Fastener Tightening Specifications

Application	Specification	
	Metric	English
Thermostat Housing Bolts	10 N·m	89 lb in
Thermostat Housing Bracket Bolt	50 N·m	37 lb ft
Water Outlet Housing Bolts	10 N·m	89 lb in
Water Pump Bolts	10 N·m	89 lb in
Water Pump Pulley Bolts	10 N·m	89 lb in

Cooling System Draining and Filling (Vac N Fill)

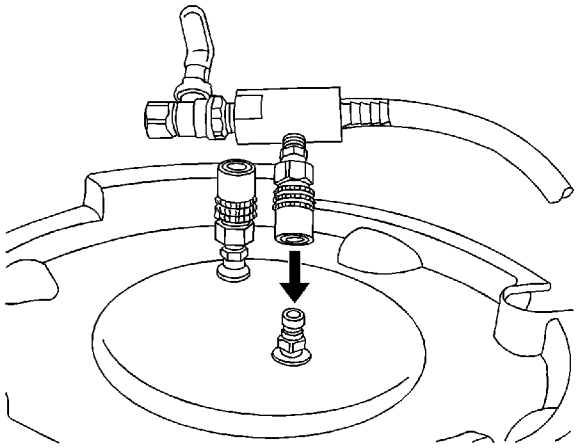
Special Tools

- J 26568 Coolant and Battery Tester
- GE-47716 Vac-N-Fill Coolant Refill Tool

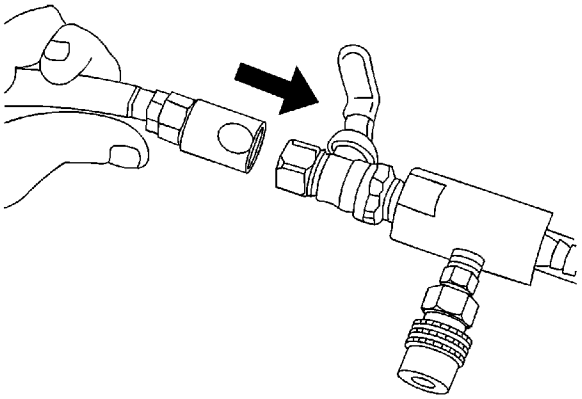
Draining Procedure

Warning: To avoid being burned, do not remove the radiator cap or surge tank cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if radiator cap or surge tank cap is removed while the engine and radiator are still hot.

1. Remove the radiator cap.



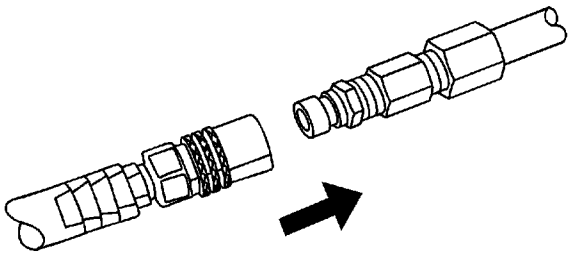
2. Attach the venturi assembly to the vacuum tank.



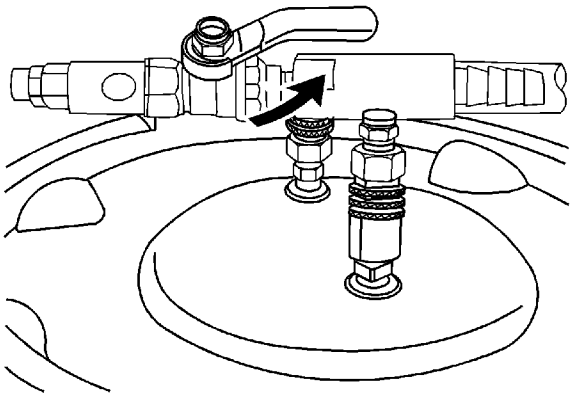
3. Attach a shop air hose to the venturi assembly.

   Ensure the valve on the venturi assembly is closed.

4. Attach the vacuum hose to the vacuum tank.



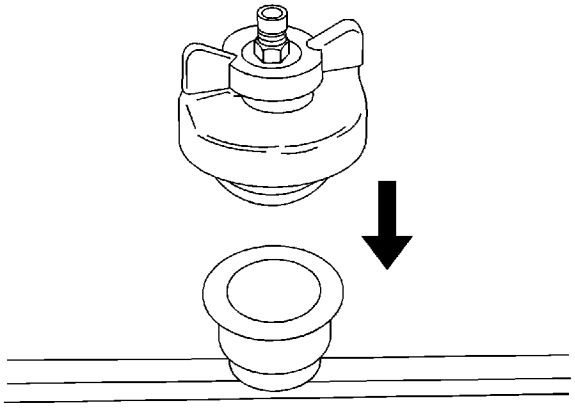
5. Attach the extraction hose to the vacuum hose.
6. Insert the extraction hose into the radiator cap opening and into the radiator until the extraction hose contacts the bottom of the radiator end tank.



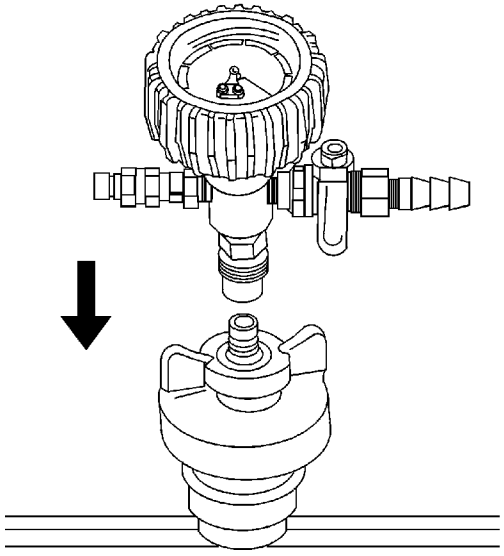
7. Open the valve on the venturi assembly to start a vacuum draw.
8. Use the extraction hose to draw out coolant until the radiator is empty.
9. The vacuum tank has a drain valve on the bottom of the tank. Open the valve to drain coolant from the vacuum tank into a suitable container for disposal.
10. If a complete engine block drain is required, remove the engine block drain plug.
11. Inspect the coolant.
12. Follow the appropriate procedure based on the condition of the coolant.
    - Normal in appearance--Follow the filling procedure.
    - Discolored--Follow the flush procedure. Refer to Flushing.

Vac-N-Fill Procedure

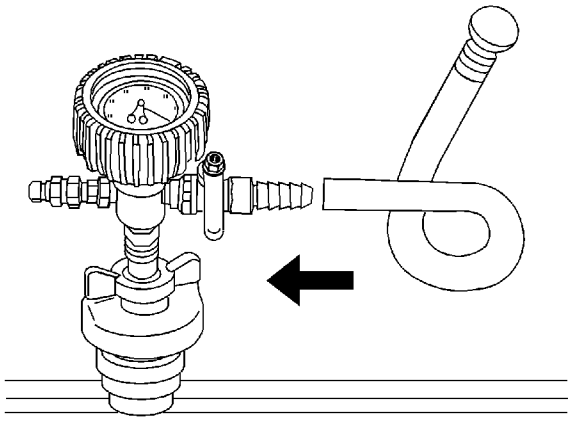
Note: To prevent boiling of the coolant/water mixture in the vehicles cooling system, do not apply vacuum to a cooling system above 49°C (120°F). The tool will not operate properly when the coolant is boiling.



1. Attach the Vac-N-Fill cap to the vehicles coolant fill port.
2. Install the extension hose.

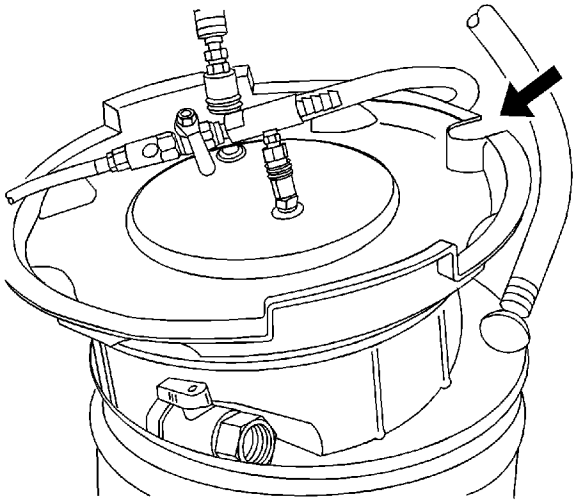


3. Attach the vacuum gage assembly to the Vac-N-Fill cap.



4. Attach the fill hose to the barb fitting on the vacuum gage assembly.

   Ensure that the valve is closed.

