Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Conditioning (A/C) Condenser Bolt	6.5 N·m	58 lb in
Air Conditioning (A/C) Line Clip to Fan Shroud Screw	1 N·m	9 lb in
Auxiliary Cooling Fan Bolt	6.5 N·m	58 lb in
Brake Master Cylinder Nut	25 N·m	18 lb ft
Clutch Master Cylinder Bolt	50 N·m	37 lb ft
Coolant Air Bleed Pipe Cover Bolt (LSA)	12 N·m	106 lb in
Coolant Air Bleed Stud (LSA)	12 N·m	106 lb in
Coolant Pipe to Cylinder Head Bolt (LP1, LY7, LLT)	50 N·m	37 lb ft
Coolant Pipe to Generator Bracket Bolt (LP1, LY7, LLT)	10 N·m	89 lb in
Coolant Pipe to Thermostat Housing Bolt (LP1, LY7, LLT)	10 N·m	89 lb in
Electric Cooling Fan Blade Nut	7 N·m	62 lb in
Electric Cooling Fan Motor Screw	5 N·m	44 lb in
Electric Cooling Fan Resistor Bolt	5.4 N·m	48 lb in
Electric Cooling Fan Shroud to Plenum Bolt	6.5 N·m	58 lb in
Electric Cooling Fan Shroud to Radiator Bolt	6.5 N·m	58 lb in
Engine Coolant Heater (LSA)	50 N·m	37 lb ft
Engine Coolant Heater Cord Fastener (LSA)	10 N·m	89 lb in
Engine Coolant Heater Ground Wire Bolt (LP1, LY7, LLT)	12 N·m	106 lb in
Oil Level Indicator Tube Bolt	20 N·m	15 lb ft
Radiator Support Bracket Bolt	9 N·m	80 lb in
Surge Tank Bolt	9 N·m	80 lb in
Surge Tank Nut	9 N·m	80 lb in
Surge Tank Outlet Pipe Bracket to Cowl Nut (LSA)	9 N·m	80 lb in
Surge Tank Outlet Pipe Bracket to Engine Bolt (LP1, LY7, LLT)	9 N·m	80 lb in
Thermostat Bolt (LP1, LY7, LLT)	10 N·m	89 lb in
Thermostat Housing Bolt (LP1, LY7, LLT)	20 N·m	15 lb ft
Thermostat Housing Bolt (LSA)	15 N·m	11 lb ft
Water Outlet Housing Bolt (LP1, LY7, LLT)	10 N·m	89 lb in
Water Pump Bolt (LP1, LY7, LLT)	10 N·m	89 lb in
Water Pump Bolt (LSA)	30 N·m	22 lb ft
Water Pump Pulley Bolt (LP1, LY7, LLT)	12 N·m	106 lb in

Cooling System Draining and Filling (GE 47716)

Special Tools

- J 26568 Coolant and Battery Fluid Tester
- J 42401 Radiator Cap and Surge Tank Test Adapter
- GE-47716 Vac N Fill Coolant Refill Tool

Draining Procedure

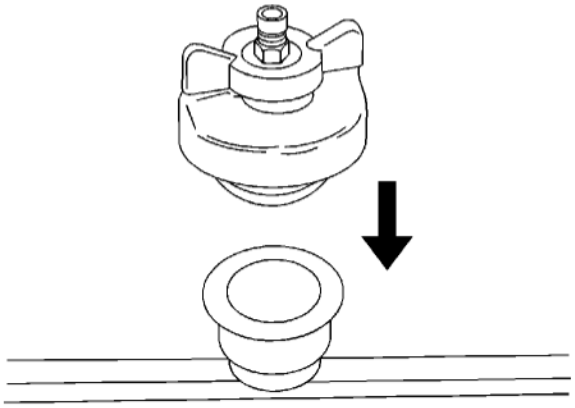
Warning: With a pressurized cooling system, the coolant temperature in the radiator can be considerably higher than the boiling point of the solution at atmospheric pressure. Removal of the surge tank cap, while the cooling system is hot and under high pressure, causes the solution to boil instantaneously 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 surge tank cap.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
4. Remove the air deflector. Refer to Front Air Deflector Replacement.
5. Place a drain pan under the radiator.
6. Insert a piece of clean flexible hose through the access hole in the cradle onto the radiator mounting pin.
7. Slowly loosen the drain cock and drain the coolant into the drain pan. Do not completely remove the drain cock.
8. Inspect the engine coolant for the following conditions:
   - Discolored appearance--Follow the flush procedure. Refer to Flushing.
   - Normal in appearance--Follow the Vac N Fill Procedure below.
9. Tighten the drain cock.

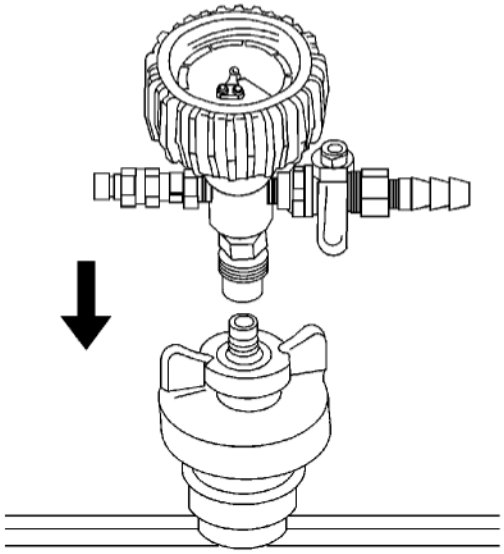
Vac N Fill Procedure

1. Install the J 42401 onto the coolant surge tank.

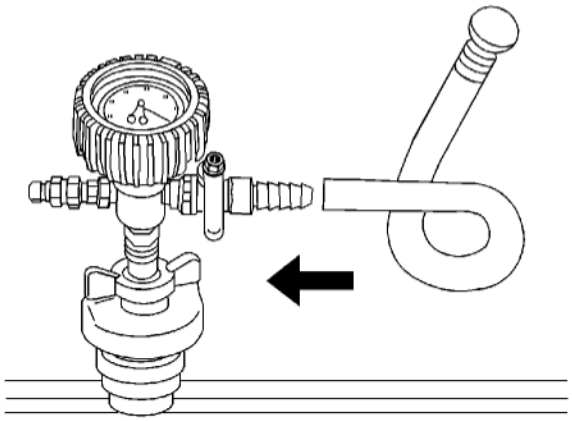
   Warning: To avoid being burned, do not remove the radiator cap or surge tank cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if radiator cap or surge tank cap is removed while the engine and radiator are still hot.



2. Attach the Vac N Fill cap to the J 42401 .

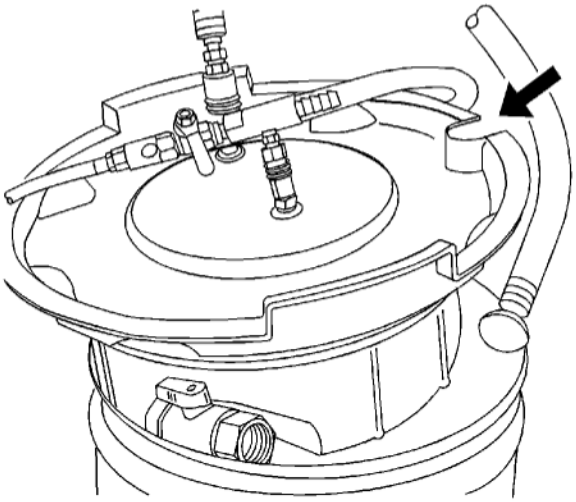


3. Attach the vacuum gage assembly to the Vac N Fill cap.



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

   Ensure that the valve is closed.



Note:

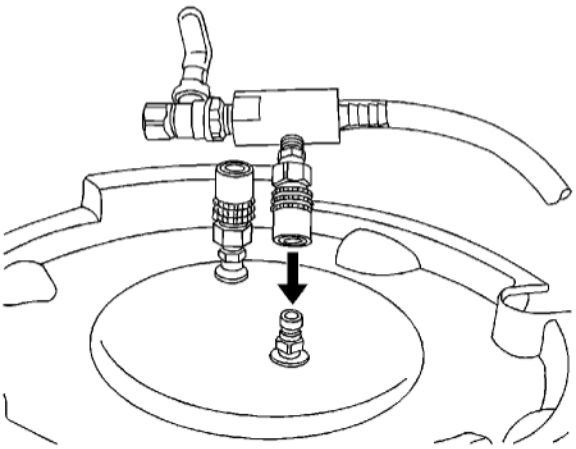
- Use a 50/50 mixture of DEX-COOL antifreeze and clean, drinkable water.
- Always use more coolant than necessary. This will eliminate air from being drawn into the cooling system.

5. Pour the coolant mixture into the graduated reservoir.

6. Place the fill hose in the graduated reservoir.

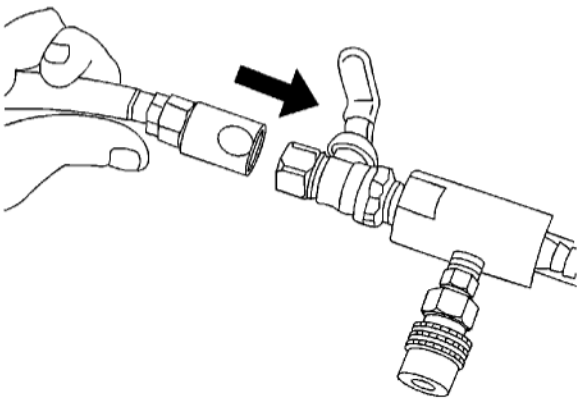
   Note: Prior to installing the vacuum tank onto the graduated reservoir, ensure that the drain valve located on the bottom of the tank is closed.

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





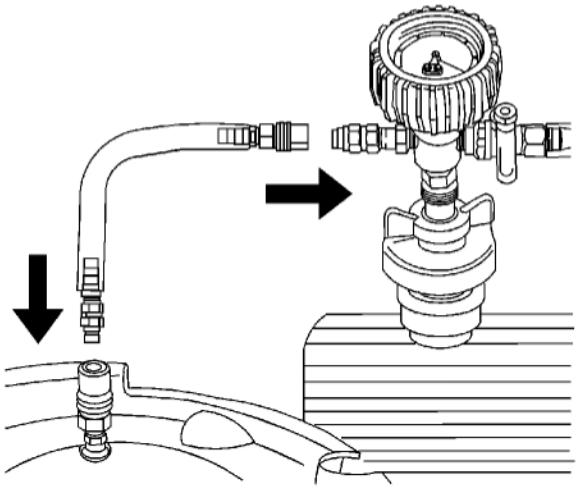
8. Attach the venturi assembly to the vacuum tank.



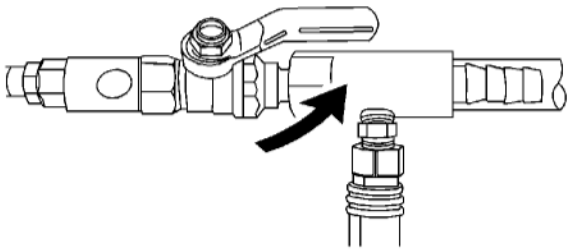


9. Attach a shop air hose to the venturi assembly.

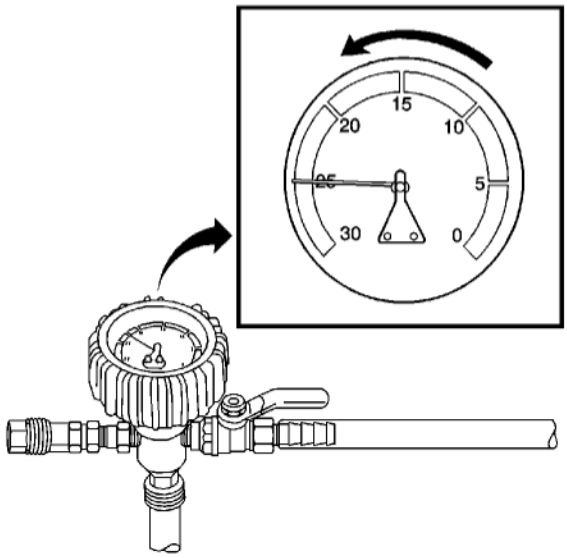
   Ensure the valve on the venturi assembly is closed.



10. Attach the vacuum hose to the vacuum gage assembly and the vacuum tank.



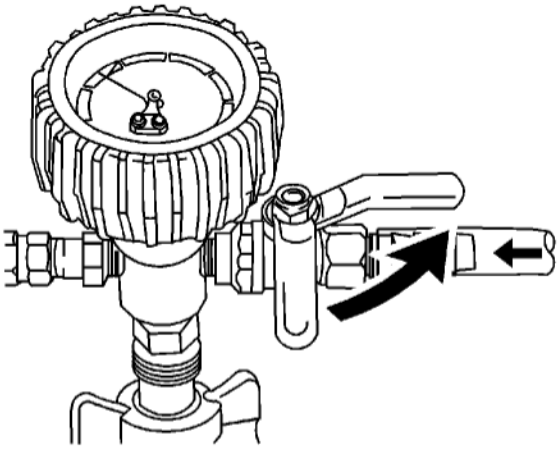
11. Open the valve on the venturi assembly. The vacuum gage will begin to rise and a hissing noise will be present.



12. 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.

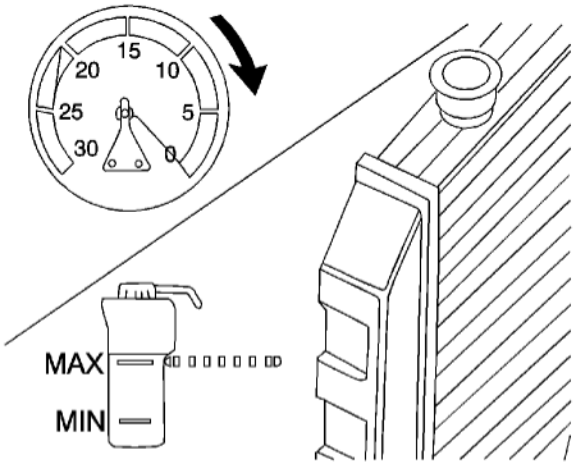
13. To aid in the fill process, position the graduated reservoir above the coolant fill port.



14. 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.
15. Close the valve on the venturi assembly.
16. 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.

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

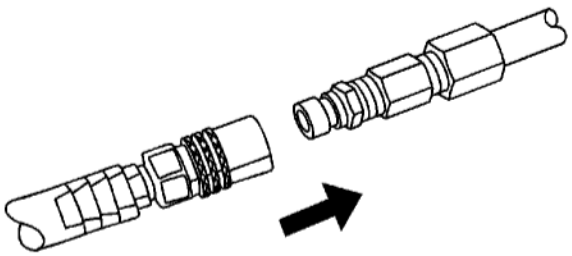




18. Once the vacuum gage reaches zero, close the valve on the vacuum gage assembly and repeat steps 11-17.
19. Detach the Vac N Fill cap from the J 42401 .
20. Remove the J 42401 from the coolant surge tank.
21. Add coolant to the system as necessary.
22. Inspect the concentration of the coolant mixture using J 26568 .

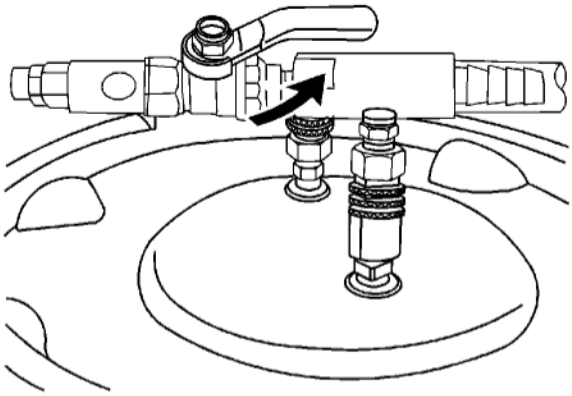
Note: After filling the cooling system, the extraction hose can be used to remove excess coolant to achieve the proper coolant level.

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



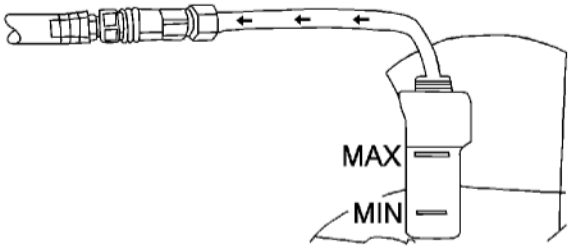


24. Attach the extraction hose to the vacuum hose.





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





26. Use the extraction hose to draw out coolant to the proper level.
27. 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.
28. Install the surge tank cap.

Cooling System Draining and Filling (Static Fill)

Special Tools

J 26568 Coolant and Battery Fluid Tester

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.

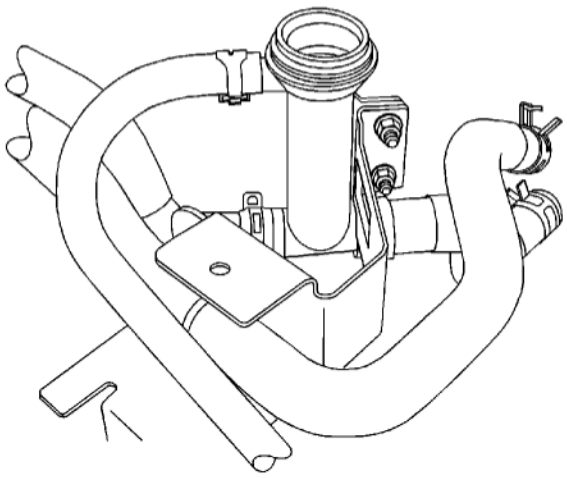
1. Park the vehicle on a level surface.
2. Remove the surge tank cap.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
4. Remove the air deflector. Refer to Front Air Deflector Replacement.
5. Place a drain pan under the radiator.
6. Insert a piece of clean flexible hose through the access hole in the cradle onto the radiator mounting pin.
7. Slowly loosen the drain cock and drain the coolant into the drain pan. Do not completely remove the drain cock.
8. Inspect the engine coolant for the following conditions:
   - Discolored appearance--Follow the flush procedure. Refer to Flushing.
   - Normal in appearance--Follow the Fill Procedure below.

Fill 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. Close the radiator drain cock.
2. Install the air deflector. Refer to Front Air Deflector Replacement.
3. Lower the vehicle.
4. Slowly add a mixture of 50/50 DEX-COOL antifreeze and clean drinkable water to the cooling system through the top of the surge tank opening. Refer to Approximate Fluid Capacities.
5. Slowly fill the cooling system until the coolant stabilizes at 25 mm (1 inch) above the FULL COLD mark on the surge tank.
6. Install the surge tank cap.
7. Start the engine.
8. Run the engine at 2,000-2,500 RPM until the engine reaches normal operating temperature.
9. Allow the engine to idle for 3 minutes.
10. Shut the engine OFF.
11. Allow the engine to cool.
12. Add or remove coolant as necessary from the surge tank until the level is stabilized at the FULL COLD mark.
13. Inspect the cooling system for leaks.
14. Using J 26568 inspect the concentration of the engine coolant.

Charge Air Cooling System Coolant Level Inspection





Note: Make sure the intercooler system is cool and the pump is not running

1. Remove the cap from the charge air cooler reservoir
2. Verify that the coolant is within the cold fill range on the charge air cooling system reservoir.

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

3. Add coolant as necessary to the fill neck and reservoir to bring the coolant level within the cold fill range.
4. Install the cap to the charge air cooler reservoir.

Charge Air Cooling System Draining and Filling (GE 47716)

Special Tools

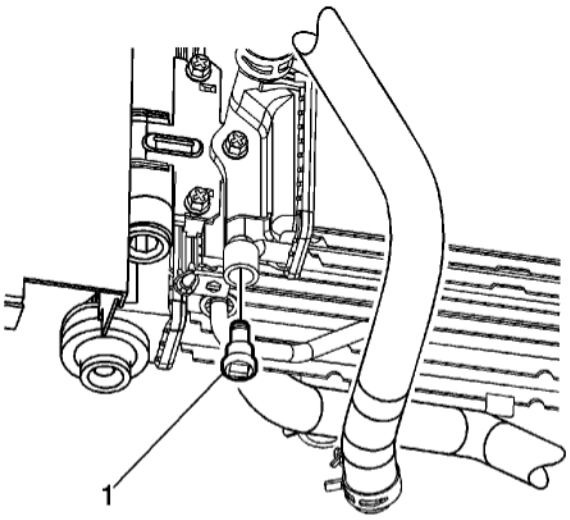
- *J 26568* Coolant and Battery Fluid Tester
- *J 46143* Cooling System Adapter
- *GE-47716* Vac N Fill Coolant Refill Tool

Draining Procedure

Warning: To avoid being burned, do not remove the charge air coolant cap while the system is hot. The cooling system will release scalding fluid and steam under pressure if charge air coolant cap is removed while the system is still hot.

Note: Make sure the intercooler system is cool and the pump is not running.

1. Remove the cap from the charge air cooler reservoir.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
3. Remove the front air deflector. Refer to Front Air Deflector Replacement
4. Place a drain pan under the charge air cooler radiator.





5. Remove the charge air cooler radiator drain plug (1) from the bottom passenger side of the charge air cooler.
6. Drain the charge air cooling system.
7. Inspect the coolant.
8. Follow the appropriate procedure based on the condition of the coolant.
   - Normal in appearance - follow the filling procedure

- Discolored - follow the flush procedure. Refer to Flushing

Caution: Refer to Fastener Caution in the Preface section.

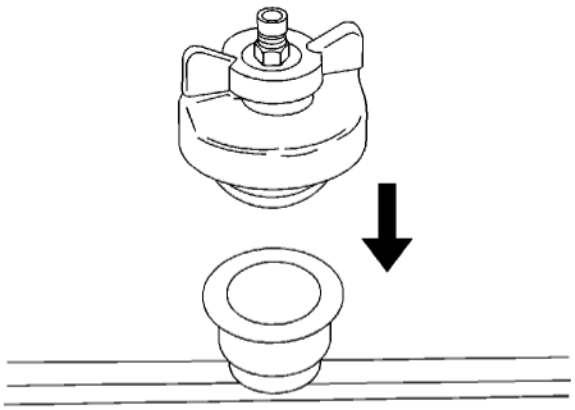
9. Install the charge air cooler radiator drain plug (1) and tighten to **1.5 N·m (13 lb in)**.
10. Install the front air deflector. Refer to Front Air Deflector Replacement
11. Lower the vehicle.

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 degrees C (120 degrees F). The tool will not operate properly when the coolant is boiling.

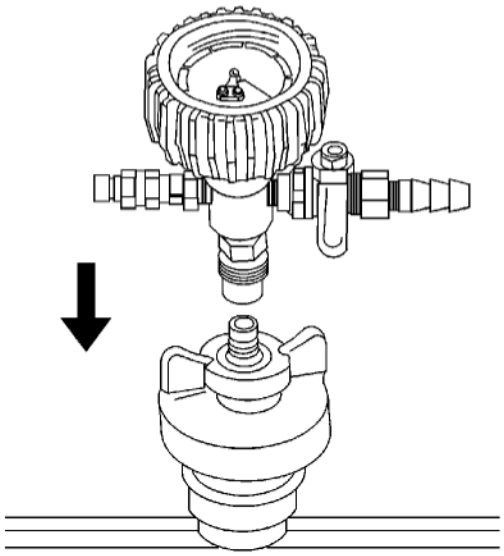
1. Install the *J 46143* Cooling System Adapter onto the charge air cooler reservoir fill neck.

Warning: To avoid being burned, do not remove the charge air coolant cap while the system is hot. The cooling system will release scalding fluid and steam under pressure if charge air coolant cap is removed while the system is still hot.

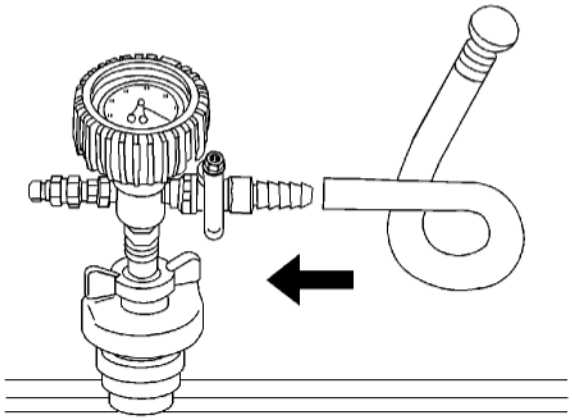




2. Attach the Vac N Fill cap to the *J 46143* Cooling System Adapter .

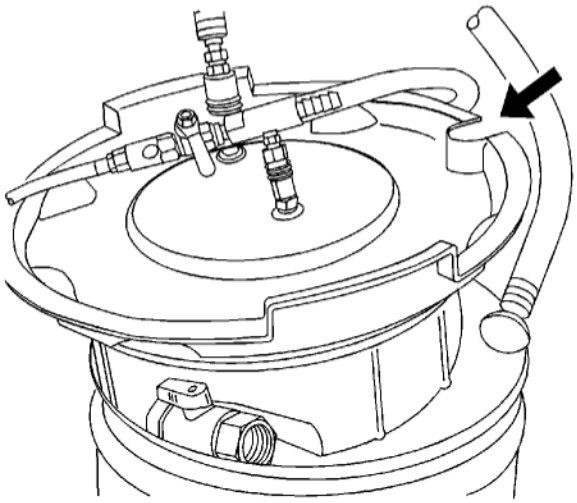


3. Attach the vacuum gage assembly to the Vac N Fill cap.



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

   Ensure that the valve is closed.



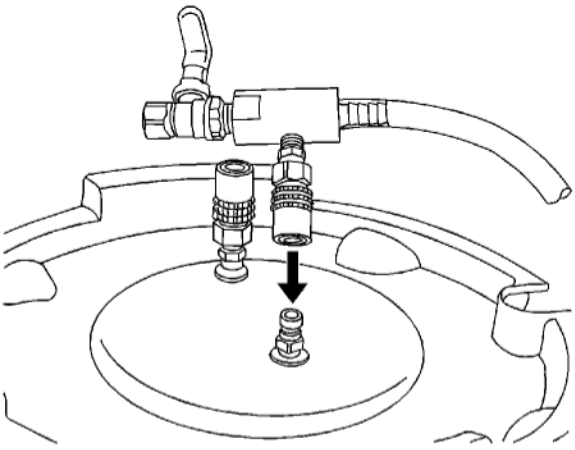
Note:

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

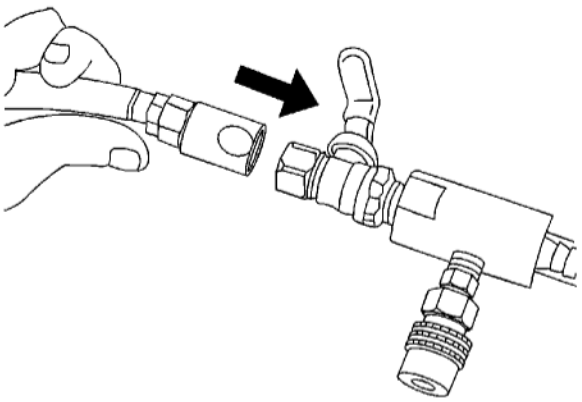
5. Pour the coolant mixture into the graduated reservoir.
6. Place the fill hose in the graduated reservoir.

