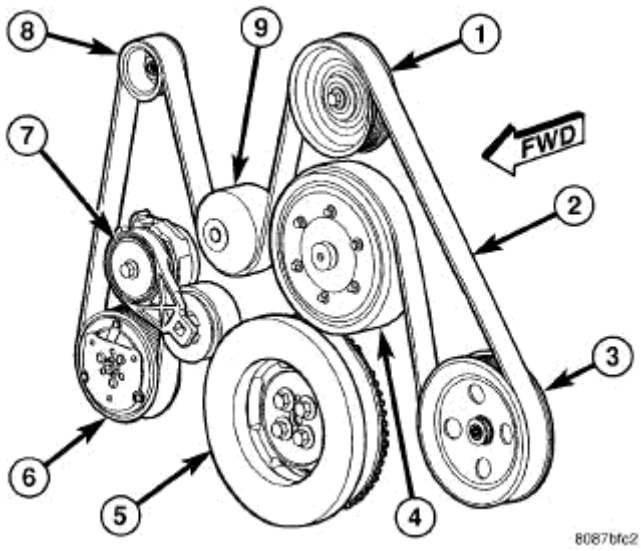

Fig. 23: Belt Routing-Diesel With A/C
Courtesy of CHRYSLER GROUP, LLC

1 - IDLER PULLEY
2 - ACCESSORY DRIVE BELT
3 - P/S PULLEY
4 - RADIATOR FAN PULLEY
5 - CRANKSHAFT PULLEY
6 - A/C COMPRESSOR PULLEY
7 - ACCESSORY DRIVE BELT TENSIONER
8 - GENERATOR
9 - WATER PUMP PULLEY

CAUTION: When installing the accessory drive belt, the belt must be routed correctly. If not, engine may overheat due to water pump rotating in wrong direction.

1. Position drive belt over all pulleys **except** water pump pulley.
2. Attach a suitable tool to the accessory drive belt tensioner.

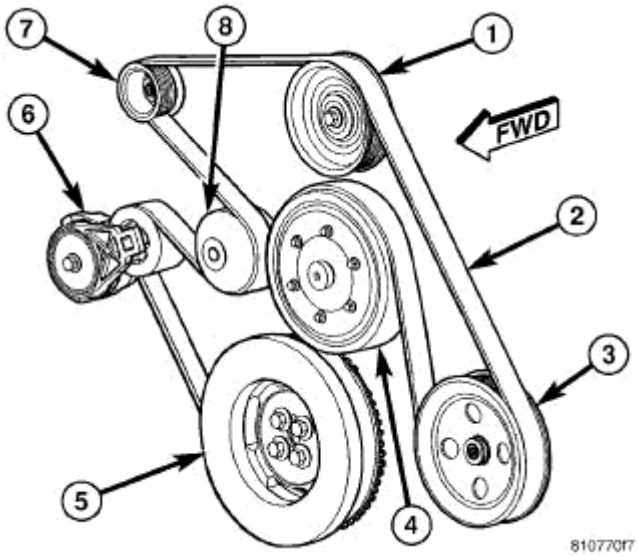

Fig. 24: Belt Routing-Diesel Engine Without A/C
Courtesy of CHRYSLER GROUP, LLC

1 - IDLER PULLEY
2 - ACCESSORY DRIVE BELT
3 - P/S PULLEY
4 - RADIATOR FAN PULLEY
5 - CRANKSHAFT PULLEY
6 - ACCESSORY DRIVE BELT TENSIONER
7 - GENERATOR
8 - WATER PUMP

3. Rotate accessory drive belt tensioner clockwise. Place belt over water pump pulley. Let tensioner rotate back into place. Remove tool. Be sure belt is properly seated on all pulleys.

PULLEY, IDLER

REMOVAL

5.7L ENGINE

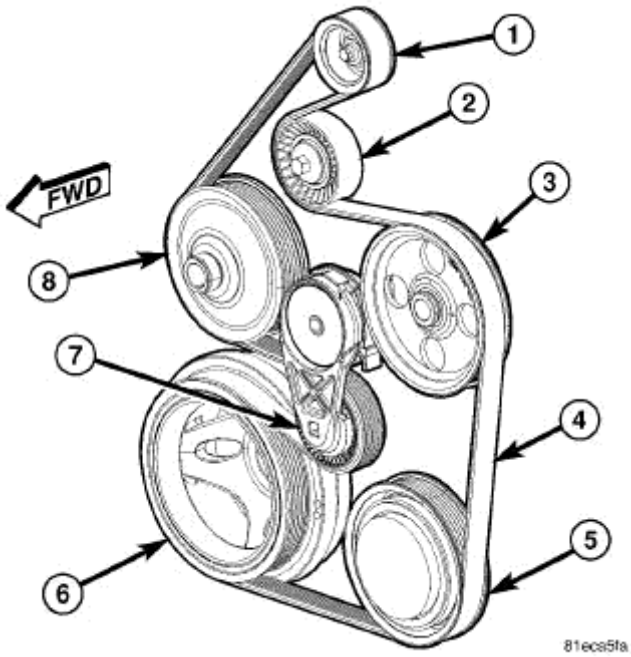

Fig. 25: Belt Routing (5.7L Engine)
Courtesy of CHRYSLER GROUP, LLC

1. Remove the accessory drive belt (4). Refer to **REMOVAL**.
2. Remove the bolt from the idler pulley (2).
3. Remove the idler pulley (2).

3.7L/4.7L ENGINE

1. The idler pulley is serviced as part of the belt tensioner assembly. For removal steps, refer to **TENSIONER, BELT, REMOVAL**.

INSTALLATION

5.7L ENGINE

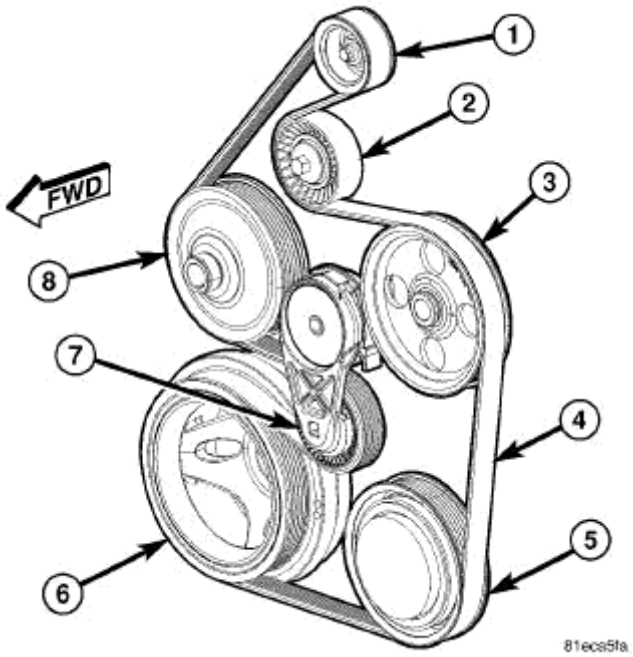

Fig. 26: Belt Routing (5.7L Engine)
Courtesy of CHRYSLER GROUP, LLC

1. Position the idler pulley (2).
2. Install the idler pulley (2) bolt. Tighten the bolt to 54 N.m (40 ft. lbs.).
3. Install the accessory drive belt (4). Refer to **BELT, SERPENTINE, INSTALLATION**.

3.7L/4.7L ENGINE

1. The idler pulley is serviced as part of the belt tensioner assembly. For installation steps, refer to **TENSIONER, BELT, INSTALLATION**.

TENSIONER, BELT

DESCRIPTION

DESCRIPTION

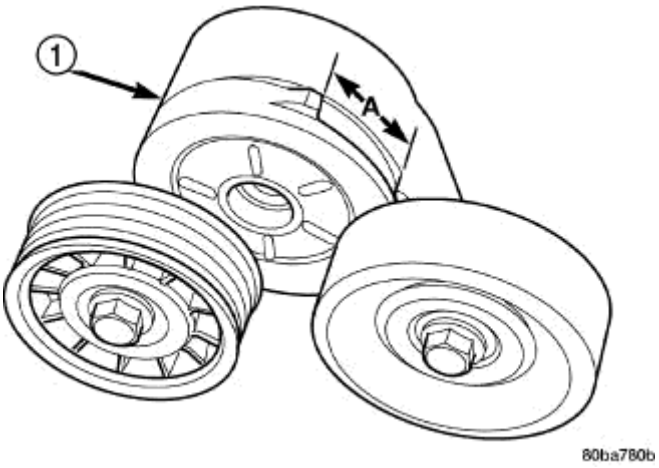

Fig. 27: Identifying Automatic Belt Tensioner
Courtesy of CHRYSLER GROUP, LLC

1 - AUTOMATIC TENSIONER ASSEMBLY

Correct drive belt tension is required to ensure optimum performance of the belt driven engine accessories. If specified tension is not maintained, belt slippage may cause; engine overheating, lack of power steering assist, loss of air conditioning capacity, reduced generator output rate, and greatly reduced belt life.

It is not necessary to adjust belt tension. All engines are equipped with an automatic belt tensioner. The tensioner maintains correct accessory drive belt tension at all times.

REMOVAL

3.7L/4.7L ENGINE

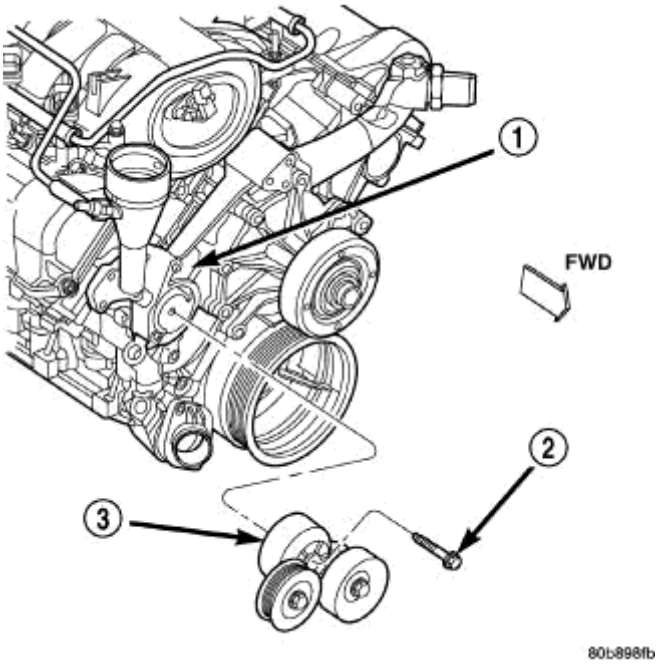

Fig. 28: Automatic Belt Tensioner & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - TIMING CHAIN COVER
2 - BOLT TORQUE TO 41 N.m (30 FT LBS)
3 - AUTOMATIC BELT TENSIONER

On 3.7L and 4.7L engines, the accessory drive belt tensioner is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new accessory drive belt is being installed, tang must be within approximately 24 mm (.94 inches) of indexing stop. Belt is considered new if it has been used 15 minutes or less.

1. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL**.

WARNING: Because of high spring pressure, do not attempt to disassemble automatic tensioner. Unit is serviced as an assembly.

2. Remove tensioner (3) assembly from timing chain cover.

5.7L ENGINE

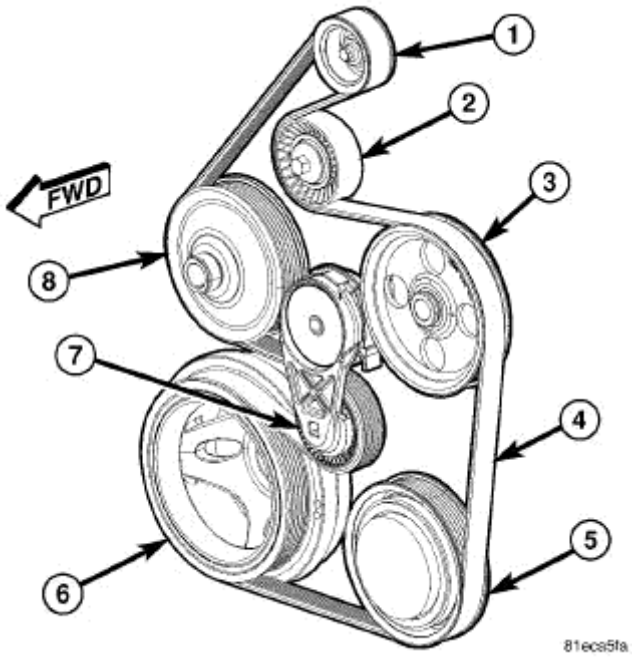

Fig. 29: Belt Routing (5.7L Engine)
Courtesy of CHRYSLER GROUP, LLC

1. Remove the accessory drive belt (4). Refer to **BELT, SERPENTINE, REMOVAL**.
2. Remove the bolt from the belt tensioner assembly (7).
3. Remove the belt tensioner assembly (7).

6.7L DIESEL ENGINE

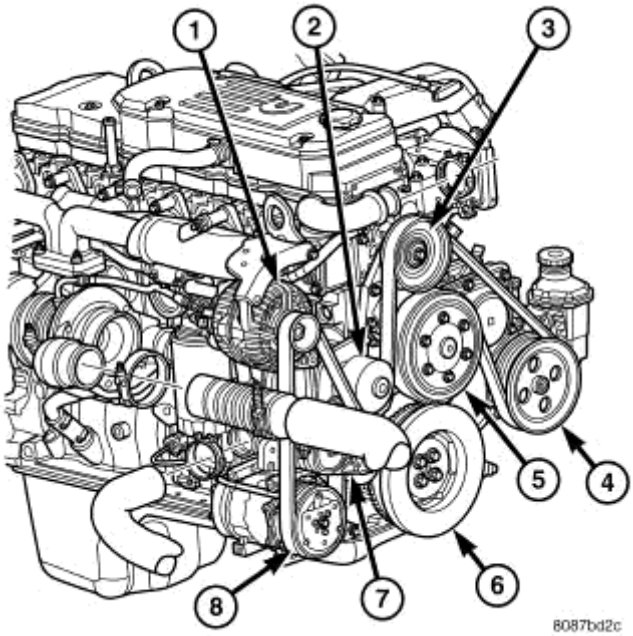

Fig. 30: Accessory Drive Belt
Courtesy of CHRYSLER GROUP, LLC

1 - GENERATOR
2 - WATER PUMP
3 - IDLER
4 - POWER STEERING PUMP
5 - RADIATOR FAN PULLEY
6 - CRANKSHAFT
7 - AUTOMATIC TENSIONER
8 - A/C COMPRESSOR

WARNING: Because of high spring pressure, do not attempt to disassemble automatic tensioner. Unit is serviced as an assembly.

1. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL**.
2. Remove tensioner mounting bolt and remove tensioner (7).

INSTALLATION

3.7L/4.7L ENGINE

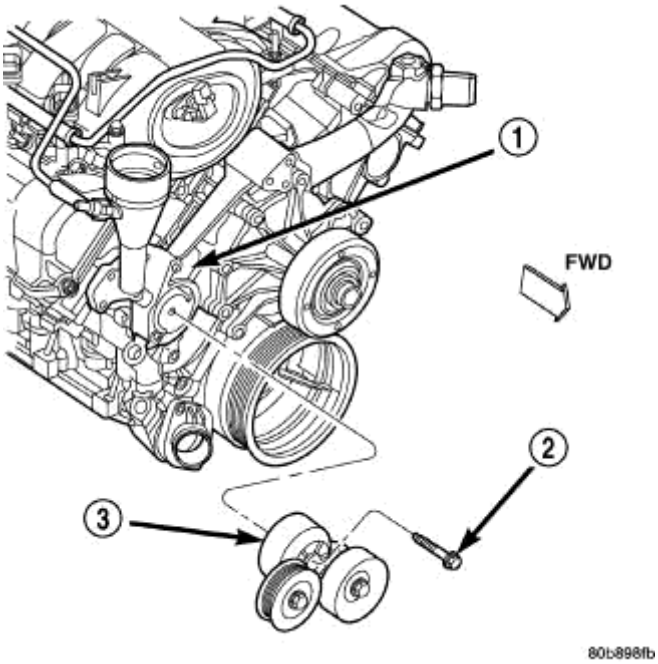

Fig. 31: Automatic Belt Tensioner & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - TIMING CHAIN COVER
2 - BOLT TORQUE TO 41 N.m (30 FT LBS)
3 - AUTOMATIC BELT TENSIONER

1. An indexing slot is located on back of tensioner (3). Align this slot to the head of the bolt on the front cover. Install the mounting bolt. Tighten bolt (2) to 41 N.m (30 ft. lbs.).
2. Install accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION**.
3. Check tensioner indexing marks.

5.7L ENGINE

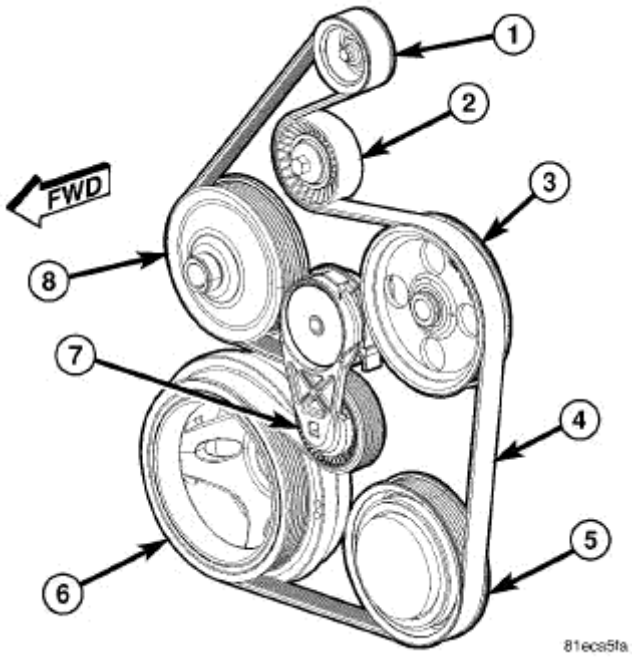

Fig. 32: Belt Routing (5.7L Engine)
Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing accessory drive belt onto pulleys, make sure that belt is properly routed and all V-grooves make proper contact with pulleys.

1. Position the belt tensioner assembly (7) onto the front of the engine block. Tighten the bolt to 41 N.m (30 ft. lbs.).
2. Install the accessory drive belt (4). Refer to **BELT, SERPENTINE, INSTALLATION**.

6.7L DIESEL ENGINE

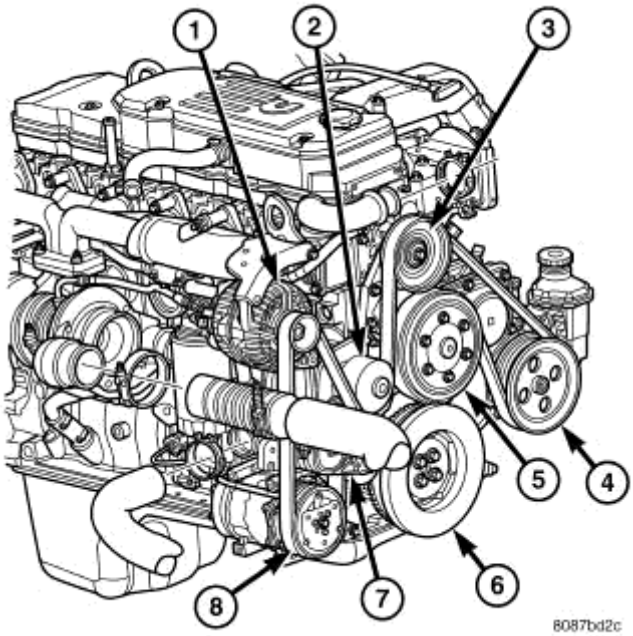

Fig. 33: Accessory Drive Belt
Courtesy of CHRYSLER GROUP, LLC

1 - GENERATOR
2 - WATER PUMP
3 - IDLER
4 - POWER STEERING PUMP
5 - RADIATOR FAN PULLEY
6 - CRANKSHAFT
7 - AUTOMATIC TENSIONER
8 - A/C COMPRESSOR

1. Install tensioner assembly (7) to water inlet bracket. A dowel is located on back of tensioner. Align this dowel to hole in tensioner mounting bracket. Tighten bolt to 43 N.m (32 ft. lbs.) torque.
2. Install drive belt. Refer to **BELT, SERPENTINE, INSTALLATION**.

ENGINE

BOTTLE, COOLANT RECOVERY

DESCRIPTION

DESCRIPTION

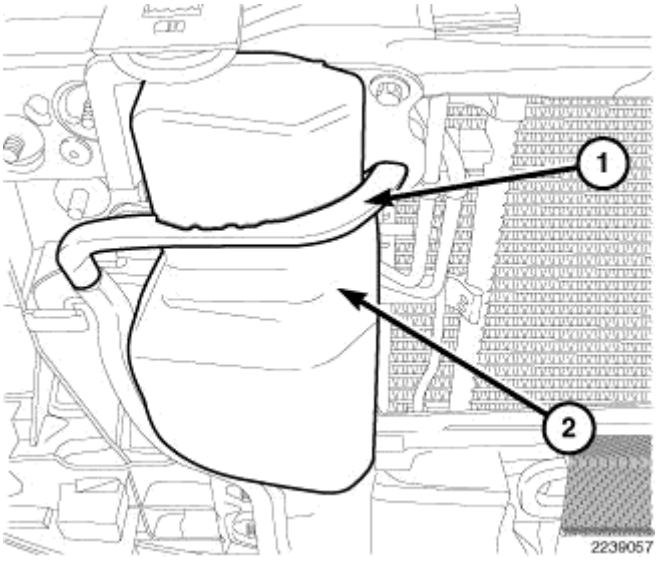

Fig. 34: Coolant Recovery/Overflow Bottle
Courtesy of CHRYSLER GROUP, LLC

The coolant recovery/overflow bottle (2) is mounted on the front of the radiator support and behind the grille. The coolant recovery/overflow bottle (2) is made of high temperature plastic.

OPERATION

OPERATION

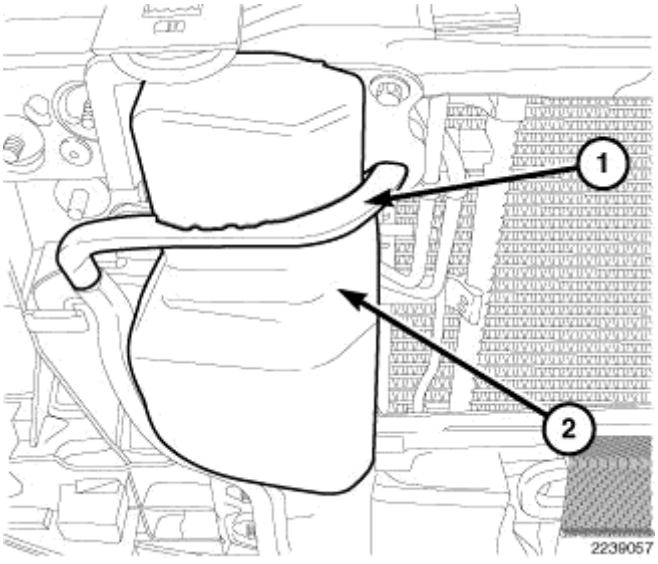

Fig. 35: Coolant Recovery/Overflow Bottle
Courtesy of CHRYSLER GROUP, LLC

The coolant recovery/overflow bottle (2) works in conjunction with the radiator pressure cap. It utilizes thermal expansion and contraction of coolant to keep coolant free of trapped air. It provides a volume for expansion and contraction of coolant. It also provides a convenient and safe method for checking coolant level and adjusting level at atmospheric pressure. This is done without removing the radiator pressure cap. The system also

provides some reserve coolant to the radiator to cover minor leaks and evaporation or boiling losses.

As the engine cools, a vacuum is formed in the cooling system of both the radiator and engine. Coolant will then be drawn from the coolant recovery/overflow bottle (2) and returned to a proper level in the radiator.

REMOVAL

3.7L/4.7L/5.7L ENGINE

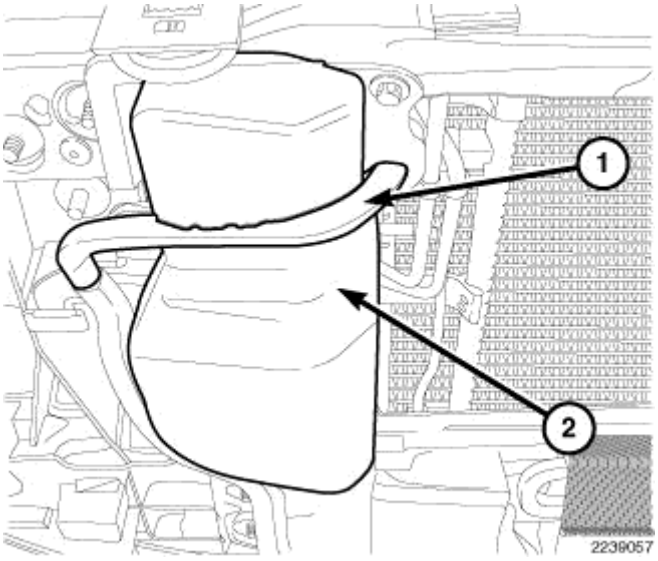

Fig. 36: Coolant Recovery/Overflow Bottle
Courtesy of CHRYSLER GROUP, LLC

1. Remove the exterior grille. Refer to **GRILLE, REMOVAL** .
2. Partially drain the cooling system using the draincock only. Refer to **STANDARD PROCEDURE**.

NOTE: DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

3. Drain system below the level of the coolant recovery pressure container.
4. Remove the recovery hose (1) from the radiator.
5. Remove the coolant recovery bottle (2) to radiator support mounting bolts.
6. Disengage the coolant recovery bottle (2) mounting pins located on the radiator support side by pulling the assembly straight up.
7. Remove the coolant recovery bottle (1).

6.7L DIESEL

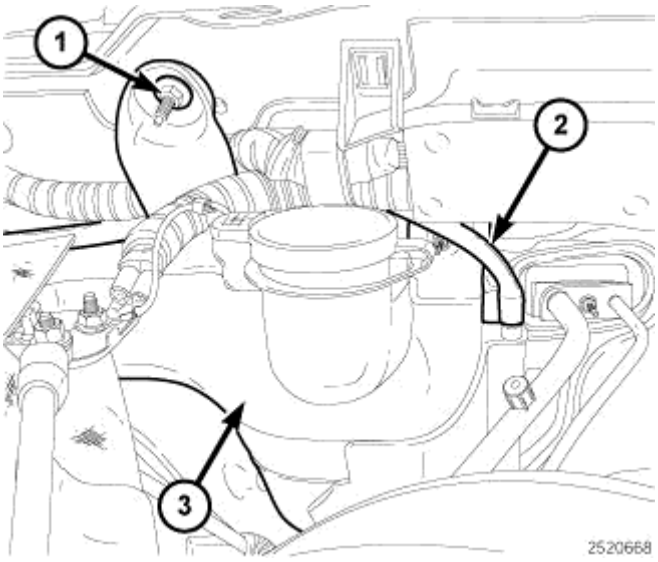

Fig. 37: Identifying Overflow Hose
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the negative battery cable.
2. If equipped, disconnect and isolate the negative battery cable from the auxiliary battery.
3. Partially drain coolant until the coolant recovery bottle (3) and overflow hose (2) are completely empty.
4. Remove the overflow hose (2) from the coolant recovery bottle (3).
5. Remove the mounting bolts (1).
6. Remove coolant recovery bottle (3) from the vehicle.

INSTALLATION

3.7L/4.7L/5.7L ENGINE

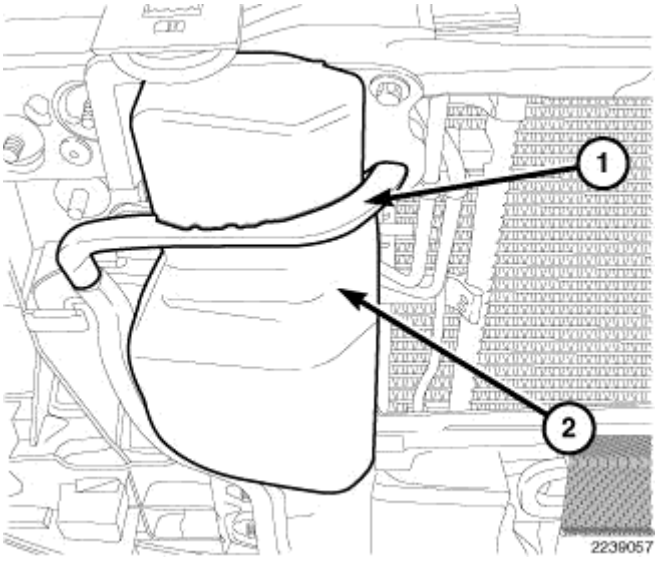

Fig. 38: Coolant Recovery/Overflow Bottle

Courtesy of CHRYSLER GROUP, LLC

1. Align the coolant recovery bottle (2) mounting pins into the slots located on the radiator support side and push the coolant recovery bottle (2) into place.

NOTE: Ensure that the mounting pins are properly seated into the radiator support.

2. Install the coolant recovery bottle (2) to radiator support bolts. Tighten the bolts to 10 N.m (89 in. lbs).
3. Connect the recovery hose (1) to the radiator.
4. Install the front grille. Refer to **GRILLE, INSTALLATION** .
5. Fill the cooling system. Refer to **STANDARD PROCEDURE**.
6. Test the system for leaks. Refer to **LEAK TESTING**.

6.7L DIESEL

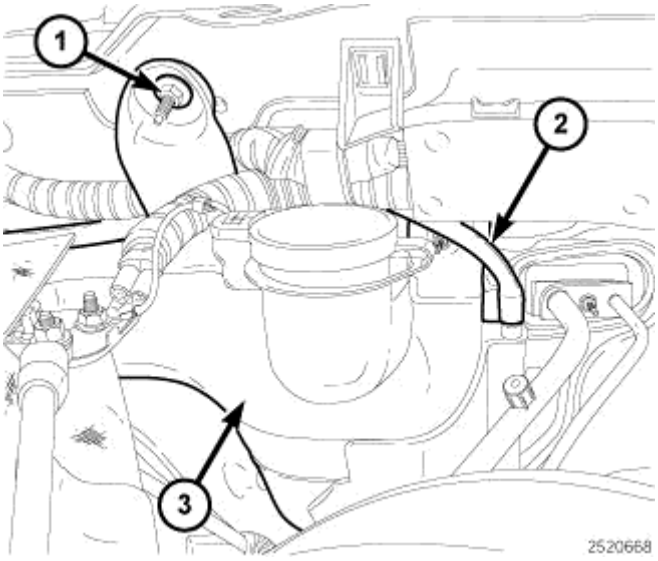

Fig. 39: Identifying Overflow Hose
Courtesy of CHRYSLER GROUP, LLC

1. Position the coolant recovery bottle (3) into the vehicle.
2. Install mounting bolts (1). Tighten to 8.5 N.m (75 in. lbs).
3. Install overflow hose (2) onto the coolant recovery bottle (3).
4. Fill the coolant recovery bottle (3) with coolant until the required level is met.
5. If equipped, connect the negative battery cable to the auxiliary battery.
6. Connect the negative battery cable.

CAP, RADIATOR

DESCRIPTION

DESCRIPTION

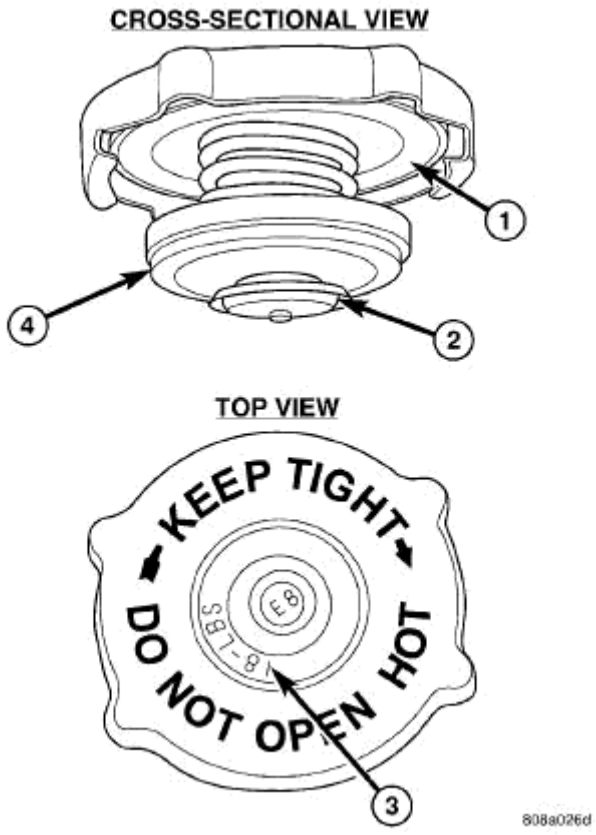

Fig. 40: Radiator Cap
Courtesy of CHRYSLER GROUP, LLC

1 - FILLER NECK SEAL
2 - VACUUM VENT VALVE
3 - PRESSURE RATING
4 - PRESSURE VALVE

All cooling systems are equipped with a pressure cap. For all engines, the pressure cap is located on top of the radiator outlet tank. The cap releases pressure at some point within a range of 97-to-124 kPa (14-to-18 psi). The pressure relief point (in pounds) is engraved on top of the cap

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve. This valve opens when system pressure reaches the release range of 97-to-124 kPa (14-to-18 psi).

A rubber gasket seals the radiator filler neck. This is done to maintain vacuum during coolant cool-down and to prevent leakage when system is under pressure.

DIAGNOSIS AND TESTING

RADIATOR CAP-TO-FILLER NECK SEAL

The pressure cap upper gasket (seal) pressure relief can be tested by removing overflow hose from the radiator filler neck tube. Attach the hose of the pressure tester tool (special tool #7700, Tester, Cooling System) (or equivalent) to the tube. It will be necessary to disconnect hose from its adapter for the filler neck. Pump air into radiator. The pressure cap upper gasket should relieve at 69 to 124kPa (10 to 18 psi) and hold pressure at a minimum of 55 kPa (8 psi).