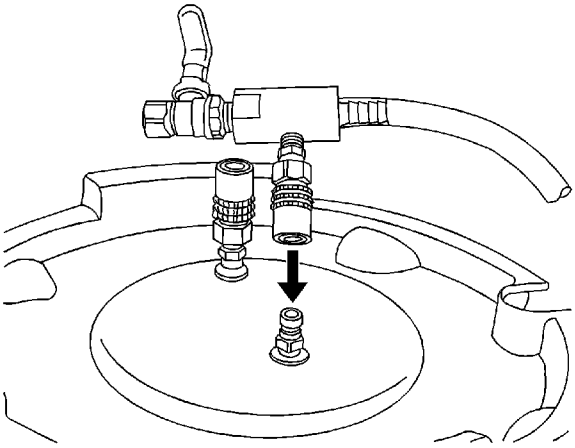


Note: Use a 50/50 mixture of DEX-COOL antifreeze and clean, drinkable water. Always use more coolant than necessary. This will eliminate air from being drawn into the cooling system.

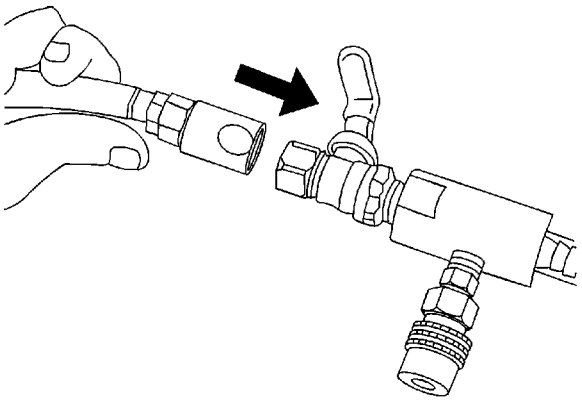
5. Pour the coolant mixture into the graduated reservoir.
6. Place the fill hose in the graduated reservoir.

Note: Prior to installing the vacuum tank onto the graduated reservoir, ensure that the drain valve located on the bottom of the tank is closed.

7. Install the vacuum tank on the graduated reservoir with the fill hose routed through the cut-out area in the vacuum tank.

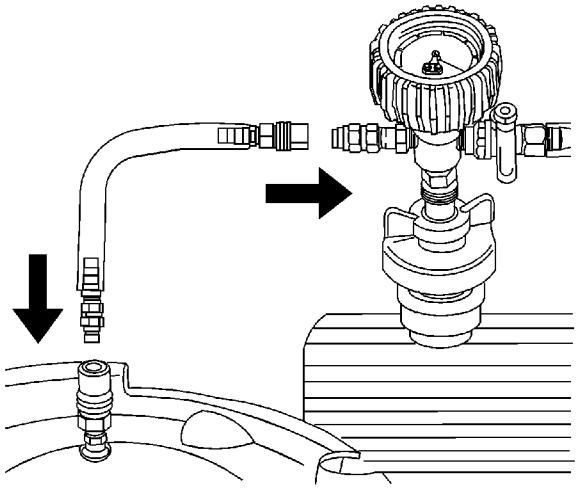


8. Attach the venturi assembly to the vacuum tank.

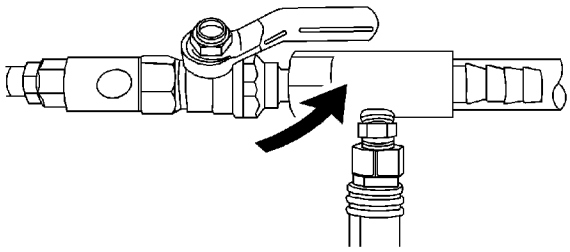


9. Attach a shop air hose to the venturi assembly.

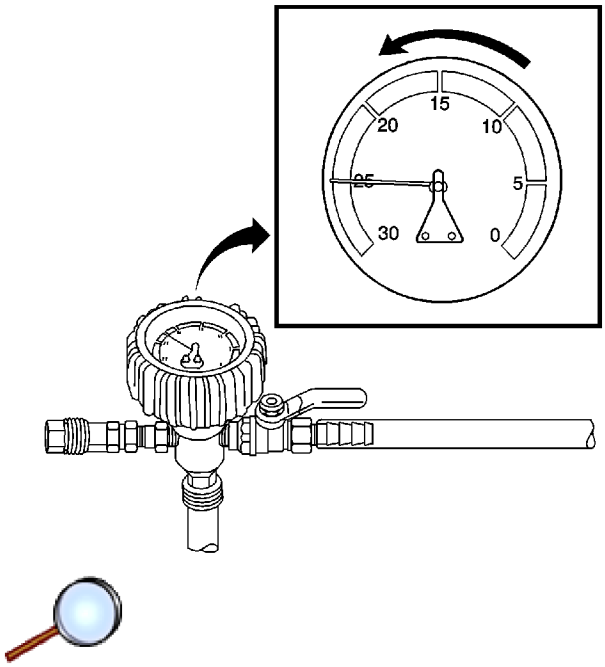
   Ensure the valve on the venturi assembly is closed.



10. Attach the vacuum hose to the vacuum gage assembly and the vacuum tank.
11. Clamp off the overflow hose.



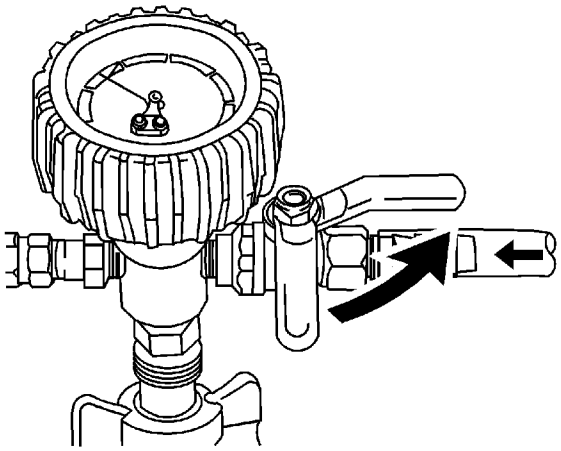
12. Open the valve on the venturi assembly. The vacuum gage will begin to rise and a hissing noise will be present.



13. Continue to draw vacuum until the needle stops rising. This should be 610-660 mm Hg (24-26 in HG).

    Cooling hoses may start to collapse. This is normal due to vacuum draw.

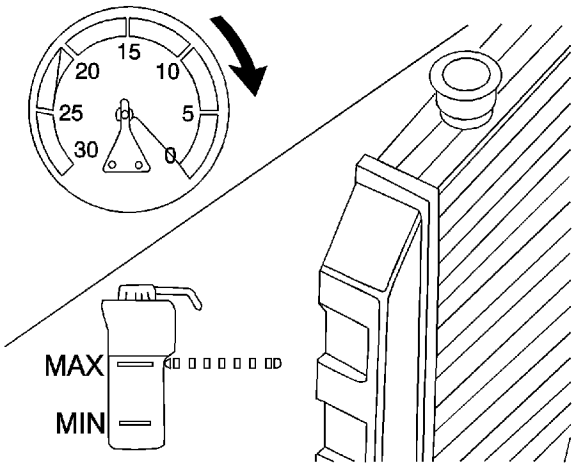
14. To aid in the fill process, position the graduated reservoir above the coolant fill port.



15. Slowly open the valve on the vacuum gage assembly. When the coolant reaches the top of the fill hose, close the valve. This will eliminate air from the fill hose.
16. Close the valve on the venturi assembly.
17. If there is a suspected leak in the cooling system, allow the system to stabilize under vacuum and monitor for vacuum loss.

    If vacuum loss is observed, refer to Loss of Coolant.