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

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

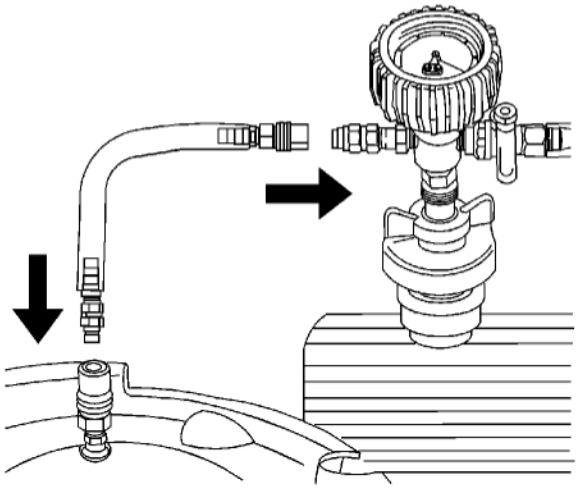


8. Attach the venturi assembly to the vacuum tank.

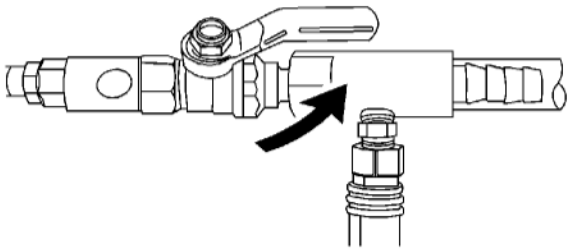


9. Attach a shop air hose to the venturi assembly.

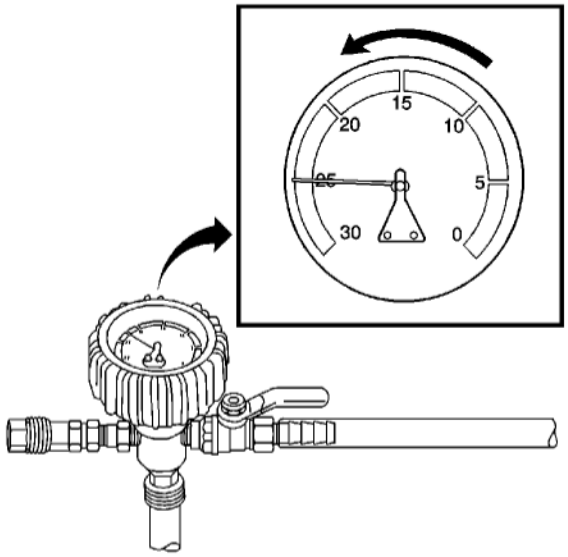
   Ensure the valve on the venturi assembly is closed.



10. Attach the vacuum hose to the vacuum gage assembly and the vacuum tank.



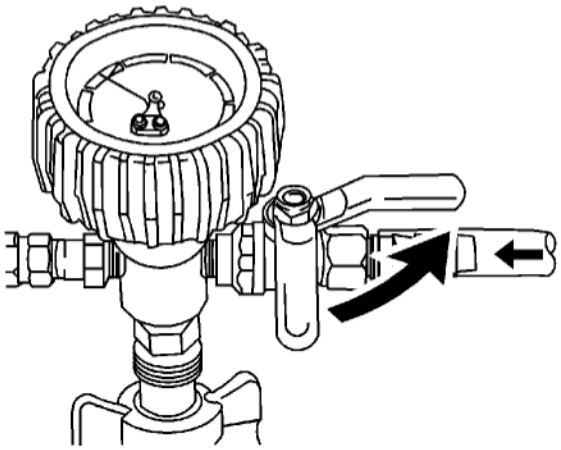
11. Open the valve on the venturi assembly. The vacuum gage will begin to rise and a hissing noise will be present.



12. 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.

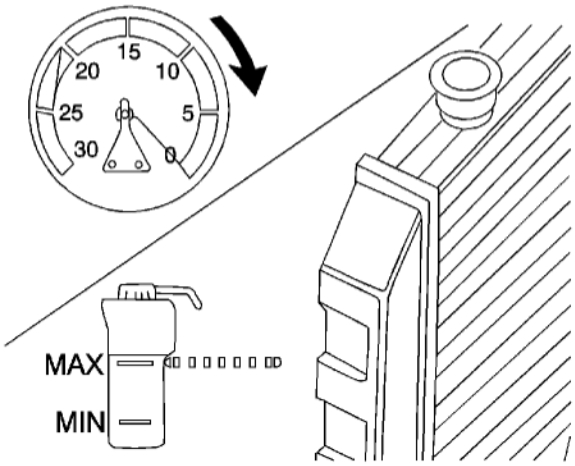
13. To aid in the fill process, position the graduated reservoir above the coolant fill port.



14. 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.
15. Close the valve on the venturi assembly.
16. 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.

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

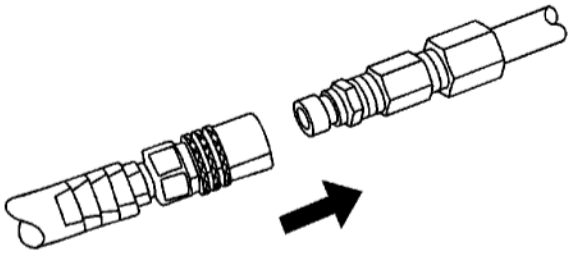


18. Once the vacuum gage reaches zero, close the valve on the vacuum gage assembly and repeat steps 11-17.
19. Detach the Vac N Fill cap from the *J 46143* Cooling System Adapter .

20. Remove the *J 46143* Cooling System Adapter from the coolant surge tank.
21. Add coolant to the system as necessary.
22. Inspect the concentration of the coolant mixture using *J 26568* Coolant and Battery Fluid Tester .

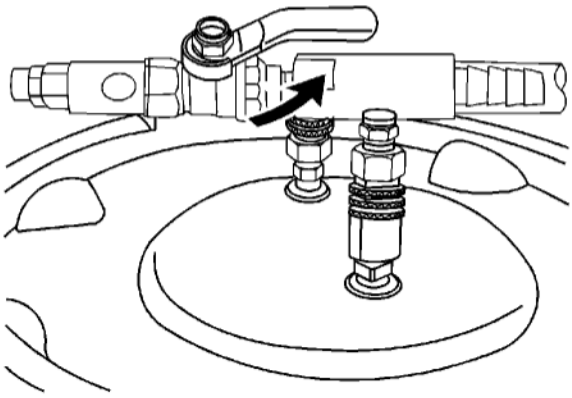
Note: After filling the cooling system, the extraction hose can be used to remove excess coolant to achieve the proper coolant level.

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



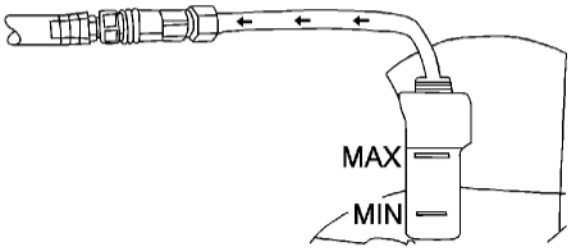


24. Attach the extraction hose to the vacuum hose.





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





26. Use the extraction hose to draw out coolant to the proper level.
27. 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.
28. Install the surge tank cap.

Flushing (Powertrain)

Important: Do not use a chemical flush.

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

Various methods and equipment can be used to flush the cooling system. If special equipment is used, such as a back flusher, follow the manufacturer's instruction. 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 reservoir to the FULL COLD mark.
8. Fill the cooling system. Refer to Cooling System Draining and Filling.

Flushing (Charge Air Cooling)

Note: 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.

Warning: Approved safety glasses and gloves should be worn when performing this procedure to reduce the chance of personal injury.

1. 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.
2. Fill the cooling system to specifications when flushing is complete. Refer to Cooling System Draining and Filling.

Radiator Cleaning

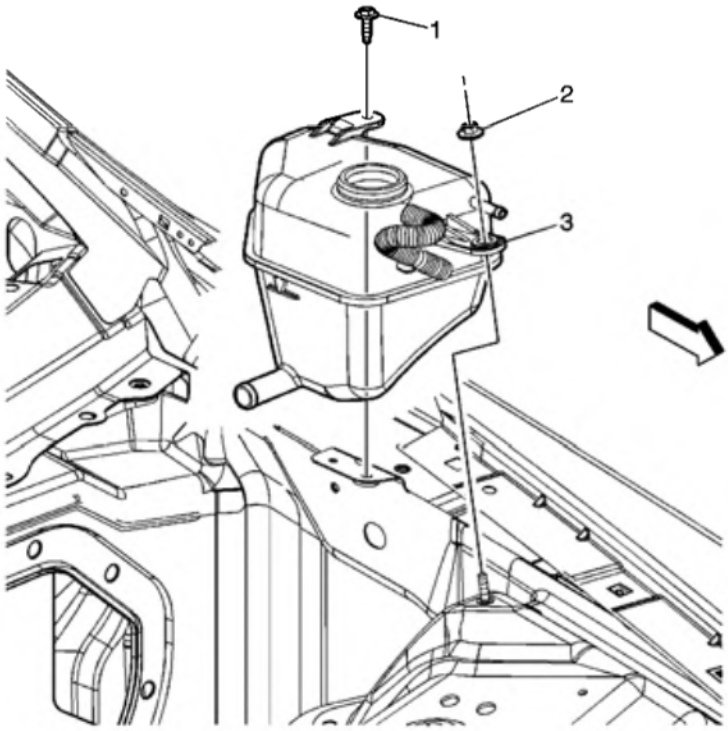
Warning: NEVER spray water on a hot heat exchanger. The resulting steam could cause personal injury.

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

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

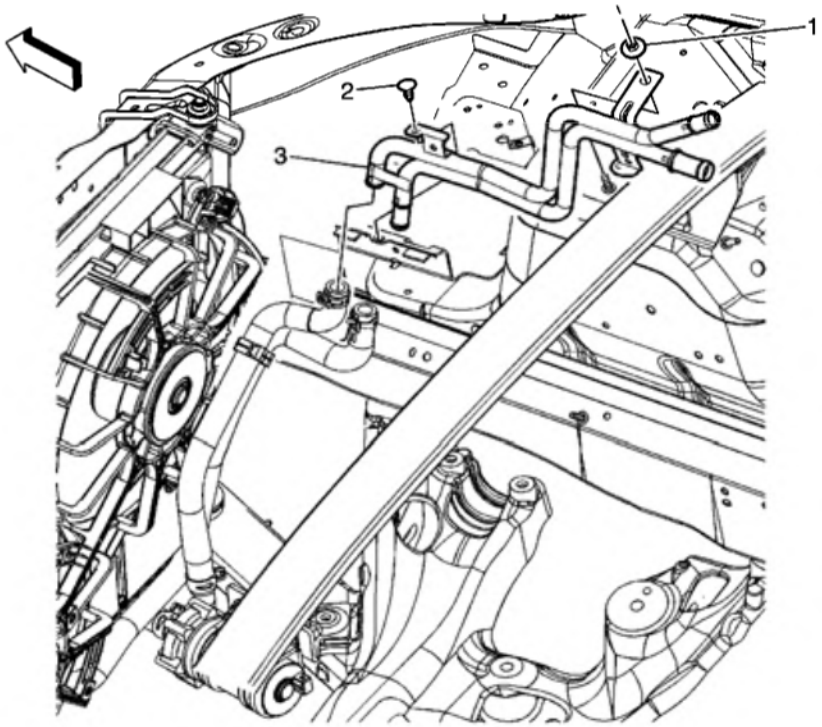
- Some conditions may require the use of warm water and a mild detergent.
- Clean the A/C condenser fins.
- Clean between the A/C condenser and radiator.
- Clean the radiator cooling fins.
- Straighten any damaged cooling fins.

Radiator Surge Tank Replacement



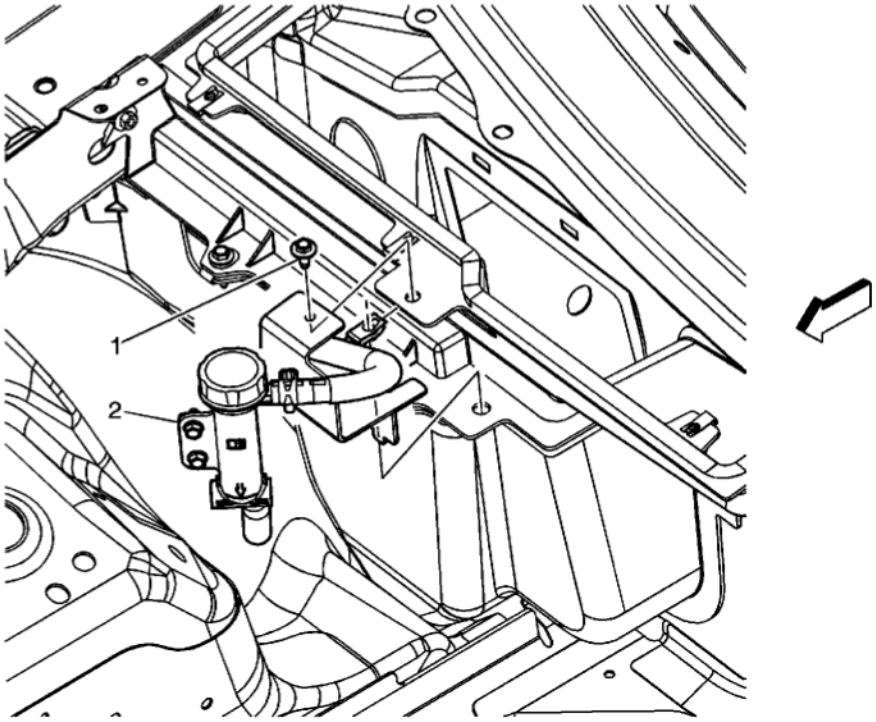
Callout	Component Name
Preliminary Procedures 1. Drain the coolant. Refer to Cooling System Draining and Filling. 2. Remove the surge tank inlet hose. Refer to Radiator Surge Tank Inlet Hose/Pipe Replacement. 3. Remove the surge tank outlet hose. Refer to Radiator Surge Tank Outlet Hose/Pipe Replacement.	
1	Surge Tank Bolt **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 9 N·m (80 lb in)
2	Surge Tank Nut **Tighten** 9 N·m (80 lb in)
3	Surge Tank

Charge Air Cooler Coolant Pipe Replacement



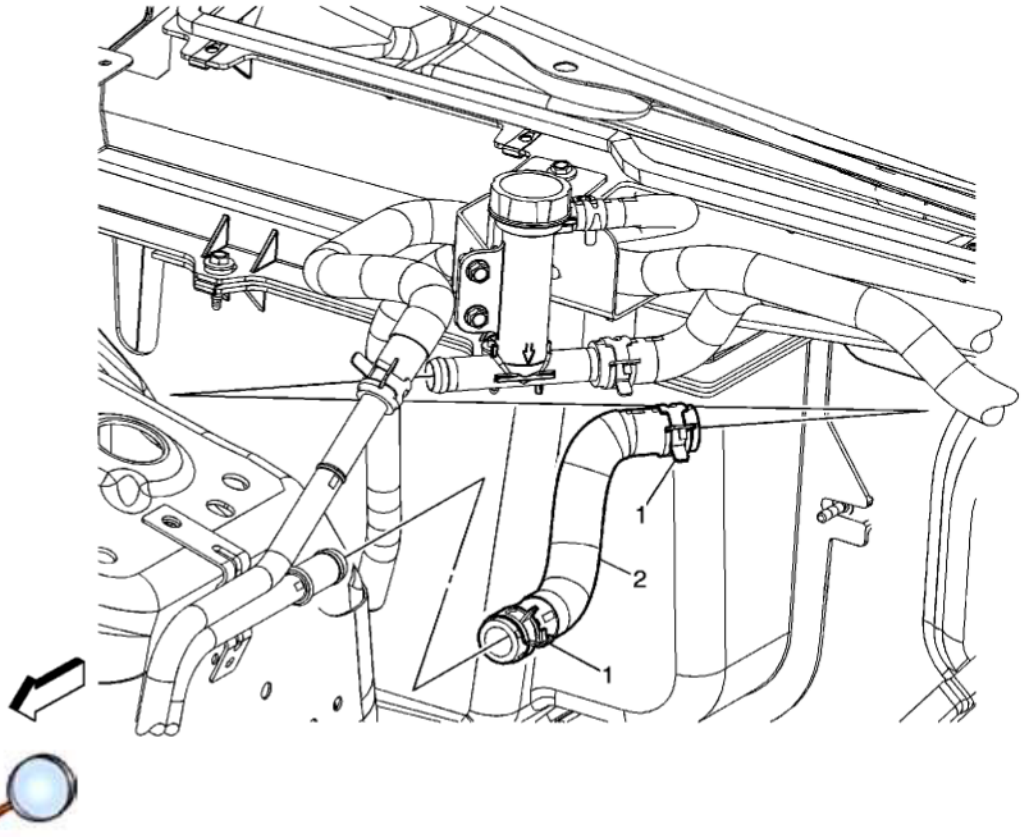
Callout	Component Name
Preliminary Procedures 1. Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling 2. Remove the charge air cooler hose pipe to pump. Refer to Charge Air Cooler Coolant Hose Replacement - Pipe to Pump 3. Remove the charge air cooler hose radiator to pipe. Refer to Charge Air Cooler Coolant Hose Replacement - Radiator to Pipe 4. Remove the charge air cooler hose pipe to reservoir. Refer to Charge Air Cooler Coolant Hose Replacement - Reservoir to Pipe 5. Remove the charge air cooler hose pipe to engine. Refer to Charge Air Cooler Coolant Hose Replacement - Engine to Pipe	
1	Charge Air Cooler Pipe Nut. **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 9 N·m (80 lb in)
2	Charge Air Cooler Pipe Retainer.
3	Charge Air C

Charge Air Cooler Coolant Reservoir Replacement



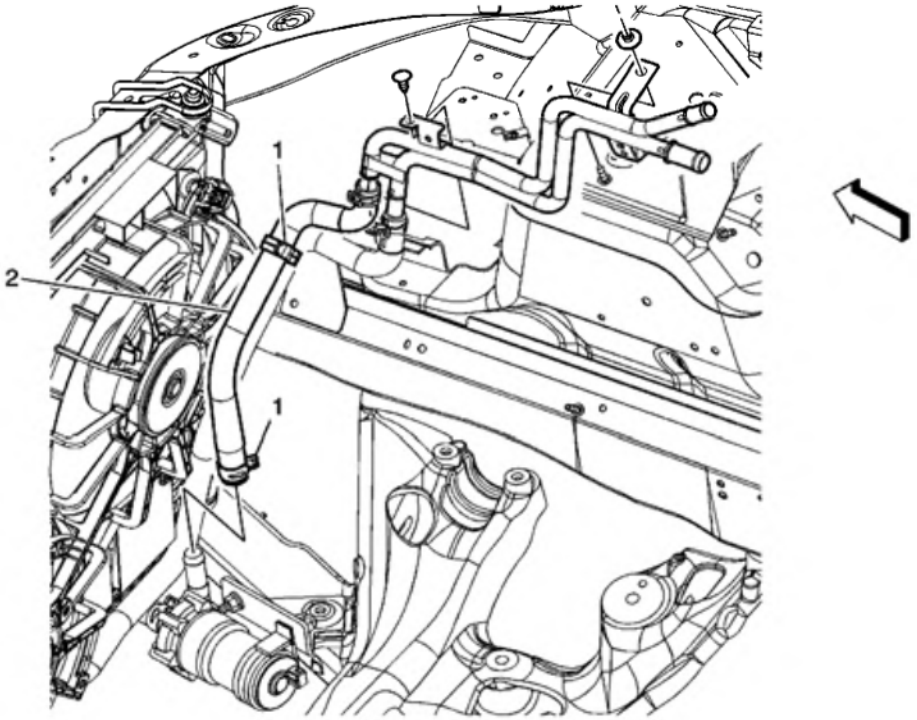
Callout	Component Name
Preliminary Procedures 1. Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling 2. Remove the charge air cooler coolant hose reservoir to pipe. Refer to Charge Air Cooler Coolant Hose Replacement - Reservoir to Pipe 3. Remove the charge air cooler coolant hose reservoir to engine. Refer to Charge Air Cooler Coolant Hose Replacement - Engine to Reservoir	
1	Charge Air Cooler Coolant Reservoir Bolt. **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 9 N·m (80 lb in)
2	Charge Air Cooler Coolant Reservoir.

Charge Air Cooler Coolant Hose Replacement - Reservoir to Pipe



Callout	Component Name
Preliminary Procedures Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling	
1	Charge Air Cooler Hose Clamps (Qty 2)
2	Charge Air Cooler Hose

Charge Air Cooler Coolant Hose Replacement - Pipe to Pump



Callout	Component Name
Preliminary Procedures 1. Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling 2. Remove the front air deflector. Refer to Front Air Deflector Replacement	
1	Charge Air Cooler Hose Clamps (Qty 2)
2	Charge Air Cooler Hose

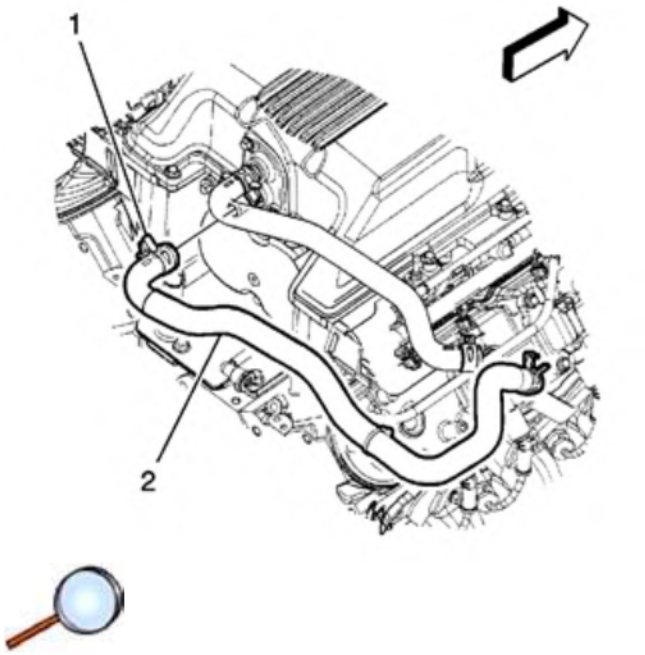
Charge Air Cooler Coolant Hose Replacement - Engine to Pipe

Special Tools

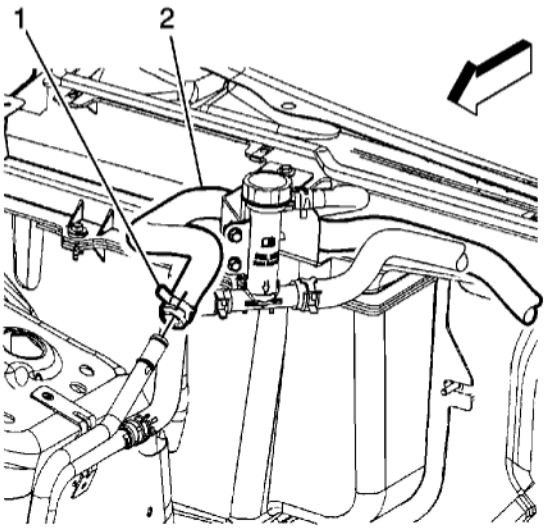
J 38185 Hose Clamp Pliers

Removal Procedure

1. Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling.
2. Remove the rear intake manifold cover. Refer to Intake Manifold Cover Replacement - Rear

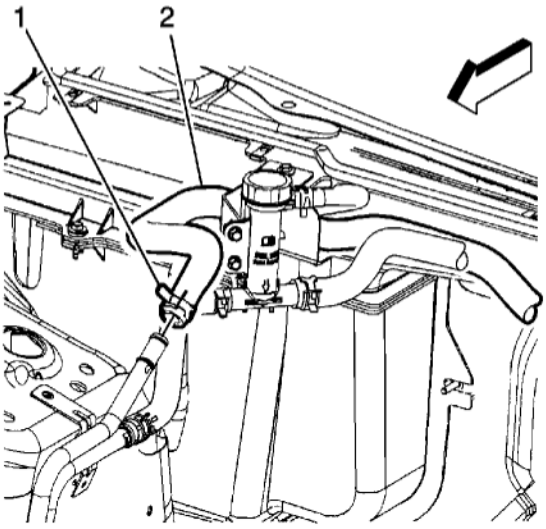


3. Reposition the charge air cooler hose clamp (1) at engine using *J 38185* Hose Clamp Pliers .
4. Remove the charge air cooler hose (2) from the engine.

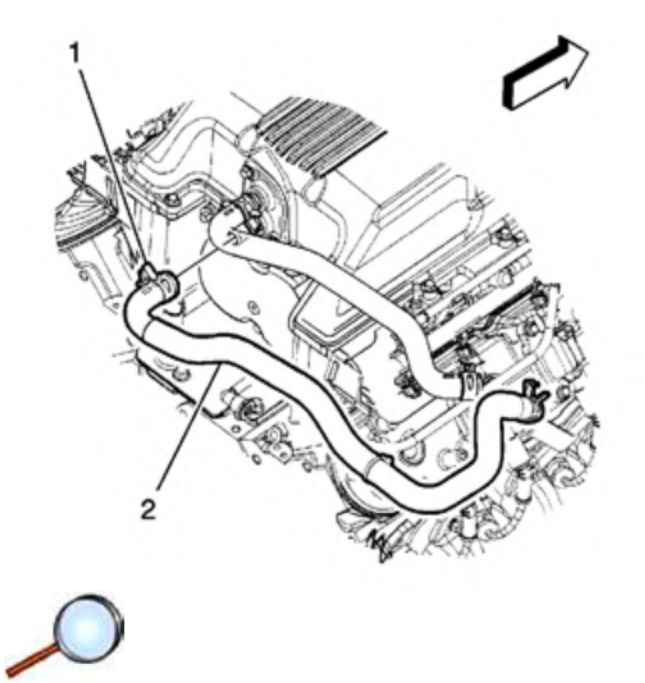


5. Reposition the charge air cooler hose clamp (1) at charge air cooler pipe using *J 38185* Hose Clamp Pliers .
6. Remove the charge air cooler hose (2) from the charge air cooler pipe.
7. Remove the charge air cooler hose from the vehicle.

Installation Procedure



1. Install the charge air cooler hose to the vehicle.
2. Install the charge air cooler hose (2) to the charge air cooler pipe.
3. Reposition the charge air cooler hose clamp (1) at the charge air cooler pipe using *J 38185* Hose Clamp Pliers .



4. Install the charge air cooler hose (2) to engine.
5. Reposition the charge air cooler hose clamp (1) at engine using *J 38185* Hose Clamp Pliers .
6. Install the rear intake manifold cover. Refer to Intake Manifold Cover Replacement - Rear
7. Fill the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling.

