

## Fastener Tightening Specifications

| Application                                                                 | Specification |           |
|-----------------------------------------------------------------------------|---------------|-----------|
|                                                                             | Metric        | English   |
| Air Cleaner Outlet Duct Clamp Screw (4.8L, 5.3L, and 6.0L)                  | 7 N·m         | 62 lb in  |
| Air Cleaner Outlet Duct Wingnut (4.3L)                                      | 3 N·m         | 27 lb in  |
| Bypass Pipe to Water Pump Bolt (6.6L)                                       | 21 N·m        | 16 lb ft  |
| Charged Air Cooler Duct Clamp (6.6L)                                        | 8 N·m         | 71 lb in  |
| Coolant Air Bleed Pipe Stud/Bolt (4.8L, 5.3L, and 6.0L )                    | 12 N·m        | 106 lb in |
| Coolant Heater (4.8L, 5.3L, 6.0L)                                           | 50 N·m        | 37 lb ft  |
| Coolant Heater Bolt (4.3L )                                                 | 2 N·m         | 18 lb in  |
| Coolant Heater Bolt (6.6L )                                                 | 2 N·m         | 18 lb in  |
| Coolant Heater Cord Bolt                                                    | 8 N·m         | 71 lb in  |
| Coolant Outlet Pipe Clip Bolt (6.6L)                                        | 9 N·m         | 80 lb in  |
| Coolant Recovery Reservoir Bolt                                             | 11 N·m        | 97 lb in  |
| Drive Belt Tensioner Bolt                                                   | 50 N·m        | 37 lb ft  |
| Engine Block Coolant Drain Plug (4.3L )                                     | 20 N·m        | 15 lb ft  |
| Engine Coolant Heater Cord Bracket Bolt                                     | 12 N·m        | 106 lb in |
| Engine Coolant Heater Cord Clip Bolt                                        | 12 N·m        | 106 lb in |
| Engine Coolant Temperature Sensor                                           | 20 N·m        | 15 lb ft  |
| Exhaust Gas Recirculation (EGR) Coolant Pipe Bole (6.6L)                    | 21 N·m        | 16 lb ft  |
| Fan and Clutch Retaining Nut to Water Pump Pulley (4.3L)                    | 57 N·m        | 42 lb in  |
| Fan and Water Pump Pulley Bolt (4.3L)                                       | 25 N·m        | 18 lb ft  |
| Fan Clutch Bolt (4.8L, 5.3L and 6.0L)                                       | 23 N·m        | 17 lb ft  |
| Fan Clutch Nut (4.8L, 5.3L and 6.0L)                                        | 56 N·m        | 41 lb ft  |
| Fan Clutch Retaining Bolts (4.3L)                                           | 33 N·m        | 24 lb ft  |
| Fan Pulley Bolt/Nut (6.6L)                                                  | 46 N·m        | 34 lb ft  |
| Fan Shroud Bolt                                                             | 9 N·m         | 80 lb in  |
| Fuel Line to Fuel Injection Control Module Bolt (6.6L)                      | 35 N·m        | 26 lb ft  |
| Heater Inlet Pipe to Fuel Filter Bolt (6.6L)                                | 21 N·m        | 16 lb ft  |
| Heater Inlet Pipe to Thermostat Bolt (6.6L)                                 | 21 N·m        | 16 lb ft  |
| Heater Outlet Hose Bracket Bolt (6.6L)                                      | 21 N·m        | 16 lb ft  |
| Oil Cooler Hose Adapter Bolt (4.8L, 5.3L and 6.0L)                          | 12 N·m        | 106 lb in |
| Oil Cooler Hose Bracket Bolt (4.8L, 5.3L and 6.0L)                          | 25 N·m        | 18 lb ft  |
| Oil Cooler Line Clip to Bracket Nut (4.3L)                                  | 12 N·m        | 106 lb in |
| Oil Cooler Line Fittings to the Oil Filter Base (4.3L)                      | 17 N·m        | 13 lb ft  |
| Oil Cooler Line Fittings to the Oil Filter Base (4.3L Auxiliary Oil Cooler) | 35 N·m        | 26 lb ft  |
| Oil Cooler Line Fittings to the Radiator (4.3L)                             | 24 N·m        | 18 lb ft  |
| Oil Level Indicator Tube and Transmission Fluid Fill Tube Lower Support     |               |           |

|                                                             |        |          |
|-------------------------------------------------------------|--------|----------|
| Bolt (4.3L)                                                 | 4 N·m  | 44 lb in |
| Radiator Bolt                                               | 25 N·m | 18 lb ft |
| Surge Tank Bolt/Nut                                         | 9 N·m  | 80 lb in |
| Thermostat Housing Bolt (4.3L)                              | 25 N·m | 18 lb ft |
| Thermostat Housing Bolt (4.8L, 5.3L, and 6.0L)              | 15 N·m | 11 lb ft |
| Thermostat Housing Cover Bolt (6.6L)                        | 21 N·m | 16 lb ft |
| Thermostat Housing Crossover Bolt (6.0L)                    | 21 N·m | 16 lb ft |
| Transmission Control Module (TCM) Cover Bolt                | 9 N·m  | 80 lb in |
| Transmission Control Module (TCM) Electrical Connector Bolt | 8 N·m  | 71 lb in |
| Turbocharger Coolant Bypass Valve (6.6L)                    | 60 N·m | 44 lb ft |
| Turbocharger Coolant Feed Pipe Bracket Bolt (6.6L)          | 21 N·m | 16 lb ft |
| Turbocharger Coolant Feed Pipe Nut (6.6L)                   | 9 N·m  | 80 lb in |
| Turbocharger Coolant Inlet Banjo Bolt (6.6L)                | 25 N·m | 18 lb ft |
| Turbocharger Coolant Outlet Pipe Bolt/Nut (6.6L)            | 9 N·m  | 80 lb in |
| Water Outlet Stud (4.3L Engine)                             | 25 N·m | 18 lb ft |
| Water Outlet Tube Bolt (6.6L)                               | 21 N·m | 16 lb ft |
| Water Pump Bolt (4.3L )                                     | 45 N·m | 33 lb ft |
| Water Pump Bolt (6.6L )                                     | 21 N·m | 16 lb ft |
| Water Pump Bolt (4.8L, 5.3L, and 6.0L)                      |        |          |
| First Pass                                                  | 15 N·m | 11 lb ft |
| Final Pass                                                  | 30 N·m | 22 lb ft |
| Water Pump Inlet Pipe Bolt (6.6L)                           | 21 N·m | 16 lb ft |
| Wiring Harness Bracket to Thermostat Housing Bolt (6.6L)    | 8 N·m  | 71 lb in |

## Cooling System Draining and Filling (Static Fill)

### Special Tools

- [J 26568](#) Coolant and Battery Tester
- [J 38185](#) Hose Clamp Pliers

### Draining Procedure

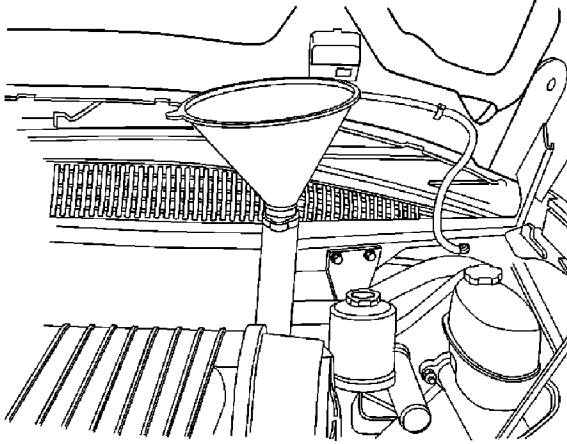
**Warning:** With a pressurized cooling system, the coolant temperature in the radiator can be considerably higher than the boiling point of the solution at atmospheric pressure. Removal of the surge tank cap, while the cooling system is hot and under high pressure, causes the solution to boil instantaneously with explosive force. This will cause the solution to spew out over the engine, the fenders, and the person removing the cap. Serious bodily injury may result.

1. Park the vehicle on a level surface.
2. Remove the coolant pressure cap.
3. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
4. Place a drain pan under the lower radiator hose.
5. Using the [J 38185](#) reposition the lower radiator hose clamp at the radiator.
6. Remove the lower radiator hose from the radiator.
7. Drain the cooling system.
8. If a complete engine block drain is required, remove the engine block drain plug.
9. Inspect the coolant.
10. 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. Connect the lower radiator hose.
2. Using the [J 38185](#) position the clamp into the original position on the hose.
3. If the engine block drain plug was removed, perform the following:
  - 3.1. Apply pipe sealer to the drain plug.
  - 3.2. Install the drain plug and tighten to **22 N·m (16 lb ft)**.
4. Lower the vehicle.
5. Using the [J 38185](#), position the upper radiator hose clamp at the radiator.
6. Remove the upper radiator hose from the radiator.
7. Remove the coolant air bleed hose from the radiator.



8. Place a funnel into the upper radiator hose.

**Note:** Use a 50/50 mixture of DEX-COOL antifreeze and deionized water.

9. Slowly fill the cooling system through the upper radiator hose with a 50/50 coolant mixture until the coolant comes out the coolant air bleed hose. Refer to [Approximate Fluid Capacities](#).
10. Connect the upper radiator hose to the radiator.
11. Using the [J 38185](#) position the radiator hose clamp into the original position on the hose.
12. Connect the coolant air bleed hose to the radiator.
13. Fill the radiator with coolant through the filler neck.
14. Install the coolant pressure cap.
15. Fill the coolant overflow bottle to the full line.
16. Start the engine.
17. Run the engine at 2,000-2,500 RPM until the engine reaches normal operating temperature.
18. Allow the engine to idle for 3 minutes.
19. Shut the engine OFF.
20. Allow the engine to cool.
21. Top off the coolant as necessary.
22. Inspect the concentration of the engine coolant, using the [J 26568](#).
23. Rinse away any excess coolant from the engine and the engine compartment.
24. Inspect the cooling system for leaks.

## Cooling System Draining and Filling (Vac N Fill)

### Special Tools

- [J 26568](#) Coolant and Battery Tester
- [GE-47716](#) Vac-N-Fill Coolant Refill Tool
- [J 42401](#) Radiator Cap and Surge Tank Test Adapter

### Draining Procedure

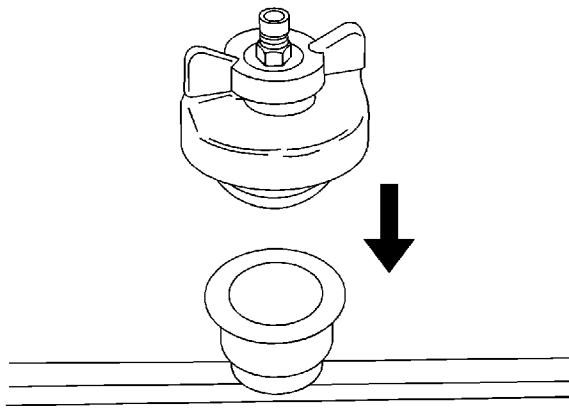
**Warning:** With a pressurized cooling system, the coolant temperature in the radiator can be considerably higher than the boiling point of the solution at atmospheric pressure. Removal of the surge tank cap, while the cooling system is hot and under high pressure, causes the solution to boil instantaneously with explosive force. This will cause the solution to spew out over the engine, the fenders, and the person removing the cap. Serious bodily injury may result.

1. Park the vehicle on a level surface.
2. Remove the coolant pressure cap.
3. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
4. Place a drain pan under the drain cock.
5. Open the radiator drain cock.
6. Drain the cooling system.
7. If a complete engine block drain is required, remove the engine block drain plug.
8. Inspect the coolant.
9. 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](#).

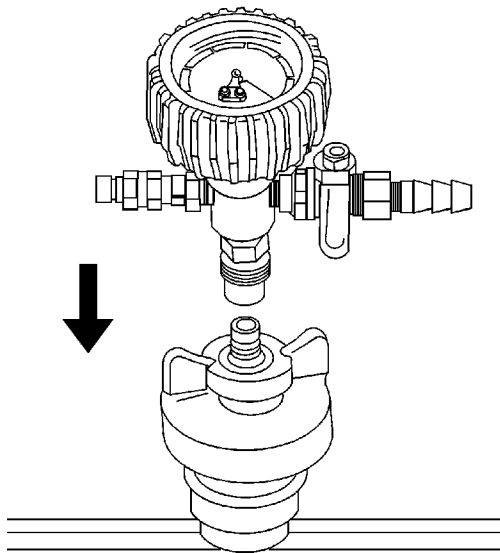
### Vac-N-Fill Procedure

**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.

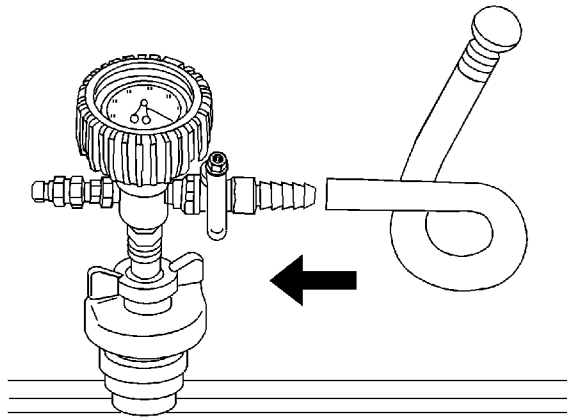
1. Install the [J 42401](#) .



2. Attach the Van-N-Fill cap to the vehicles coolant fill port.

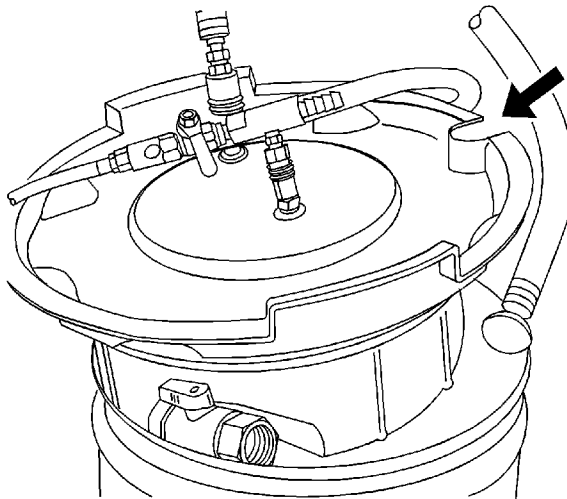


3. Attach the vacuum gage assembly to the Vac-N-Fill cap.



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

Ensure that the valve is closed.

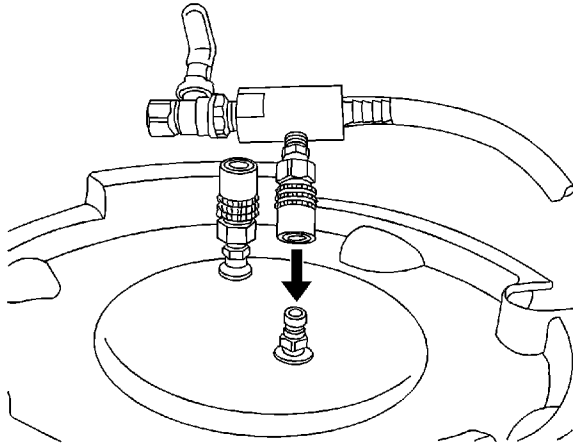


**Note:** Use a 50/50 mixture of DEX-COOL antifreeze and clean, drinkable water. Always use more coolant than necessary. This will eliminate air from being drawn into the cooling system.

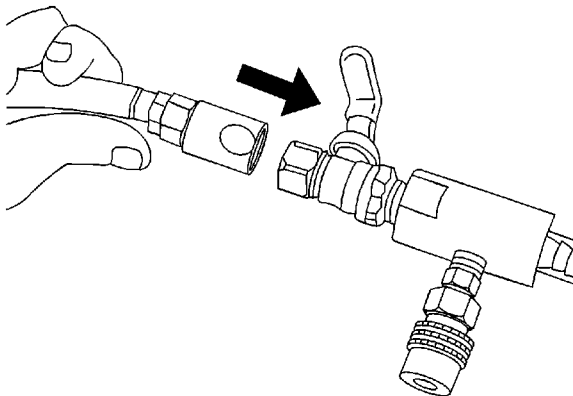
5. Pour the coolant mixture into the graduated reservoir.
6. Place the fill hose in the graduated reservoir.

**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.

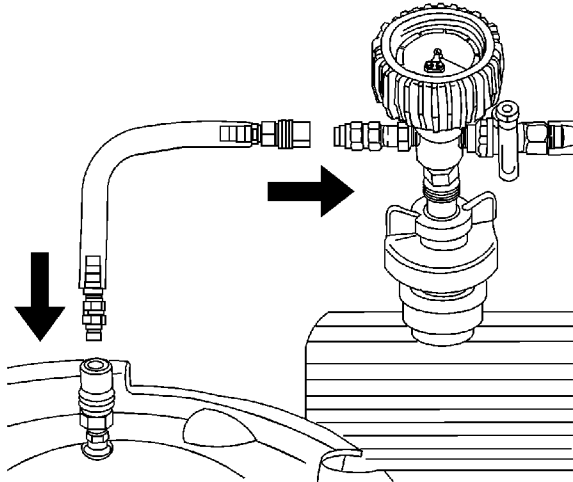


8. Attach the venture assembly to the vacuum tank.

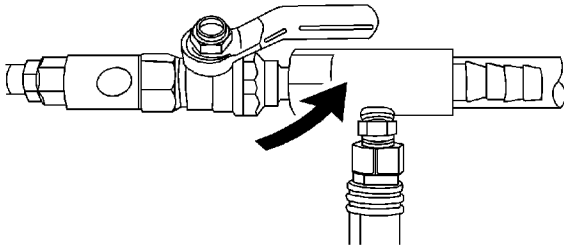


9. Attach a shop air hose to the venture assembly.

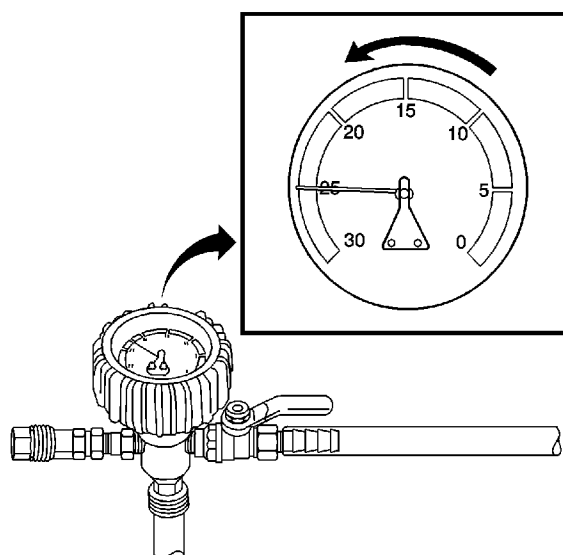
Ensure the valve on the venture assembly is closed.



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



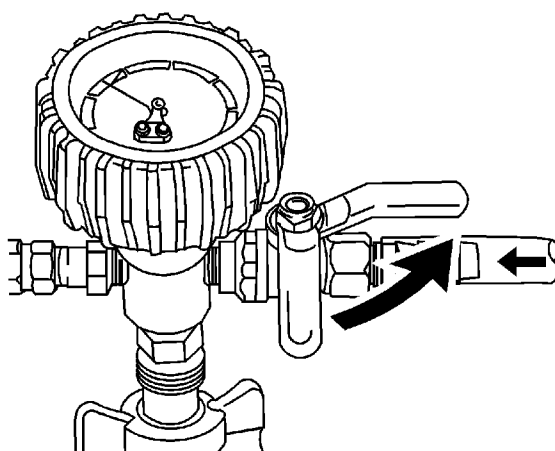
12. Open the valve on the venture assembly. The vacuum gage will begin to rise and a hissing noise will be present.



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.

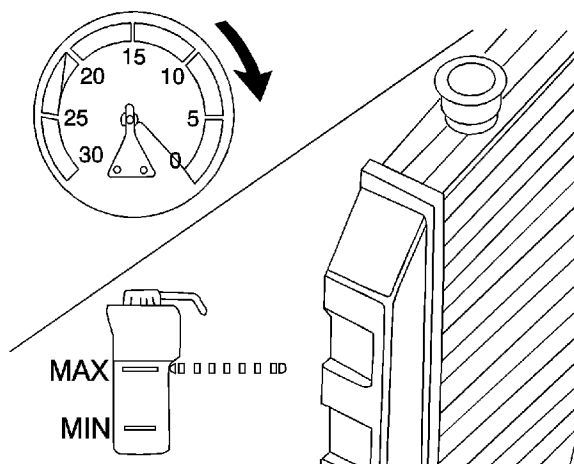
14. To aid in the fill process, position the graduated reservoir above the coolant fill port.



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 venture 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](#).

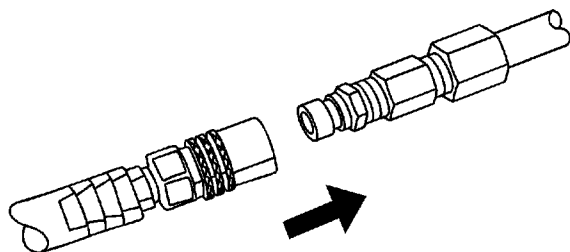
18. Open the valve on the vacuum gage assembly. The vacuum gage will drop as coolant is drawn into the system.



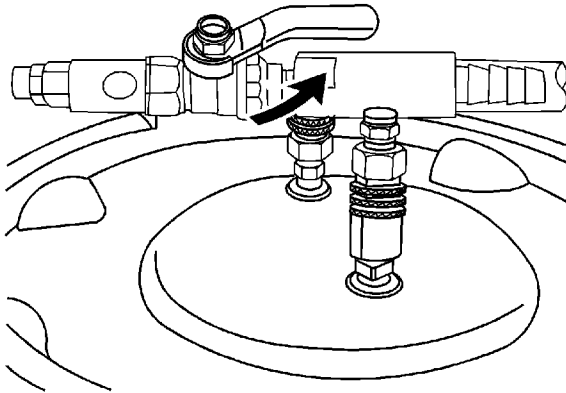
19. Once the vacuum gage reaches zero, close the valve on the vacuum gage assembly and repeat steps 11-17.
20. Remove the [J 42401](#).
21. Detach the Vac-N-Fill cap from the vehicles coolant fill port.
22. Add coolant to the system as necessary.
23. Inspect the concentration of the coolant mixture using [J 26568](#).

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

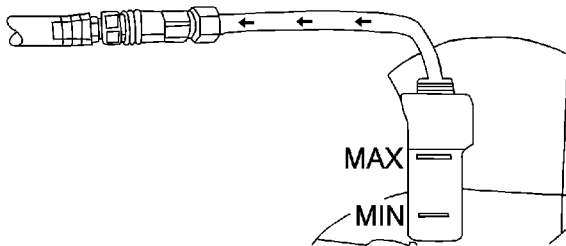
24. Detach the vacuum hose from the vacuum gage assembly.



25. Attach the extraction hose to the vacuum hose.



26. Open the valve on the venture 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.

## 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 instructions. However, always remove the thermostat before back flushing the system.
- 
1. Block the drive wheels.
  2. Place the transmission in park (P) or neutral (N).
  3. Engage the park brake.
  4. Run the engine until the thermostat opens.
  5. Stop the engine.
  6. Follow the drain and fill procedure using only clean drinkable water. Repeat the procedure if necessary, until the fluid is nearly colorless. Refer to [Cooling System Draining and Filling](#) .
  7. Fill the coolant surge tank to the FULL HOT mark. Refer to [Cooling System Draining and Filling](#) .

## Radiator Cleaning

An engine will overheat if the radiator has any of the following conditions:

- Leaks
- Dirt or obstructions in the core

Use a soft bristle brush and clean hot water or a mild detergent solution in order to clean the outside of the radiator core. A car wash or dishwashing liquid is a suitable detergent.

A common city water hose may also be used in order to clean the outside of the radiator. Remove the nozzle from the hose prior to use in order to prevent damage to the fins.

Use one of the following solutions in order to pressure flush and clean the inside of the core tubes:

- Clean hot water
- Mild car wash
- Dishwashing liquid

Use the following steps in order to test the radiator for restrictions:

1. Warm the engine.
2. Turn off the engine.
3. Feel the radiator.

The radiator should be hot along the left side and warm along the right side. There should be an even temperature rise from right to left.

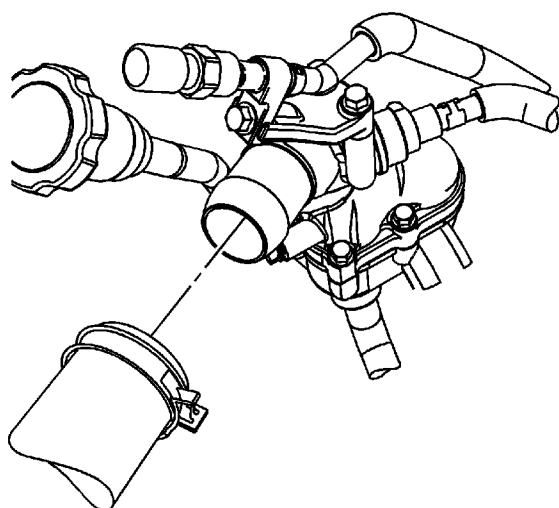
Cold spots in the radiator indicate clogged sections.

## Cooling Layer Removal

### Special Tools

[J 38185](#) Hose Clamp Piers

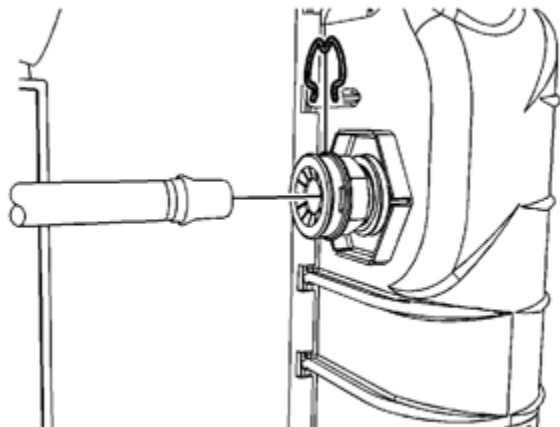
1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#) .
2. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#) .
3. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#) .
4. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) .
5. Remove the surge tank. Refer to [Radiator Surge Tank Replacement](#) .
6. Remove the front grille. Refer to [Grille Replacement](#) .
7. Remove the front bumper. Refer to [Front Bumper Replacement](#) .
8. Remove the charge air cooler inlet and outlet ducts. Refer to [Charged Air Cooler Hoses/Pipes Replacement](#) .



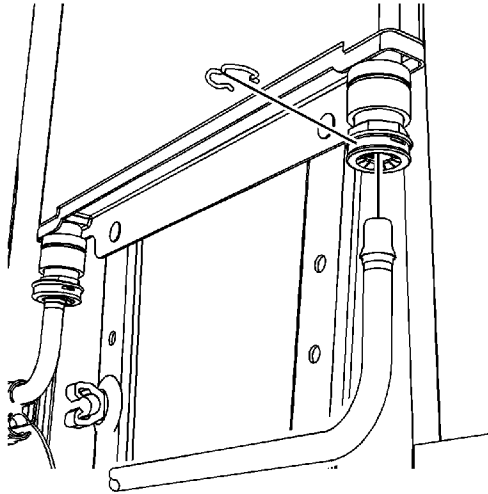
9. Using the [J 38185](#) , reposition the radiator inlet hose clamp.
10. Disconnect the radiator inlet hose from the thermostat housing.
11. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .



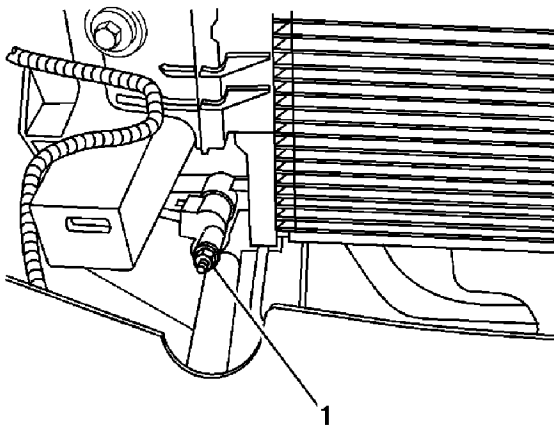
12. Remove the radiator outlet hose to radiator retaining clip and disconnect the hose.



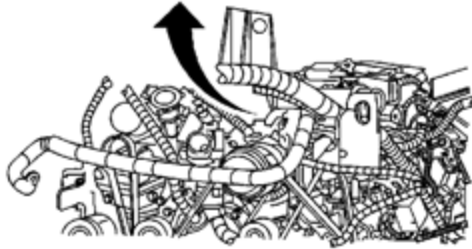
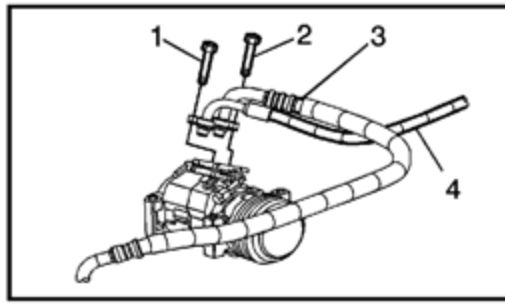
13. Remove the upper transmission cooler line to radiator retaining clip and disconnect the line.



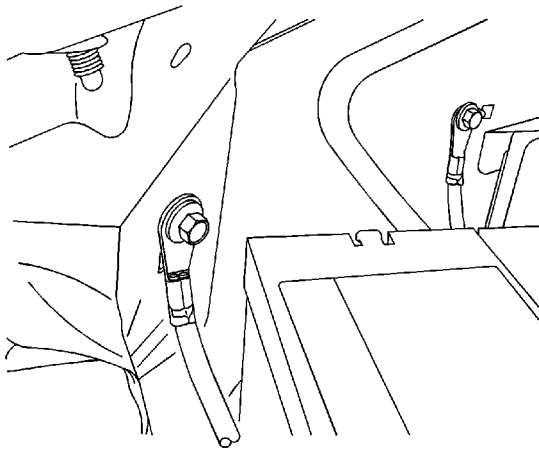
14. Remove the transmission cooler line to auxiliary transmission cooler retaining clip and disconnect the line.



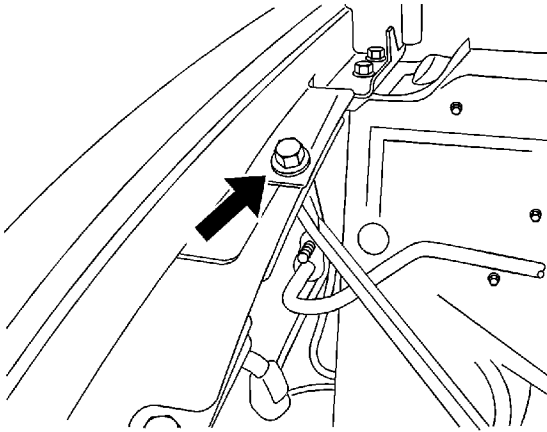
15. Remove the evaporator to condenser hose retaining nut (1).
16. Disconnect the evaporator to condenser hose from the condenser.



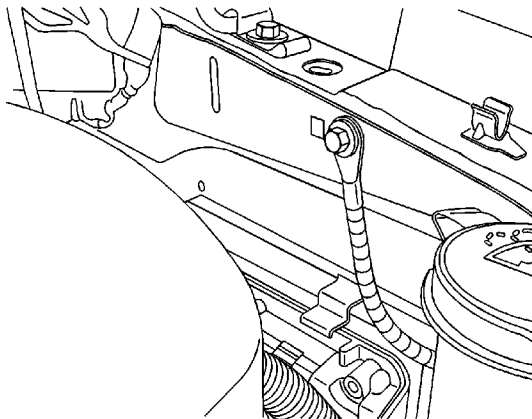
17. Remove the suction hose bolt (1) from the air conditioning (A/C) compressor.
18. Disconnect the suction hose (4) from the A/C compressor.



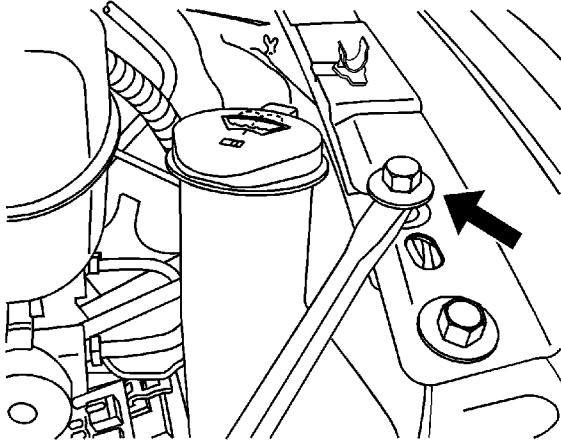
19. Disconnect the wiring ground located at the RH fender.



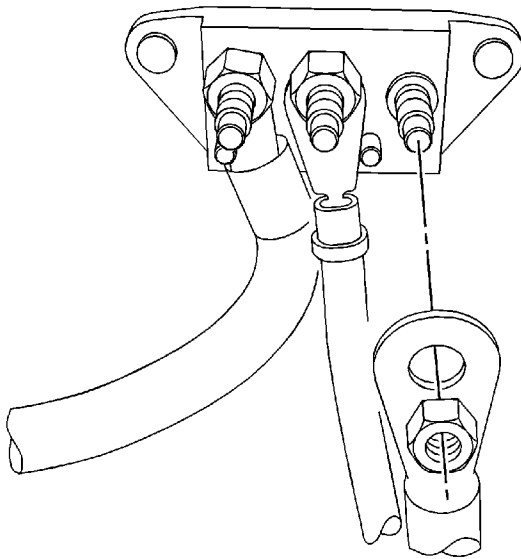
20. Remove the RH fender to core support brace bolts and remove the brace.



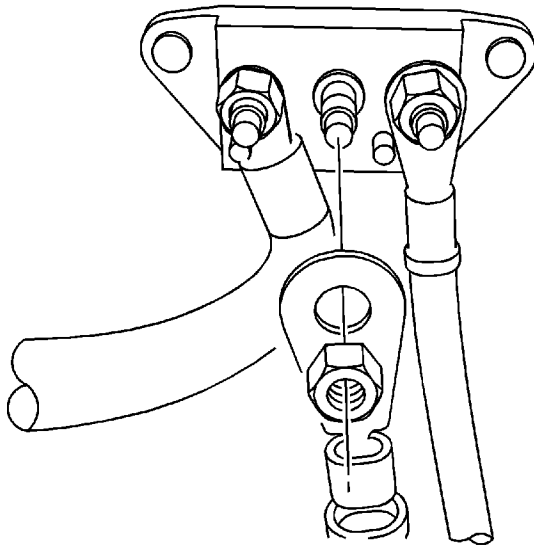
21. Disconnect the wiring ground located at the LH fender.



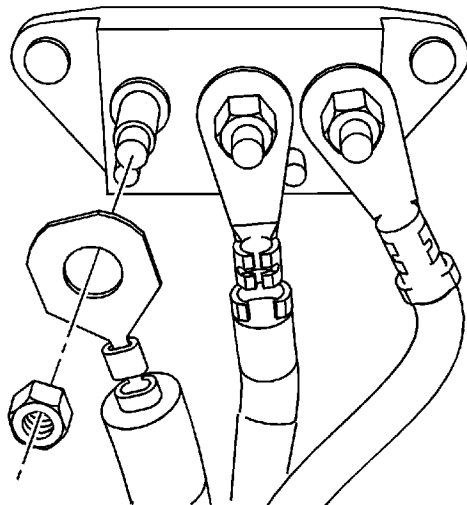
22. Remove the LH fender to core support brace bolts and remove the brace.
23. Disconnect the wiring harness electrical connector at the underhood based electrical center (UBEC).
24. Disconnect the hood release cable at the hood release latch. Position the cable aside.



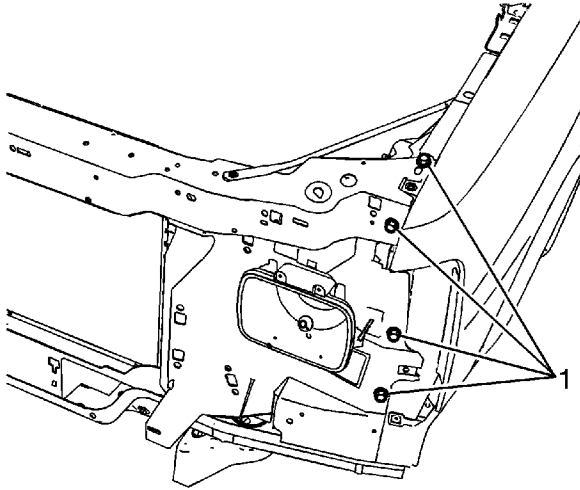
25. Remove the positive battery cable nut from the junction block and disconnect the cable.