18. Open the valve on the vacuum gage assembly. The vacuum gage will drop as coolant is drawn into the system.



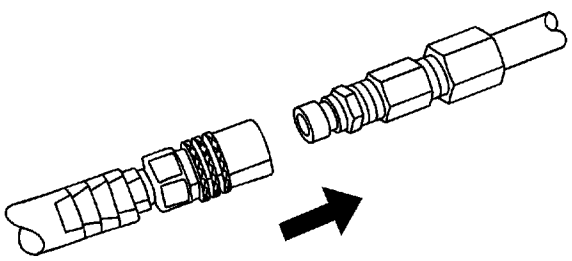
19. Once the vacuum gage reaches zero, close the valve on the vacuum gage assembly and repeat steps 11-17.

    Remove the extension hose.

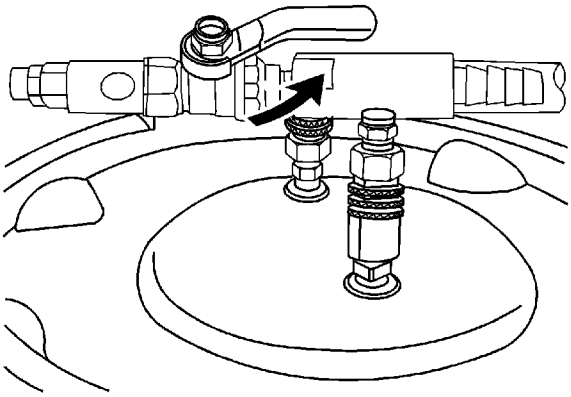
20. Remove the J 42401 .
21. Detach the Vac-N-Fill cap from the vehicles coolant fill port.
22. Add coolant to the system as necessary.
23. Inspect the concentration of the coolant mixture using J 26568 .

    Note: After filling the cooling system, the extraction hose can be used to remove excess coolant to achieve the proper coolant level.

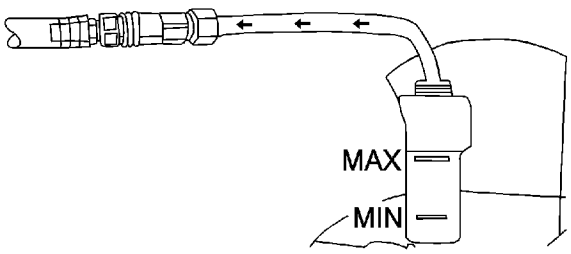
24. Detach the vacuum hose form the vacuum gage assembly.



25. Attach the extraction hose to the vacuum hose.



26. Open the valve on the venturi assembly to start a vacuum draw.



27. Use the extraction hose to draw out coolant to the proper level.
28. The vacuum tank has a drain valve on the bottom of the tank. Open the valve to drain coolant from the vacuum tank into a suitable container for disposal.

Cooling System Draining and Filling (Static Fill)

Draining Procedure

Special Tools

J 26568 Coolant and Battery Tester

Warning: To avoid being burned, do not remove the radiator cap or surge tank cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if radiator cap or surge tank cap is removed while the engine and radiator are still hot.

Note: Draining the cooling system with the pressure cap installed will syphon the coolant from the overflow tank.

1. Place a drain pan under the radiator hose.
2. Remove the radiator outlet hose from the engine. Refer to Radiator Outlet Hose Replacement.
3. Move down the end of the radiator hose to drain the radiator.
4. Drain the cooling system.
5. Remove the coolant pressure cap.
6. If a complete engine block drain is required, remove the engine drain plugs.
7. Inspect the coolant.
8. Follow the appropriate procedure based on the condition of the coolant.
   - Normal in appearance--Follow the filling procedure.
   - Discolored--Follow the flush procedure. Refer to Flushing.

Filling Procedure

Caution: The procedure below must be followed. Improper coolant level could result in a low or high coolant level condition, causing engine damage.

1. Install the radiator outlet hose to the engine. Refer to Radiator Outlet Hose Replacement.

   Caution: Refer to Fastener Caution in the Preface section.

2. If the engine block drain plug was removed, perform the following:
   2.1. Apply pipe sealer to the drain plugs.
   2.2. Install the drain plugs.

   Tighten
   Tighten the drain plug to 22 N·m (16 lb ft).

3. Lower the vehicle.

   Note: Use a 50/50 mixture of DEX-COOL antifreeze and clean, drinkable water.

4. Slowly fill the cooling system with a 50/50 coolant mixture. Refer to Approximate Fluid

Capacities.

5. Install the coolant pressure cap.
6. Start the engine.
7. Run the engine at 2,000-2,500 RPM until the engine reaches normal operating temperature.
8. Allow the engine to idle for 3 minutes.
9. Shut the engine OFF.
10. Allow the engine to cool.
11. Top off the coolant as necessary.
12. Inspect the concentration of the engine coolant, using the J 26568 .
13. Rinse away any excess coolant from the engine and the engine compartment.

Flushing

Important: Do not use a chemical flush.

Store used coolant in the proper manner, such as in a used engine coolant holding tank. Do not pour used coolant down a drain. Ethylene glycol antifreeze is a very toxic chemical. Do not dispose of coolant into the sewer system or ground water. This is illegal and ecologically unsound.

Various methods and equipment can be used to flush the cooling system. If special equipment is used, such as a back flusher, follow the manufacturer's instruction. Always remove the thermostat before flushing the cooling system.

When the cooling system becomes contaminated, the cooling system should be flushed thoroughly to remove the contaminants before the engine is seriously damaged.

1. Drain the cooling system. Refer to Cooling System Draining and Filling .
2. Remove the coolant recovery reservoir. Refer to Coolant Recovery Reservoir Replacement .
3. Clean and flush the coolant recovery reservoir with clean, drinkable water.
4. Install the coolant recovery reservoir. Refer to Coolant Recovery Reservoir Replacement .
5. Follow the drain and fill procedure using only clean, drinkable water. Refer to Cooling System Draining and Filling .
6. Run the engine for 20 minutes.
7. Stop the engine.
8. Drain the cooling system. Refer to Cooling System Draining and Filling .
9. Repeat the procedure if necessary, until the fluid is nearly colorless.
10. Fill the cooling system. Refer to Cooling System Draining and Filling .

Radiator Cleaning

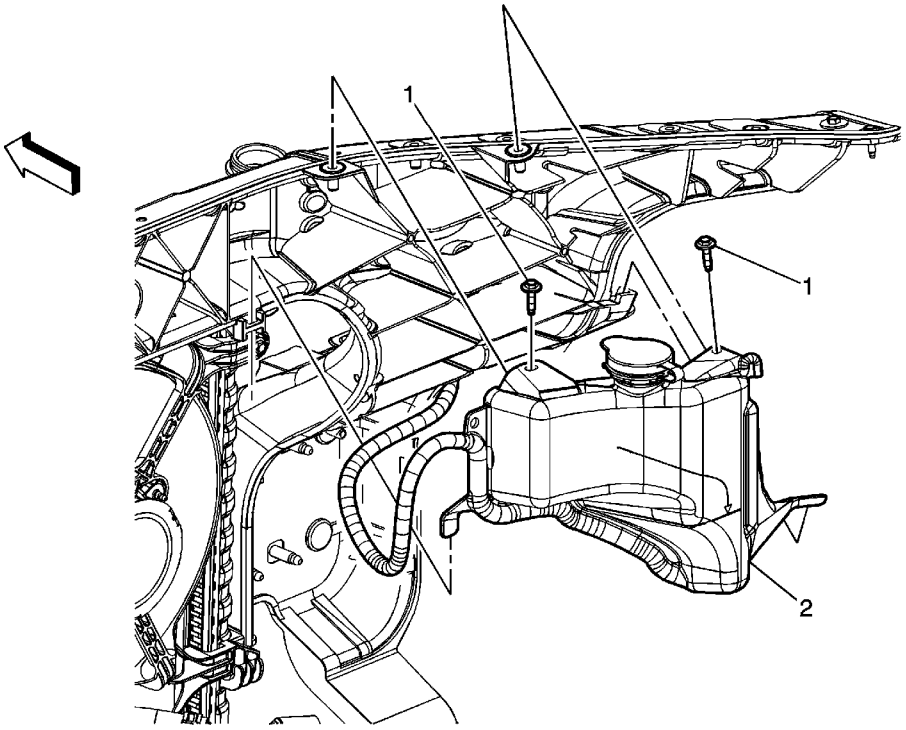
Warning: NEVER spray water on a hot heat exchanger. The resulting steam could cause personal injury.