WARNING: The warning words, "DO NOT OPEN HOT", on radiator pressure cap, are a safety precaution. When hot, pressure builds up in cooling system. To prevent scalding or injury, radiator cap should not be removed while system is hot and/or under pressure.

Do not remove the radiator cap at any time **except** for the following purposes:

- Check and adjust antifreeze freeze point.
- Refill the system with new antifreeze.
- Conducting service procedures.
- Checking for vacuum leaks.

WARNING: If vehicle has been run recently, wait at least 15 minutes before removing radiator cap. With a rag, squeeze radiator upper hose to check if system is under pressure. Place a rag over cap and without pushing cap down, rotate it counter-clockwise to first stop. Allow fluid to escape through the coolant reserve/overflow hose into reserve/overflow tank. Squeeze radiator upper hose to determine when pressure has been released. When coolant and steam stop being pushed into tank and system pressure drops, remove radiator cap completely.

RADIATOR CAP

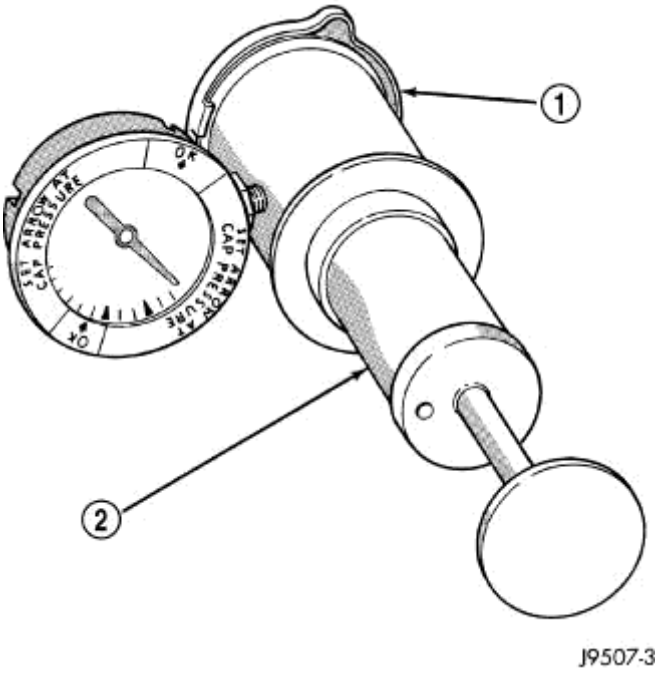

Fig. 41: Pressure Testing Radiator Cap
Courtesy of CHRYSLER GROUP, LLC

1 - PRESSURE CAP
2 - TYPICAL COOLING SYSTEM PRESSURE TESTER

Remove the cap from the radiator. Be sure that the sealing surfaces are clean. Moisten the rubber gasket with water and install the cap on the pressure tester (special tool #7700, Tester, Cooling System) or an equivalent. Refer to **Fig. 41**.

Operate the tester pump to bring the pressure to 104 kPa (15 psi) on the gauge. If the pressure cap fails to hold pressure of at least 97 kPa (14 psi) replace the cap. Refer to the following **CAUTION** .

The pressure cap may test properly while positioned on tool (special tool #7700, Tester, Cooling System) (or equivalent). It may not hold pressure or vacuum when installed on the radiator. If so, inspect the radiator filler neck and radiator cap's top gasket for damage. Also inspect for dirt or distortion that may prevent the cap from sealing properly.

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks which will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.

INSPECTION

INSPECTION

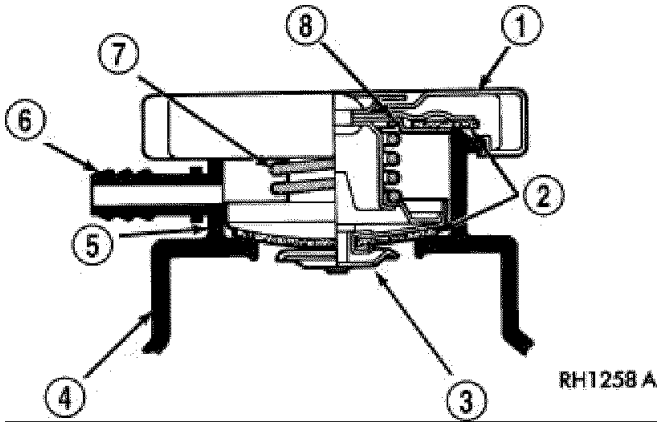

Fig. 42: Sectional View Of Radiator Pressure Cap
Courtesy of CHRYSLER GROUP, LLC

1 - STAINLESS-STEEL SWIVEL TOP
2 - RUBBER SEALS
3 - VENT VALVE
4 - RADIATOR TANK
5 - FILLER NECK
6 - OVERFLOW NIPPLE
7 - MAIN SPRING
8 - GASKET RETAINER

Hold cap at eye level, right side up. The vent valve at bottom of cap should closed. Refer to **Fig. 42**. A slight downward pull on the vent valve should open it. If the rubber gasket has swollen and prevents vent valve from opening, replace cap.

Hold cap at eye level, upside down. If any light can be seen between vent valve and rubber gasket, replace cap. A replacement cap must be the type designed for a coolant reserve/overflow system with a completely sealed diaphragm spring and a rubber gasket. This gasket is used to seal to radiator filler neck top surface. Use of proper cap will allow coolant return to radiator.

COOLANT

DESCRIPTION

DESCRIPTION

WARNING: Antifreeze is an ethylene-glycol base coolant and is harmful if swallowed or inhaled. If swallowed, drink two glasses of water and induce vomiting. If inhaled, move to fresh air area. Seek medical attention immediately. Do not store in open or unmarked containers. Wash skin and clothing thoroughly after coming in contact with ethylene-glycol. Keep out of reach of children. Dispose of glycol based coolant properly, contact your dealer or government agency for location of collection center in your

area. Do not open a cooling system when the engine is at operating temperature or hot under pressure, personal injury can result. Avoid radiator cooling fan when engine compartment related service is performed, personal injury can result.

CAUTION: Use of Propylene-Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps require special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100, 000 Mile Formula (MS-9769), or the equivalent ethylene-glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% ethylene-glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100, 000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT) may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

The required ethylene-glycol and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Water- Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol - The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic. The increased temperature can result in severe engine damage. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

50/50 Ethylene-Glycol and Water - Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90° F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

CAUTION: Richer antifreeze mixtures cannot be measured with normal field

equipment and can cause problems associated with 100 percent ethylene-glycol.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - COOLANT CONCENTRATION TESTING

Check coolant concentration when any additional coolant is added to the system, or after a coolant drain, flush and refill. Use of a hydrometer or Refractometer Tool (special tool #8286, Refractometer), refractometer can be used to test coolant concentration.

A hydrometer tests the amount of glycol in a mixture by measuring the specific gravity of the mixture. The higher the concentration of ethylene glycol, the larger the number of balls that will float, and the higher the freeze protection (up to a maximum of 60% by volume glycol).

A Refractometer Tool (special tool #8286, Refractometer) tests the amount of glycol in a coolant mixture by measuring the amount a beam of light bends as it passes through the fluid.

Some coolant manufacturers use other types of glycols into their coolant formulations. Propylene glycol is the most common new coolant. However, propylene glycol based coolants do not provide the same freezing protection and corrosion protection and are not recommended.

CAUTION: Do not mix types of coolant - corrosion protection will be severely reduced.

COOLER, EGR

DESCRIPTION

DESCRIPTION

The Exhaust Gas Recirculation cooler is located above the exhaust manifold on the right side of the engine. Using engine coolant, the EGR cooler reduces the temperature of the exhaust gas that is recirculated to the air intake.

OPERATION

OPERATION

Exhaust gas enter the rear portion of the EGR Cooler from the exhaust manifold. The gas is cooled as it passes through the EGR Cooler and then enters the EGR crossover tube and is routed to the EGR valve.

Coolant enters the rear of the EGR Cooler and flow the same direction as the exhaust gases.

REMOVAL

PICKUP - REMOVAL

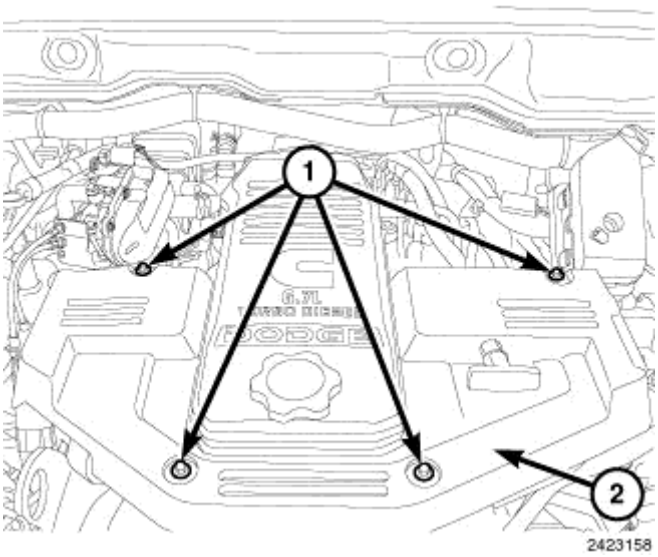

Fig. 43: EGR Crossover Tube Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the bolts (1) and the engine cover.
3. Drain cooling system below level of EGR cooler. Refer to **STANDARD PROCEDURE**.

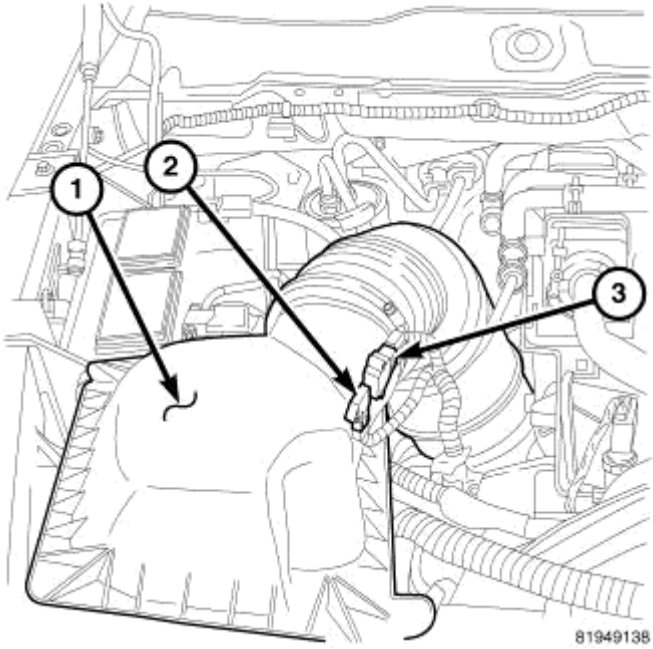

Fig. 44: Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

4. Remove the air cleaner assembly. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L** .

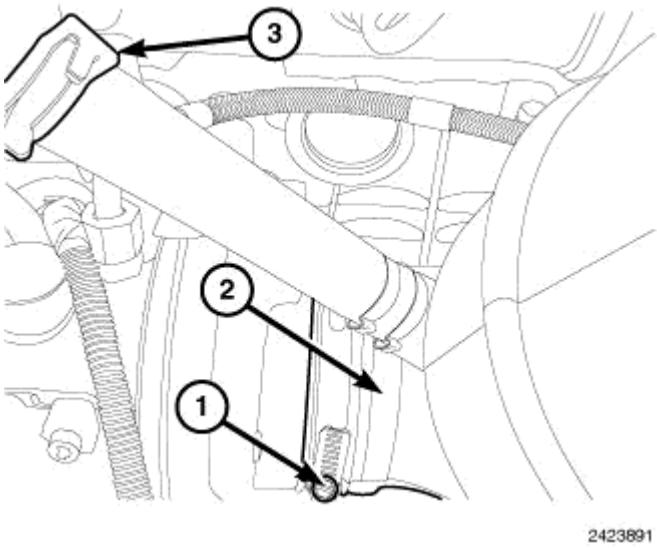

Fig. 45: Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

5. Disconnect the breather hose (3).
6. Loosen the clamp (1) and remove the outlet tube (2) from the turbocharger.

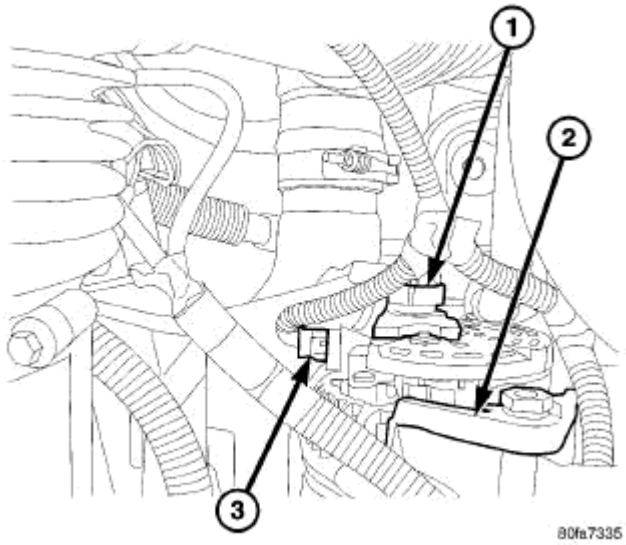

Fig. 46: Diesel Generator Connectors
Courtesy of CHRYSLER GROUP, LLC

1 - B+ CONNECTOR
2 - GENERATOR
3 - FIELD WIRE CONNECTOR

7. Remove the generator. Refer to **GENERATOR, REMOVAL** .

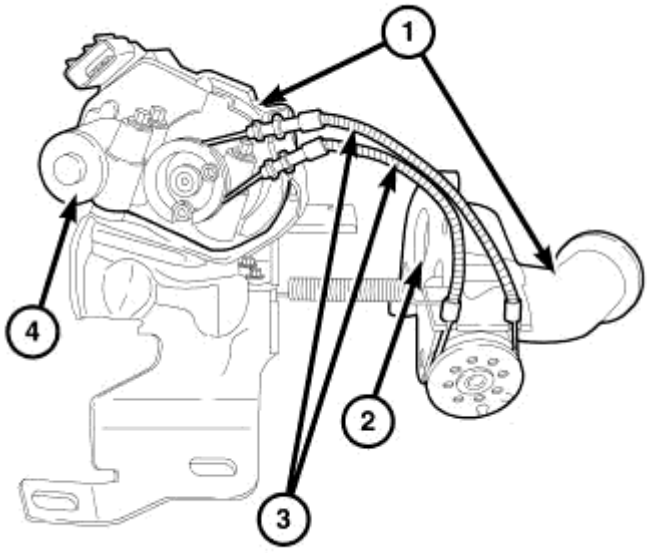

Fig. 47: EGR Cooler Bypass Valve Assembly
Courtesy of CHRYSLER GROUP, LLC

8. Remove the EGR cooler bypass valve. Refer to **VALVE, EXHAUST GAS RECIRCULATION (EGR) COOLER BYPASS, REMOVAL** .

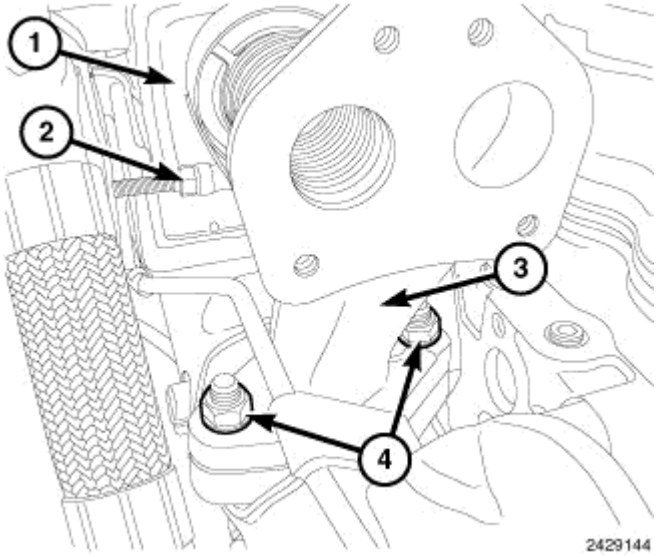

Fig. 48: EGR Cooler, Clamp, Exhaust Transfer Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

9. Remove the clamp (2) securing the EGR cooler (1) to exhaust transfer manifold (3).
10. Remove the nuts (4) and the exhaust transfer manifold (3).

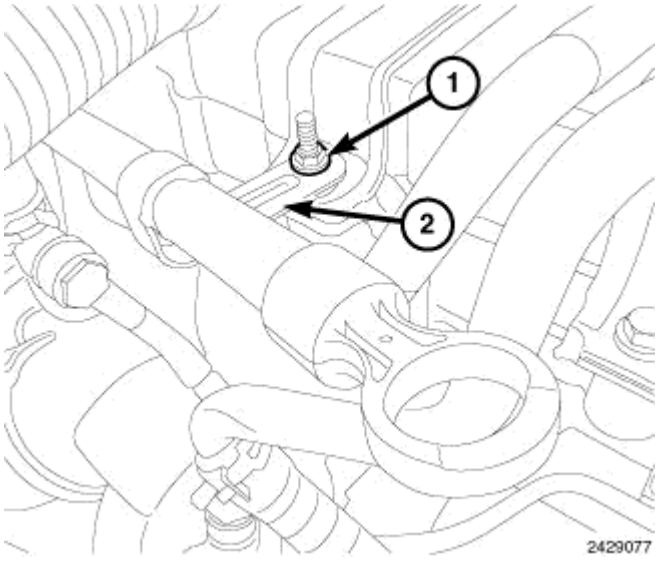

Fig. 49: Transmission Fill Tube Retaining Nut
Courtesy of CHRYSLER GROUP, LLC

11. If equipped, remove the retaining nut and position aside the transmission fill tube from the EGR cooler.

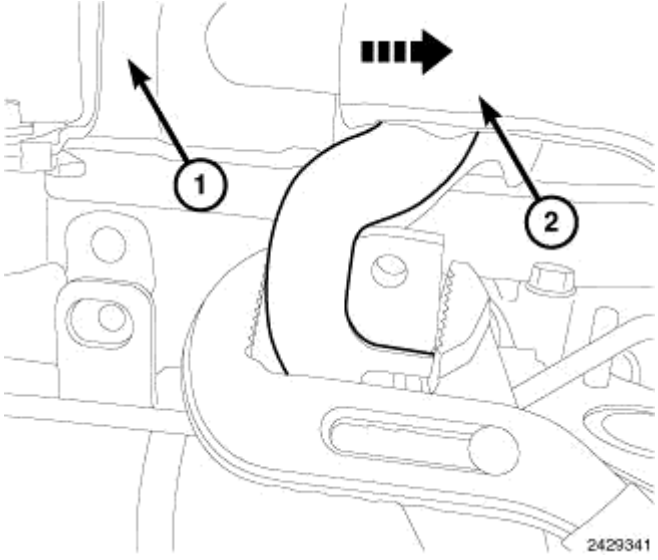

Fig. 50: Forward Coolant Tube & EGR Cooler
Courtesy of CHRYSLER GROUP, LLC

12. As illustrated, using a suitable pair of channel lock pliers, remove forward coolant tube (2) from EGR cooler (1).

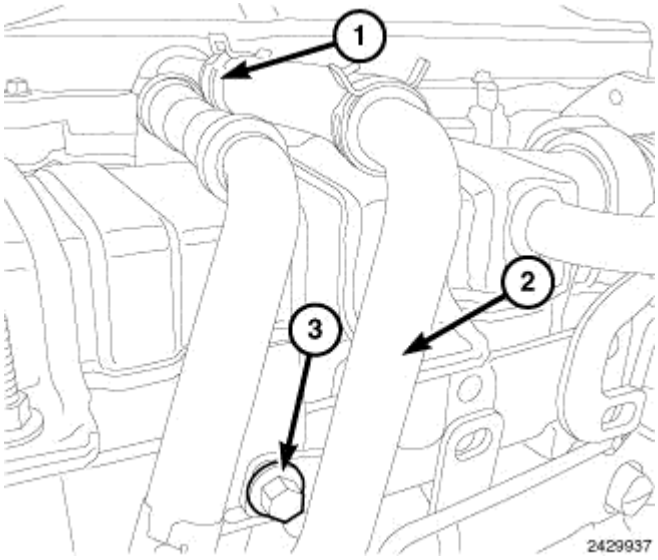

Fig. 51: Breather Hose, Breather Tube & Bolt
Courtesy of CHRYSLER GROUP, LLC

13. Disconnect breather hose (1), remove the bolt (3) and remove the breather tube (2).

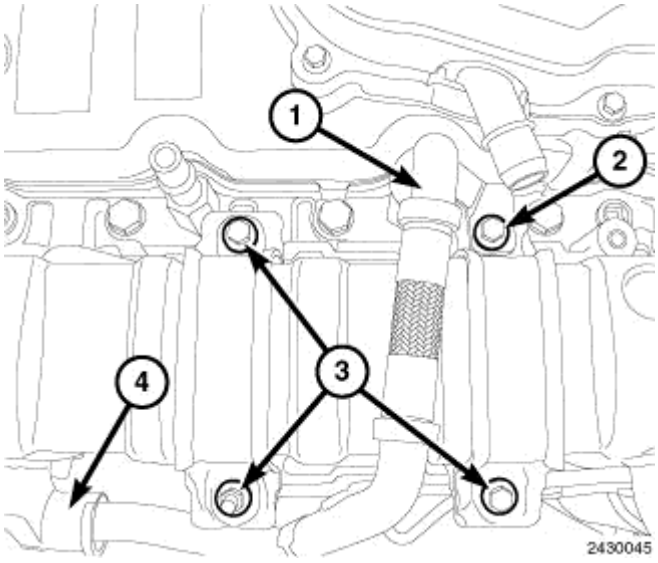

Fig. 52: Rear Coolant Tube & EGR Cooler Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Remove the bolt (2), and remove rear coolant tube from connection (1) and (4).
15. Remove EGR cooler mount bolts (3).

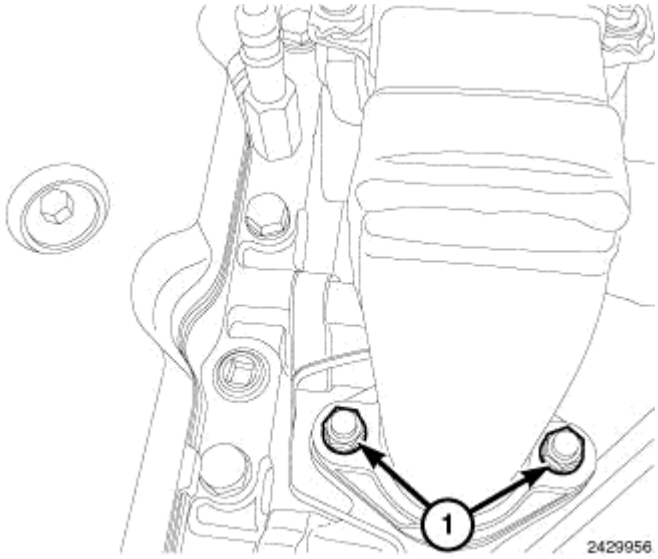

Fig. 53: EGR Cooler Inlet Flange Nuts
Courtesy of CHRYSLER GROUP, LLC

16. Remove EGR cooler flange nuts (1).
17. Remove EGR cooler and discard the flange gasket.
18. If damaged, remove EGR cooler mounting support.

CLEANING

CLEANING

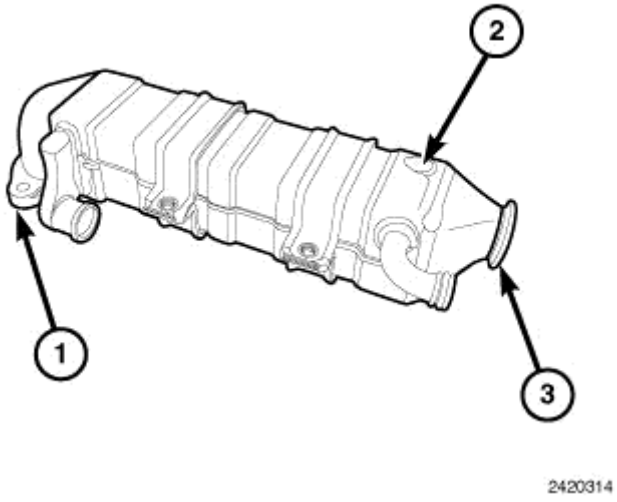

Fig. 54: EGR Cooler
Courtesy of CHRYSLER GROUP, LLC

1. Remove EGR Cooler. Refer to **COOLER, EGR, REMOVAL**.
2. Spray the internal cavity of EGR Cooler (2) with hot tap water for 10 minutes.

3. Plug the EGR Cooler inlet (1) with a locally obtained rubber expansion plug to make a watertight seal.
4. Following instruction on the container, mix MOPAR® EGR System Cleaner and hot tap water with a ratio of one part EGR Cleaner, four parts water.
5. Position the EGR Cooler with the outlet (3) facing up. Fill EGR Cooler with hot tap water and MOPAR® EGR System Cleaner until cooler is completely full. Soak for one hour.
6. Remove the plug from EGR Cooler inlet (1). Drain cleaning solution from cooler. Discard according to local governmental regulations.
7. Rinse the EGR Cooler (2) using hot tap water until all cleaning solution has been rinsed clean. Dry completely.
8. Install EGR Cooler. Refer to **COOLER, EGR, INSTALLATION**.

INSTALLATION

P/U

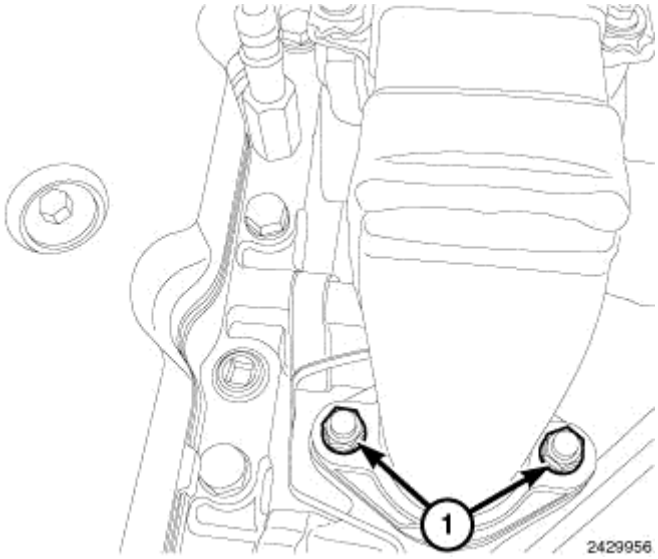

Fig. 55: EGR Cooler Inlet Flange Nuts
Courtesy of CHRYSLER GROUP, LLC

1. Install EGR cooler support bracket, if removed and tighten mounting bolts finger tight. If the EGR cooler support bracket was already installed, loosen the bolts to finger tight.
2. Using a new gasket, position EGR cooler (2) on exhaust manifold flange. Tighten flange nuts (1) to finger tight.

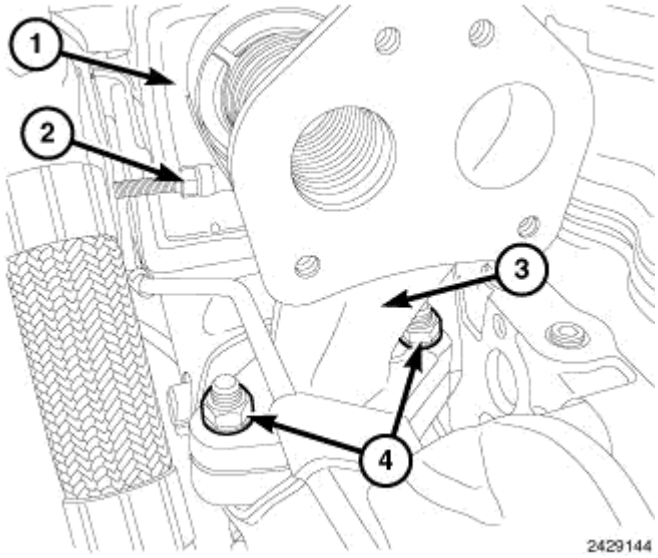

Fig. 56: EGR Cooler, Clamp, Exhaust Transfer Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

3. Using a new gasket, install the exhaust transfer manifold (3) Tighten nuts (4) to finger tight.
4. Using a new gasket, install the clamp (2) securing the EGR cooler (1) to exhaust transfer manifold (3), make sure that the bellows pilot is centered in the EGR cooler outlet. Tighten clamp finger tight.

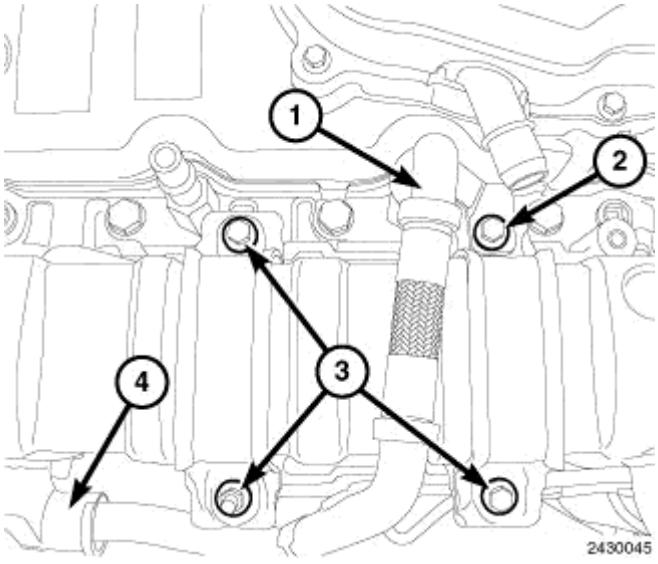

Fig. 57: Rear Coolant Tube & EGR Cooler Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Lubricate the new O-rings with a soapy water solution.

5. Install EGR Cooler mounting bolts (3) finger tight.
6. Using new O-rings, install the rear coolant tube to connection (4) then (1) and install the bolt (2) finger tight.

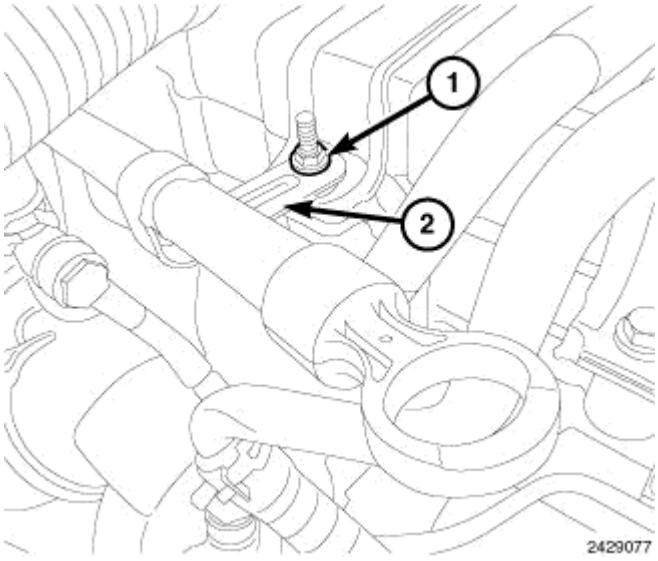

Fig. 58: Transmission Fill Tube Retaining Nut
Courtesy of CHRYSLER GROUP, LLC

7. If equipped, position back the transmission fill tube (2) to the EGR cooler (1) finger tight.

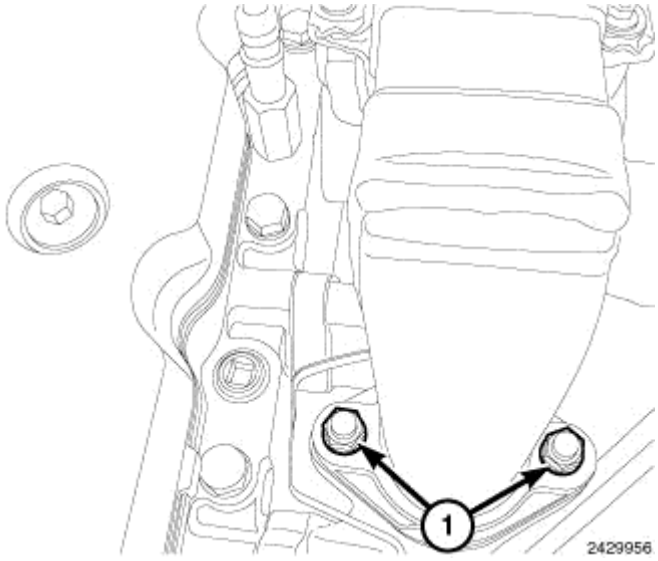

Fig. 59: EGR Cooler Inlet Flange Nuts
Courtesy of CHRYSLER GROUP, LLC

8. Tighten nuts (1) on the EGR cooler inlet flange to the exhaust manifold to 60 N.m (44 ft. lbs.).

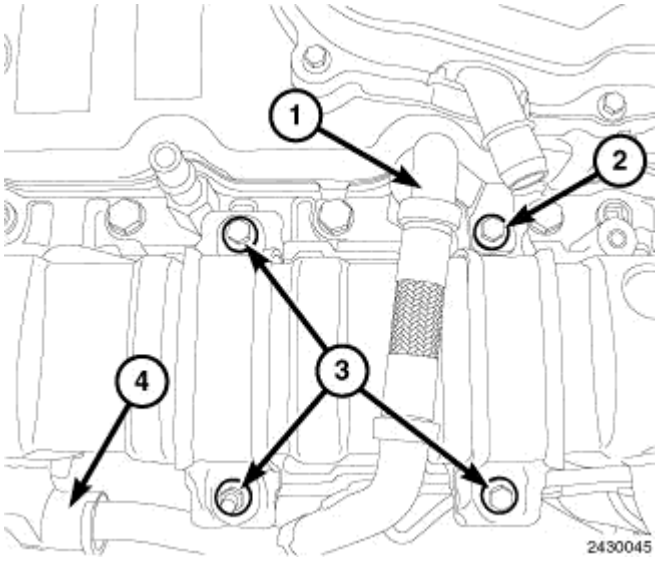

Fig. 60: Rear Coolant Tube & EGR Cooler Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Using a crisscross pattern, tighten bolt (2) and (3) to 24 N.m 18 ft. lbs.) to secure the EGR cooler onto the EGR cooler mounting bracket.