26. Remove the auxiliary positive cable nut from the junction block and disconnect the cable.



27. Remove the positive battery to UBEC cable nut from the junction block and disconnect the cable.



28. Remove the 4 LH and 4 RH core support bolts (1).
29. Remove the core support and the cooling layer.

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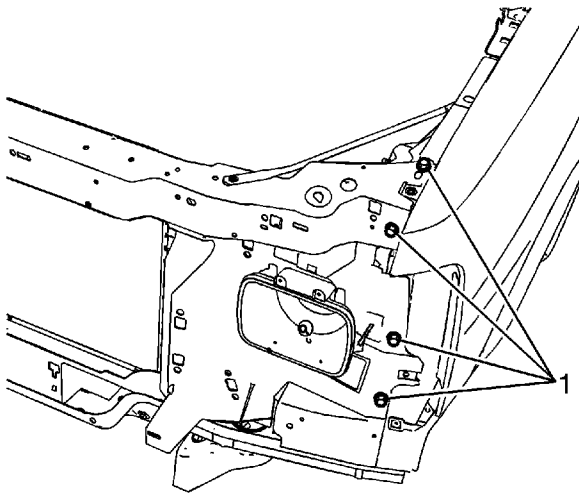
## Cooling Layer Installation

### Special Tools

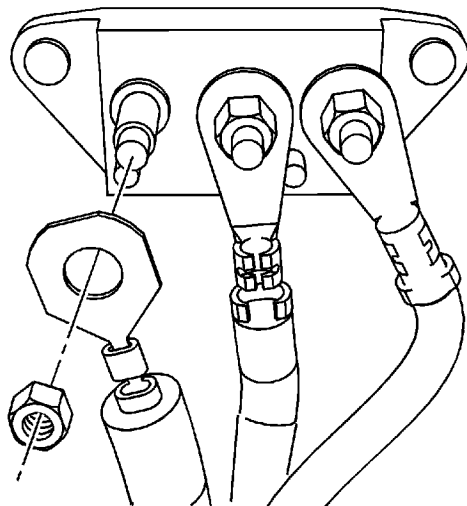
[J 38185](#) Hose Clamp Pliers

1. Position the core support and the cooling layer to the vehicle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

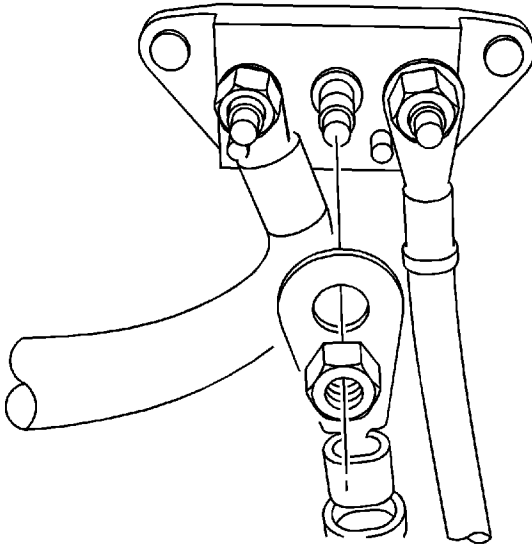


2. Install the 4 LH and RH core support bolts (1) and tighten to **25 N·m (18 lb ft)**.

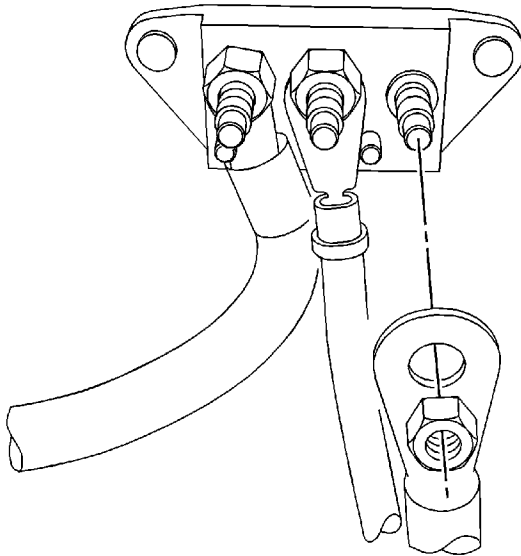




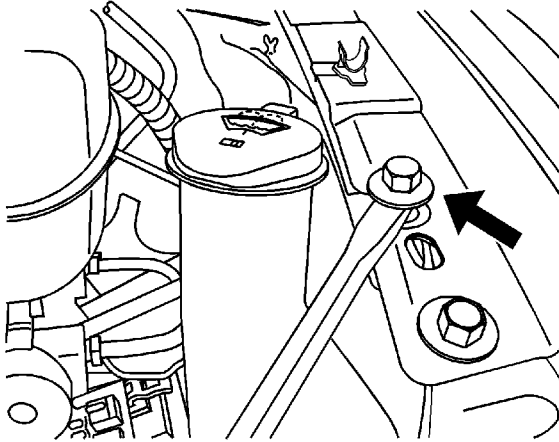
3. Position the positive battery to underhood based electrical center (UBEC) cable to the junction block and install the nut then tighten to **8 N·m (71 lb in)**.



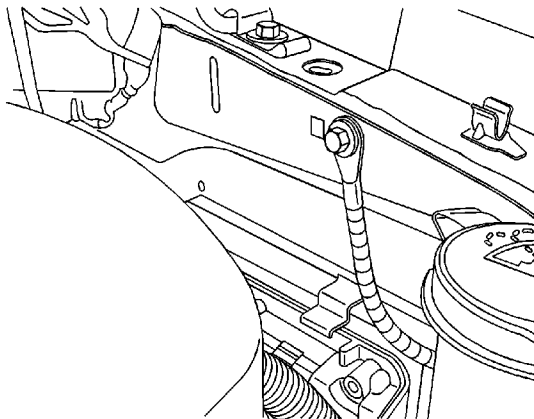
4. Position the auxiliary positive cable to the junction block and install the nut then tighten to **8 N·m (71 lb in)**.



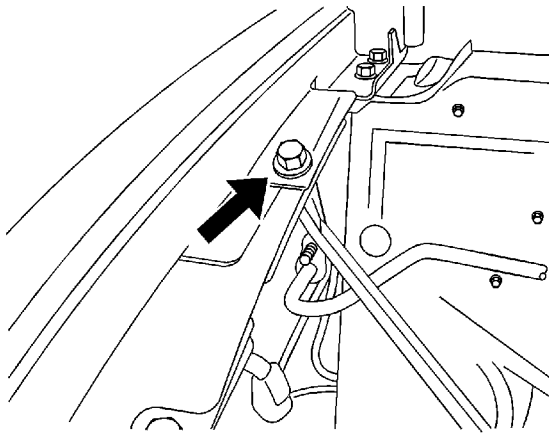
5. Position the positive battery cable to the junction block and install the nut then tighten to **8 N·m (71 lb in)**.
6. Reposition and connect the hood release cable to the hood release latch.
7. Connect the wiring harness electrical connector at the UBEC.



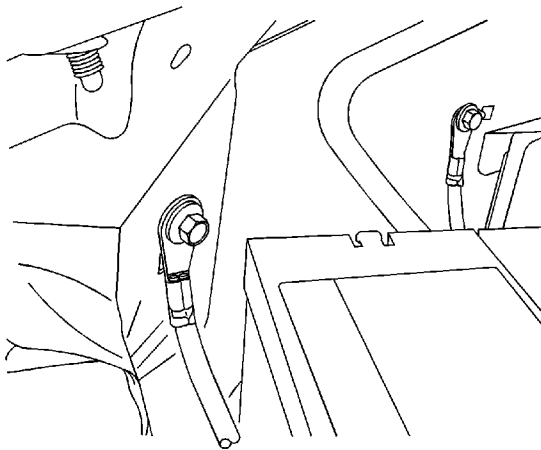
8. Position the LH fender to core support brace and install the bolts.



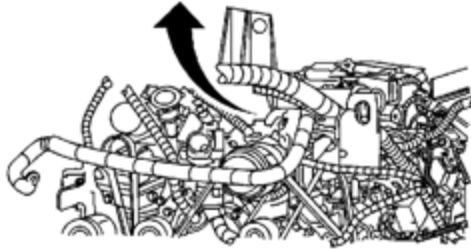
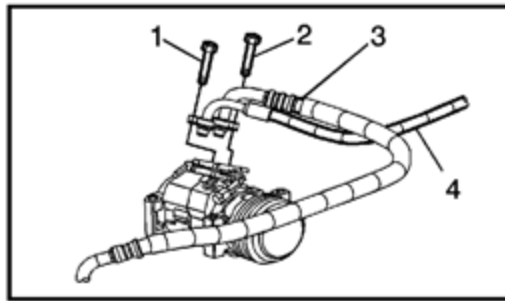
9. Position the wiring ground to the LH fender and install the bolt and tighten to **9 N·m (80 lb in)**.



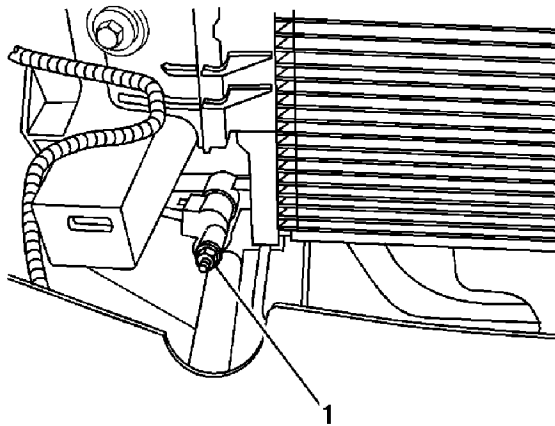
10. Position the RH fender to core support brace and install the bolts.



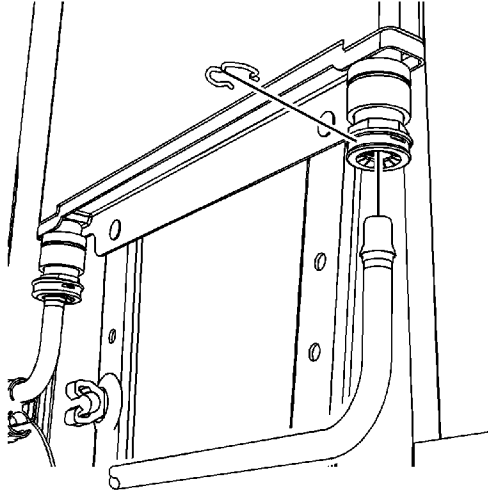
11. Position the wiring ground to the RH fender and install the bolt and tighten to **9 N·m (80 lb in)**.



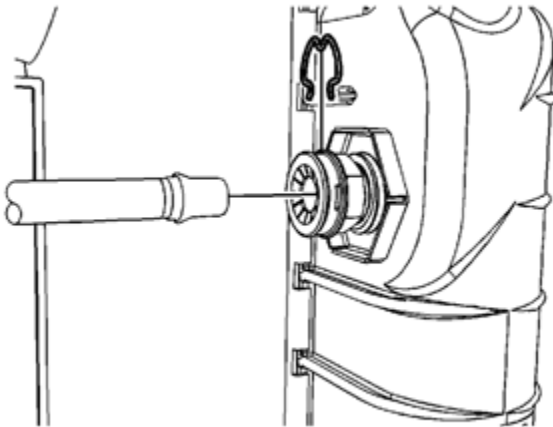
12. Connect the suction hose (4) to the air conditioning (A/C) compressor.
13. Install the suction hose bolt (1) to the A/C compressor and tighten to **16 N·m (12 lb ft)**.
14. Position the evaporator to condenser hose to the condenser.



15. Install the evaporator to condenser hose nut (1) and tighten to **16 N·m (12 lb ft)**.



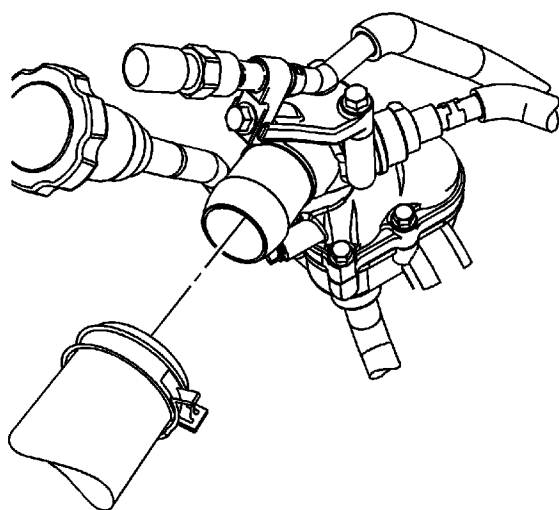
16. Position the transmission cooler line to the auxiliary transmission cooler and install the retaining clip.



17. Position the upper transmission cooler line to the radiator and install the retaining clip.  
18. Lower the vehicle.



19. Position the radiator outlet hose to radiator and install the retaining clip.
20. Connect the radiator inlet hose to the radiator.



21. Using the [J 38185](#) , reposition the radiator inlet hose clamp.
22. Install the charge air cooler inlet and outlet ducts. Refer to [Charged Air Cooler Hoses/Pipes Replacement](#).
23. Install the front bumper. Refer to [Front Bumper Replacement](#).
24. Install the front grille. Refer to [Grille Replacement](#).
25. Install the surge tank. Refer to [Radiator Surge Tank Replacement](#).
26. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
27. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
28. Recharge the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
29. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

# Radiator Surge Tank Replacement

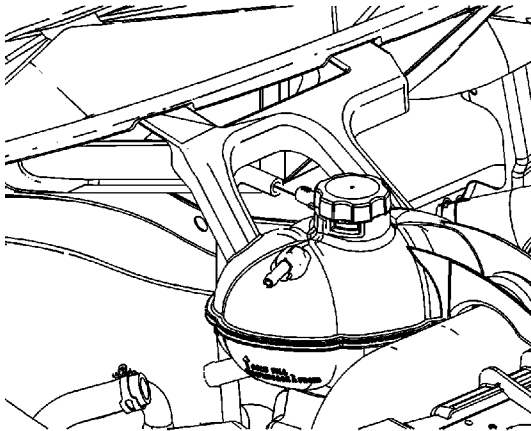
## Removal Procedure

### Special Tools

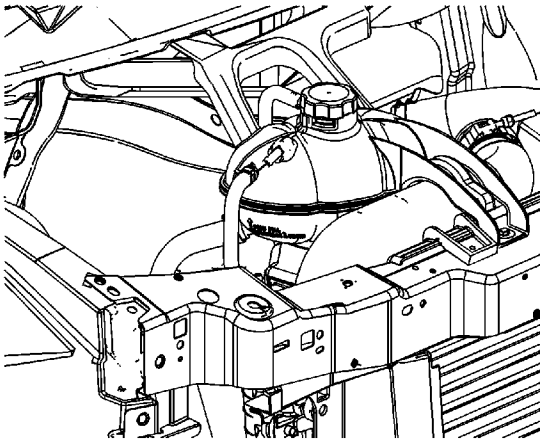
[J 38185](#) Hose Clamp Pliers

**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.

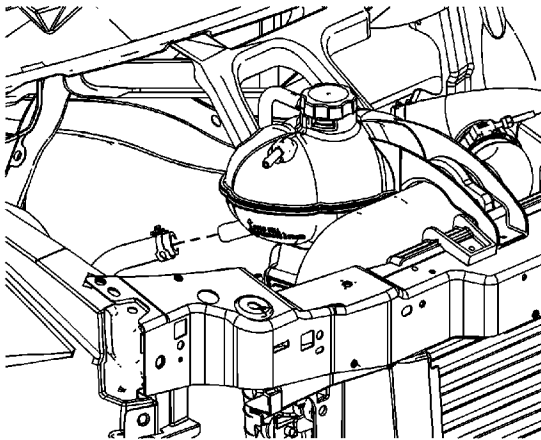
1. Partially drain the cooling system. Refer to [Cooling System Draining and Filling](#).



2. Remove the overflow hose from the surge tank.

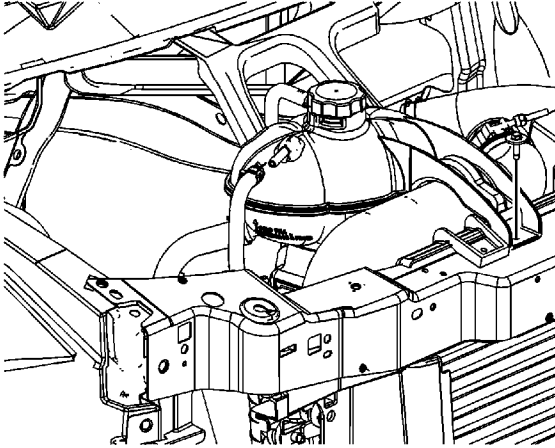


3. Using [J 38185](#) , reposition the surge tank inlet hose clamp.
4. Remove the surge tank inlet hose from the surge tank.

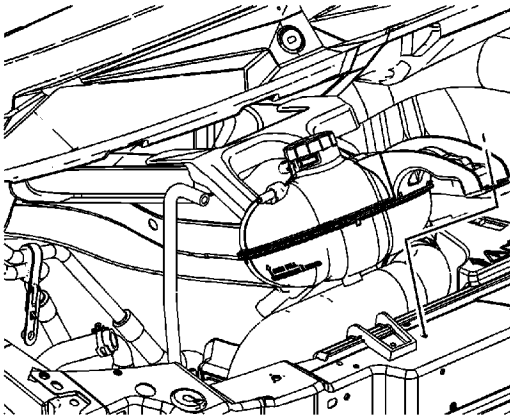


5. Using [J 38185](#) , reposition the surge tank outlet hose clamp.
6. Disconnect the surge tank outlet hose from the surge tank.

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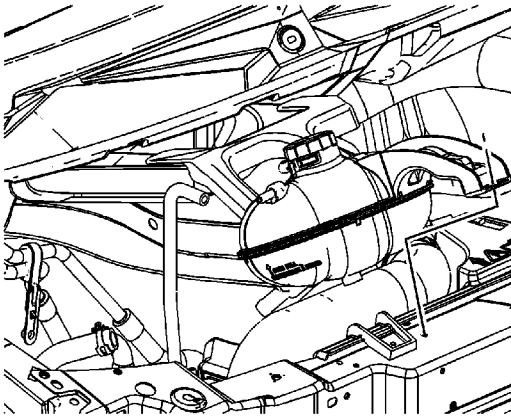


7. Remove the surge tank retaining bolt.



8. Tilt the surge tank assembly and disconnect the surge tank electrical connector.
9. Remove the surge tank from the vehicle.

## **Installation Procedure**

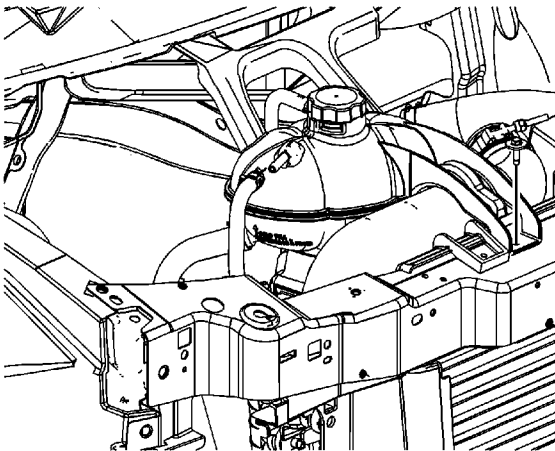


1. Connect the surge tank electrical connector.

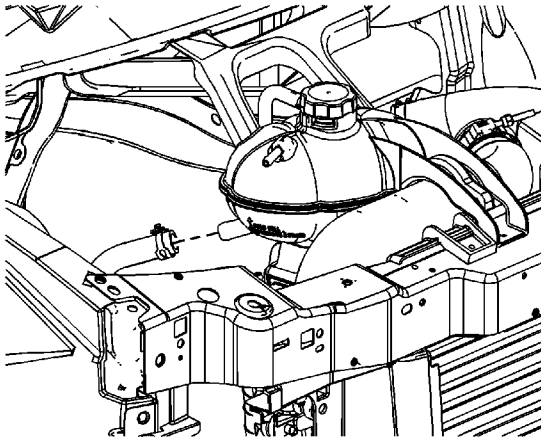
**Note:** Lubricate the inside diameters of the hoses with clean coolant prior to installation.

2. Install the surge tank to the vehicle.

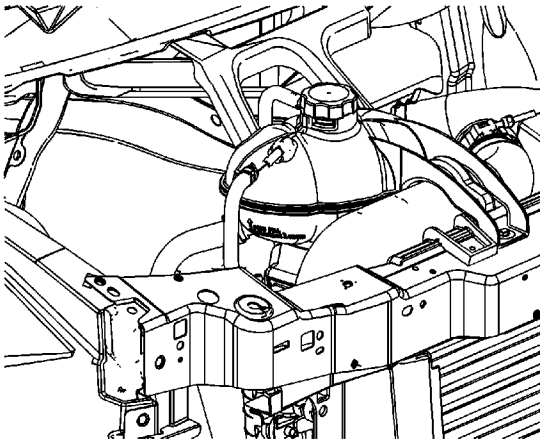
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



3. Install the surge tank retaining bolt and tighten to **9 N·m (80 lb in)**.

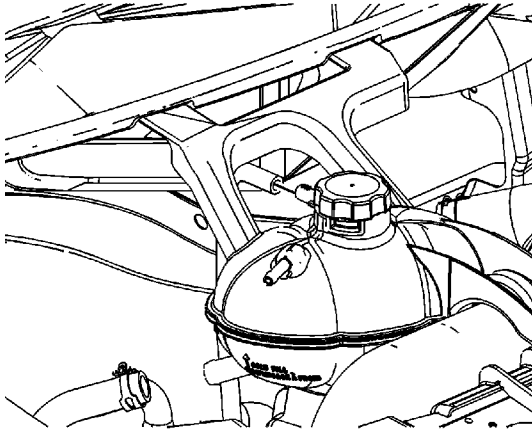


4. Install the surge tank outlet hose to the surge tank.
5. Using [J 38185](#) , reposition the surge tank outlet hose clamp.



6. Install the surge tank inlet hose to the surge tank.
7. Using [J 38185](#) , reposition the surge tank inlet hose clamp.

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8. Install the overflow hose to the surge tank.
9. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

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## Coolant Recovery Reservoir Replacement

### Removal Procedure

1. Partially drain the coolant. Refer to [Cooling System Draining and Filling](#).
2. Disconnect the hose from the coolant recovery reservoir.
3. Remove the coolant recovery reservoir retaining screws.
4. Remove the coolant recovery reservoir.

### Installation Procedure

1. Install the coolant recovery reservoir.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the coolant recovery reservoir retaining screws and tighten to **6 N·m (53 lb in)**.
3. Connect the hose to the coolant recovery reservoir.
4. Add coolant to reservoir. Refer to [Cooling System Draining and Filling](#).

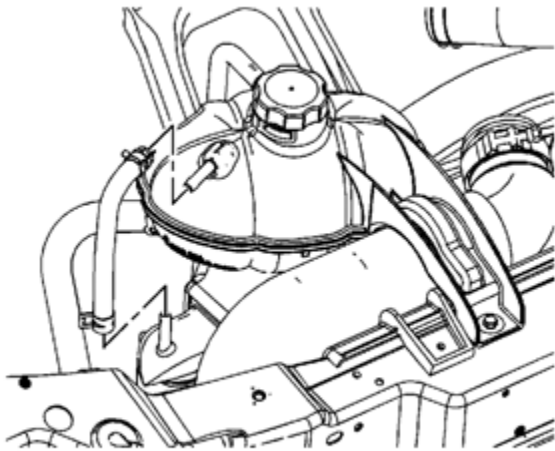
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## Radiator Surge Tank Inlet Hose / Pipe Replacement

### Removal Procedure

### Special Tools

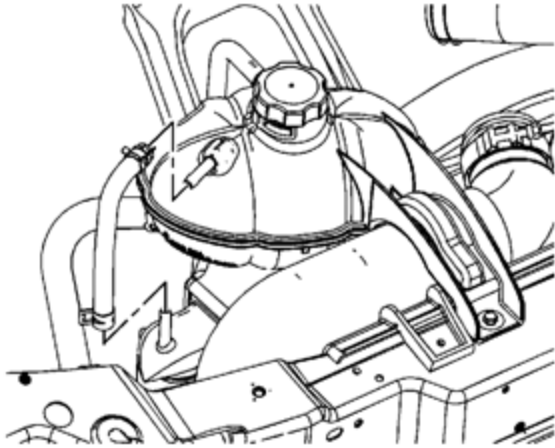
[J 38185](#) Hose Clamp Pliers



**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. Partially drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Using [J 38185](#) reposition the surge tank inlet hose clamps.
3. Remove the surge tank inlet hose from the surge tank.
4. Remove the surge tank inlet hose from the radiator.

### Installation Procedure



**Note:** Lubricate the inside diameters of the hoses with clean coolant prior to installation.

1. Install the surge tank inlet hose to the radiator.
2. Install the surge tank inlet hose to the surge tank.
3. Using [J 38185](#) reposition the surge tank inlet hose clamp.
4. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

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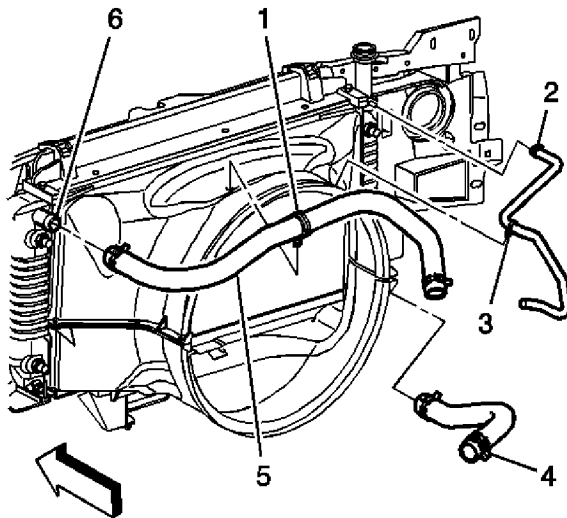
## Radiator Inlet Hose Replacement (LU3, LR4, LM7, LQ4)

### Tools Required

[J 38185](#) Hose Pliers

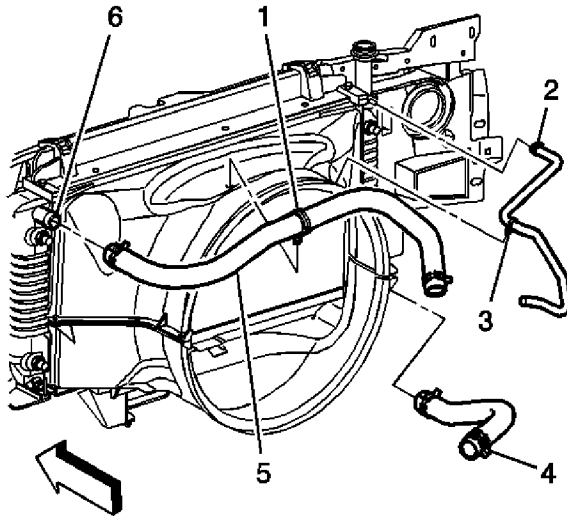
### Removal Procedure

1. Partially drain the cooling system. Refer to [Cooling System Draining and Filling](#) .
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) .
3. Reposition the clamp from the radiator inlet using the [J 38185](#) .
4. Reposition the clamp from the engine using the [J 38185](#) .
5. Remove the radiator inlet hose from the radiator.
6. Remove the radiator inlet hose from the engine.



7. Remove the radiator inlet hose (5).

### Installation Procedure



1. Install the radiator inlet hose (5).
2. Install the radiator inlet hose to the radiator.
3. Install the radiator inlet hose to the engine.
4. Position the hose clamp from the engine using the [J 38185](#) .
5. Position the hose clamp from the radiator inlet engine the [J 38185](#) .
6. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
7. Fill the cooling system. Refer to [Cooling System Draining and Filling](#) .

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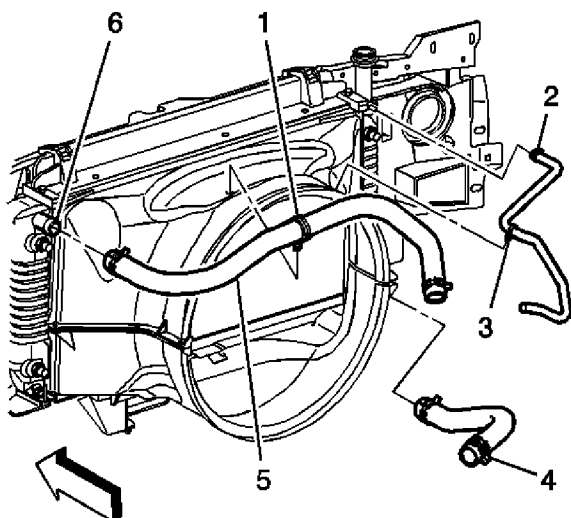
## Radiator Outlet Hose Replacement (LR4, LM7, LQ4)

### Tools Required

[J 38185](#) Hose Clamp Pliers

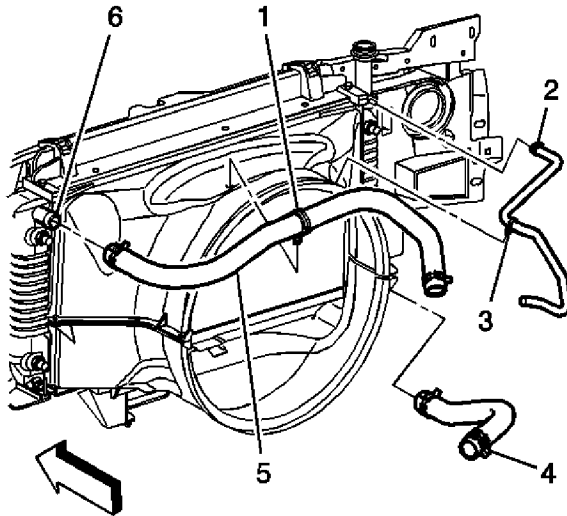
### Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#) .
2. Remove the clamp at the radiator outlet using the [J 38185](#) .
3. Remove the radiator outlet hose clamp at the engine using the [J 38185](#) .
4. Remove the radiator outlet hose clamp at the coolant recovery reservoir using the [J 38185](#) .
5. Remove the radiator outlet hose from the coolant recovery reservoir.
6. Remove the radiator outlet hose from the radiator.
7. Remove the radiator outlet hose from the engine.



8. Remove the radiator outlet hose (4).

### Installation Procedure



1. Install the radiator outlet hose (4).
2. Install the radiator outlet hose to the engine.
3. Install the radiator outlet hose to the radiator.
4. Install the radiator outlet hose to the coolant recovery reservoir.
5. Install the radiator outlet hose clamp to the coolant recovery reservoir using the [J 38185](#).
6. Install the radiator outlet hose clamp to the engine using the [J 38185](#).
7. Install the radiator outlet clamp to the radiator outlet using the [J 38185](#).
8. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

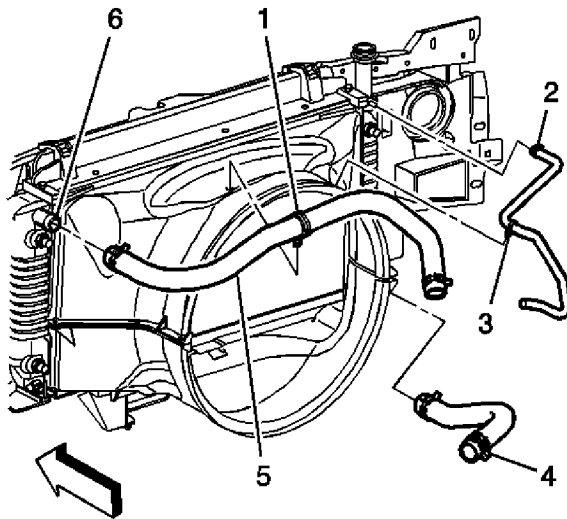
## Radiator Outlet Hose Replacement (LU3)

### Tools Required

[J 38185](#) Hose Clamp Pliers

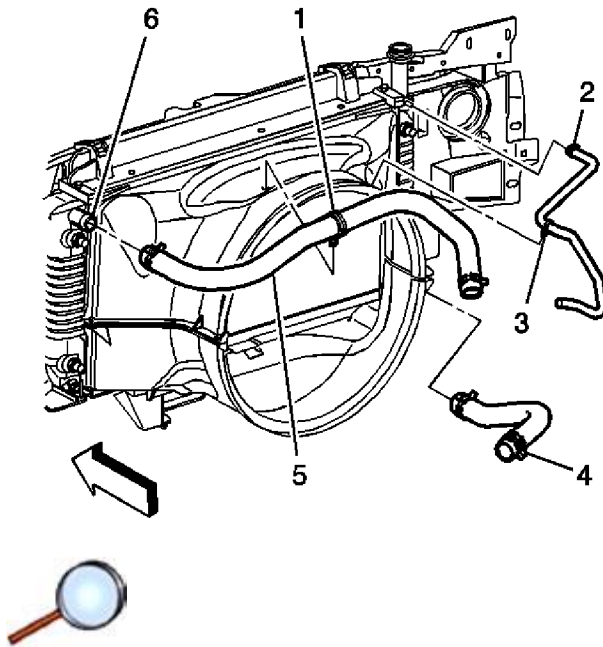
### Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#) .
2. Remove the clamp at the radiator outlet using the [J 38185](#) .
3. Remove the radiator outlet hose clamp at the engine using the [J 38185](#) .
4. Remove the radiator outlet hose clamp at the coolant recovery reservoir using the [J 38185](#) .
5. Disconnect the radiator outlet hose from the radiator. Refer to [Radiator Hose Quick Connect Fitting](#)
6. Disconnect the radiator outlet hose from the engine.



7. Remove the radiator outlet hose (4) from the engine compartment.

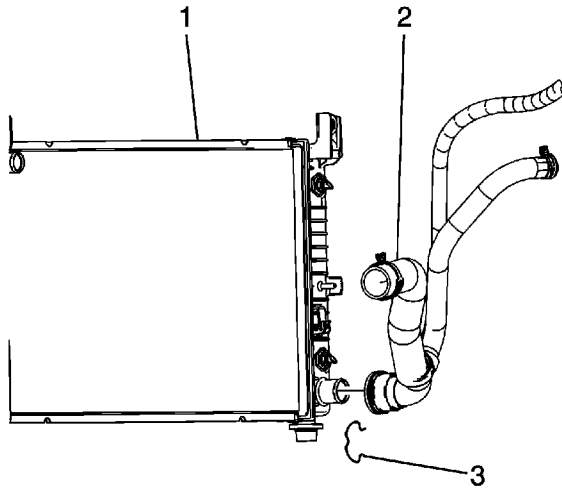
### Installation Procedure



1. Install the radiator outlet hose (4) into the engine compartment.
2. Connect the radiator outlet hose to the engine.
3. Connect the radiator outlet hose to the radiator. Refer to [Radiator Hose Quick Connect Fitting](#)
4. Install the radiator outlet hose to the coolant recovery reservoir.
5. Install the radiator outlet hose clamp to the coolant recovery reservoir using the [J 38185](#).
6. Install the radiator outlet hose clamp to the engine using the [J 38185](#).
7. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

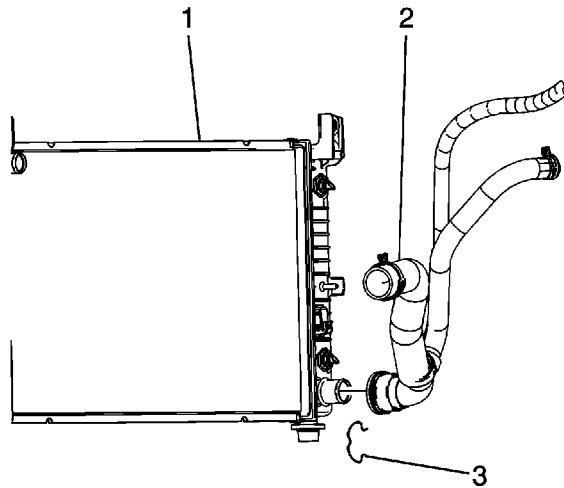
## Radiator Hose Quick Connect Fitting

### Removal Procedure



1. Using a bent-tip screwdriver or equivalent, pull on one of the open ends of the retaining ring in order to rotate the retaining ring.
2. Rotate the retaining ring (3) around the quick connector until the retaining ring is out of position and can be completely removed.
3. Remove the radiator outlet hose (2) from the quick connector fitting at the radiator (1).

### Installation Procedure



**Important:** Do not install the retaining ring (3) onto the fitting by pushing the retaining ring down over the fitting.

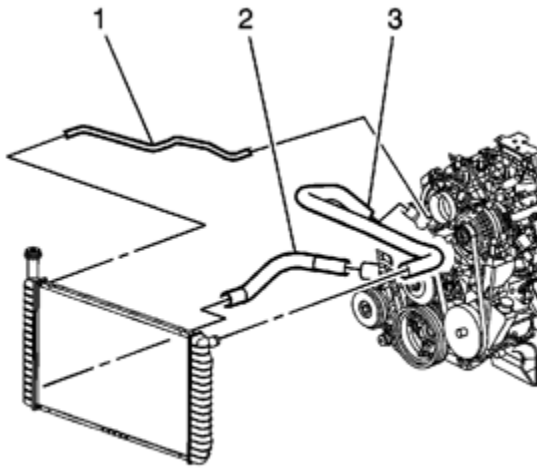
1. Hook one of the open ends of the retaining ring (3) in one of the slots in the quick connector.
2. Rotate the retaining ring (3) around the connector until the retaining ring is positioned with all 3 ears through the 3 slots.
3. Ensure the 3 retaining ring ears can be seen from the inside of the connector and the retaining ring can move freely in the slots.
4. Install the radiator outlet hose (2) onto the radiator quick connector fitting until a click is heard or felt.