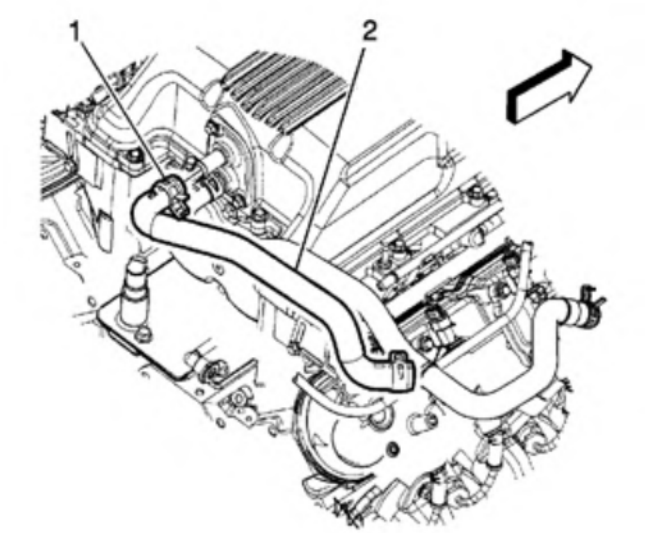
Charge Air Cooler Coolant Hose Replacement - Engine to Reservoir

Special Tools

J 38185 Hose Clamp Pliers

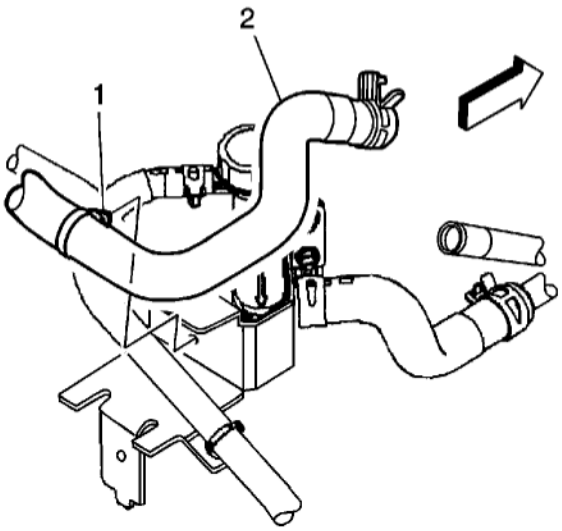
Removal Procedure

1. Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling.
2. Remove the rear intake manifold cover. Refer to Intake Manifold Cover Replacement - Rear



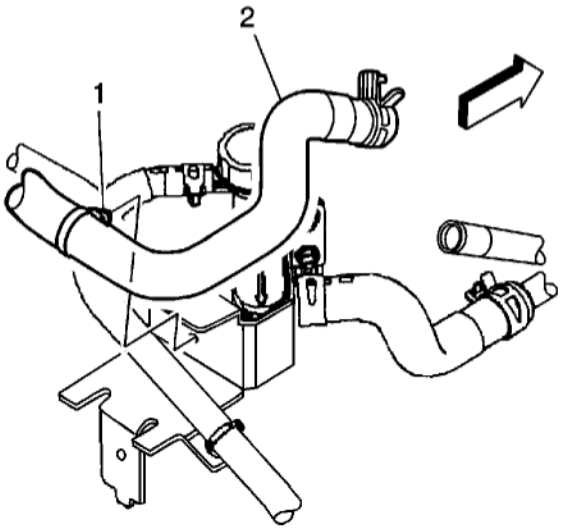


3. Reposition the charge air cooler hose clamp (1) at engine using *J 38185* Hose Clamp Pliers .
4. Remove the charge air cooler hose (2) from the engine.

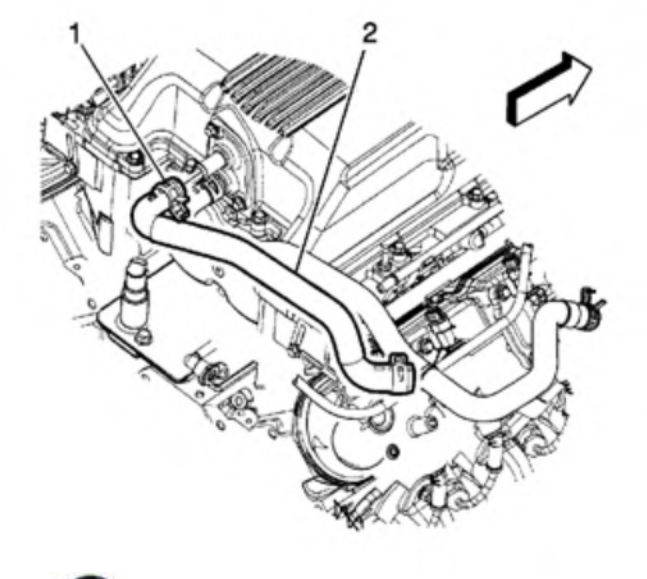


5. Reposition the charge air cooler hose clamp (1) at charge air cooler reservoir using *J 38185* Hose Clamp Pliers .
6. Remove the charge air cooler hose (2) from the charge air cooler reservoir.
7. Remove the charge air cooler hose from the vehicle.

Installation Procedure



1. Install the charge air cooler hose to the vehicle.
2. Install the charge air cooler hose (2) to the charge air cooler reservoir.
3. Reposition the charge air cooler hose clamp (1) at the charge air cooler reservoir using *J 38185* Hose Clamp Pliers .



4. Install the charge air cooler hose (2) to engine.
5. Reposition the charge air cooler hose clamp (1) at engine using *J 38185* Hose Clamp Pliers .
6. Install the rear intake manifold cover. Refer to Intake Manifold Cover Replacement - Rear
7. Fill the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling.

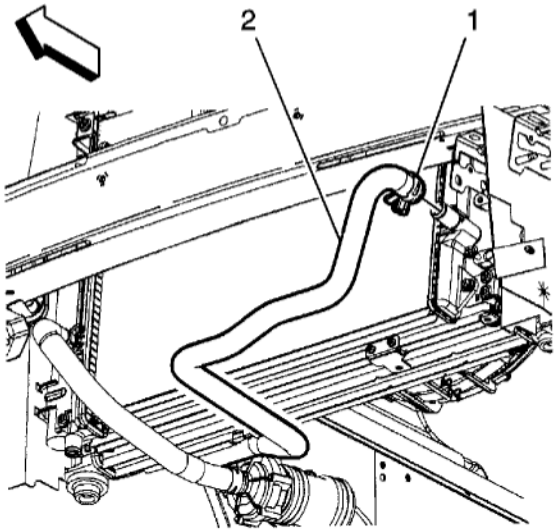
Charge Air Cooler Coolant Hose Replacement - Radiator to Pipe

Special Tools

J 38185 Hose Clamp Pliers

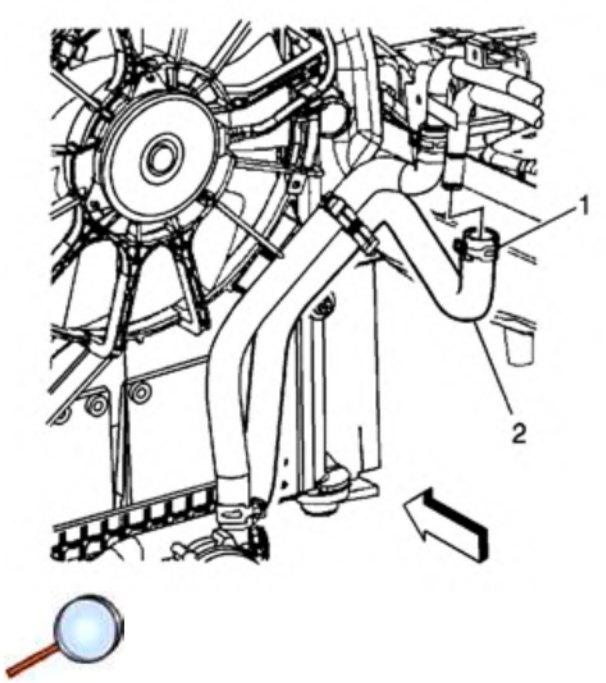
Removal Procedure

1. Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
3. Remove the front air deflector. Refer to Front Air Deflector Replacement



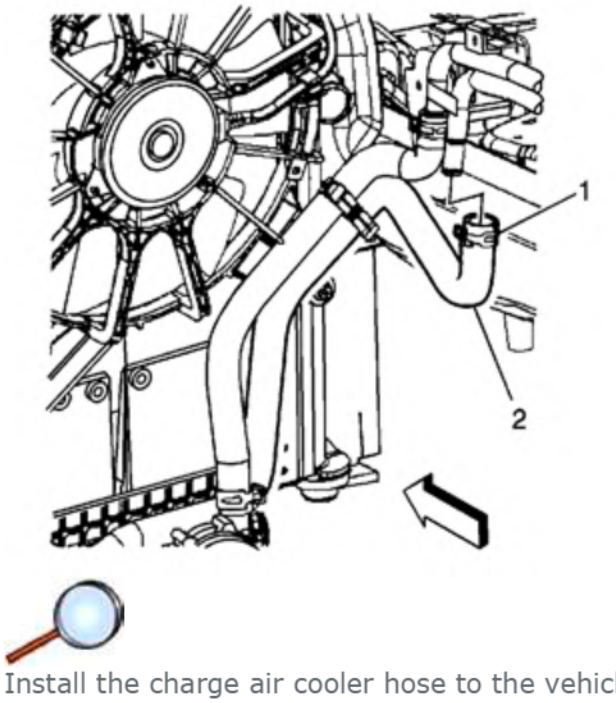


4. Reposition the charge air cooler hose clamp (1) at the charge air cooler using *J 38185* Hose Clamp Pliers .
5. Remove the charge air cooler hose (2) from the charge air cooler.

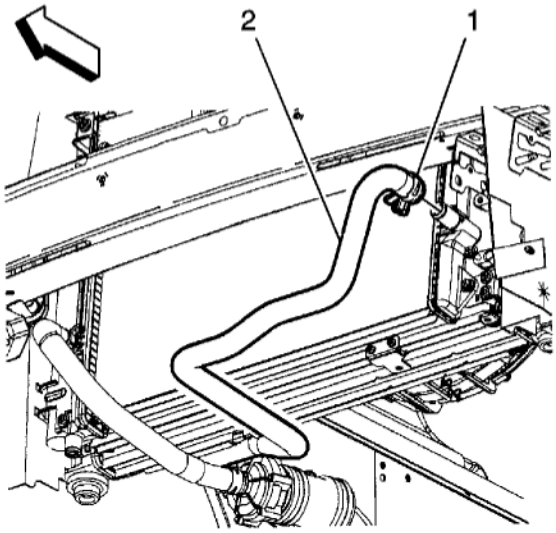


6. Reposition the charge air cooler hose clamp (1) at charge air cooler pipe assembly using *J 38185* Hose Clamp Pliers .
7. Remove the charge air cooler hose (2) from the charge air cooler pipe assembly.
8. Unclip charge air cooler hose and remove from vehicle.

Installation Procedure

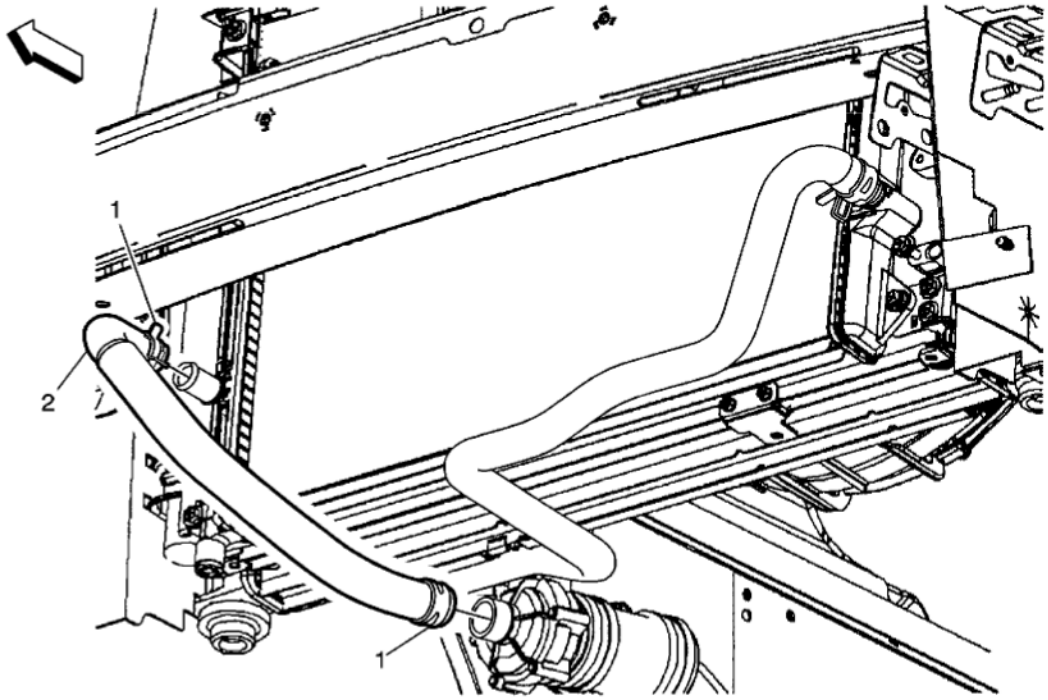


1. Install the charge air cooler hose to the vehicle and clip to hose.
2. Install the charge air cooler hose (2) to the charge air cooler pipe assembly.
3. Reposition the charge air cooler hose clamp (1) at the charge air cooler pipe assembly using *J 38185* Hose Clamp Pliers .



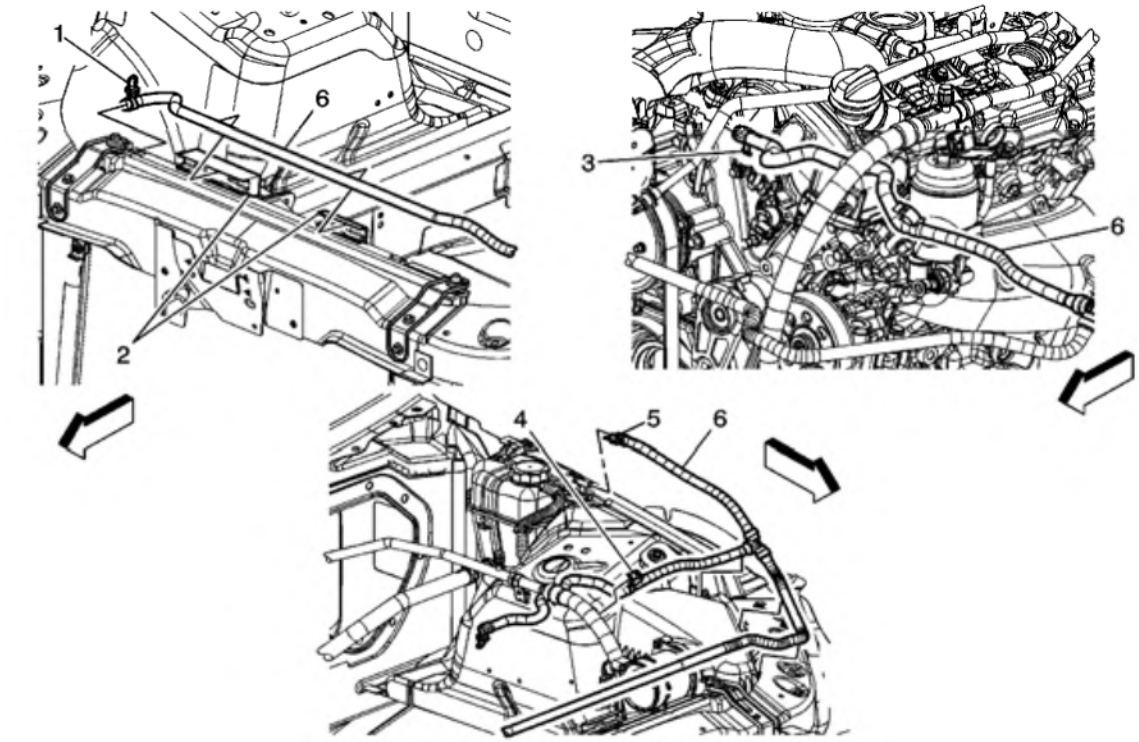
4. Install the charge air cooler hose (2) to the charge air cooler.
5. Reposition the charge air cooler hose clamp (1) at the charge air cooler using *J 38185* Hose Clamp Pliers .
6. Install the front air deflector. Refer to Front Air Deflector Replacement
7. Lower the vehicle. Refer to Lifting and Jacking the Vehicle
8. Fill the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling.

Charge Air Cooler Coolant Hose Replacement - Radiator to Pump



Callout	Component Name
Preliminary Procedures 1. Drain the charge air cooling system. Refer to Charge Air Cooling System Draining and Filling 2. Remove the front air deflector. Refer to Front Air Deflector Replacement	
1	Charge Air Cooler Hose Clamps (Qty 2)
2	Charge Air Cooler Hose

Radiator Surge Tank Inlet Hose/Pipe Replacement (LY7, LLT)



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

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3	**Procedure** Use J 38185 to reposition the surge tank inlet hose clamp. **Special Tools** J 38185 Hose Clamp Pliers
4	Surge Tank Inlet Hose Clip
5	Surge Tank Inlet Hose Clamp **Procedure** Use J 38185 to reposition the surge tank inlet hose clamp. **Special Tools** J 38185 Hose Clamp Pliers
6	Surge Tank Inlet Hose

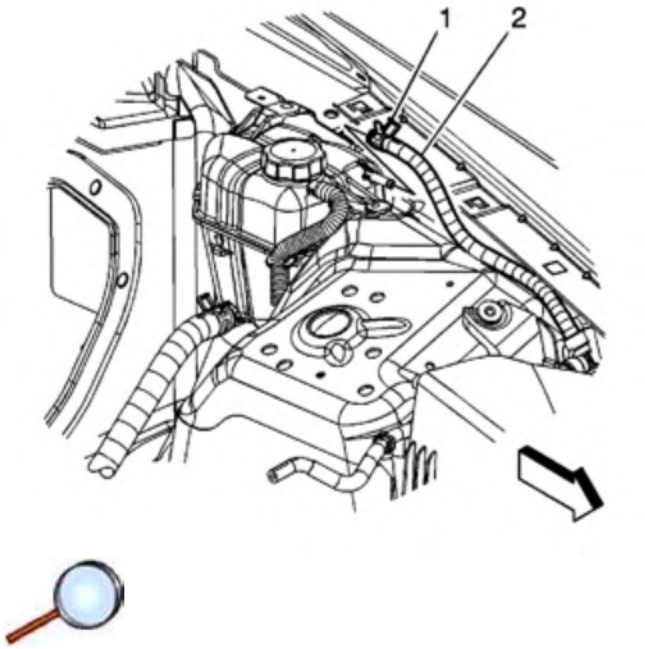
Radiator Surge Tank Inlet Hose/Pipe Replacement (LSA)

Special Tools

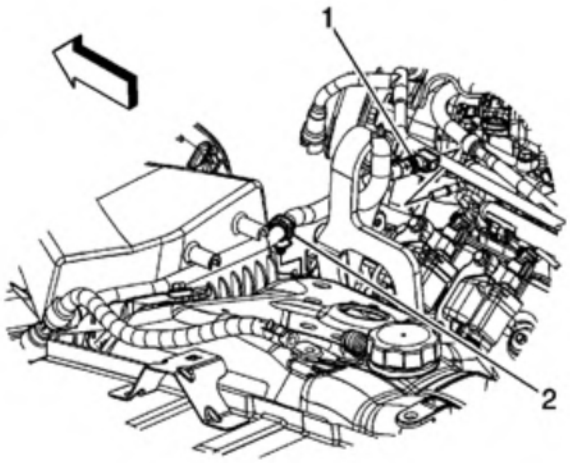
J 38185 Hose Clamp Pliers

Removal Procedure

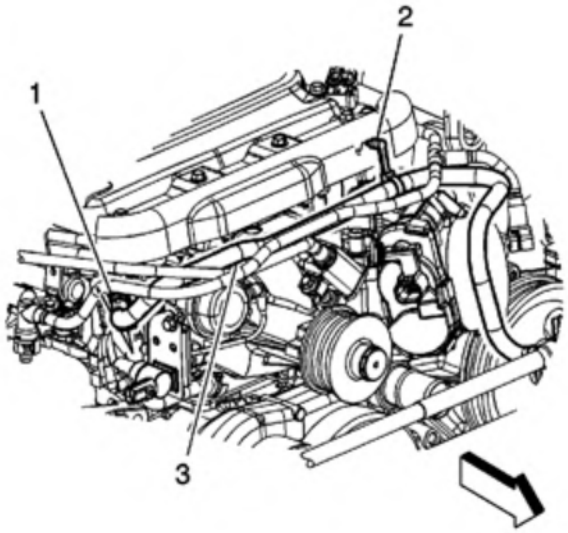
1. Drain the coolant. Refer to Cooling System Draining and Filling.
2. Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement
3. Remove the front compartment side sight shield. Refer to Front Compartment Side Sight Shield Replacement
4. Remove the intake manifold cover front. Refer to Intake Manifold Cover Replacement - Front



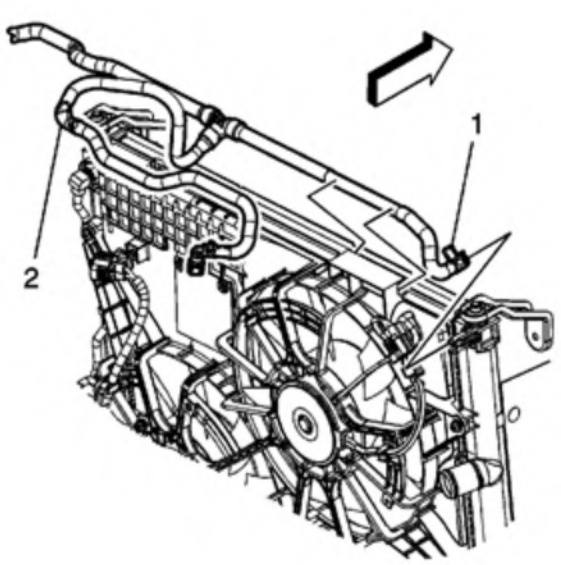
5. Reposition the surge tank inlet hose clamp (1) at surge tank using *J 38185* Hose Clamp Pliers .
6. Remove the surge tank inlet hose (2) from the surge tank.



7. Disconnect the quick connect fitting (1) at the engine.
8. Disconnect the clip (2) at the air cleaner assembly.

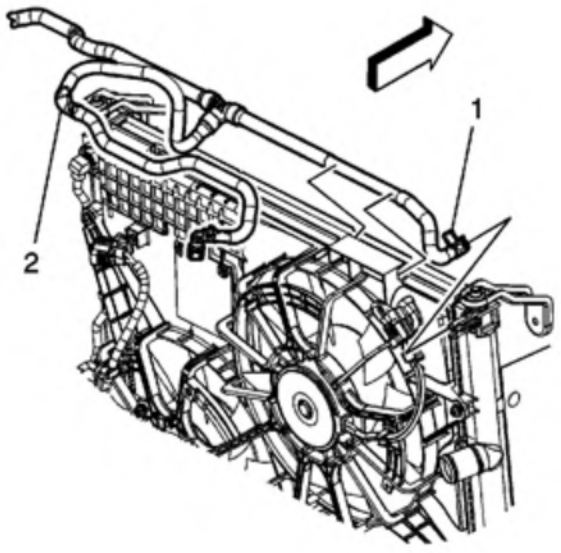


9. Disconnect the quick connect fitting (1) at the engine.
10. Disconnect the clip (2) at the engine.

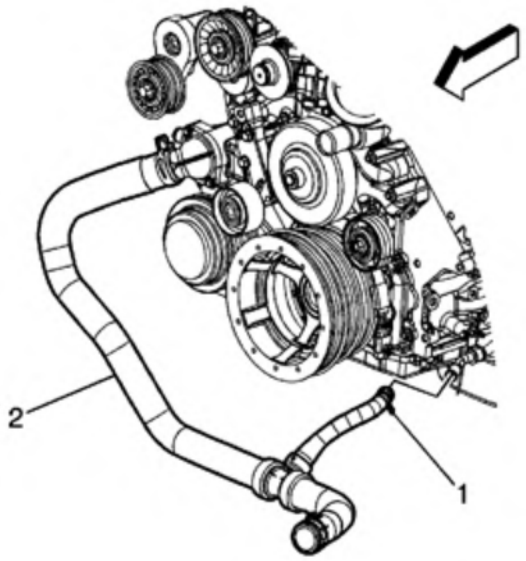


11. Reposition the surge tank inlet hose clamp (1) at radiator using *J 38185* Hose Clamp Pliers .
12. Remove the surge tank inlet hose (2) from the radiator.
13. Remove the surge tank inlet hose from the vehicle.

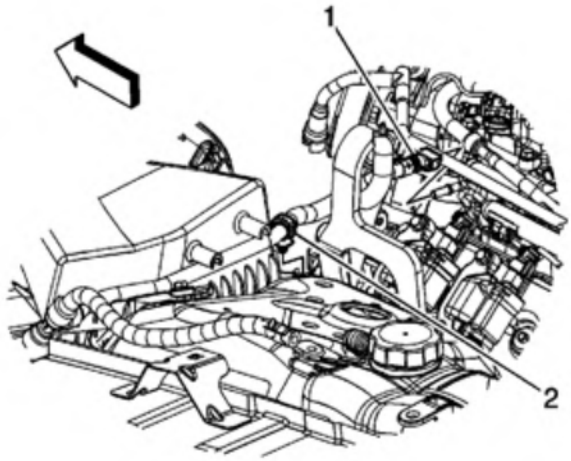
Installation Procedure



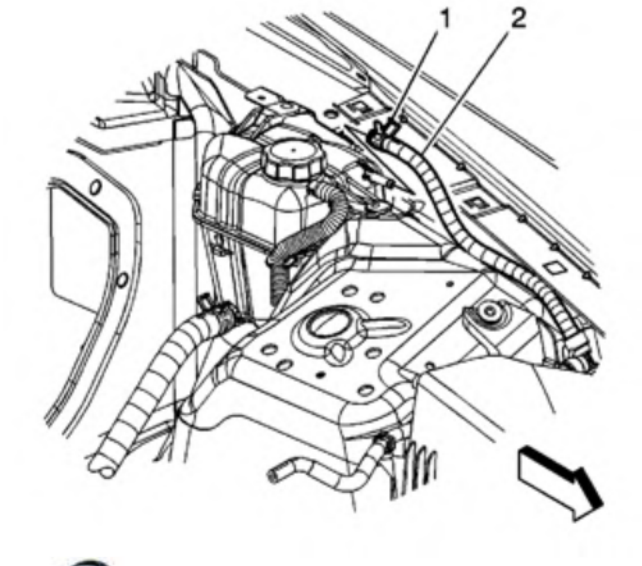
1. Install the surge tank inlet hose to the vehicle.
2. Install the surge tank inlet hose (2) to the radiator.
3. Reposition the surge tank inlet hose clamp (1) at radiator using *J 38185* Hose Clamp Pliers .