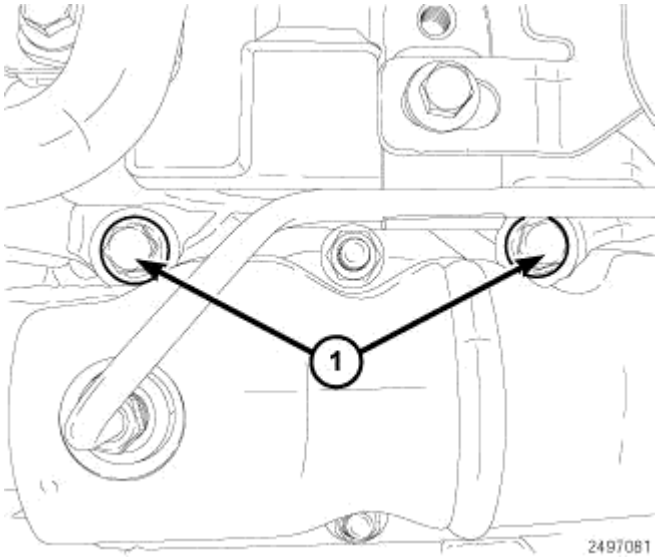

Fig. 61: EGR Cooler Mounting Bracket-To-Cylinder Head Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Tighten the EGR cooler mounting bracket to cylinder head bolts to 36 N.m (27 ft. lbs.).

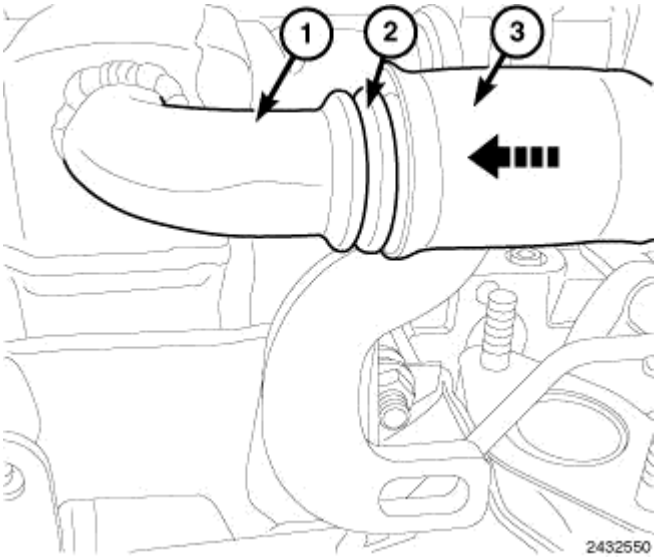

Fig. 62: Installing EGR Cooler, O-Ring & Forward Coolant Tube
Courtesy of CHRYSLER GROUP, LLC

NOTE: Lubricate the new O-rings with a soapy water solution.

11. Using a new O-ring (2), install the forward coolant tube (3) onto EGR cooler (1).

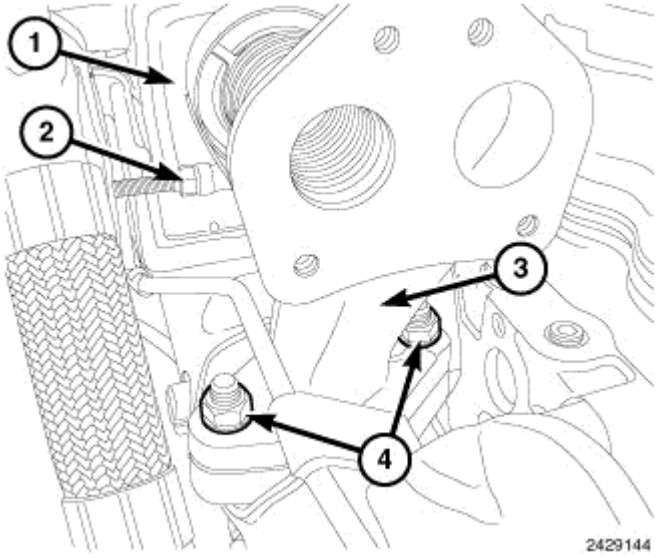

Fig. 63: EGR Cooler, Clamp, Exhaust Transfer Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

12. Tighten nuts (4) on the exhaust transfer manifold (3) to 43 N.m (18 ft. lbs.).
13. Tighten clamp (2) to 10 N.m (89 in. lbs.).

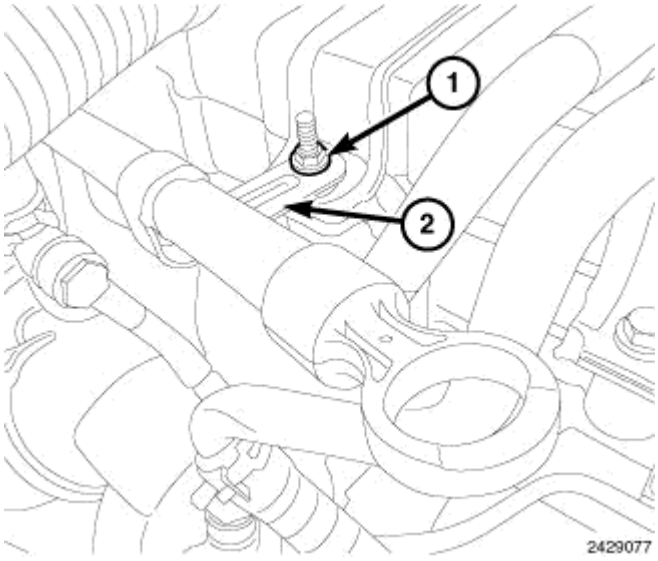

Fig. 64: Transmission Fill Tube Retaining Nut
Courtesy of CHRYSLER GROUP, LLC

14. If equipped, tighten the nut (1) on the transmission fill tube (2) 10 N.m (89 in. lbs.).

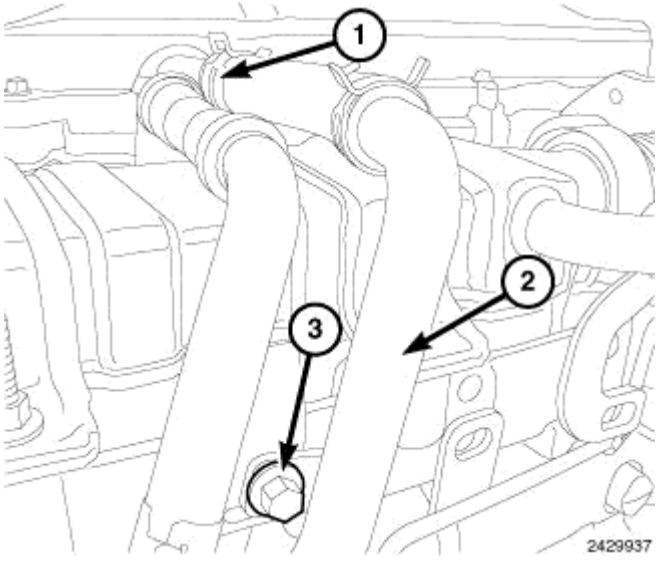

Fig. 65: Breather Hose, Breather Tube & Bolt
Courtesy of CHRYSLER GROUP, LLC

15. Install the breather tube (2) and connect breather hose (1), Tighten the bolt (3) 24 N.m (18 ft. lbs.).

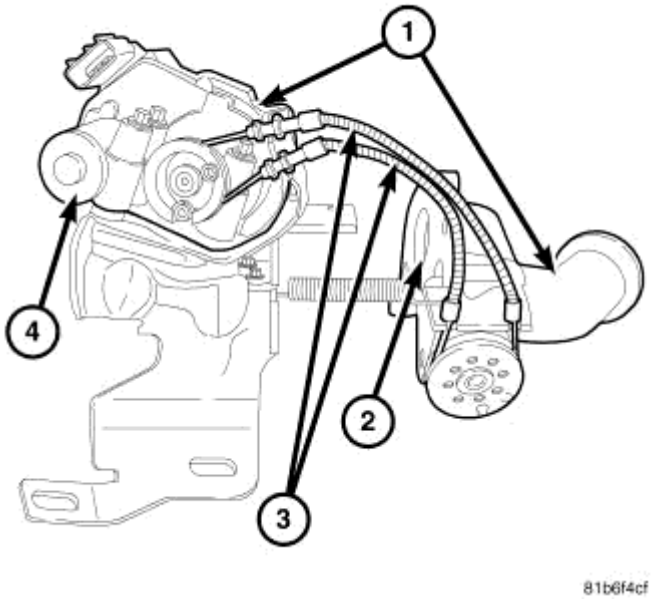

Fig. 66: EGR Cooler Bypass Valve Assembly
Courtesy of CHRYSLER GROUP, LLC

16. Install the EGR cooler bypass valve. Refer to **VALVE, EXHAUST GAS RECIRCULATION (EGR) COOLER BYPASS, INSTALLATION** .

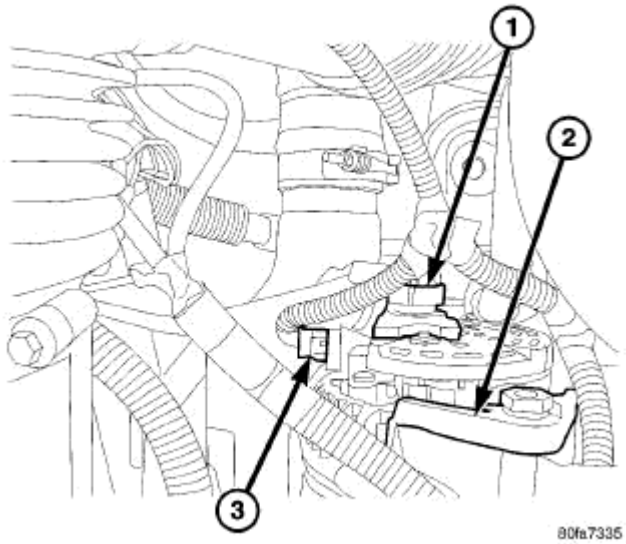

Fig. 67: Diesel Generator Connectors
Courtesy of CHRYSLER GROUP, LLC

1 - B+ CONNECTOR
2 - GENERATOR
3 - FIELD WIRE CONNECTOR

17. Install the generator. Refer to **GENERATOR, INSTALLATION** .

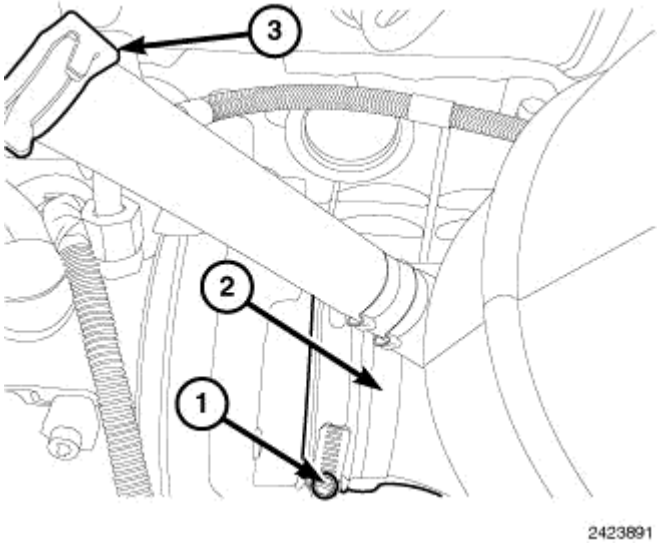

Fig. 68: Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

18. Install the outlet tube (2) to the turbocharger and tighten the clamp (1) 11 N.m (95 in. lbs.).
19. Connect the breather hose (3).

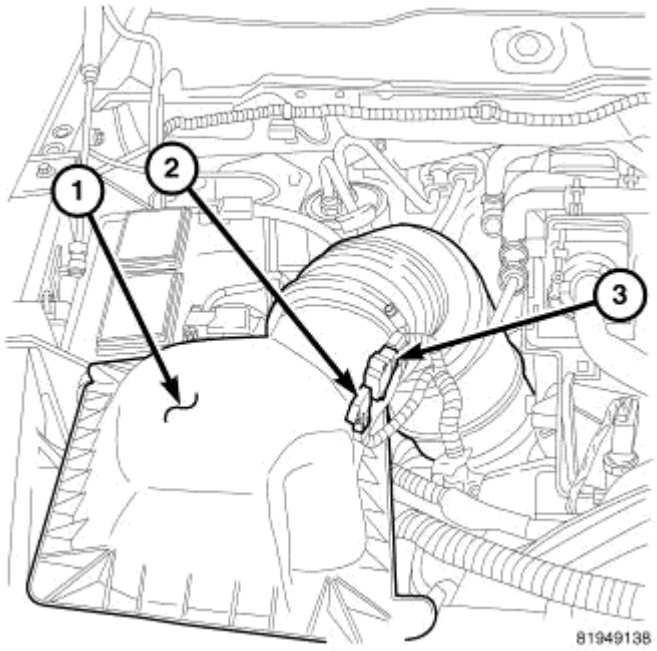

Fig. 69: Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

20. Install the air cleaner assembly. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L** .

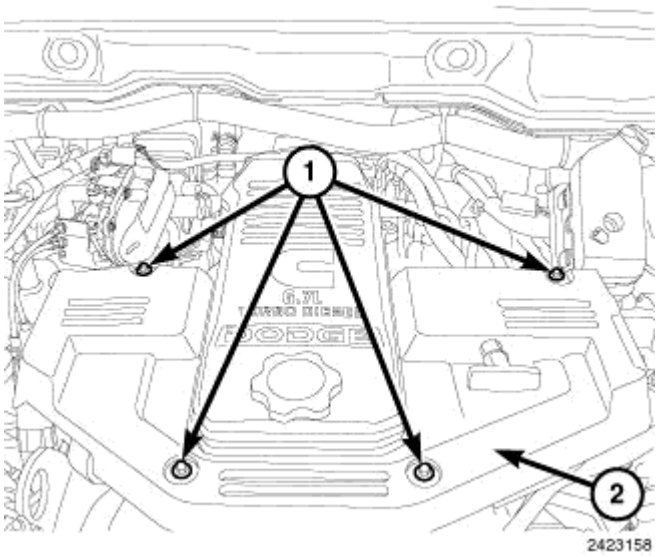

Fig. 70: EGR Crossover Tube Cover
Courtesy of CHRYSLER GROUP, LLC

21. Install engine cover and tighten bolts (1) to 10 N.m (89 in. lbs.).
22. Connect negative battery cable(s).
23. Fill coolant system. Refer to **STANDARD PROCEDURE**.
24. Start engine and check for coolant or exhaust leaks.

FAN, COOLING, ELECTRIC

REMOVAL

REMOVAL

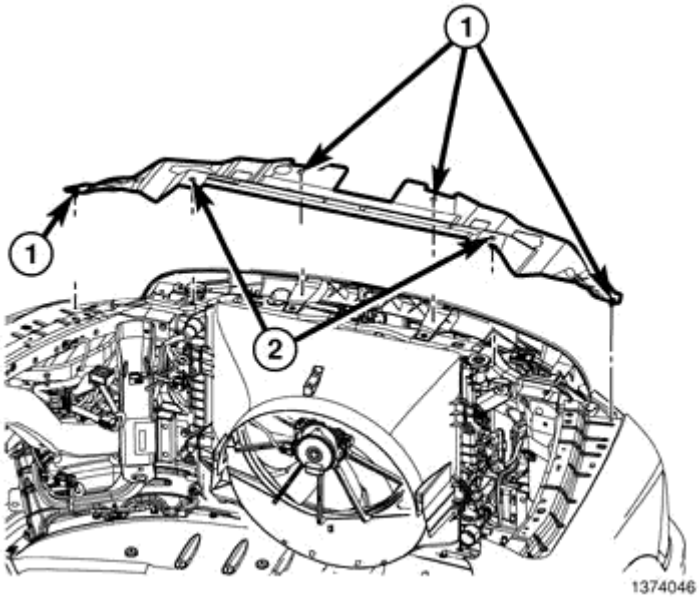

Fig. 71: Upper Radiator Seal

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the negative battery cable.
2. Remove the upper radiator seal push pins (1).
3. Remove the upper radiator seal plastic rivets (2).
4. Remove the upper radiator seal.
5. If equipped, remove the viscous fan assembly from the water pump hub shaft. Refer to **FAN, COOLING, VISCOUS, REMOVAL**.

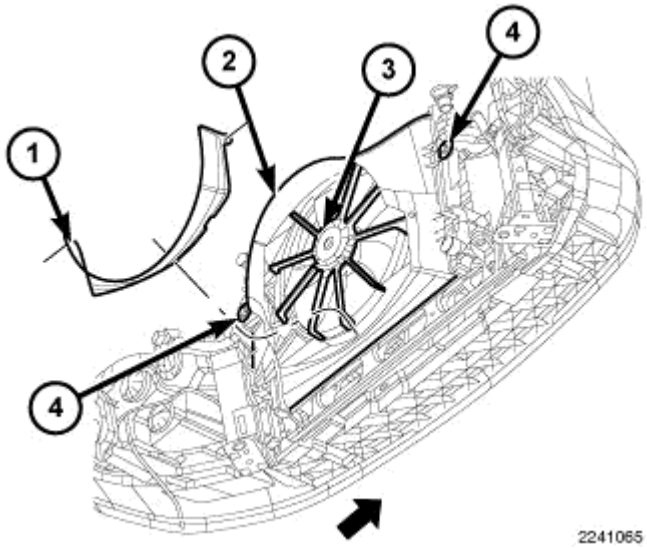

Fig. 72: Radiator Fan, Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the radiator fan (3) electrical connector.
7. Remove the fan shroud (1, 2) to radiator mounting bolts (4).
8. Disengage the fan shroud's (1, 2) lower retaining clips and position the fan shroud (1, 2) towards the rear of vehicle.
9. Disengage the electric cooling fan (3) to radiator upper retaining clips.
10. Disengage the electric fan (3) to radiator lower retaining clips.
11. Pulling upward remove the viscous fan, radiator fan shroud (1, 2) and the electric cooling fan (3) as an assembly.
12. The lower fan shroud (1) can be removed from the upper fan shroud (2) if needed.
13. If damaged, remove radiator fan resistor from shroud (1, 2).

INSTALLATION

INSTALLATION

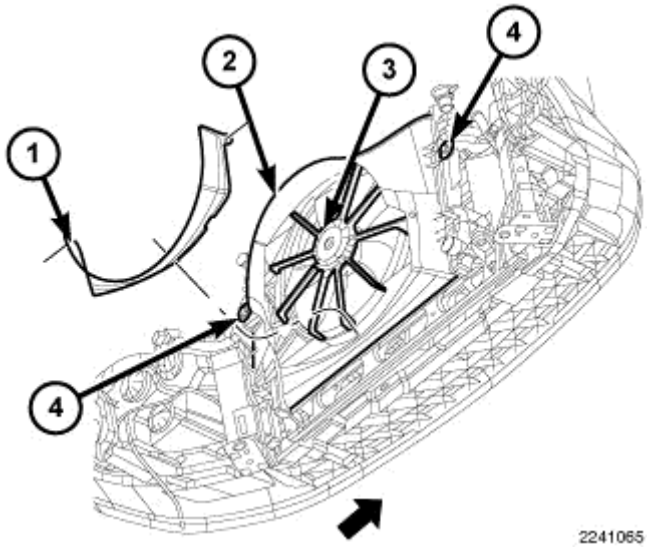

Fig. 73: Radiator Fan, Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. If removed, install the electric cooling fan resistor. Tighten the mounting screw securely.
2. If removed, install the lower fan shroud (1) to the upper fan shroud (2).
3. Position the viscous fan (if equipped), radiator fan shroud (1, 2) and electric cooling fan (3) into the vehicle as an assembly.
4. Install the electric cooling fan (3) by engaging the electric cooling fan's (3) upper and lower retaining clips to the radiator.
5. Install the fan shroud (1, 2) by engaging the fan shroud's (1, 2) lower retaining clips to the radiator/electric cooling fan (3).

NOTE: Make sure all retaining clips lock into place.

6. Install the fan shroud (1, 2) mounting bolts (4). Tighten to 10 N.m (89 in. lbs.).
7. Connect the electric cooling fan (3) electrical connector.

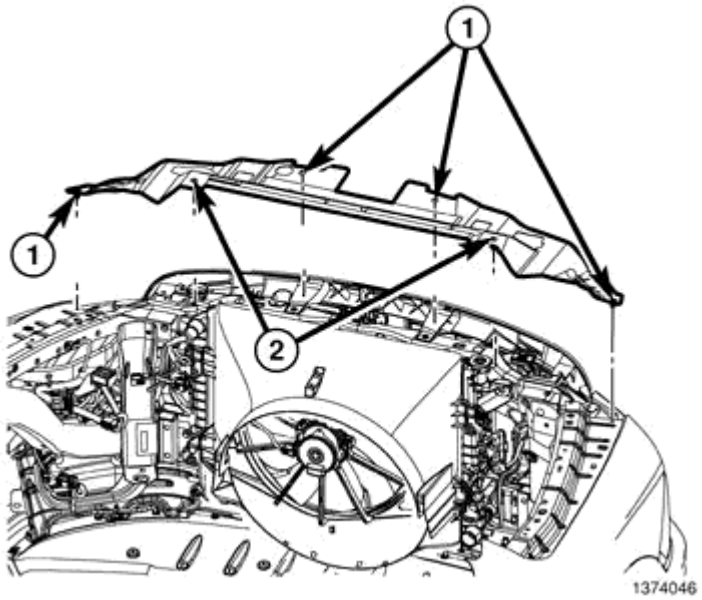

Fig. 74: Upper Radiator Seal
Courtesy of CHRYSLER GROUP, LLC

8. If equipped, install the viscous fan assembly. Refer to **FAN, COOLING, VISCOUS, INSTALLATION**.
9. Position the upper radiator seal.
10. Install the upper radiator seal plastic rivets (2).
11. Install the upper radiator push pins (1).
12. Connect the negative battery cable.

FAN, COOLING, VISCOUS

DESCRIPTION

DESCRIPTION

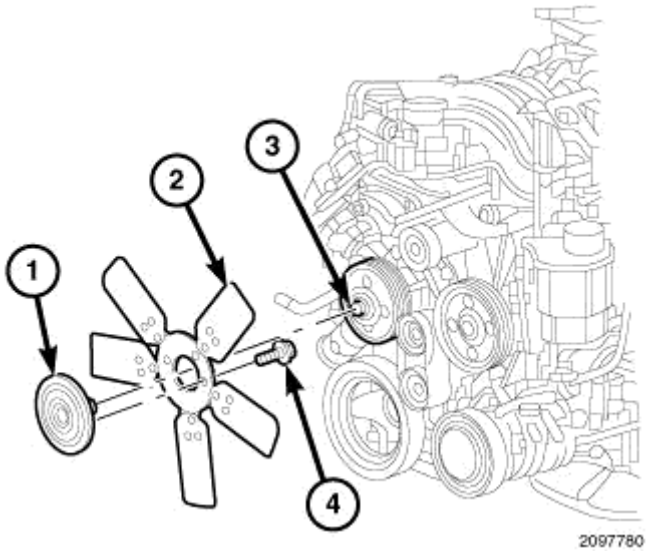

Fig. 75: Viscous Fan Drive & Blade
Courtesy of CHRYSLER GROUP, LLC

1 -VISCOUS FAN DRIVE
2 - FAN BLADE ASSEMBLY
3 - WATER PUMP AND PULLEY
4 - BOLT (4)

A thermostatic bi-metallic spring coil is located on the front face of the viscous fan drive unit. This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, the fan will remain at a reduced rpm regardless of engine speed.

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bi-metallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bi-metallic coil again reacts and the fan speed is reduced to the previous disengaged speed.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - RADIATOR VISCOUS FAN

NOISE

NOTE: It is normal for fan noise to be louder (roaring) when:

- The underhood temperature is above the engagement point for the viscous drive coupling. This may occur when ambient (outside air temperature) is very high.
- Engine loads and temperatures are high such as when towing a trailer.

- Cool silicone fluid within the fan drive unit is being redistributed back to its normal disengaged (warm) position. This can occur during the first 15 seconds to one minute after engine start-up on a cold engine.

LEAKS

Viscous fan drive operation is not affected by small oil stains near the drive bearing. If leakage appears excessive, replace the fan drive unit.

VISCOUS DRIVE

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: Be sure that there is adequate fan blade clearance before drilling.

1. Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.
2. Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18°-to-105°C (0°-to-220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.
3. Connect a tachometer and an engine ignition timing light. The timing light is to be used as a strobe light.
4. Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator. Use tape at the top to secure the plastic and be sure that the air flow is blocked.
5. Be sure that the air conditioner (if equipped) and blower fan is turned off.

WARNING: Use extreme caution when the engine is operating. Do not stand in a direct line with the fan. Do not put your hands near the pulleys, belts or fan. Do not wear loose clothing.

6. Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 88° C (190° F). Fan drive **engagement** should start to occur at/between:
   - 3.7L Automatic - 93° C - 99°C (200° F - 210° F)
   - 3.7L Manual/4.7L Automatic - 85° - 91° C (185° - 195° F)
   - 4.7L Manual - 74° - 79° C (165° - 175° F)
   - 5.7L Automatic Standard Cool - 94° C - 99°C (201° F - 211° F)
   - 5.7L Manual - 93° C - 100°C (199° F - 212° F)
   - 5.7L Heavy Duty Snowplow - 76° C - 83°C (169° F - 181° F)
   - Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.
7. When viscous drive engagement is verified, remove the plastic sheet. Fan drive **disengagement** should start to occur at or between:
   - 3.7L Automatic - 76°C - 81°C (168° F - 178° F)
   - 3.7L Manual/4.7L Auto - 67°C - 73°C (153° F - 163° F)

- 4.7L Manual - 56°C - 62°C (133° F - 143° F)
- 5.7L Automatic Standard Cool - 69° C - 74°C (156° F - 166° F)
- 5.7L Manual - 71° C - 76°C (160° F - 170° F)
- 5.7L Heavy Duty Snowplow - 55° C - 60°C (168° F - 178° F)

A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

CAUTION: Some engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. Installation of the wrong fan or viscous fan drive can result in engine overheating.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

DIESEL

NOISE

NOTE: It is normal for fan noise to be louder (roaring) when:

- Fan duty cycle high. This may occur when ambient (outside air temperature) is very high.
- Engine loads and temperatures are high such as when towing a trailer.
- Operating conditions where transmission temperatures may be high
- Cool silicone fluid within the fan drive unit is being redistributed back to its normal disengaged (warm) position. This can occur during the first 15 seconds to one minute after engine start-up on a cold engine.

LEAKS

Viscous fan drive operation is not affected by small oil stains near the drive bearing. If leakage appears excessive, replace the fan drive unit.

ELECTRONICALLY CONTROLLED VISCOUS DRIVE - DIESEL

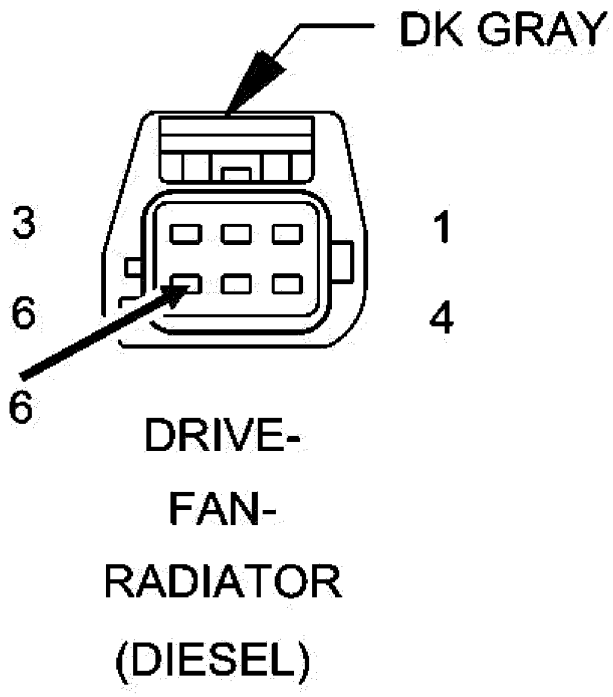

Fig. 76: Electronically Controlled Viscous Fan Drive Connector Pin ID
Courtesy of CHRYSLER GROUP, LLC

If the fan assembly does not free-wheel and a metallic grinding sound exists, replace the electronically controlled fan drive. Refer to **FAN, COOLING, VISCOUS, REMOVAL**.

NOTE: The following test may take up to 15 minutes to perform.

The engine should be at normal operating temperature.

1. Set the parking brake and verify the transmission is in park or neutral.
2. Set air conditioner (if equipped) and blower fan to OFF.
3. Start and allow engine to reach normal operating temperatures.
4. Stop engine, connect the scan tool and select appropriate model year and engine option.
5. Check for and correct existing DTC's
6. Locate the electronically controlled viscous fan drive connector on the fan shroud.

WARNING: A spark may occur when the connection to battery is made. Be sure there are no combustible materials near the area where this procedure is being performed.

7. Using a jumper wire, backprobe pin 6 of the viscous fan drive connector to battery positive.

NOTE: The fan drive control coil is energized to 12 volts at this time.

8. Using the scan tool, confirm that DTC 0480 is set to verify a good connection at the cooling fan harness connector.
9. Start the engine.
10. Actuate engine speed to 2000 RPM.
11. Go to the SENSOR screen and observe the fan speed.
12. Run the engine at 2000 RPM until the fan speed increases to 1850 RPM or more for 30 seconds.

NOTE: Fan RPM may ramp up slowly.

NOTE: It may take 15 minutes before fan speed increases.

13. The fan speed should be in accordance to the table below.
14. If fan speed does not increase, make sure that the jumper wire has a good connection. If so replace the electronically control viscous fan drive.
15. If the fan speed does increase and there is still a concern, refer to the appropriate Electrical Diagnostic article to diagnosis the electronically controlled viscous fan drive control circuit.

ELECTRONICALLY CONTROLLED VISCOUS FAN DRIVE SPEEDS	
ENGINE RPM	**FAN RPM** (Min)
1000	950

1500	1420
2000	1850
2500	2230

REMOVAL

5.7L

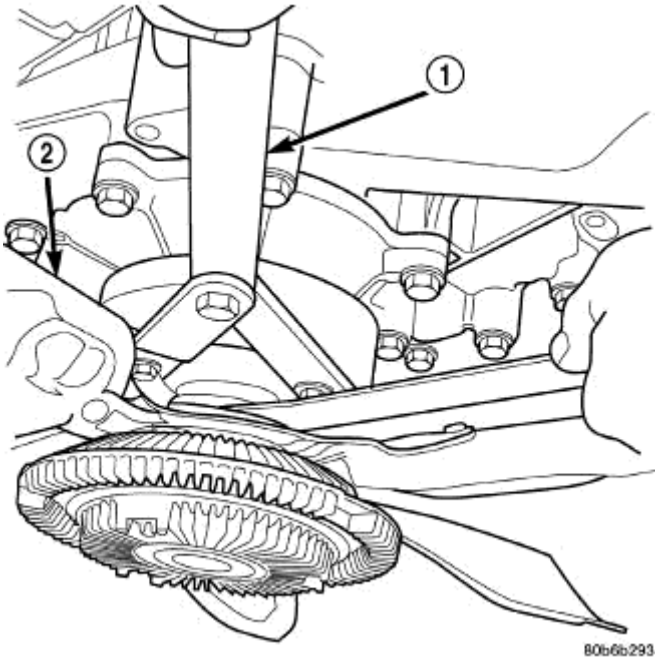

Fig. 77: Fan & Spanner Wrench
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 6958 SPANNER WRENCH WITH ADAPTER PINS 8346
2 - FAN

1. **Do Not** attempt to remove the fan/viscous fan drive assembly (2) from the vehicle at this time.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

2. Disconnect negative battery cable from battery.
3. The thermal viscous fan drive/fan blade assembly (2) is attached (threaded) to the water pump hub shaft.

Remove the fan blade/viscous fan drive assembly from the water pump by turning the mounting nut clockwise as viewed from the front. Threads on the viscous fan drive are **LEFT-HAND.** A 36 MM Fan Wrench (1) should be used to prevent pulley from rotating.

4. **Do Not** unbolt the fan blade assembly from viscous fan drive at this time.
5. Remove the fan shroud-to-radiator mounting bolts.
6. Pull the lower shroud mounts out of the radiator tank clips.
7. Remove the fan shroud, electric cooling fan, and fan blade/viscous fan drive assembly (2) as a complete unit from vehicle. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL**.
8. After removing the fan blade/viscous fan drive assembly (2), **do not** place the viscous fan drive in a horizontal position. If stored horizontally, silicone fluid in the viscous fan drive could drain into its bearing assembly and contaminate lubricant.

CAUTION: Do not remove water pump pulley-to-water pump bolts. This pulley is under spring tension.

9. Remove four bolts securing fan blade assembly to viscous fan drive.

CAUTION: Some engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word REVERSE to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

6.7L DIESEL

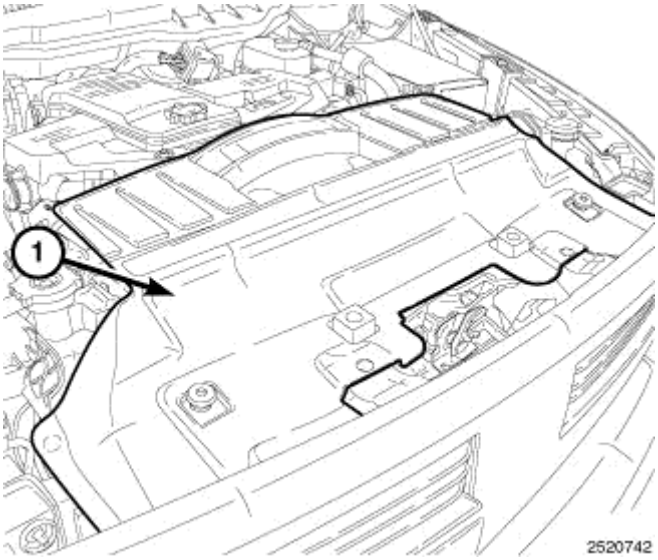

Fig. 78: Upper Radiator Shroud
Courtesy of CHRYSLER GROUP, LLC

CAUTION: If the electronically controlled viscous fan drive is replaced because of

mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, or chipped blades that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect wiring harness and connectors for damage.