Pull back on the radiator outlet hose (2) to ensure a proper connection.

## Radiator Vent Inlet Hose Replacement

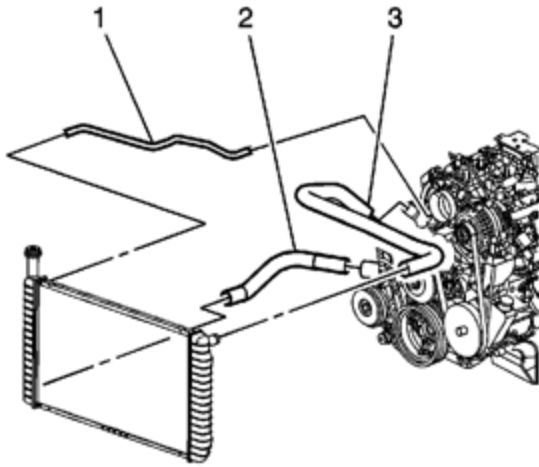
### Removal Procedure

1. Drain the coolant from the reservoir. Refer to [Cooling System Draining and Filling](#) .
2. Remove the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#) .



3. Remove the vent hose from the throttle body.
4. Remove the vent hose from the radiator.
5. Remove the vent hose (1) from the vehicle.

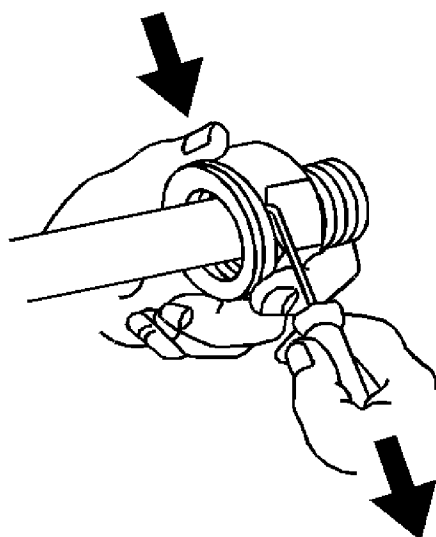
### Installation Procedure



1. Install the vent hose (1) to the vehicle.
2. Connect the vent hose to the radiator.
3. Connect the vent hose to the throttle body.
4. Install the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#) .
5. Fill the reservoir with coolant. Refer to [Cooling System Draining and Filling](#) .

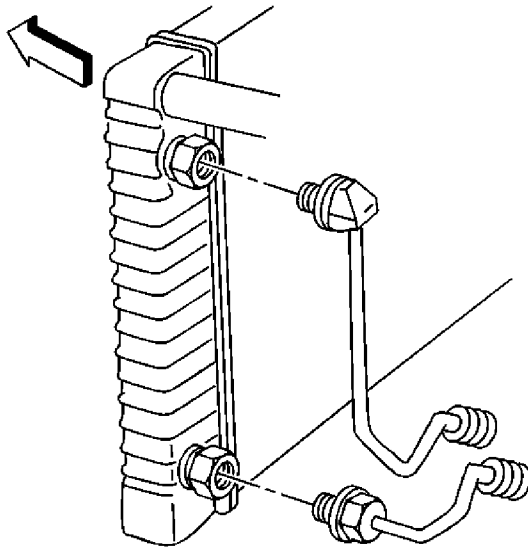
## Engine Oil Cooler Pipe / Hose Quick Connect Fitting Replacement

### Removal Procedure



1. Disengage the plastic caps from the quick connect fittings. Pull the caps back along the pipe.
2. Using a bent-tip screwdriver or equivalent, pull on one of the open ends of the retaining ring in order to rotate the retaining ring.
3. Rotate the retaining ring around the quick connector until the retaining ring is out of position and can be completely removed.

Discard the retaining rings.

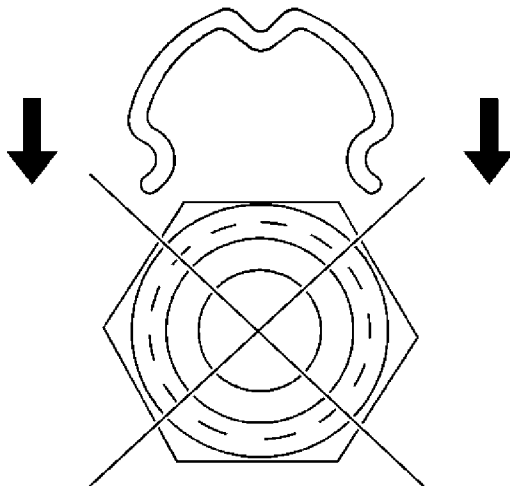


4. Remove the engine oil cooler line from the quick connector fitting at the radiator.

Pull the lines straight out from the connectors.

5. Clean all of the components in a suitable solvent, and dry them with compressed air.
6. Inspect the fittings, the connectors, the cooler lines, and the cooler for damage, distortion, or restriction. Replace parts as necessary.

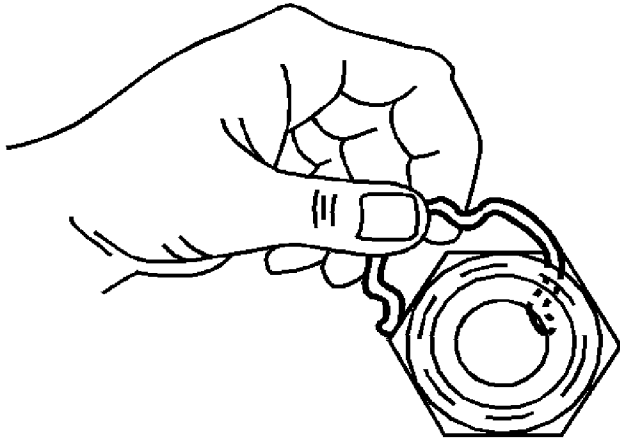
## Installation Procedure



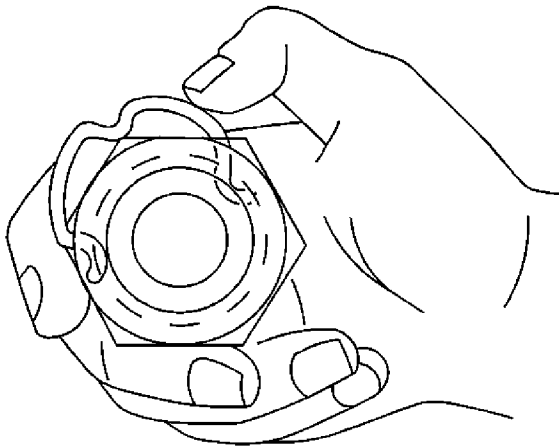
**Important:** When performing the following procedure, do not reuse the old retaining rings. Replace the old retaining rings with new ones.

Do not install the new retaining ring onto the fitting by pushing the retaining ring down over the fitting.

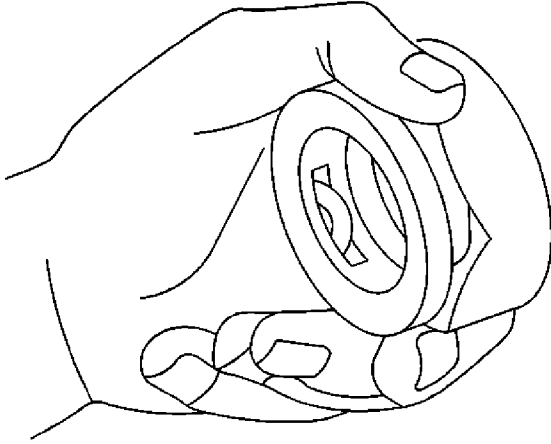
1. Install a new retaining ring into each quick connector fitting.



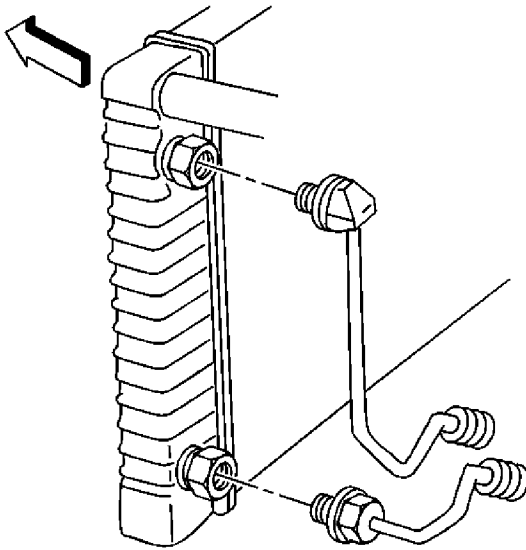
2. Hook one of the open ends of the retaining ring in one of the slots in the quick connector.



3. Rotate the retaining ring around the connector until the retaining ring is positioned with all 3 ears through the 3 slots.

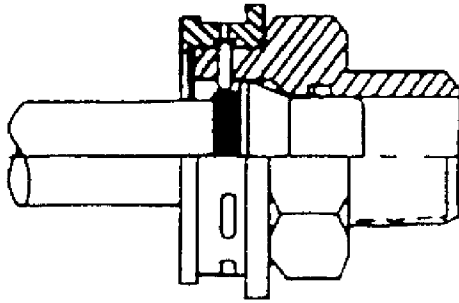


4. Ensure the 3 retaining ring ears can be seen from the inside of the connector and the retaining ring can move freely in the slots.



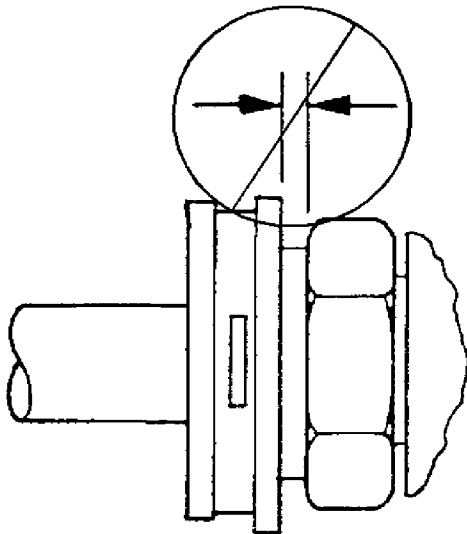
5. Install the engine oil cooler line into the quick connector fitting until a click is heard or felt.

Pull back on the engine oil cooler lines to ensure a proper connection.



**Important:** Do not manually press the retaining clip when installing the plastic cap.

6. Snap the plastic cap onto the quick connect fitting.
7. Ensure that the plastic cap is fully seated against the fitting.



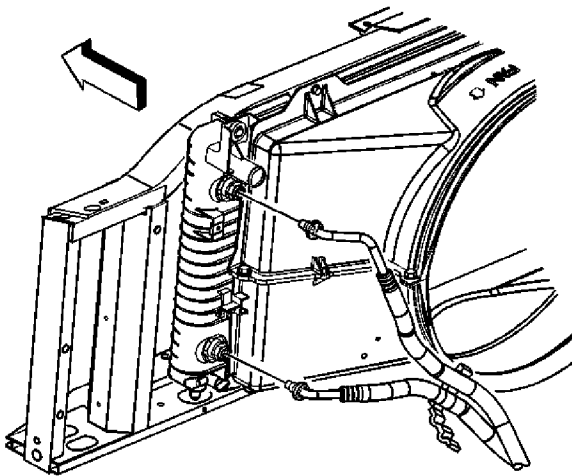
8. Ensure that no gap is present between the cap and the fitting.
9. Inspect and fill the engine oil to the proper level.

## Engine Oil Cooler Hose / Pipe Replacement (LR4, LM7, LQ4)

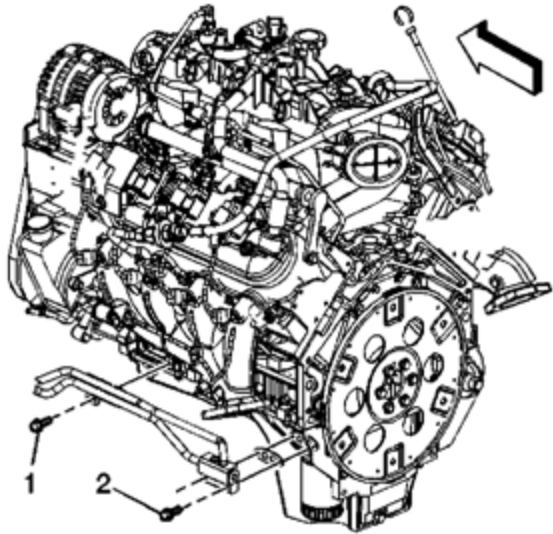
### Removal Procedure

The optional oil cooler is either an integral part of the radiator or a separate unit placed in front of the radiator. The cooler lines and hoses are serviceable.

1. Disconnect the cooler lines. Refer to [Engine Oil Cooler Pipe/Hose Quick Connect Fitting Replacement](#).

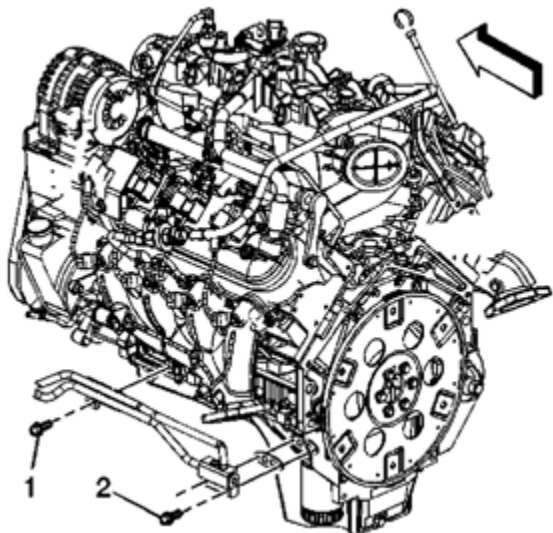


2. Open the oil cooler hose clip located on the lower fan shroud.
3. Remove the oil cooler hoses from the clip.
4. Gently, pull the oil cooler pipe fittings straight out from the radiator quick connect fittings.
5. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



6. Remove the oil cooler hose bracket bolt (1).
7. Remove the oil cooler hose adapter bolts (2).
8. Remove the oil cooler hose assembly and gasket.
9. Discard the gasket.
10. Inspect the fittings, connectors and cooler hoses for damage or distortion.

## Installation Procedure

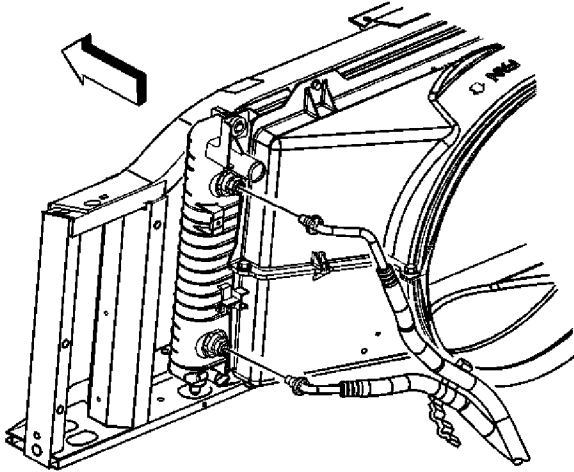


**Note:** A distinct snap should be heard when assembling tube ends of the hose assembly to quick connectors. To ensure tube is fully inserted into the connector, check by giving tube a forceful pull.

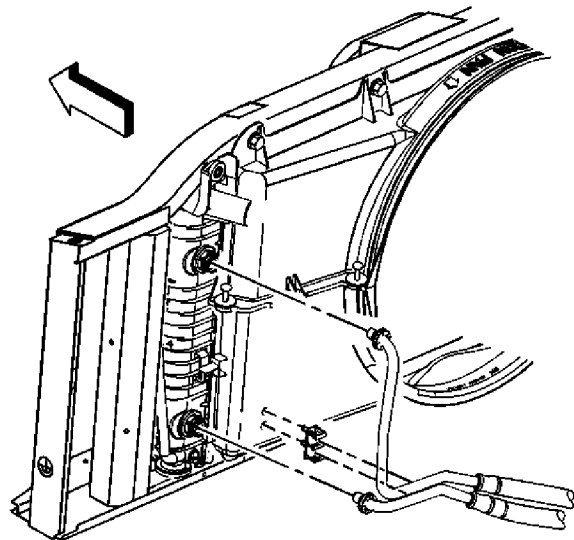
1. Install the oil cooler hose assembly and a new gasket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the oil cooler hose adapter bolts (2) and tighten to **12 N·m (106 lb in)**.
3. Install the oil cooler hose bracket bolt (1) and tighten to **25 N·m (18 lb ft)**.



4. Install the oil cooler hoses to the hose clip on the fan shroud.
5. Snap the oil cooler hose clip shut.



**Note:**

- Ensure the oil cooler line being installed has a plastic cap on the end that connects to the quick connect fitting. If no plastic cap exists, or the plastic cap is damaged, obtain a new cap. Install the cap on to the cooler line prior to cooler line installation.

- Do not use the plastic cap in order to install the cooler line into the fitting.
6. Connect the oil cooler lines. Refer to [Engine Oil Cooler Pipe/Hose Quick Connect Fitting Replacement](#).
  7. Pull back sharply on the cooler line in order to ensure that the cooler line is installed in the quick connect fitting.

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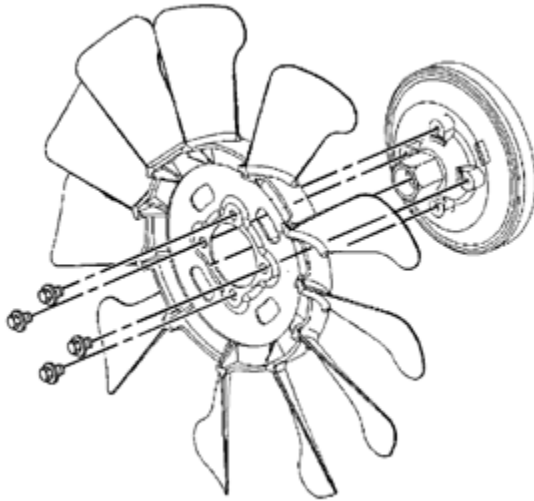
## Fan Replacement

### Removal Procedure

1. If a fan assembly fails, inspect the hub and the drive components. A fan assembly may fail due to an imbalance in the hub. This type of failure may not be the fault of the blades.

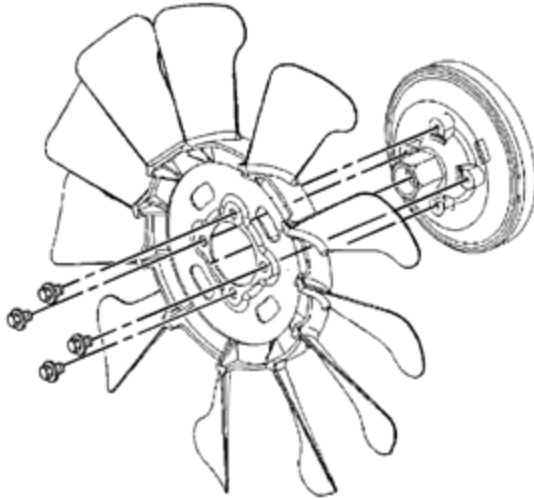
**Caution:** If a fan blade is bent or damaged, do not repair and use the damaged part. Replace a bent or damaged fan assembly with a new fan assembly. Using a fan with a different diameter, pitch, number of blades, or type of blade material may effect the cooling efficiency, performance and engine noise level.

2. Remove the fan clutch assembly. Refer to [Fan Clutch Replacement](#).



3. Remove the fan to fan clutch retaining bolts.
4. Remove the fan from the fan clutch.

### Installation Procedure



1. Install the fan to the fan clutch.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the fan to fan clutch retaining bolts and tighten to **23 N·m (17 lb ft)**.
3. Install the fan clutch assembly. Refer to [Fan Clutch Replacement](#).

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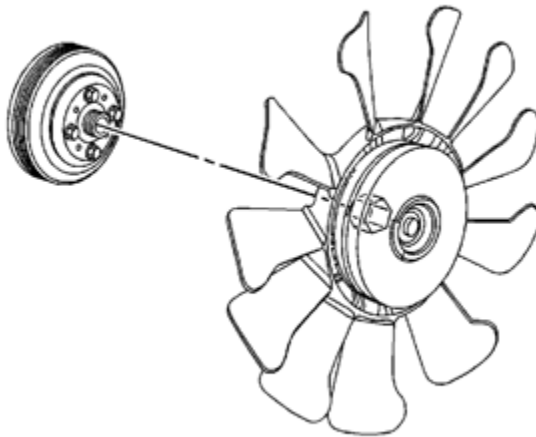
## Fan Clutch Replacement

### Special Tools

- [J 41240-5A](#) Fan Clutch Wrench
- [J 46406](#) Fan Clutch Remover and Installer

### Removal Procedure

1. Remove the upper fan shroud. Refer to [Engine Coolant Fan Upper Shroud Replacement](#).



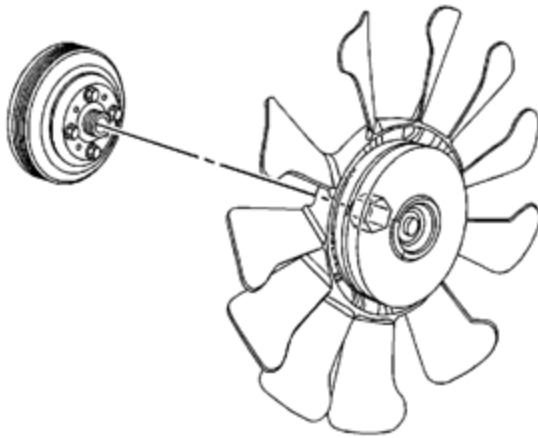
2. Install the [J 41240-5A](#) onto the fan clutch nut.

Install the [J 46406](#) in order to secure the pulley.

3. Remove the fan clutch assembly.
4. Inspect the following components for cracks, distortion, or other damage:
  - The belt
  - The hub
  - The adapter
  - The pulley
5. Remove the cooling fan from the fan clutch. Refer to [Fan Replacement](#).

### Installation Procedure

1. Install the cooling fan to the fan clutch. Refer to [Fan Replacement](#).



2. Install the fan clutch assembly to the pulley.

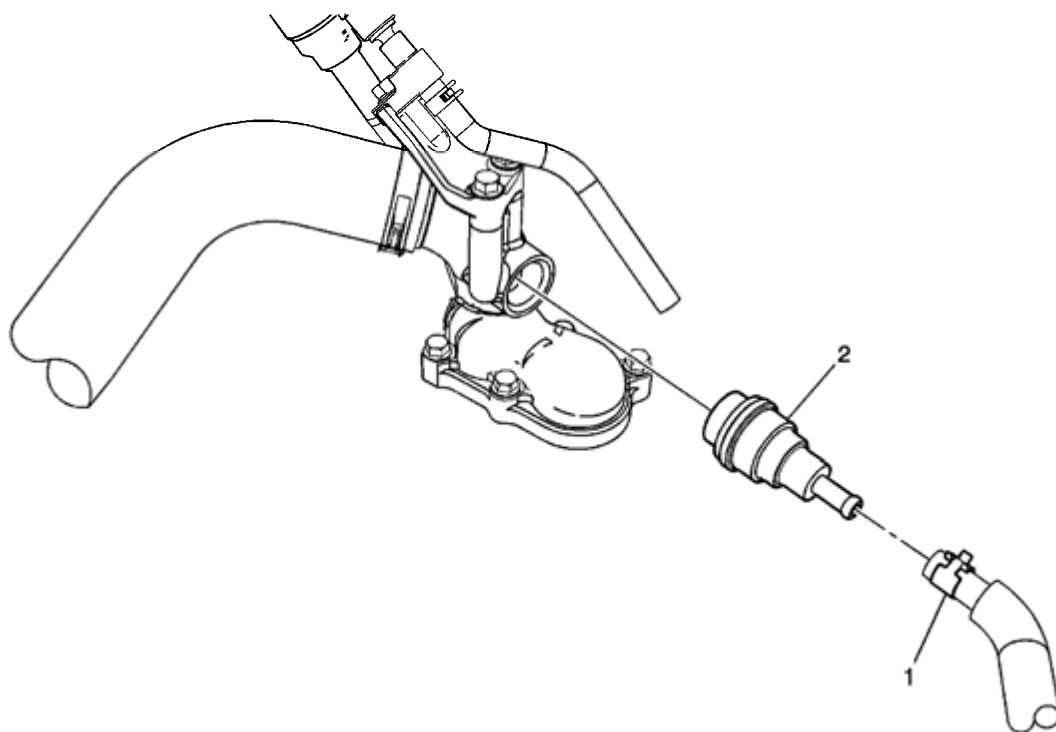
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the [J 41240-5A](#) onto the fan clutch nut and tighten to **95 N·m (70 lb ft)**.

Install the [J 46406](#) in order to secure the pulley.

4. Install the upper fan shroud. Refer to [Engine Coolant Fan Upper Shroud Replacement](#).

## Turbocharger Coolant Bypass Valve Replacement

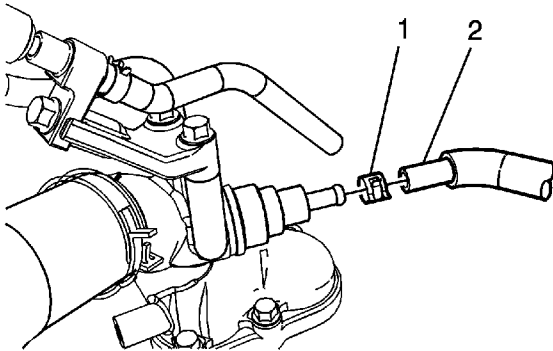


| Callout                                                                                                                                                                                                                                                                             | Component Name                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <i>Fastener Tightening Specifications:</i> Refer to <a href="#">Fastener Tightening Specifications</a> .                                                                                                                                                                            |                                                                                                   |
| <b>Preliminary Procedures</b> <ul style="list-style-type: none"><li>• Drain the cooling system. Refer to <a href="#">Cooling System Draining and Filling</a>.</li><li>• Remove the air cleaner outlet duct. Refer to <a href="#">Air Cleaner Outlet Duct Replacement</a>.</li></ul> |                                                                                                   |
| 1                                                                                                                                                                                                                                                                                   | Turbocharger Inlet Cooling Hose/Pipe<br><b>Tip</b><br>Compress the clamp and disconnect the hose. |
| 2                                                                                                                                                                                                                                                                                   | Turbocharger Coolant Bypass Valve Replacement                                                     |

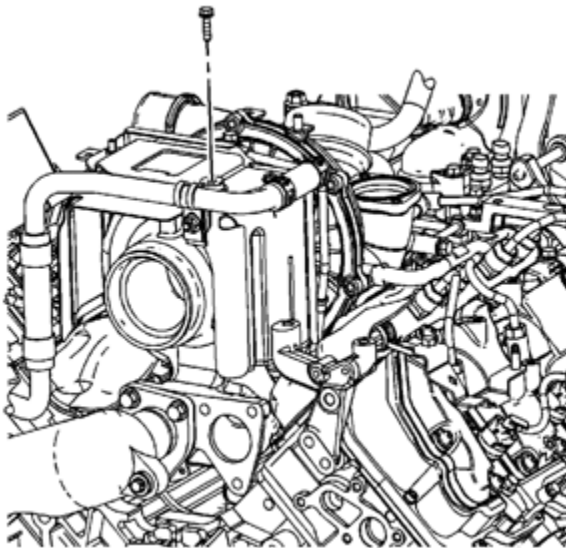
## Turbocharger Coolant Hoses/Pipes Replacement (Inlet)

### Removal Procedure

1. Remove the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
2. Remove the engine cover. Refer to [Engine Cover Replacement](#).
3. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).

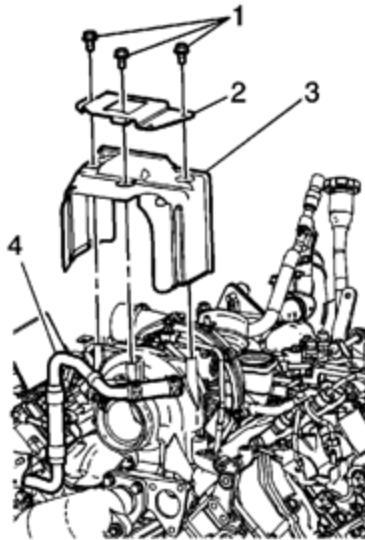


- 
4. Compress the clamp (1) and disconnect the turbocharger inlet cooling hose/pipe (2) from the thermostat housing.

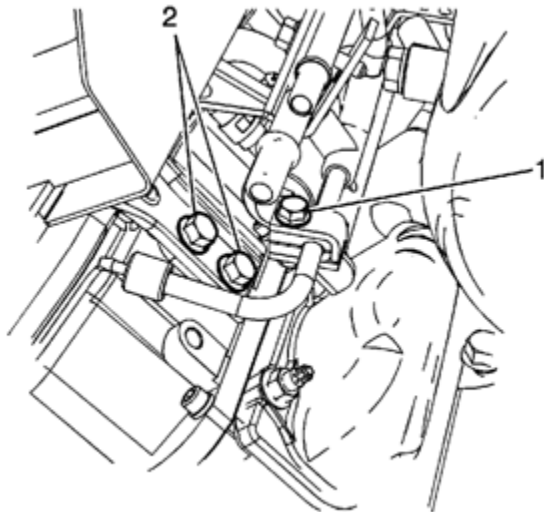


- 
5. Remove the EGR cooler pipe bolt.

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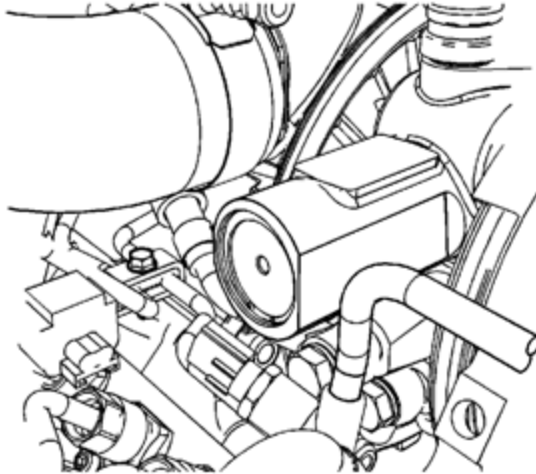


6. Reposition the EGR cooler pipe (4) out of the way.
7. Remove the EGR valve adapter pipe bracket bolts (1).
8. Remove the EGR valve adapter pipe bracket (2) and turbocharger heat shield (3).

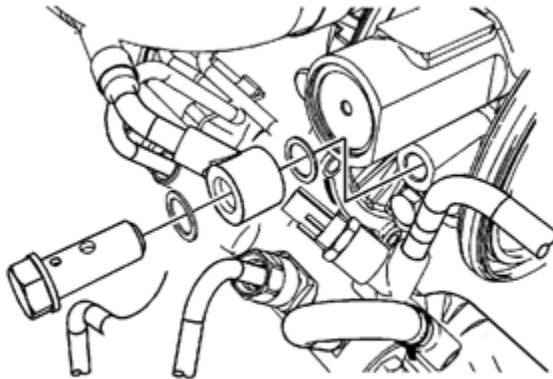


**Note:** Steps 6 and 7 are to allow for movement of the fuel lines and glow plug bracket to gain access to the turbocharger inlet cooling hose/pipe bolt.

9. Remove the left bank fuel return line bracket bolt (1) and the 2 glow plug module bracket bolts (2).



10. Remove the left bank fuel line bracket bolt.

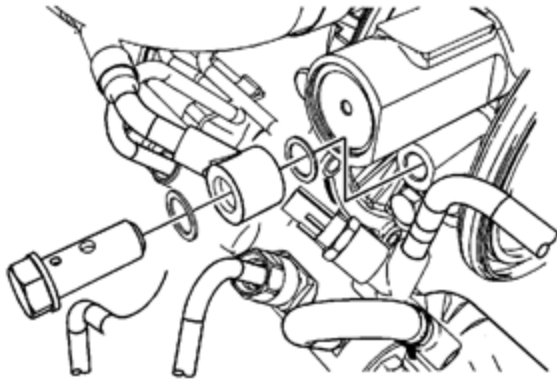


11. Remove the turbocharger inlet cooling hose/pipe bolt and remove the inlet hose/pipe.

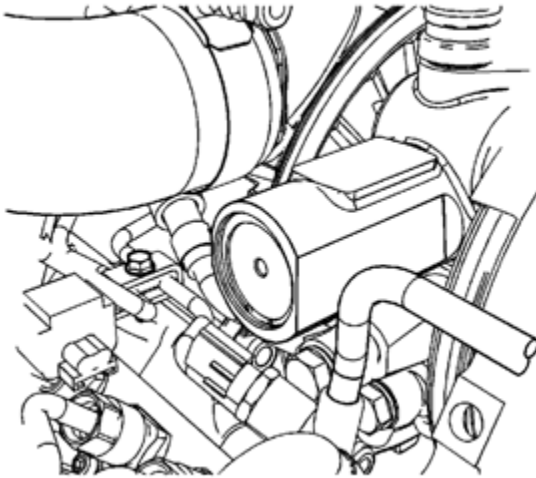
## Installation Procedure

1. Position the turbocharger inlet cooling hose/pipe to the vehicle.

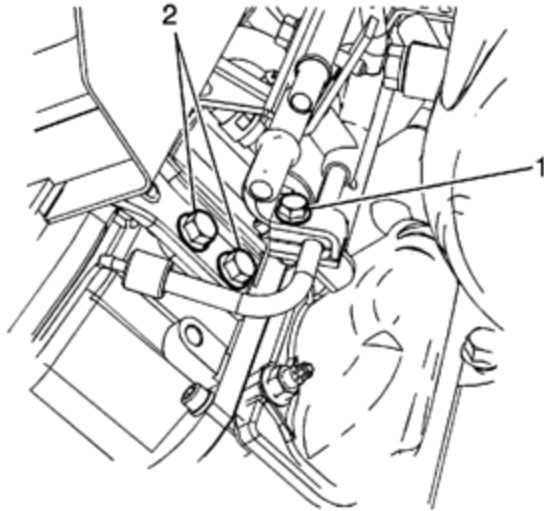
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



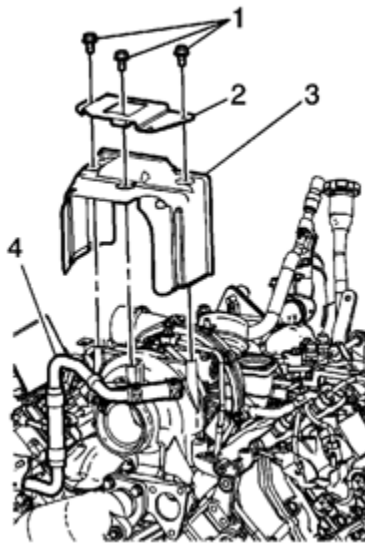
2. Using new brass seals, install the turbocharger inlet cooling hose/pipe bolt and tighten to **25 N·m (18 lb ft)**.



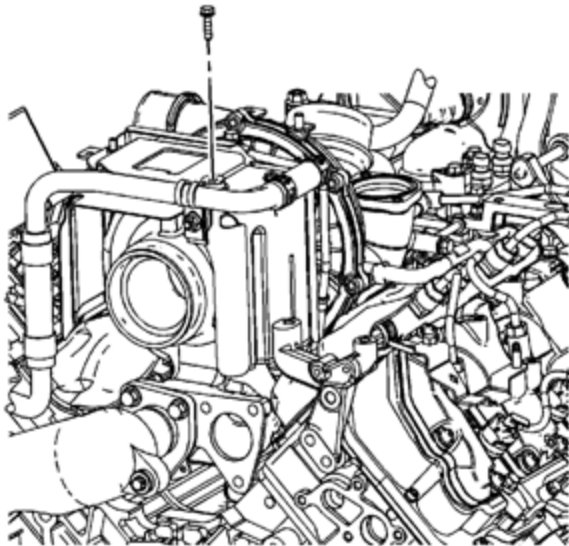
3. Position the left bank fuel line and install the bracket bolt then tighten to **25 N·m (18 lb ft)**.



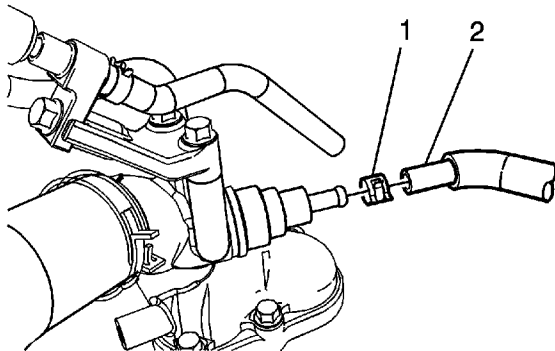
4. Position the glow module bracket to the valve cover, install the 2 bolts (2) and the remaining left bank fuel line bracket bolt (1).
- Tighten the glow plug module bracket bolts to **10 N·m (89 lb in)**.
  - Tighten the fuel line bracket bolt to **25 N·m (18 lb ft)**.