4. Connect the quick connect fitting (1) at the engine.
5. Connect the clip (2) at the engine.

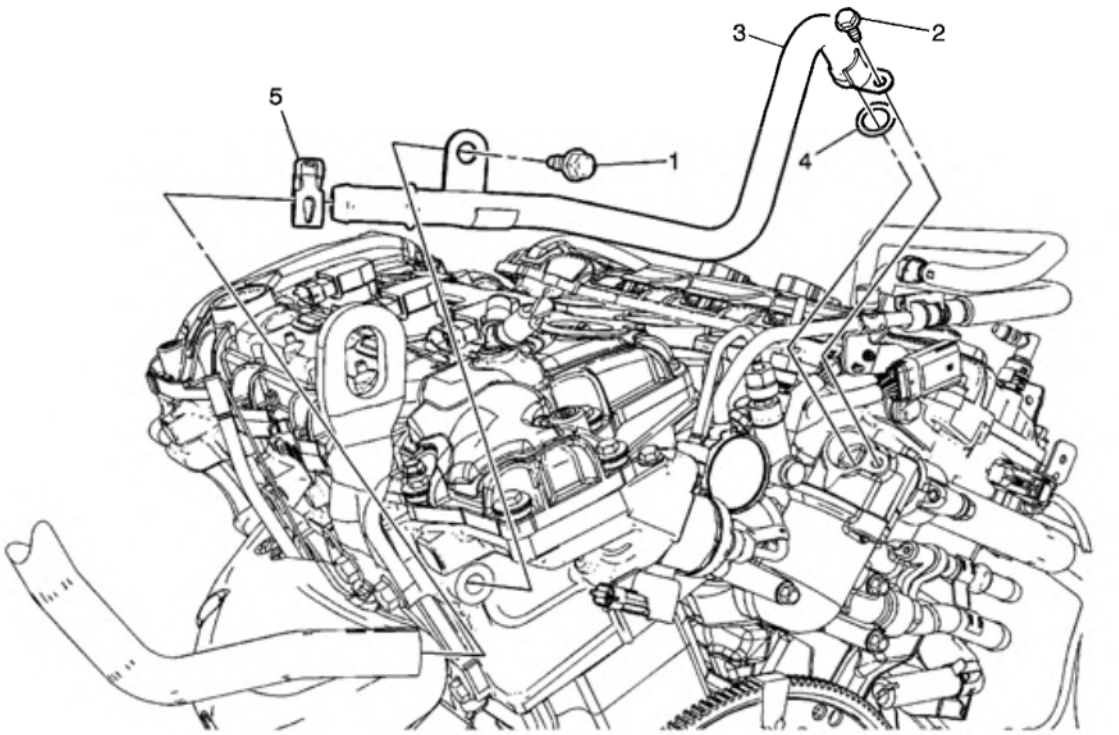


6. Connect the quick connect fitting (1) at the engine.
7. Connect the clip (2) at the air cleaner assembly.



8. Install the surge tank inlet hose (2) to the surge tank.
9. Reposition the surge tank inlet hose clamp (1) at surge tank using *J 38185* Hose Clamp Pliers .
10. Install the intake manifold cover front. Refer to Intake Manifold Cover Replacement - Front
11. Install the front compartment side sight shield. Refer to Front Compartment Side Sight Shield Replacement
12. Install the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement
13. Fill the coolant. Refer to Cooling System Draining and Filling.

Radiator Surge Tank Outlet Hose / Pipe Replacement (LLT)



Callout	Component Name
Preliminary Procedure 1. Partially drain the cooling system. Refer to Cooling System Draining and Filling. 2. Remove the fuel pipe shield. Refer to Fuel Pipe Shield Replacement.	
1	Outlet Pipe Bolt (Attached to Head) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 23 N·m (17 lb ft)
2	Outlet Pipe Bolt (Attached to Thermostat Housing) **Tighten** 10 N·m (89 lb in)
3	Radiator Surge Tank Outlet Pipe
	O-ring

4	**Procedure** Apply a small amount of lubricant to the surge tank pipe O-ring to allow the O-ring to seal properly.
5	Spring Clamp

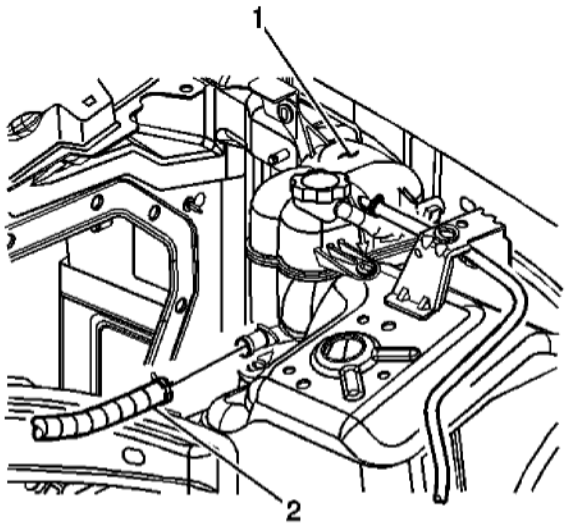
Radiator Surge Tank Outlet Hose / Pipe Replacement (LY7 / LLT)

Special Tools

J 38185 Hose Clamp Pliers

Removal Procedure

1. Drain the cooling system. Refer to Cooling System Draining and Filling.



2. Position J 38185 to the clamp in order to remove the outlet hose (2) from the surge tank (1).
3. Loosen the bolt on the bracket which secures the surge tank outlet hose to the engine.
4. Remove the windshield wiper transmission. Refer to Windshield Wiper Transmission Replacement.
5. Position J 38185 to the clamp in order to remove the surge tank outlet hose from the thermostat assembly.
6. Remove the surge tank outlet hose/pipe from the engine.

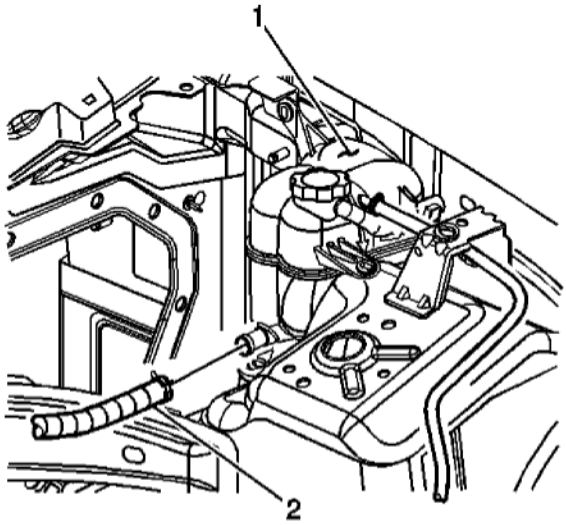
Installation Procedure

1. Position the surge tank outlet hose/pipe to the engine.
2. Position J 38185 to the clamp in order to connect the surge tank outlet hose to the thermostat assembly.
3. Install the windshield wiper transmission. Refer to Windshield Wiper Transmission Replacement.

Caution: Refer to Fastener Caution in the Preface section.

4. Install the bolt to the ɔ the engine and tighten to

9 N·m (80 lb in).



5. Position J 38185 to the clamp in order to connect the outlet hose (2) to the surge tank (1).
6. Fill the cooling system. Refer to Cooling System Draining and Filling.

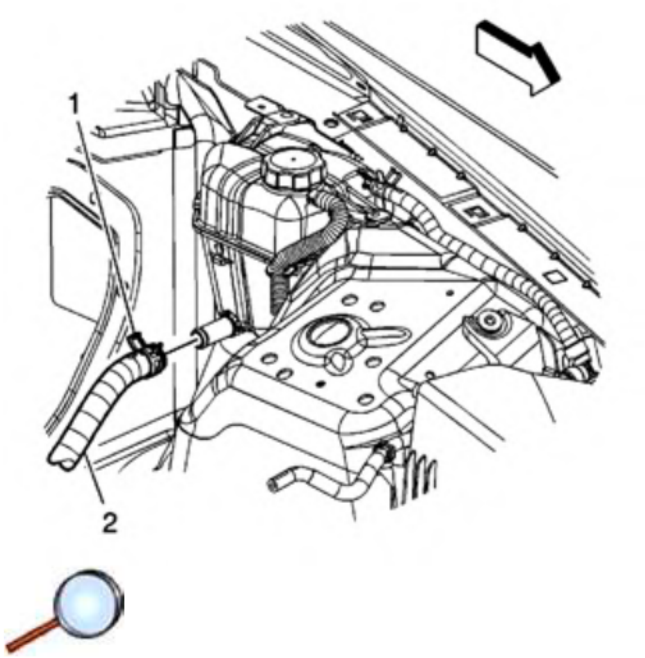
Radiator Surge Tank Outlet Hose/Pipe Replacement (LSA)

Special Tools

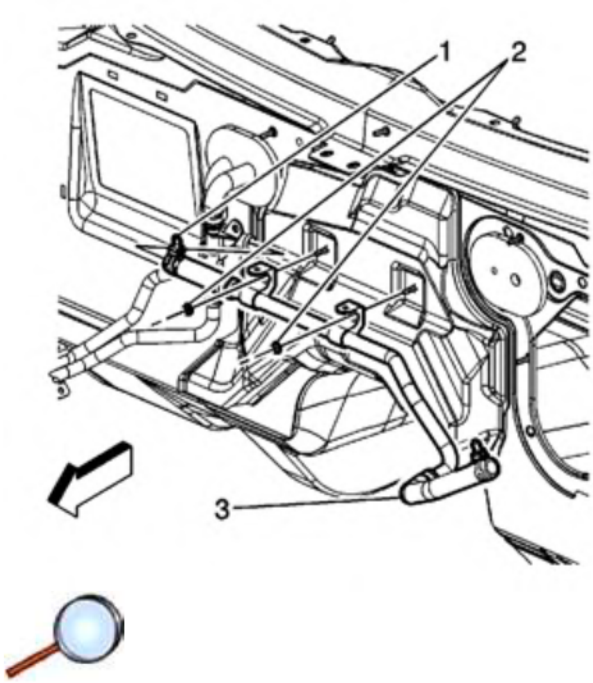
J 38185 Hose Clamp Pliers

Removal Procedure

1. Drain the cooling system. Refer to Cooling System Draining and Filling.

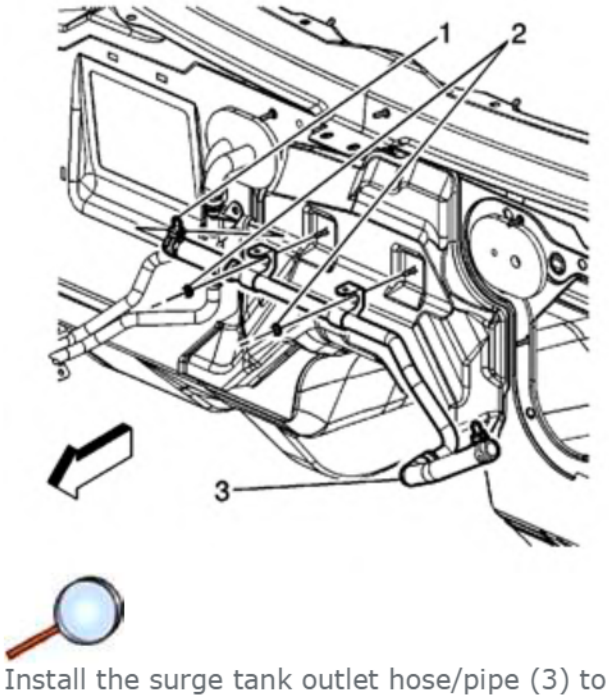


2. Reposition the surge tank outlet hose/pipe clamp (1) at surge tank using *J 38185* Hose Clamp Pliers .
3. Remove the surge tank outlet hose/pipe (2) from the surge tank.
4. Remove the rear intake manifold cover. Refer to Intake Manifold Cover Replacement - Rear.



5. Reposition the surge tank outlet hose clamp (1) at heater hose assembly using *J 38185* Hose Clamp Pliers .
6. Remove the surge tank outlet hose/pipe nuts (2).
7. Remove the surge tank outlet hose/pipe (3) from the vehicle.

Installation Procedure

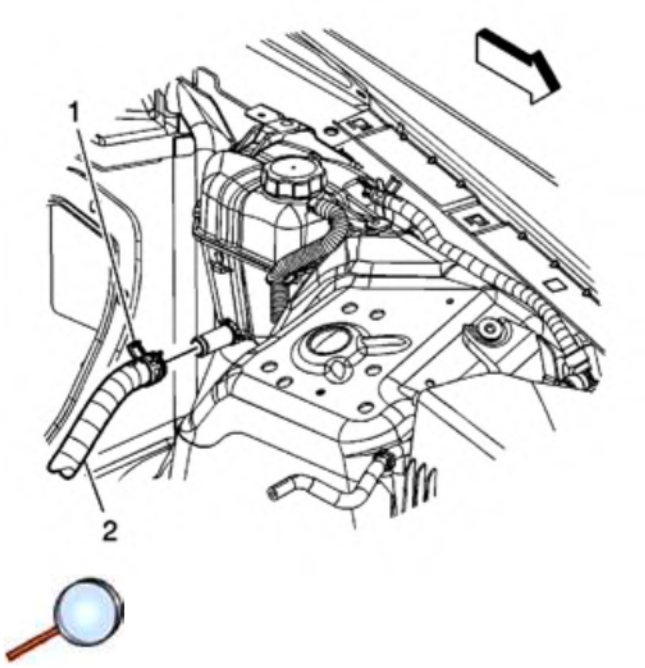


1. Install the surge tank outlet hose/pipe (3) to the vehicle.

   Caution: Refer to Fastener Caution in the Preface section.

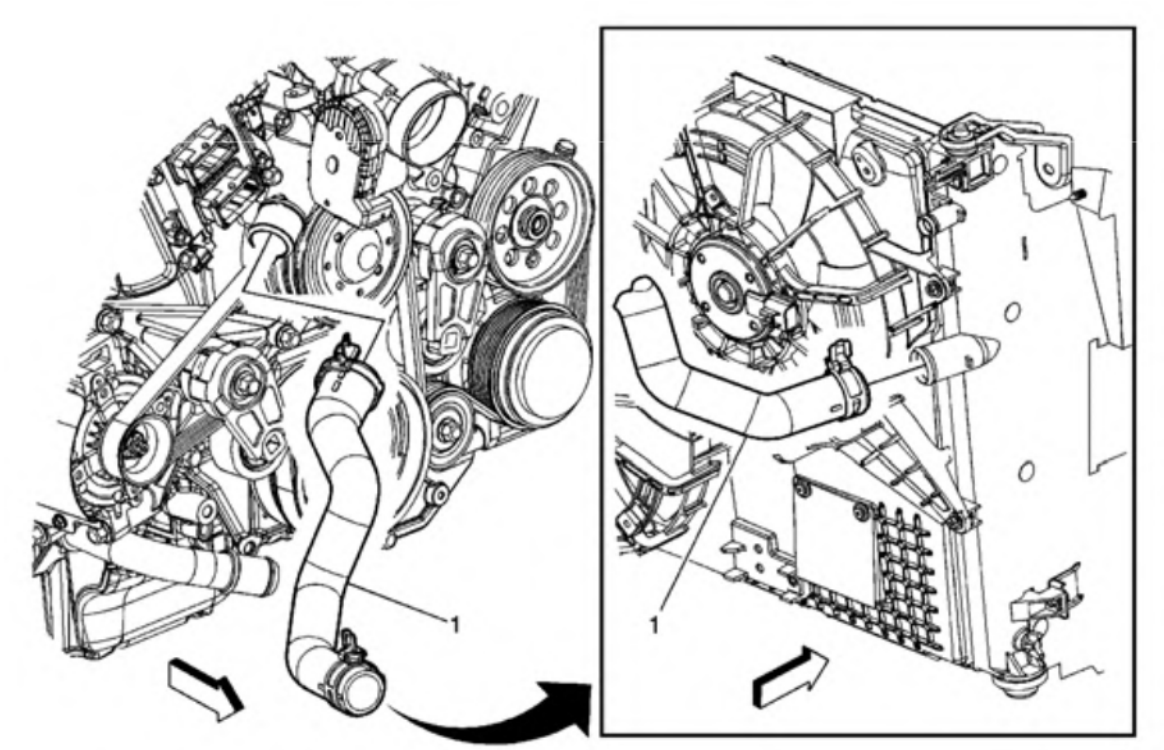
2. Install the surge tank outlet hose/pipe nuts (2) and tighten to **10 N·m (89 lb in)**

3. Reposition the surge tank outlet hose clamp (1) at heater hose assembly using *J 38185* Hose Clamp Pliers .
4. Install the rear intake manifold cover. Refer to Intake Manifold Cover Replacement - Rear.



5. Install the surge tank outlet hose/pipe (2) to the surge tank.
6. Reposition the surge tank outlet hose/pipe clamp (1) at surge tank using *J 38185* Hose Clamp Pliers .
7. Fill the cooling system. Refer to Cooling System Draining and Filling.

Radiator Inlet Hose Replacement (LY7, LLT)



Callout	Component Name
Preliminary Procedure • Drain the coolant. Refer to Cooling System Draining and Filling. • Remove the radiator fan shroud. Refer to Engine Coolant Fan Shroud Replacement	
1	Radiator Inlet Hose **Procedure** Using J 38185 reposition the radiator inlet hose clamps. **Special Tools** J 38185 Hose Clamp Pliers

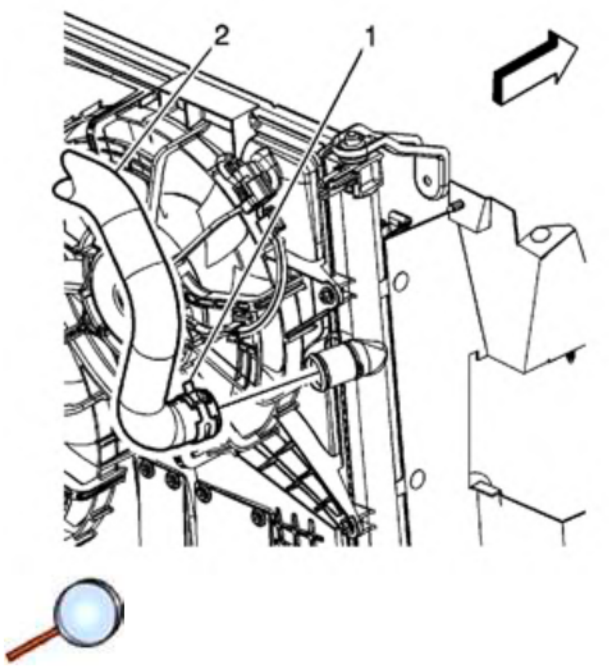
Radiator Inlet Hose Replacement (LSA)

Special Tools

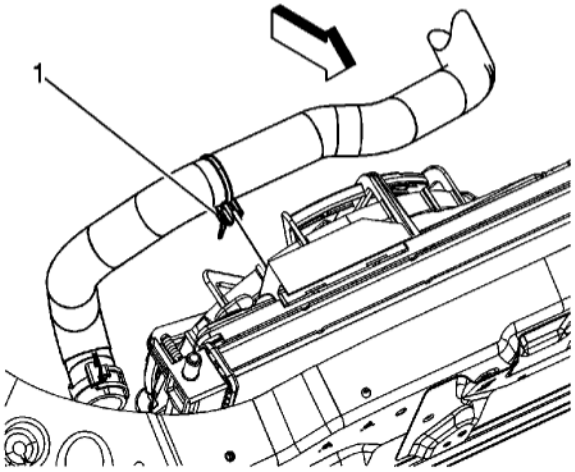
J 38185 Hose Clamp Pliers

Removal Procedure

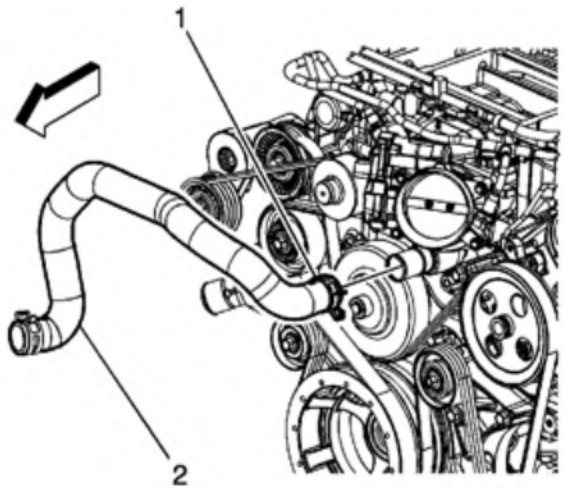
1. Drain the cooling system. Refer to Cooling System Draining and Filling.
2. Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement



3. Reposition the radiator inlet hose clamp (1) at radiator using *J 38185* Hose Clamp Pliers .
4. Remove the radiator inlet hose (2) from the radiator.

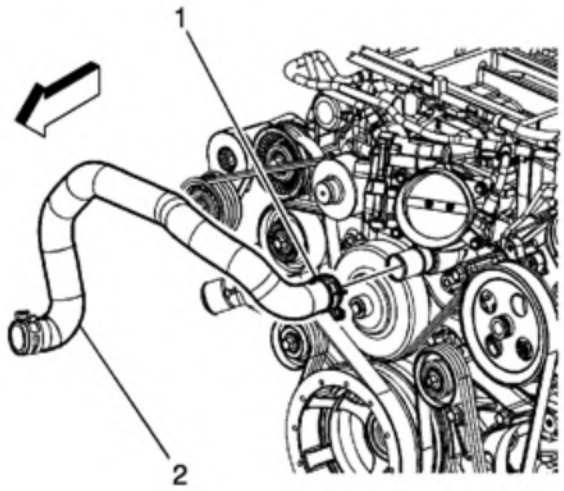


5. Unclip the radiator inlet hose retainer (1) from the fan shroud.

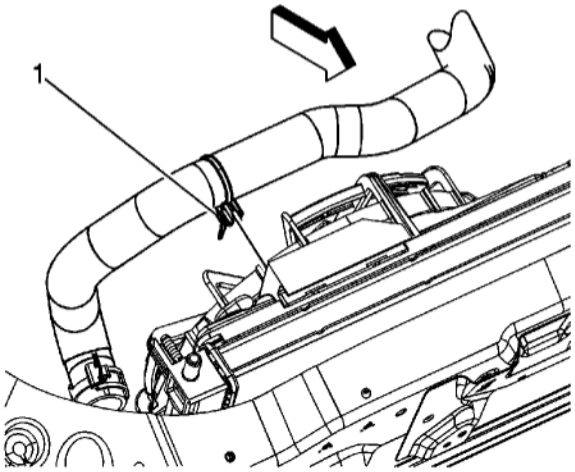


6. Reposition the radiator inlet hose clamp (1) at engine using *J 38185* Hose Clamp Pliers .
7. Remove the radiator inlet hose (2) from the engine.
8. Remove the radiator inlet hose from the vehicle.

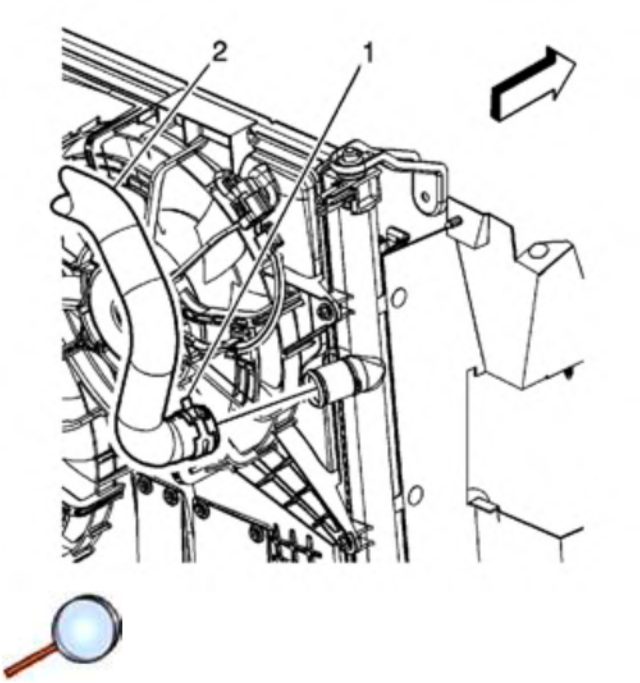
Installation Procedure



1. Install the radiator outlet hose to the vehicle.
2. Install the radiator inlet hose (2) to the engine.
3. Reposition the radiator inlet hose clamp (2) at engine using *J 38185* Hose Clamp Pliers .



4. Clip the radiator inlet hose retainer (1) to the fan shroud.



5. Install the radiator inlet hose (2) to the radiator.
6. Reposition the radiator inlet hose clamp (1) at radiator using *J 38185* Hose Clamp Pliers .
7. Install the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement
8. Fill the cooling system. Refer to Cooling System Draining and Filling.

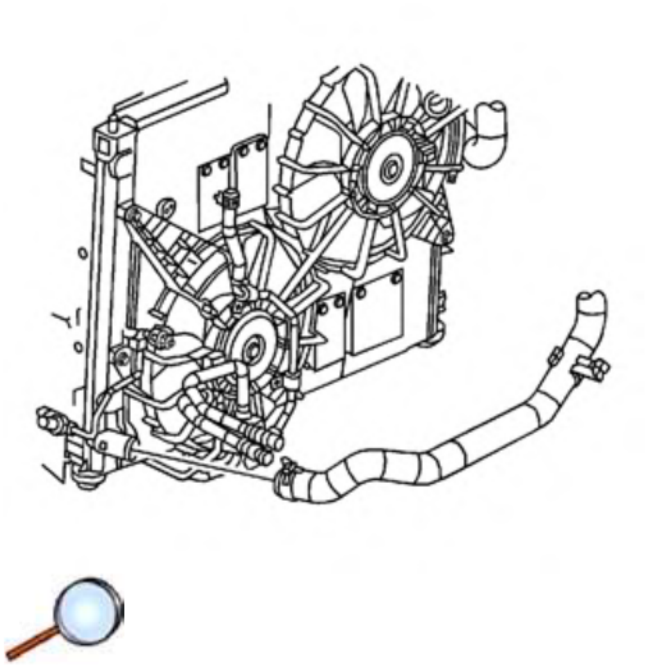
Radiator Outlet Hose Replacement (LY7, LLT)

Special Tools

J 38185 Hose Clamp Pliers

Removal Procedure

1. Drain the coolant. Refer to Cooling System Draining and Filling.
2. Remove the air cleaner outlet duct. Refer to Air Cleaner Outlet Duct Replacement.
3. Using the J 38185 , disengage the tension on the hose clamp and remove the radiator outlet hose from the engine coolant inlet pipe.
4. Remove left front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement



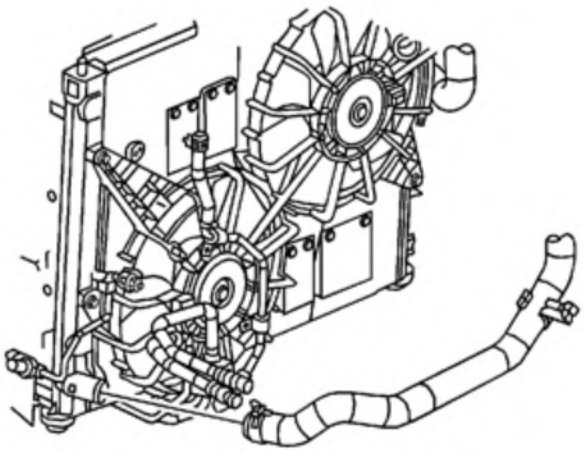
5. Using the J 38185 , disengage the tension on the hose clamp and remove the radiator outlet hose from the radiator.
6. Remove the radiator outlet hose from the vehicle.