1. Remove the upper radiator shroud (1).
2. Disconnect and isolate the battery negative cable.
3. If equipped, disconnect and isolate the negative battery cable from the auxiliary battery.

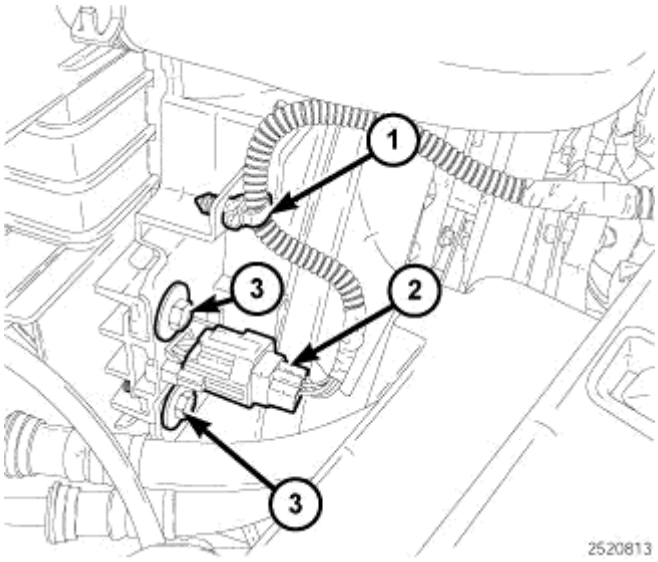

Fig. 79: Viscous Fan Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the electronically controlled viscous fan electrical connector (2) at the fan shroud.
5. Remove and re-position the fan drive wire harness support (1) from the fan shroud.
6. Remove the two fan shroud-to-radiator shroud mounting bolts (3) located on the driver side of the vehicle.

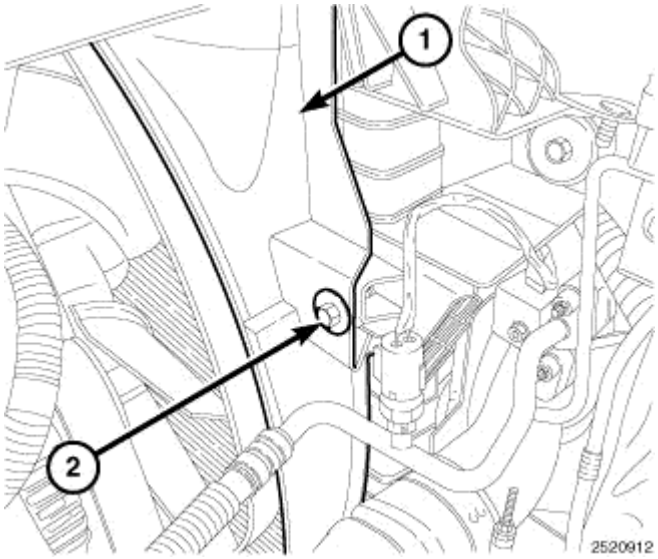

Fig. 80: Fan Shroud-To-Radiator Shroud Mounting Bolt
Courtesy of CHRYSLER GROUP, LLC

7. Remove the fan shroud-to-radiator shroud mounting bolt (2) located on the passenger side of the vehicle.
8. Remove the fan shroud-to-lower radiator shroud push pins.

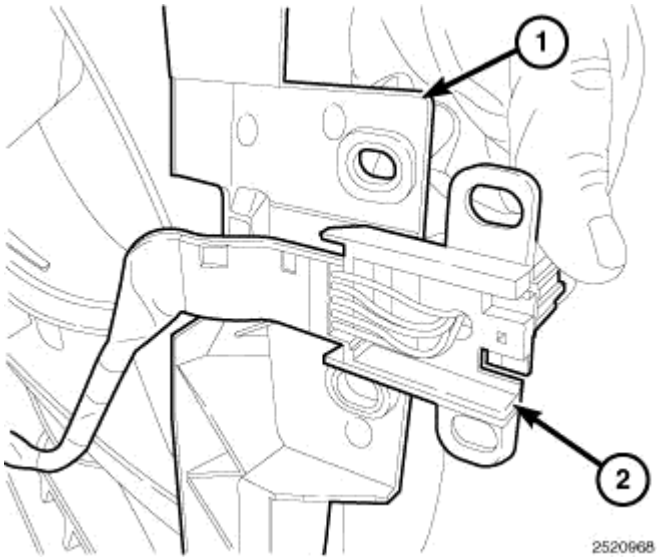

Fig. 81: Electrical Connector Bracket
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not remove the fan pulley bolts. This pulley is under spring tension.

9. The electronically controlled viscous fan drive/fan blade assembly is attached (threaded) to the fan pulley shaft. Remove the fan blade/fan drive assembly from fan pulley by turning the mounting nut counterclockwise (as viewed from front). Threads on the viscous fan drive are **RIGHT-HAND.** A 36

MM Fan Wrench can be used. Place a bar or screwdriver between the fan pulley bolts to prevent pulley from rotating.

10. Disengage the fan shroud lower retaining clips.
11. Collapse fan shroud toward front of vehicle and remove fan drive/fan blade and fan shroud as an assembly.
12. Remove the electrical connector bracket (2) by disengaging the retainer clip and sliding the connector bracket (2) out of the fan shroud (1).

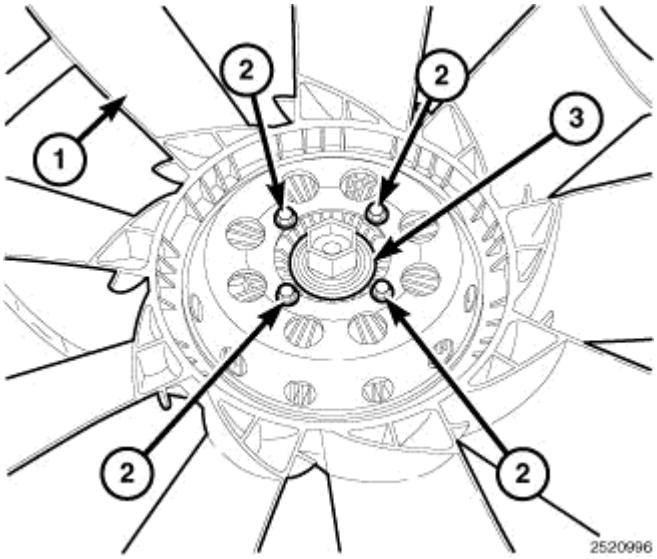

Fig. 82: Fan Blade Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The electronically controlled viscous fan drive is vibration and impact sensitive, especially at the electrical connectors. Do not drop the unit.

13. Remove the four fan blade mounting bolts (2) from the viscous fan drive (3).
14. Inspect the fan for cracked, chipped or damaged fan blades (1).

CLEANING

CLEANING

Clean the fan blades using a mild soap and water. Do not use an abrasive to clean the blades.

INSPECTION

INSPECTION

WARNING: Do not attempt to bend or straighten fan blades if fan is not within specifications.

CAUTION: If fan blade assembly is replaced because of mechanical damage, water pump and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

INSTALLATION

3.7L/4.7L/5.7L

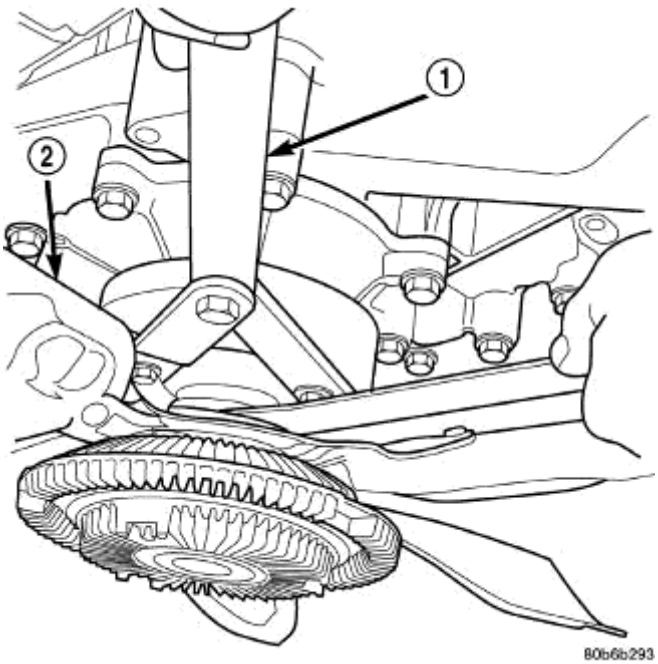

Fig. 83: Fan & Spanner Wrench
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 6958 SPANNER WRENCH WITH ADAPTER PINS 8346
2 - FAN

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

NOTE: Viscous Fan Drive Fluid Pump Out Requirement: After installing a new viscous fan drive, bring the engine speed up to approximately 2000 rpm and hold for approximately two minutes. This will ensure proper fluid distribution within the drive.

1. Install fan blade assembly (2) to the viscous fan drive. Tighten the bolts to 24 N.m (18 ft. lbs.) torque.

2. Position the fan shroud, electric cooling fan and the fan blade/viscous fan drive assembly (2) to the vehicle as a complete unit. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION**.
3. Install the fan shroud.
4. The thermal viscous fan drive/fan blade assembly is attached (threaded) to the water pump hub shaft. Install the fan blade/viscous fan drive assembly to the water pump by turning the mounting nut counterclockwise as viewed from the front. Threads on the viscous fan drive are **LEFT-HAND.** A 36 MM Fan Wrench (1) should be used to prevent pulley from rotating. Tighten mounting nut to 50 N.m (37 ft. lbs.).
5. Connect the negative battery cable.

6.7L DIESEL

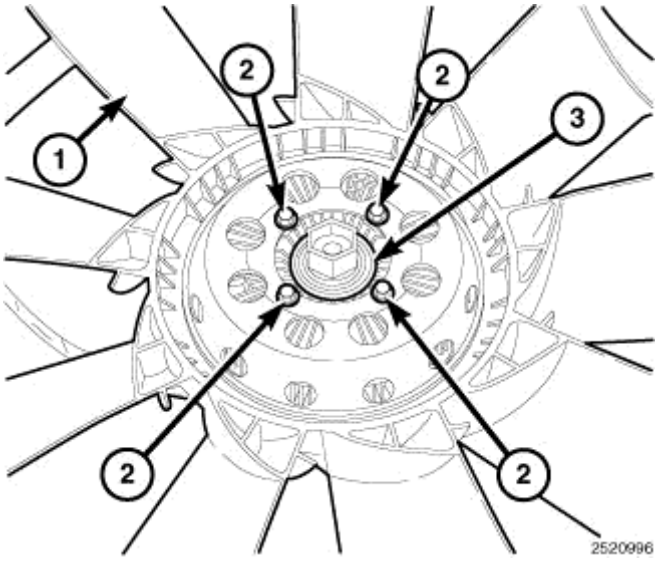

Fig. 84: Fan Blade Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The electronically controlled viscous fan drive is vibration and impact sensitive, especially at the electrical connectors. Do not drop the unit.

1. Install the fan blade assembly (1) to the electrically controlled viscous fan drive (3). Tighten the mounting bolts (2) to 24 N.m (18 ft. lbs.) torque.

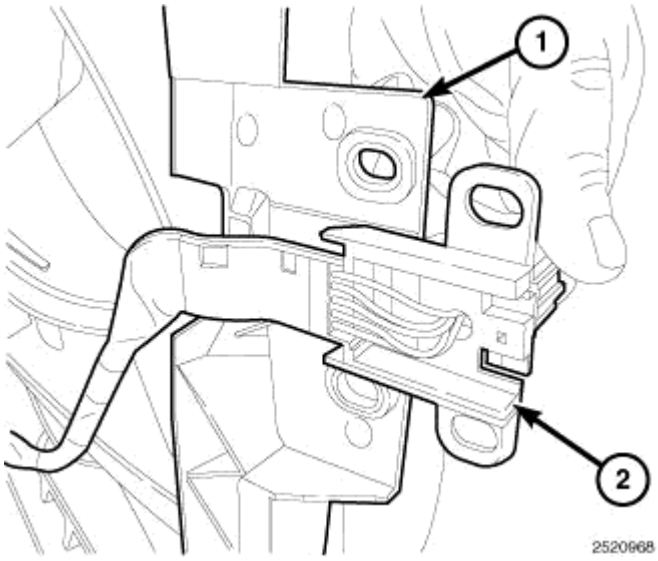

Fig. 85: Electrical Connector Bracket
Courtesy of CHRYSLER GROUP, LLC

2. Position the fan/fan drive assembly inside fan shroud (1).
3. Install the electrical connector bracket (2) by sliding the connector bracket (2) into the fan shroud (1) and engaging the retainer clip.
4. Tilt the fan shroud/fan blade toward front of vehicle and position the fan shroud/fan blade as an assembly into the engine compartment.
5. Engage the fan shroud lower retaining clips.
6. Install the fan blade/fan drive assembly to the fan pulley by turning the mounting nut clockwise (as viewed from front). The threads on the viscous fan drive are **RIGHT-HAND.** A 36 MM Fan Wrench can be used. Place a bar or screwdriver between the fan pulley bolts to prevent pulley from rotating. Tighten the mounting nut to 115 N.m (85 ft. lbs.) torque.

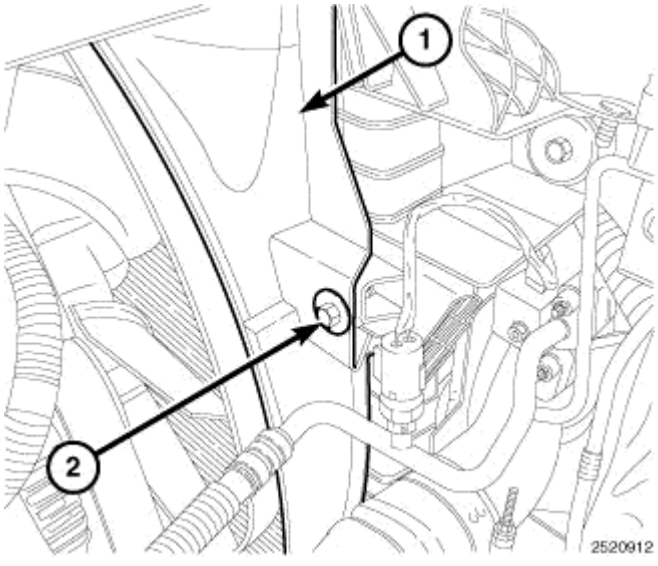

Fig. 86: Fan Shroud-To-Radiator Shroud Mounting Bolt

Courtesy of CHRYSLER GROUP, LLC

7. Install the fan shroud-to-lower radiator shroud push pins.
8. Install the fan shroud-to-radiator shroud mounting bolt (2) located on the passenger side of the vehicle. Tighten the bolt (2) to 24 N.m (18 ft. lbs.).

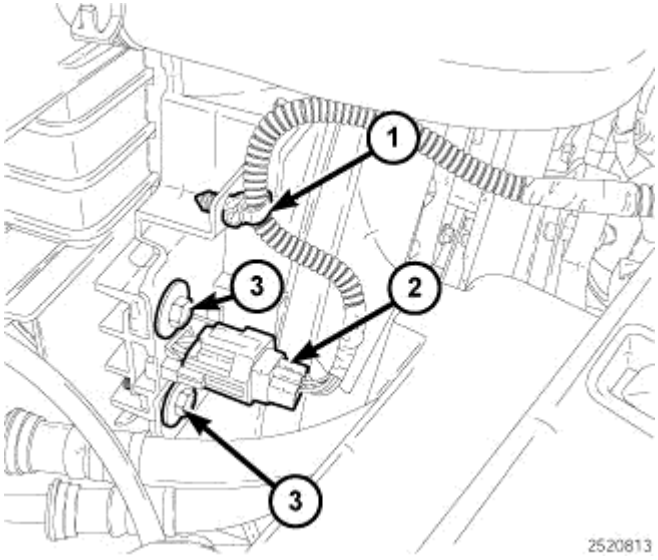

Fig. 87: Viscous Fan Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

9. Install the two fan shroud-to-radiator shroud mounting bolts (3) located on the driver side of the vehicle. Tighten the bolts (3) to 24 N.m (18 ft. lbs.).
10. Position and connect the fan drive wire harness support (1) to the fan shroud.
11. Connect the electronically controlled viscous fan electrical connector (2) at the fan shroud.

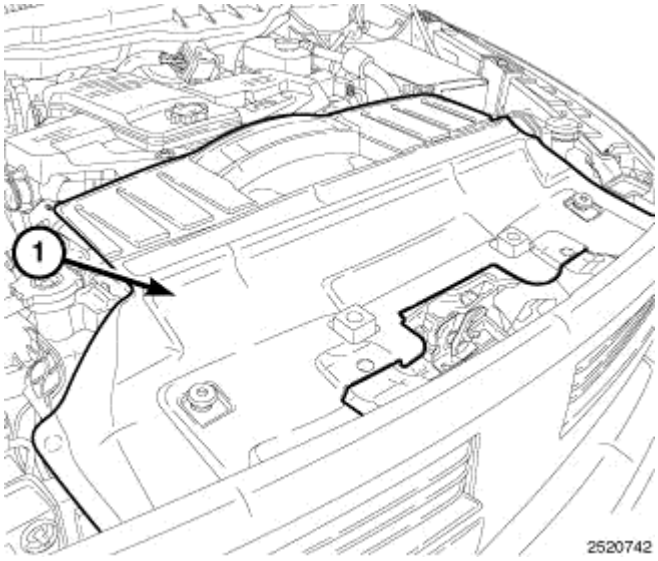

Fig. 88: Upper Radiator Shroud
Courtesy of CHRYSLER GROUP, LLC

12. If equipped, connect the negative battery cable to the auxiliary battery.
13. Connect the negative battery cable.
14. Install the upper radiator shroud (1).

NOTE: Viscous Fan Drive Fluid Pump Out Requirement: After installing a new viscous fan drive, bring the engine speed up to approximately 2000 rpm and hold for approximately two minutes. This will ensure proper fluid distribution within the drive.

15. Start the vehicle and check for proper clearance between the fan blade assembly and the fan shroud.

HEATER, ENGINE BLOCK

DESCRIPTION

DESCRIPTION

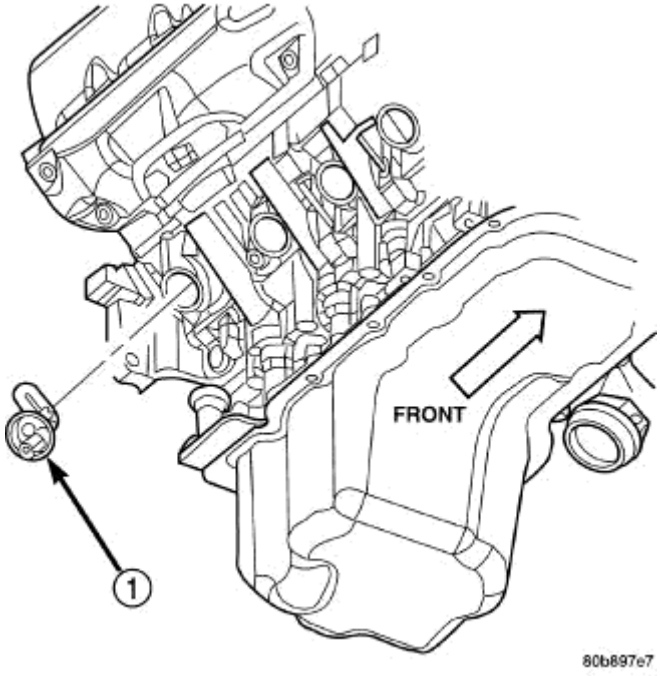

Fig. 89: Engine Block Heater - 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE BLOCK HEATER

WARNING: Do not operate engine unless block heater cord has been disconnected from power source and secured in place. The power cord must be secured in its retaining clips and routed away from exhaust manifolds and moving parts.

An optional engine block heater is available with all models. The heater is equipped with a power cord. The cord is attached to an engine compartment component with tie-straps. The heater warms the engine providing easier engine starting and faster warm-up in low temperatures. The heater is mounted in a core hole of the engine cylinder block in place of a freeze plug with the heating element immersed in engine coolant. The 3.7L/4.7L gas powered engines have the block heater located to the rear on the right side of the engine.

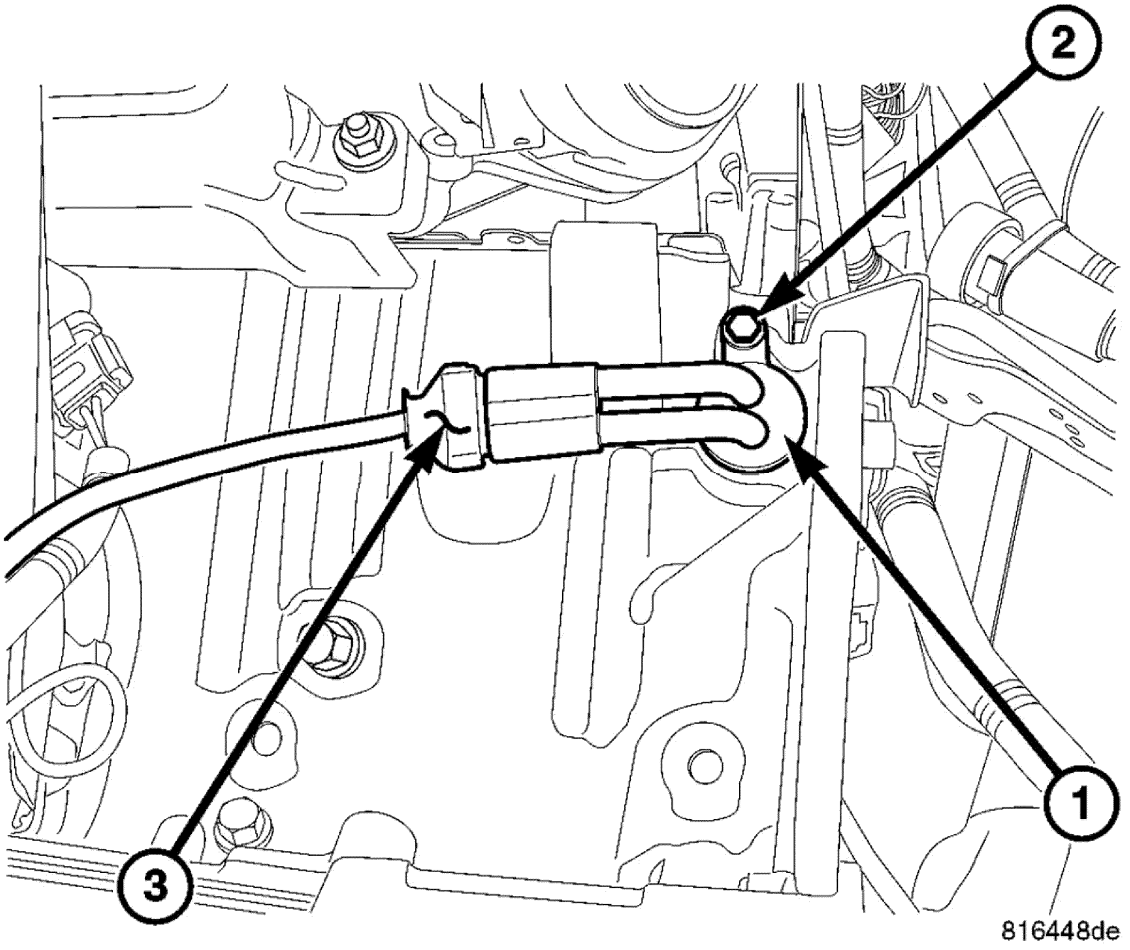

Fig. 90: 5.7L Engine Block Heater
Courtesy of CHRYSLER GROUP, LLC

1 - BLOCK HEATER

The 5.7L engine has the block heater (1) located on the left side of the engine below the exhaust manifold in the rear of the engine and is not immersed in engine coolant but makes direct contact with the block.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE BLOCK HEATER

If the unit does not operate, possible causes can be either the power cord or the heater element. Test the power cord for continuity with a 110-volt voltmeter or 110-volt test light. Test heater element continuity with an ohmmeter or a 12-volt test light.

CAUTION: To prevent damage, the power cord must be secured in its retainer clips and away from any components that may cause abrasion or damage, such as linkages, exhaust components, etc.

REMOVAL

3.7L/4.7L ENGINE

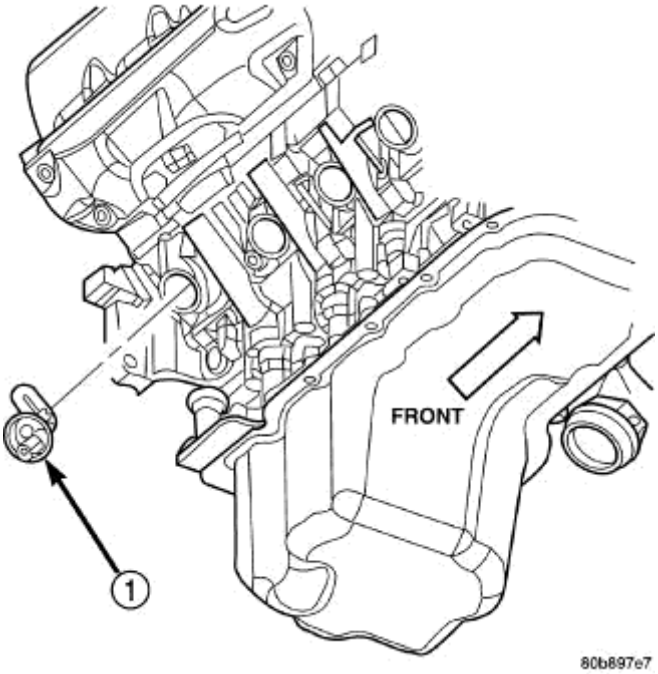

Fig. 91: Engine Block Heater - 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the battery negative cable.
2. Drain the coolant. Refer to **STANDARD PROCEDURE**.
3. Remove the power cord from the heater by unplugging.
4. Loosen (but do not completely remove) the screw at center of block heater.
5. Remove the block heater (1) by carefully prying from side-to-side. Note the direction of the heating element coil (up or down). The element coil must be installed correctly to prevent damage.

5.7L ENGINE

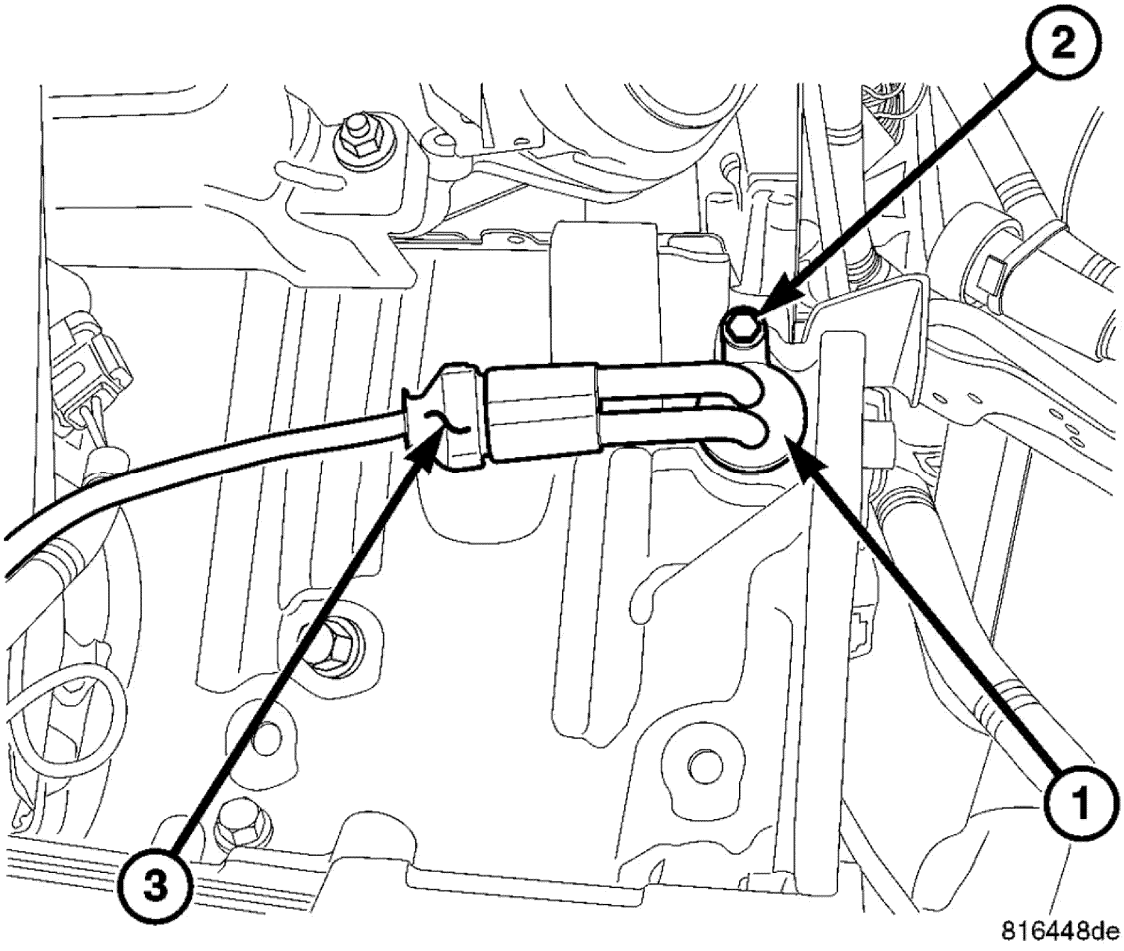

Fig. 92: 5.7L Engine Block Heater
Courtesy of CHRYSLER GROUP, LLC

1 - BLOCK HEATER

1. Raise vehicle.
2. Remove power cord from block heater (1).
3. Remove bolt (2) on block heater (1). Remove heater assembly (1).

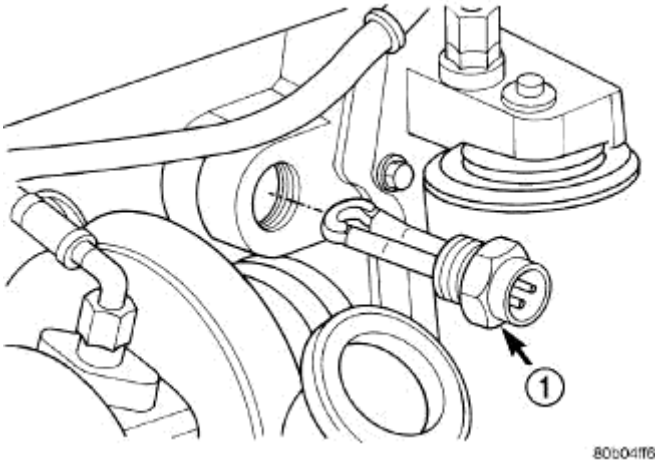

Fig. 93: Block Heater - Diesel Engine
Courtesy of CHRYSLER GROUP, LLC

1 - BLOCK HEATER

1. Disconnect the battery negative cables.
2. Drain coolant from radiator and cylinder block. Refer to **STANDARD PROCEDURE**.
3. Unscrew the power cord retaining cap and disconnect cord from heater element.
4. Using a suitable size socket, loosen and remove the block heater element. Refer to **Fig. 93**.

INSTALLATION

3.7L/4.7L ENGINE

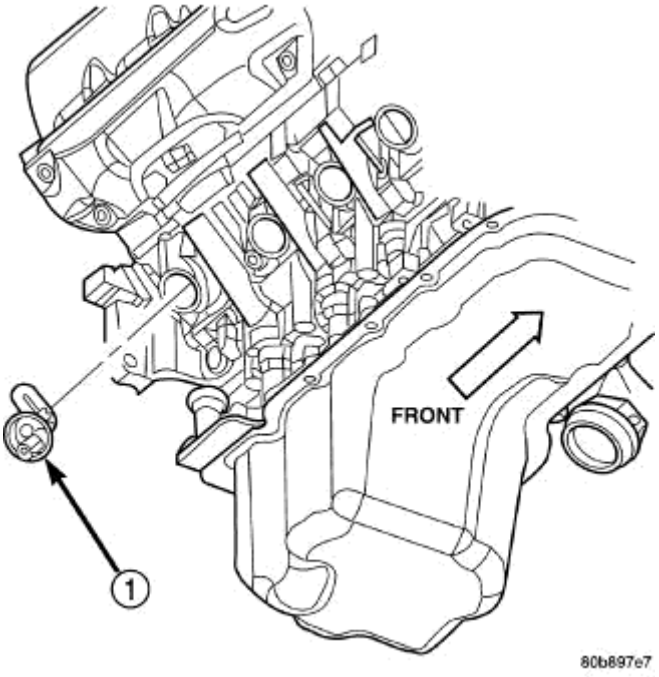

Fig. 94: Engine Block Heater - 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

1. Clean and inspect the block heater hole.
2. Install the new O-ring seal(s) to heater.
3. Insert the block heater (1) into cylinder block and position the element properly.
4. With the heater fully seated, tighten center screw to 2 N.m (17 in. lbs.).
5. Fill the cooling system with the recommended coolant. Refer to **CAPACITIES AND RECOMMENDED FLUIDS** .
6. Start and warm the engine.
7. Check the block heater for leaks.