5. Install the turbocharger heat shield (3) and EGR valve adapter pipe bracket (2).
6. Install the EGR valve adapter pipe bracket bolts (1) and tighten to **9 N·m (80 lb in)**.
7. Position the EGR cooler pipe (4).



8. Install the EGR cooler pipe bolt and tighten to **9 N·m (80 lb in)**.

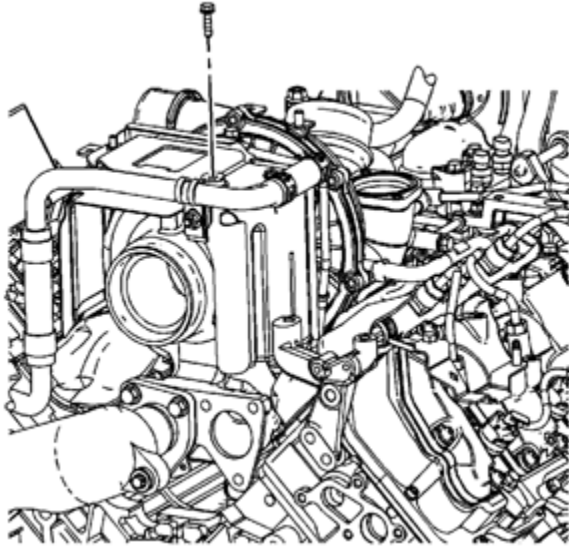


9. Position the turbocharger inlet cooling hose/pipe (2) to the thermostat housing and position the compression clamp (1) to secure.
10. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
11. Install the engine cover. Refer to [Engine Cover Replacement](#).
12. Install the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).

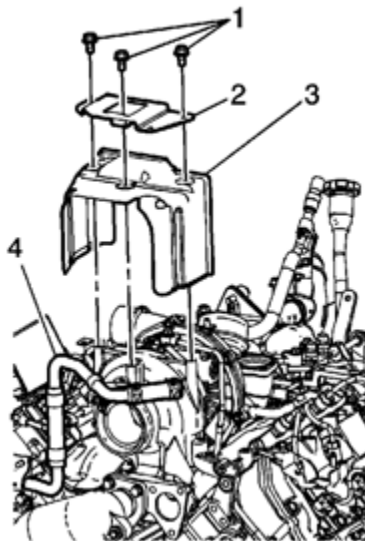
## Turbocharger Coolant Hoses / Pipes Replacement (Outlet)

### Removal Procedure

1. Remove the engine cover. Refer to [Engine Cover Replacement](#).

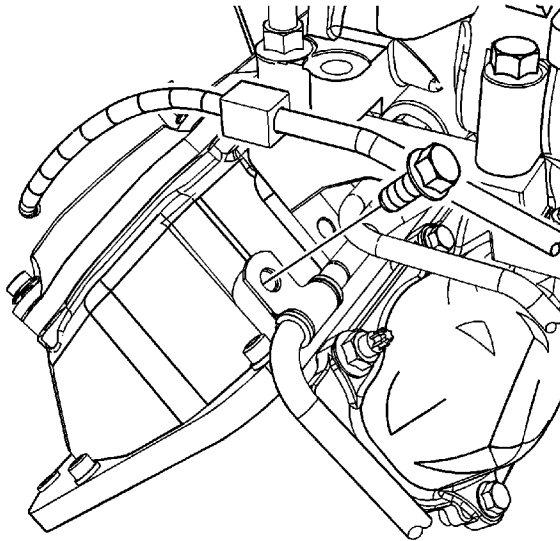


2. Remove the exhaust gas recirculation (EGR) cooler tube. Refer to [Exhaust Gas Recirculation Valve Cooler Replacement](#).
3. Remove the EGR cooler pipe bolt.

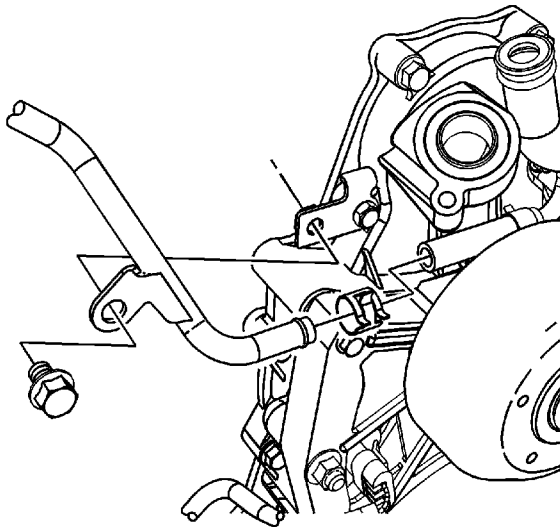




4. Reposition the EGR cooler pipe (4) out of the way.
5. Remove the EGR valve adapter pipe bracket bolts (1).
6. Remove the EGR valve adapter pipe bracket (2) and turbocharger heat shield (3).
7. Remove the exhaust gas recirculation (EGR) valve. Refer to [Exhaust Gas Recirculation Valve Replacement](#).
8. Remove the center intake manifold. Refer to [Center Intake Manifold Replacement](#).
9. Remove the thermostat housing crossover. Refer to [Thermostat Housing Crossover Replacement](#).

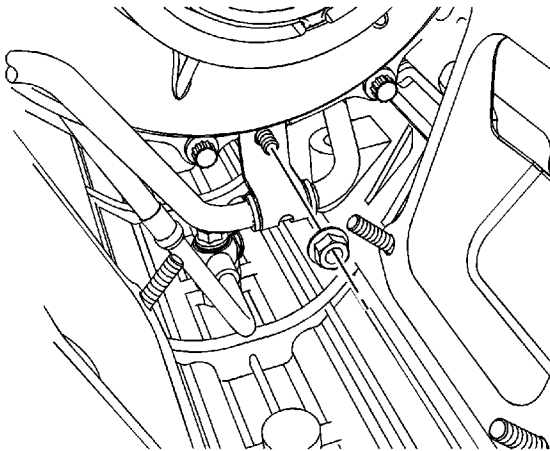


10. Remove the turbocharger outlet cooling hose/pipe bolt from the valve cover.

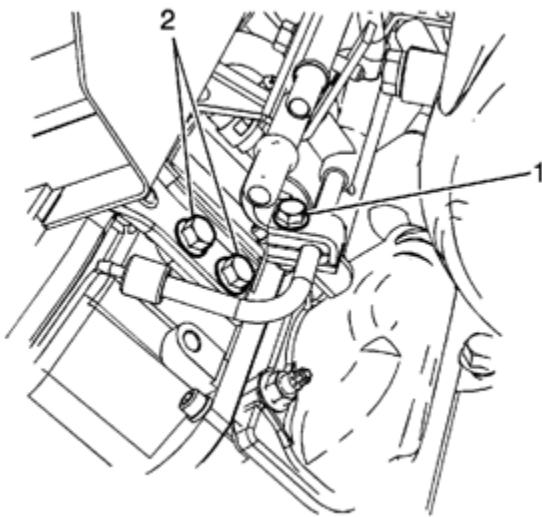


11. Remove the turbocharger outlet cooling hose/pipe bolt.
12. Compress the clamp and disconnect the turbocharger cooling hose/pipe from the thermostat

bypass pipe.

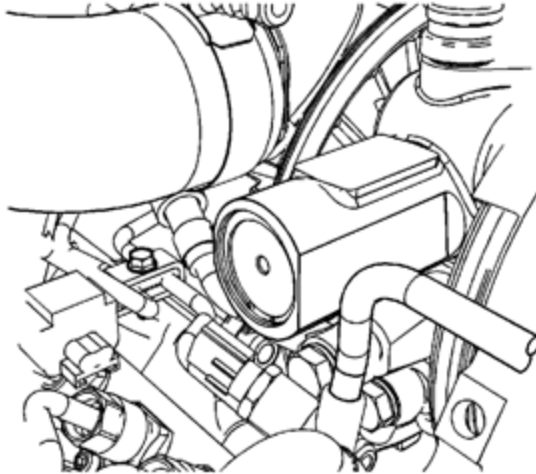


13. Remove the turbocharger outlet cooler pipe to turbocharger nut.

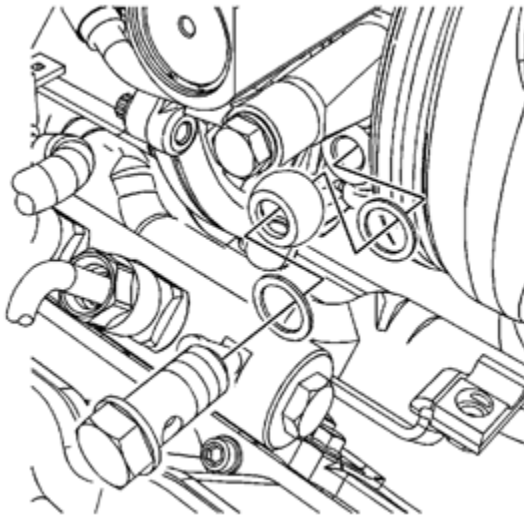


**Note:** Steps 11 and 12 are to allow movement of the fuel lines and glow plug bracket to gain access to the turbocharger inlet cooling hose/pipe bolt.

14. Remove the left bank fuel return line bracket bolt (1) and the two glow plug module bracket bolts (2).



15. Remove the left bank fuel line bracket bolt.

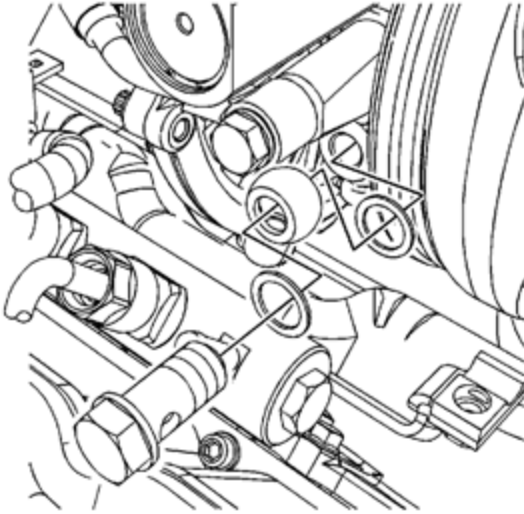


16. Remove the turbocharger outlet cooling hose/pipe to turbocharger bolt and remove the inlet hose/pipe.

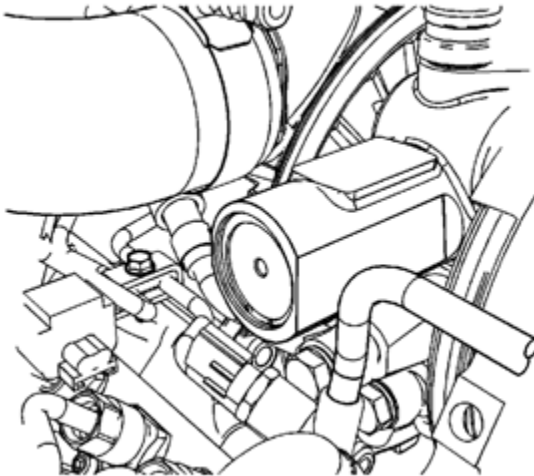
## Installation Procedure

1. Position the turbocharger inlet cooling hose/pipe to the vehicle.

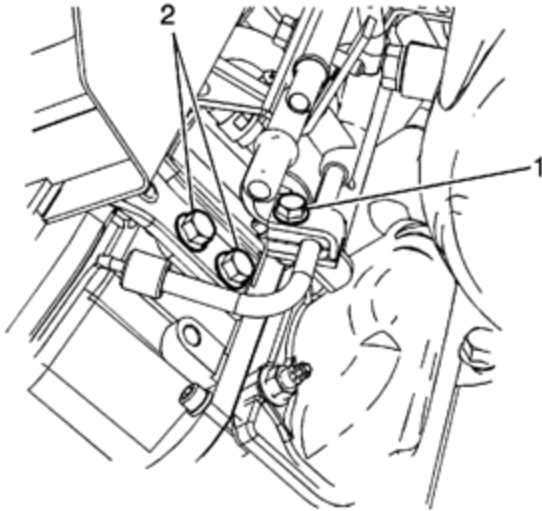
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



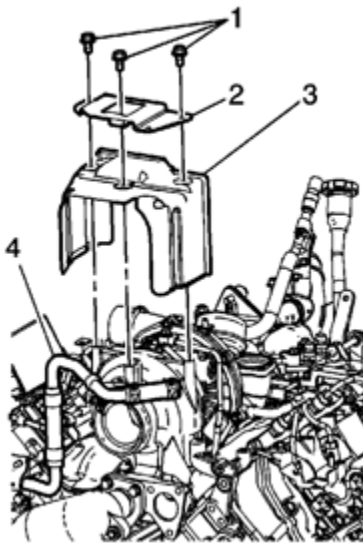
2. Using new brass seals, install the turbocharger inlet cooling hose/pipe bolt and tighten to **25 N·m (18 lb ft)**.



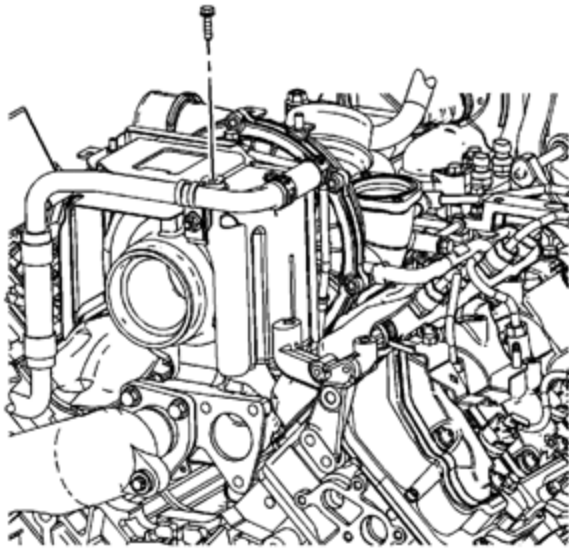
3. Position the left bank fuel line and install the bracket bolt and tighten to **25 N·m (18 lb ft)**.



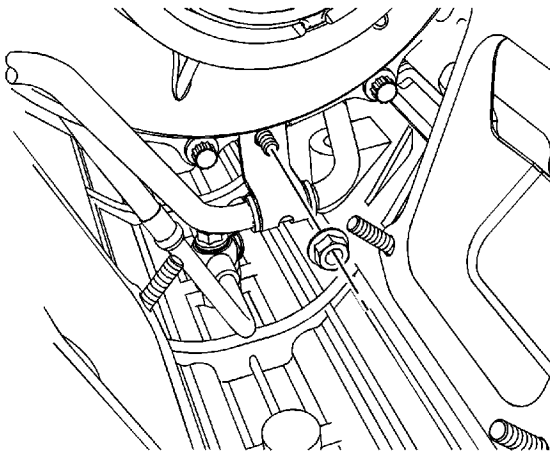
4. Position the glow module bracket to the valve cover, install the two bolts (2) and the remaining left bank fuel line bracket bolt (1).
  - 4.1. Tighten the glow plug module bracket bolts to **10 N·m (89 lb in)**.
  - 4.2. Tighten the fuel line bracket bolt to **25 N·m (18 lb ft)**.



5. Install the turbocharger heat shield (3) and EGR valve adapter pipe bracket (2).
6. Install the EGR valve adapter pipe bracket bolts (1) and tighten to **9 N·m (80 lb in)**.
7. Position the EGR cooler pipe (4).

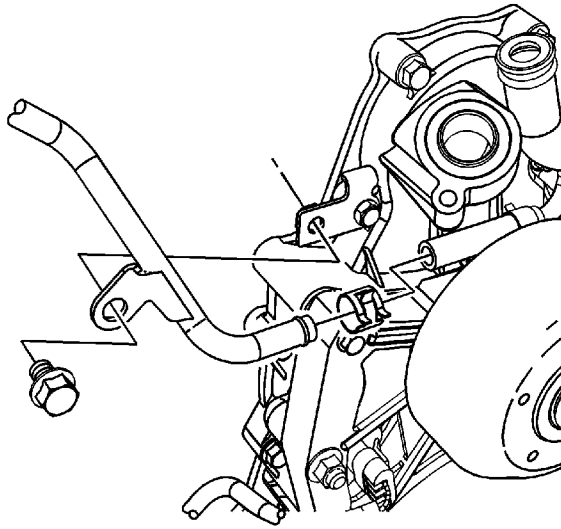


8. Install the EGR cooler pipe bolt and tighten to **9 N·m (80 lb in)**.

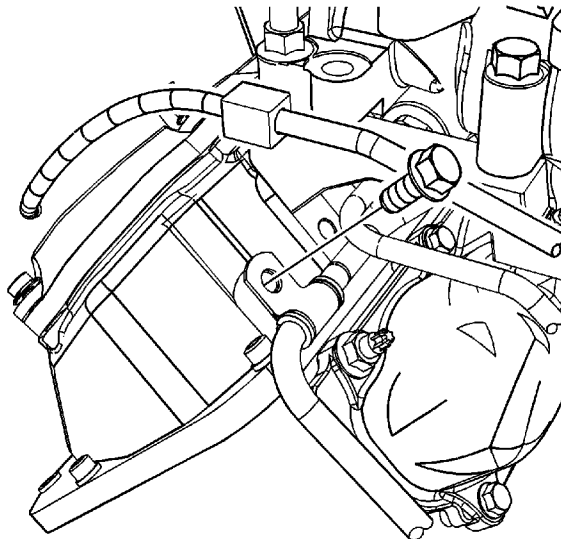


9. Install the turbocharger outlet cooler pipe to the turbocharger nut and tighten to **9 N·m (80 lb in)**.

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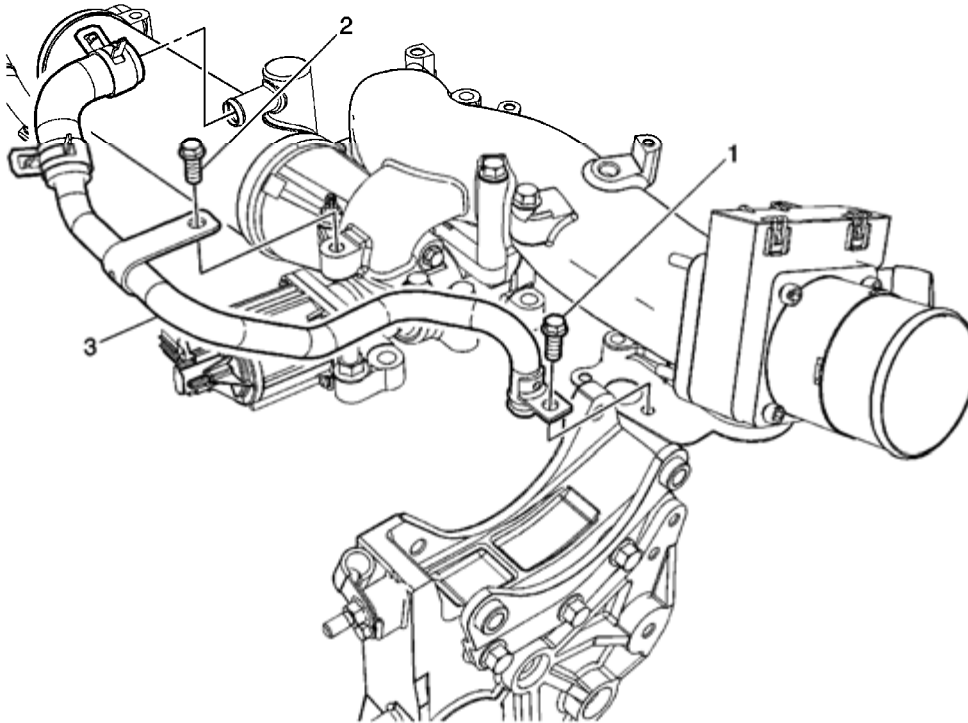


10. Compress the clamp and connect the turbocharger cooling hose/pipe to the thermostat bypass pipe.



11. Install the turbocharger outlet cooling hose/pipe to the valve cover and tighten turbocharger outlet pipe bolt to **9 N·m (80 lb in)**.
12. Install the turbocharger outlet cooling hose/pipe bolt and tighten to **9 N·m (80 lb in)**.
13. Install the thermostat housing crossover. Refer to [Thermostat Housing Crossover Replacement](#).
14. Install the center intake manifold. Refer to [Center Intake Manifold Replacement](#).
15. Install the EGR cooler tube replacement. Refer to [Exhaust Gas Recirculation Valve Cooler Replacement](#).
16. Install the EGR valve. Refer to [Exhaust Gas Recirculation Valve Replacement](#).
17. Install the engine cover. Refer to [Engine Cover Replacement](#).
18. Perform the turbocharger learn procedure. Refer to [Turbocharger Learn](#).

## Exhaust Gas Recirculation Coolant Hoses/Pipes Replacement (LLY/LBZ)



| Callout                                                                                                                                                                                                                                                                                                                                       | Component Name                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ul style="list-style-type: none"><li>• Drain the cooling system. Refer to <a href="#">Cooling System Draining and Filling</a>.</li><li>• Remove the engine cover. Refer to <a href="#">Engine Cover Replacement</a>.</li><li>• Remove the generator. Refer to <a href="#">Generator Replacement</a>.</li></ul> |                                                                                                                                                                                                     |
| 1                                                                                                                                                                                                                                                                                                                                             | Exhaust Gas Recirculation (EGR) Coolant Pipe to Thermostat Housing Bolt<br><b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.<br><b>Tighten</b><br>21 N·m (16 lb ft) |
| 2                                                                                                                                                                                                                                                                                                                                             | EGR Coolant Pipe Bolt<br><b>Tighten</b><br>21 N·m (16 lb ft)                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                               | EGR Coolant Pipe                                                                                                                                                                                    |

3

**Tip**

- Compress the clamp and disconnect the EGR coolant pipe from the EGR cooler tube.
- When installing the EGR coolant pipe, replace the O-ring seal.

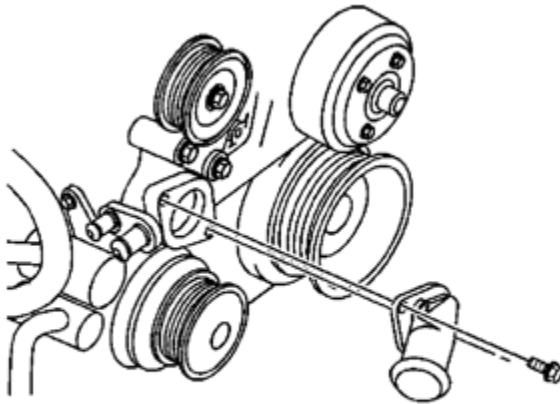
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## Engine Coolant Thermostat Housing Replacement

### Removal Procedure

**Note:** The thermostat is not serviceable separately. The water pump inlet and thermostat must be replaced as an assembly.

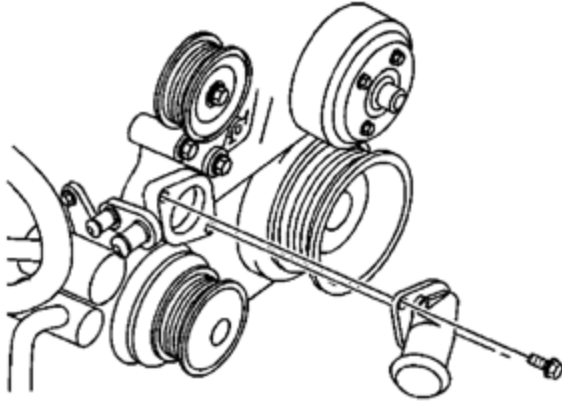
1. Remove the bolt from the coolant recovery reservoir and reposition.



2. Remove air cleaner assembly.
3. Remove the radiator outlet hose. Refer to [Radiator Outlet Hose Replacement](#).
4. Remove the water pump inlet bolts.
5. Remove the water pump inlet and thermostat from the water pump.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



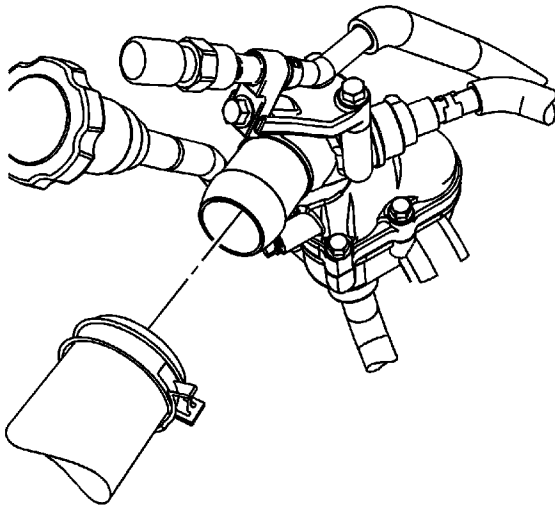
1. Install the thermostat and water pump inlet to the water pump.
2. Install the water pump inlet bolts and tighten to **15 N·m (11 lb ft)**.
3. Install the radiator outlet hose. Refer to [Radiator Outlet Hose Replacement](#).
4. Install the air cleaner assembly.
5. Install the coolant recovery reservoir and bolt and tighten to **11 N·m (97 lb in)**.

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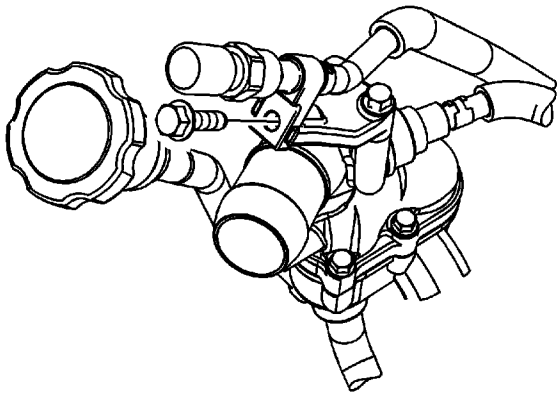
## Engine Coolant Thermostat Replacement (6.6L (LLY/LBZ))

### Removal Procedure

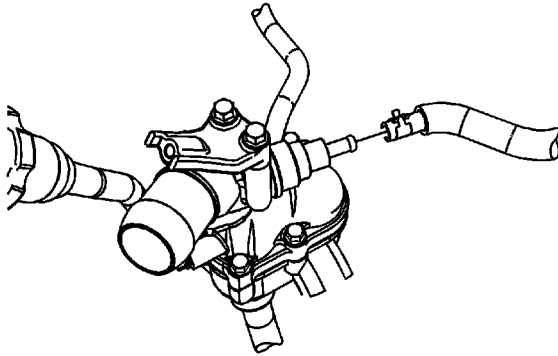
1. Remove the upper fan shroud. Refer to [Engine Coolant Fan Upper Shroud Replacement](#).
2. Remove the intake manifold. Refer to [Intake Manifold Tube Replacement](#).
3. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).



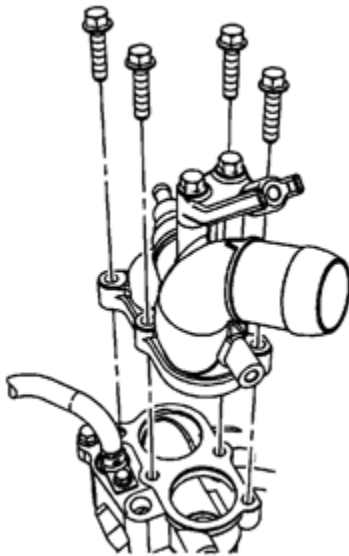
4. Compress the clamp and disconnect the radiator inlet hose from the thermostat housing.



5. Remove the fuel line bracket bolt and position the fuel line aside.



6. Compress the clamp and disconnect the turbocharger cooling inlet pipe from the thermostat housing.

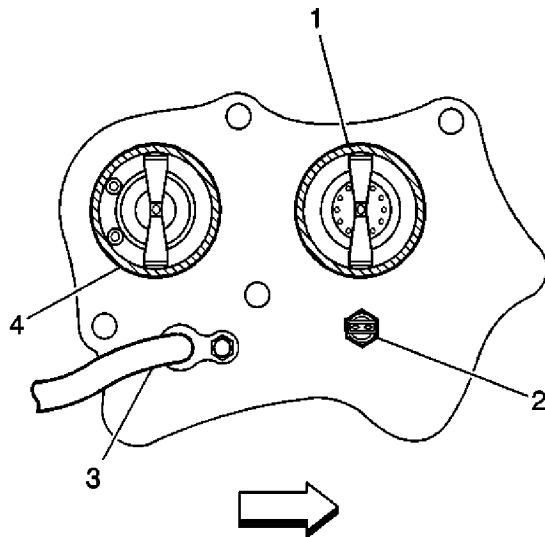


7. Remove the 4 bolts and the thermostat housing.
8. Remove the thermostat and seals.

## **Inspection Procedure**

1. Inspect the thermostats for sticking, cracks, and/or leakage of wax.
2. Replace the thermostats if damage is found.
3. Clean the thermostat housing and thermostat housing cover sealing surfaces.

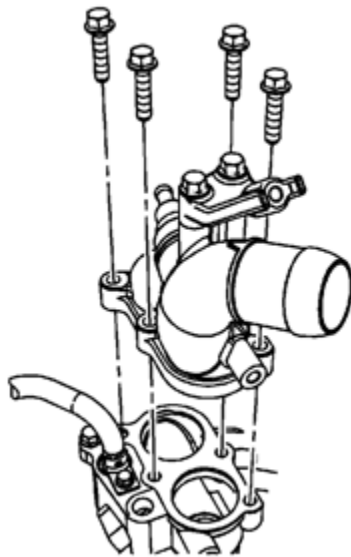
## Installation Procedure



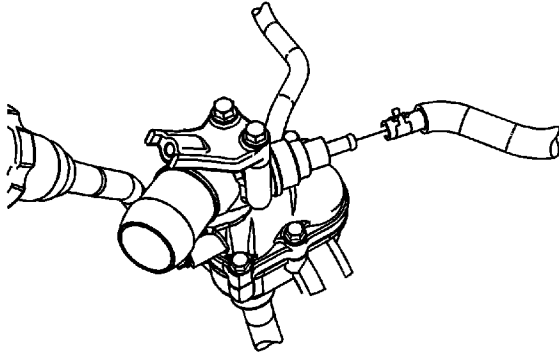
1. Install the thermostats and seals to the thermostat housing.

The rear thermostat (4) has 2 vent valves. Install the vent valves towards the rear of the engine.

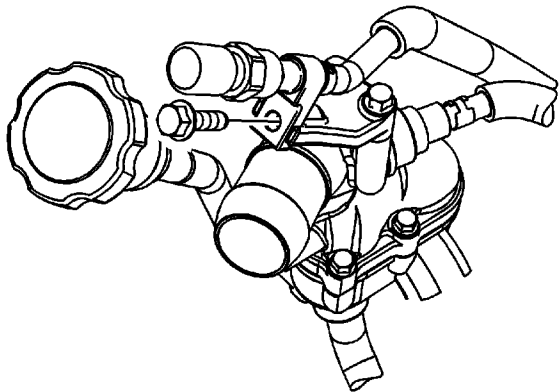
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



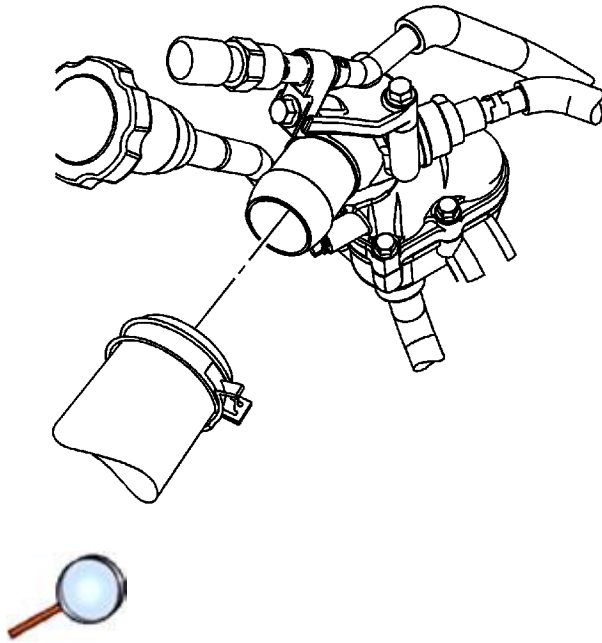
2. Position the thermostat housing and install the 4 bolts and tighten to **21 N·m (15 lb ft)**.



3. Compress the clamp and connect the turbocharger cooling inlet pipe to the thermostat housing.



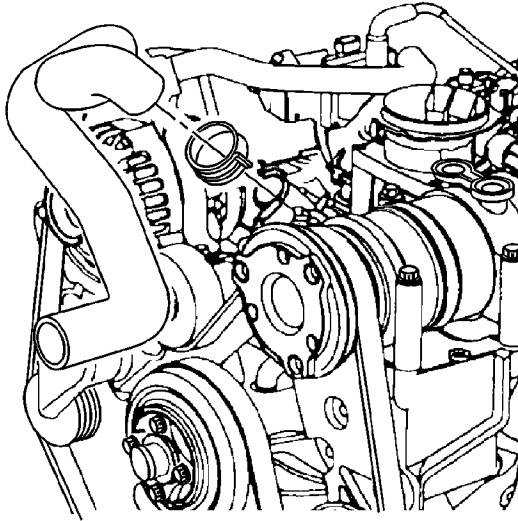
4. Position the fuel line to the thermostat housing and install the fuel line bracket bolt and tighten to **21 N·m (15 lb ft)**.



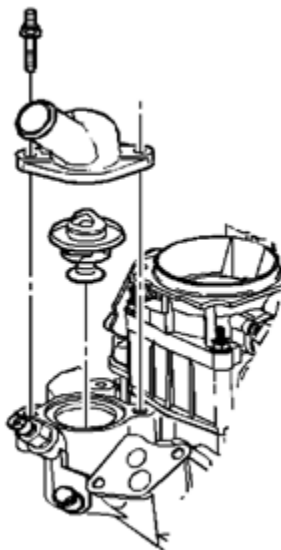
5. Compress the clamp and connect the radiator inlet hose to the thermostat housing.
6. Install the intake manifold tube. Refer to [Intake Manifold Tube Replacement](#).
7. Install the upper fan shroud. Refer to [Engine Coolant Fan Upper Shroud Replacement](#).
8. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

## Engine Coolant Thermostat Replacement (4.3L)

### Removal Procedure

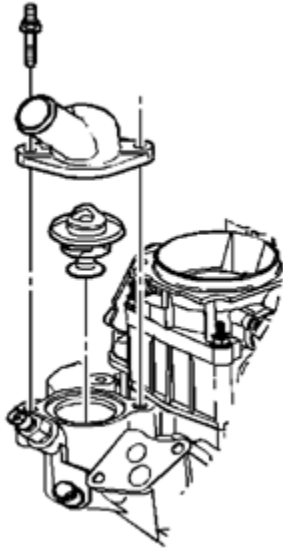


1. Remove the air cleaner and the duct assembly. Refer to [Air Cleaner Outlet Resonator Replacement](#).
2. Partially drain the coolant. Refer to [Cooling System Draining and Filling](#).
3. Remove the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).
4. Disconnect the radiator hose from the thermostat housing.



5. Remove the bolts attaching the thermostat housing to the thermostat.
6. Remove the thermostat housing.
7. Remove the thermostat.
8. Clean the gasket mating surfaces.

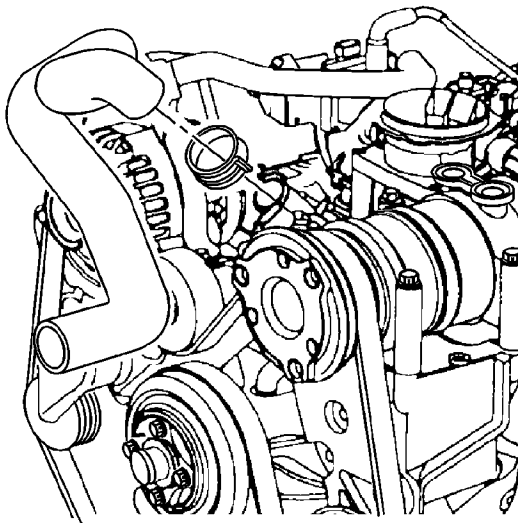
## Installation Procedure



1. Install the thermostat.
2. Install the thermostat housing to the intake manifold.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the bolts to the housing and tighten to **25 N·m (18 lb ft)**.





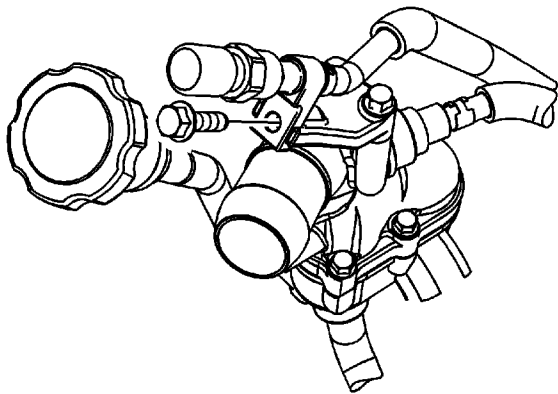
4. Connect the radiator hose to the thermostat housing.
5. Install the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).
6. Install the air cleaner and the duct. Refer to [Air Cleaner Outlet Resonator Replacement](#).
7. Refill the cooling system. Refer to [Cooling System Draining and Filling](#).
8. Bleed the air from the cooling system.
9. Inspect the thermostat housing and the gasket for coolant leaks.