Installation Procedure

1. Install the radiator outlet hose to the vehicle.

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

2. Using the J 38185 , disengage the tension on the hose clamp and install the radiator outlet hose to the radiator.



3. Using the J 38185 slide the clamp into the original position.
4. Install the air cleaner outlet duct. Refer to Air Cleaner Outlet Duct Replacement.
5. Remove left front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement
6. Fill the cooling system. Refer to Cooling System Draining and Filling.

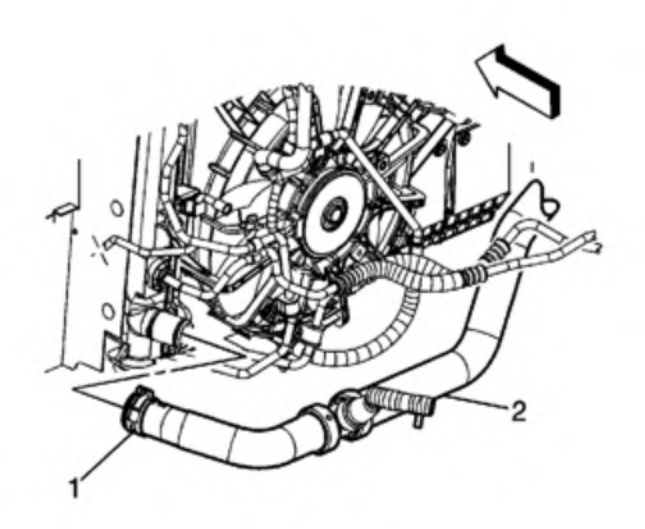
Radiator Outlet Hose Replacement (LSA)

Special Tools

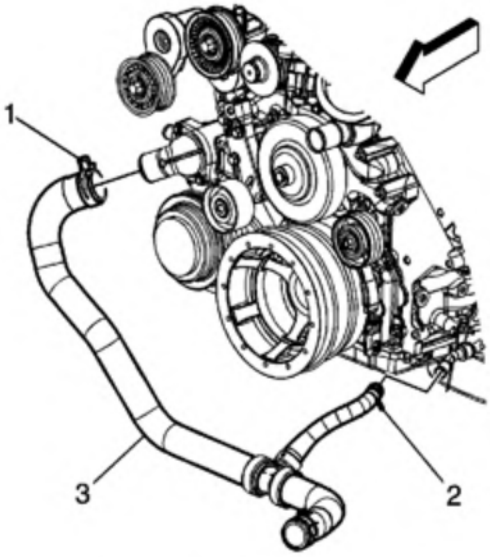
J 38185 Hose Clamp Pliers

Removal Procedure

1. Drain the cooling system. Refer to Cooling System Draining and Filling.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
3. Remove the front air deflector. Refer to Front Air Deflector Replacement

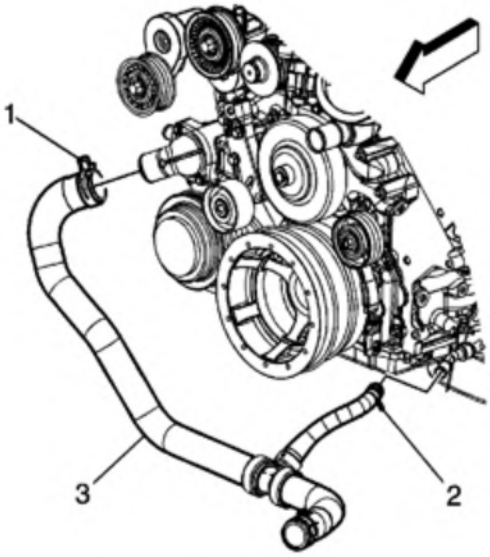


4. Reposition the radiator outlet hose clamp (1) at radiator using *J 38185* Hose Clamp Pliers .
5. Remove the radiator outlet hose (2) from the radiator.



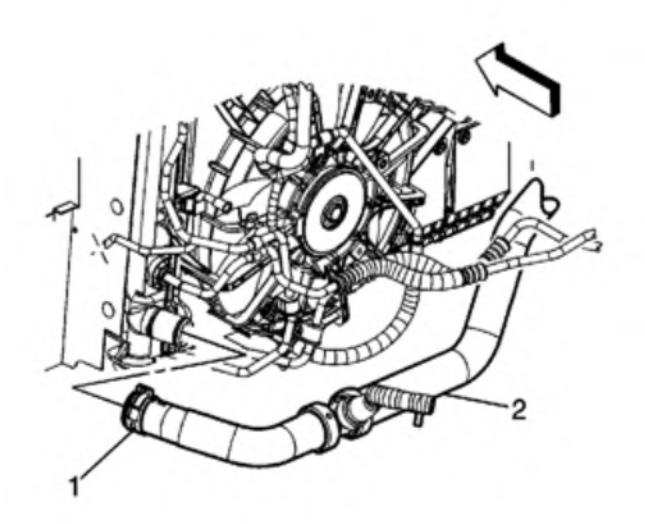
6. Reposition the radiator outlet hose clamp (1) at engine oil cooler pipe using *J 38185* Hose Clamp Pliers .
7. Remove the radiator outlet hose (3) from the engine oil cooler pipe.
8. Reposition the radiator outlet hose clamp (2) at engine using *J 38185* Hose Clamp Pliers .
9. Remove the radiator outlet hose (3) from the engine.
10. Remove the radiator outlet hose (3) from the vehicle.

Installation Procedure



1. Install the radiator outlet hose (3) to the vehicle.
2. Install the radiator outlet hose (3) to the engine.
3. Reposition the radiator outlet hose clamp (2) at engine using *J 38185* Hose Clamp Pliers .

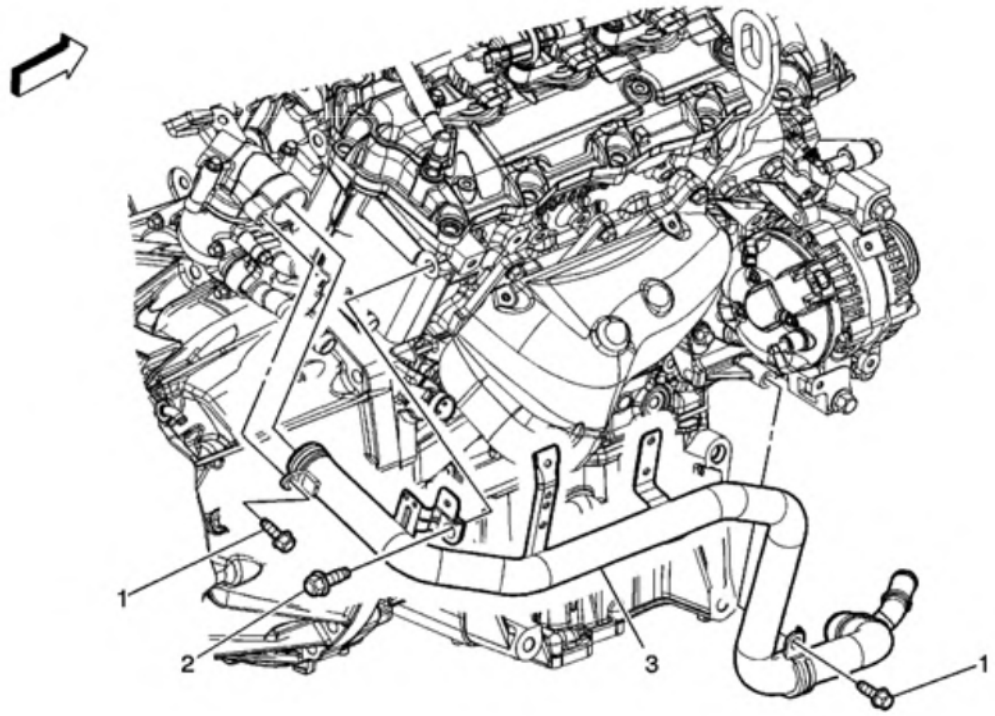
4. Install the radiator outlet hose (3) to the engine oil cooler pipe.
5. Reposition the radiator outlet hose clamp (1) at engine oil cooler pipe using *J 38185* Hose Clamp Pliers .





6. Install the radiator outlet hose (2) to the radiator.
7. Reposition the radiator outlet hose clamp (1) at radiator using *J 38185* Hose Clamp Pliers .
8. Install the front air deflector. Refer to Front Air Deflector Replacement
9. Lower the vehicle. Refer to Lifting and Jacking the Vehicle
10. Fill the cooling system. Refer to Cooling System Draining and Filling.

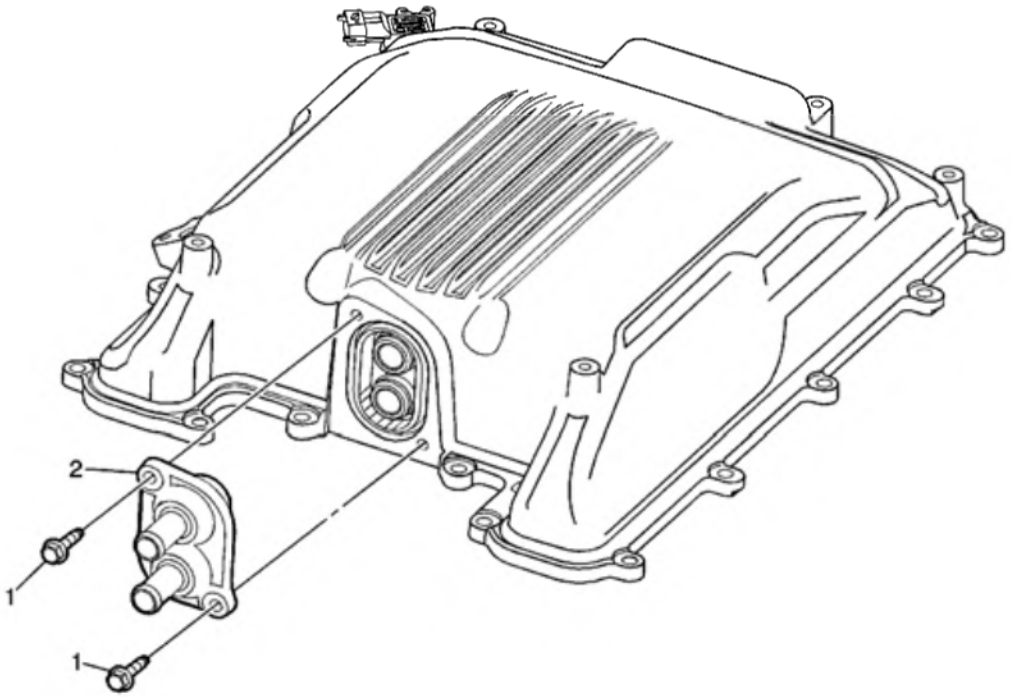
Engine Coolant Inlet Pipe Replacement



Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to Cooling System Draining and Filling. 2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle. 3. Disconnect the radiator outlet hose from the coolant pipe. Refer to Radiator Outlet Hose Replacement. 4. Disconnect the auxiliary water pump hose from the coolant pipe. Refer to Auxiliary Water Pump Inlet Hose Replacement 5. Remove the passenger compartment air filter housing. Refer to Passenger Compartment Air Filter Housing Replacement.	
1	Radiator Outlet Pipe Bolt (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 10 N·m (89 lb in)
2	Radiator Outlet Pipe Bolt **Tighten** 50 N·m (37 lb ft)

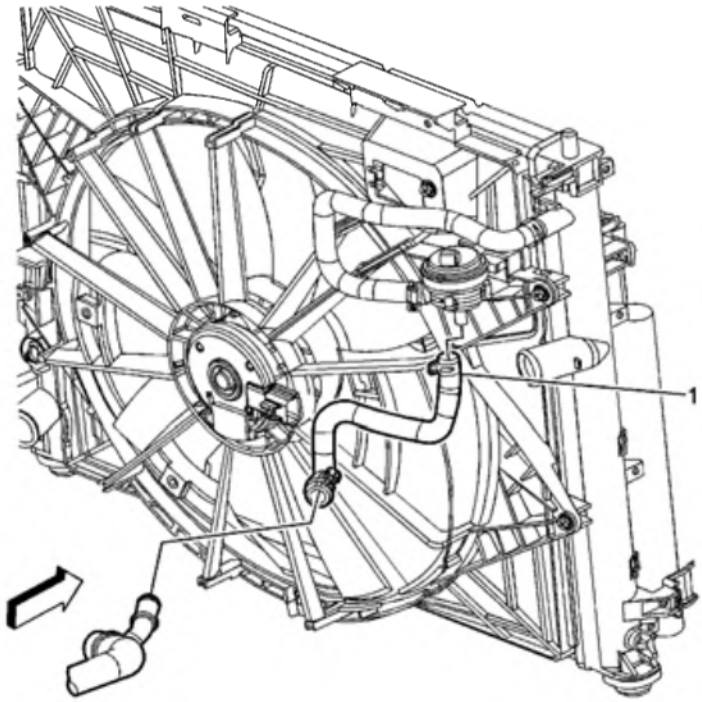
3	Engine Coolant Inlet Pipe

Charge Air Cooler Coolant Outlet Pipe Replacement



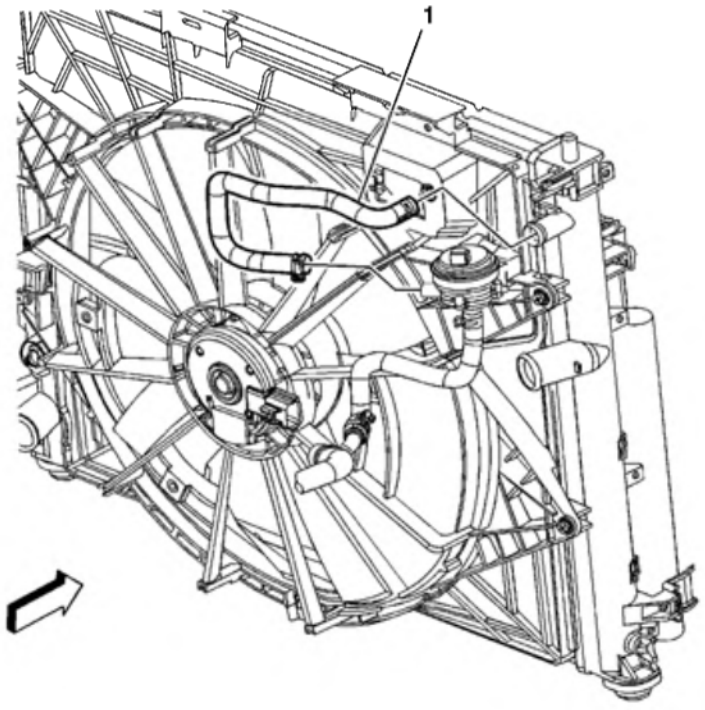
Callout	Component Name
Preliminary Procedures 1. Remove the charge air cooler inlet hose. Refer to Charge Air Cooler Coolant Hose Replacement - Engine to Pipe. 2. Remove the charge air cooler outlet hose. Refer to Charge Air Cooler Coolant Hose Replacement - Engine to Reservoir.	
1	Charge Air Cooler Coolant Outlet Pipe Fastener (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 10 N·m (89 lb in)
2	Charge Air Cooler Coolant Outlet Pipe **Procedure** 1. Do not reuse the same gasket. 2. Transfer components as necessary.

Auxiliary Water Pump Inlet Hose Replacement



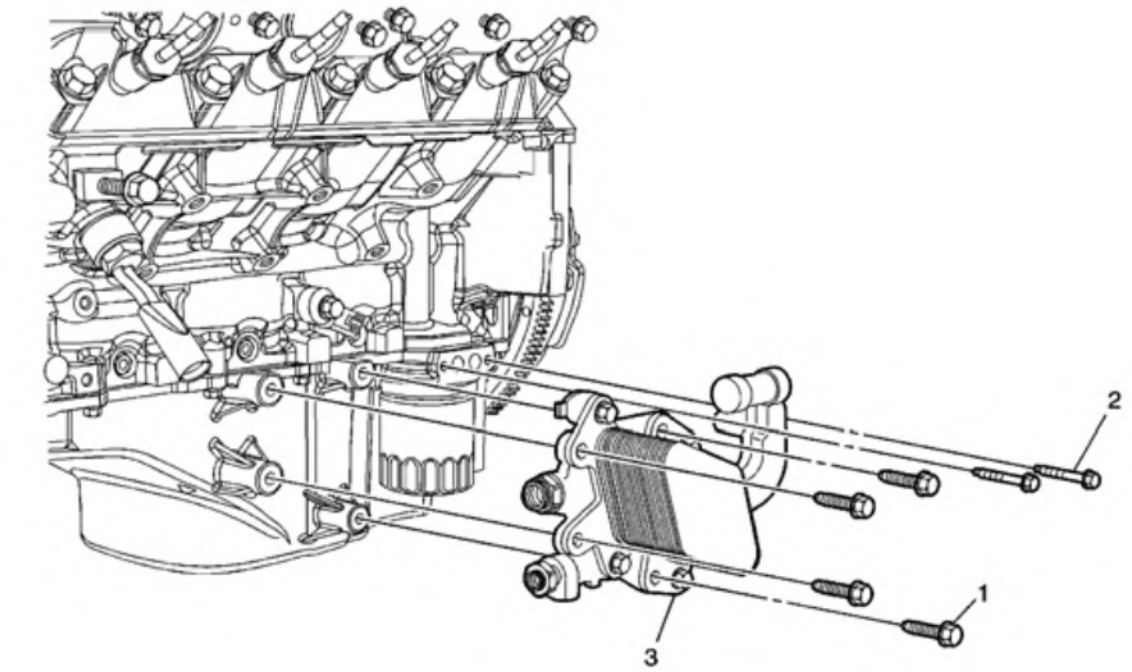
Callout	Component Name
Preliminary Procedures Drain the coolant. Refer to Refer to Cooling System Draining and Filling	
1	Auxiliary Water Pump Inlet Hose **Procedure** Using *J 38185* Hose Clamp Pliers reposition the auxiliary water pump inlet hose clamps. **Special Tools** *J 38185* Hose Clamp Pliers

Auxiliary Water Pump Outlet Hose Replacement



Callout	Component Name
Preliminary Procedures Drain the coolant. Refer to Refer to Cooling System Draining and Filling	
1	Auxiliary Water Pump Outlet Hose **Procedure** Using *J 38185* Hose Clamp Pliers reposition the auxiliary water pump outlet hose clamps. **Special Tools** *J 38185* Hose Clamp Pliers

Engine Oil Cooler Replacement



Callout	Component Name
Preliminary Procedure Remove the engine oil cooler hose/pipe. Refer to Engine Oil Cooler Hose/Pipe Replacement.	
1	Engine Oil Cooler Fastener (Qty: 2) **Caution:** Refer to Component Fastener Tightening Caution in the Preface section. **Tighten** 10 N·m (89 lb in)
2	Engine Oil Cooler Fastener (Qty: 5) **Tighten** 25 N·m (18 lb ft)
3	Engine Oil Cooler **Procedure** 1. Transfer components as necessary 2. Ensure the full oil level after installation.

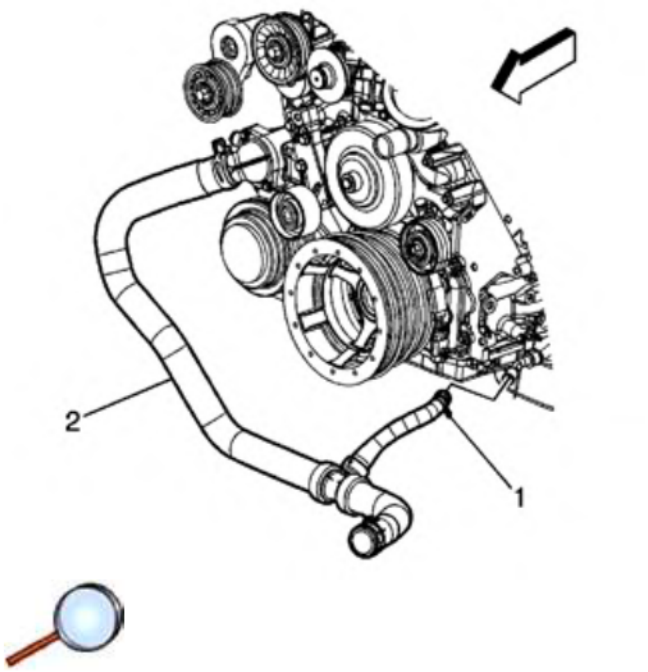
Engine Oil Cooler Hose / Pipe Replacement

Special Tools

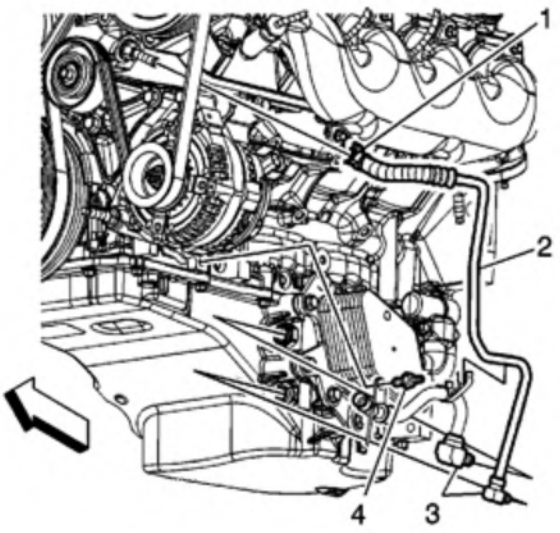
J 38185 Hose Clamp Pliers

Removal Procedure

1. Drain the coolant. Refer to Cooling System Draining and Filling.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
3. Remove the front compartment lower noise shield. Refer to Front Compartment Lower Noise Shield Replacement

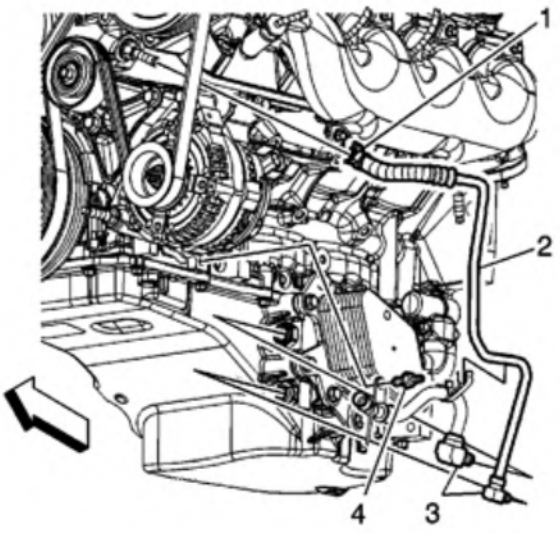


4. Reposition the engine oil cooler hose clamp (1) at radiator hose using *J 38185* Hose Clamp Pliers .
5. Remove the engine oil cooler hose (2) from the radiator hose.



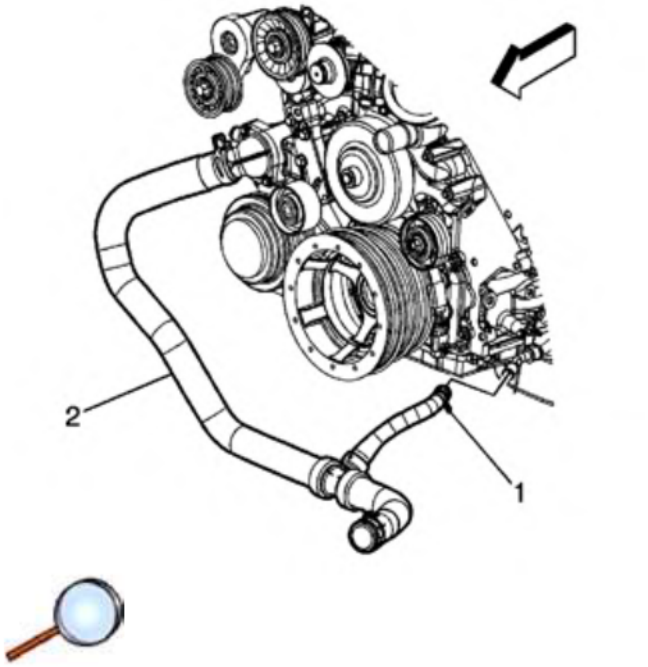
6. Reposition the engine oil cooler hose clamp (1) at engine using *J 38185* Hose Clamp Pliers .
7. Remove the engine oil cooler hose (2) from the engine.
8. Remove the engine oil cooler bolt (4) from the engine.
9. Disconnect the engine oil cooler hoses (3) from the engine.
10. Remove the engine oil cooler hoses from the vehicle.

Installation Procedure



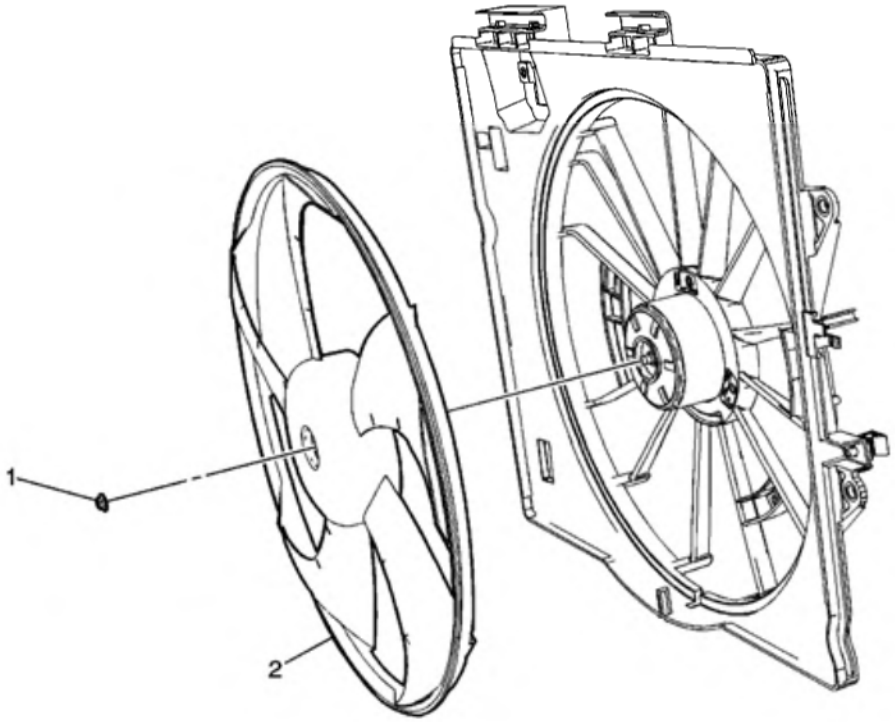
1. Install the engine oil cooler hoses to the vehicle.
2. Connect the engine oil cooler hoses (3) to the engine.
3. Install the engine oil cooler bolt (4) form the engine.
4. Install the engine oil cooler hose (2) to the engine.