5.7L ENGINE

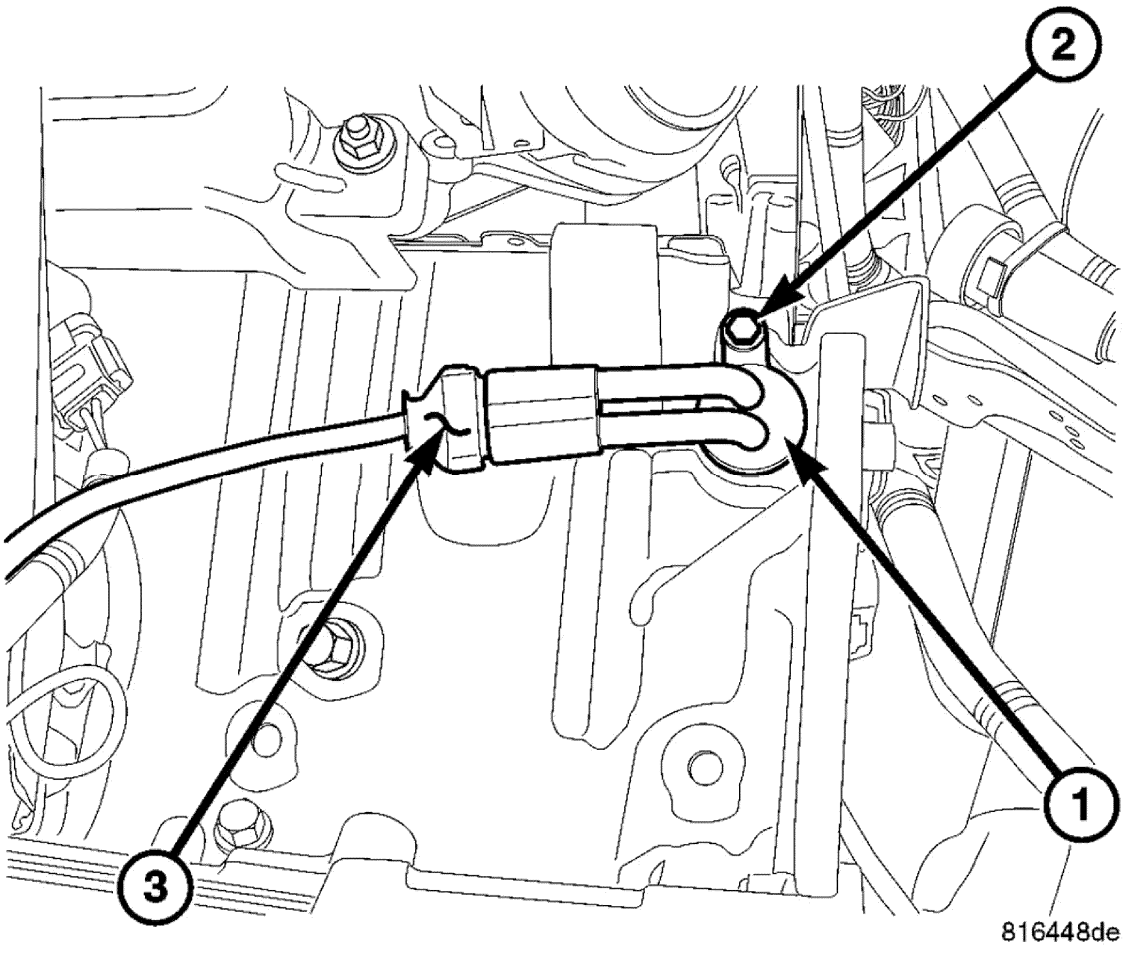

Fig. 95: 5.7L Engine Block Heater
Courtesy of CHRYSLER GROUP, LLC

1 - BLOCK HEATER

1. Thoroughly clean cylinder block core hole and block heater seat.
2. Insert block heater assembly (1) into the block.
3. With block heater fully seated, tighten bolt (1) to 2 N.m (17 in. lbs.) torque.

6.7L DIESEL ENGINE

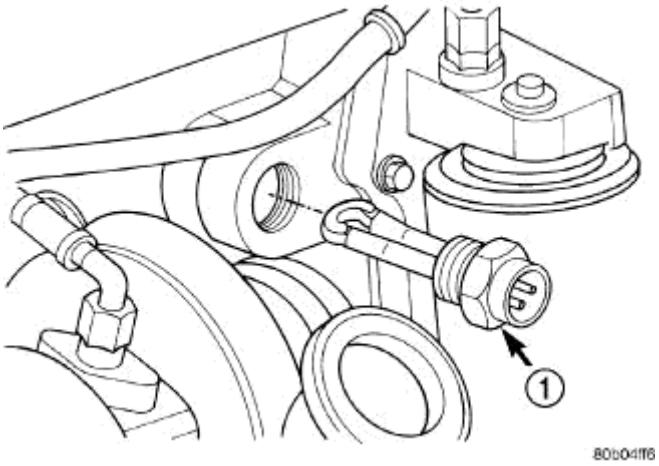

Fig. 96: Block Heater - Diesel Engine
Courtesy of CHRYSLER GROUP, LLC

1 - BLOCK HEATER

1. Clean and inspect the threads in the cylinder block and heater element.
2. Coat heater element threads with Mopar® Thread Sealer with Teflon.
3. Screw block heater (1) into cylinder block and tighten to 75 N.m (55 ft. lbs.).
4. Connect block heater cord and tighten retaining cap.
5. Fill cooling system with recommended coolant. Refer to **CAPACITIES AND RECOMMENDED FLUIDS** .
6. Start and warm the engine.
7. Check block heater for leaks.

PUMP, WATER

DESCRIPTION

WATER PUMP

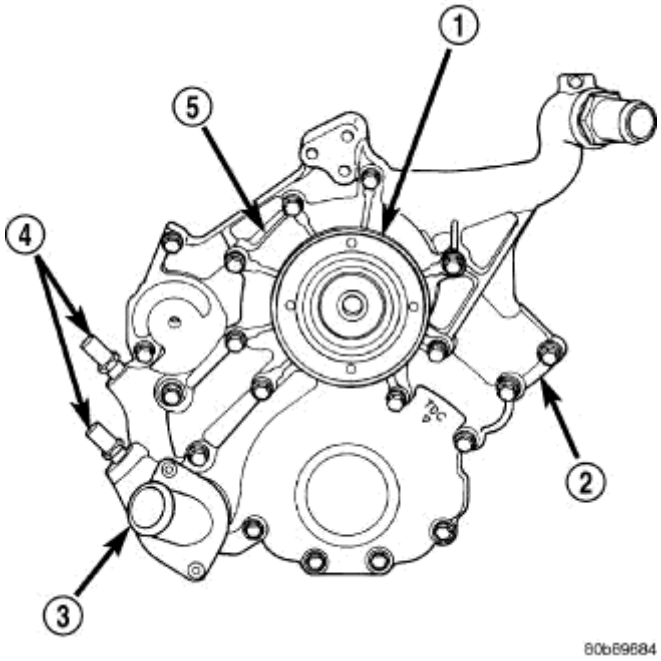

Fig. 97: Water Pump & Timing Chain Cover
Courtesy of CHRYSLER GROUP, LLC

1 - INTEGRAL WATER PUMP PULLEY
2 - TIMING CHAIN COVER
3 - THERMOSTAT HOUSING
4 - HEATER HOSE FITTINGS
5 - WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a single serpentine drive belt.

The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has two small holes to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

WATER PUMP BYPASS

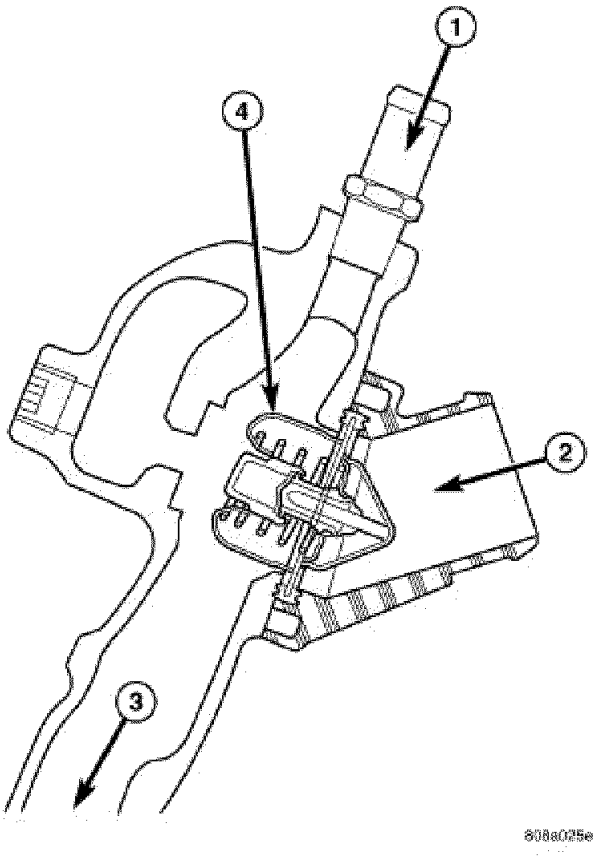

Fig. 98: Cutaway View Of Thermostat & Bypass
Courtesy of CHRYSLER GROUP, LLC

1 - FROM HEATER AND DEGAS CONTAINER
2 - FROM RADIATOR
3 - TO WATER PUMP
4- THERMOSTAT

The 3.7L and 4.7L engine uses an internal water/coolant bypass system. The design uses galleries in the timing chain cover to circulate coolant during engine warm-up preventing the coolant from flowing through the radiator. Refer to **Fig. 98**.

OPERATION

WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core, this coolant absorbs the heat generated when the engine is running. The pump is driven by the engine crankshaft via a drive belt.

WATER PUMP BYPASS - 3.7L/4.7L

When the thermostat is in the closed position the bypass gallery is not obstructed allowing 100% flow. When the thermostat is in the open position the pill partially covers the bypass hole, reducing the amount of bypass flow. This design allows the coolant to reach operating temperature quickly when cold, while adding extra cooling during normal temperature operation.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - WATER PUMP

A quick test to determine if pump is working is to check if heater warms properly. A defective water pump will not be able to circulate heated coolant through the long heater hose to the heater core.

STANDARD PROCEDURE

STANDARD PROCEDURE - COOLANT AIR EVACUATION

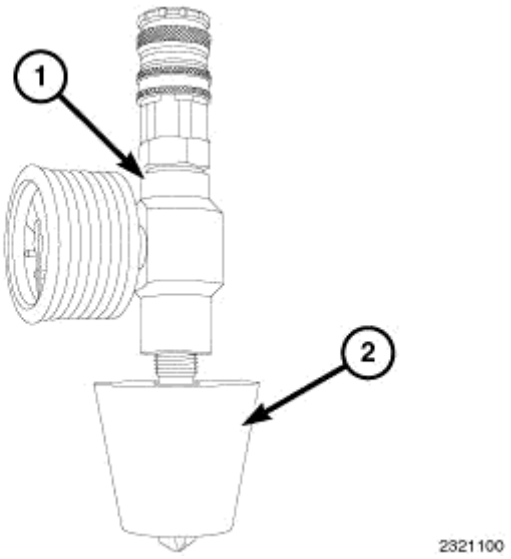

Fig. 99: Pressurized Air Operated Vacuum Generator
Courtesy of CHRYSLER GROUP, LLC

Evacuating or purging air from the cooling system involves the use of a pressurized air operated vacuum generator. The vacuum created allows for a quick and complete coolant refilling while removing any airlocks present in the system components.

NOTE: To avoid damage to the cooling system, ensure that no component would be susceptible to damage when a vacuum is drawn on the system.

WARNING: ANTIFREEZE IS AN ETHYLENE GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH

ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASED COOLANT PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE; PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED; PERSONAL INJURY CAN RESULT.

WARNING: WEAR APPROPRIATE EYE AND HAND PROTECTION WHEN PERFORMING THIS PROCEDURE.

NOTE: The service area where this procedure is performed should have a minimum shop air requirement of 80 PSI (5.5 bar) and should be equipped with an air dryer system.

NOTE: For best results, the radiator should be empty. The vehicle's heater control should be set to the heat position (ignition may need to be turned to the on position but do not start the motor).

1. Refer to the Chrysler Pentastar Service Equipment (Chrysler PSE) Coolant Refiller #85-15-0650 or equivalent tool's operating manual for specific assembly steps.
2. Choose an appropriate adapter cone that will fit the vehicle's radiator filler neck or reservoir tank.
3. Attach the adapter cone (2) to the vacuum gauge (1).

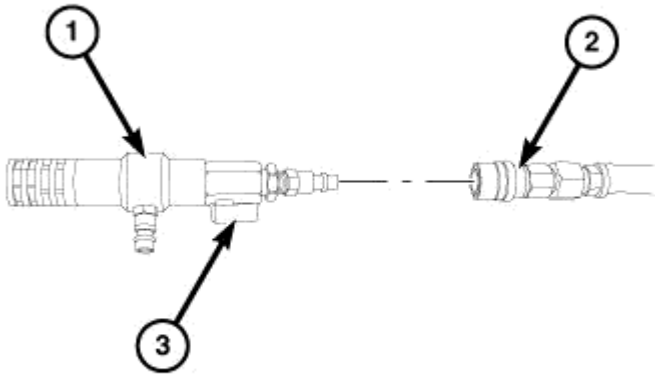

Fig. 100: Vacuum Generator/Venturi Ball Valve
Courtesy of CHRYSLER GROUP, LLC

4. Make sure the vacuum generator/venturi ball valve (3) is closed and attach an airline hose (2) (minimum shop air requirement of 80 PSI/5.5 bar) to the vacuum generator/venturi (1).

5. Position the adaptor cone/vacuum gauge assembly into the radiator filler neck or reservoir tank. Ensure that the adapter cone is sealed properly.

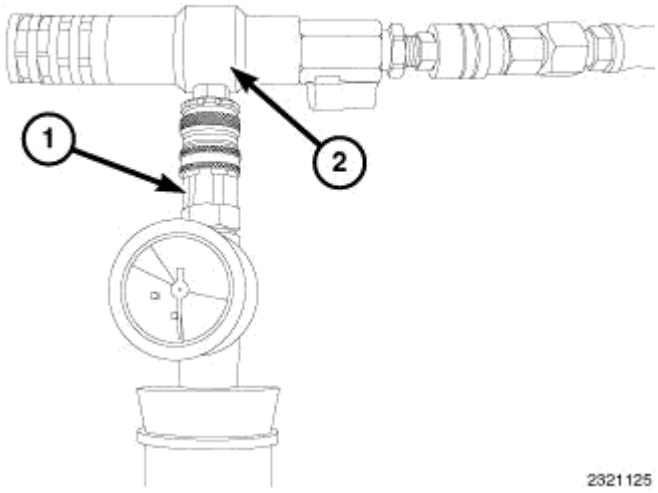

Fig. 101: Vacuum Generator/Venturi
Courtesy of CHRYSLER GROUP, LLC

6. Connect the vacuum generator/venturi (2) to the positioned adaptor cone/vacuum gauge assembly (1).
7. Open the vacuum generator/venturi ball valve.

NOTE: Do not bump or move the assembly as it may result in loss of vacuum. Some radiator overflow hoses may need to be clamped off to obtain vacuum.

8. Let the system run until the vacuum gauge shows a good vacuum through the cooling system. Refer to the tool's operating manual for appropriate pressure readings.

NOTE: If a strong vacuum is being created in the system, it is normal to see the radiator hoses to collapse.

9. Close the vacuum generator/venturi ball valve.

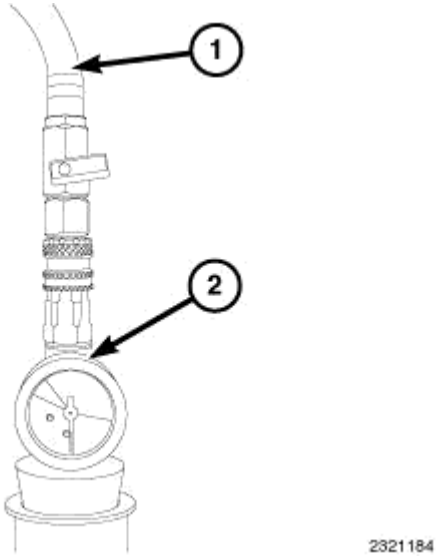

Fig. 102: Vacuum Generator/Venturi & Air Line
Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the vacuum generator/venturi and airline from the adaptor cone/vacuum gauge assembly.
11. Wait approximately 20 seconds, if the pressure readings do not move, the system has no leaks. If the pressure readings move, a leak could be present in the system and the cooling system should be checked for leaks and the procedure should be repeated.
12. Place the tool's suction hose into the coolant's container.

NOTE: **Ensure there is a sufficient amount of coolant, mixed to the required strength/protection level available for use. For best results and to assist the refilling procedure, place the coolant container at the same height as the radiator filler neck. Always draw more coolant than required. If the coolant level is too low, it will pull air into the cooling system which could result in airlocks in the system.**

13. Connect the tool's suction hose (1) to the adaptor cone/vacuum gauge assembly (2).

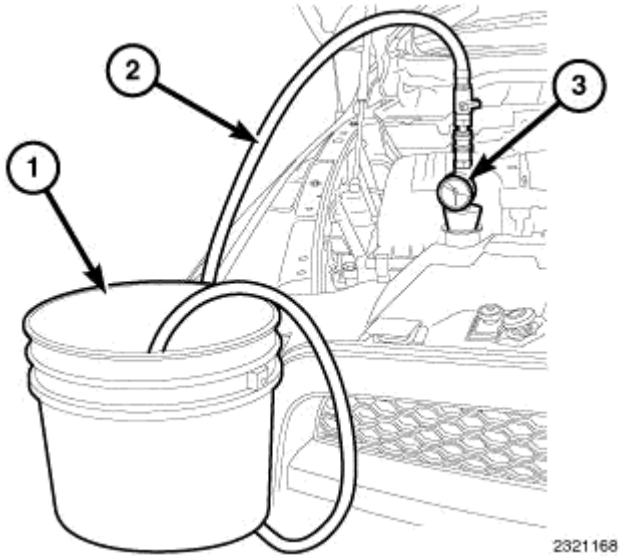

Fig. 103: Refilling Cooling System
Courtesy of CHRYSLER GROUP, LLC

14. Open the suction hose's ball valve to begin refilling the cooling system.
15. When the vacuum gauge reads zero, the system is filled.

NOTE: On some remote pressurized tanks, it is recommended to stop filling when the proper level is reached.

16. Close the suction hose's ball valve and remove the suction hose from the adaptor cone/vacuum gauge assembly.
17. Remove the adaptor cone/vacuum gauge assembly from the radiator filler neck or reservoir tank.
18. With heater control unit in the HEAT position, operate engine with container cap in place.
19. After engine has reached normal operating temperature, shut engine off and allow it to cool. When engine is cooling down, coolant will be drawn into the radiator from the pressure container.
20. Add coolant to the recovery bottle/container as necessary. **Only add coolant to the container when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.** Add necessary coolant to raise container level to the COLD MINIMUM mark after each cool down period.
21. Once the appropriate coolant level is achieved, attach the radiator cap or reservoir tank cap.

REMOVAL

3.7L/4.7L

The water pump on 3.7L/4.7L engines is bolted directly to the engine timing chain case cover.

1. Disconnect the negative battery cable.
2. Drain cooling system. Refer to **STANDARD PROCEDURE**.
3. Remove fan/viscous fan drive assembly from water pump. Refer to **FAN, COOLING, VISCOUS, REMOVAL**. Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

4. If the water pump is being replaced, do not unbolt the fan blade assembly from the thermal viscous fan drive.

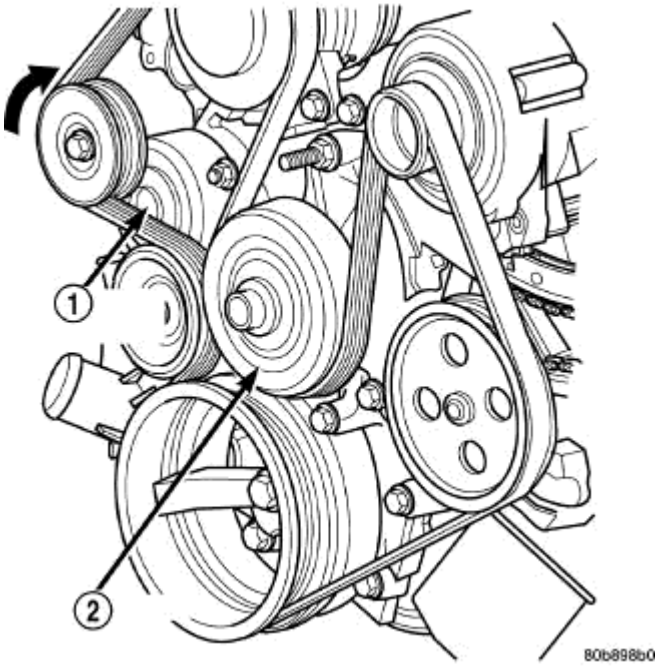

Fig. 104: Identifying Water Pump Pulley
Courtesy of CHRYSLER GROUP, LLC

1 - AUTOMATIC TENSIONER
2 - WATER PUMP PULLEY

5. Remove the radiator fan. Refer to **FAN, COOLING, VISCOUS, REMOVAL**.
6. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL**.
7. Remove the lower radiator hose clamp and remove the lower hose at the water pump.
8. Remove the water pump mounting bolts.

CAUTION: Do not pry on the water pump at the timing chain case/cover. The machined surfaces may be damaged resulting in leaks.

9. Remove the water pump and gasket. Discard gasket.

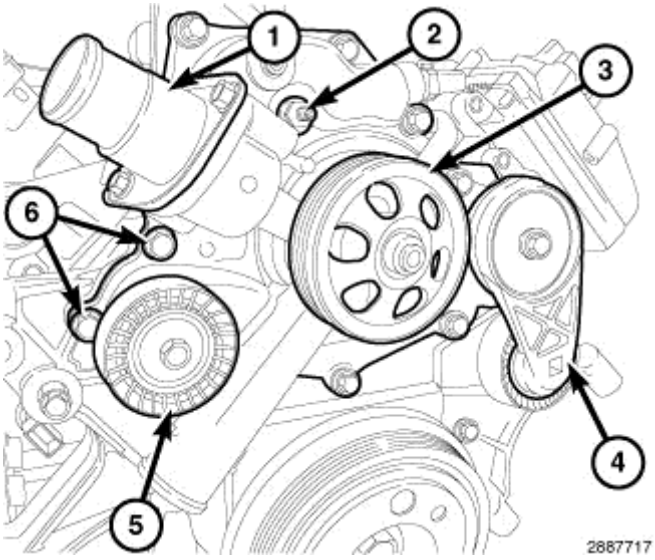

Fig. 105: Thermostat Housing, Water Pump, Belt Tensioner, & Idler Pulley
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative battery cable.
2. Remove the air intake assembly. Refer to **BODY, AIR CLEANER, REMOVAL, 5.7L** .
3. Remove the resonator mounting bracket.
4. Remove cooling fan assembly. Refer to **FAN, COOLING, VISCOUS, REMOVAL**.
5. Drain coolant into a clean container. Refer to **STANDARD PROCEDURE**.
6. Remove the upper radiator hose from the thermostat housing (1) and position aside.
7. Remove serpentine belt. Refer to **BELT, SERPENTINE, REMOVAL**.
8. Remove idler pulley (5).
9. Remove belt tensioner assembly (4). Refer to **TENSIONER, BELT, REMOVAL**.
10. Remove lower radiator hose from the water pump and position aside.
11. Remove the upper metal heater tube from the cylinder head.
12. Remove water pump mounting bolts (6) and remove pump (3).

6.7L DIESEL ENGINE

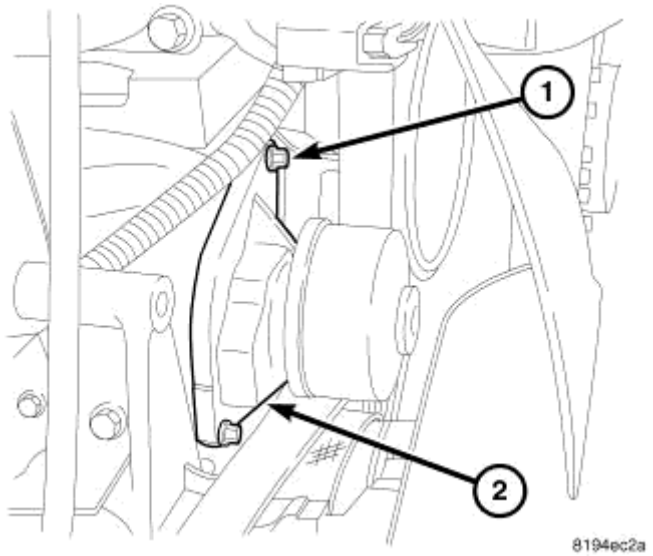

Fig. 106: Diesel Water Pump
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - WATER PUMP

1. Disconnect battery negative cables.
2. Drain cooling system. Refer to **STANDARD PROCEDURE**.
3. Disconnect ambient air temp sensor electrical connector and mass airflow sensor electrical connector (if equipped).
4. Remove turbocharger inlet tube and air filter housing. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L** .
5. Remove generator assembly. Refer to **GENERATOR, REMOVAL** .
6. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL**.
7. Remove water pump mounting bolts (1).
8. Remove O-ring from water pump (2).
9. Remove water pump (2). Clean water pump sealing surface on cylinder block.

CLEANING

CLEANING

Clean the gasket mating surface. Use caution not to damage the gasket sealing surface.

To ensure proper gasket sealing, surface preparation must be performed, especially with the use of aluminum engine components.

Never use the following to clean gasket surfaces:

- Metal scraper.

- Abrasive pad or paper to clean cylinder block and head.
- High speed power tool with an abrasive pad or a wire brush).
- High speed power tool with 3M Roloc™ Bristle Disc (white or yellow).

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper.

INSPECTION

INSPECTION

Inspect the water pump assembly for cracks in the housing, water leaks from the shaft seal, worn bearing or the impeller rubbing either the pump body or the timing chain case/cover.

INSTALLATION

3.7L/4.7L ENGINE

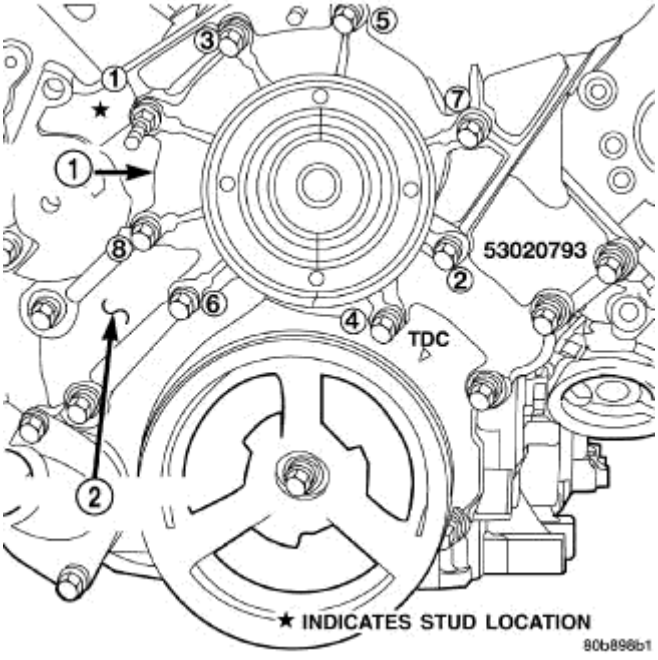

Fig. 107: Water Pump Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1 - WATER PUMP
2 - TIMING CHAIN COVER

1. Clean the gasket mating surfaces.

2. Using a new gasket, position water pump and install the mounting bolts. Tighten the water pump mounting bolts to 58 N.m (43 ft. lbs.).
3. Spin the water pump to be sure that the pump impeller does not rub against the timing chain case/cover.
4. Connect the radiator lower hose to the water pump.
5. Install accessory drive belt tensioner. Refer to **TENSIONER, BELT, INSTALLATION**.
6. Install the drive belt. Refer to **BELT, SERPENTINE, INSTALLATION**.
7. Install the radiator fan. Refer to **FAN, COOLING, VISCOUS, INSTALLATION**.
8. Evacuate air and refill the cooling system. Refer to **PUMP, WATER, STANDARD PROCEDURE**.
9. Connect the negative battery cable.
10. Check cooling system for leaks. Refer to **LEAK TESTING**.

5.7L ENGINE

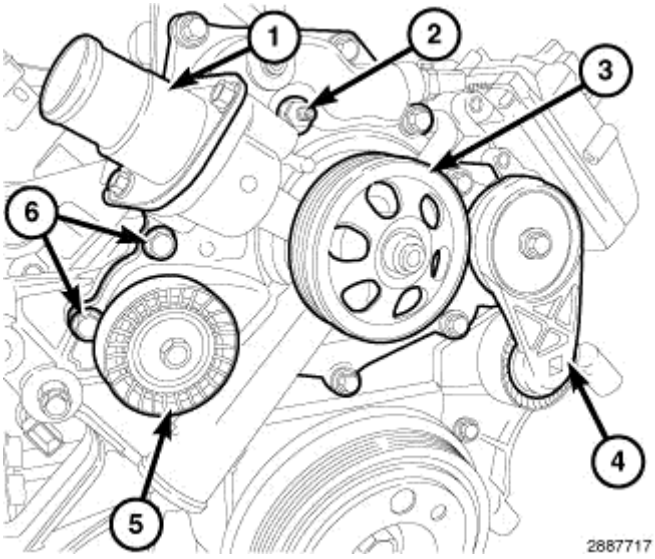

Fig. 108: Thermostat Housing, Water Pump, Belt Tensioner, & Idler Pulley
Courtesy of CHRYSLER GROUP, LLC

1. Clean mating surfaces and install water pump (3). Tighten mounting bolts to 24 N.m (18 ft. lbs.).
2. Install upper metal heater tube.
3. Install belt tensioner assembly (4). Refer to **TENSIONER, BELT, INSTALLATION**.
4. Install idler pulley (5).
5. Install the lower radiator hose.
6. Install serpentine belt. Refer to **BELT, SERPENTINE, INSTALLATION**.
7. Install the resonator mounting bracket.
8. Install cooling fan assembly. Refer to **FAN, COOLING, VISCOUS, INSTALLATION**.
9. Install the upper radiator hose to the thermostat housing (1).
10. Install the air intake assembly. Refer to **BODY, AIR CLEANER, INSTALLATION, 5.7L** .
11. Connect negative battery cable.

12. Evacuate air and refill cooling system. Refer to **STANDARD PROCEDURE**.
13. Check cooling system for leaks. Refer to **LEAK TESTING**.

6.7L DIESEL ENGINE

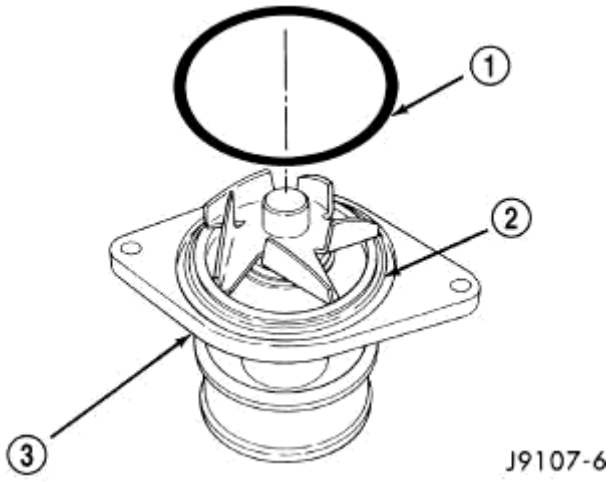

Fig. 109: Pump O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

1 - O-RING SEAL
2 - GROOVE
3 - WATER PUMP

1. Install new O-ring seal (1) in groove (2) on water pump (3).

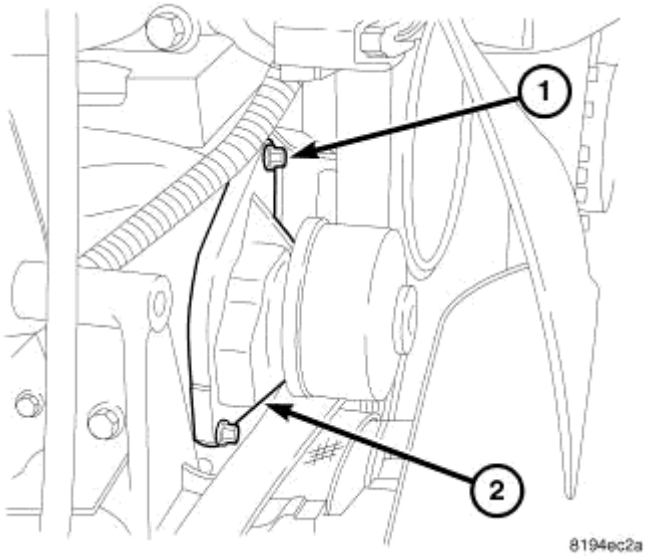

Fig. 110: Diesel Water Pump
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - WATER PUMP

2. Install water pump (2) with the weep hole facing downward. Tighten mounting bolts (1) to 24 N.m (18 ft. lbs.) torque.
3. Install generator assembly. Refer to **GENERATOR, INSTALLATION** .
4. Install accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION**.
5. Install air box and tube assembly. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L** .
6. Install air filter housing. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L** .
7. Evacuate air and refill cooling system. Refer to **PUMP, WATER, STANDARD PROCEDURE**.
8. Connect both battery cables.
9. Start and warm the engine. Check for leaks. Refer to **LEAK TESTING**.

RADIATOR, ENGINE COOLING

DESCRIPTION

DESCRIPTION

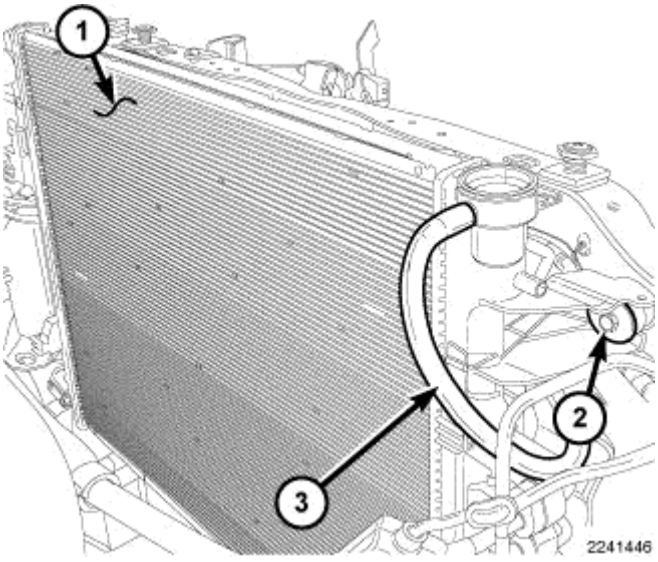

Fig. 111: Radiator
Courtesy of CHRYSLER GROUP, LLC

The radiator (1) is a aluminum cross-flow design with horizontal tubes through the radiator core and vertical plastic side tanks.