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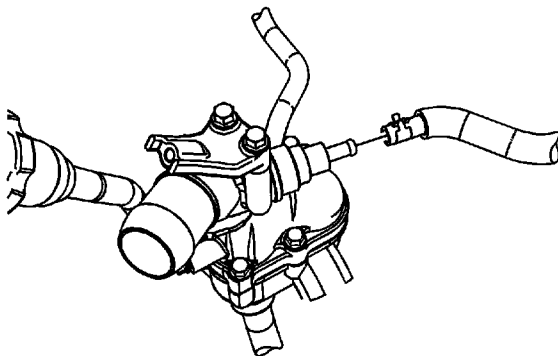
## Thermostat Housing Crossover Replacement (LLY/LBZ)

### Removal Procedure

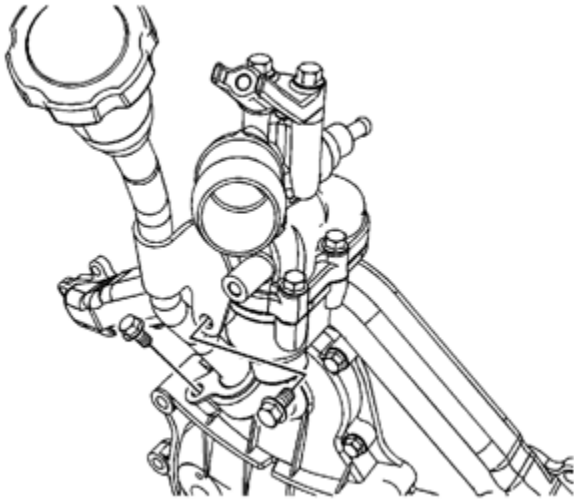
1. Remove the radiator fan. Refer to [Fan Replacement](#).
2. Remove the drive belt tensioner and generator bracket. Refer to [Generator Bracket Replacement](#).
3. Remove the air conditioning (A/C) and power steering bracket. Refer to [Air Conditioning \(A/C\) Compressor and Power Steering Pump Bracket Replacement](#).



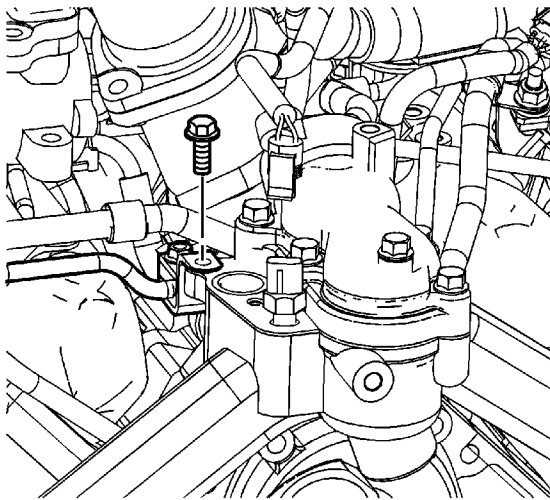
4. Remove the fuel line bolt and position the fuel line aside.



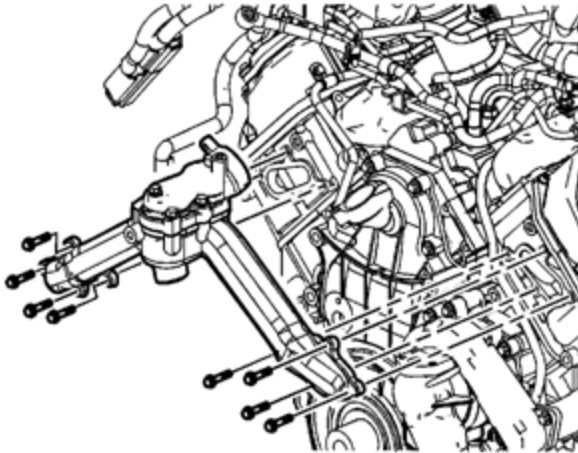
5. Compress the clamp and disconnect the turbocharger inlet cooling hose/pipe.



6. Remove the oil fill tube bolts and the oil fill tube.
7. Disconnect the coolant temperature sensor electrical connector.
8. Remove the exhaust gas recirculation (EGR) coolant pipe. Refer to [Exhaust Gas Recirculation Coolant Hoses/Pipes Replacement](#).



9. Remove the fuel pipe bracket bolt.
10. Disconnect the hose at the thermostat bypass pipe.
11. Disconnect the radiator inlet hose from the thermostat housing.
12. Remove the thermostat bypass bolts at the water pump.

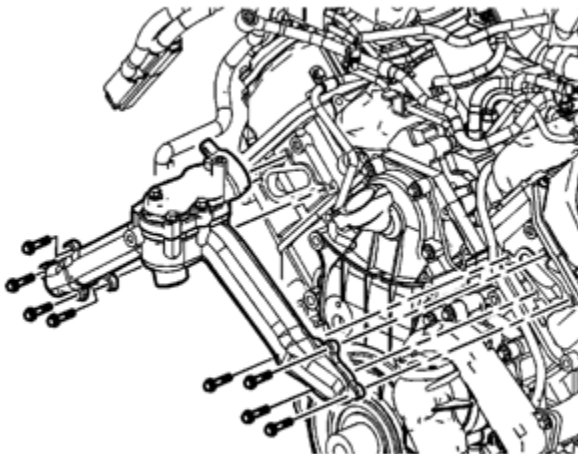


13. Remove the 8 thermostat housing crossover bolts.
14. Remove the thermostat housing crossover.

## Installation Procedure

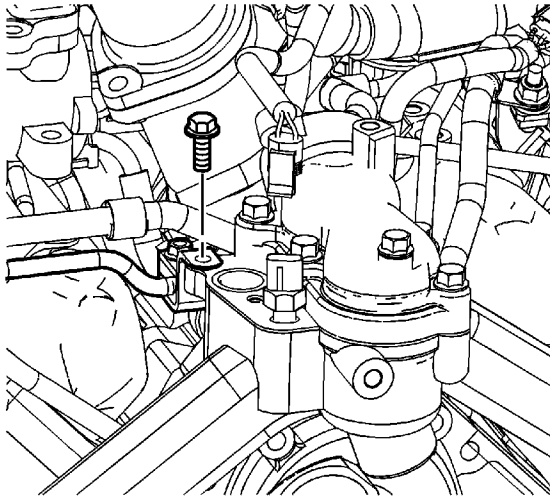
1. Position the thermostat housing crossover.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

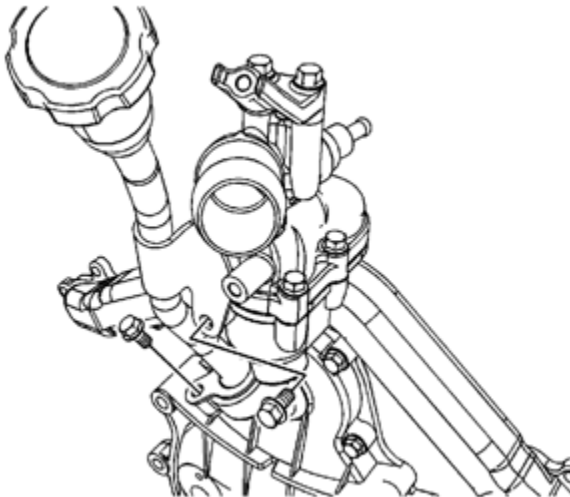


2. Install the 8 thermostat housing crossover bolts and tighten to **25 N·m (18 lb ft)**.
3. Install the thermostat bypass bolts to the water pump and tighten to **21 N·m (16 lb ft)**.

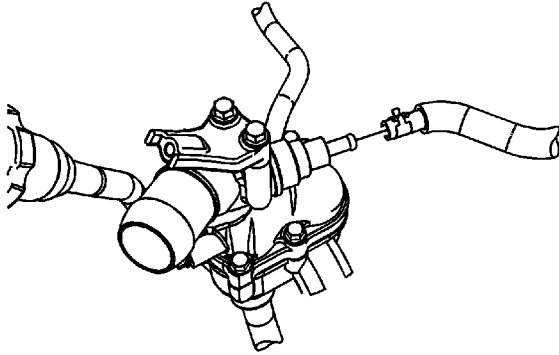
4. Install the radiator inlet hose to the thermostat housing.
5. Connect the hose to the thermostat bypass pipe.



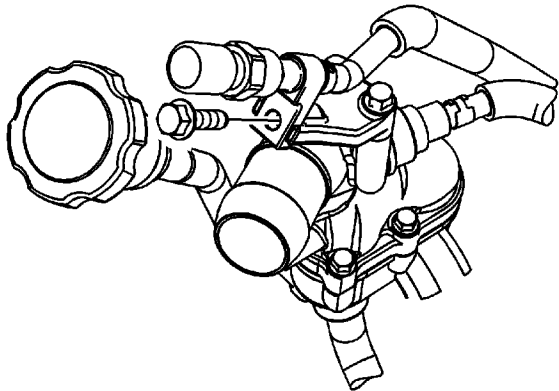
6. Install the fuel pipe bracket bolt and tighten to **25 N·m (18 lb ft)**.
7. Install the EGR coolant pipe. Refer to [Exhaust Gas Recirculation Coolant Hoses/Pipes Replacement](#).
8. Connect the coolant temperature sensor electrical connector.



9. Install the oil fill tube bolts and the oil fill tube and tighten to **25 N·m (18 lb ft)**.

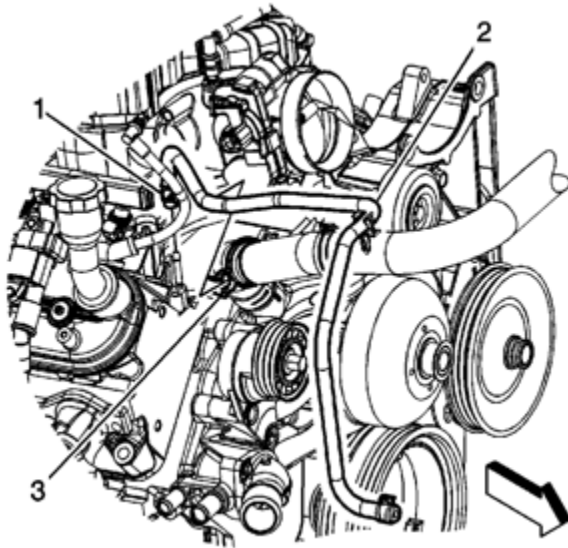


10. Compress the clamp and connect the turbocharger inlet cooling hose/pipe.

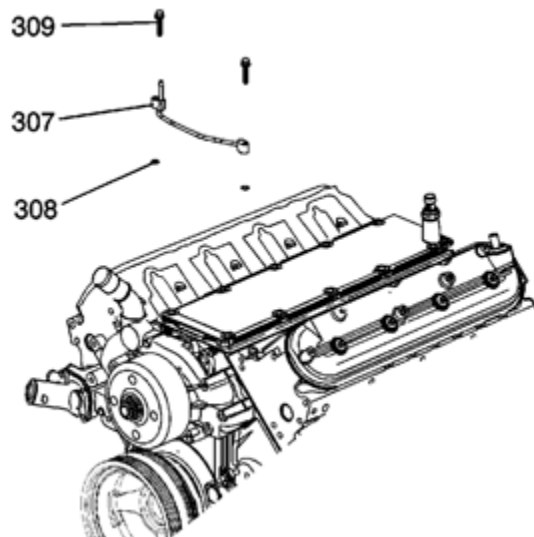


11. Position the fuel line and install the fuel line bolt.
12. Install the A/C and power steering bracket. Refer to [Air Conditioning \(A/C\) Compressor and Power Steering Pump Bracket Replacement](#).
13. Install the drive belt tensioner and generator bracket. Refer to [Generator Bracket Replacement](#).
14. Install the radiator fan. Refer to [Fan Replacement](#).

## Engine Coolant Air Bleed Pipe Replacement (With LH8) Removal Procedure



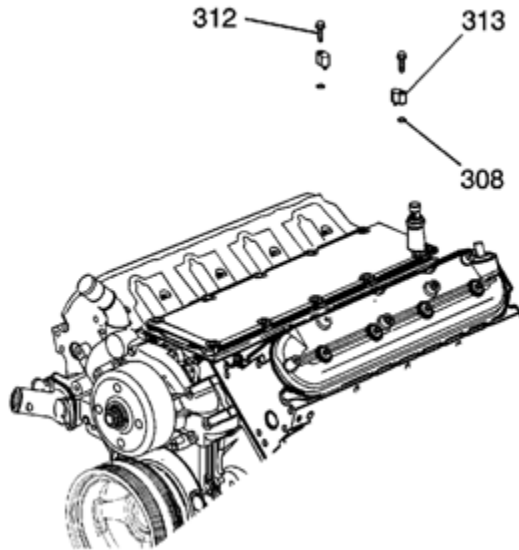
1. Remove the air cleaner outlet duct. Refer to [Air Cleaner Resonator Outlet Duct Replacement](#).
2. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
3. Reposition the radiator vent inlet hose clamp (1) at the coolant air bleed pipe fitting.
4. Remove the radiator vent inlet hose (2) from the coolant air bleed pipe fitting.



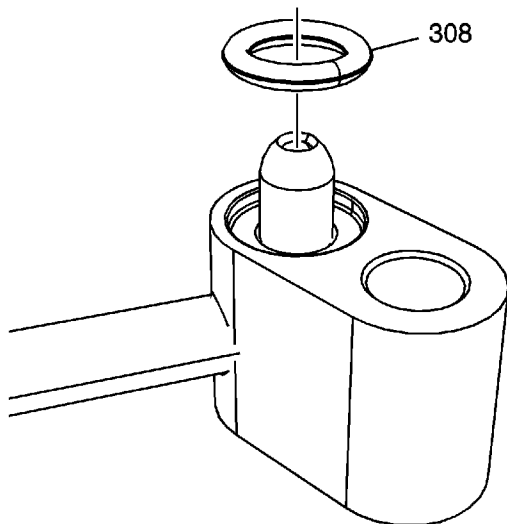
5. Remove the coolant air bleed pipe bolts (309) (intake manifold shown removed for clarity).

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6. Remove the coolant air bleed pipe (307) and seals (308).

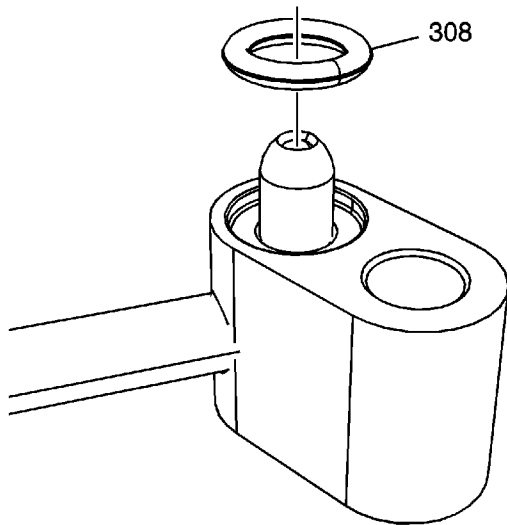


7. Remove the coolant air bleed cover bolts (312), if required.  
8. Remove the coolant air bleed covers (313) and seals (308), if required.



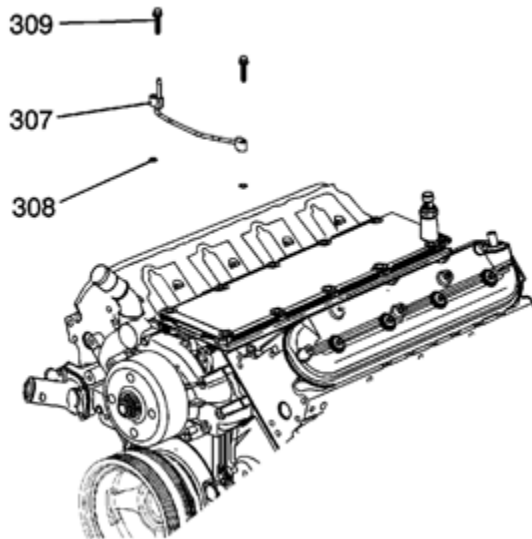
9. Remove the seals (308) from the coolant air bleed pipe and/or covers.  
10. Discard the seals.

## **Installation Procedure**



**Note:** Position the O-ring seal (308) onto the nipple portion of the pipe.

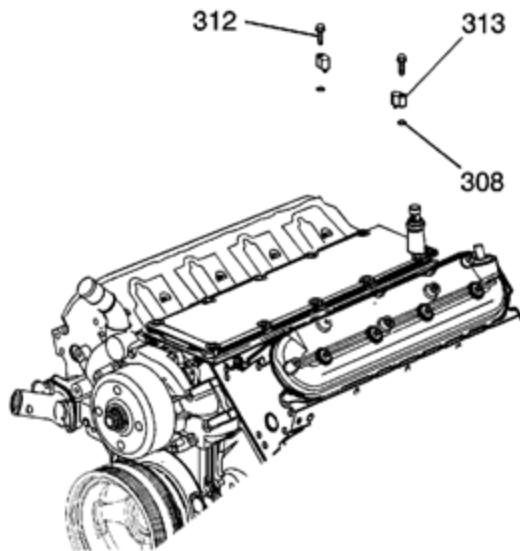
1. Install the seals onto the coolant air bleed pipe and/or covers.



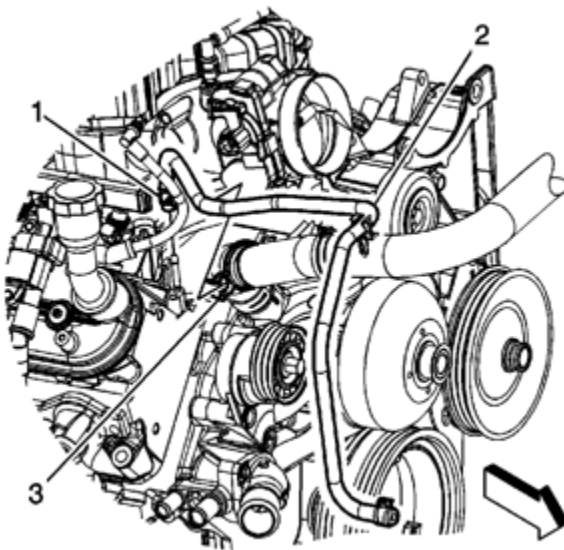
2. Install the coolant air bleed pipe (307) and seals (308) onto the cylinder heads.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the coolant air bleed pipe bolts (309) and tighten to **12 N·m (106 lb in)**.

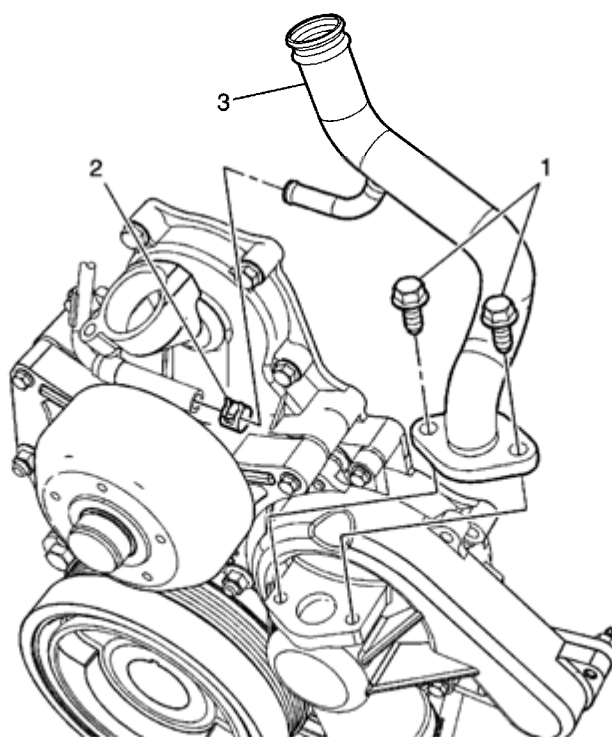


4. Install the coolant air bleed covers (313) and seals (308), if required.
5. Install the coolant air bleed cover bolts (312), if required and tighten to **12 N·m (106 lb in)**.



6. Install the radiator vent inlet hose (2) to the coolant air bleed pipe fitting.
7. Position the radiator vent inlet hose clamp (1) at the coolant air bleed pipe fitting.
8. Install the air cleaner outlet duct. Refer to [Air Cleaner Resonator Outlet Duct Replacement](#).
9. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

## Thermostat Bypass Pipes Replacement



| Callout                                                                                                                  | Component Name                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedure</b>                                                                                             |                                                                                                                                                                  |
| Remove the thermostat housing crossover replacement. Refer to <a href="#">Thermostat Housing Crossover Replacement</a> . |                                                                                                                                                                  |
| 1                                                                                                                        | Thermostat Bypass Pipe Bolt (Qty: 2)<br><b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.<br><b>Tighten</b><br>21 N·m (16 lb ft) |
| 2                                                                                                                        | Thermostat Bypass Pipe to Turbocharger Outlet Cooler Pipe Clamp                                                                                                  |
| 3                                                                                                                        | Thermostat Bypass Pipe<br><b>Tip</b><br>Install new O-ring seals. Lubricate using clean engine coolant.                                                          |

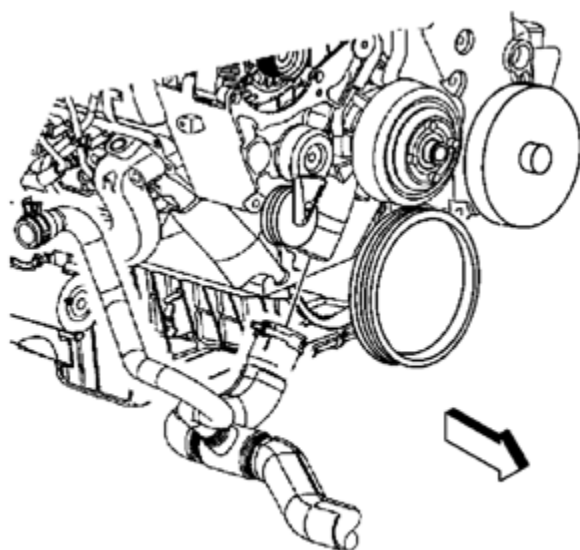
## Water Pump Replacement (LU3)

### Special Tools

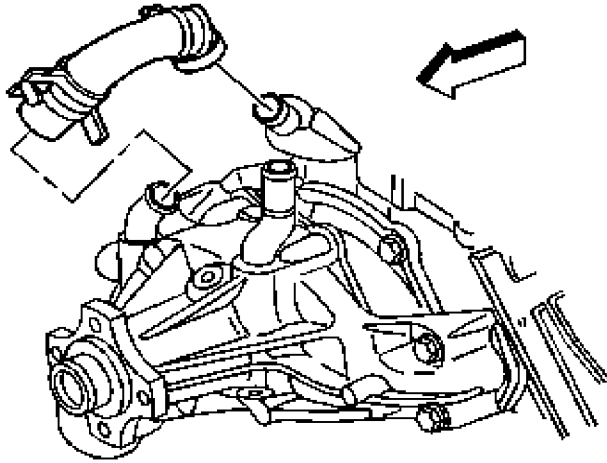
[J 41240](#) Fan Clutch Remover and Installer

### Removal Procedure

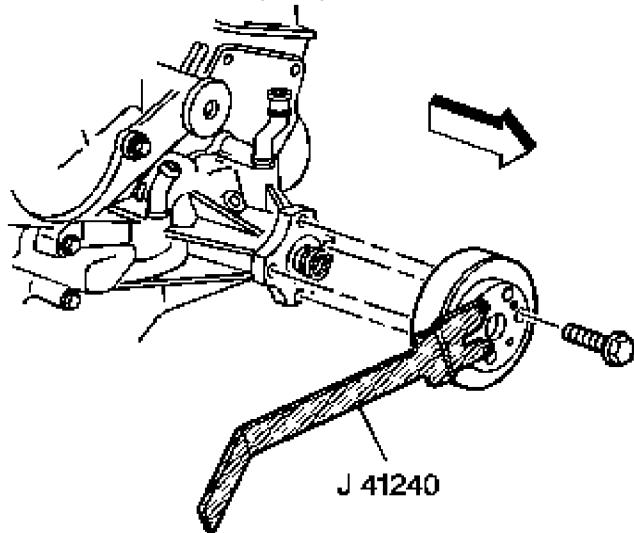
1. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
2. Remove the air cleaner outlet resonator duct. Refer to [Air Cleaner Outlet Resonator Replacement](#).
3. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
4. Remove the cooling fan.
5. Remove the drive belt. Refer to [Drive Belt Replacement](#).



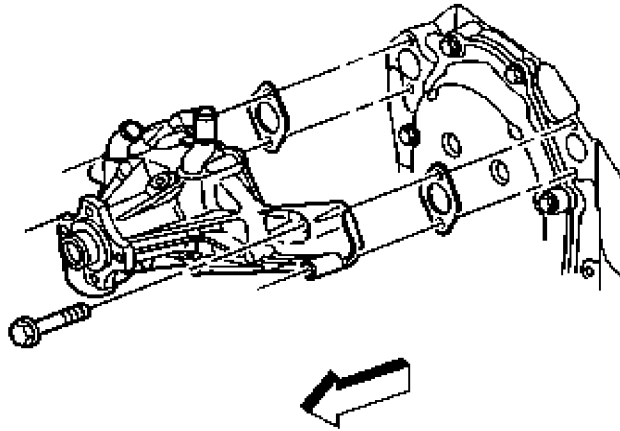
6. Reposition the radiator outlet hose clamps at the surge tank and water pump.
7. Remove the radiator outlet hose from the surge tank.
8. Remove the radiator outlet hose from the water pump.



9. Reposition the water pump inlet hose clamps.
10. Remove the water pump inlet hose.

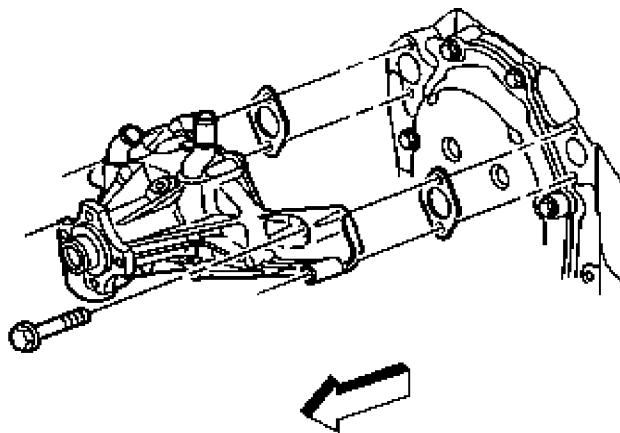


11. Using [J 41240](#) to hold the water pump pulley, remove the water pump pulley bolts.



12. Remove the water pump bolts.
13. Remove the water pump.
14. Remove and discard the water pump gaskets.
15. Clean and inspect the water pump, if necessary. Refer to [Water Pump Cleaning and Inspection](#).

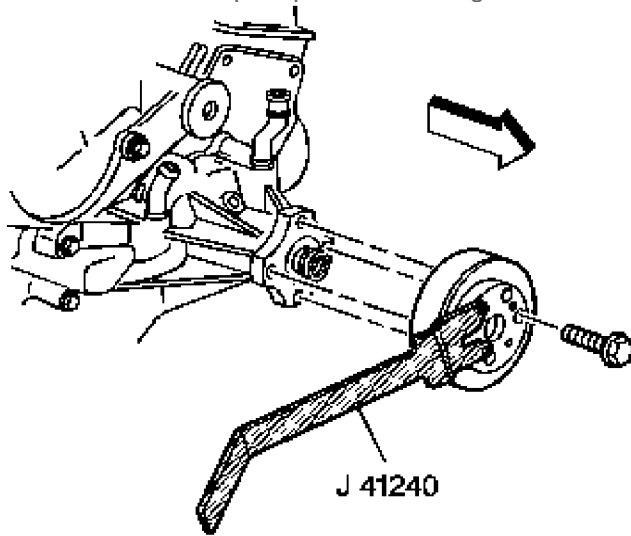
## Installation Procedure



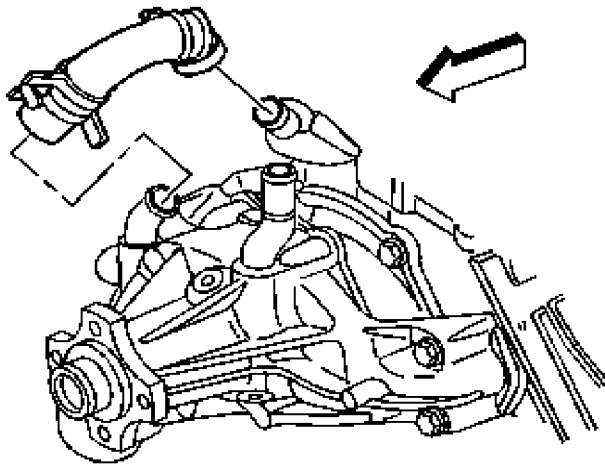
1. If reusing the fasteners, apply sealant GM P/N 12346004 (Canadian P/N 10953480), or equivalent to the threads of the water pump bolts.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install NEW water pump gaskets and the water pump.
3. Install the water pump bolts and tighten to **45 N·m (33 lb ft)**.

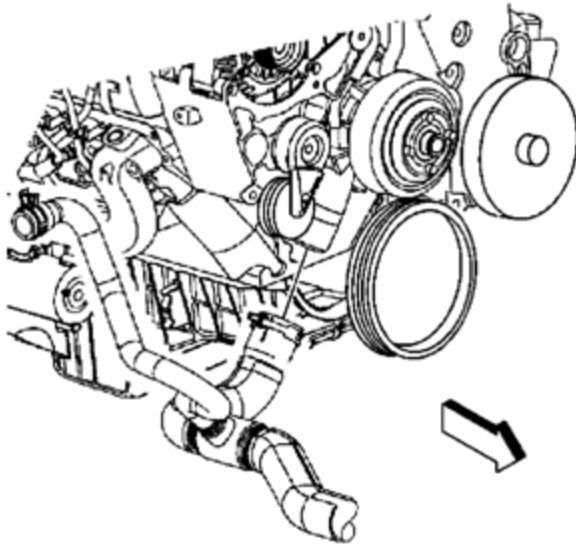


- 
4. Using [J 41240](#) to hold the water pump pulley, install the water pump pulley bolts and tighten to **25 N·m (18 lb ft)**.



**Note:** After assembly, the hose clamp tangs (water pump end) must point forward and the upper tang should be level with the outside diameter of the water pump inlet hose.

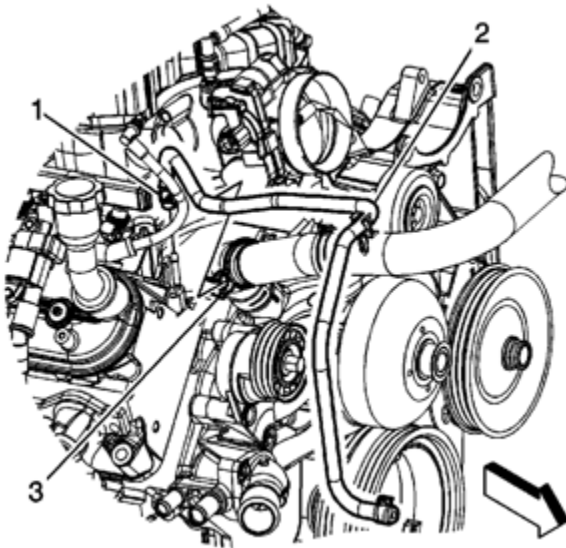
5. Install the water pump inlet hose.
6. Position the water pump inlet hose clamps.



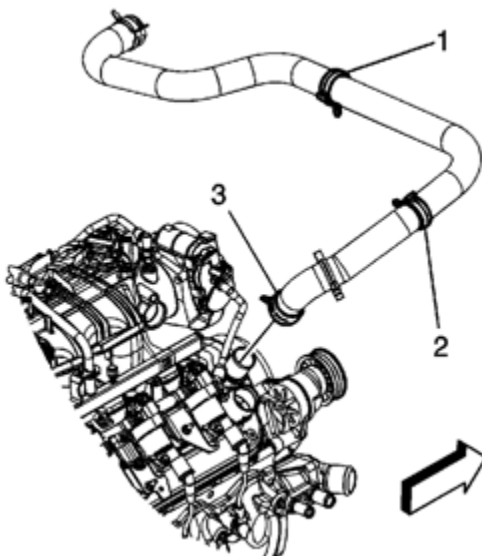
7. Install the radiator outlet hose to the water pump.
8. Install the radiator outlet hose to the surge tank.
9. Position the radiator outlet hose clamps at the surge tank and water pump.
10. Install the drive belt. Refer to [Drive Belt Replacement](#).
11. Install the cooling fan.
12. Install the air cleaner outlet resonator duct. Refer to [Air Cleaner Outlet Resonator Replacement](#).
13. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
14. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
15. Inspect the cooling system for leaks.

## Water Pump Replacement (LMF/LY2)

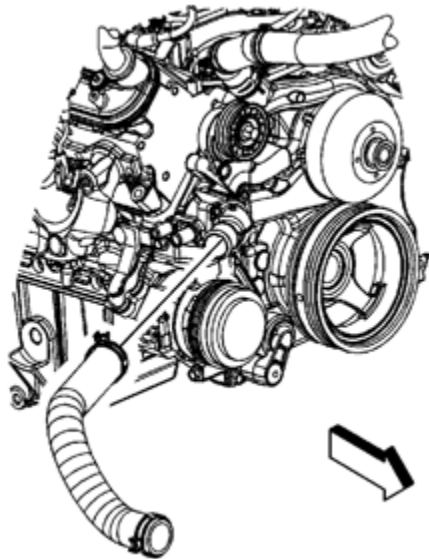
### Removal Procedure



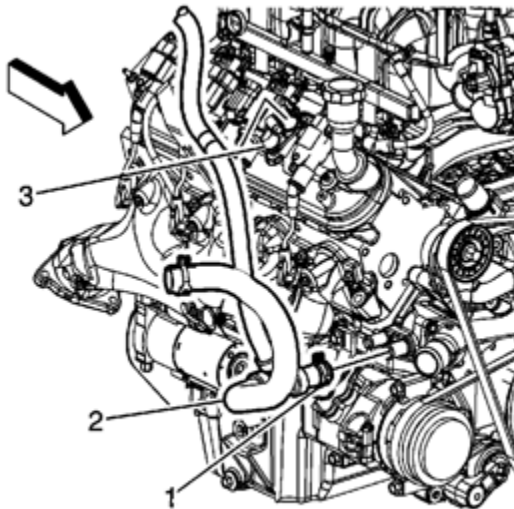
1. Remove the air cleaner outlet assembly. Refer to [Air Cleaner Assembly Replacement](#).
2. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
3. Reposition the radiator vent inlet hose clamp (1) at the coolant air bleed pipe fitting.
4. Remove the radiator vent inlet hose (2) from the coolant air bleed pipe fitting.



5. Reposition the radiator inlet hose clamp (3) at the water pump.
6. Remove the radiator inlet hose from the water pump.
7. Reposition the radiator inlet hose and vent inlet hose out of the way.
8. Remove the accessory drive belt. Refer to [Drive Belt Replacement - Accessory](#).

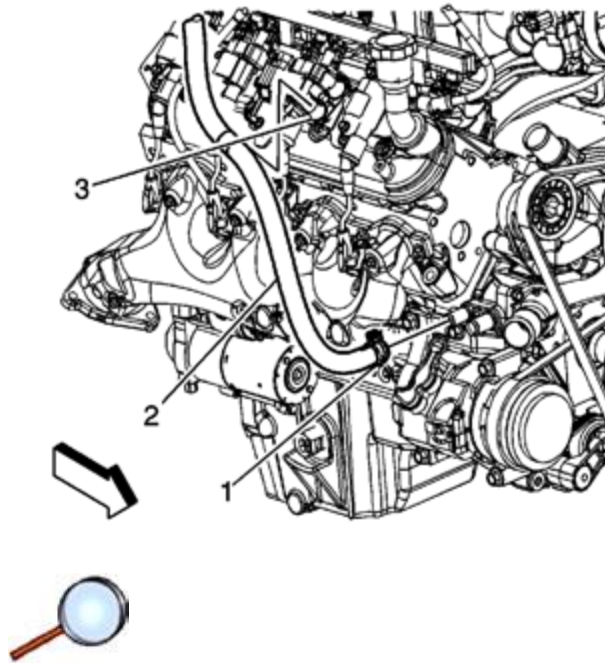


9. Reposition the radiator outlet hose clamp at the water pump.
10. Remove the radiator outlet hose from the water pump.
11. Reposition the outlet hose out of the way.

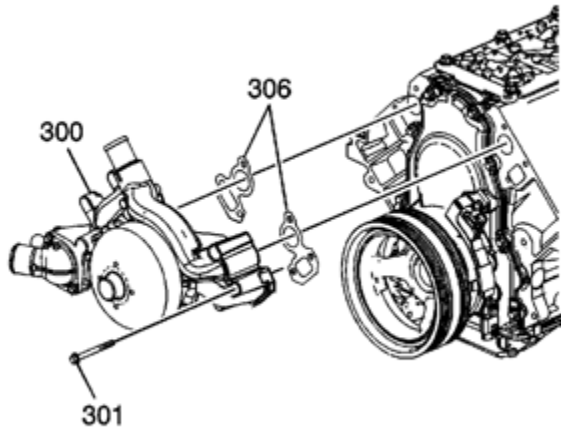


12. Reposition the radiator surge tank outlet hose clamp (1) at the water pump.
13. Remove the radiator surge tank outlet hose (2) from the water pump.
14. Reposition the outlet hose out of the way.