5. Reposition the engine oil cooler hose clamp (1) at engine using *J 38185* Hose Clamp Pliers .



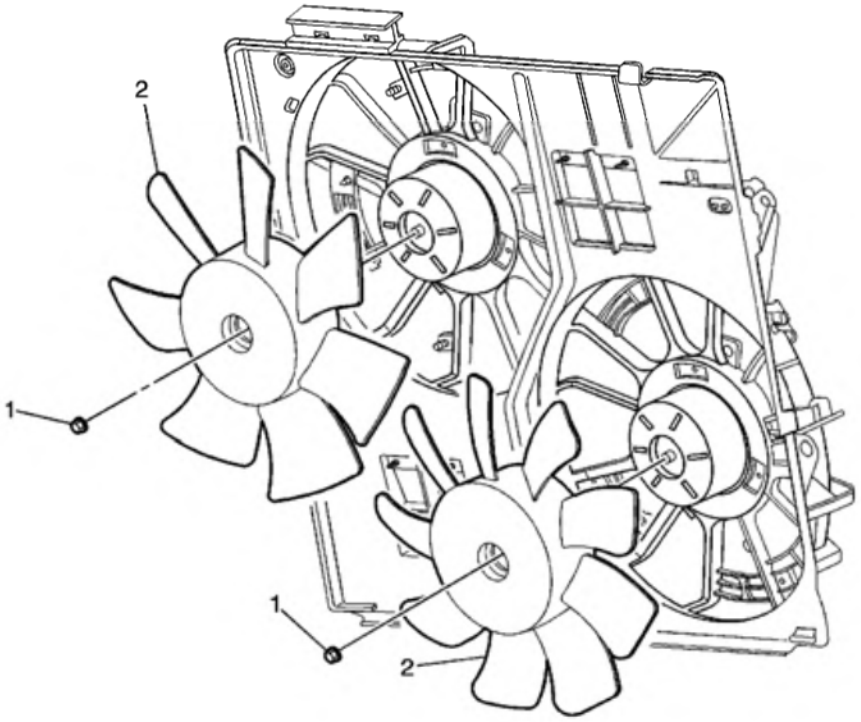
6. Install the engine oil cooler hose (2) to engine.
7. Reposition the engine oil cooler hose clamp (1) at radiator hose using *J 38185* Hose Clamp Pliers .
8. Install the front compartment lower noise shield. Refer to Front Compartment Lower Noise Shield Replacement
9. Lower the vehicle. Refer to Lifting and Jacking the Vehicle
10. Fill the coolant. Refer to Cooling System Draining and Filling.

Engine Coolant Fan Replacement (LLT, LP1, LY7)



Callout	Component Name
Preliminary Procedures Remove the cooling fan shroud. Refer to Engine Coolant Fan Shroud Replacement	
1	Cooling Fan Retainer **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 7 N·m (62 lb in)
2	Cooling Fan

Engine Coolant Fan Replacement (LSA)

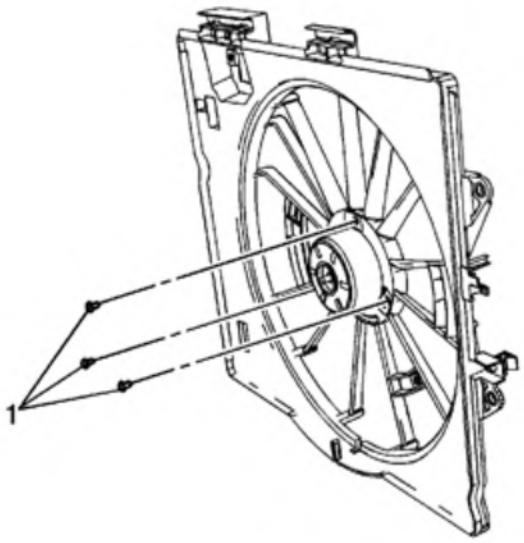


Callout	Component Name
Preliminary Procedures Remove the cooling fan shroud. Refer to Engine Coolant Fan Shroud Replacement	
1	Cooling Fan Retainer **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 7 N·m (62 lb in)
2	Cooling Fan

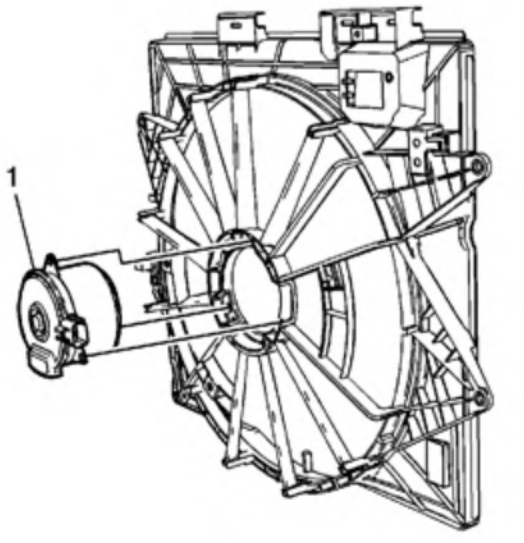
Engine Coolant Fan Motor Replacement (LLT, LP1, LY7)

Removal Procedure

1. Remove the cooling fan shroud. Refer to Engine Coolant Fan Shroud Replacement
2. Remove the cooling fan. Refer to Engine Coolant Fan Replacement



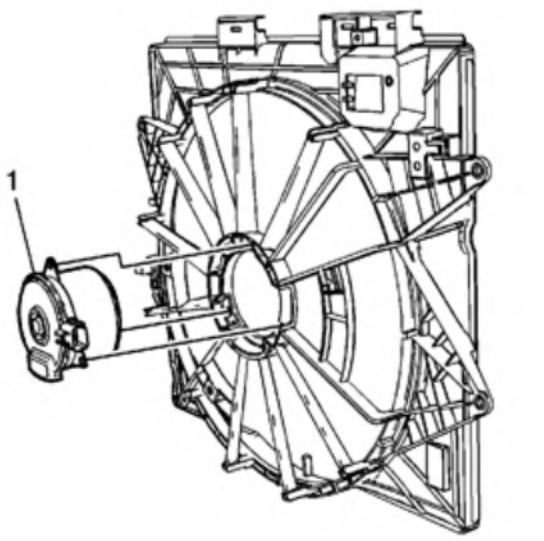
3. Remove the motor retaining screws (1).



4. Remove the motor from the shroud (1).

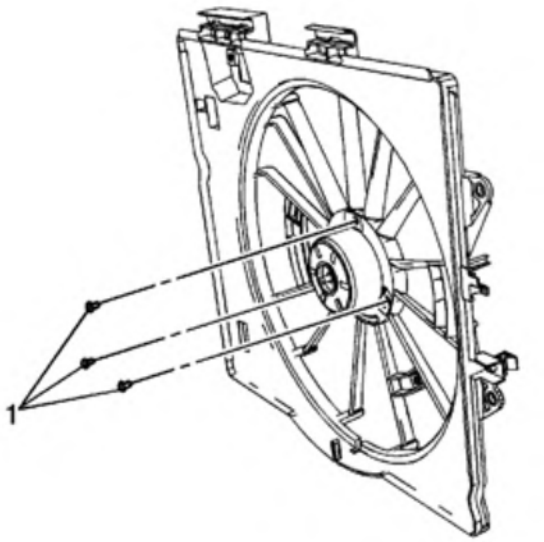
Installation Procedure

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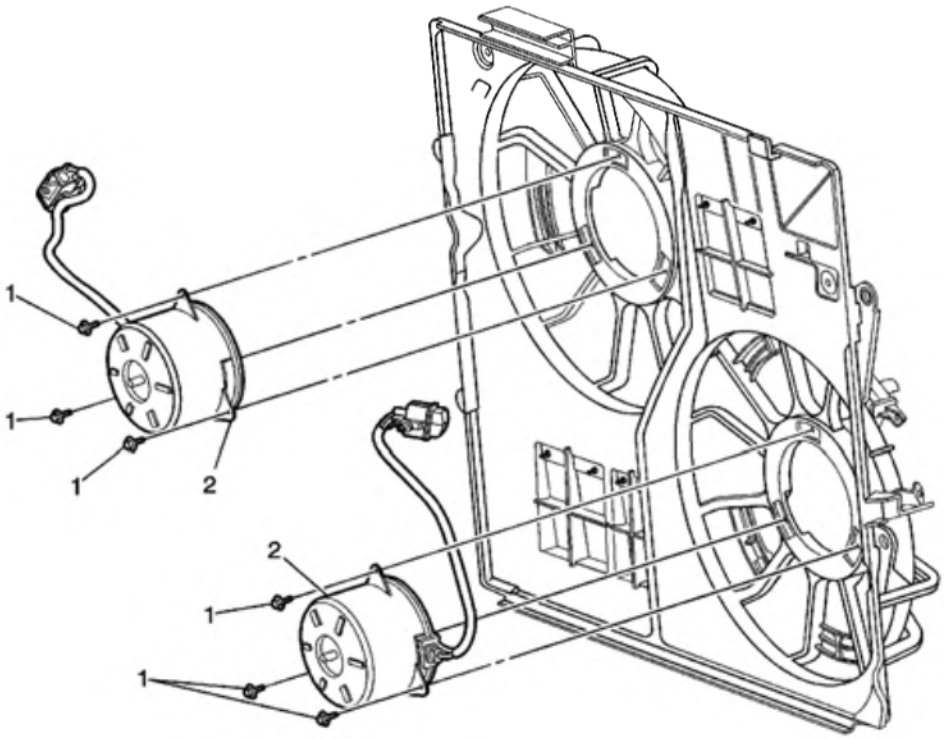
1. Install the motor to the shroud (1).

Caution: Refer to Fastener Caution in the Preface section.



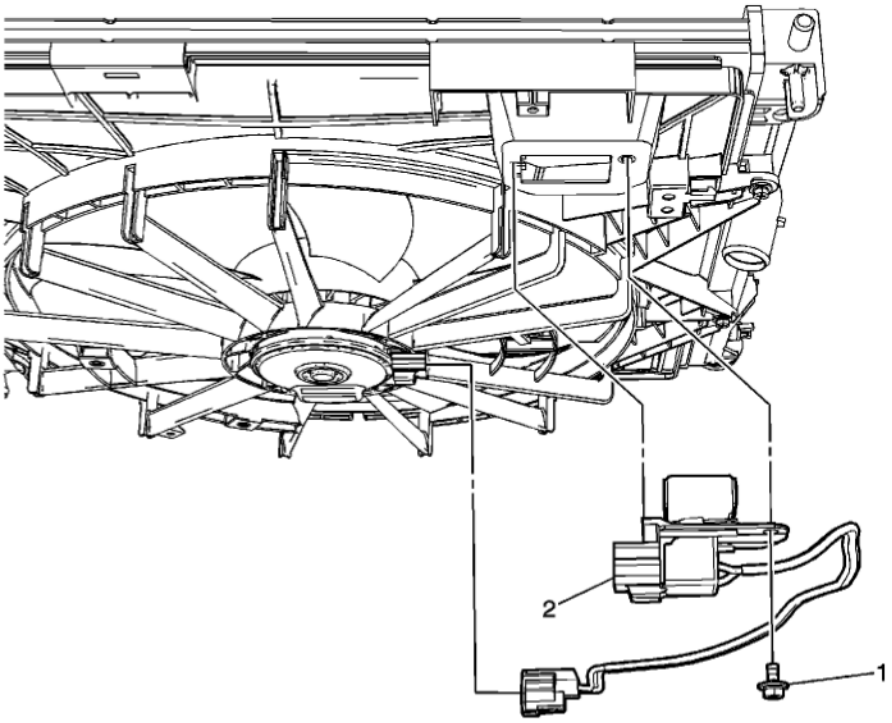
2. Install the motor retaining screws (1) and tighten to **7 N·m (62 lb in)**.
3. Install the cooling fan. Refer to Engine Coolant Fan Replacement
4. Install the cooling fan shroud. Refer to Engine Coolant Fan Shroud Replacement

Engine Coolant Fan Motor Replacement (LSA)



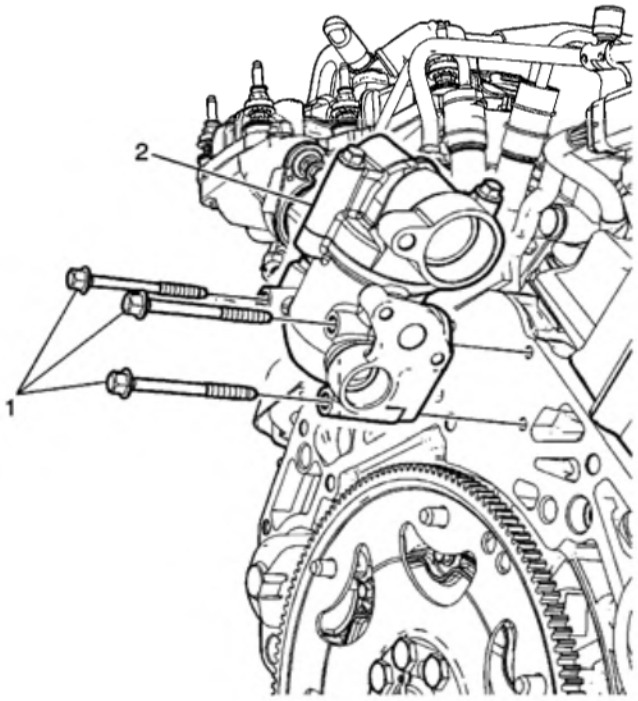
Callout	Component Name
Preliminary Procedures 1. Remove the cooling fan shroud. Refer to Engine Coolant Fan Shroud Replacement 2. Remove the cooling fan. Refer to Engine Coolant Fan Replacement	
1	Cooling Fan Motor Retaining Screw (Qty 6) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 7 N·m (62 lb in)
2	Cooling Fan Motor

Engine Coolant Fan Resistor Replacement (LLT, LP1, LY7)



Callout	Component Name
Preliminary Procedures 1. Disconnect the engine cooling fan resistor connector. 2. Disconnect the engine cooling fan electrical connector.	
1	Engine Cooling Fan Resistor Fasteners **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 5.4 N·m (48 lb in)
2	Engine Cooling Fan Resistor

Engine Coolant Thermostat Housing Replacement (V6)

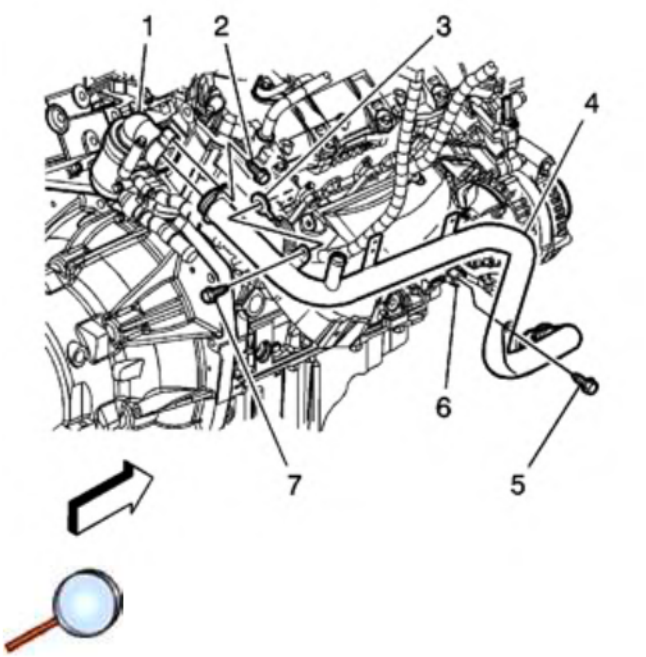


Callout	Component Name
Preliminary Procedures 1. Remove the fuel pipe shield. Refer to Fuel Pipe Shield Replacement. 2. Disconnect the engine coolant inlet pipe. Refer to Engine Coolant Inlet Pipe Replacement. 3. Disconnect the radiator inlet and outlet hoses. Refer to Heater Inlet Hose Replacement and Heater Outlet Hose Replacement. 4. Disconnect the outlet pipe from the thermostat housing. Refer to Radiator Surge Tank Outlet Hose/Pipe Replacement.	
1	Thermostat Housing Bolt (Qty: 3) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 20 N·m (15 lb ft)
2	Engine Coolant Thermostat Housing

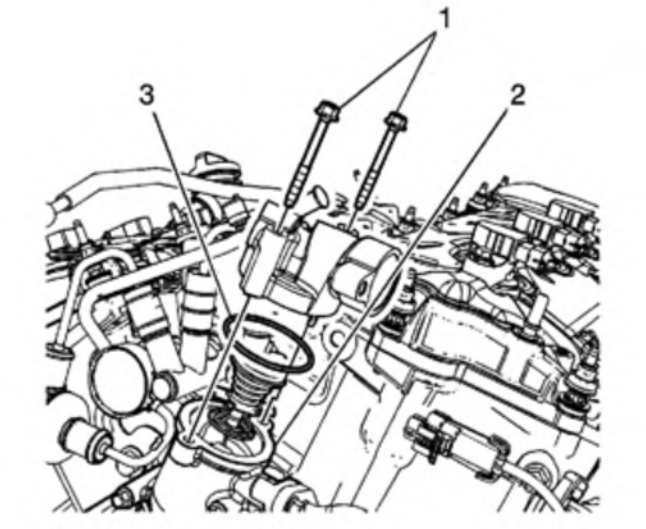
Engine Coolant Thermostat Replacement (V6)

Removal Procedure

1. Partially drain the cooling system. Refer to Cooling System Draining and Filling.
2. Remove the upper intake manifold. Refer to Intake Manifold Replacement.
3. Disconnect the surge tank outlet pipe from the thermostat. Refer to Radiator Surge Tank Outlet Hose/Pipe Replacement.

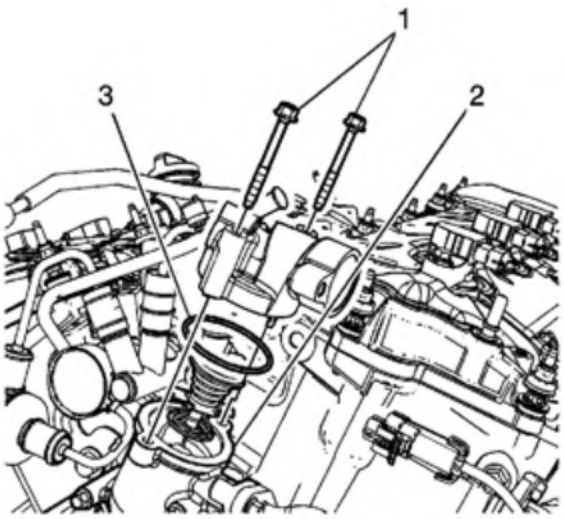


4. Remove the coolant pipe/thermostat housing bolt (2).
5. Remove the coolant pipe upper bolt (7).
6. Remove the coolant inlet pipe (4) from the thermostat.



7. Remove the thermostat bolts (1).
8. Remove the thermostat (2) and discard the thermostat seal (3).

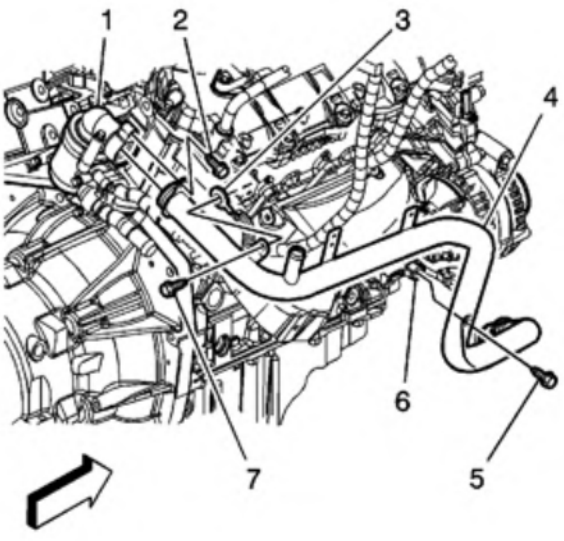
Installation Procedure



1. Install the thermostat (2) with a NEW thermostat seal (3).

   Caution: Refer to Fastener Caution in the Preface section.

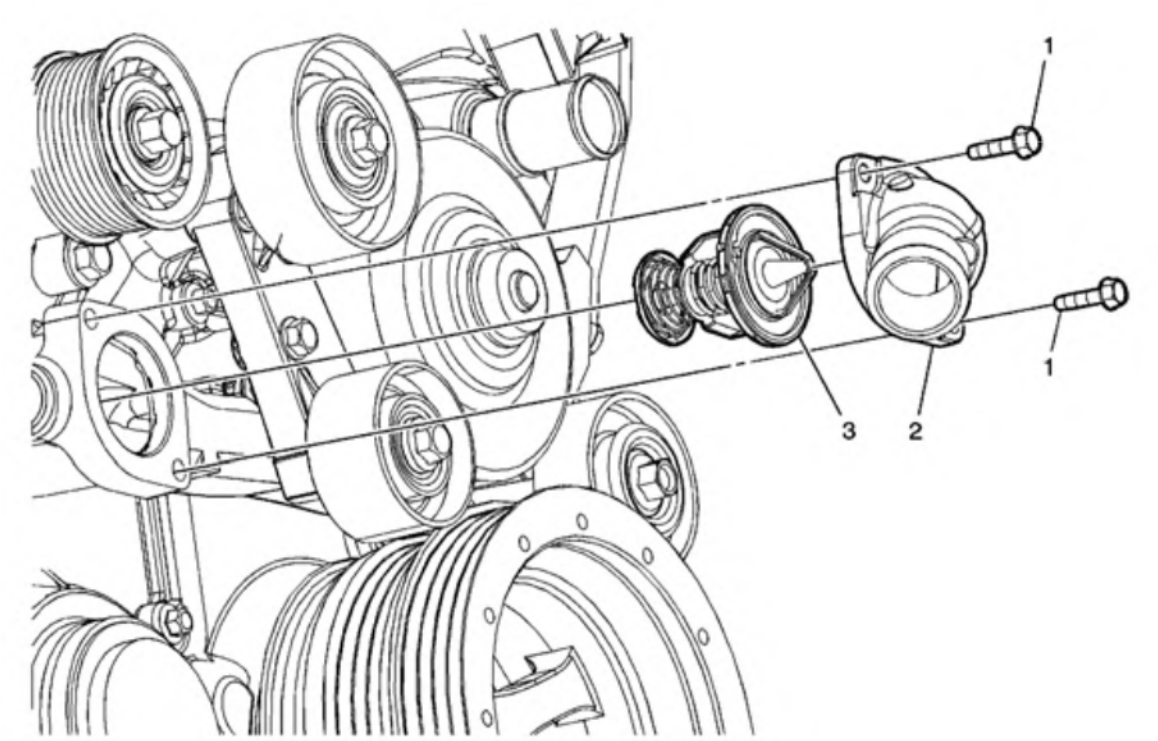
2. Install the thermostat bolts (1) and tighten to **10 N·m (89 lb in)**.





3. Install the coolant pipe (4), NEW seal, and fasteners (2 and 7). Refer to Engine Coolant Inlet Pipe Replacement.
4. Connect the surge tank outlet pipe to the thermostat. Refer to Radiator Surge Tank Outlet Hose/Pipe Replacement.
5. Install the upper intake manifold. Refer to Intake Manifold Replacement.
6. Fill the cooling system. Refer to Cooling System Draining and Filling.

Engine Coolant Thermostat Replacement (V8)

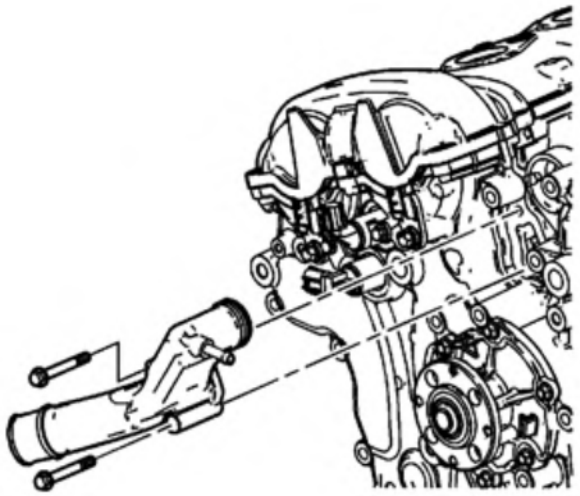


Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to Cooling System Draining and Filling. 2. Remove the engine cooling fan. Refer to Engine Coolant Fan Replacement. 3. Disconnect the radiator inlet hose and position aside. Refer to Radiator Inlet Hose Replacement.	
1	Water Pump Inlet Bolt (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 15 N·m(11 lb ft)
2	Water Pump Inlet
3	Engine Coolant Thermostat **Note:** • The thermostat mating surfaces must be clean and free of debris. • Always install a NEW seal on the thermostat.

Water Outlet Replacement (LY7, LLT)

Removal Procedure

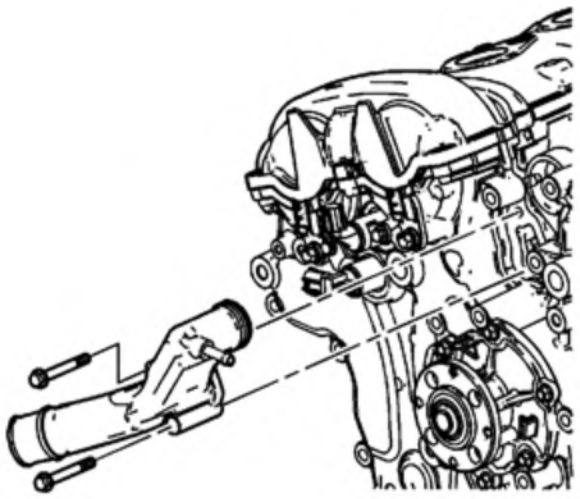
1. Partially drain the cooling system. Refer to Cooling System Draining and Filling.
2. For the LLT engine, remove the throttle body. Refer to Throttle Body Assembly Replacement.
3. Remove the radiator hose from the water outlet. Refer to Radiator Inlet Hose Replacement.





4. Remove the water outlet housing bolts.
5. Remove the water outlet.
6. Remove and discard the water outlet seals.
7. Clean the water outlet housing sealing surfaces.

Installation Procedure



1. Install NEW water outlet housing seals.
2. Install the water outlet.

Caution: Refer to Fastener Caution in the Preface section.

3. Install the water outlet bolts and tighten to **10 N·m(89 lb in)**..
4. Install the radiator hose to the water outlet. Refer to Radiator Inlet Hose Replacement.
5. For the LLT engine, install the throttle body. Refer to Throttle Body Assembly Replacement.
6. Fill the cooling system. Refer to Cooling System Draining and Filling.