This radiator (1) does not contain an internal transmission oil cooler.

OPERATION

OPERATION

The radiator supplies sufficient heat transfer using the cooling fins interlaced between the horizontal tubes in the radiator core to cool the engine.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - RADIATOR COOLANT FLOW

Use the following procedure to determine if coolant is flowing through the cooling system.

1. Idle engine until operating temperature is reached. If the upper radiator hose is warm to the touch, the thermostat is opening and coolant is flowing to the radiator.

   WARNING: Hot, pressurized coolant can cause injury by scalding. Using a rag to cover the radiator pressure cap, open radiator cap slowly to the first stop. This will allow any built-up pressure to vent to the reserve/overflow tank. After pressure build-up has been released, remove cap from filler neck.

2. Drain a small amount of coolant from the radiator until the ends of the radiator tubes are visible through the filler neck. Idle the engine at normal operating temperature. If coolant is flowing past the exposed tubes, the coolant is circulating.

REMOVAL

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Raise and secure the vehicle.

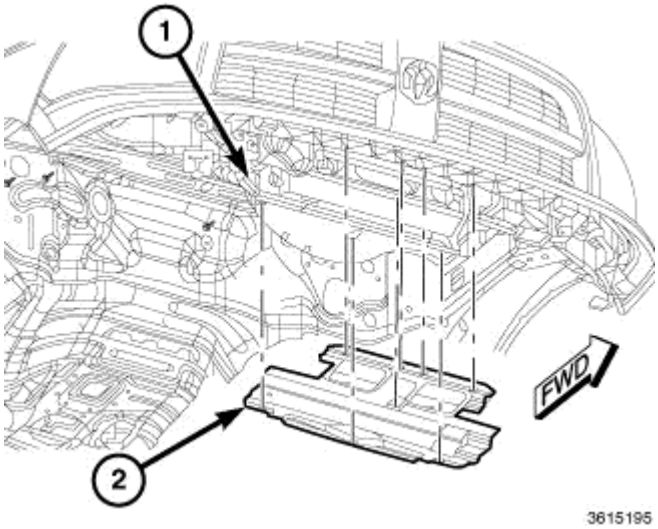

Fig. 112: Lower Radiator Cover
Courtesy of CHRYSLER GROUP, LLC

3. Remove the lower radiator cover (2).

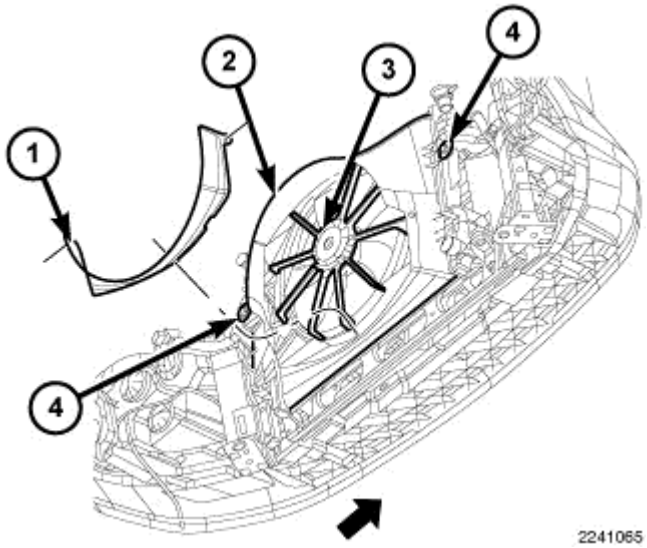

Fig. 113: Radiator Fan, Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Drain the cooling system. Refer to **STANDARD PROCEDURE**.

> **WARNING: Do not remove the cylinder block drain plugs or loosen the radiator draincock with the system hot and under pressure. Serious burns from the coolant can occur.**

5. Remove the lower radiator hose.
6. Remove the lower fan shroud cover (1).
7. Remove the lower electric cooling fan retainer clip.
8. Lower the vehicle.

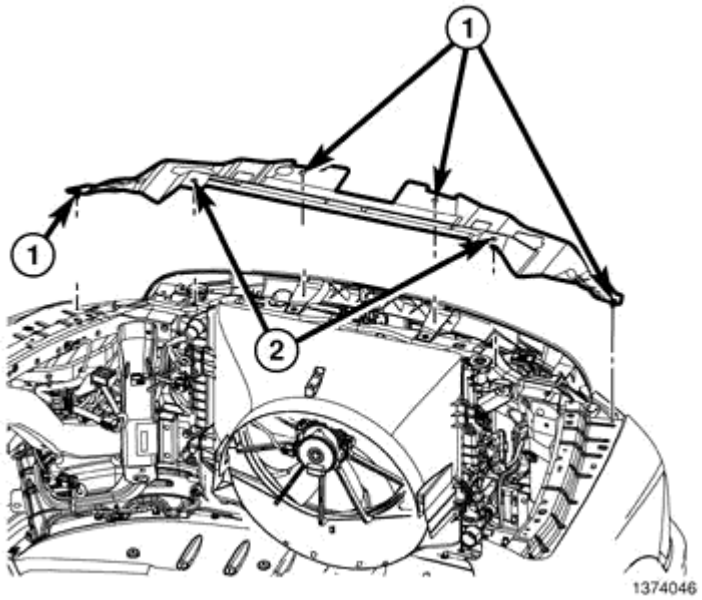

Fig. 114: Upper Radiator Seal
Courtesy of CHRYSLER GROUP, LLC

9. Remove the upper radiator clamp and hose.
10. Remove the upper radiator seal push pins (1).
11. Remove the upper radiator seal plastic rivets (2).
12. Remove the upper radiator seal.

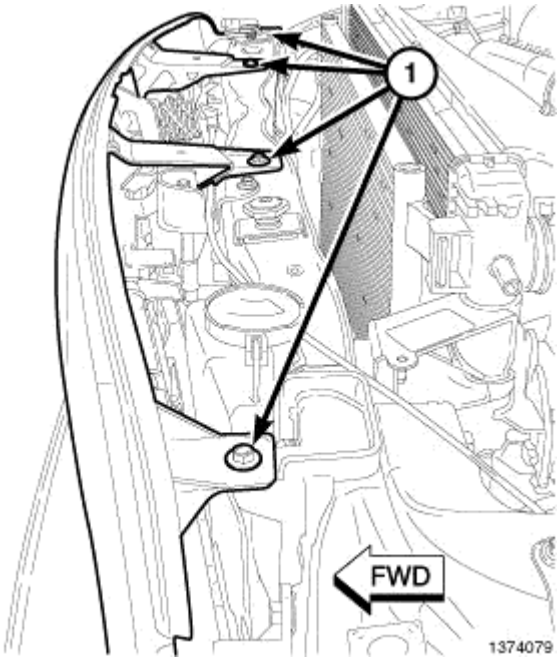

Fig. 115: Upper Grille Support Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Remove the grille. Refer to **GRILLE, REMOVAL** .

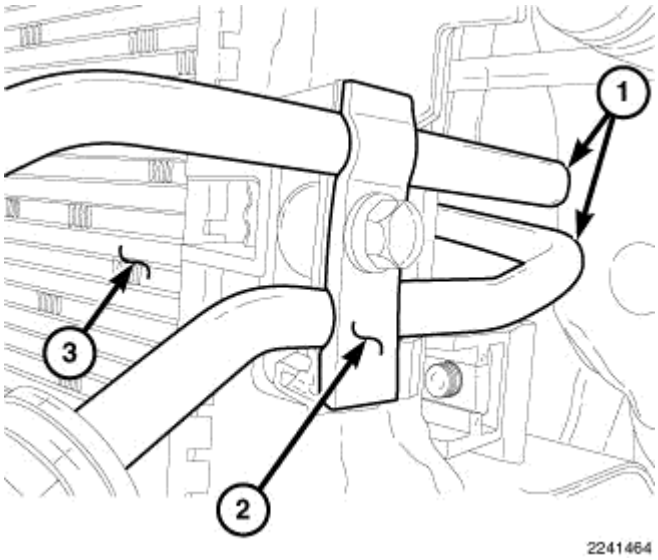

Fig. 116: Transmission Cooler Line & Bracket
Courtesy of CHRYSLER GROUP, LLC

14. Remove the bolt from the transmission cooler line (1) to radiator (3) bracket (2).

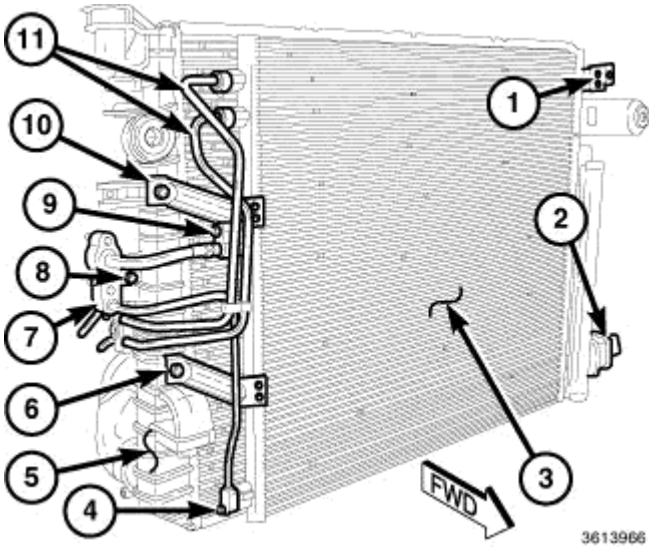

Fig. 117: A/C Compressor/Transmission Combination Cooler, Lines, Bolts & Brackets
Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove the transmission cooler lines or the A/C lines from the cooler.

15. Remove the bolt (8) that secures the condenser jumper line tapping block (7) to the right side of the radiator (5).
16. Remove the three brackets (10) from the A/C compressor/transmission combination cooler (3).

17. Using care, disengage the A/C condenser/transmission combination cooler mounting bracket (2) from the left side of the radiator, **do not disconnect the A/C lines.**

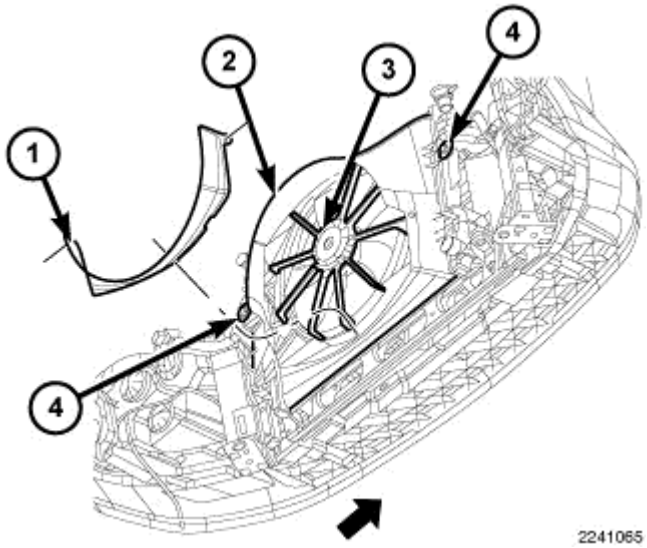

Fig. 118: Radiator Fan, Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

18. Disconnect the electrical connector to the cooling fan.
19. Remove the electric cooling fan (3) to radiator upper retaining clips.
20. Remove the fan shroud mounting bolts (4) and pull up and out of the radiator tank clips. Position the shroud (2) rearward over the fan blades towards engine.
21. Remove the fan shroud (2) and electric cooling fan (3) as an assembly.

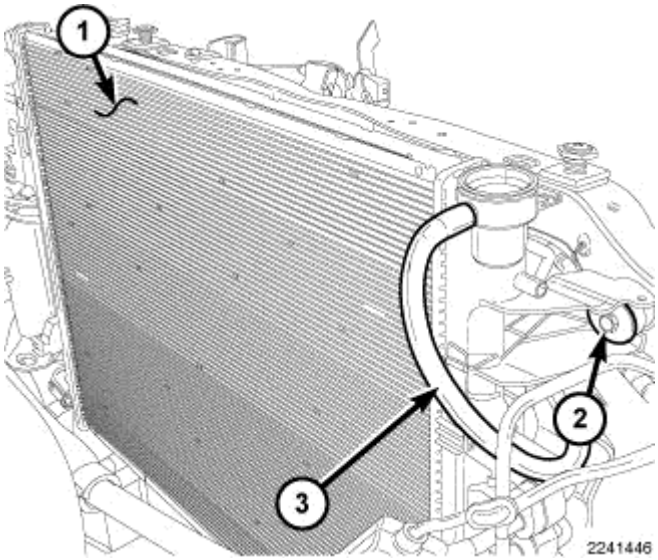

Fig. 119: Radiator
Courtesy of CHRYSLER GROUP, LLC

22. Remove the overflow hose (3) from the radiator filler neck.
23. Remove the two radiator upper mounting bolts (2).
24. Lift the radiator (1) straight up and out of the engine compartment. Take care not to damage cooling fins when removing.

6.7L DIESEL

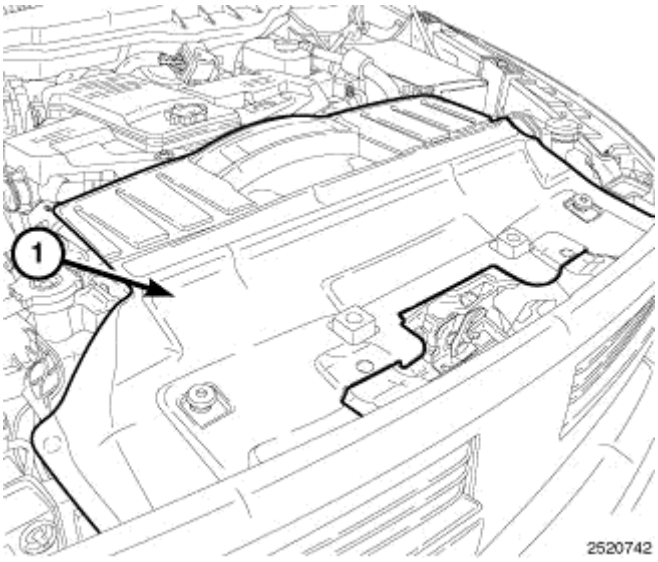

Fig. 120: Upper Radiator Shroud
Courtesy of CHRYSLER GROUP, LLC

1. Remove the upper radiator shroud (1).
2. Disconnect and isolate the battery negative cable.
3. If equipped, disconnect and isolate the negative battery cable from the auxiliary battery.

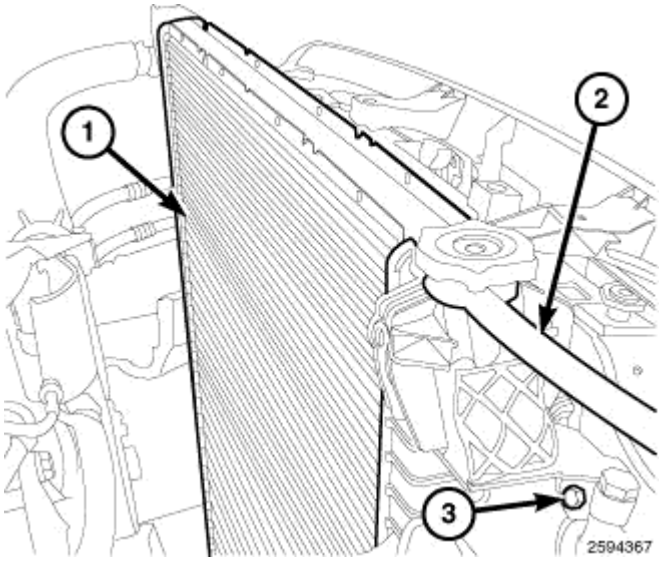

Fig. 121: Radiator - Diesel

Courtesy of CHRYSLER GROUP, LLC

WARNING: Do not remove the cylinder block drain plugs or loosen the radiator draincock with the system hot and under pressure. Serious burns from coolant can occur.

4. Drain the cooling system. Refer to **STANDARD PROCEDURE**.
5. Disconnect the ambient air temperature sensor electrical connector and mass airflow sensor electrical connector (If equipped).
6. Remove air box and turbocharger inlet tube. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L** .
7. Remove coolant tank hose from the fastening clips located on top of the radiator.
8. Remove the viscous fan and fan shroud. Refer to **FAN, COOLING, VISCOUS, REMOVAL**.
9. Remove the hose clamps and hoses from radiator.
10. Disconnect the transmission cooler lines at the transmission cooler. The transmission cooler will remain on the radiator and can be removed as an assembly. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, STANDARD PROCEDURE**.
11. Remove the two radiator upper mounting bolts.
12. Lift and support the vehicle.
13. Remove the power steering cooler mounting bolts and position the power steering cooler out of the way.
14. Lower the vehicle.
15. Tilt the radiator towards the rear of the vehicle and lift it out of the engine compartment. The bottom of the radiator is equipped with two alignment dowels that fit into holes in the lower radiator support panel. Rubber biscuits (insulators) are installed to these dowels. Take care not to damage cooling fins or tubes on the radiator and air conditioning condenser or the electronic viscous fan connector when removing.

INSPECTION

INSPECTION

Inspect the radiator side tanks for cracks, and broken or missing fittings. Inspect the joint where the tanks seam up to the radiator core for signs of leakage and/or deteriorating seals.

Inspect radiator core for corroded, bent or missing cooling fins. Inspect the core for bent or damaged cooling tubes.

INSTALLATION

INSTALLATION

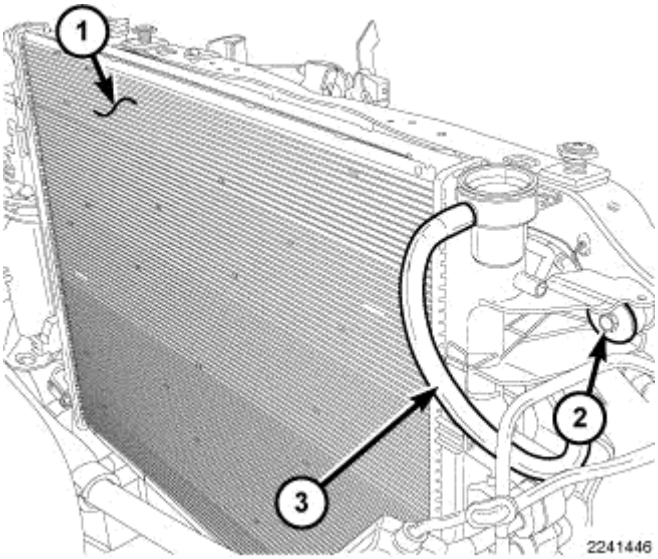

Fig. 122: Radiator
Courtesy of CHRYSLER GROUP, LLC

1. Install the rubber insulators to the lower radiator mounting features (alignment dowel and support bracket at the lower part of the radiator).
2. Position the radiator (1) into the engine compartment. Take care not to damage cooling fins when installing.
3. Install the two radiator upper mounting bolts (2). Tighten the bolts to 8 N-m (71 in. lbs.).
4. Install the coolant overflow hose (3).

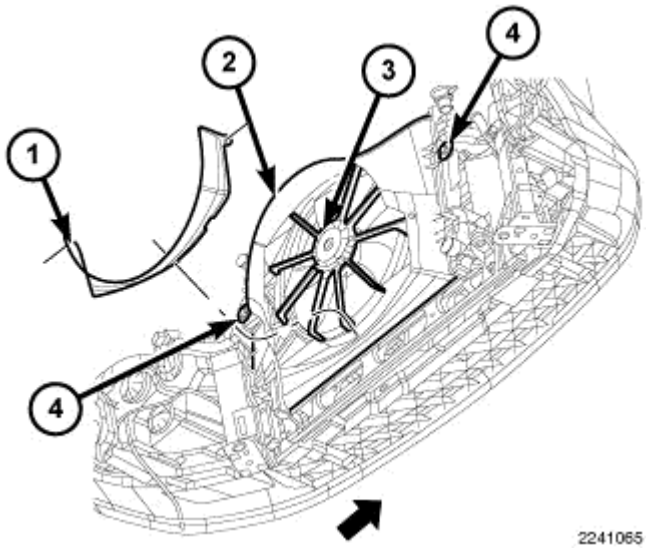

Fig. 123: Radiator Fan, Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Make sure all retaining clips lock into place.

5. Position the electric cooling fan (3) to the mounts located on the radiator.
6. Install the upper cooling fan retainer clip.
7. Install the fan shroud (2) to the radiator/electric cooling fan (3) mount.
8. Install the fan shroud mounting bolts (4). Tighten to 10 N.m (89 in. lbs.).
9. Connect the electric cooling fan (3) electrical connector.

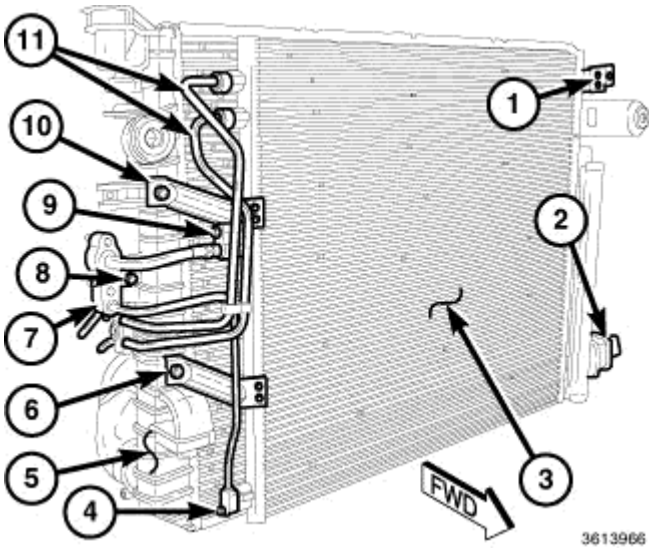

Fig. 124: A/C Compressor/Transmission Combination Cooler, Lines, Bolts & Brackets
Courtesy of CHRYSLER GROUP, LLC

10. Using care, guide the lower left side A/C condenser/transmission combination cooler mounting bracket (2) into the lower mount located on the left lower side of the radiator.
11. Install the three A/C condenser/transmission combination cooler mounting brackets (10) to the radiator (3). Tighten the bolts to 2.2 N.m (20 in. lbs.).
12. Install the bolt (8) that secures the condenser jumper line tapping block (7) to the radiator. Tighten the bolt securely.

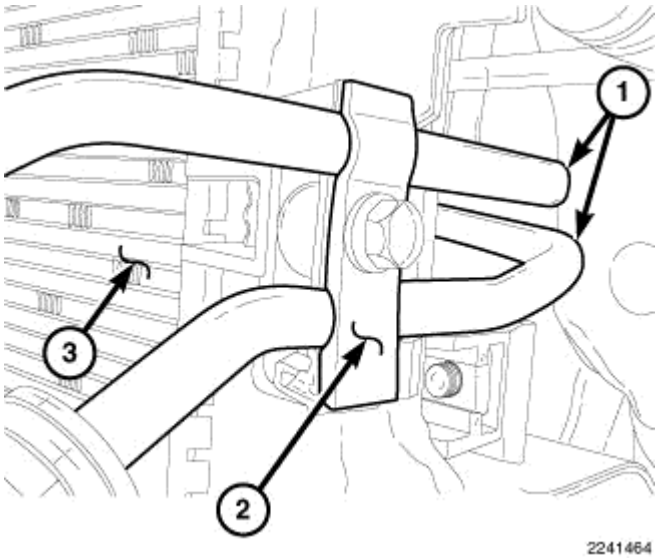

Fig. 125: Transmission Cooler Line & Bracket
Courtesy of CHRYSLER GROUP, LLC

13. Install the bolt securing the transmission cooler line (1) to radiator (3) bracket (2). Tighten the bolt securely.

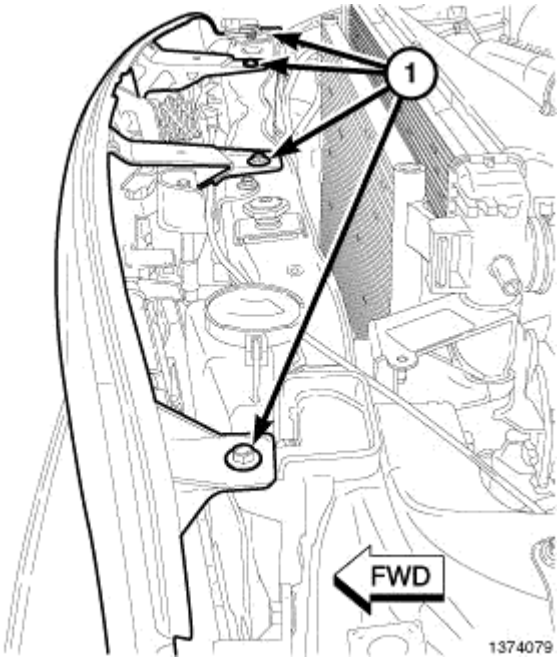

Fig. 126: Upper Grille Support Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Install the front grille. Refer to **GRILLE, INSTALLATION** .
15. Connect the upper radiator hose and install the clamp in it's proper position.

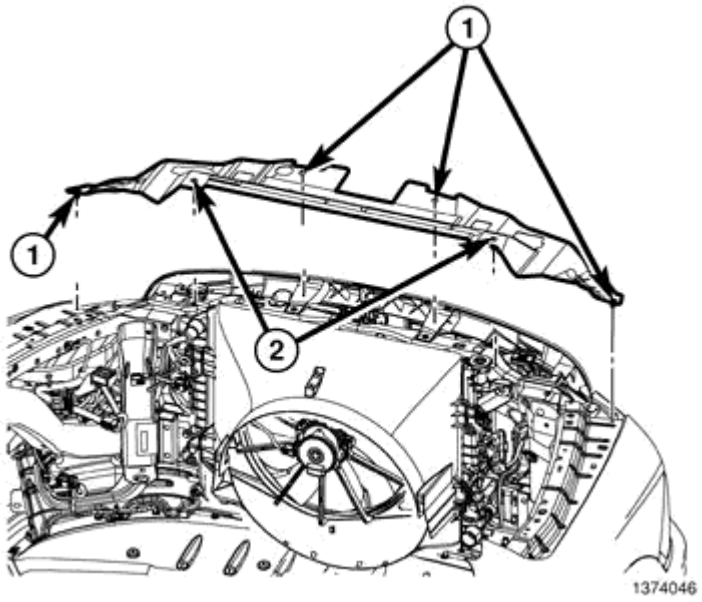

Fig. 127: Upper Radiator Seal
Courtesy of CHRYSLER GROUP, LLC

16. Install the upper radiator seal plastic rivets (2).
17. Install the upper radiator seal push pins (1).
18. Raise and secure the vehicle.

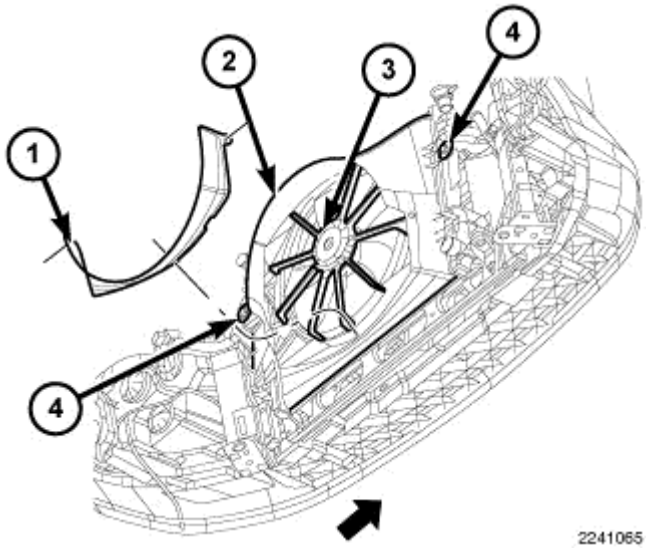

Fig. 128: Radiator Fan, Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

19. Install the lower center cooling fan retaining clip.
20. Install the lower radiator clamp and hose.

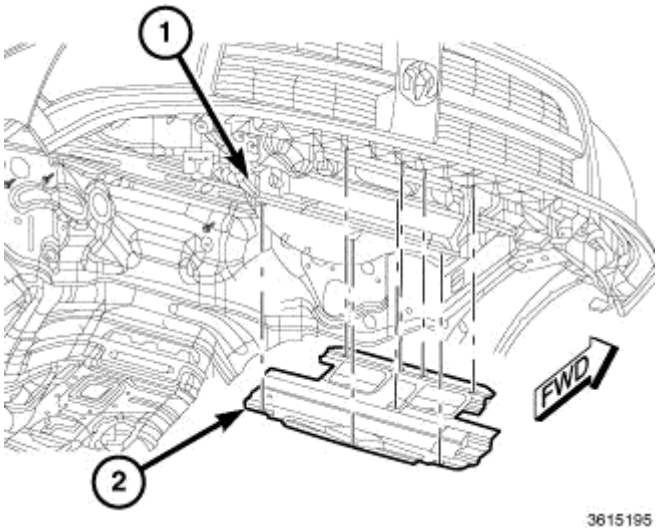

Fig. 129: Lower Radiator Cover
Courtesy of CHRYSLER GROUP, LLC

21. Install the lower radiator cover (2).
22. Lower the vehicle.
23. Install negative battery cable.
24. Fill cooling system with coolant. Refer to **STANDARD PROCEDURE**.
25. Check the system for any leaks. Refer to **LEAK TESTING**.
26. Operate the engine until it reaches normal operating temperature. Check cooling system fluid levels.

6.7L DIESEL

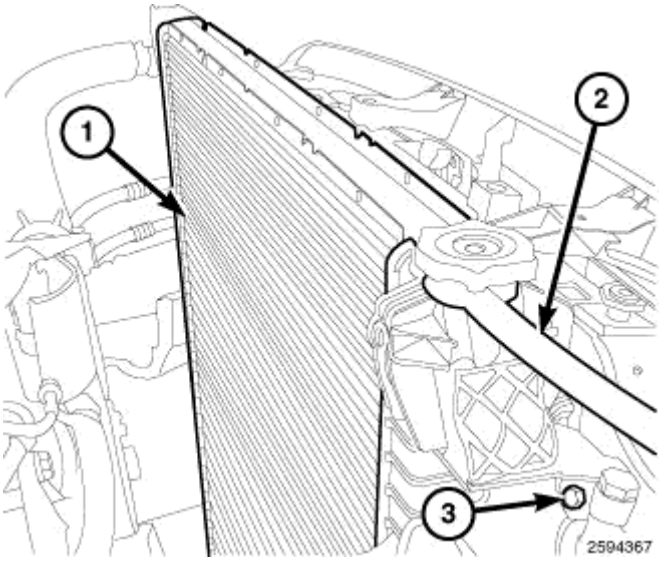

Fig. 130: Radiator - Diesel
Courtesy of CHRYSLER GROUP, LLC

1. Install the rubber insulators to the alignment dowels at the lower part of radiator.
2. Lower the radiator into position while guiding the two alignment dowels into the lower radiator support.
3. Raise the vehicle.
4. Position the power steering cooler on the radiator and tighten the nuts to 10 N.m (90 in. lbs.)
5. Lower the vehicle.
6. Install the two upper radiator mounting bolts. Tighten the bolts to 12 N.m (105 in. lbs.) torque.
7. If equipped, connect the transmission cooler lines to the transmission cooler. Inspect quick connect fittings for debris and install until an audible "click" is heard. Tug on lines to verify connection. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, STANDARD PROCEDURE**.
8. Connect both radiator hoses and install hose clamps.
9. Install the cooling fan. Refer to **FAN, COOLING, VISCOUS, INSTALLATION**.
10. Position the coolant recovery tank hose into the clips located on the top of the radiator.
11. Install the air box and the turbocharger inlet hose. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L** . Tighten clamps to 4 N.m (35 in. lbs.).
12. Connect the mass airflow sensor electrical connector and ambient air temp sensor electrical connector (if equipped).

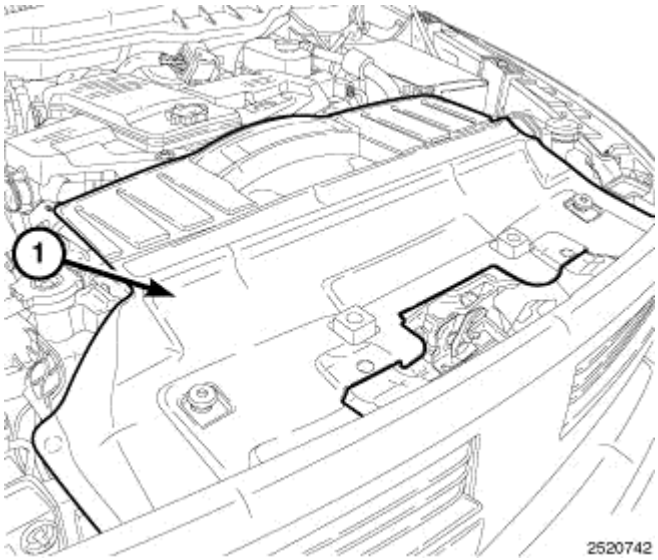

Fig. 131: Upper Radiator Shroud
Courtesy of CHRYSLER GROUP, LLC

13. Install the upper radiator shroud (1).
14. If equipped, connect the negative battery cable to the auxiliary battery.
15. Connect the battery negative cable.
16. Position heater controls to **full heat** position.
17. Fill cooling system with coolant. Refer to **STANDARD PROCEDURE**.
18. Operate the engine until it reaches normal operating temperature. Check the cooling system and automatic transmission (if equipped) for leaks.