Caution: The heat exchanger fins are necessary for good heat transfer. Do not brush the fins. This may cause damage to the fins, reducing heat transfer.

Note: Remove bugs, leaves, dirt and other debris by blowing compressed air through the engine side of the radiator.

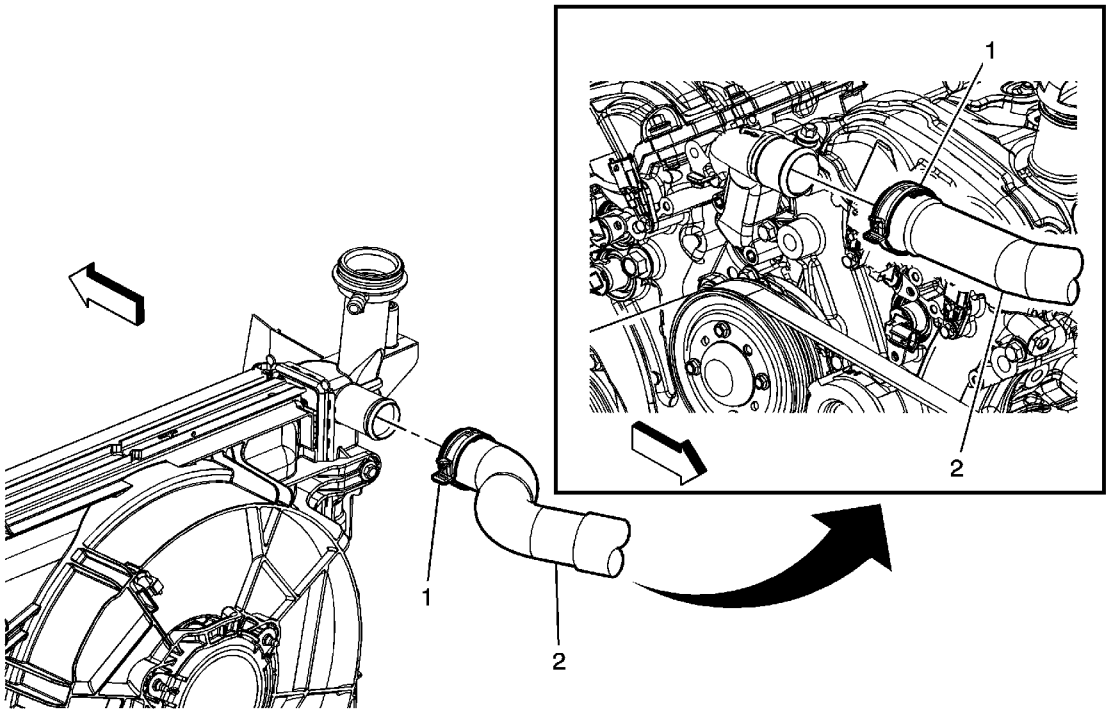
- Some conditions may require the use of warm water and a mild detergent.
- Clean the A/C condenser fins.
- Clean between the A/C condenser and radiator.
- Clean the radiator cooling fins.
- Straighten any damaged cooling fins.

Coolant Recovery Reservoir Replacement



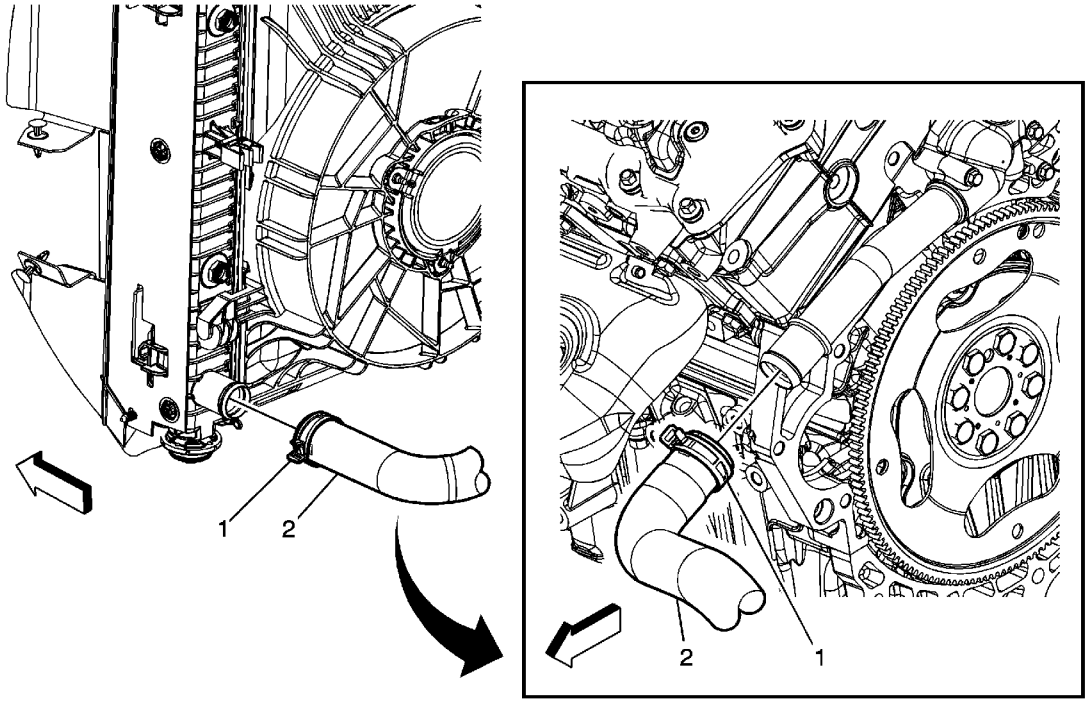
Callout	Component Name
Preliminary Procedure 1. Drain the coolant from the recovery reservoir. 2. Remove the front compartment sight shield if necessary. Refer to Front Compartment Sight Shields Replacement	
1	Coolant Recovery Reservoir Bolt (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 5 N·m (44 lb in)
2	Coolant Recovery Reservoir **Procedure** Remove overflow hose from reservoir

Radiator Inlet Hose Replacement



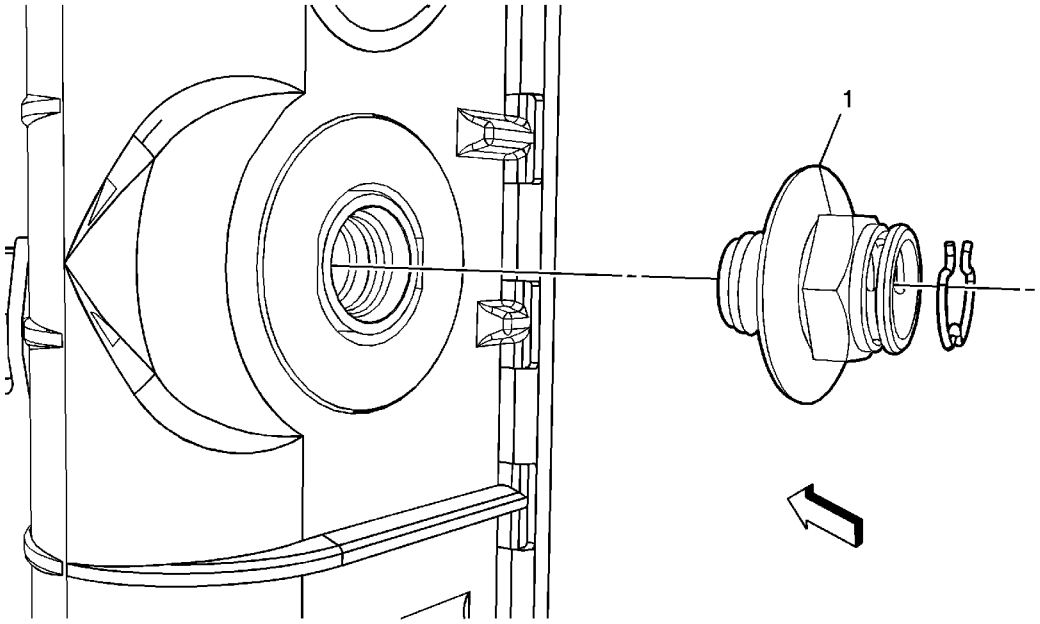
Callout	Component Name
Preliminary Procedure 1. Drain the coolant. Refer to Cooling System Draining and Filling 2. Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement	
1	Radiator Inlet Hose Clamp (Qty: 2) **Procedure** Using J 38185 reposition the radiator inlet hose clamps. **Special Tools** J 38185 Hose Clamp Pliers
2	Radiator Inlet Hose