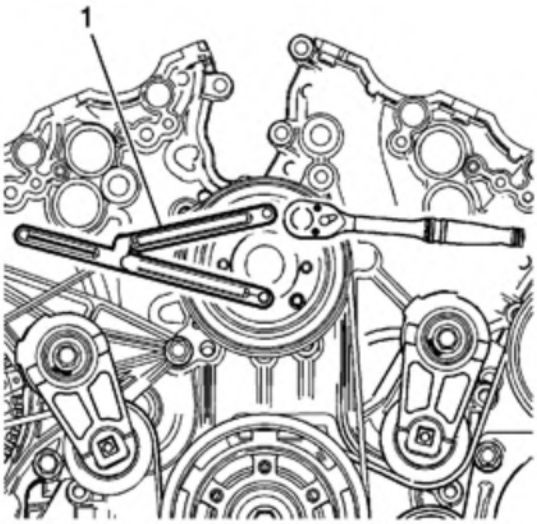
Water Pump Replacement (V6)

Special Tools

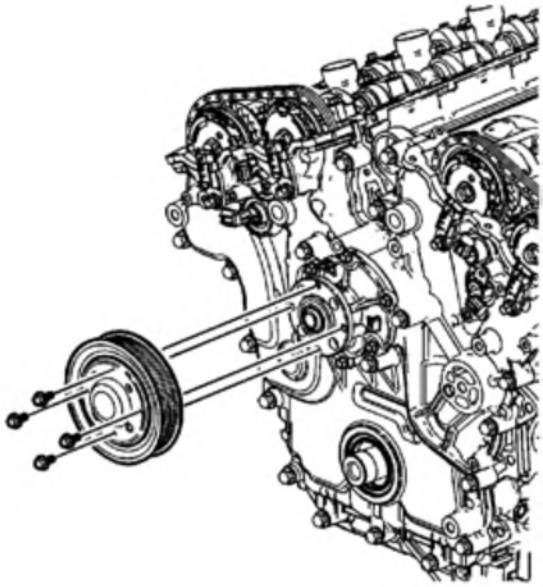
EN 46104 Water Pump Pulley Holding Tool

Removal Procedure

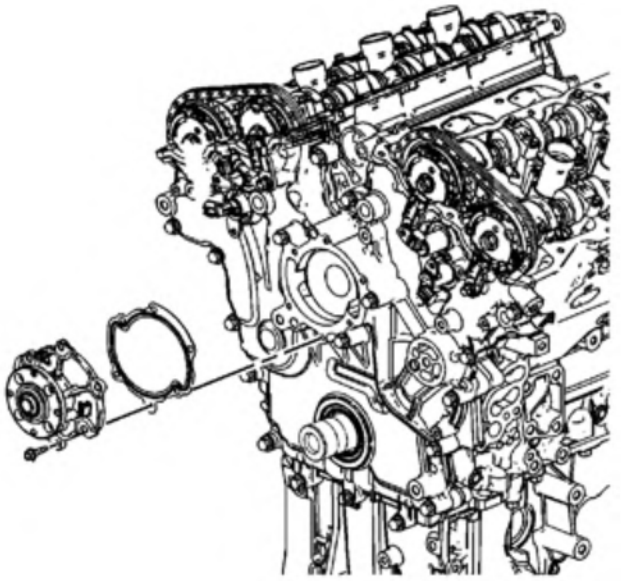
1. Drain the cooling system. Refer to Cooling System Draining and Filling.
2. Remove the generator drive belt. Refer to Water Pump and Generator Belt Replacement.



3. Use the EN 46104 (1) in order to retain the water pump pulley.

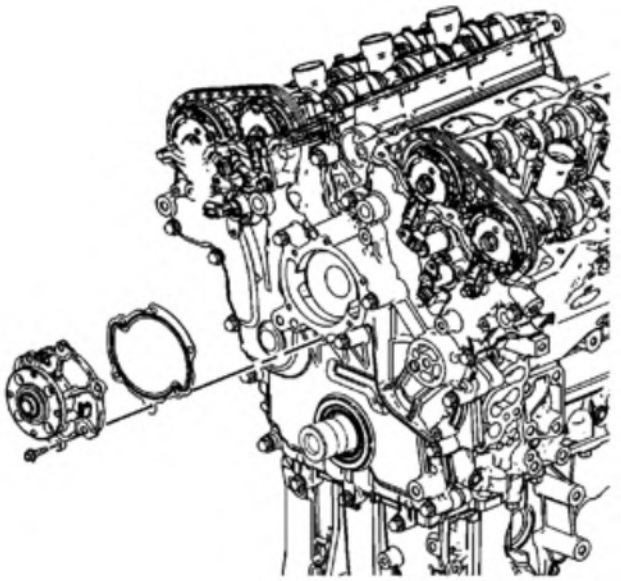


4. Remove the water pump pulley bolts.
5. Remove the water pump pulley.



6. Remove the water pump bolts.
7. Remove the water pump.
8. Remove and DISCARD the water pump seal.
9. Carefully clean the water pump sealing surfaces.

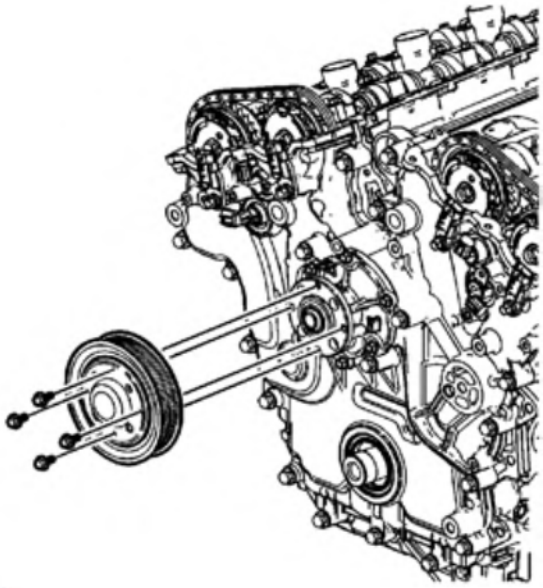
Installation Procedure



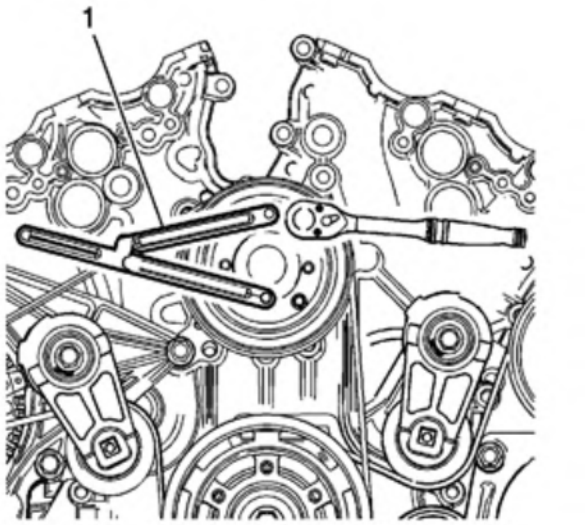
1. Install a NEW water pump seal.
2. Install the water pump.

Caution: Refer to Fastener Caution in the Preface section.

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



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

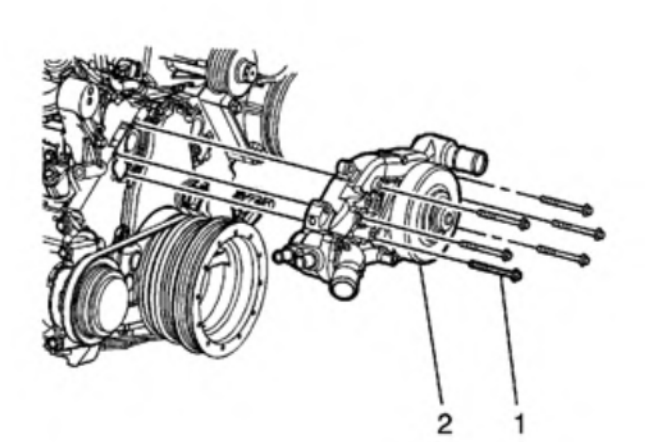


5. Use the EN 46104 (1) in order to retain the water pump pulley.
6. Install the water pump pulley bolts and tighten to **12 N·m (106 lb in)**.
7. Install the generator drive belt. Refer to Water Pump and Generator Belt Replacement.
8. Fill the cooling system. Refer to Cooling System Draining and Filling.

Water Pump Replacement (V8)

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. Remove the cooling fan shroud. Refer to Engine Coolant Fan Shroud Replacement.
4. Remove the supercharger belt. Refer to Supercharger Belt Replacement
5. Remove the drive belt tensioner. Refer to Drive Belt Tensioner Replacement - Accessory.
6. Remove the drive belt idler pulley. Refer to Drive Belt Idler Pulley Replacement.
7. Remove the supercharger belt idler pulley bracket. Refer to Supercharger Belt Idler Pulley Bracket Replacement.
8. Disconnect the radiator inlet hose from the water pump. Refer to Radiator Inlet Hose Replacement.
9. Disconnect the radiator outlet hose from the water pump. Refer to Radiator Outlet Hose Replacement.
10. Disconnect the radiator surge tank outlet hose from the water pump. Refer to Radiator Surge Tank Outlet Hose/Pipe Replacement.
11. Disconnect the engine coolant inlet pipe from the water pump. Refer to Engine Coolant Inlet Pipe Replacement



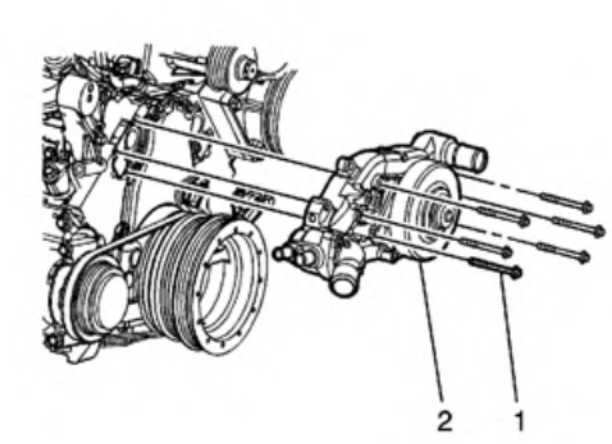
12. Remove the water pump to block bolts (1).

Note: Always clean the water pump and engine block mating surfaces and discard the gaskets.

13. Remove the water pump (2).

Installation Procedure

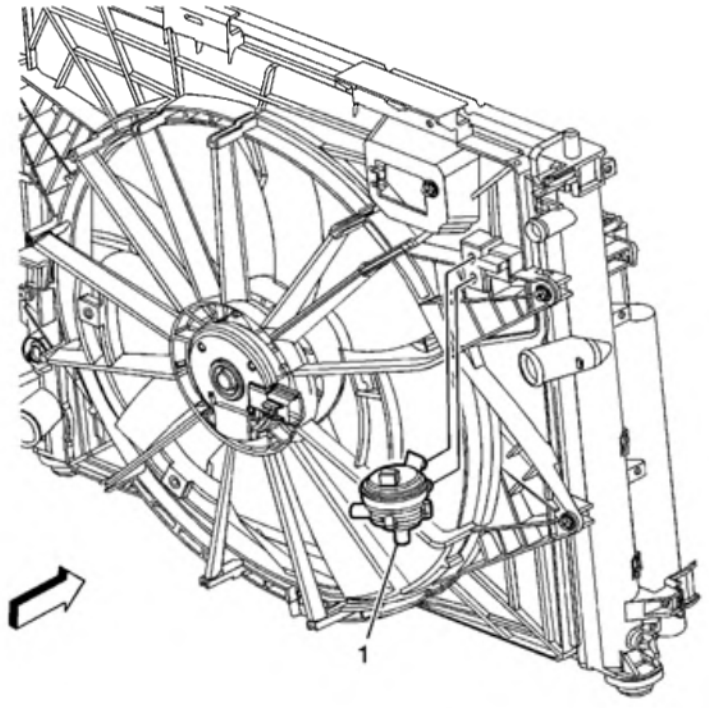
Caution: Refer to Fastener Caution in the Preface section.



Note: Always install a NEW water pump gasket.

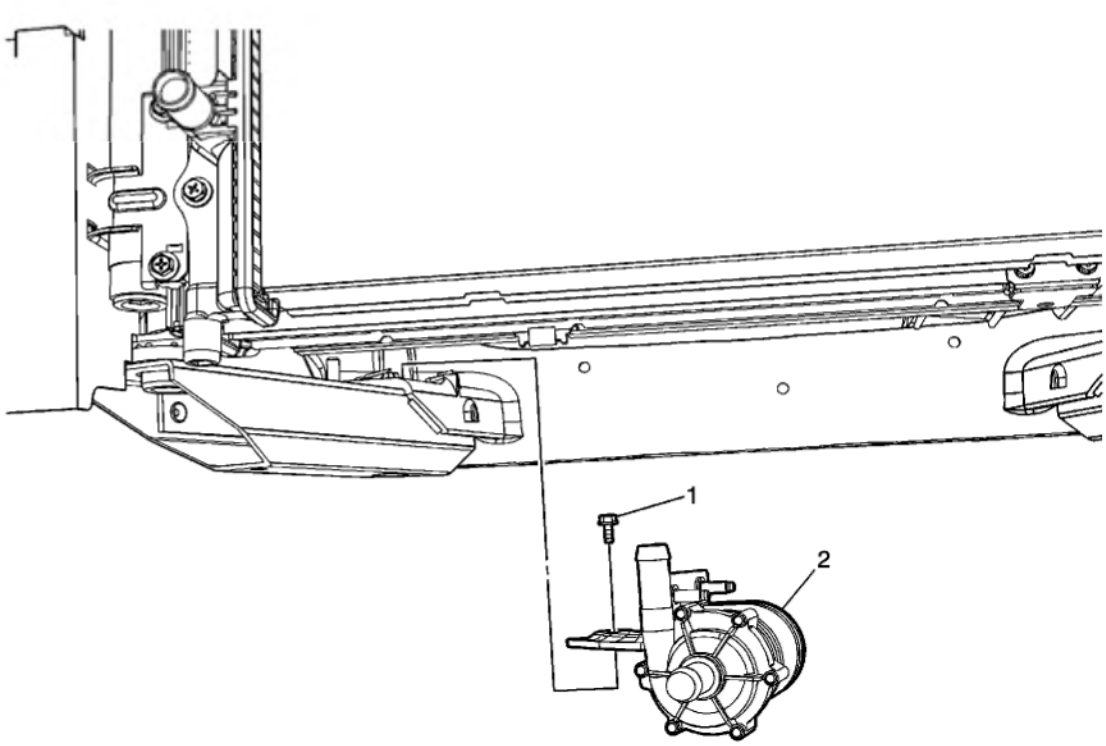
1. Install the water pump to the engine block and tighten the bolts to **30 N·m (22 lb ft)**.
2. Connect the engine coolant inlet pipe to the water pump. Refer to Engine Coolant Inlet Pipe Replacement
3. Connect the radiator surge tank outlet hose to the water pump. Refer to Radiator Surge Tank Outlet Hose/Pipe Replacement.
4. Connect the radiator outlet hose to the water pump. Refer to Radiator Outlet Hose Replacement.
5. Connect the radiator inlet hose to the water pump. Refer to Radiator Inlet Hose Replacement.
6. Install the supercharger belt idler pulley bracket. Refer to Supercharger Belt Idler Pulley Bracket Replacement.
7. Install the drive belt idler pulley. Refer to Drive Belt Idler Pulley Replacement.
8. Install the drive belt tensioner. Refer to Drive Belt Tensioner Replacement - Accessory.
9. Install the supercharger belt. Refer to Supercharger Belt Replacement
10. Install the cooling fan shroud. Refer to Engine Coolant Fan Shroud Replacement.
11. Fill the cooling system. Refer to Cooling System Draining and Filling.
12. install the air cleaner outlet duct. Refer to Air Cleaner Resonator Outlet Duct Replacement.

Auxiliary Water Pump Replacement



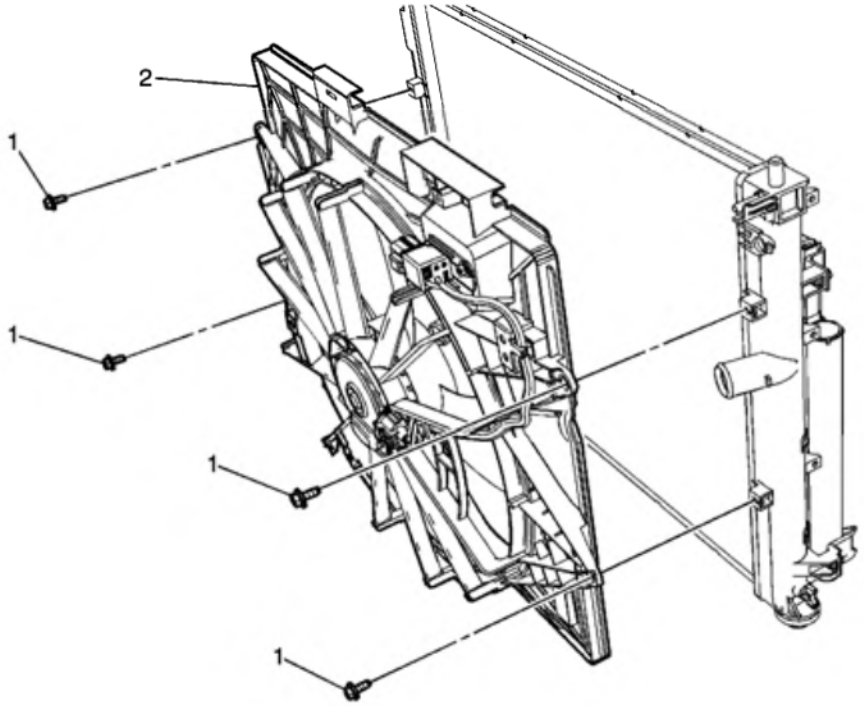
Callout	Component Name
Preliminary Procedures 1. Drain the coolant. Refer to Refer to Cooling System Draining and Filling 2. Disengage auxiliary water pump inlet hose from auxiliary water pump. Refer to Auxiliary Water Pump Inlet Hose Replacement 3. Disengage auxiliary water pump outlet hose from auxiliary water pump. Refer to Auxiliary Water Pump Outlet Hose Replacement 4. Disconnect the auxiliary water pump electrical connector. 5. Remove the upper fan shroud bolts. 6. Push fan shroud rearward of vehicle. 7. Press the auxiliary water pump push retainers and pull auxiliary water pump rearward of vehicle.	
1	Auxiliary Water Pump

Charge Air Cooler Coolant Pump Replacement



Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling 2. Remove the front air deflector. Refer to Front Air Deflector Replacement. 3. Remove the charged air cooler coolant hose radiator to pump. Refer to Charge Air Cooler Coolant Hose Replacement - Radiator to Pump. 4. Remove the charged air cooler coolant hose pipe to pump. Refer to Charge Air Cooler Coolant Hose Replacement - Pipe to Pump. 5. Raise and support vehicle. Refer to Lifting and Jacking the Vehicle.	
1	Charged Air Cooler Coolant Pump Bolt **Tighten** 16 N·m (12 lb ft)
2	Charged Air Cooler Coolant Pump **Procedure** Disconnect electrical connection

Engine Coolant Fan Shroud Replacement (LLT, LP1, LY7)

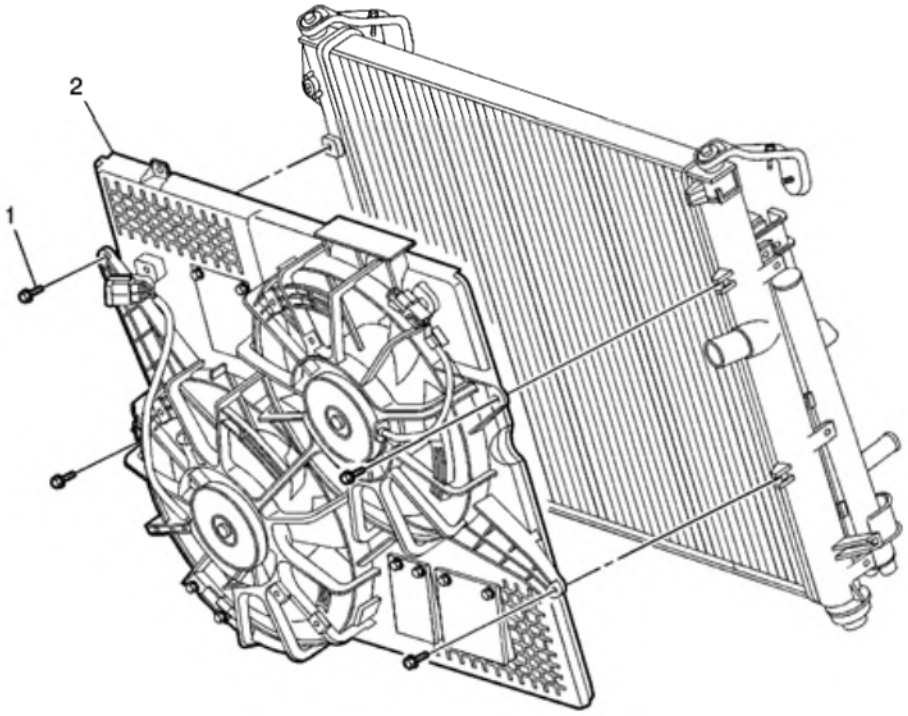


Callout	Component Name
Preliminary Procedures **Warning:** An electric fan under the hood can start up even when the engine is not running and can injure you. Keep hands, clothing and tools away from any underhood electric fan. 1. Remove the air cleaner. Refer to Air Cleaner Assembly Replacement 2. Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement 3. Disconnect the cooling fan electrical connectors 4. Remove the auxiliary water pump and any hoses. 5. Remove any hoses or pipes. 6. Disconnect the condenser tube from the cooling fan shroud retainer clip. 7. Disengage the surge tank inlet hose from the retaining features on the cooling fan shroud and reposition aside.	
1	Engine Cooling Fan Shroud Fasteners (Qty 4) **Caution:** Refer to Fastener Caution in the Preface section.

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	Tighten 5.4 N·m (48 lb in)
2	Engine Cooling Fan Shroud

Engine Coolant Fan Shroud Replacement (LSA)



Callout	Component Name
Preliminary Procedures **Warning:** An electric fan under the hood can start up even when the engine is not running and can injure you. Keep hands, clothing and tools away from any underhood electric fan. 1. Remove the air cleaner. Refer to Air Cleaner Assembly Replacement 2. Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement 3. Disconnect the cooling fan electrical connectors 4. Remove any hoses or pipes. 5. Disconnect the condenser tube from the cooling fan shroud retainer clip. 6. Disengage the surge tank inlet hose from the retaining features on the cooling fan shroud and reposition aside.	
1	Engine Cooling Fan Shroud Fasteners (Qty 4) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 5.4 N·m (48 lb in)

2	Engine Cooling Fan Shroud

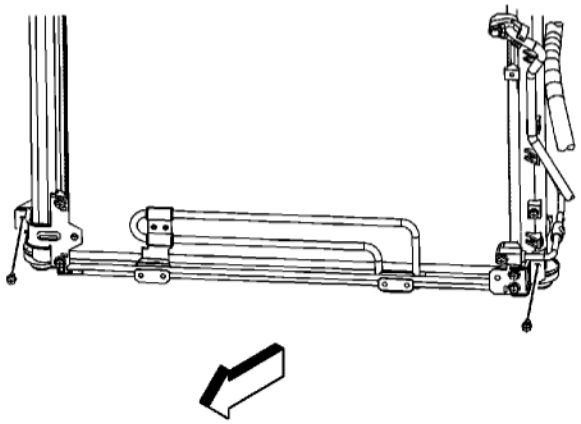
Radiator Replacement (Standard Duty Cooling)

Special Tools

- J 38185 Hose Clamp Pliers
- J 38778 Door Trim Pad Clip Remover

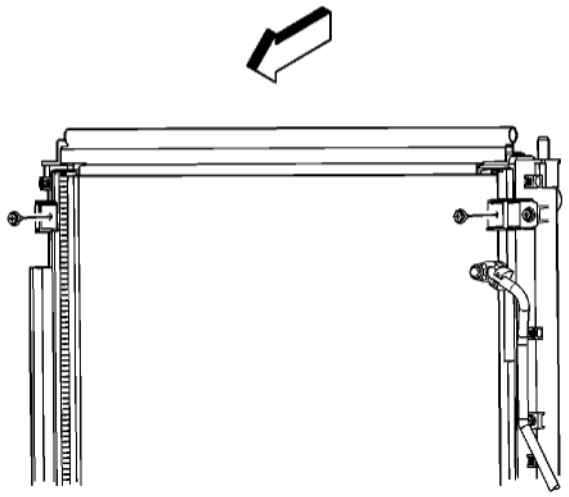
Removal Procedure

1. Drain the coolant. Refer to Cooling System Draining and Filling.
2. Remove the electric cooling fan assembly. Refer to Engine Coolant Fan Replacement.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.

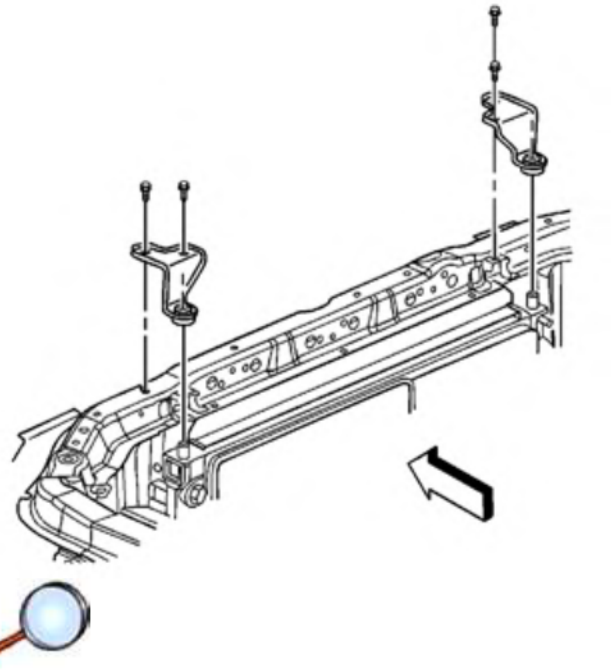




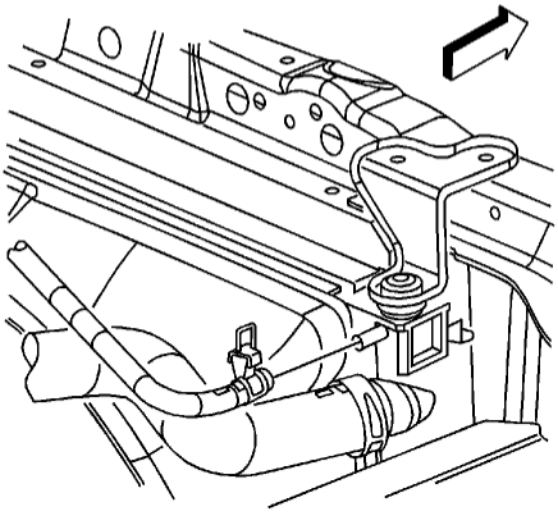
4. Remove the lower condenser mounting bolts.



5. Remove the upper condenser mounting bolts.

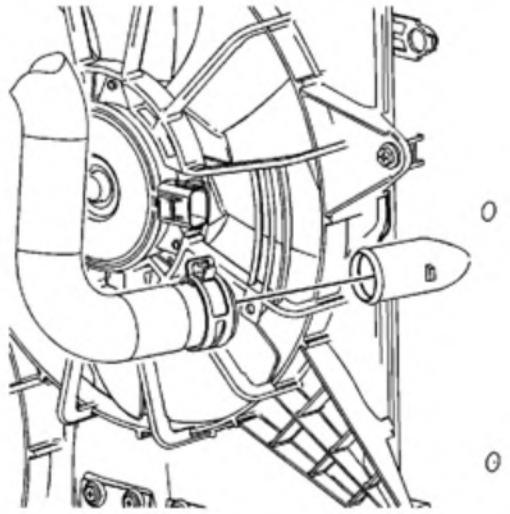


6. Disconnect the lower retainer pins of the side air baffle from the radiator.
7. Lower the vehicle.
8. Remove the radiator support bracket bolts.
9. Remove the radiator support brackets.
10. Use J 38778 to remove the radiator/condenser upper support.