SENSOR, COOLANT TEMPERATURE

DESCRIPTION

DESCRIPTION

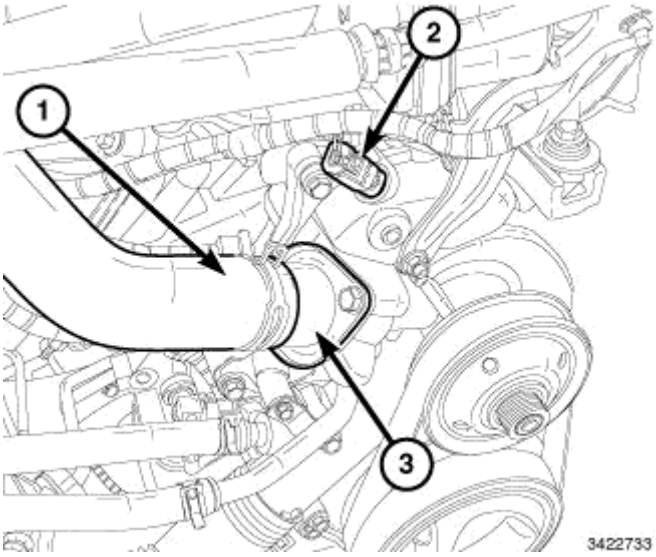

Fig. 132: Upper Radiator Hose, Thermostat Housing & Engine Coolant Temperature (ECT) Sensor
Courtesy of CHRYSLER GROUP, LLC

The Engine Coolant Temperature (ECT) sensor (2) is used to sense engine coolant temperature. The ECT sensor protrudes into an engine water jacket.

The ECT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as engine coolant temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

OPERATION

At key-on, the Powertrain Control Module (PCM) sends out a regulated 5 volt signal to the ECT sensor. The PCM then monitors the signal as it passes through the ECT sensor to the sensor ground (sensor return).

When the engine is cold, the PCM will operate in Open Loop cycle. It will demand slightly richer air-fuel mixtures and higher idle speeds. This is done until normal operating temperatures are reached.

The PCM uses inputs from the ECT sensor for the following calculations:

- for engine coolant temperature gauge operation through CAN Bus communications
- Injector pulse-width
- Spark-advance curves
- ASD relay shut-down times

- Idle Air Control (IAC) motor key-on steps
- Pulse-width prime-shot during cranking
- O2 sensor closed loop times
- Purge solenoid on/off times
- Cooling fan control
- Temperature gauge operation
- A/C cutoff at high coolant temperatures
- EGR solenoid on/off times (if equipped)
- Evaporation System Integrity Monitor (ESIM) operation (if equipped)
- Radiator fan relay on/off times (if equipped)
- Target idle speed

REMOVAL

3.7L ENGINE

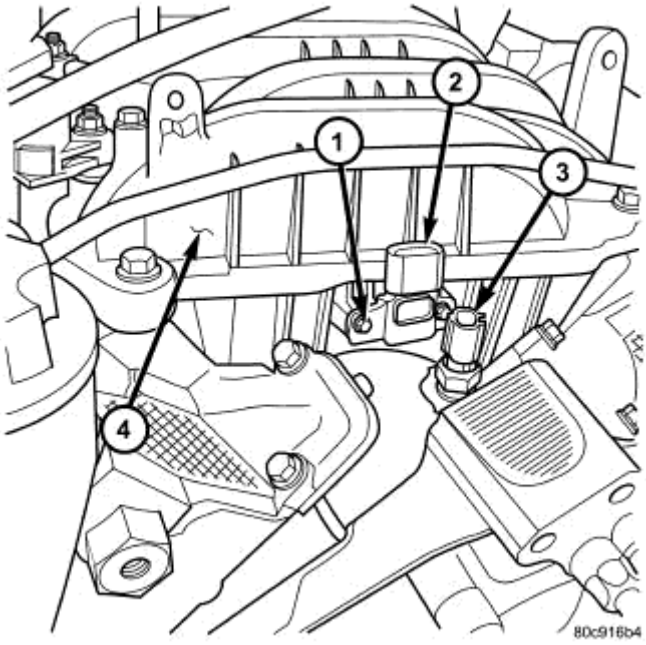

Fig. 133: MAP Sensor & ECT Sensor
Courtesy of CHRYSLER GROUP, LLC

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

WARNING: Hot, pressurized coolant can cause injury by scalding. Cooling system must be partially drained before removing the coolant temperature sensor.

1. Partially drain the cooling system.
2. Disconnect the electrical connector from the ECT sensor (3).
3. Remove the sensor from the intake manifold (4).

4.7L ENGINE

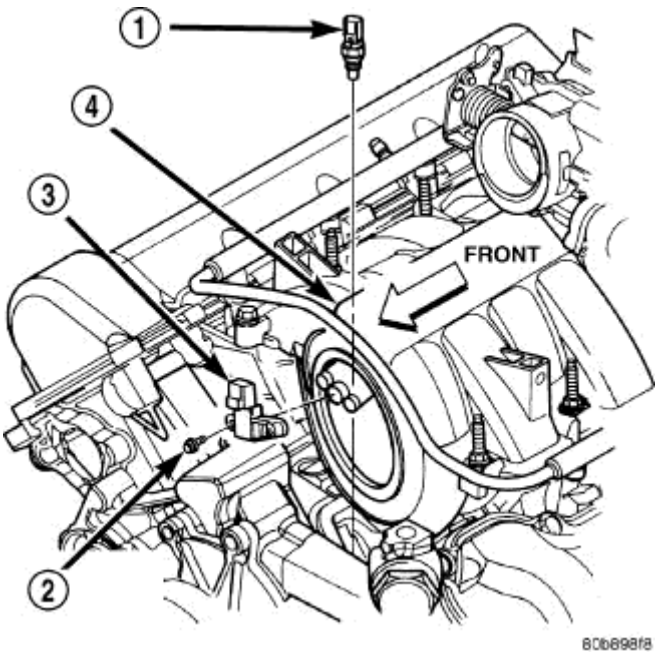

Fig. 134: Identifying Engine Coolant Temperature Sensor & MAP Sensor (4.7L)
Courtesy of CHRYSLER GROUP, LLC

1 - ECT SENSOR
2 - MOUNTING BOLTS (2)
3 - MAP SENSOR
4 - INTAKE MANIFOLD

WARNING: Hot, pressurized coolant can cause injury by scalding. Cooling system must be partially drained before removing the engine coolant temperature (ECT) sensor.

1. Partially drain the cooling system. Refer to **STANDARD PROCEDURE**.
2. Disconnect the electrical connector from the ECT sensor (1).
3. Remove the sensor from the intake manifold (4).

5.7L ENGINE

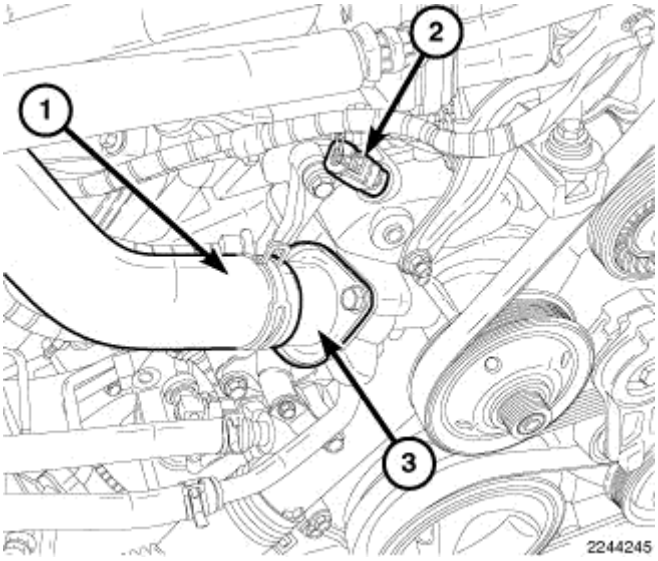

Fig. 135: Engine Coolant Temperature (ECT) Sensor & Thermostat
Courtesy of CHRYSLER GROUP, LLC

NOTE: Viscous fan, fan shroud and electric cooling fan removed for clarity.

1. Partially drain the cooling system. Refer to **STANDARD PROCEDURE**.

WARNING: Hot, pressurized coolant can cause injury by scalding. Cooling system must be partially drained before removing the engine coolant temperature (ECT) sensor.

2. Disconnect the electrical connector from the engine coolant temperature (ECT) sensor (2).
3. Remove the engine coolant temperature (ECT) sensor (2) from the water pump assembly.

6.7L DIESEL

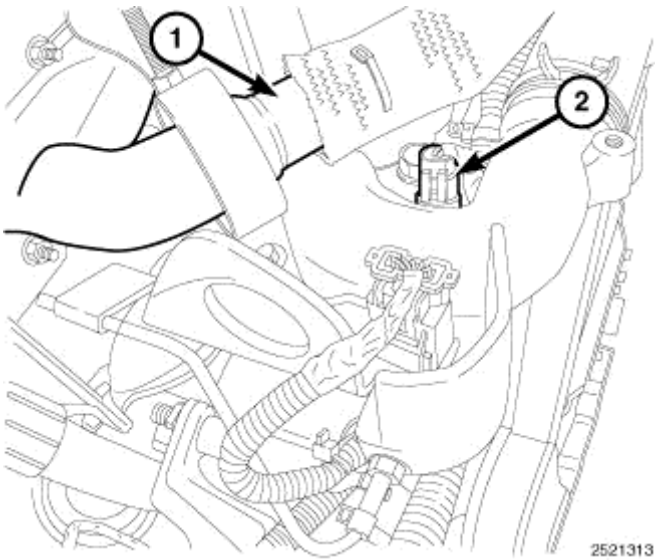

Fig. 136: ETC Sensor Connector
Courtesy of CHRYSLER GROUP, LLC

WARNING: Hot, pressurized coolant can cause injury by scalding. Cooling system must be partially drained before removing the coolant temperature sensor.

1. Partially drain the cooling system. Refer to **STANDARD PROCEDURE**.
2. Remove the engine trim cover.
3. Remove the upper EGR tube (2). Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, REMOVAL** .
4. Remove heat shield.
5. Disconnect the electrical connector (2) from the ETC sensor (3).
6. Remove the ETC sensor from the cylinder head.

INSTALLATION

3.7L ENGINE

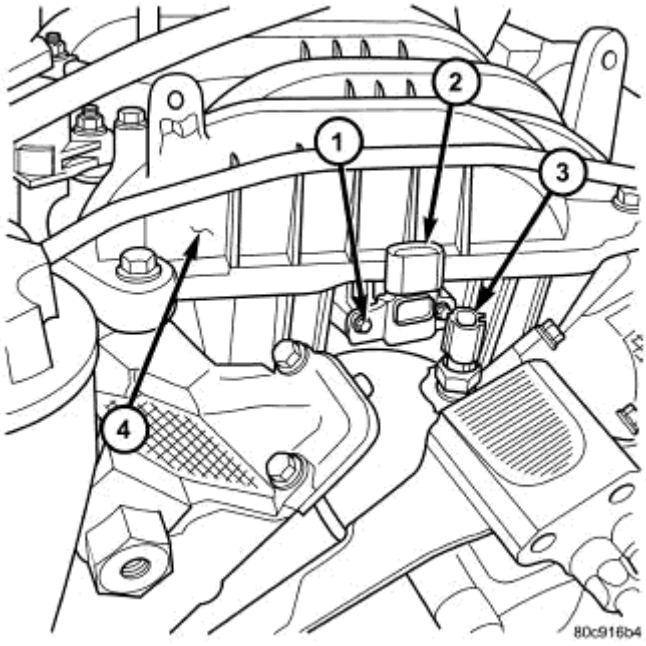

Fig. 137: MAP Sensor & ECT Sensor
Courtesy of CHRYSLER GROUP, LLC

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

1. Apply thread sealant to ECT sensor threads.
2. Install ECT sensor (3) to engine.
3. Tighten sensor to 11 N.m (8 ft. lbs.) torque.
4. Connect electrical connector to ECT sensor (3).
5. Replace any lost engine coolant. Refer to **STANDARD PROCEDURE**.

4.7L ENGINE

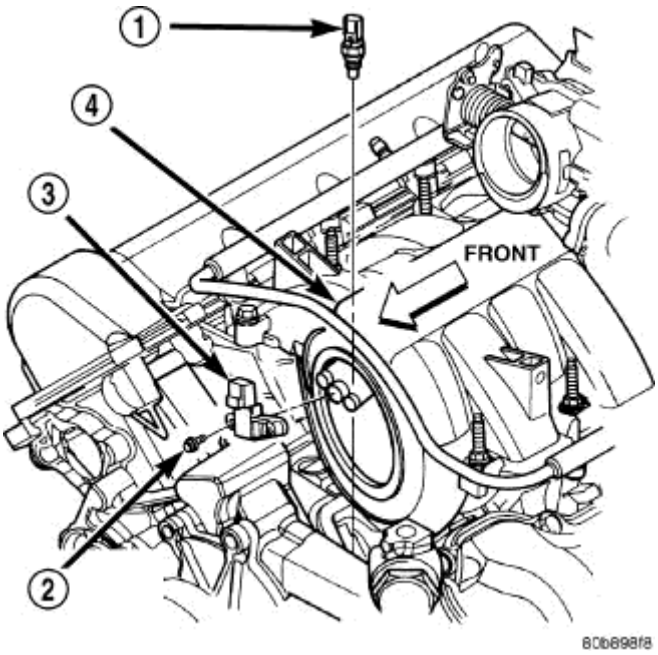

Fig. 138: Identifying Engine Coolant Temperature Sensor & MAP Sensor (4.7L)
Courtesy of CHRYSLER GROUP, LLC

1 - ECT SENSOR
2 - MOUNTING BOLTS (2)
3 - MAP SENSOR
4 - INTAKE MANIFOLD

1. Apply thread sealant to ECT sensor threads.
2. Install ECT sensor (1) to engine.
3. Tighten ECT sensor to 11 N.m (8 ft. lbs.) torque.
4. Connect electrical connector to ECT sensor (1).
5. Replace any lost engine coolant. Refer to **STANDARD PROCEDURE**.

5.7L ENGINE

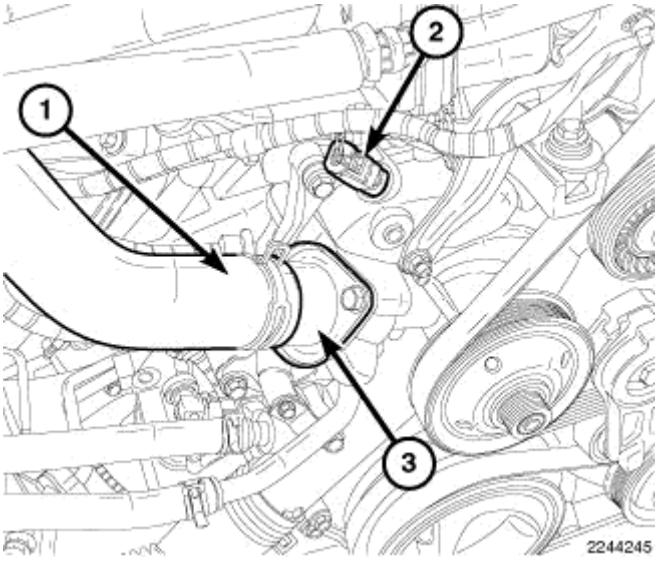

Fig. 139: Engine Coolant Temperature (ECT) Sensor & Thermostat
Courtesy of CHRYSLER GROUP, LLC

NOTE: Viscous fan, fan shroud and electric cooling fan removed for clarity.

1. Apply thread sealant to the engine coolant temperature (ECT) sensor (2) threads.
2. Install the ECT sensor (2) into engine.
3. Tighten the ECT sensor (2) to 11 N.m (8 ft. lbs.) torque.
4. Connect the electrical connector to the ECT sensor (2).
5. Fill the cooling system the proper level. Refer to **STANDARD PROCEDURE**.

6.7L DIESEL

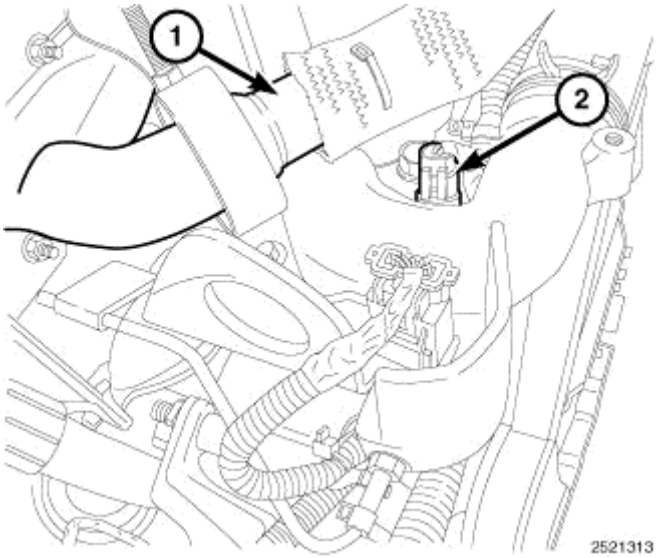

Fig. 140: ETC Sensor Connector
Courtesy of CHRYSLER GROUP, LLC

1. Install ETC sensor (2) to engine.
2. Tighten sensor (2) to 18 N.m (13 ft. lbs.) torque.
3. Connect the electrical connector to the ETC sensor (2).
4. Install heat shield.
5. Install the upper EGR tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, INSTALLATION** .
6. Install the engine trim cover.
7. Replace any lost engine coolant. Refer to **STANDARD PROCEDURE**.

THERMOSTAT

DESCRIPTION

DESCRIPTION

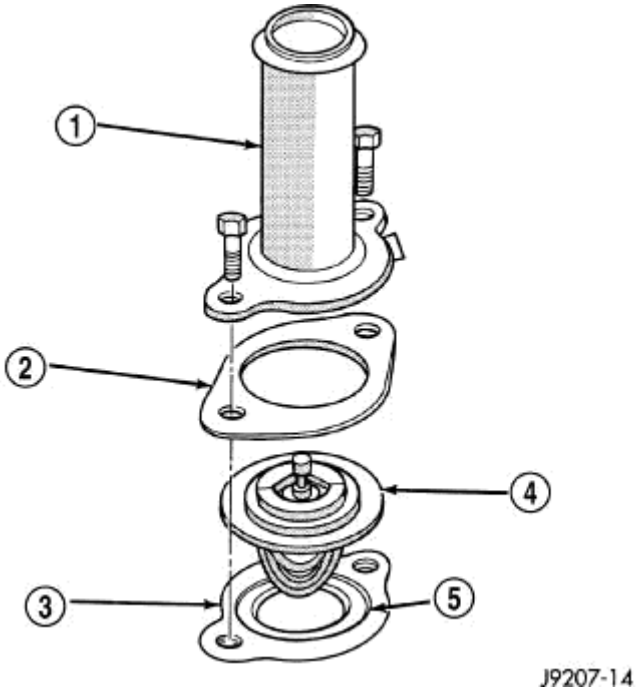

Fig. 141: Thermostat - Gas Powered Engines
Courtesy of CHRYSLER GROUP, LLC

1 - THERMOSTAT HOUSING
2 - GASKET
3 - INTAKE MANIFOLD
4 - THERMOSTAT
5 - MACHINED GROOVE

CAUTION: Do not operate the engine without a thermostat, except for servicing or

testing.

The 3.7L/4.7L/5.7L engines use a pellet-type thermostat that controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90° C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warm up and overall temperature control.

Coolant leakage into the pellet container will cause the thermostat to fail in the open position. Thermostats very rarely stick. Do not attempt to free a thermostat with a prying device.

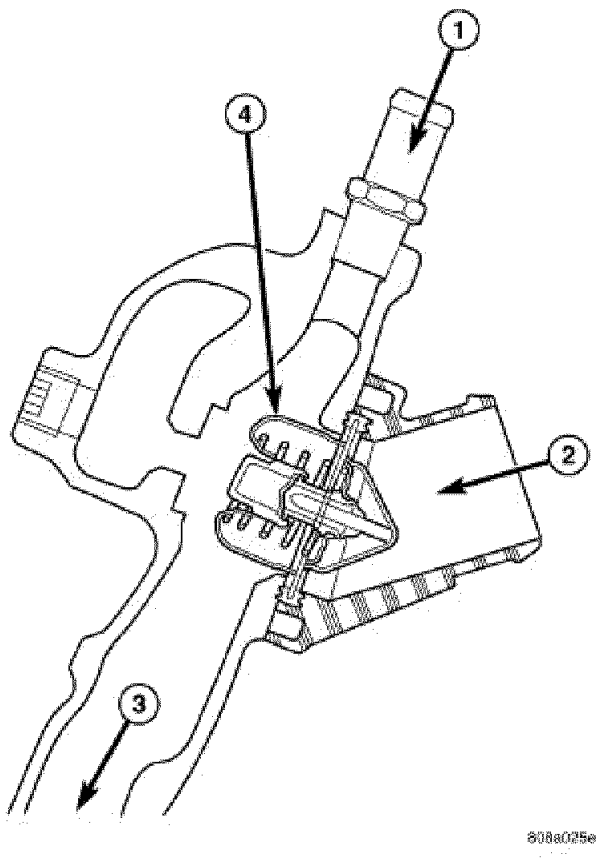

Fig. 142: Cutaway View Of Thermostat & Bypass
Courtesy of CHRYSLER GROUP, LLC

1 - FROM HEATER AND DEGAS CONTAINER
2 - FROM RADIATOR
3 - TO WATER PUMP
4- THERMOSTAT

On the 3.7L/4.7L engine the thermostat is designed to block the flow of the coolant bypass journal by 50% instead of completely blocking the flow. This design controls coolant temperature more accurately. Refer to **Fig. 142**.

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes other problems. These are: longer engine warm-up time, unreliable warm-up performance, increased exhaust emissions and crankcase condensation. This condensation can result in sludge formation.

OPERATION

OPERATION

The wax pellet is located in a sealed container at the spring end of the thermostat. When heated, the pellet expands, overcoming closing spring tension and water pump pressure to force the valve to open.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ON-BOARD DIAGNOSTICS

All models are equipped with On-Board Diagnostics for certain cooling system components. Refer to appropriate Electrical Diagnostic article. If the powertrain control module (PCM) detects low engine coolant temperature, it will record a Diagnostic Trouble Code (DTC) in the PCM memory. Do not change a thermostat for lack of heat as indicated by the instrument panel gauge or by poor heater performance unless a DTC is present. For other probable causes, refer to the appropriate diagnostic information.

REMOVAL

3.7L/4.7L ENGINE

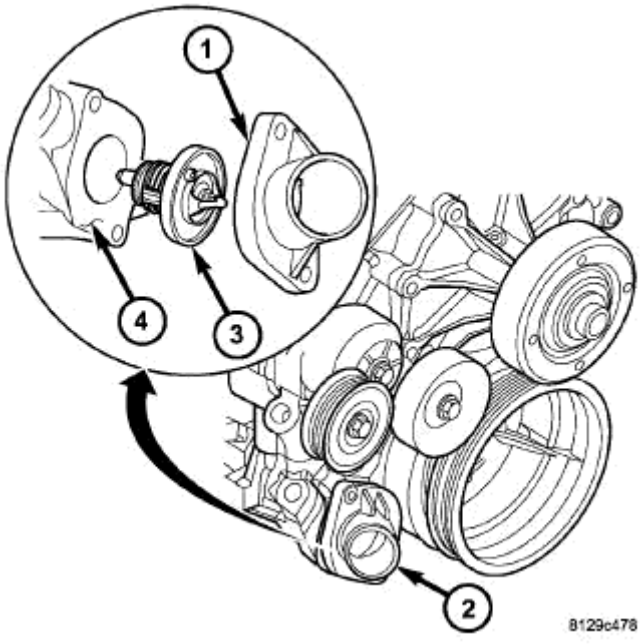

Fig. 143: Thermostat & Thermostat Housing 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - THERMOSTAT HOUSING
2 - THERMOSTAT LOCATION
3 - THERMOSTAT AND GASKET
4 - TIMING CHAIN COVER

WARNING: Do not loosen the radiator draincock with the cooling system hot and pressurized. Serious burns from the coolant can occur.

1. Disconnect the negative battery cable.
2. Drain the cooling system. Refer to **STANDARD PROCEDURE**.
3. Raise and support the vehicle.
4. Remove the splash shield.
5. Remove the lower radiator hose clamp and the lower radiator hose at the thermostat housing (1).
6. Remove the thermostat housing mounting bolts, thermostat housing (1) and thermostat (3). Refer to **Fig. 143**.

5.7L ENGINE

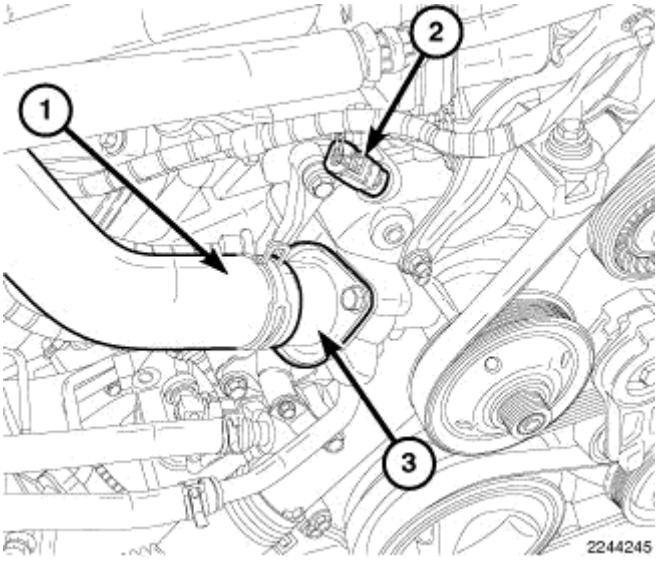

Fig. 144: Engine Coolant Temperature (ECT) Sensor & Thermostat
Courtesy of CHRYSLER GROUP, LLC

WARNING: Do not loosen the radiator draincock with the cooling system hot and pressurized. Serious burns from the coolant can occur.

1. Disconnect the negative battery cable.
2. Drain the cooling system. Refer to **STANDARD PROCEDURE**.
3. Remove the radiator hose clamp and radiator hose (1) at the thermostat housing (3).
4. Remove the thermostat housing mounting bolts, thermostat housing (3) and thermostat.

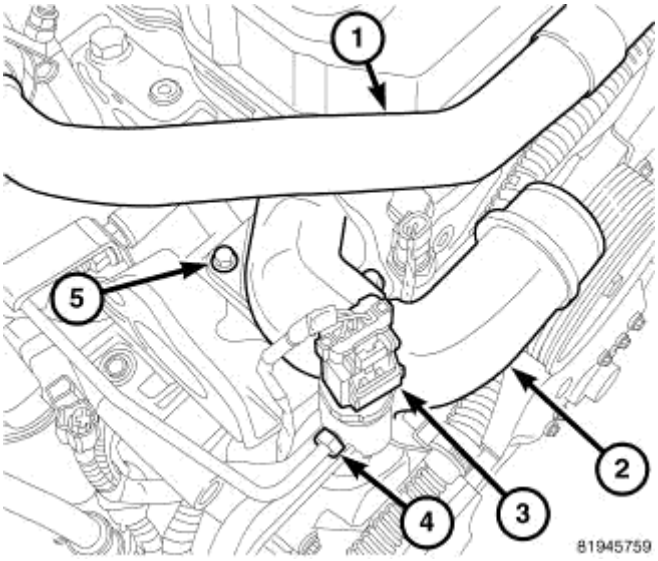

Fig. 145: Thermostat Housing - 6.7L Diesel
Courtesy of CHRYSLER GROUP, LLC

1 - EGR CROSSOVER TUBE
2 - THERMOSTAT HOUSING
3 - EXHAUST GAS PRESSURE SENSOR CONNECTOR
4 - EXHAUST GAS PRESSURE TUBE
5 - MOUNTING BOLT

NOTE: Thermostats for the Cummins diesel, while physically interchangeable, should not be mixed and matched. For model year 2010 and forward, the 6.7L diesel engine uses a 200° Fahrenheit thermostat. Confirm the temperature stamp on the thermostat rim prior to removal or installation.

WARNING: Do not loosen the radiator draincock with the system hot and pressurized. Serious burns from the coolant can occur.

1. Disconnect the battery negative cables.
2. Remove the vent plug near EGR cooler.
3. Drain the cooling system until the coolant level is below the thermostat. Refer to **STANDARD PROCEDURE**.
4. Disconnect the exhaust gas pressure sensor electrical connector (3).
5. Remove the exhaust pressure tube (4) from the thermostat housing.
6. Remove the EGR cooler cross over tube (1).
7. Remove the radiator hose clamp and hose from the thermostat housing (1).
8. Remove the heat shield.

9. Remove the three water outlet-to-cylinder head bolts (5) and remove the water outlet connector.
10. Clean the mating surfaces of the thermostat housing (1) and clean the thermostat seat groove at the top of the thermostat housing (1).

INSTALLATION

3.7L/4.7L ENGINE

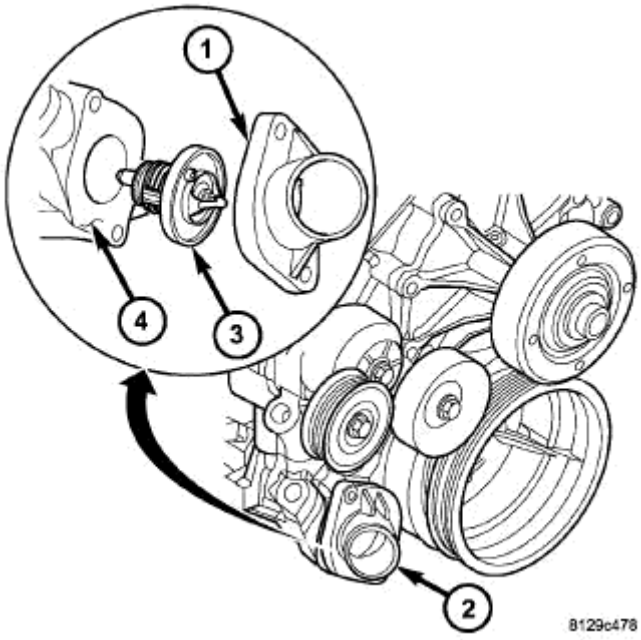

Fig. 146: Thermostat & Thermostat Housing 3.7L/4.7L
Courtesy of CHRYSLER GROUP, LLC

1 - THERMOSTAT HOUSING
2 - THERMOSTAT LOCATION
3 - THERMOSTAT AND GASKET
4 - TIMING CHAIN COVER

1. Clean the mating areas of the timing chain cover (4) and the thermostat housing (1).
2. Install the thermostat (3) (spring side down) into the recessed machined groove on the timing chain cover (4).

CAUTION: The housing must be tightened evenly and the thermostat must be centered into the recessed groove in the timing chain cover. If not, it may result in a cracked housing, damaged timing chain cover threads or coolant leaks.

3. Position the thermostat housing (1) on the timing chain cover (4).

4. Install the housing-to-timing chain cover bolts. Tighten the bolts to 13 N.m (112 in. lbs.).
5. Install the lower radiator hose on the thermostat housing (1).
6. Install the splash shield.
7. Lower the vehicle.
8. Fill the cooling system. Refer to **STANDARD PROCEDURE**.
9. Connect negative battery cable.
10. Start and warm the engine. Check for leaks.

5.7L ENGINE

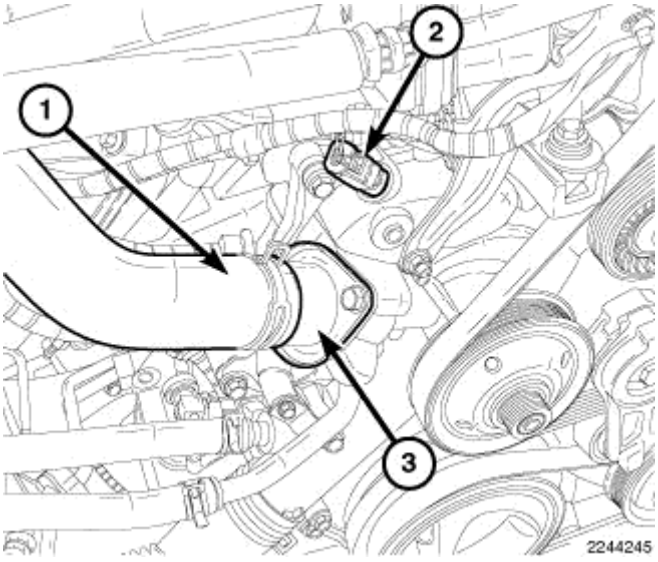

Fig. 147: Engine Coolant Temperature (ECT) Sensor & Thermostat
Courtesy of CHRYSLER GROUP, LLC

1. Position the thermostat and thermostat housing (3) onto the water pump.
2. Install the thermostat housing (3) bolts. Tighten the bolts to 13 N.m (10 ft. lbs.).
3. Install the radiator hose (1) onto the thermostat housing (3).
4. Fill the cooling system. Refer to **STANDARD PROCEDURE**.
5. Connect the negative battery cable.
6. Start and warm the engine. Check for leaks. Refer to **LEAK TESTING**.