Radiator Outlet Hose Replacement



Callout	Component Name
Preliminary Procedure 1. Drain the coolant. Refer to Cooling System Draining and Filling 2. Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement	
1	Radiator Outlet Hose Clamp (Qty: 2) **Procedure** Using J 38185 reposition the radiator outlet hose clamps. **Special Tools** J 38185 Hose Clamp Pliers
2	Radiator Outlet Hose

Engine Oil Cooler Connector Replacement



Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling. 2. Remove the engine oil cooler pipe from the oil cooler fittings on the radiator. Refer to Engine Oil Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection.	
1	Engine Oil Cooler Fitting **Caution:** Refer to Fastener Caution in the Preface section. **Procedure** Remove the plastic caps from the quick connect fittings by pulling the caps back along the pipe before installation. **Tip** • Do not remove the upper and lower engine oil cooler fittings from the radiator at the same time, otherwise the engine oil cooler may fall inside the radiator end tank. • The correct thread engagement is critical. Cross-threaded fittings can achieve

	proper tightness and still leak. **Tighten** 24 N·m (18 lb ft)

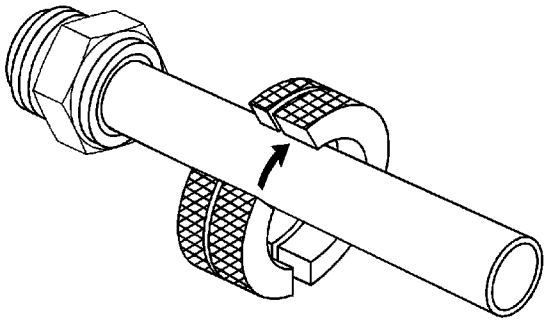
Engine Oil Cooler Hose / Pipe Quick-Connect Fitting Disconnection and Connection

Tools Required

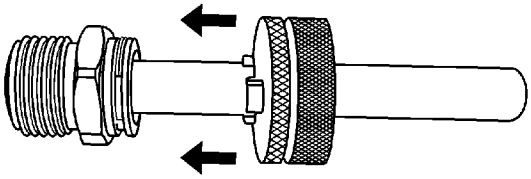
- DT-47731 1/2 in. Cooler Line Quick Release Tool
- J 28585 Universal Snap Ring Remover for the 5/8 in. Cooler Line

Removal Procedure

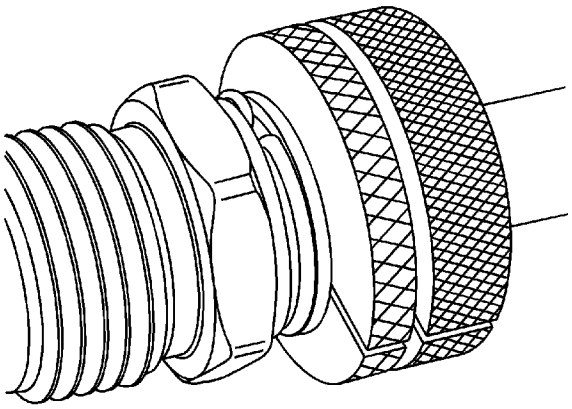
1. Remove the plastic caps from the quick connect fittings by pulling the caps back along the pipe before installation.



2. Install the DT-47731 onto the transmission oil cooler (TOC) pipe, or use the J 28585



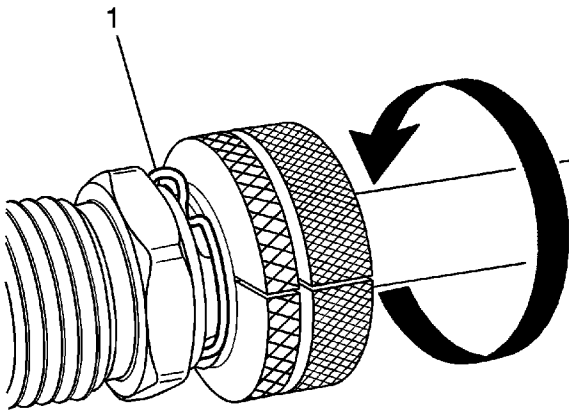
3. Slide the DT-47731 toward the TOC pipe fitting, or use the J 28585



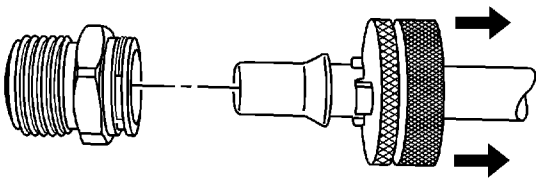
Important: Rotate the DT-47731 to engage the TOC pipe fitting's retainer slots.

The DT-47731 should be nearly flush with the fitting.

4. Connect the DT-47731 onto the TOC pipe fitting.

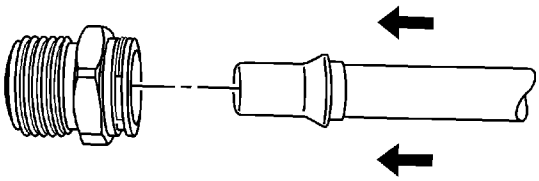


5. Rotate the DT-47731 or use the J 28585 until the retainer clip (1) rises above the fitting retainer seat.



6. Pull back on the TOC pipe to disengage the pipe from the TOC pipe fitting.
7. Remove the DT-47731 or the J 28585 from the TOC pipe.

Installation Procedure



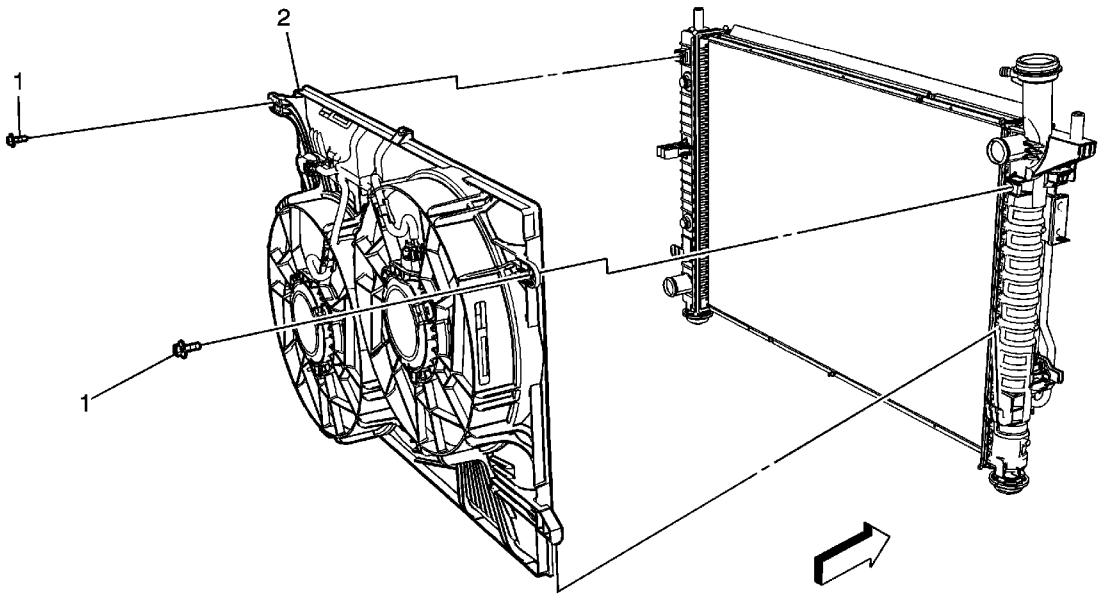
Important: Discard the TOC retaining clip and install a new retaining clip.

1. Install the TOC pipe into the TOC pipe fitting.

   A distinct snap should be heard or felt when assembling the TOC pipe to the fitting.