15. Reposition the heater inlet hose clamp (1) at the water pump.
16. Remove the heater inlet hose (2) from the water pump.
17. Reposition the inlet hose out of the way.

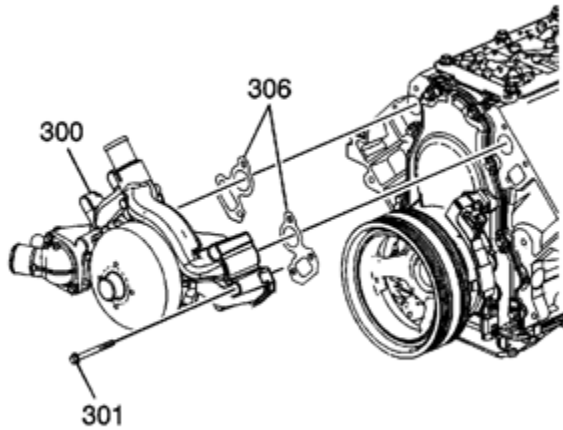


18. Remove the water pump bolts (301).
19. Remove the water pump (300) and gaskets (306). Discard the gaskets.

## Installation Procedure

**Caution:** DO NOT use cooling system seal tabs, or similar compounds, unless otherwise instructed. The use of cooling system seal tabs, or similar compounds, may restrict coolant flow through the passages of the cooling system or the engine components. Restricted coolant flow may cause engine overheating and/or damage to the cooling system or the engine components/assembly.

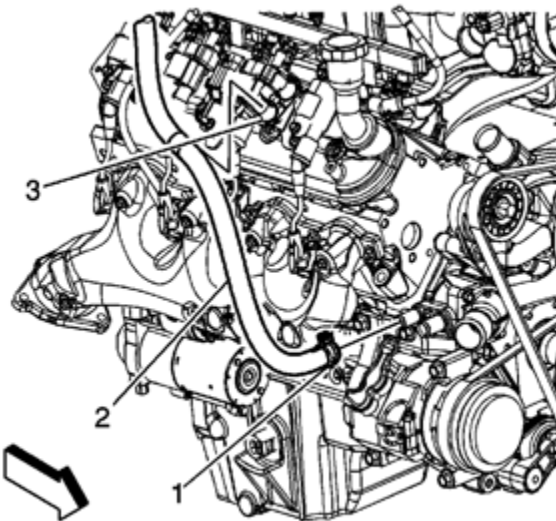
**Note:** All gaskets surfaces are to be free of oil or other foreign material during assembly.



1. Position the water pump (300) and NEW gaskets (306) to the engine block.

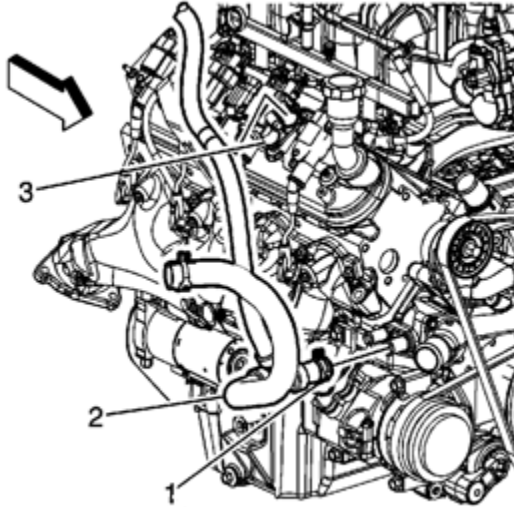
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the water pump bolts (301).
  - 2.1. Tighten the bolts a first pass to **15 N·m (11 lb ft)**.
  - 2.2. Tighten the bolts a final pass to **30 N·m (22 lb ft)**.

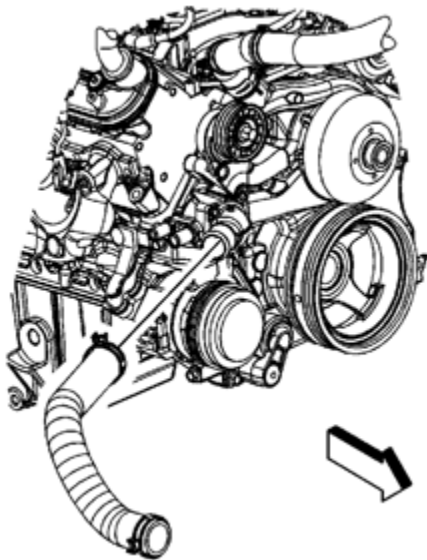


3. Position and install the heater inlet hose (2) to the water pump.

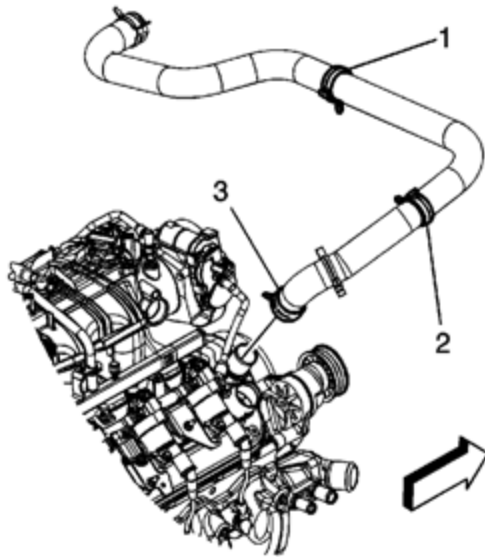
4. Position the heater inlet hose clamp (1) at the water pump.



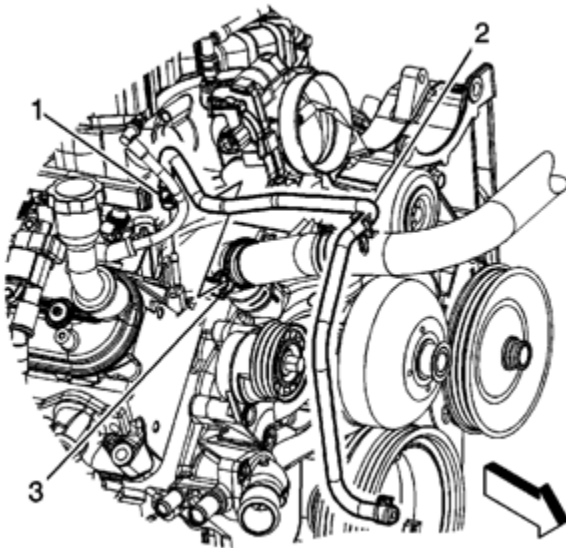
5. Position and install the radiator surge tank outlet hose (2) to the water pump.
6. Position the radiator surge tank outlet hose clamp (1) at the water pump.



7. Position and install the radiator outlet hose to the water pump.
8. Position the radiator outlet hose clamp at the water pump.
9. Install the accessory drive belt. Refer to [Drive Belt Replacement - Accessory](#).



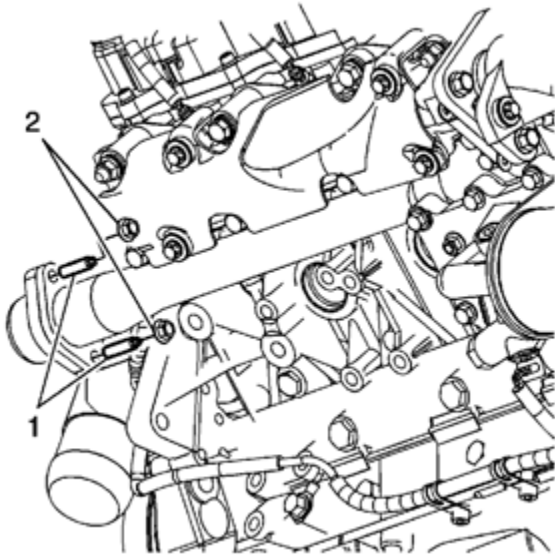
10. Position the radiator inlet hose and vent inlet hose to the correct position.
11. Install the radiator inlet hose to the water pump.
12. Position the radiator inlet hose clamp (3) at the water pump.



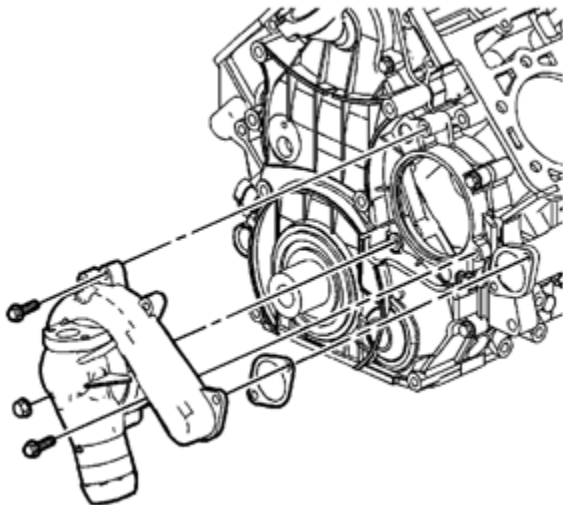
13. Install the radiator vent inlet hose (2) to the coolant air bleed pipe fitting.
14. Position the radiator vent inlet hose clamp (1) at the coolant air bleed pipe fitting.
15. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
16. Install the air cleaner outlet assembly. Refer to [Air Cleaner Assembly Replacement](#).

## Water Pump Replacement (LMM)

### Removal Procedure



1. Remove the thermostat bypass pipes. Refer to [Thermostat Bypass Pipes Replacement](#).
2. Remove the crankshaft balancer. Refer to [Crankshaft Balancer Replacement](#).
3. Remove the water pump to water pump outlet pipe nuts (2).

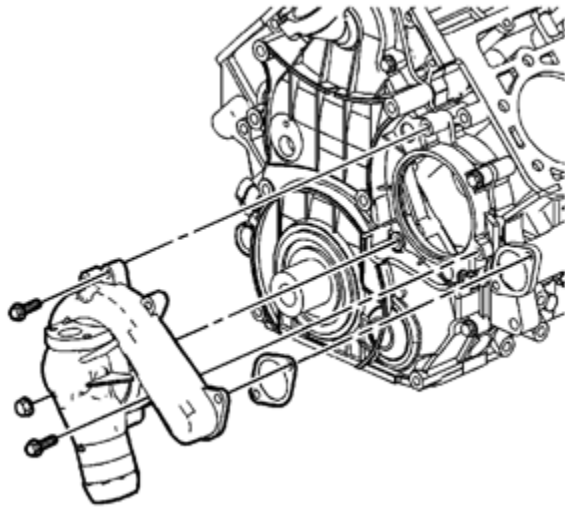


4. Remove the water pump nuts/bolts.

Note the location of the bolts. The bolts are different lengths.

5. Remove the water pump.
6. Remove and discard the water pump O-ring and the water pump outlet pipe gasket.

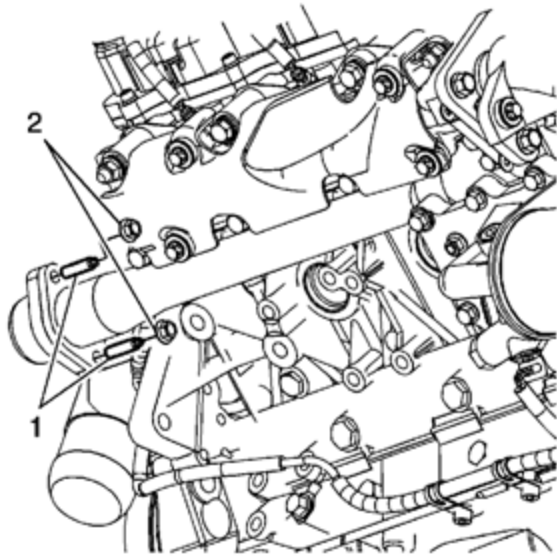
## Installation Procedure



1. Lubricate the water pump O-ring with engine oil.
2. Install the water pump outlet pipe gasket and water pump O-ring.
3. Install the water pump.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the water pump nuts/bolts. Ensure the correct length bolt is used in the proper location and tighten to **21 N·m (15 lb ft)**.

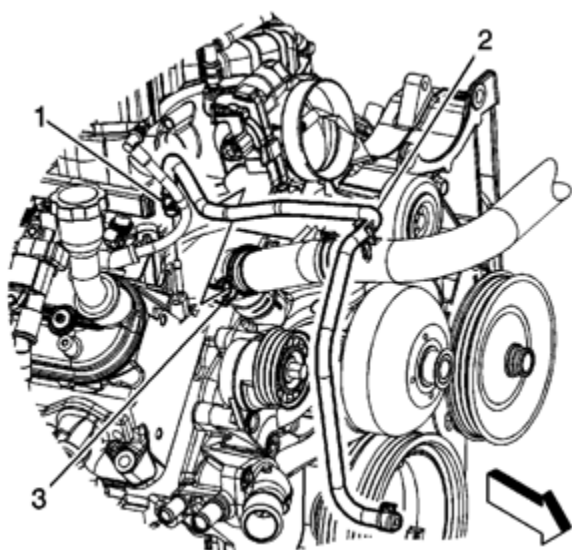


5. Install the water pump to water pump outlet pipe nuts (2) and tighten to **25 N·m (18 lb ft)**.
6. Install the crankshaft balancer. Refer to [Crankshaft Balancer Replacement](#).
7. Install the thermostat bypass pipes. Refer to [Thermostat Bypass Pipes Replacement](#).

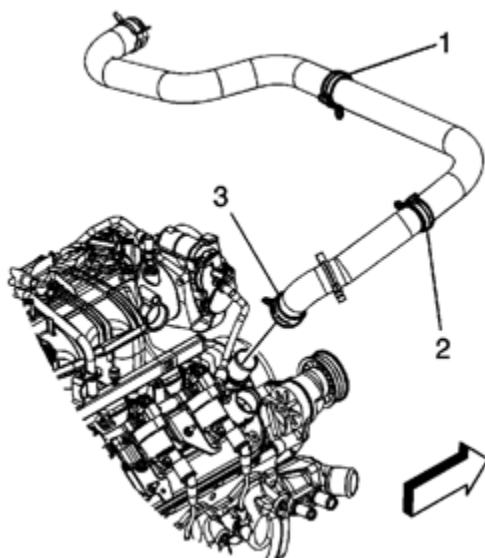
cardiagn.com

## Water Pump Replacement (LY6)

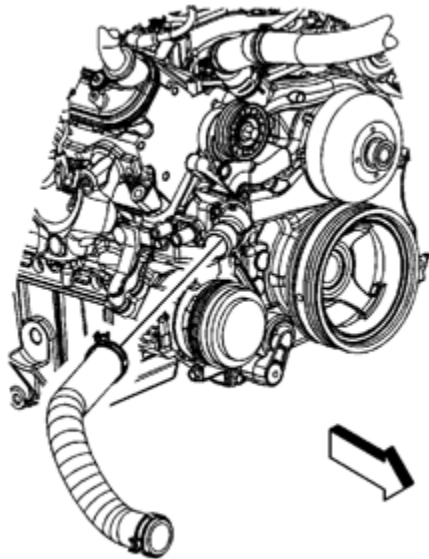
### Removal Procedure



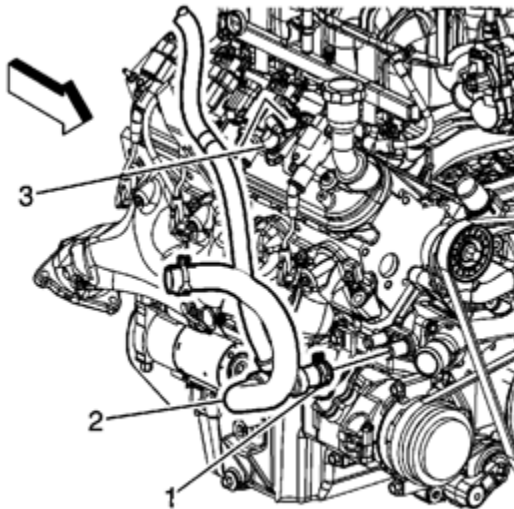
1. Remove the air cleaner outlet assembly. Refer to [Air Cleaner Assembly Replacement](#).
2. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
3. Reposition the radiator vent inlet hose clamp (1) at the coolant air bleed pipe fitting.
4. Remove the radiator vent inlet hose (2) from the coolant air bleed pipe fitting.



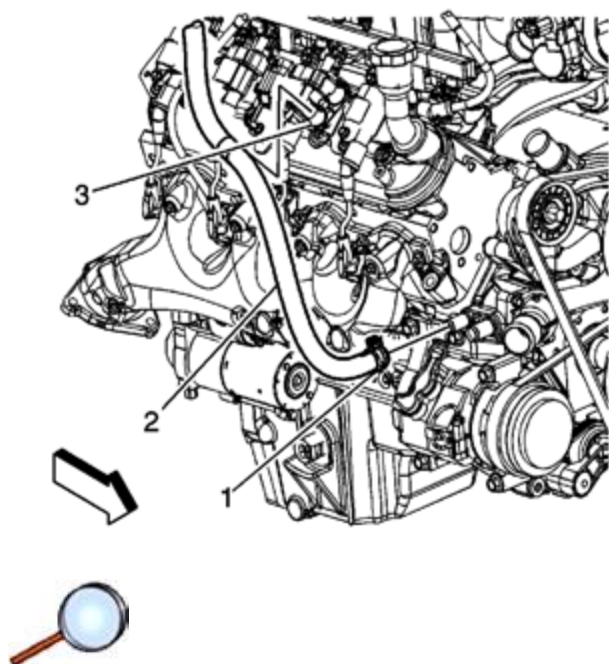
5. Reposition the radiator inlet hose clamp (3) at the water pump.
6. Remove the radiator inlet hose from the water pump.
7. Reposition the radiator inlet hose and vent inlet hose out of the way.
8. Remove the accessory drive belt. Refer to [Drive Belt Replacement - Accessory](#).



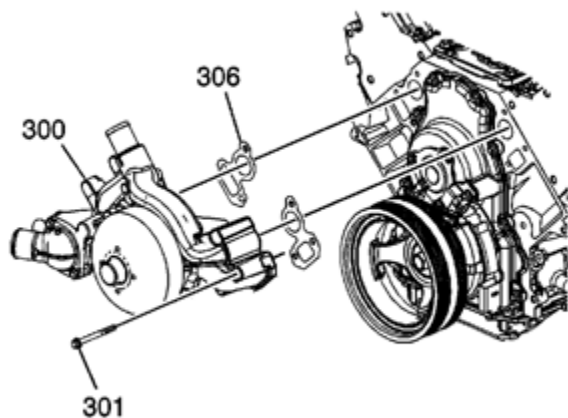
9. Reposition the radiator outlet hose clamp at the water pump.
10. Remove the radiator outlet hose from the water pump.
11. Reposition the outlet hose out of the way.



12. Reposition the radiator surge tank outlet hose clamp at the water pump (1).
13. Remove the radiator surge tank outlet hose (2) from the water pump.
14. Reposition the outlet hose out of the way.



15. Reposition the heater inlet hose clamp (1) at the water pump.
16. Remove the heater inlet hose (2) from the water pump.
17. Reposition the inlet hose out of the way.

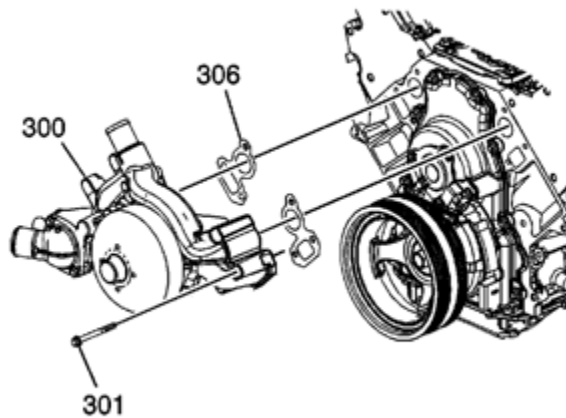


18. Remove the water pump bolts (301).
19. Remove the water pump (300) and gaskets (309). Discard the gaskets.

## Installation Procedure

**Caution:** DO NOT use cooling system seal tabs, or similar compounds, unless otherwise instructed. The use of cooling system seal tabs, or similar compounds, may restrict coolant flow through the passages of the cooling system or the engine components. Restricted coolant flow may cause engine overheating and/or damage to the cooling system or the engine components/assembly.

**Note:** All gaskets surfaces are to be free of oil or other foreign material during assembly.



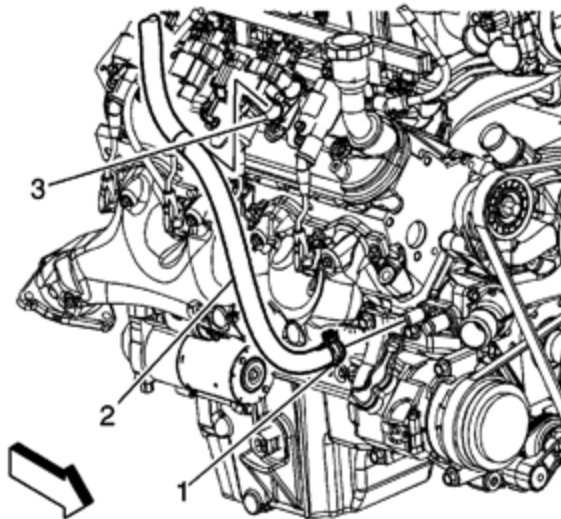
1. Inspect the drained coolant for sand or other debris, flush the system as needed. Refer to [Flushing](#).
2. Inspect and clear the radiator vent hose fitting, if necessary.

There is a small 2.0 mm (0.080 in) orifice (vent hose fitting) in the neck of the radiator where the coolant vent hose from the engine attaches to the radiator.

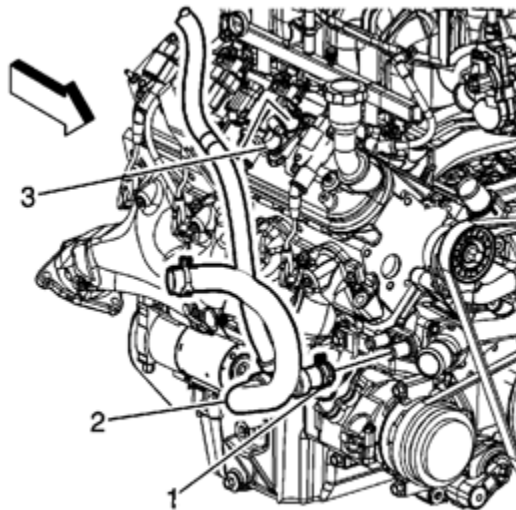
3. Position the water pump (300) and NEW gaskets (306) to the engine block.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

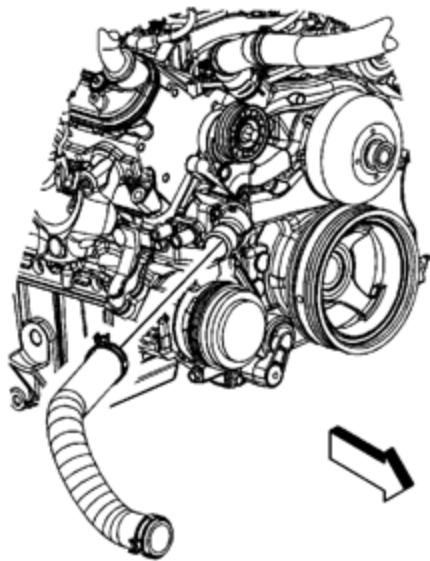
4. Install the water pump bolts (301).
  - 4.1. Tighten the bolts a first pass to 15 N·m (11 lb ft).
  - 4.2. Tighten the bolts a final pass to 30 N·m (22 lb ft).



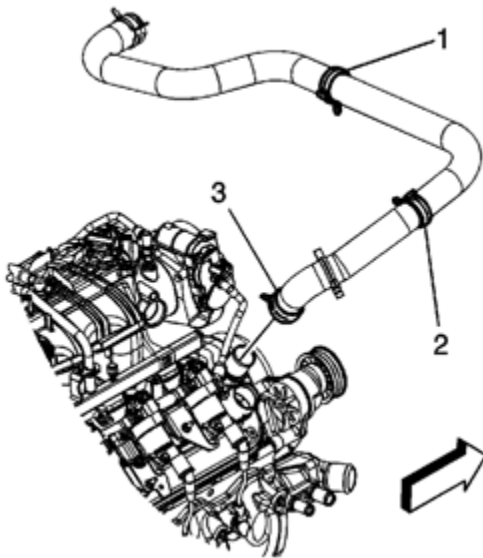
5. Position and install the heater inlet hose (2) to the water pump.
6. Position the heater inlet hose clamp (1) at the water pump.



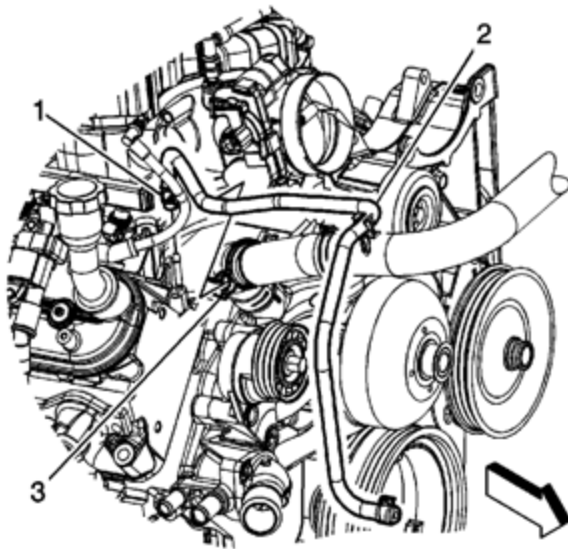
7. Position and install the radiator surge tank outlet hose (2) to the water pump.
8. Position the radiator surge tank outlet hose clamp at the water pump (1).



9. Position and install the radiator outlet hose to the water pump.
10. Position the radiator outlet hose clamp at the water pump.
11. Install the accessory drive belt. Refer to [Drive Belt Replacement - Accessory](#).



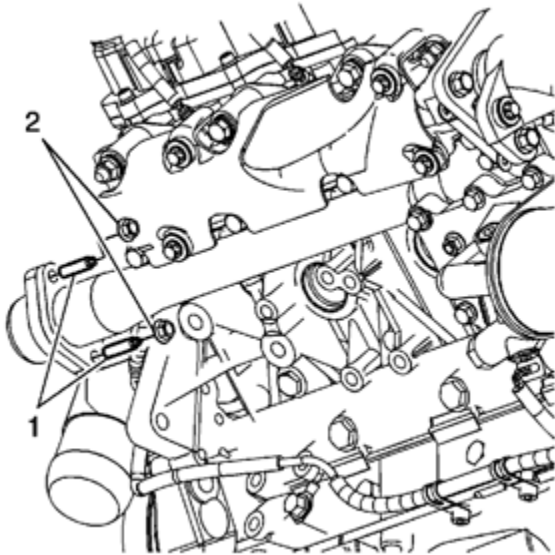
12. Position the radiator inlet hose and vent inlet hose to the correct position.
13. Install the radiator inlet hose to the water pump.
14. Position the radiator inlet hose clamp (3) at the water pump.



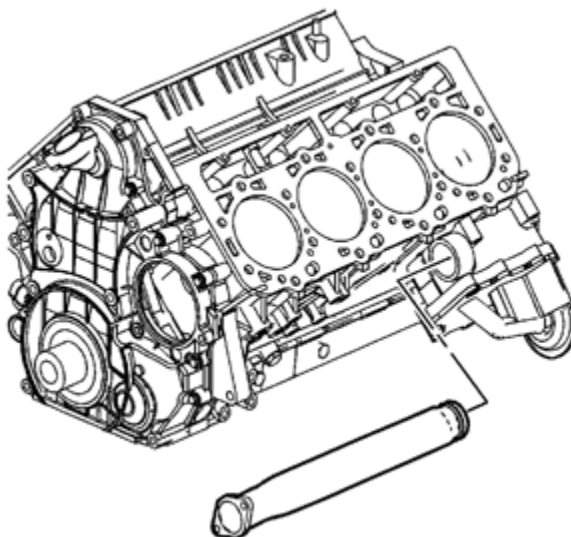
15. Install the radiator vent inlet hose (2) to the coolant air bleed pipe fitting.
16. Position the radiator vent inlet hose clamp (1) at the coolant air bleed pipe fitting.
17. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
18. Install the air cleaner outlet assembly. Refer to [Air Cleaner Assembly Replacement](#).

## Water Pump Outlet Pipe Replacement

### Removal Procedure

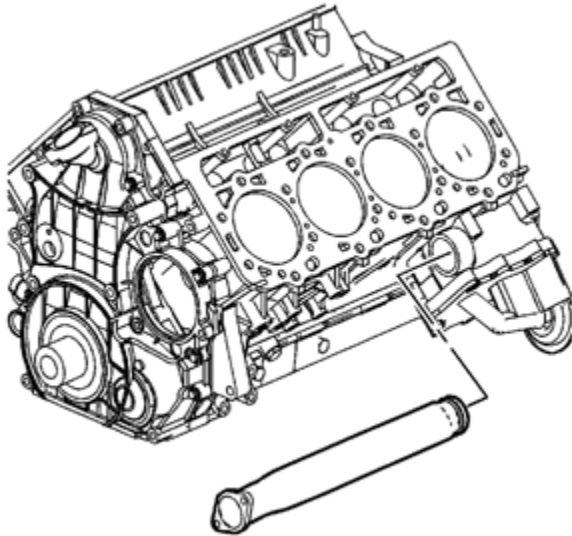


1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the oil filter adapter and oil cooler assembly. Refer to [Oil Filter Adapter and Oil Cooler Assembly Replacement](#).
3. Remove the water pump to water pump outlet pipe nuts (2).
4. Remove the water pump to water pump outlet pipe studs (1).



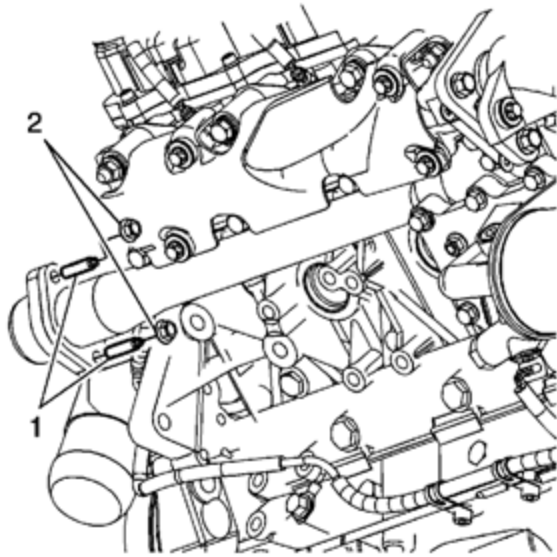
5. Remove the water pump outlet pipe.
6. Remove and discard the water pump outlet pipe O-ring and gasket.

## Installation Procedure



1. Install a NEW water pump outlet pipe O-ring onto the pipe.
2. Lubricate the O-ring seal with engine coolant.
3. Position a NEW water pump outlet pipe gasket to the water pump.
4. Install the water pump outlet pipe.
5. Install the oil filter adapter and oil cooler assembly. Refer to [Oil Filter Adapter and Oil Cooler Assembly Replacement](#).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



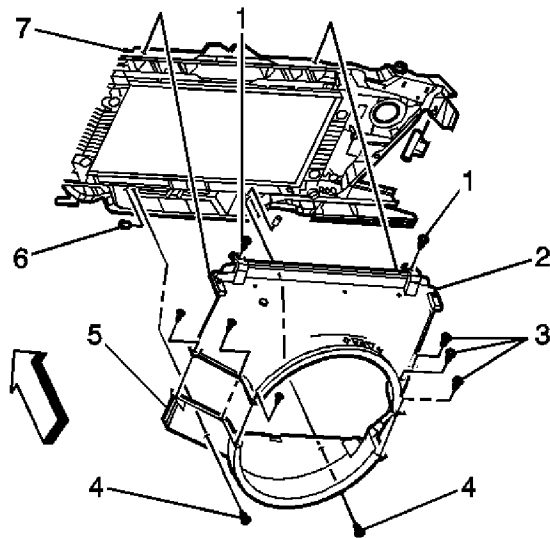
6. Install the water pump to water pump outlet pipe studs (1) and tighten to **20 N·m (15 lb ft)**.
7. Install the water pump to water pump outlet pipe nuts (2) and tighten to **25 N·m (18 lb ft)**.
8. Lower the vehicle.

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## Engine Coolant Fan Upper Shroud Replacement (4.3L, 4.8L, 5.3L, 6.0L, 6.2L, 7.0L)

### Removal Procedure

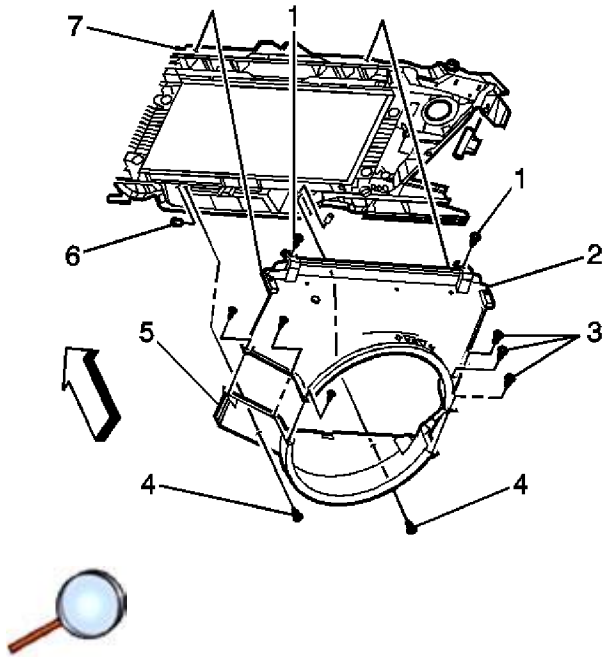
1. Remove the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) for the 4.3L engine or [Air Cleaner Assembly Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, and 7.0L engines.



3. Remove the air cleaner outlet resonator. Refer to [Air Cleaner Outlet Resonator Replacement](#) for the 4.3L engine or [Air Cleaner Resonator Outlet Duct Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, and 7.0L engines.
4. For the 4.3L engine, remove the air conditioning (A/C) suction hose. Refer to [Suction Hose Replacement](#) for the 4.3L engine.
5. For the 4.8L, 5.3L and 6.0L engine, remove the radiator inlet hose. Refer to [Radiator Inlet Hose Replacement](#).
6. Remove the battery cable from the fan shroud clips and reposition.
7. Remove the mass air flow (MAF) sensor wire from the fan shroud clip and reposition.
8. Remove the transmission oil level indicator.
9. Remove the fan shroud bolts (1, 3, 4).
10. Remove the fan shroud (2, 5).

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

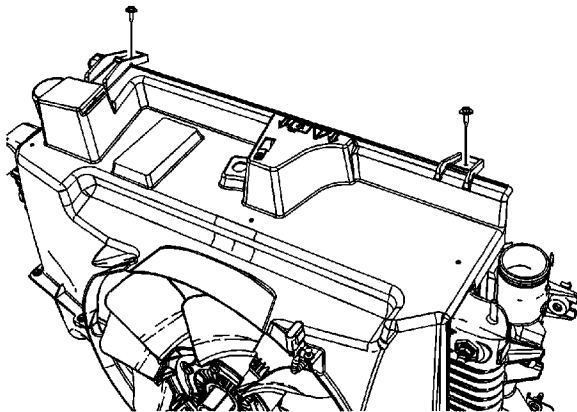


1. Install the fan shroud (2, 5).
2. Install the fan shroud bolts (1, 3, 4) and tighten to **6 N·m (53 lb in)**.
3. Install the transmission oil level indicator.
4. Install the MAF sensor wire to the fan shroud clip.
5. Install the battery cable to the fan shroud clips.
6. For the 4.3L engine, install the A/C suction hose. Refer to [Suction Hose Replacement](#) for the 4.3L engine.
7. For the 4.8L, 5.3L and 6.0L engine, install the radiator inlet hose. Refer to [Radiator Inlet Hose Replacement](#).
8. Install the air cleaner outlet resonator. Refer to [Air Cleaner Outlet Resonator Replacement](#) for the 4.3L engine or [Air Cleaner Resonator Outlet Duct Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, and 7.0L engines.
9. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, and 7.0L engines or [Air Cleaner Assembly Replacement](#) for the 4.3L engine.
10. Install the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).