6.7L DIESEL

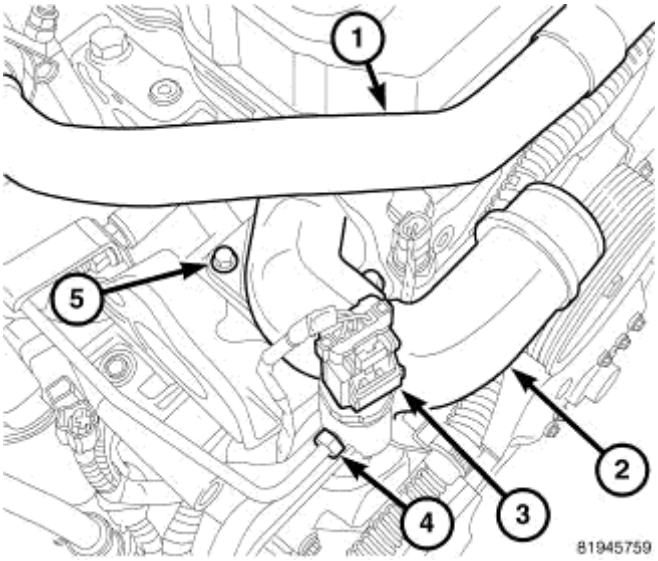

Fig. 148: Thermostat Housing - 6.7L Diesel
Courtesy of CHRYSLER GROUP, LLC

1 - EGR CROSSOVER TUBE
2 - THERMOSTAT HOUSING
3 - EXHAUST GAS PRESSURE SENSOR CONNECTOR
4 - EXHAUST GAS PRESSURE TUBE
5 - MOUNTING BOLT

NOTE: Thermostats for the Cummins diesel, while physically interchangeable, should not be mixed and matched. For model year 2010 and forward, the 6.7L diesel engine uses a 200° Fahrenheit thermostat. Confirm the temperature stamp on the thermostat rim prior to removal or installation.

1. Inspect the thermostat seal for cuts or nicks. Replace if damaged.
2. Install the thermostat into the groove in the top of the cylinder head.
3. Install the thermostat housing and bolts (5). Tighten the bolts to 10 N.m (89 in. lbs.).
4. Install the heat shield. Tighten the bolts to 9 N.m (79 in. lbs.).
5. Install the exhaust pressure tube (4). Tighten to 10 N.m (89 in. lbs.).
6. Connect exhaust pressure sensor electrical connector (2).
7. Install the EGR cross over tube (1).
8. Install the P-clip and bolt. Tighten to 8 N.m (71 in. lbs.).
9. Install the radiator upper hose and clamp.
10. Fill the cooling system with coolant. Refer to **STANDARD PROCEDURE**.
11. Connect the battery negative cables.
12. Start the engine and check for any coolant leaks. Run engine to check for proper thermostat operation.

TRANSMISSION

COOLER, TRANSMISSION OIL

DESCRIPTION

GAS ENGINES

EXTERNAL TRANS COOLER

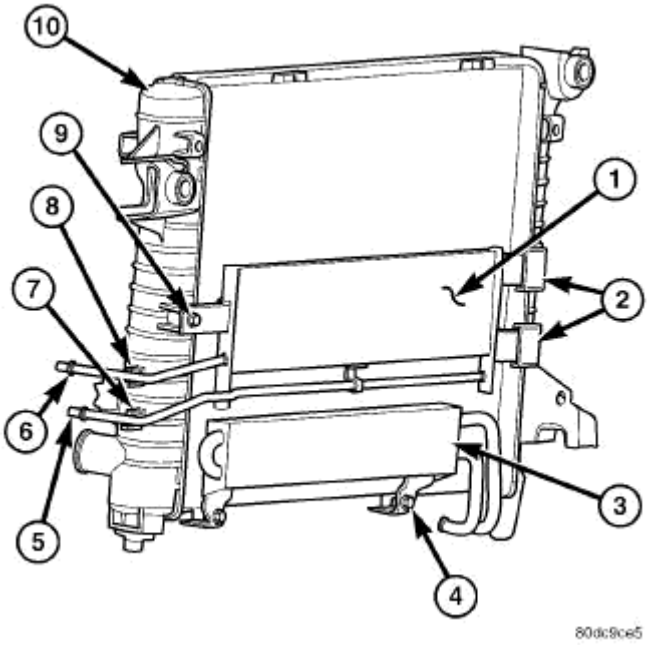

Fig. 149: Transmission Oil Cooler
Courtesy of CHRYSLER GROUP, LLC

An air-to-oil transmission oil cooler is standard on all engine packages. The transmission oil cooler is mounted to the front of the radiator above the power steering cooler.

A/C CONDENSER/TRANSMISSION COOLER COMBINATION

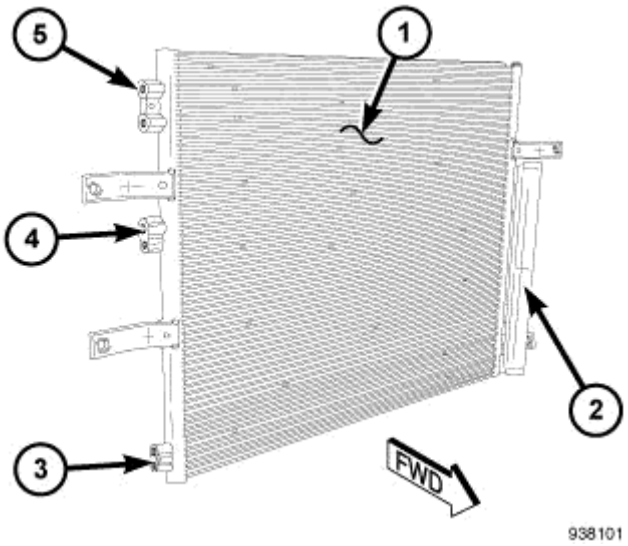

Fig. 150: A/C Condenser/Transmission Cooler
Courtesy of CHRYSLER GROUP, LLC

The automatic transmission cooler assembly is integrated in with the A/C condenser and behind the grille. The transmission cooler is a heat exchanger that allows heat in the transmission fluid to be transferred to the air passing over the cooler fins. The transmission oil cooler assembly is equipped with quick connect fitting for the transmission oil. The transmission oil cooler is serviced as an assembly with the A/C condenser.

To service the A/C condenser/Transmission cooler, refer to **CONDENSER, A/C, REMOVAL** and **CONDENSER, A/C, INSTALLATION** .

DIESEL ENGINES

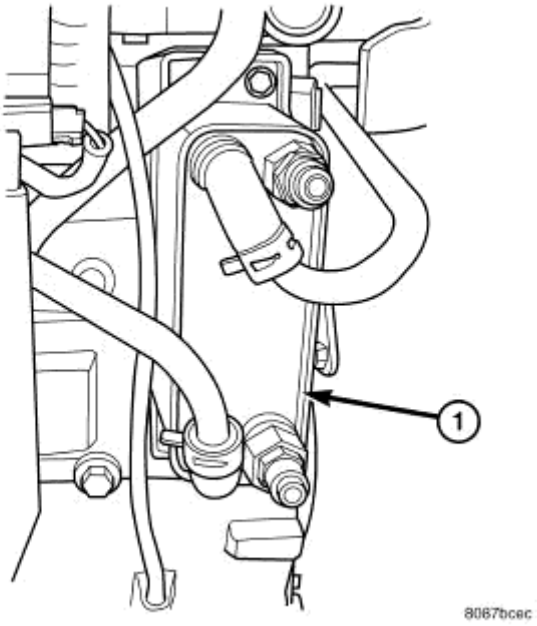

Fig. 151: Transmission Water - To - Oil Cooler
Courtesy of CHRYSLER GROUP, LLC

1 - TRANSMISSION WATER-TO-OIL COOLER

All diesel models equipped with an automatic transmission are equipped with both a main water-to-oil cooler and a separate air-to-oil cooler. Both coolers are supplied as standard equipment on diesel engine powered models when equipped with an automatic transmission.

The main water-to-oil transmission oil cooler is mounted to a bracket on the intake side of the engine. Refer to **Fig. 151**.

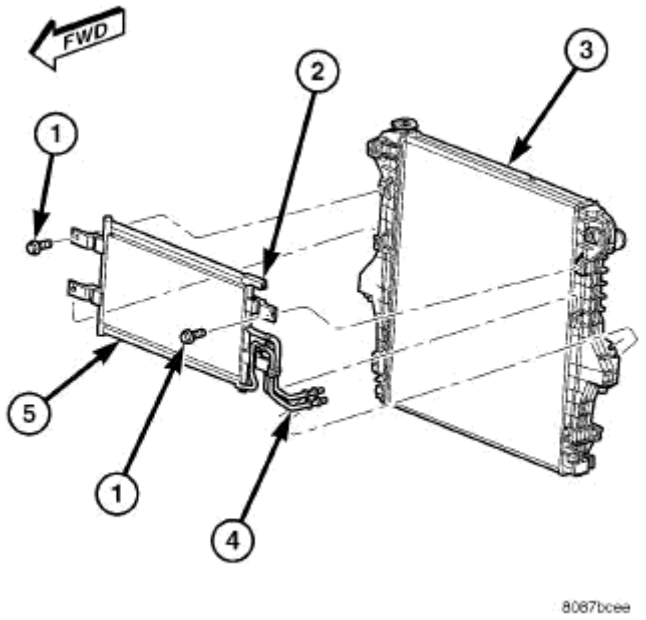

Fig. 152: Transmission Oil Cooler - Diesel Engine
Courtesy of CHRYSLER GROUP, LLC

1 - MOUNTING BOLTS
2 - THERMOSTATIC BYPASS VALVE
3 - RADIATOR
4 - QUICK-CONNECT FITTINGS
5 - TRANSMISSION OIL COOLER

The air-to-oil cooler is located in front of the radiator. Refer to **Fig. 152**.

OPERATION

OPERATION

On all models equipped with an automatic transmission, the transmission oil is routed through the air-to-oil transmission oil cooler where heat is removed from the transmission oil before returning to the transmission. The air-to-oil cooler has an internal thermostat that controls oil flow through the cooler. When the transmission oil is cold (less then operating temperature), the oil is routed through the cooler bypass. When the transmission oil reaches operating temperatures and above, the thermostat closes off the bypass allowing the oil to flow through the cooler. The thermostat is serviceable.

On heavy duty diesel engine models, the transmission oil is routed through an oil-to water transmission oil cooler first, then to the air-to-oil transmission oil cooler.

REMOVAL

REMOVAL

EXTERNAL TRANSMISSION COOLER

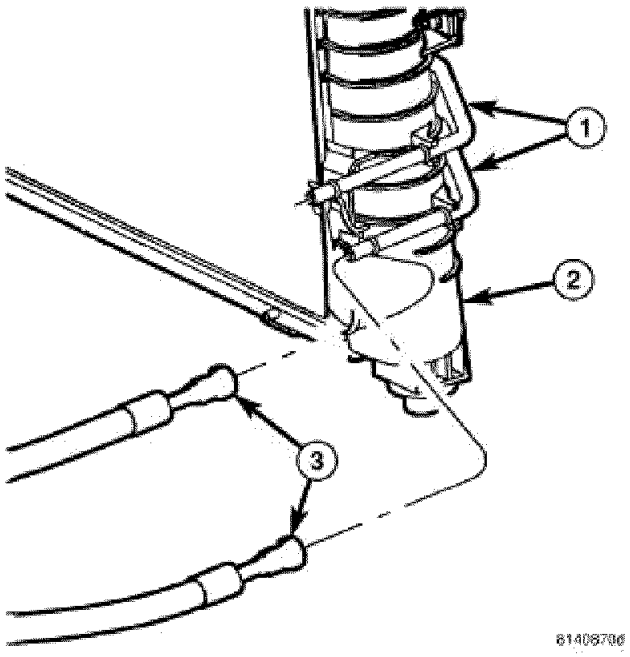

Fig. 153: Transmission Oil Cooler Lines
Courtesy of CHRYSLER GROUP, LLC

1. Place a drain pan under the oil cooler lines.
2. Disconnect the transmission oil cooler line quick-connect fitting at the cooler outlet. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, STANDARD PROCEDURE**. Plug the cooler lines to prevent oil leakage.
3. Unsnap the transmission cooler tubes from the radiator tank clips.
4. Remove the bolt attaching the transmission cooler to the radiator.
5. Remove oil cooler from the vehicle. Take care not to damage the radiator core or transmission cooler tubes.

A/C CONDENSER/TRANSMISSION COOLER

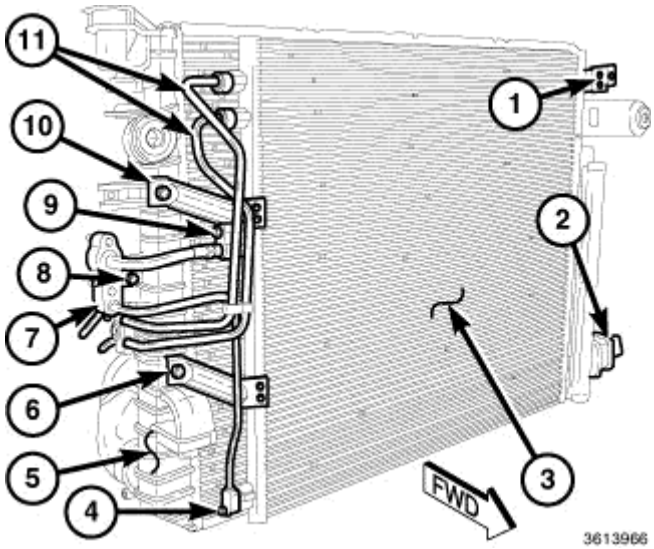

Fig. 154: A/C Compressor/Transmission Combination Cooler, Lines, Bolts & Brackets
Courtesy of CHRYSLER GROUP, LLC

NOTE: The transmission cooler has been integrated with the A/C condenser.

1. The A/C condenser/transmission cooler is removed as an unit. Refer to **CONDENSER, A/C, REMOVAL** .

AIR TO OIL COOLER - DIESEL

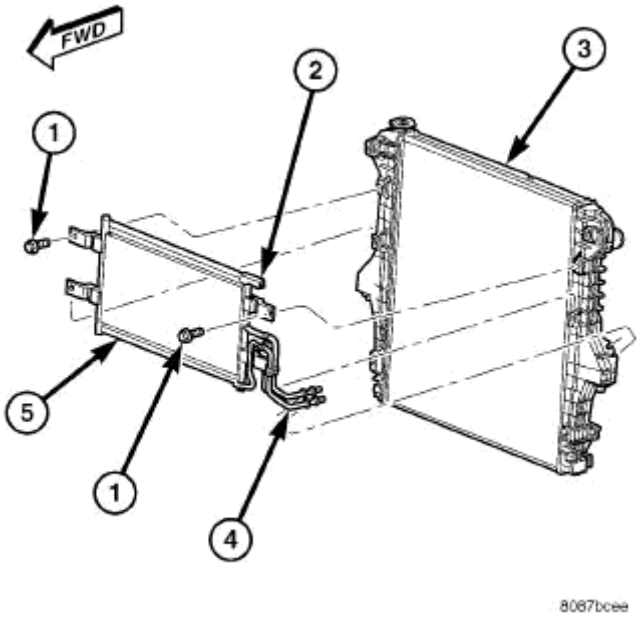

Fig. 155: Transmission Oil Cooler - Diesel Engine

Courtesy of CHRYSLER GROUP, LLC

1 - MOUNTING BOLTS
2 - THERMOSTATIC BYPASS VALVE
3 - RADIATOR
4 - QUICK-CONNECT FITTINGS
5 - TRANSMISSION OIL COOLER

1. Remove Charge Air Cooler. Refer to **COOLER AND HOSES, CHARGE AIR, REMOVAL, 6.7L** .
2. Place a drain pan under the oil cooler.
3. Raise the vehicle.
4. Disconnect the oil cooler quick-connect fittings from the transmission lines. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, STANDARD PROCEDURE**.
5. Remove the charge air cooler-to-oil cooler bolt. Refer to **Fig. 155**.
6. Remove two mounting nuts.
7. Remove the oil cooler and line assembly towards the front of vehicle. Cooler must be rotated and tilted into position while removing.

WATER TO OIL COOLER

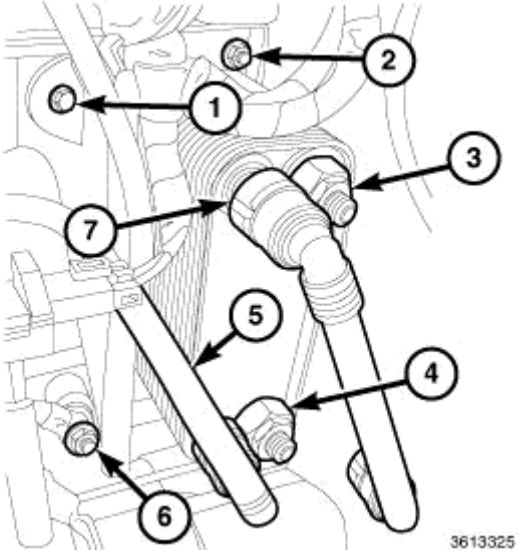

Fig. 156: Water To Oil Cooler, Lines, Bolts & Nuts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: If a leak should occur in the water-to-oil cooler mounted to the side of the engine block, engine coolant may become mixed with transmission fluid. Transmission fluid may also enter engine cooling system. Both cooling system and transmission should be drained and inspected in case of oil cooler leakage.

1. Disconnect both battery negative cables.
2. Remove starter. Refer to **STARTER, REMOVAL** .
3. Drain cooling system. Refer to **STANDARD PROCEDURE**.
4. Disconnect coolant lines from cooler.

NOTE: Use a back-up wrench on the transmission cooler fittings to prevent damage to the cooler.

5. Disconnect transmission oil lines from cooler. Plug cooler lines to prevent oil leakage.
6. Remove cooler bracket to transmission adapter bolt.
7. Remove the nut (6) secures the ground cable to the mounting stud then remove the nut.
8. Remove the upper nut (2).
9. Remove cooler bracket to block bolts (1).
10. Remove cooler assembly from vehicle.

DISASSEMBLY

DISASSEMBLY

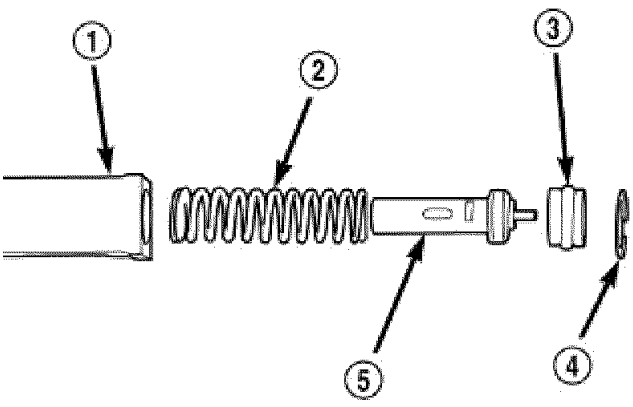

Fig. 157: Exploded View Of Transmission Oil Cooler Thermostat
Courtesy of CHRYSLER GROUP, LLC

1 - THERMOSTAT HOUSING
2 - SPRING
3 - END PLUG
4 - SNAP RING
5 - THERMOSTAT

NOTE: The transmission oil cooler uses an internal thermostat to control transmission oil flow through the cooler. This thermostat is serviceable.

1. Remove the transmission oil cooler. Refer to **COOLER, TRANSMISSION OIL, REMOVAL**.
2. Remove the snap ring (4) retaining the thermostat end plug (3). Refer to **Fig. 157**.
3. Remove the end plug (3), thermostat (5) and spring (2) from transmission oil cooler. Refer to **Fig. 157**.

ASSEMBLY

ASSEMBLY

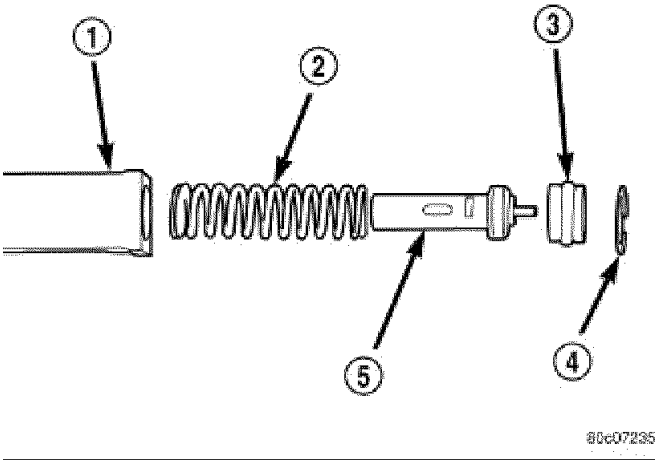

Fig. 158: Exploded View Of Transmission Oil Cooler Thermostat
Courtesy of CHRYSLER GROUP, LLC

1 - THERMOSTAT HOUSING
2 - SPRING
3 - END PLUG
4 - SNAP RING
5 - THERMOSTAT

1. Thoroughly clean the thermostat bore on the transmission oil cooler.
2. Install the new spring (2), thermostat (5), end plug (3) and snap ring (4).
3. Install the transmission oil cooler. Refer to **COOLER, TRANSMISSION OIL, INSTALLATION**.

INSTALLATION

INSTALLATION

EXTERNAL TRANSMISSION COOLER

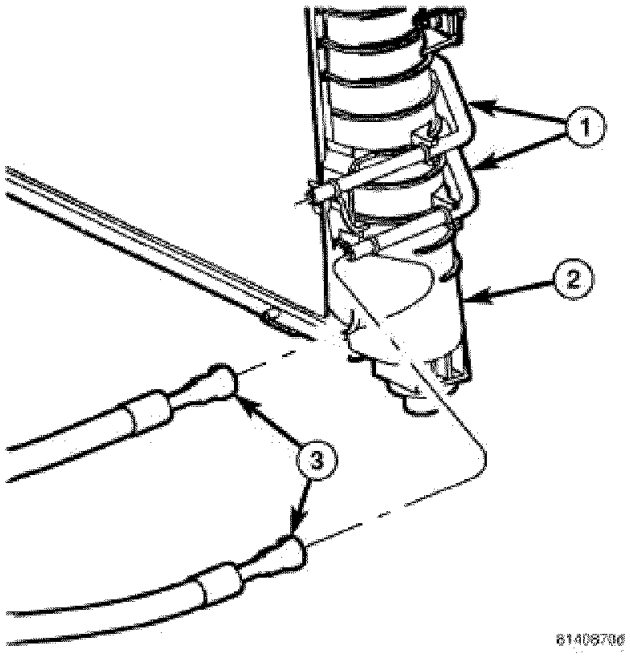

Fig. 159: Transmission Oil Cooler Lines
Courtesy of CHRYSLER GROUP, LLC

1. Position the transmission cooler tubes to the front of the radiator by sliding brackets into slots on radiator inlet tank.
2. Snap the transmission cooler tubes into the clips on the side of the radiator tank.
3. Install the transmission cooler attaching bolt. Tighten the bolt to 16 N.m (140 in. lbs.).
4. Inspect the quick connect fittings for debris and install the quick connect fitting on the cooler tube until an audible "click" is heard. Pull on the connection to verify proper installation and install the secondary latches. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, STANDARD PROCEDURE**.
5. Start the engine and check all fittings for leaks.
6. Check the fluid level in the automatic transmission.

A/C CONDENSER/TRANSMISSION COOLER

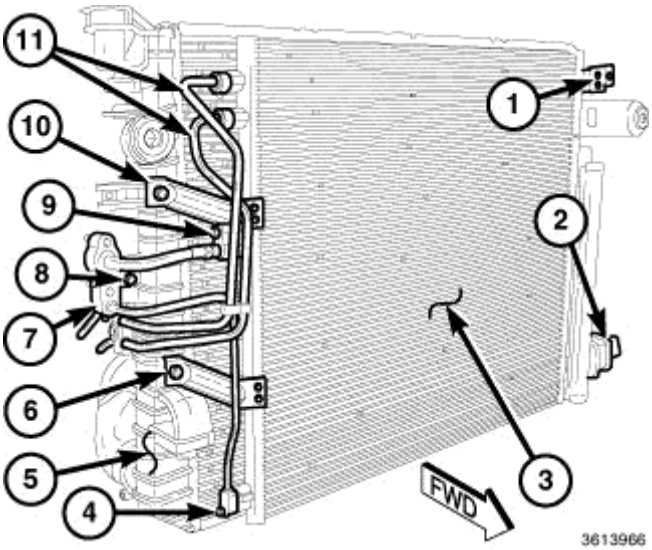

Fig. 160: A/C Compressor/Transmission Combination Cooler, Lines, Bolts & Brackets
Courtesy of CHRYSLER GROUP, LLC

NOTE: The transmission cooler is integrated in with the A/C condenser.

1. The A/C condenser/transmission cooler is installed as an unit. Refer to **CONDENSER, A/C, INSTALLATION** .
2. Top off the transmission oil to the required level.
3. Take vehicle for test to ensure all the air has escaped from the cooler.
4. Recheck the transmission oil.

AIR TO OIL COOLER - DIESEL

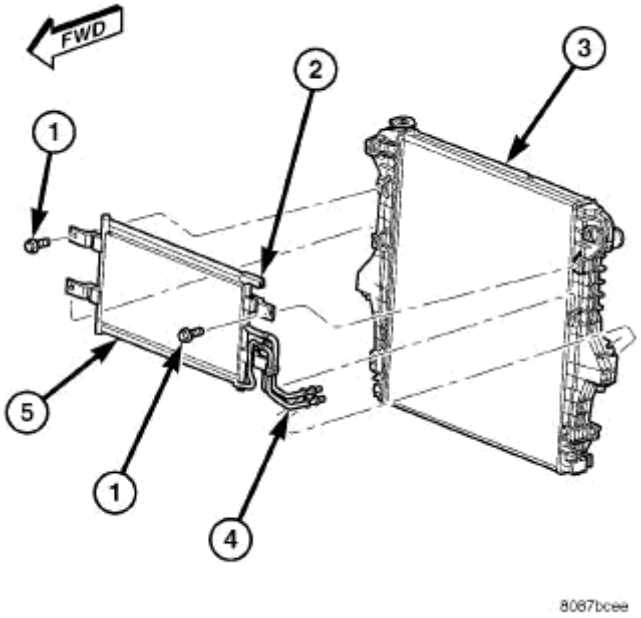

Fig. 161: Transmission Oil Cooler - Diesel Engine
Courtesy of CHRYSLER GROUP, LLC

1 - MOUNTING BOLTS
2 - THERMOSTATIC BYPASS VALVE
3 - RADIATOR
4 - QUICK-CONNECT FITTINGS
5 - TRANSMISSION OIL COOLER

1. Carefully position the oil cooler assembly to the vehicle.
2. Install two nuts and one bolt. Tighten to 11 N.m (95 in. lbs.) torque.
3. Connect the quick-connect fittings to the transmission cooler lines. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, STANDARD PROCEDURE**.
4. Install Charge Air Cooler. Refer to **COOLER AND HOSES, CHARGE AIR, INSTALLATION, 6.7L** .
5. Start the engine and check all fittings for leaks.
6. Check the fluid level in the automatic transmission.

WATER-TO-OIL COOLER

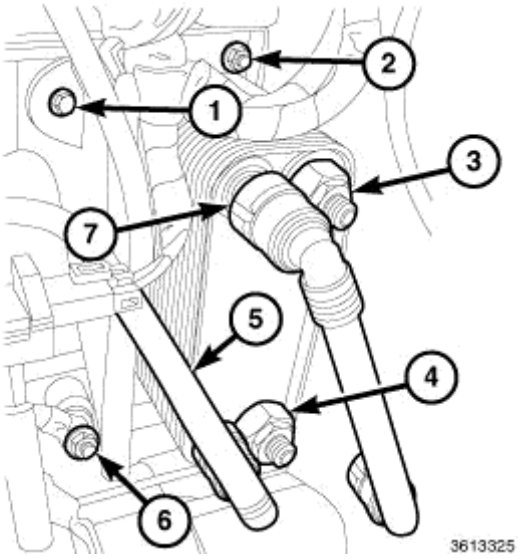

Fig. 162: Water To Oil Cooler, Lines, Bolts & Nuts
Courtesy of CHRYSLER GROUP, LLC

1. Guide the oil cooler onto the studs located on the cylinder block.
2. Install the upper (2) and lower nuts to cylinder block finger tight.
3. Install and tighten mounting bolt (1) to cooler at cylinder block to 24 N.m (18 ft. lbs).
4. Torque the nuts to 24 N.m (18 ft. lbs.)
5. Install the ground cable. Install the retaining nut (6).
6. Tighten lower mounting bolt to cooler at the cylinder block. Tighten to 77 N.m (57 ft. lbs.).

NOTE: Use a back-up wrench on the transmission cooler fittings to prevent damage to the cooler.

7. Tighten upper mounting bolt to cooler at cylinder block to 24 N.m (18 ft. lbs).
8. Install wire harness push in clip at bottom of cooler bracket.
9. Install starter motor. Refer to **STARTER, INSTALLATION** .
10. Connect battery negative cables.
11. Fill cooling system. Refer to **STANDARD PROCEDURE**.
12. Check transmission oil level and fill as necessary.

TUBES AND HOSES, TRANSMISSION OIL COOLER

STANDARD PROCEDURE

STANDARD PROCEDURE - TRANSMISSION COOLER LINE QUICK CONNECT FITTING DISASSEMBLY/ASSEMBLY

DISCONNECT

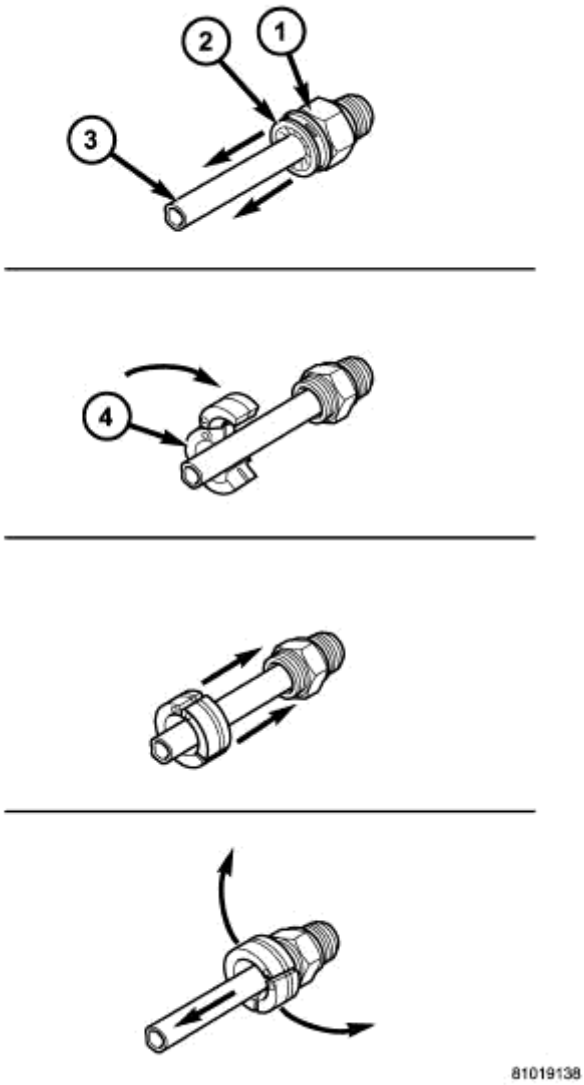

Fig. 163: Oil Cooler Line Quick Connect Fitting - Disassembly
Courtesy of CHRYSLER GROUP, LLC

1 - QUICK CONNECT FITTING
2 - DUST CAP
3 - OIL COOLER LINE
4 - SPECIAL TOOL 8875A

1. Remove dust cap by pulling it straight back off of quick connect fitting
2. Place disconnect Special Tool (special tool #8875A, Disconnect, Transmission Cooler Line) onto a ? inch transmission cooler lines or Special Tool (special tool #9546, Disconnect Tool) onto a 1/2 inch transmission cooler lines with the fingers of the tool facing the quick connect fitting.
3. Slide disconnect tool down the transmission line and engage the fingers of the tool into the retaining clip.

When properly engaged in the clip, the tool will fit flush against the quick connect fitting.

4. Rotate the disconnect tool 60° to expand the retaining clip.
5. While holding the disconnect tool against the quick connect fitting, pull back on the transmission cooler line to remove.

CONNECT

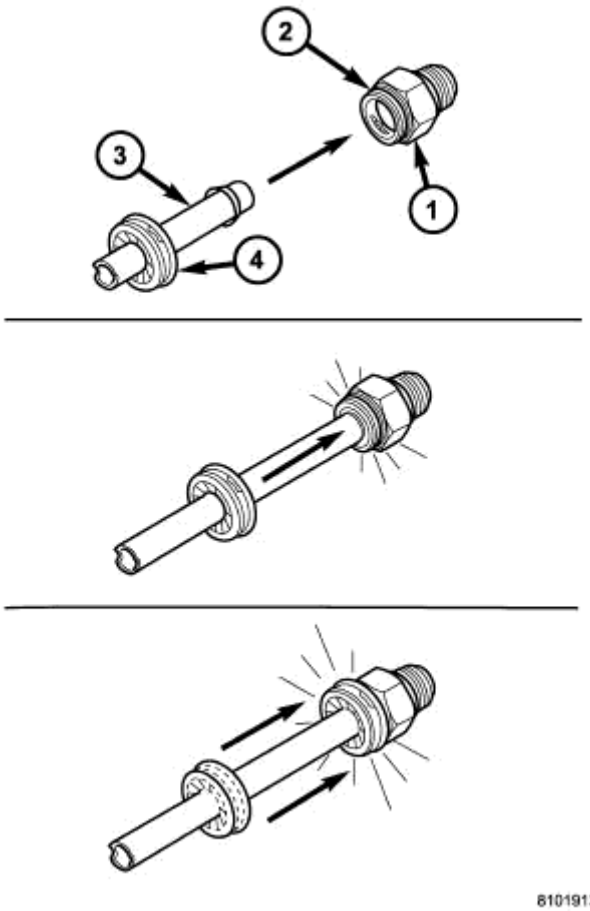

Fig. 164: Oil Cooler Line Quick Connect Fitting - Assembly
Courtesy of CHRYSLER GROUP, LLC

1 - QUICK CONNECT FITTING
2 - CLIP
3 - OIL COOLER LINE
4 - DUST CAP

1. Align transmission cooler line with quick connect fitting while pushing straight into the fitting.
2. Push in on transmission cooler line until a "click" is heard or felt.
3. Slide dust cap down the transmission cooler line and snap it over the quick connect fitting until it is fully

seated and rotates freely. Dust cap will only snap over quick connect fitting when the transmission cooler line is properly installed.

NOTE: If dust cap will not snap into place, repeat assembly step 2.