2. To ensure the cooler line is properly installed, give the cooler pipe a gentle pull.

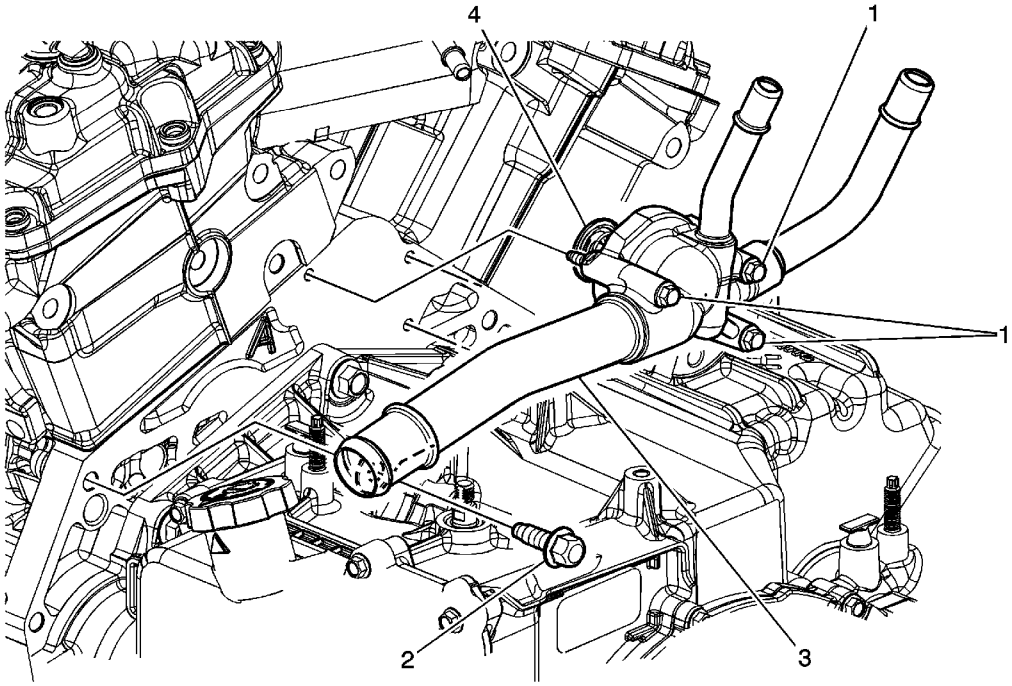
Cooling Fan and Shroud Replacement



Callout	Component Name
Preliminary Procedure 1. Remove front bumper impact bar. Refer to Front Bumper Impact Bar Replacement. 2. Remove radiator inlet hose at radiator. Refer to Radiator Inlet Hose Replacement. 3. Disconnect electrical connector at fan shroud harness. 4. Remove front fascia upper support. Refer to Front Bumper Fascia Upper Support Replacement. 5. Remove hood latch. Refer to Hood Primary and Secondary Latch Replacement. 6. Remove upper radiator mounting brackets and tip radiator forward for additional clearance.	
1	Fan Shroud Mounting Bolt (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Procedure** Remove small pushpin retainers. **Tighten** 10 N·m (89 lb in)

2	Fan Shroud **Procedure** Tilt fan shroud rearward and upward to remove. **Tip** Reposition of radiator hoses my be necessary for removal.

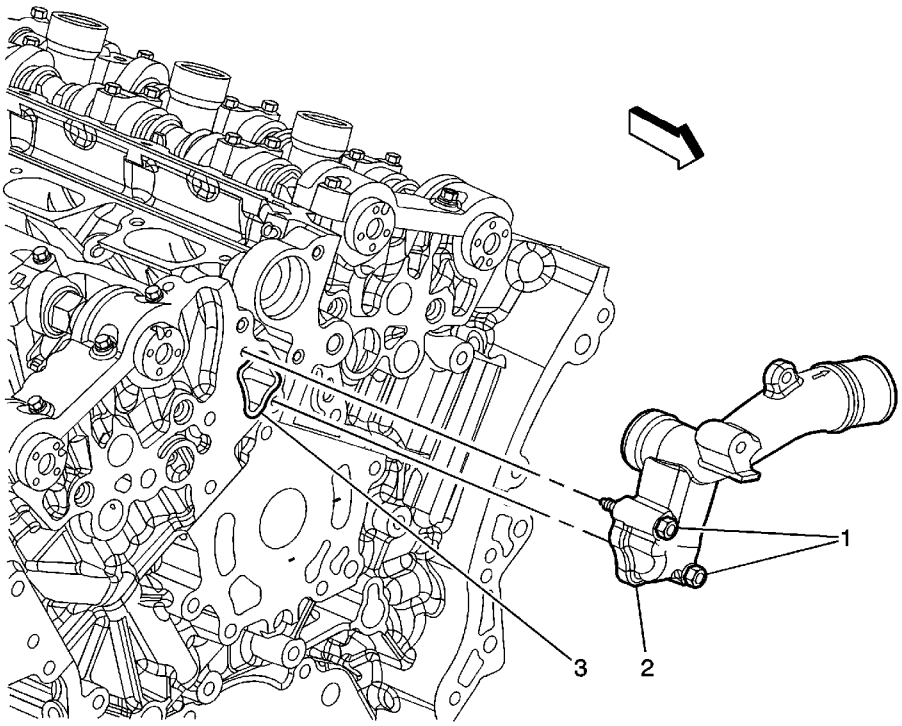
Engine Coolant Thermostat Replacement



Callout	Component Name
Preliminary Procedures 1. Partially drain the cooling system. Refer to Cooling System Draining and Filling. 2. Remove the air cleaner outlet duct. Refer to Air Cleaner Outlet Duct Replacement. 3. Remove the heater inlet and outlet hoses. Refer to Heater Inlet Hose Replacement and Heater Outlet Hose Replacement.	
1	Thermostat Housing Bolt (Qty: 3) **Caution:** Refer to Fastener Caution in the Preface section. **Procedure** Remove the thermostat housing bolts. **Tighten** 10 N·m (89 lb in)
	Thermostat Housing Bolt **Procedure**

2	Remove the thermostat housing bolt. **Tighten** 50 N·m (37 lb ft)
3	Thermostat Housing
4	Thermostat **Procedure** 1. Remove the thermostat and discard the thermostat gasket. 2. Install a new thermostat gasket.

Water Outlet Replacement



Callout	Component Name
Preliminary Procedures 1. Remove the radiator inlet hose. Refer to Radiator Inlet Hose Replacement. 2. Remove the right engine strut mount. Refer to Engine Mount Strut Replacement - Right Side. 3. Remove the right engine mount strut bracket. Refer to Engine Mount Strut Bracket Replacement - Right Side.	
1	Water Outlet Housing Bolt (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Procedure** Remove the water outlet housing bolts. **Tighten** 10 N·m (89 lb in)
2	Water Outlet Housing
	Seal

3	**Procedure** 1. Remove the water outlet housing seal. Discard the seal. 2. Install a new water outlet housing seal.