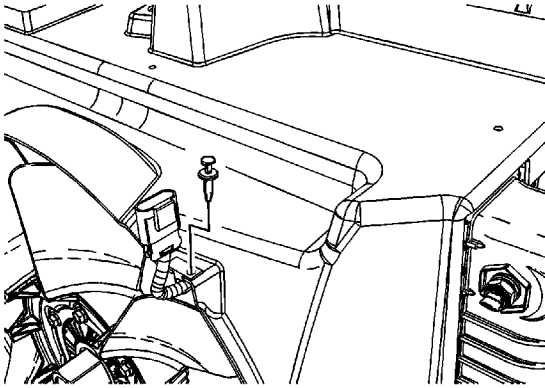
## Engine Coolant Fan Upper Shroud Replacement (6.6L)

### Removal Procedure

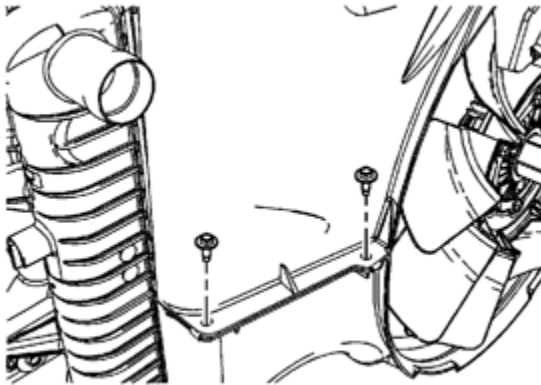
1. Remove the surge tank. Refer to [Radiator Surge Tank Replacement](#).
2. Remove the charge air cooler inlet and outlet hoses. Refer to [Charged Air Cooler Hoses/Pipes Replacement](#).
3. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
4. Disconnect the fan clutch electrical connector, if equipped.
5. Remove the intake air heater. Refer to [Intake Air Heater Replacement](#).
6. Disconnect the cross car harness at buss bar on right core support.
7. Position cross car harness out of way.
8. Remove the transmission oil indicator.
9. Remove the engine oil indicator.
10. Remove the engine oil fill cap.



11. Remove the 2 upper fan shroud to core support bolts.



12. Remove the fan clutch electrical wiring harness routing clip, if equipped.

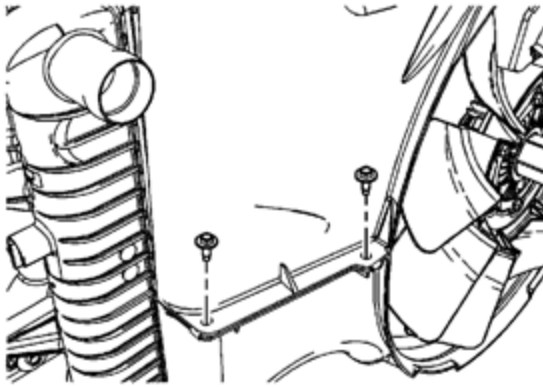


13. Remove the 4 upper fan shroud to lower fan shroud bolts.
14. Remove the upper fan shroud, while positioning the upper radiator hose.

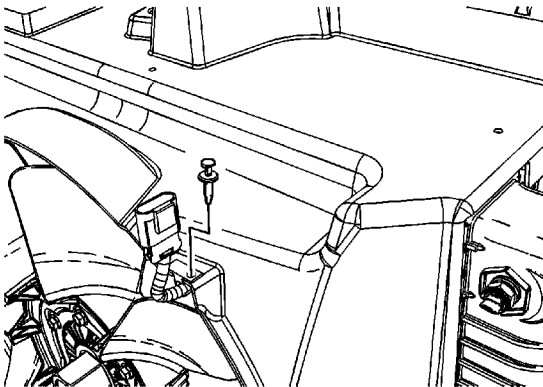
## Installation Procedure

1. Position the upper fan shroud in the vehicle, while positioning the upper radiator hose.

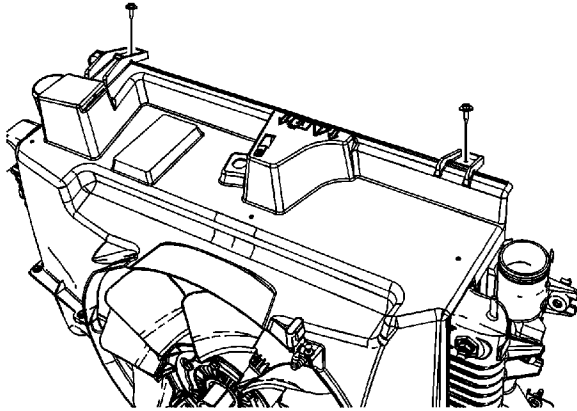
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Install the 4 upper fan shroud to lower fan shroud bolts and tighten to **6 N·m (53 lb in)**.



3. Install the fan clutch electrical wiring harness routing clip, if equipped.



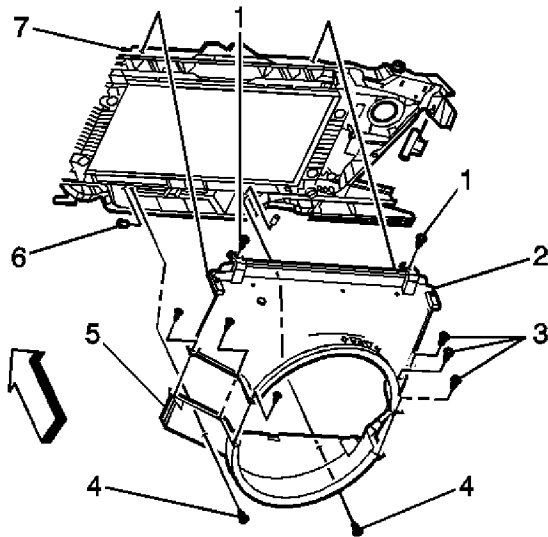
4. Install the 2 upper fan shroud to core support bolts and tighten to **6 N·m (53 lb in)**.
5. Install the engine oil fill cap.
6. Install the engine oil indicator.
7. Install the transmission oil indicator.
8. Position back cross car harness.
9. Connect the cross car harness on buss bar at right core support.
10. Install the intake air heater. Refer to [Intake Air Heater Replacement](#).
11. Connect the fan clutch electrical connector, if equipped.
12. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
13. Install the charge air cooler inlet and outlet hoses. Refer to [Charged Air Cooler Hoses/Pipes Replacement](#).
14. Install the surge tank. Refer to [Radiator Surge Tank Replacement](#).

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## Engine Coolant Fan Lower Shroud Replacement (4.3L, 4.8L, 5.3L, 6.0L, 6.2L, 7.0L)

### Removal Procedure

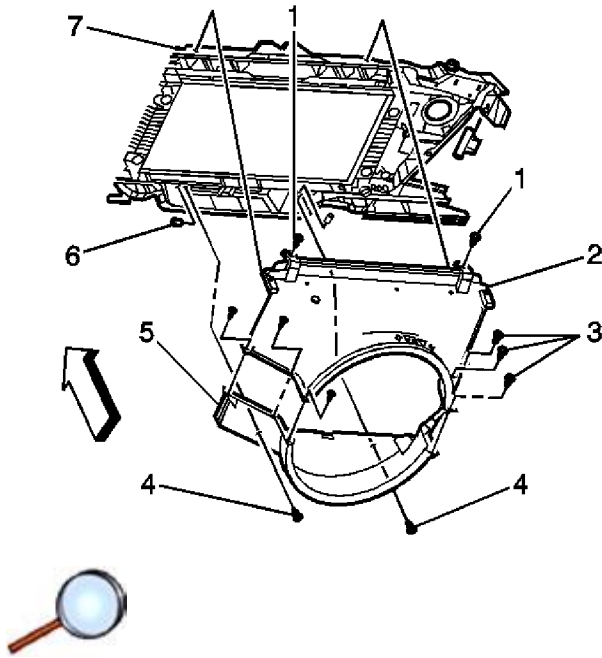
1. Remove the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, 7.0L engines or [Air Cleaner Assembly Replacement](#) for the 4.3L engine.



3. Remove the fan shroud bolts (1,3,4).
4. Remove the fan shroud (2,5).

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

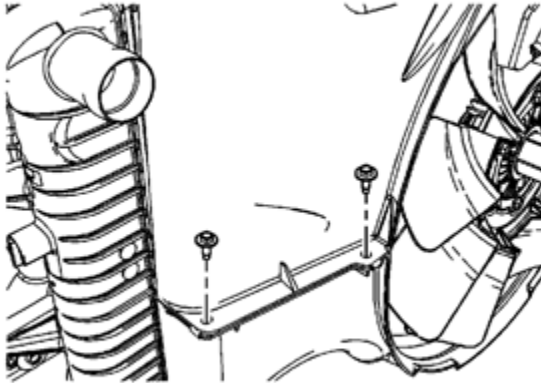


1. Install the fan shroud (2,5).
2. Install the fan shroud bolts (1,3,4) and tighten to **6 N·m (53 lb in)**.
3. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, 7.0L engines or [Air Cleaner Assembly Replacement](#) for the 4.3L engine.
4. Install the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).

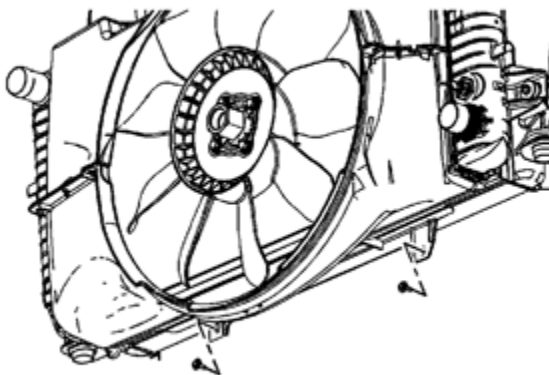
## Engine Coolant Fan Lower Shroud Replacement (6.6L)

### Removal Procedure

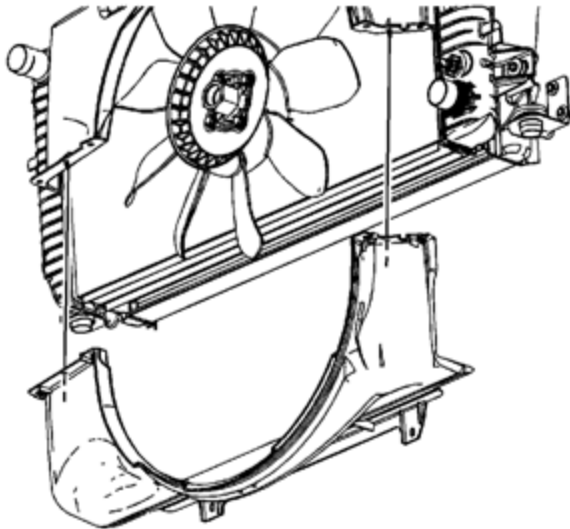
1. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).



2. Remove the upper fan shroud to lower fan shroud retaining bolts.
3. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

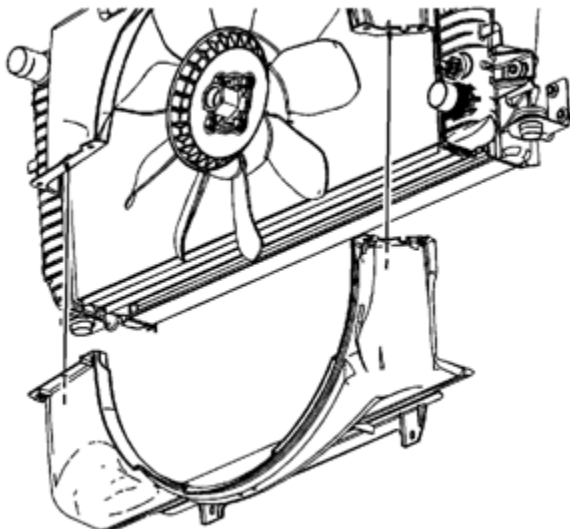


4. Remove the lower fan shroud retaining bolts.



5. Remove the lower fan shroud from the vehicle.

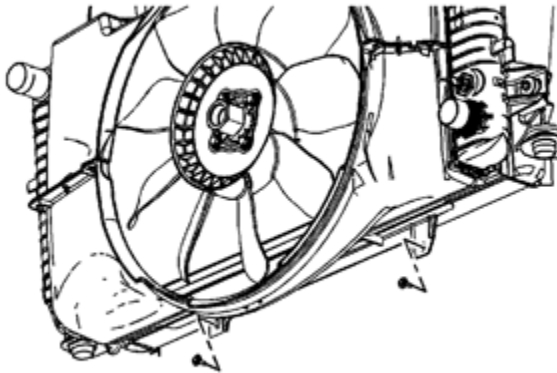
## Installation Procedure



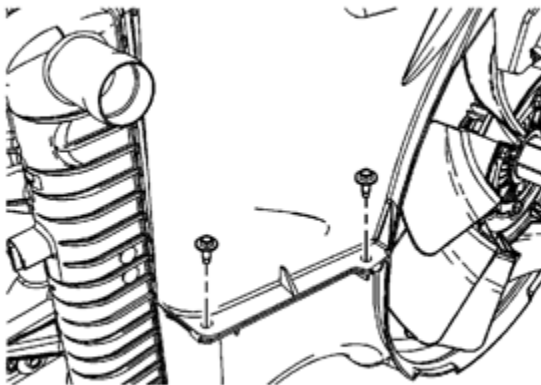
**Note:** Align lower fan shroud to the upper fan shroud with the alignment pins in the upper fan shroud.

1. Install the lower fan shroud to the vehicle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Install the lower fan shroud retaining bolts and tighten to **6 N·m (53 lb in)**.
3. Lower the vehicle.



4. Install the upper fan shroud to lower fan shroud retaining bolts and tighten to **6 N·m (53 lb in)**.
5. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).

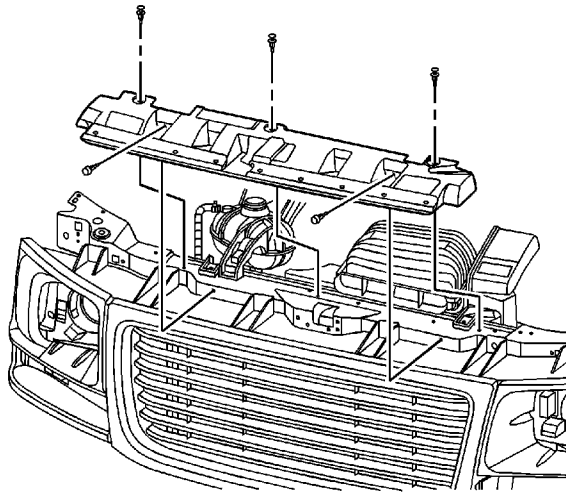
# Radiator Replacement (Diesel)

## Special Tools

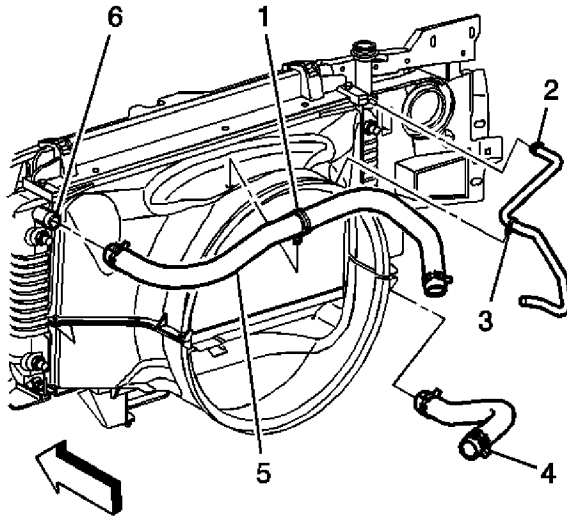
[J 38185](#) Hose Clamp Pliers

## Removal Procedure

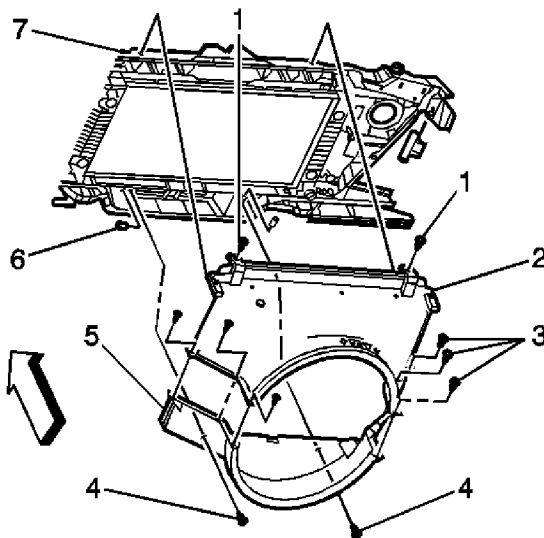
**Note:** Always install a new set of insulators when replacing a radiator. Used insulators may be worn or too large for the new radiator. These conditions may cause the new radiator to be loose.



1. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
2. Remove the upper radiator baffle.
3. Remove the surge tank. Refer to [Radiator Surge Tank Replacement](#).
4. Remove battery. Refer to [Battery Replacement](#).
5. Remove the charged air cooler inlet hose/pipe. Refer to [Charged Air Cooler Hoses/Pipes Replacement](#).



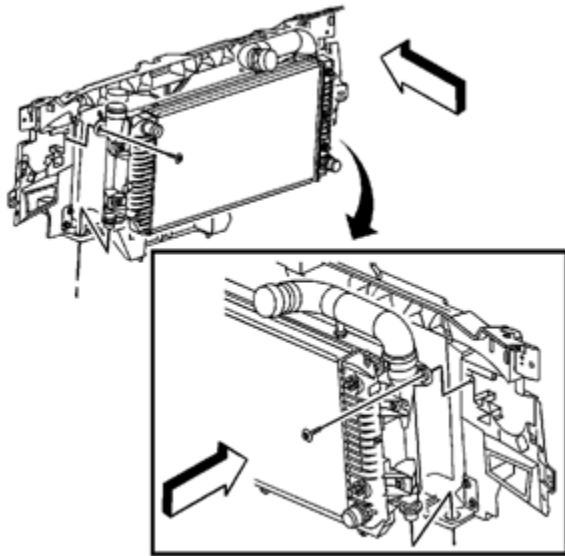
6. Remove the clamp at the radiator inlet using the [J 38185](#).
7. Remove the radiator inlet hose (5) from the radiator.
8. Remove the outlet heater hose clamp at the radiator using the [J 38185](#).
9. Remove the outlet heater hose (2) from the radiator.
10. Remove the automatic transmission cooler lines. Refer to [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L60-E/4L65-E/4L70-E transmissions or [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L80-E/4L85-E transmissions.
11. Remove the engine oil cooler lines. Refer to [Engine Oil Cooler Pipe/Hose Quick Connect Fitting](#).
12. Remove the engine oil fill tube. Refer to [Oil Filler Tube Replacement](#).
13. Remove intake manifold tube. Refer to [Intake Manifold Tube Replacement](#).



14. Remove the upper radiator baffle.

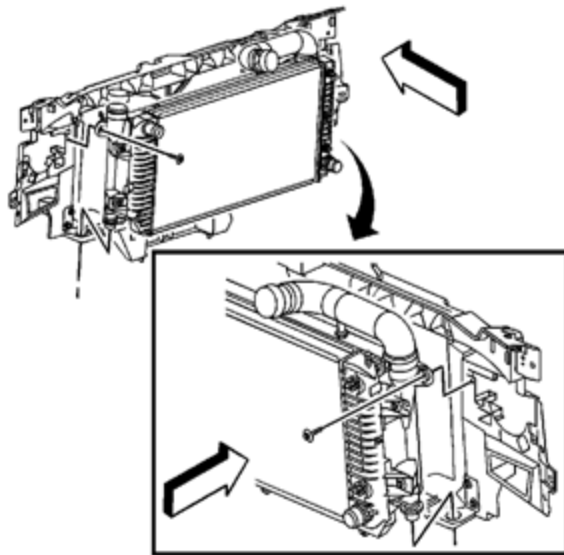
Remove the fan shroud bolts (1) from the top of the radiator support.

15. Remove the fan shroud bolts (3) from the sides of the fan shroud.



16. Remove the radiator mounting bolts from the charged air cooler.  
17. Remove the charge air cooler bolts to core support.  
18. Remove the radiator and charge air cooler as assembly.  
19. Remove radiator bolts to charge air cooler.  
20. Remove the radiator insulators.  
21. Inspect the following components:
- The radiator
  - The insulators
  - The hoses and clamps
  - The mounting hardware
  - Replace the components as necessary.

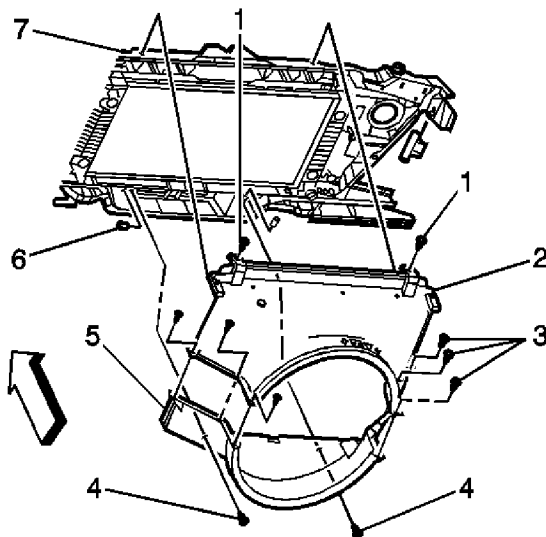
## Installation Procedure



1. Install the radiator insulators.

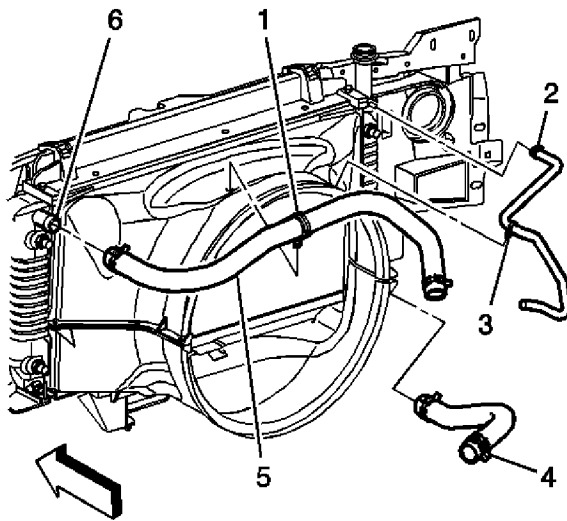
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the radiator to the charge air cooler and tighten the bolts to **6 N·m (53 lb in)**.
3. Install the radiator and charge air cooler as an assembly.
4. Install the radiator mounting bolts to the charged air cooler and tighten to **6 N·m (53 lb in)**.

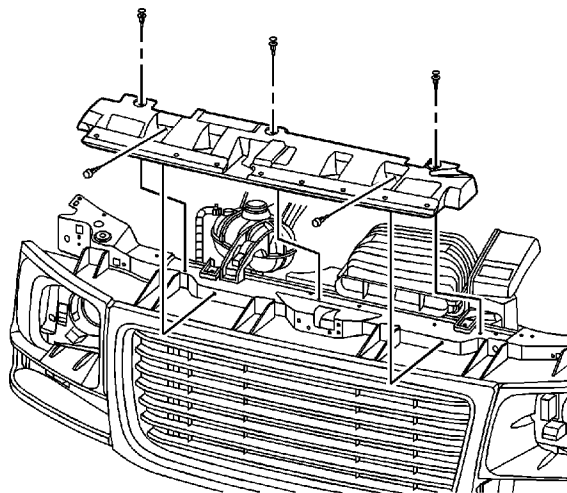


5. Install the fan shroud bolts (1) to the top of the radiator support and tighten to **6 N·m (53 lb in)**.
6. Install the fan shroud bolts (3) to the sides of the fan shroud and tighten to **6 N·m (53 lb in)**.
7. Install the engine oil cooler lines. Refer to [Engine Oil Cooler Pipe/Hose Quick Connect Fitting](#).

8. Install the automatic transmission oil cooler lines. Refer to [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L60-E/4L65-E/4L70-E transmissions or [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L80-E/4L85-E transmissions.



9. Install the radiator inlet hose (5) to the radiator.
10. Install the hose clamp at the radiator inlet housing using the [J 38185](#).
11. Install the outlet heater hose (2).
12. Install the outlet heater hose clamp using the [J 39529](#).
13. Install the intake manifold tube. Refer to [Intake Manifold Tube Replacement](#).
14. Install oil fill tube. [Oil Filler Tube Replacement](#).
15. Install the upper radiator baffle.
16. Install the battery. Refer to [Battery Replacement](#).
17. Install the charged air cooler hose/pipe. Refer to [Charged Air Cooler Hoses/Pipes Replacement](#).
18. Install the surge tank assembly. Refer to [Radiator Surge Tank Replacement](#).
19. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).





20. Install the upper radiator baffle.
21. Inspect the automatic transmission fluid level. Refer to [Approximate Fluid Capacities](#).
22. Inspect the engine oil level. Refer to [Approximate Fluid Capacities](#).

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## Radiator Replacement (Gas)

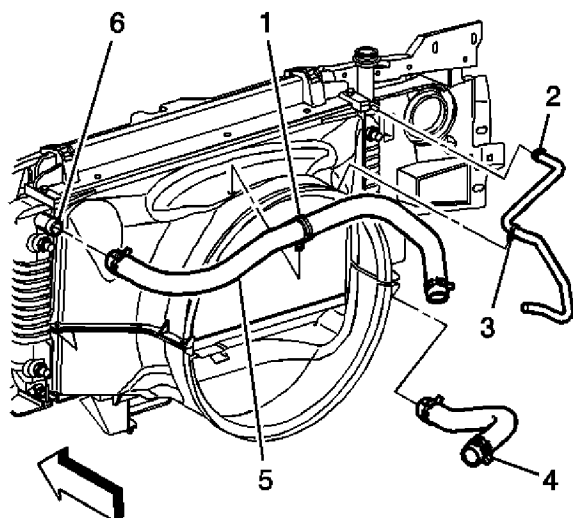
### Special Tools

[J 38185](#) Hose Clamp Pliers

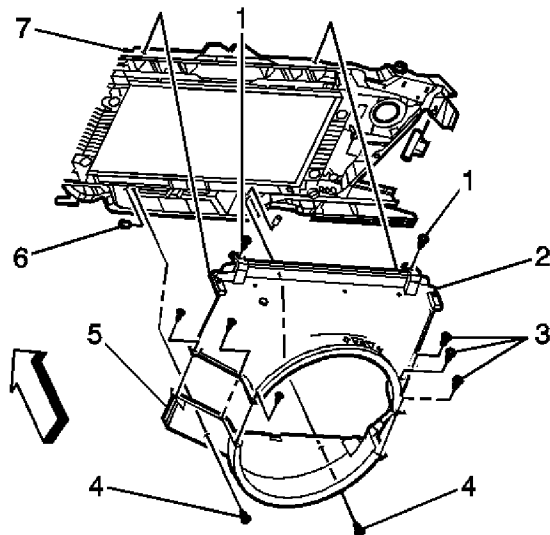
### Removal Procedure

**Note:** Always install a new set of insulators when replacing a radiator. Used insulators may be worn or too large for the new radiator. These conditions may cause the new radiator to be loose.

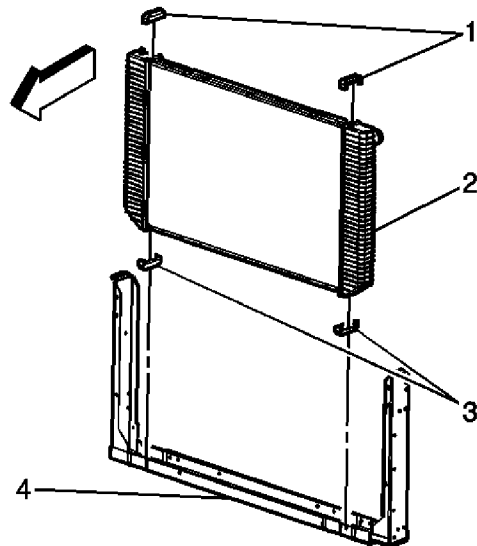
1. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, 7.0L engines or [Air Cleaner Assembly Replacement](#) for the 4.3L engine.
2. Remove the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).



3. Remove the clamp at the radiator inlet using the [J 38185](#).
4. Remove the radiator inlet hose (5) from the radiator.
5. Remove the outlet heater hose clamp at the radiator using the [J 38185](#).
6. Remove the outlet heater hose (2) from the radiator.
7. Remove the automatic transmission cooler lines. Refer to [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L60-E/4L65-E/4L70-E transmission or [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L80-E/4L85-E transmission.
8. Remove the engine oil cooler lines. Refer to [Engine Oil Cooler Pipe/Hose Quick Connect Fitting](#).

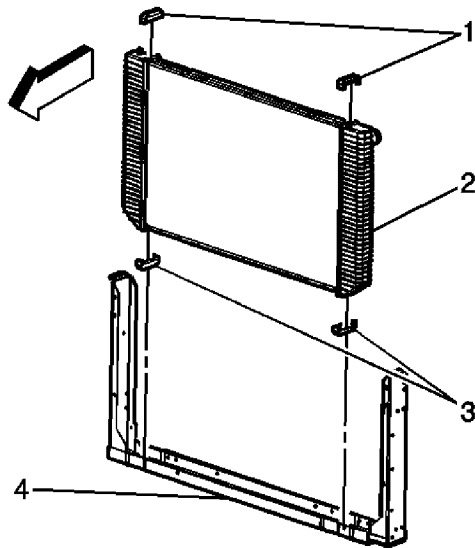


9. Remove the fan shroud bolts (1) from the top of the radiator support.
10. Remove the fan shroud bolts (3) from the sides of the fan shroud.



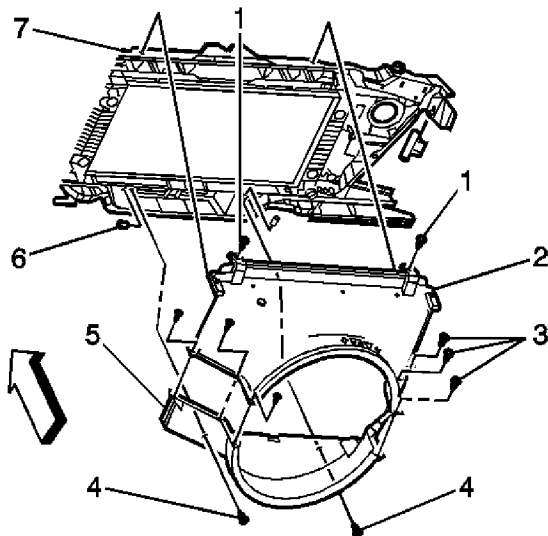
11. Remove the radiator (2).
12. Remove the radiator insulators (1, 3).
13. Inspect the following components:
  - The radiator
  - The insulators
  - The hoses and clamps
  - The mounting hardware
  - Replace the components as necessary.

## Installation Procedure



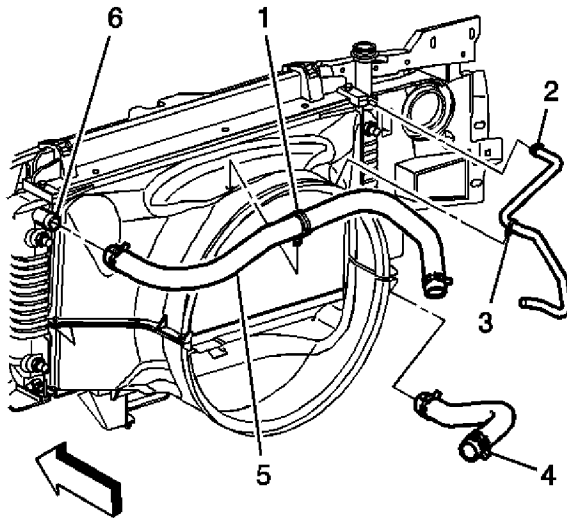
1. Install the radiator insulators (1, 3).
2. Install the radiator (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



3. Install the fan shroud bolts (1) to the top of the radiator support and tighten to **6 N·m (53 lb in)**.
4. Install the fan shroud bolts (3) to the sides of the fan shroud and tighten to **6 N·m (53 lb in)**.

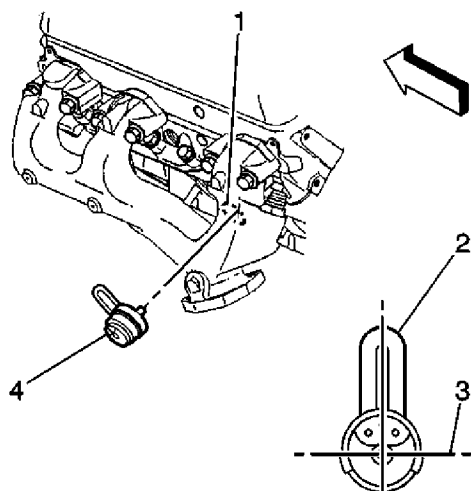
5. Install the engine oil cooler lines. Refer to [Engine Oil Cooler Pipe/Hose Quick Connect Fitting](#).
6. Install the automatic transmission oil cooler lines. Refer to [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L60-E/4L65-E/4L70-E transmission or [Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection](#) for the 4L80-E/4L85-E transmission.



7. Install the radiator inlet hose (5) to the radiator.
8. Install the hose clamp at the radiator inlet housing using the [J 38185](#).
9. Install the outlet heater hose (2).
10. Install the outlet heater hose clamp using the [J 39529](#).
11. Install the coolant recovery reservoir. Refer to [Coolant Recovery Reservoir Replacement](#).
12. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) for the 4.8L, 5.3L, 6.0L, 6.2L, 7.0L engines or [Air Cleaner Assembly Replacement](#) for the 4.3L engine.
13. Inspect the automatic transmission fluid level. Refer to [Approximate Fluid Capacities](#).
14. Inspect the engine oil level. Refer to [Approximate Fluid Capacities](#).

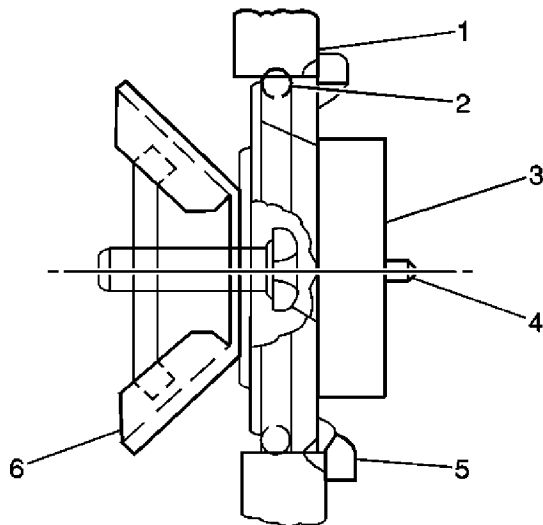
## Coolant Heater Replacement (4.3L)

### Removal Procedure



1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Disconnect the heater cord from the coolant heater (4).
3. Loosen the coolant heater bolt.
4. Remove the coolant heater from the engine block.
5. Do not score the machined surface of the hole.
6. Grasp the plug with pliers.
7. Pull the plug from the engine block.
8. Clean the core plug hole in order to remove the following substances:
  - Burrs
  - Compound
  - Paint
  - Rough spots

### Installation Procedure

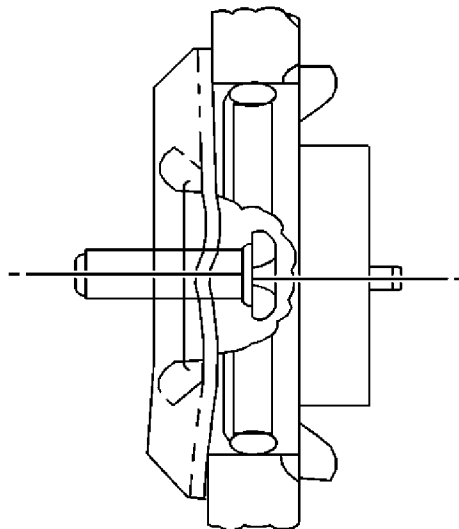


1. Coat the O-ring seal and the cleaned surface of the plug opening with water resistant high-temperature grease lubricant GM P/N 9985164 (Canadian P/N 10953480), or the equivalent.

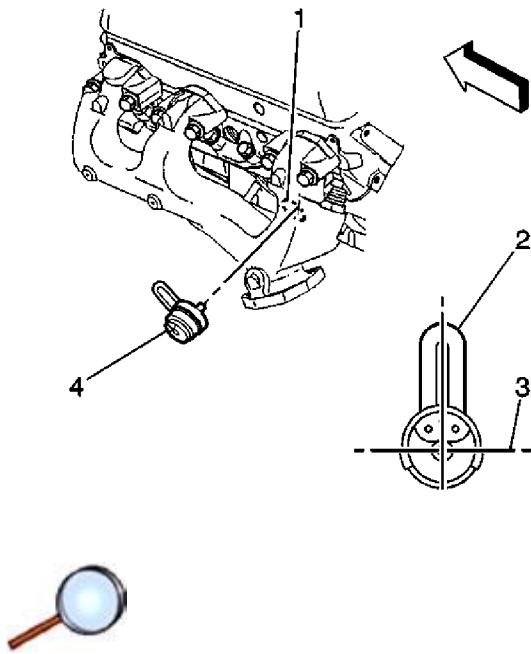
**Note:** Avoid element contact with the inside walls of the engine block.

2. Tightly push the coolant heater (1) into the engine block.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



3. Tighten the coolant heater bolt until both of the locking wings draw tightly against the inner wall of the engine block and tighten to **2 N·m (18 lb in)**.