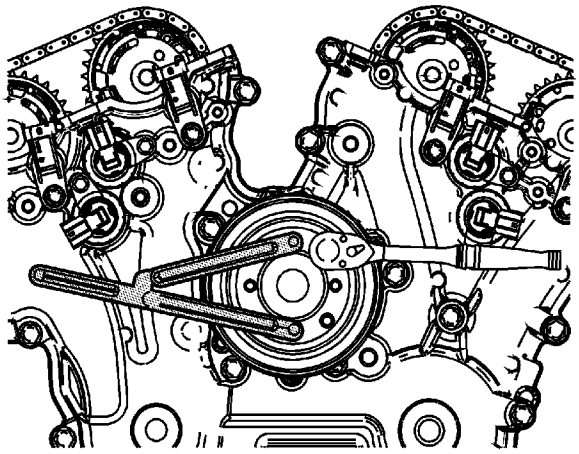
Water Pump Replacement

Special Tools

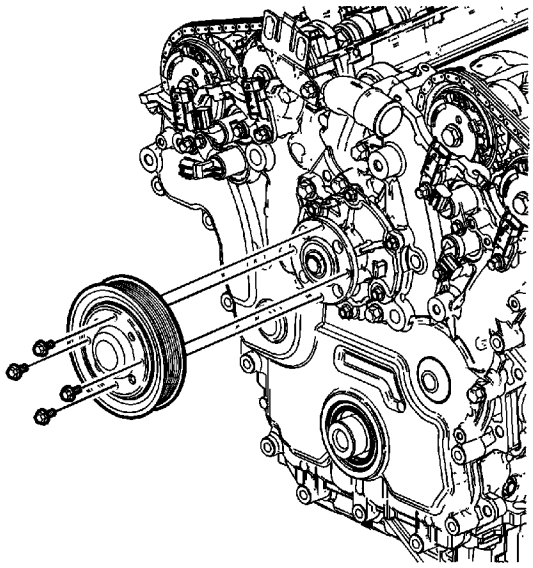
EN 46104 Water Pump Pulley Holding Tool

Removal Procedure

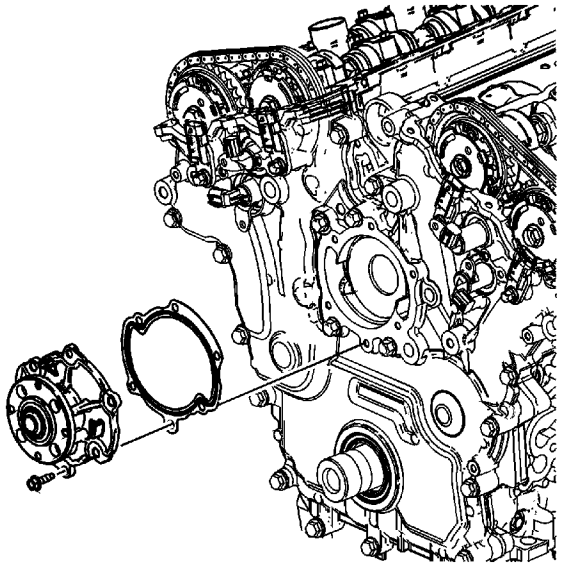
1. Drain the cooling system. Refer to Cooling System Draining and Filling .
2. Remove the drive belt. Refer to Drive Belt Replacement .
3. Remove the right engine strut mount. Refer to Engine Mount Strut Replacement - Right Side .
4. Remove the right engine mount strut bracket. Refer to Engine Mount Strut Bracket Replacement - Right Side .



5. Use the *EN 46104* tool in order to retain the water pump pulley.

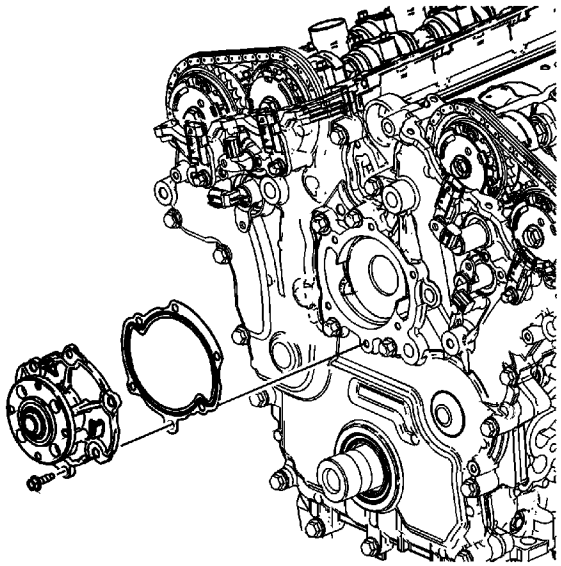


6. Remove the water pump pulley bolts.
7. Remove the water pump pulley.



8. Remove the water pump bolts.
9. Remove the water pump.
10. Remove and DISCARD the water pump seal.
11. Carefully clean the water pump sealing surfaces.

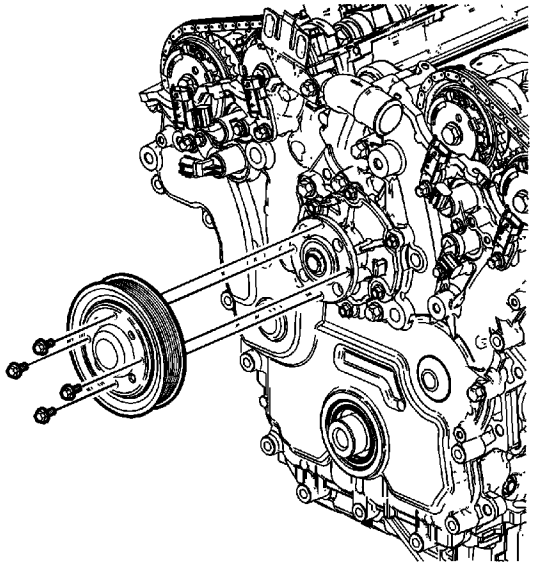
Installation Procedure



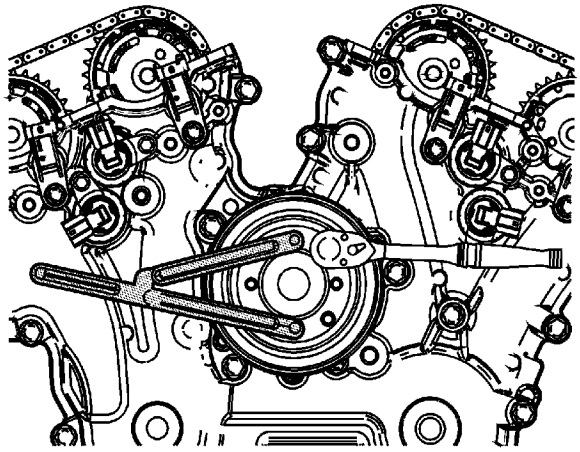
1. Install a NEW water pump seal.
2. Install the water pump.

Caution: Refer to Fastener Caution in the Preface section.

3. Install the water pump bolts and tighten to **10 N·m (89 lb in)** .

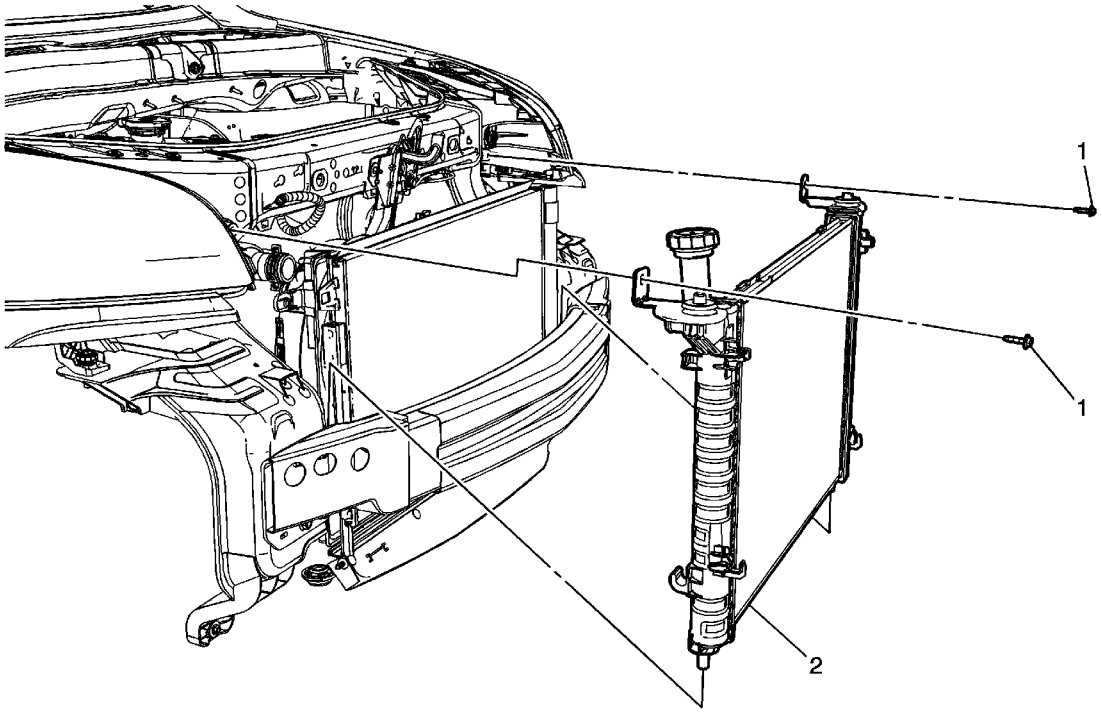


4. Install the water pump pulley and the water pump pulley bolts.



5. Use the *EN 46104* tool in order to retain the water pump pulley.
6. Install the water pump pulley bolts and tighten to **10 N·m (89 lb in)** .
7. Install the right engine strut mount. Refer to Engine Mount Strut Replacement - Right Side .
8. Install the right engine mount strut bracket. Refer to Engine Mount Strut Bracket Replacement - Right Side .
9. Install the drive belt. Refer to Drive Belt Replacement .
10. Fill the cooling system. Refer to Cooling System Draining and Filling .

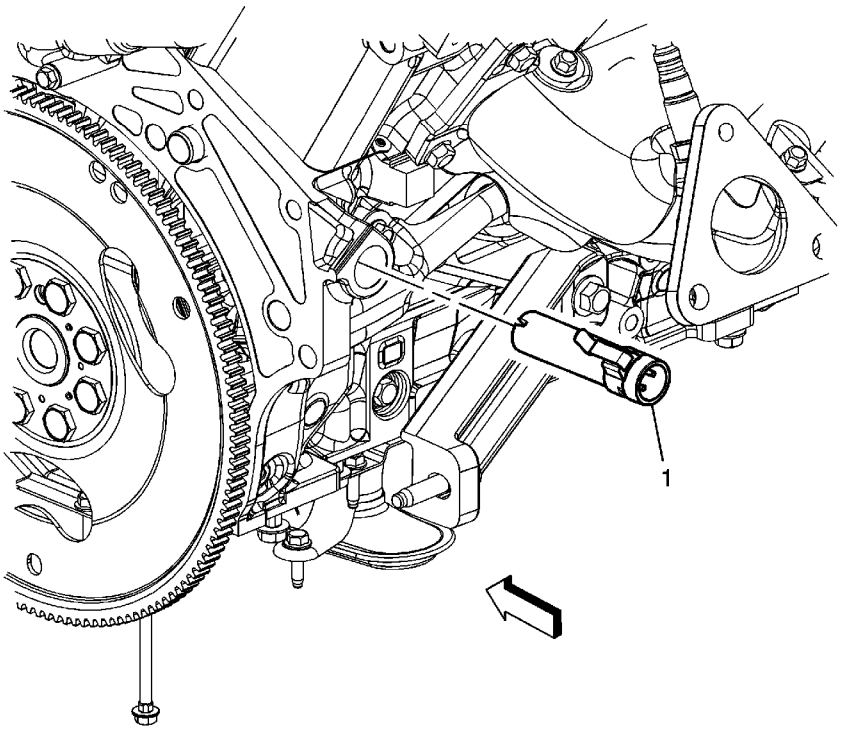
Radiator Replacement (Enclave)



Callout	Component Name
Preliminary Procedure 1. Drain the coolant. Refer to Cooling System Draining and Filling 2. Remove radiator inlet hose. Refer to Radiator Inlet Hose Replacement. 3. Remove radiator outlet hose. Refer to Radiator Outlet Hose Replacement. 4. Remove fan shroud top mounting bolts and pushpin from radiator and position fan shroud rearward. Refer to Cooling Fan and Shroud Replacement. 5. Remove transmission inlet cooling line from radiator. Refer to Transmission Fluid Cooler Inlet Hose Replacement. 6. Remove transmission outlet cooling line from radiator. Refer to Transmission Fluid Cooler Outlet Hose Replacement. 7. Remove coolant reservoir hose from radiator filler neck. 8. Pinch fastening tabs together at top of condenser to remove from radiator and position forward. 9. Remove side rubber air deflectors from radiator tanks.	
1	Radiator Mounting Bolt (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten**

	10 N·m (89 lb in)
2	Radiator **Tip** • Bottom of condenser mounts into holding fixtures at bottom of radiator. • Radiator will slide out between the condenser and fan shroud.

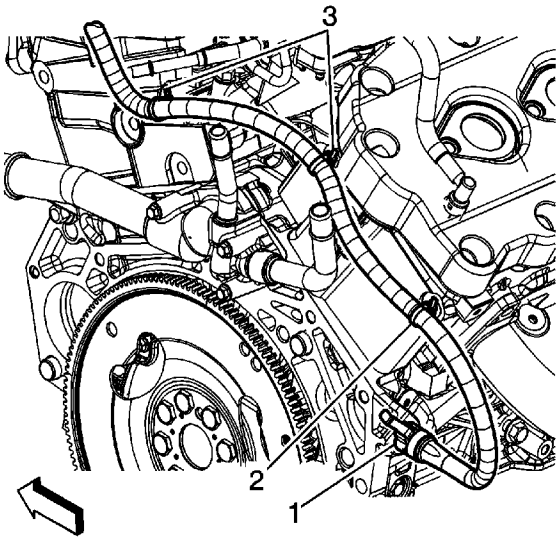
Coolant Heater Replacement



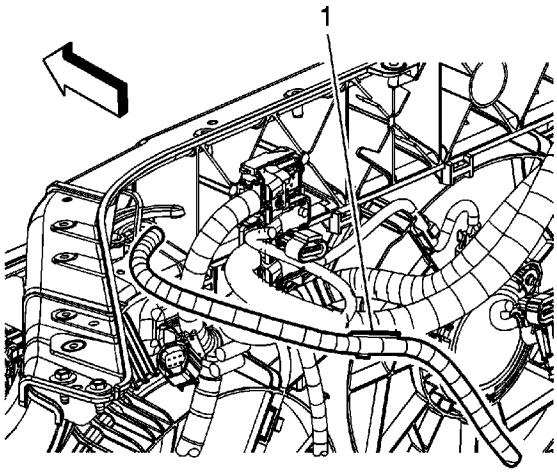
Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	Coolant Heater **Procedure** 1. Disconnect the coolant heater cord from the coolant heater. 2. Remove the coolant heater.

Coolant Heater Cord Replacement

Removal Procedure



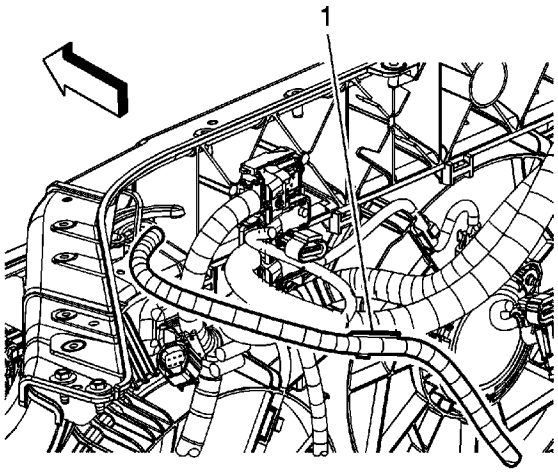
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Disconnect the coolant heater power supply cord from the coolant heater.
3. Lower the vehicle.
4. Disconnect the coolant heater cord clips (3) from the cylinder heads.



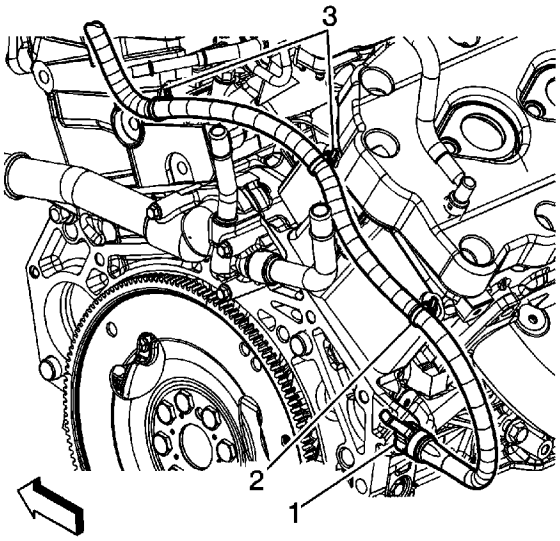
5. Disconnect the coolant heater cord clip from the engine wiring harness.

6. Remove the coolant heater cord (1) from the vehicle.

Installation Procedure



1. Position the coolant heater cord (1) to the engine harness.
2. Connect the coolant heater cord clip to the engine wiring harness.



3. Connect the coolant heater cord clips (3) to the cylinder heads.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Connect the coolant heater cord to the coolant heater.
6. Lower the vehicle.