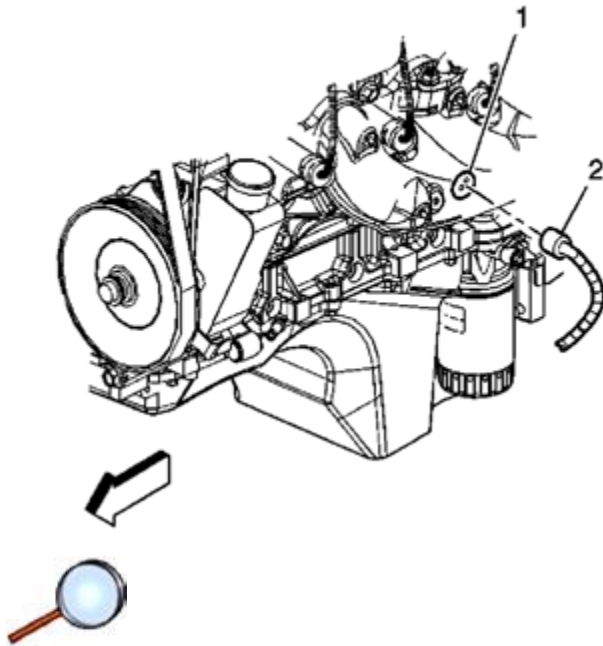


**Caution:** The heater cord must not touch the engine, hot pipes, manifold, or any moving parts. Route the cord to the left front of the engine compartment securing with tie straps as necessary to prevent damage.

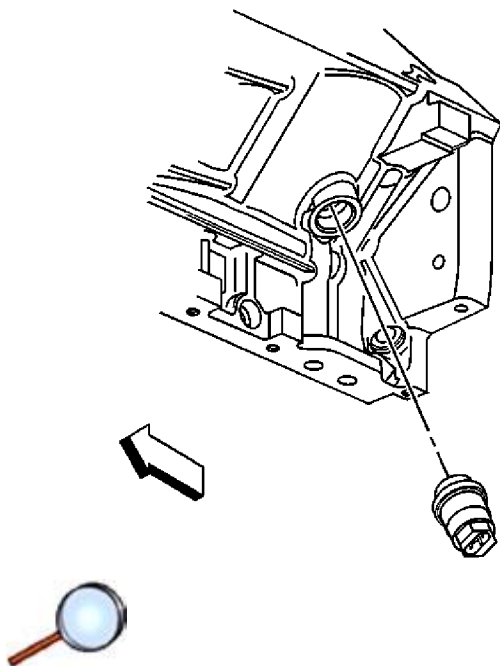
4. Connect the heater cord to the coolant heater (4).
5. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
6. Inspect the cooling system for leaks.

## Coolant Heater Replacement (4.8L / 5.3L (except RPO L33) 6.0L)

### Removal Procedure



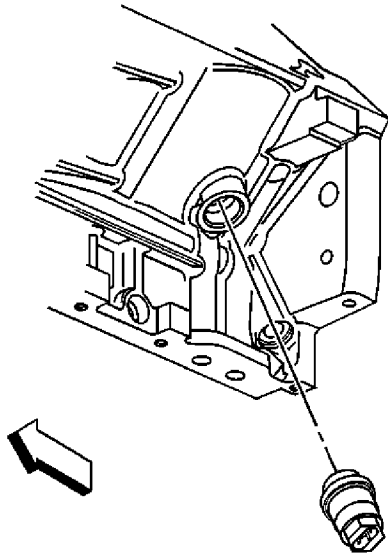
1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Disconnect the coolant heater electrical connector (2).



**Note:** Do not score the surface of the engine block hole when removing the coolant heater.

4. Remove the coolant heater from the engine block.
5. Remove any burrs, sealer, paint or other rough spots.

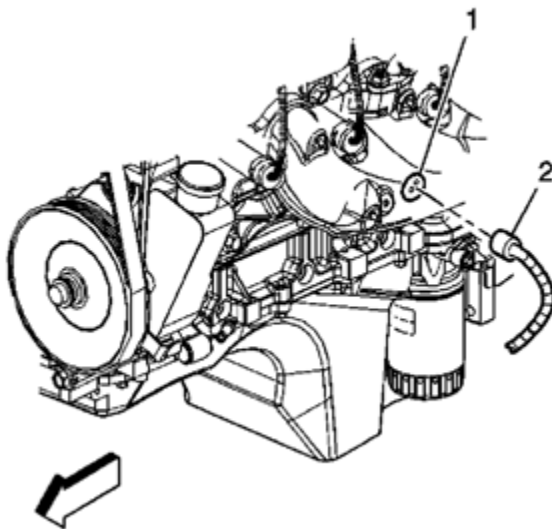
## Installation Procedure



1. If re-using the old coolant heater, apply thread sealant GM P/N 12346004 (Canadian P/N 10953480), or equivalent to the threads.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the coolant heater to the engine block and tighten to **50 N·m (37 lb ft)**.





**Caution:** The heater cord must not touch the engine, hot pipes, manifold, or any moving parts. Route the cord to the left front of the engine compartment securing with tie straps as necessary to prevent damage.

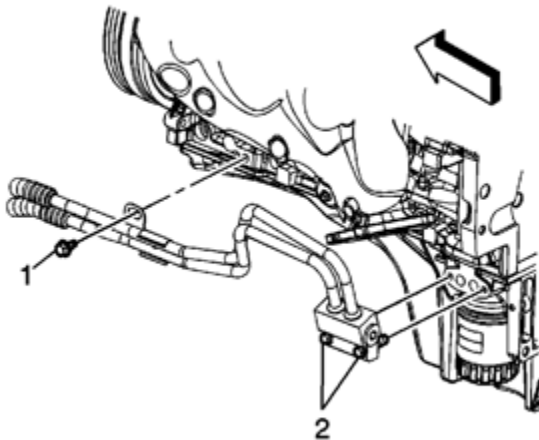
3. Connect the coolant heater electrical connector (2).
4. Lower the vehicle.
5. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

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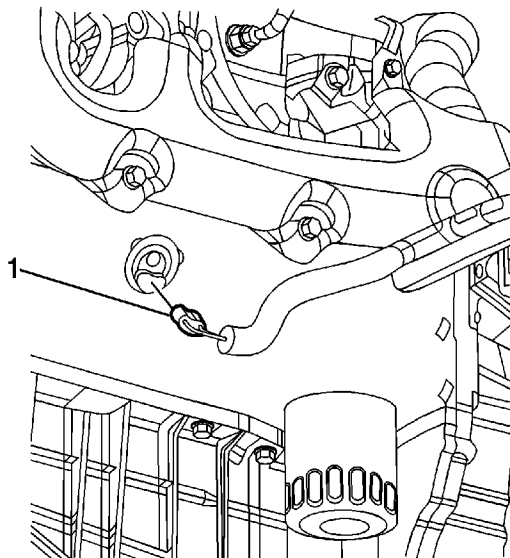
## Coolant Heater Replacement (4.8L / 5.3L / 6.0L)

### Removal Procedure

1. Drain the cooling system/engine block. Refer to [Cooling System Draining and Filling](#).
2. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

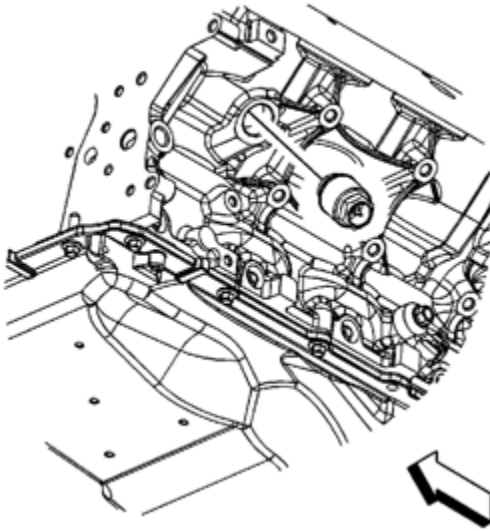


3. For vehicles with regular production option (RPO) L76 (6.0L), perform the following steps. Otherwise, proceed to step 8.
4. Remove the oil cooler hose bracket bolt (1), if equipped.
5. Remove the oil cooler hose adapter bolts (2), if equipped.
6. Remove and discard the oil cooler hose adapter gasket, if equipped.
7. Position the oil cooler hose adapter end out of the way, if equipped.





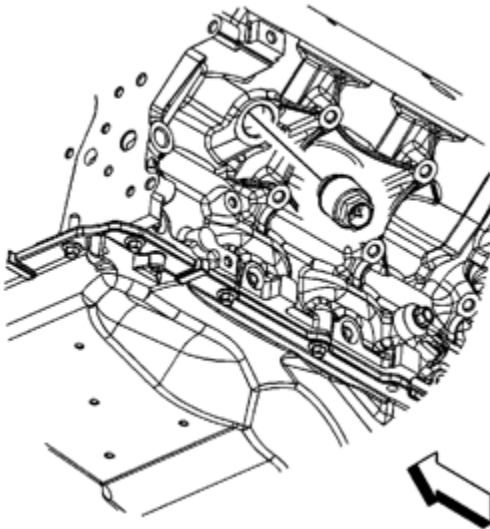
8. Disconnect the coolant heater cord electrical connector (1).



**Note:** Do not score the surface of the engine block hole when removing the coolant heater.

9. Remove the coolant heater from the engine block.
10. Remove any burrs, sealer, or other rough spots.

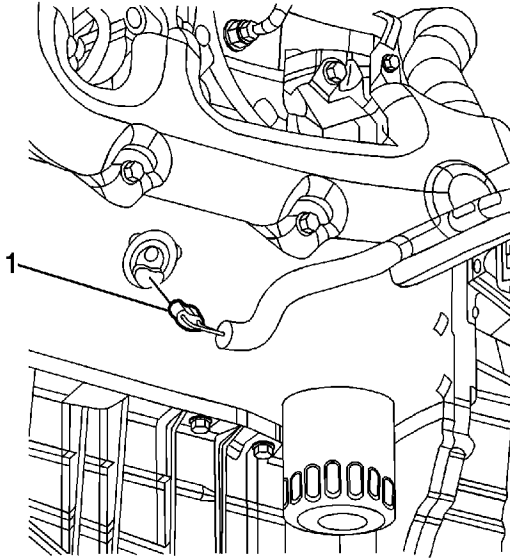
## Installation Procedure



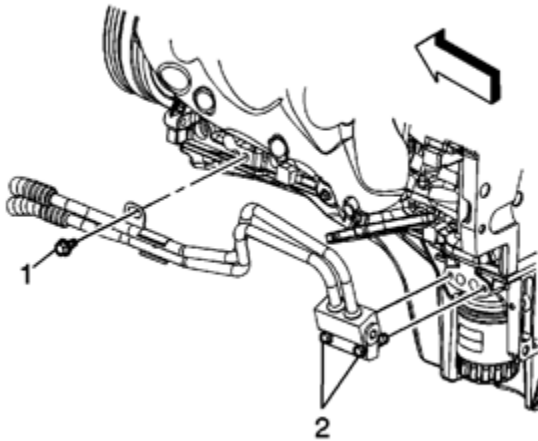
1. If reusing the old coolant heater, apply thread sealant GM P/N 12346004 (Canadian P/N 10953480), or equivalent to the threads.

**Caution:** Refer to Fastener Caution in the Preface section.

2. Install the coolant heater to the engine block and tighten to **50 N·m (37 lb ft)**.



3. Connect the coolant heater cord electrical connector (1).



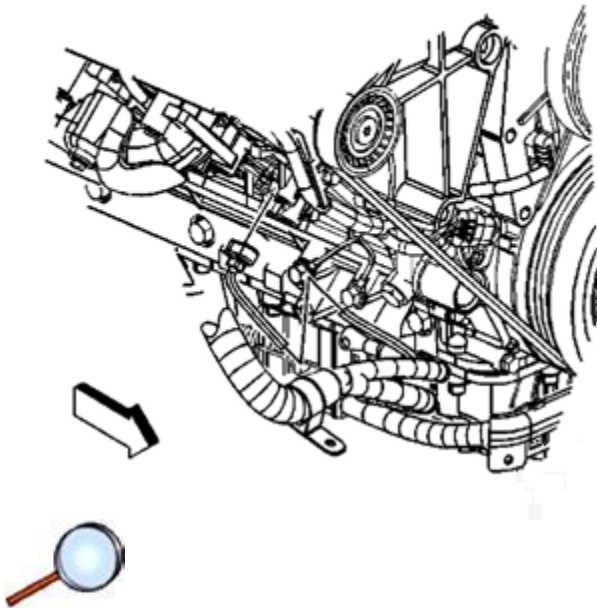
4. For vehicles with RPO L76 (6.0L) perform the following steps otherwise proceed to step 10.
5. Position the oil cooler hose adapter end, if equipped.
6. Install a NEW oil cooler hose adapter gasket, if equipped.
7. Install the oil cooler hose adapter bolts (2), if equipped and tighten to **12 N·m (106 lb in)**.
8. Install the oil cooler hose bracket bolt (1), if equipped and tighten to **25 N·m (18 lb ft)**.
9. Lower the vehicle.

10. Fill the cooling system/engine block. Refer to [Cooling System Draining and Filling](#).

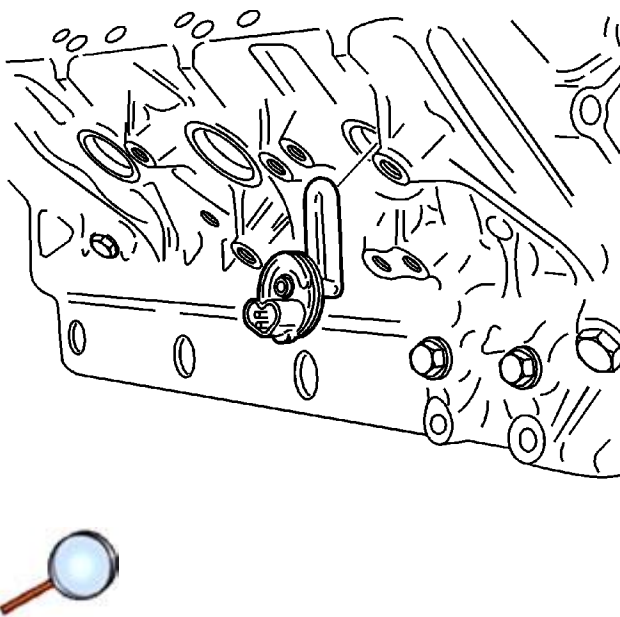
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## Coolant Heater Replacement (6.6L)

### Removal Procedure



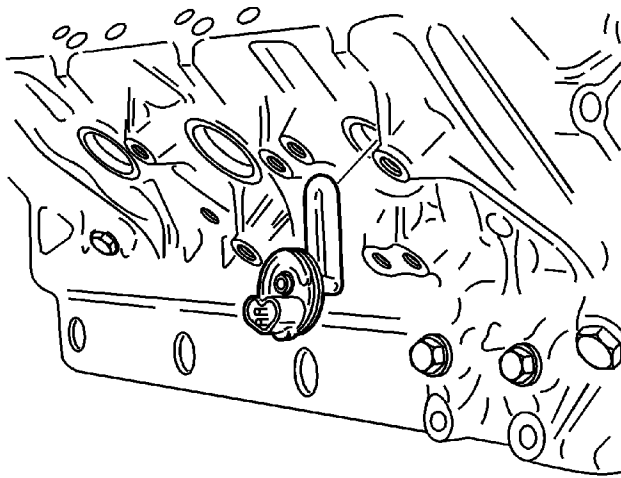
1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Remove the right front tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
3. Disconnect the engine coolant heater cord.



4. Loosen the coolant heater bolt.
  5. Remove the engine coolant heater from the engine block.
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6. Do not score the machined surface of the hole.
7. Grasp the plug with pliers.
8. Pull the plug from the engine block.
9. Clean the core plug hole in order to remove the following substances:
  - Burrs
  - Compound
  - Paint
  - Rough spots

## Installation Procedure

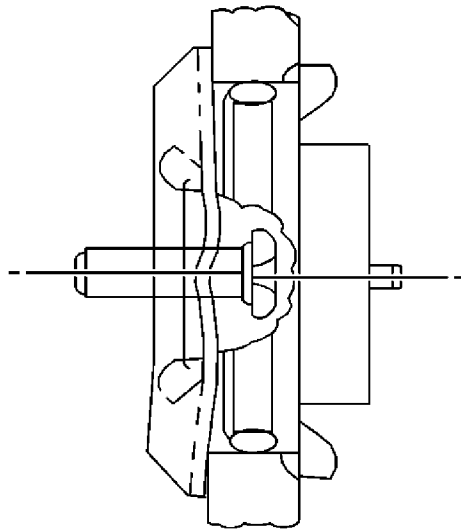


1. Coat the O-ring seal and the cleaned surface of the plug opening with water resistant high-temperature grease lubricant GM P/N 1052196 (Canadian P/N 5264008), or the equivalent.

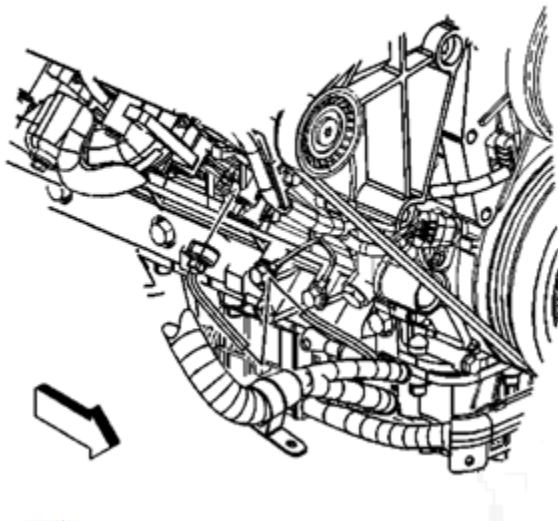
**Note:** Avoid element contact with the inside walls of the engine block.

2. Align the coolant heater element to point towards the top of the engine.
3. Tightly push the coolant heater into the engine block.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



4. Tighten the bolt on the engine coolant heater until both of the locking wings draw tightly against the inner wall of the engine block and tighten to **2 N·m (18 lb in)**.

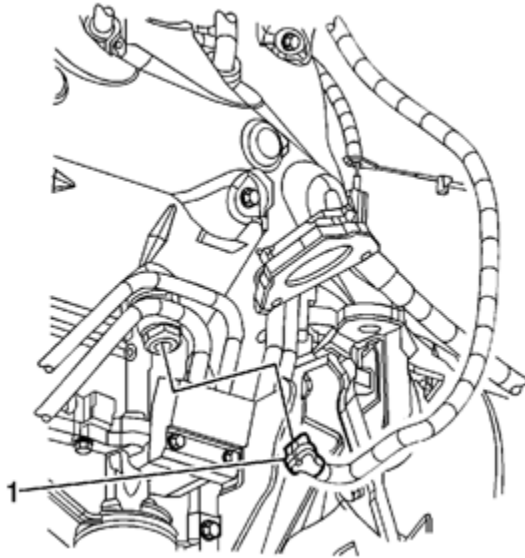


**Caution:** The heater cord must not touch the engine, hot pipes, manifold, or any moving parts. Route the cord to the left front of the engine compartment securing with tie straps as necessary to prevent damage.

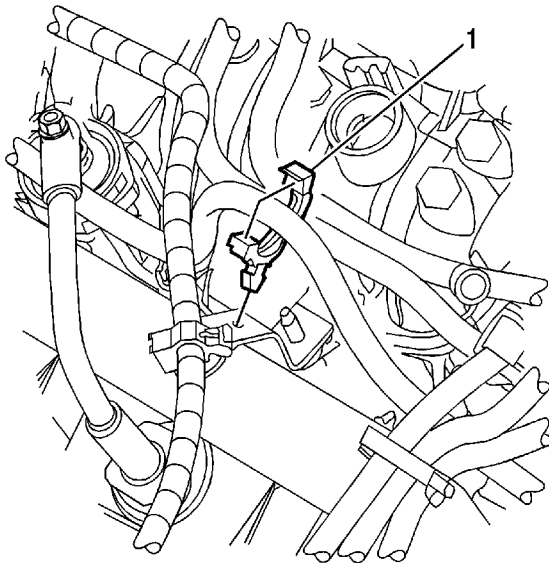
5. Connect the heater cord to the coolant heater.
6. Install the right front tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
7. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
8. Inspect for coolant leaks.

## Coolant Heater Cord Replacement (4.3 L Engine)

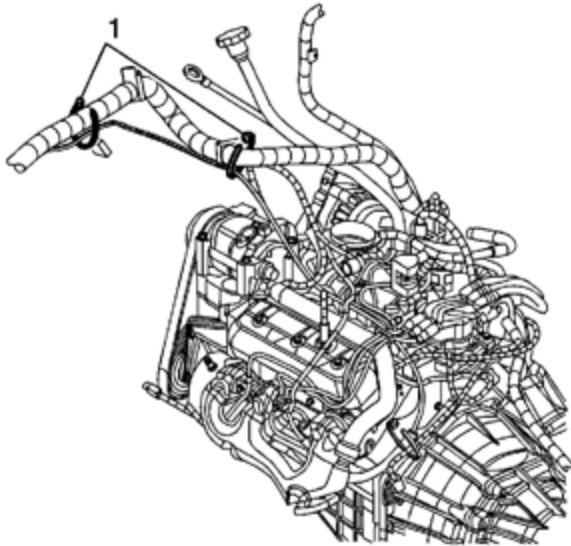
### Removal Procedure



1. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Disconnect the coolant heater electrical connector (1).



3. Remove the coolant heater cord retainer (1).



4. Remove the coolant heater cord retainers (1).

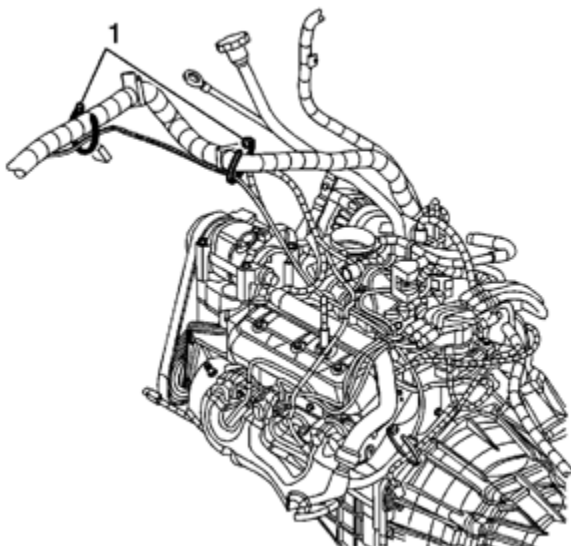
**Note:** Note location of cord prior to removal.

5. Remove the coolant heater cord.

## Installation Procedure

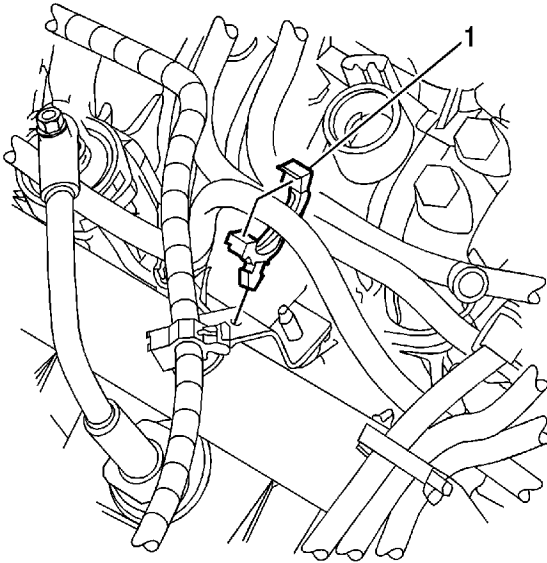
**Caution:** The heater cord must not touch the engine, hot pipes, manifold, or any moving parts. Route the cord to the left front of the engine compartment securing with tie straps as necessary to prevent damage.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

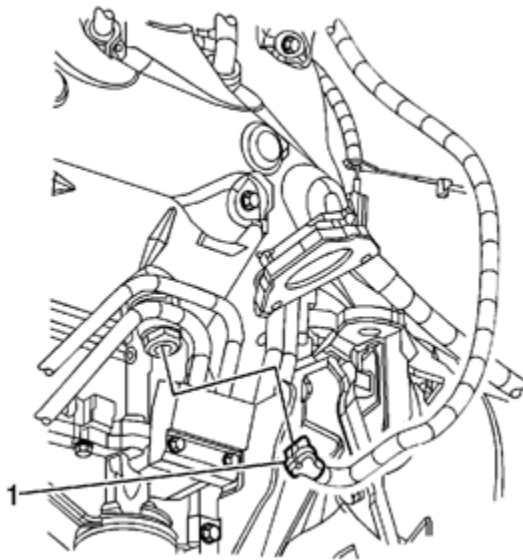




1. Install the coolant heater cord.
2. Install the coolant heater cord retainer (1).



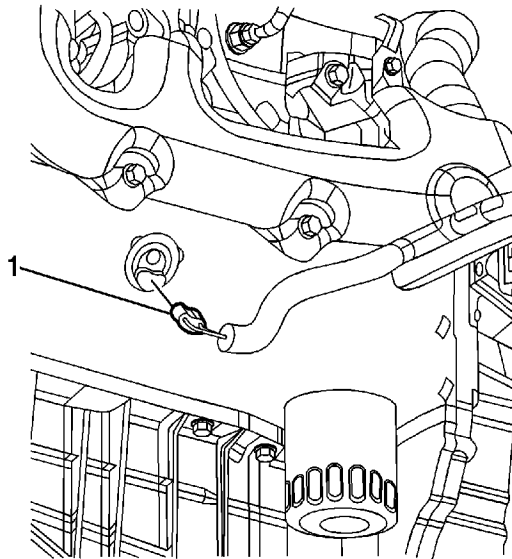
3. Install the coolant heater cord retainers (1).



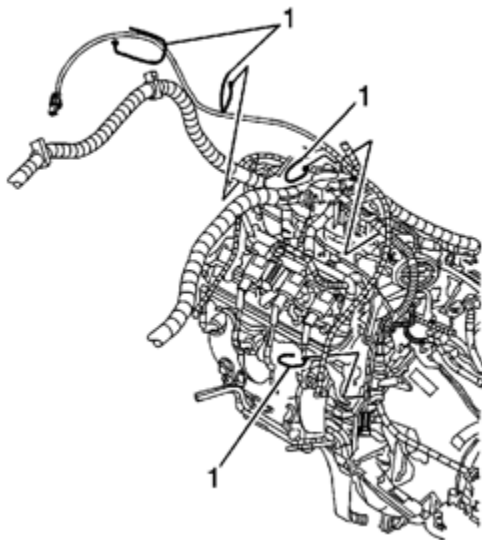
4. Connect the coolant heater electrical connector (1).
5. Lower the vehicle.

## Coolant Heater Cord Replacement (4.8L, 5.3L And 6.0L Engine)

### Removal Procedure



1. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Disconnect the coolant heater electrical connector (1).



3. Remove the coolant heater cord retainers (1).

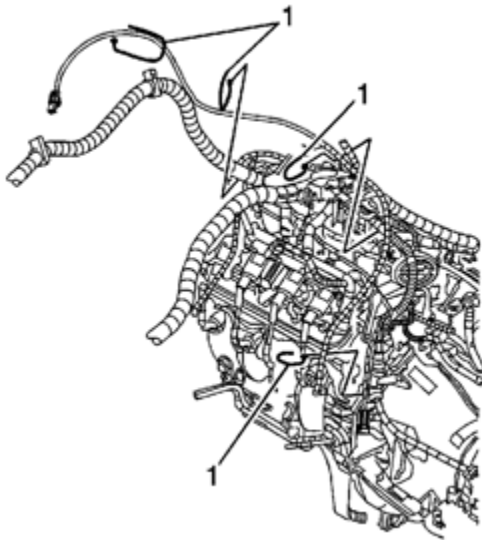
**Note:** Note location of cord prior to removal.

4. Remove the coolant heater cord.

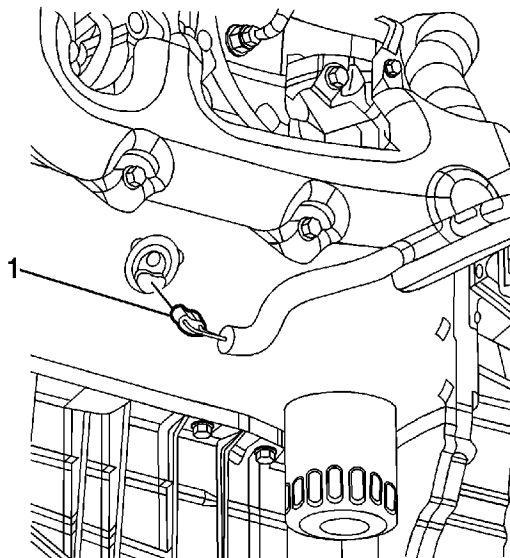
## Installation Procedure

**Caution:** The heater cord must not touch the engine, hot pipes, manifold, or any moving parts. Route the cord to the left front of the engine compartment securing with tie straps as necessary to prevent damage.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the coolant heater cord.
2. Install the coolant heater cord retainers (1).



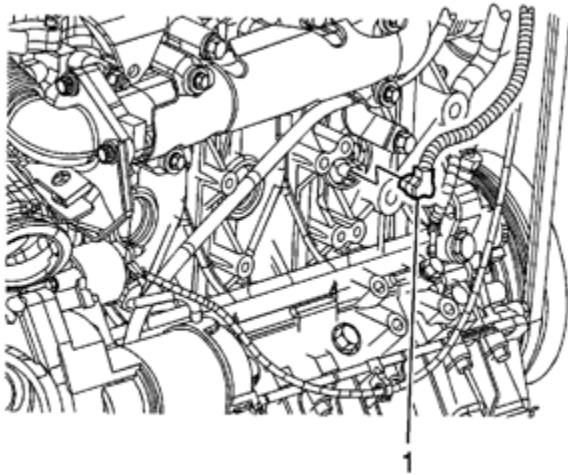


3. Connect the coolant heater electrical connector (1).
4. Lower the vehicle.

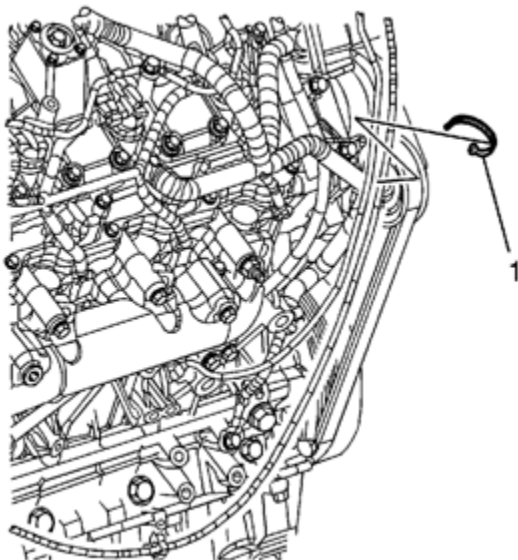
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## Coolant Heater Cord Replacement (6.6 L Engine)

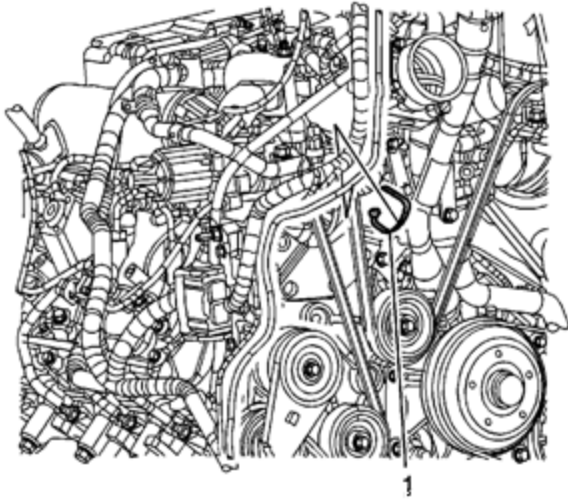
### Removal Procedure



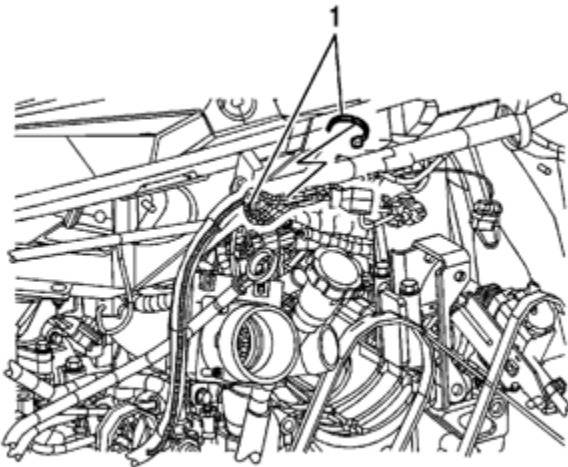
1. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Disconnect the coolant heater electrical connector (1).



3. Remove the coolant heater cord retainer (1).



4. Remove the coolant heater cord retainer (1).



5. Remove the coolant heater cord retainer (1).

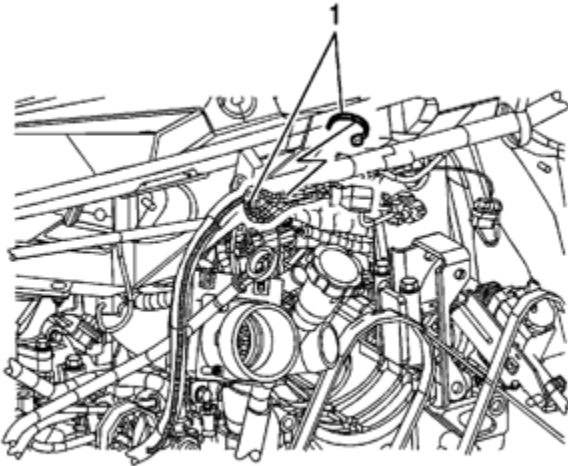
**Note:** Note location of cord prior to removal.

6. Remove the coolant heater cord.

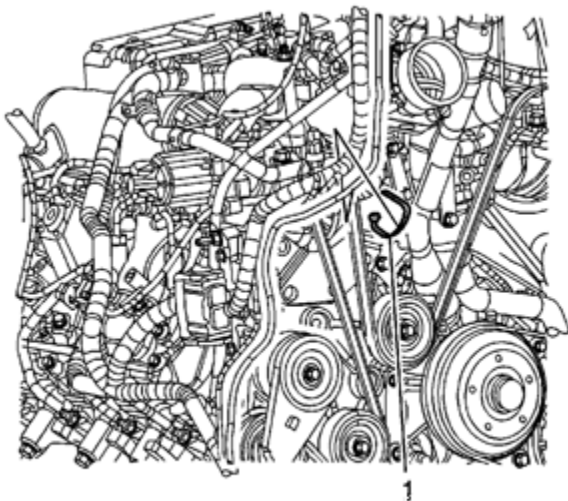
## Installation Procedure

**Caution:** The heater cord must not touch the engine, hot pipes, manifold, or any moving parts. Route the cord to the left front of the engine compartment securing with tie straps as necessary to prevent damage.

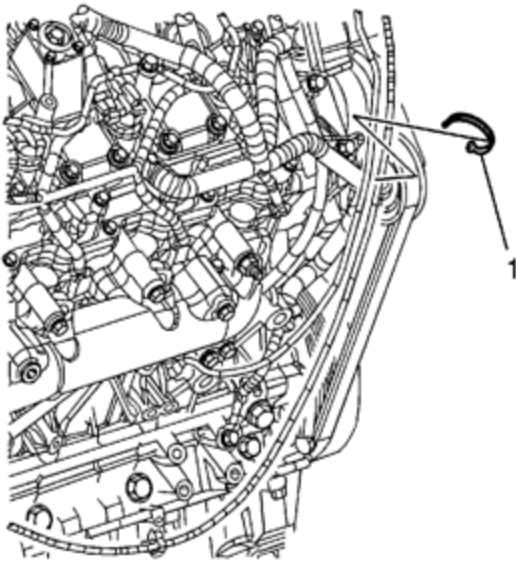
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



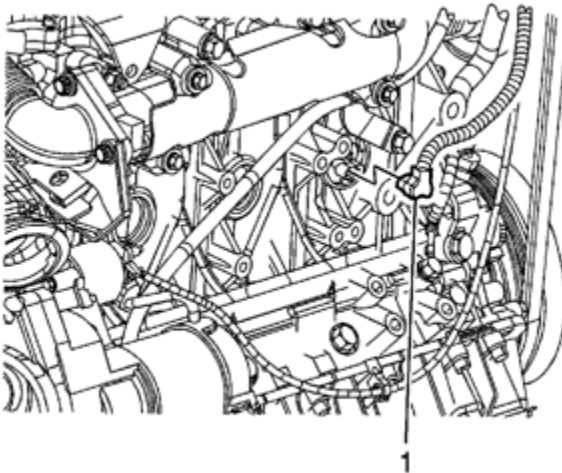
1. Install the coolant heater cord.
2. Install the coolant heater cord retainer (1).



3. Install the coolant heater cord retainer (1).



4. Install the coolant heater cord retainer (1).



5. Connect the coolant heater electrical connector (1).
6. Lower the vehicle.