11. Use J 38185 to disconnect the surge tank inlet hose from the radiator. Reposition the hose aside.



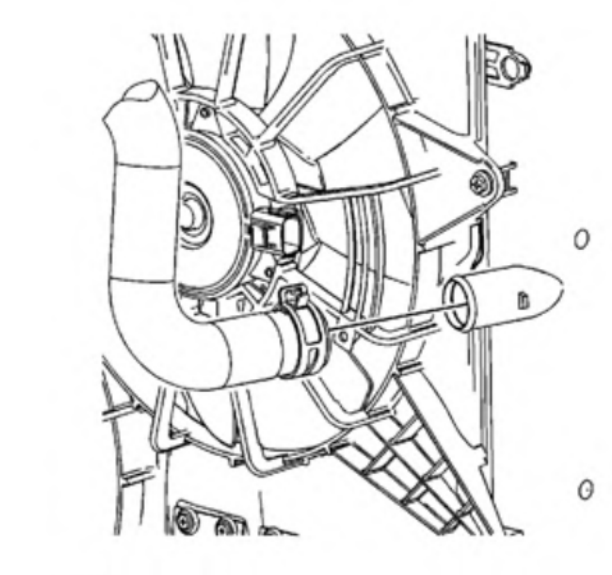


12. Using J 38185 disengage tension on the radiator inlet hose clamp and disconnect the hose from the radiator.
13. Using J 38185 disengage tension on the radiator outlet hose clamp and disconnect the hose from the radiator.
14. Disconnect the upper retainer pins on the side air baffle from the radiator.
15. Remove the radiator.

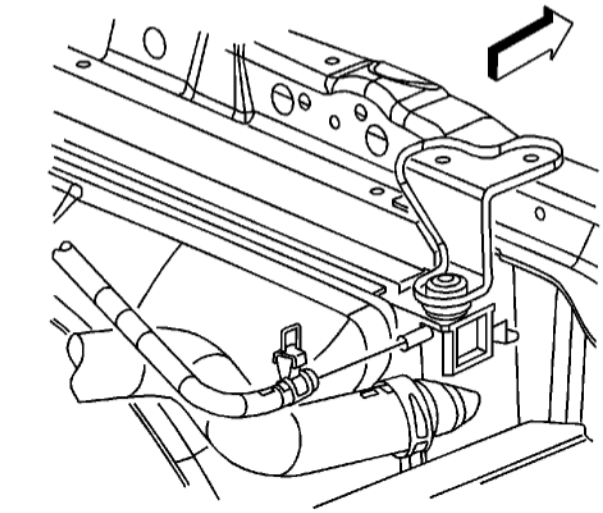
Installation Procedure

1. Install the radiator.
2. Connect the upper retainer pins of the side air baffle to the radiator.

3. Connect the radiator outlet hose to the radiator. Use J 38185 to position the radiator outlet hose clamp to secure the hose.



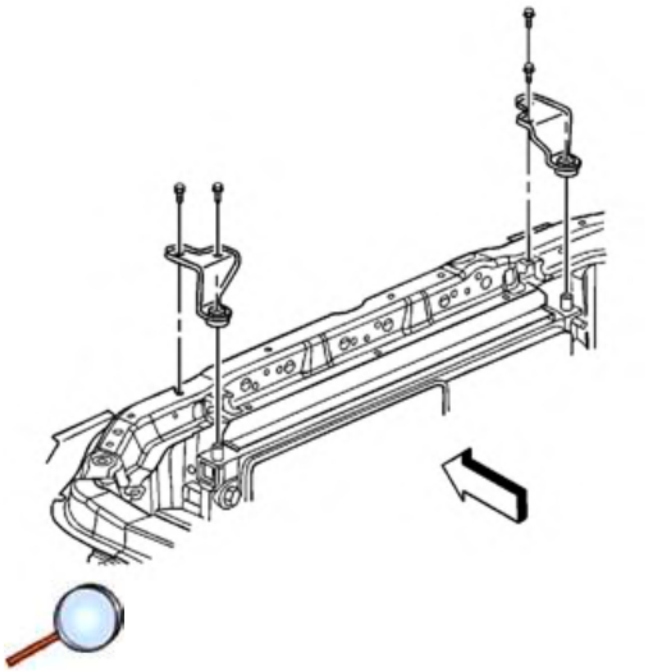
4. Connect the radiator inlet hose to the radiator. Use J 38185 to position the radiator inlet hose clamp to secure the hose.



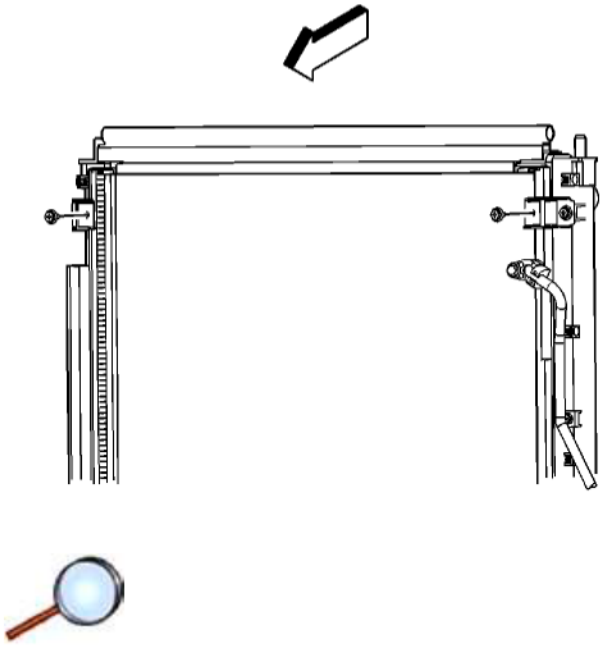
5. Connect the surge tank inlet hose to the radiator. Use J 38185 to position the hose clamp to secure the hose.
6. Install the radiator/condenser upper support.
7. Install the radiator support brackets.

Caution: Refer to Fastener Caution in the Preface section.

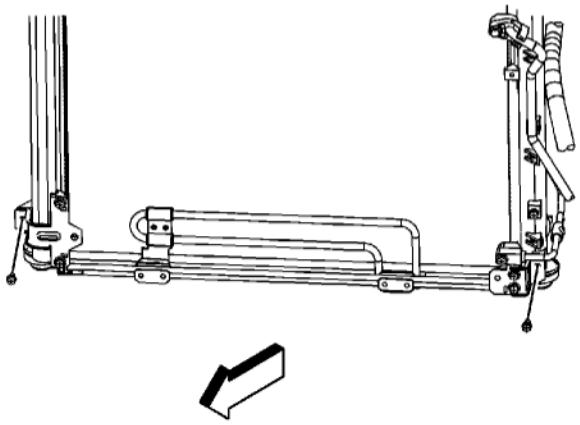
8. Install the radiator support bracket bolts and tighten to **9 N·m (80 lb in)**.
9. Raise and support the vehicle.



10. Connect the lower retainer pins of the side air baffle to the radiator.



11. Install the upper condenser mounting bolts and tighten to **5.4 N·m (48 lb in)**.



12. Install the lower condenser mounting bolts and tighten to **5.4 N·m (48 lb in)**.
13. Lower the vehicle.
14. Install the electric cooling fan assembly. Refer to Engine Coolant Fan Replacement.
15. Fill the cooling system. Refer to Cooling System Draining and Filling.

Charge Air Cooling System Draining and Filling (Static)

Special Tools

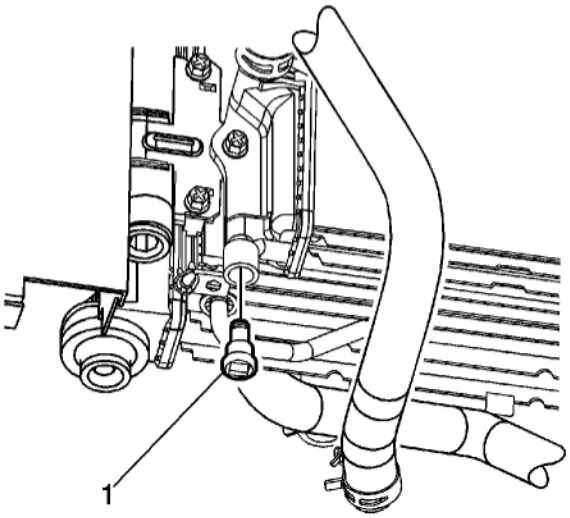
- *7000081* Tech 2 Kit
- *J 26568* Coolant and Battery Fluid Tester

Draining Procedure

Warning: To avoid being burned, do not remove the charge air coolant cap while the system is hot. The cooling system will release scalding fluid and steam under pressure if charge air coolant cap is removed while the system is still hot.

Note: Make sure the intercooler system is cool and the pump is not running.

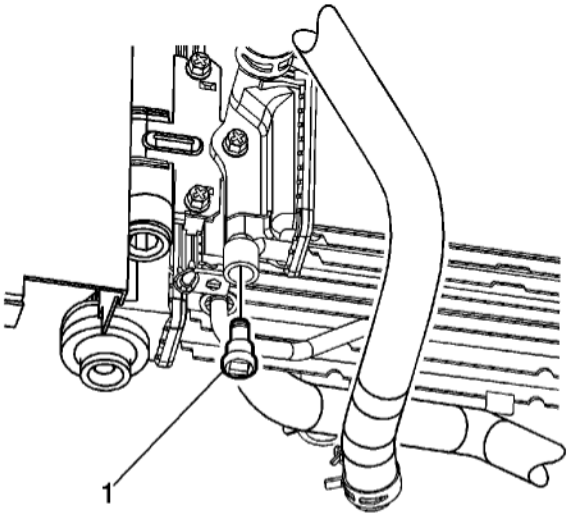
1. Remove the cap from the charge air cooler reservoir.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
3. Remove the front air deflector. Refer to Front Air Deflector Replacement
4. Place a drain pan under the charge air cooler radiator.





5. Remove the charge air cooler radiator drain plug (1) from the bottom passenger side of the charge air cooler.
6. Drain the charge air cooling system.
7. Inspect the coolant.
8. Follow the appropriate procedure based on the condition of the coolant.
   - Normal in appearance -- follow the filling procedure
   - Discolored - follow the flush procedure. Refer to Flushing

Caution: Refer to Fastener Caution in the Preface section.





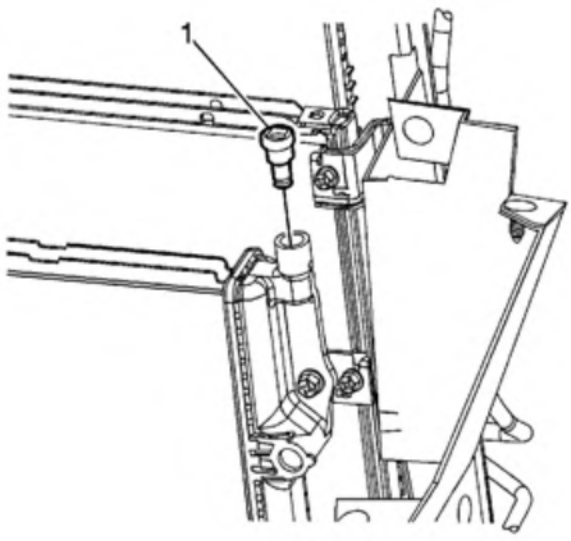
9. Install the charge air cooler radiator drain plug (1) and tighten to **1.5 N·m (13 lb in)**.
10. Install the front air deflector. Refer to Front Air Deflector Replacement
11. Lower the vehicle.

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.

Note: The charge air cooling system is filled through the charge air cooler reservoir fill neck.

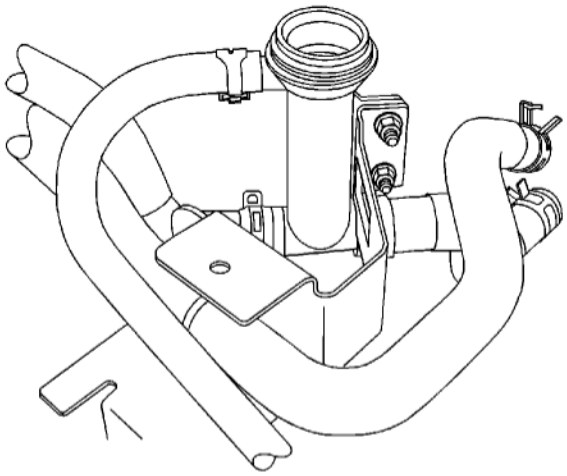
1. Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement



2. Loosen the bleeder screw (1) from the charge air cooler radiator on the top driver side of the charge air cooler.

Note: Use a 50/50 mixture of DEX-COOL antifreeze and clean, drinkable water. It is necessary to maintain the coolant level within the cold fill level range on the charge air cooler reservoir to ensure all the air has been purged from the cooling system.

3. Slowly add a mixture of 50/50 DEX-COOL antifreeze and clean, drinkable water to the cooling system until the coolant level reaches the top of the charge air cooler radiator at the bleeder screw opening. Refer to Approximate Fluid Capacities
4. Install the bleeder screw (1) and tighten to **1.5 N·m (13 lb in)**.



5. Slowly add the coolant mixture to the charge air cooler reservoir until the coolant level is at the top of the cold fill level range on the reservoir.

Note: Do not cycle the charge air coolant pump without the charge air cooling reservoir cap in place or loss of coolant will occur.

6. Install the cap to the charge air cooler reservoir.
7. Using a Tech 2 Scan Tool, cycle the charge air coolant pump ON for 2 seconds.
8. Cycle the charge air coolant pump OFF.
9. Remove the charge air cooler reservoir cap, and wait for the air bubbles to travel up the charge air cooler reservoir hose to the reservoir.
10. Slowly add the coolant mixture to the charge air cooler reservoir until the coolant level is at the top of the cold fill level range on the reservoir.
11. Install the cap to the charge air cooler reservoir.
12. Repeat steps 7-11 until all of the air has been purged from the system and no air bubbles travel up the charge air cooler reservoir hose to the reservoir.
13. Install the charge air cooler reservoir cap and cycle the charge air coolant pump ON for 5 minutes.
14. Cycle the charge air coolant pump OFF.
15. Remove the charge air cooler reservoir cap and allow the vehicle to sit for 15 minutes.

16. Slowly add the coolant mixture to the charge air cooler reservoir until the coolant level is at the top of the cold fill level range on the reservoir.
17. Inspect the concentration of the charge air cooling system coolant using the *J 26568* Coolant and Battery Fluid Tester
18. Install the charge air cooler reservoir cap.
19. Inspect the cooling system for leaks.
20. Install the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement
21. Rinse away any excess coolant from the engine and the engine compartment.

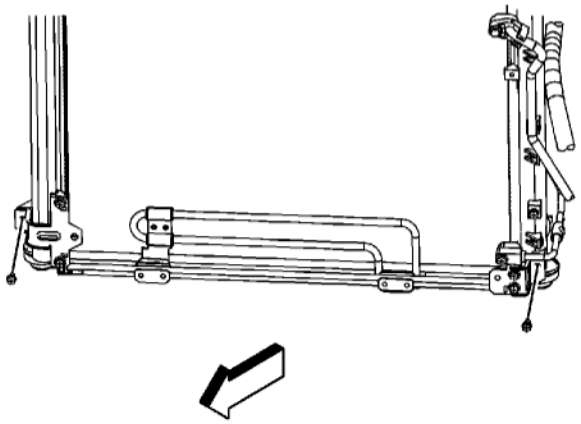
Radiator Replacement (Heavy Duty Cooling)

Special Tools

- J 38185 Hose Clamp Pliers
- J 38778 Door Trim Pad Clip Remover

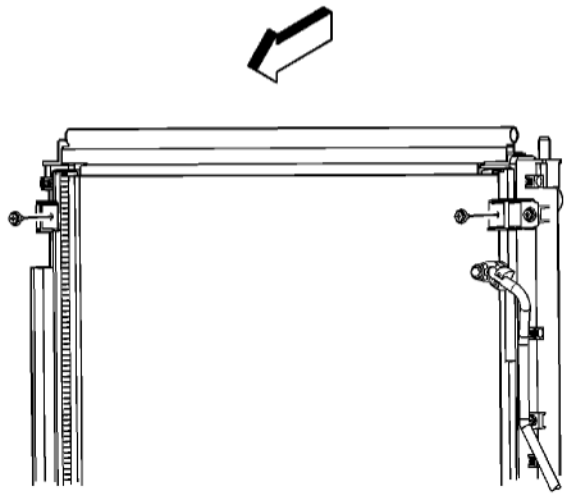
Removal Procedure

1. Drain the coolant. Refer to Cooling System Draining and Filling.
2. Remove the electric cooling fan assembly. Refer to Engine Coolant Fan Replacement.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.

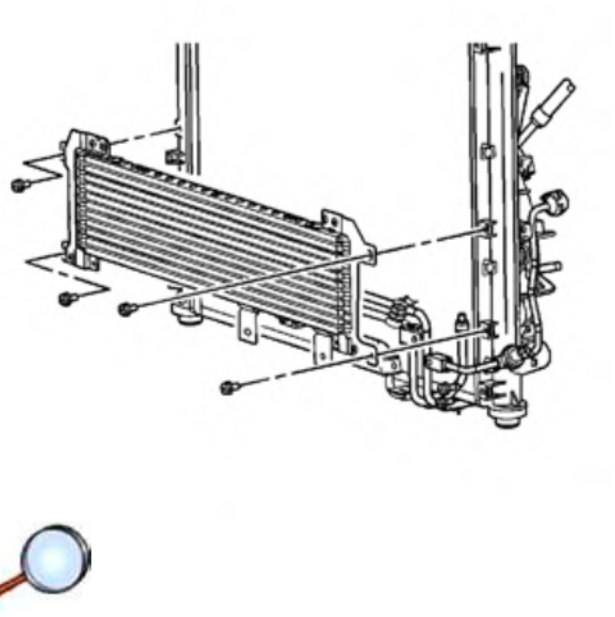




4. Remove the lower condenser mounting bolts.

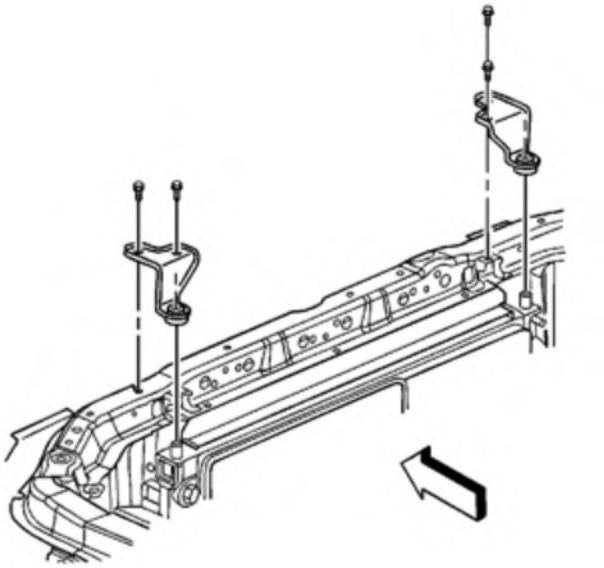


5. Remove the upper condenser mounting bolts.

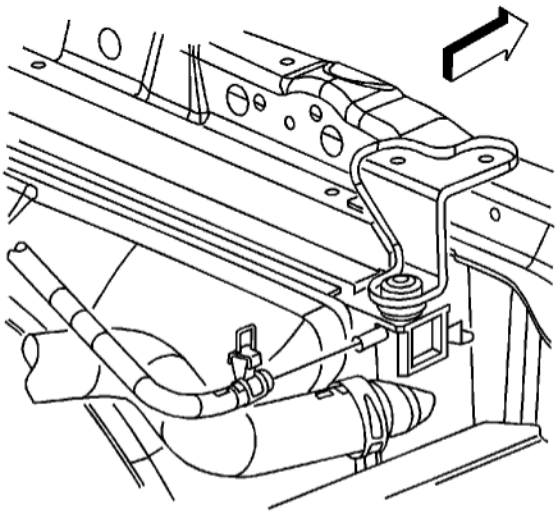


Note: Reposition the condenser to access the transmission oil cooler mounting bolts.

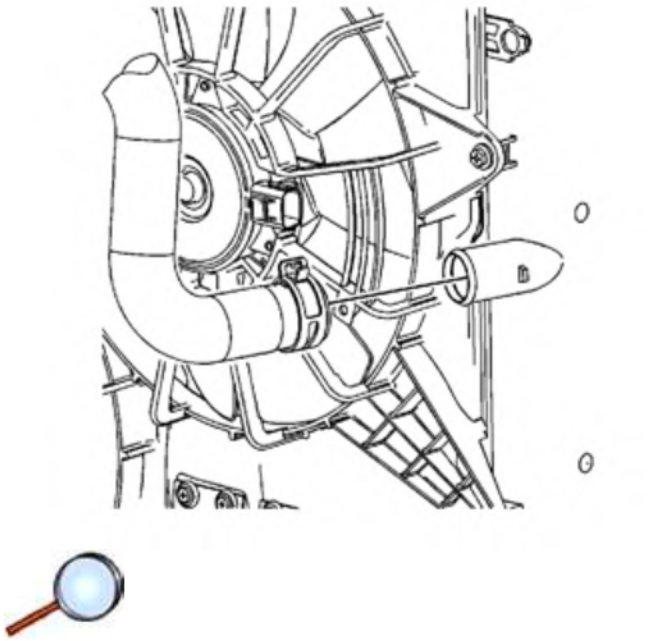
6. Remove the transmission oil cooler mounting bolts.



7. Disconnect the lower retainer pins of the side air baffle from the radiator.
8. Lower the vehicle.
9. Remove the radiator support bracket bolts.
10. Remove the radiator support brackets.
11. Use J 38778 to remove the radiator/condenser upper support.



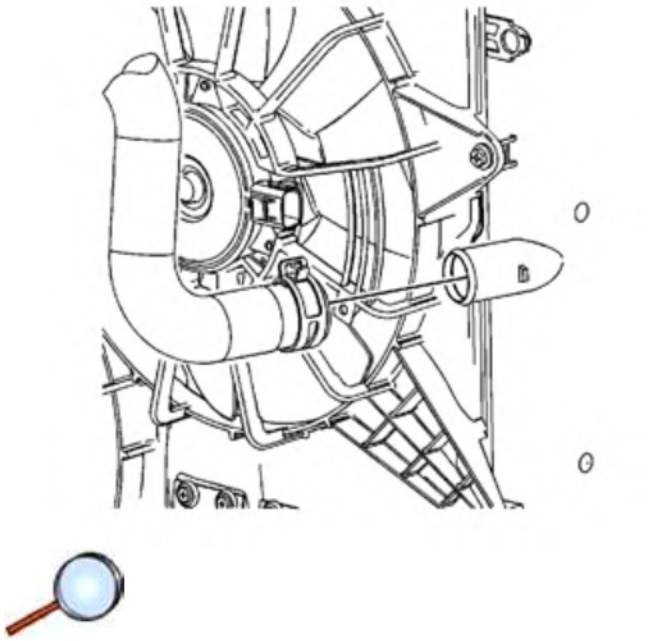
12. Use J 38185 to disconnect the surge tank inlet hose from the radiator. Reposition the hose aside.



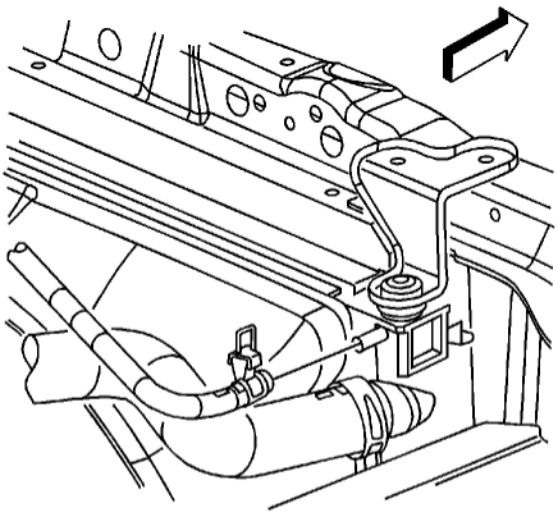
13. Using J 38185 disengage tension on the radiator inlet hose clamp and disconnect the hose from the radiator.
14. Using J 38185 disengage tension on the radiator outlet hose clamp and disconnect the hose from the radiator.
15. Disconnect the upper retainer pins on the side air baffle from the radiator.
16. Remove the radiator.

Installation Procedure

1. Install the radiator.
2. Connect the upper retainer pins of the side air baffle to the radiator.
3. Connect the radiator outlet hose to the radiator. Use J 38185 to position the radiator outlet hose clamp to secure the hose.



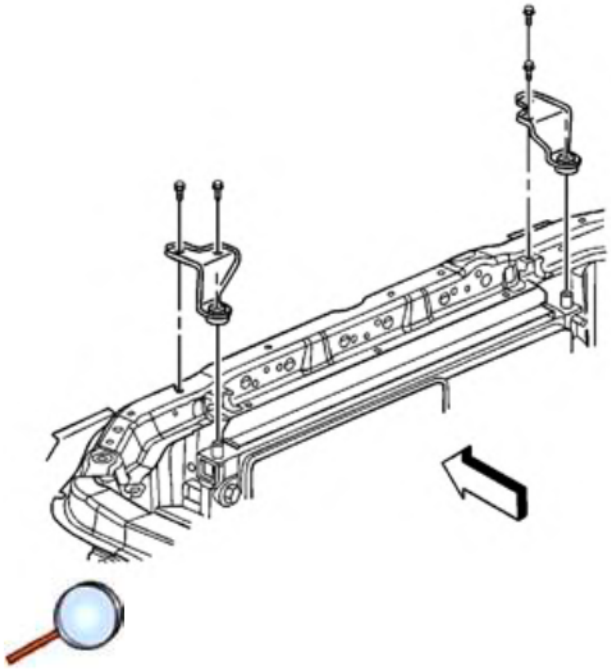
4. Connect the radiator inlet hose to the radiator. Use J 38185 to position the radiator inlet hose clamp to secure the hose.



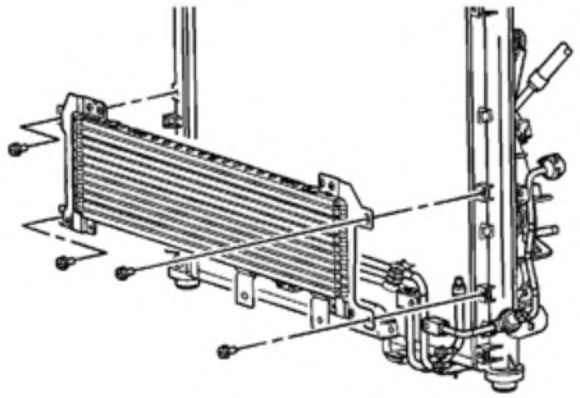
5. Connect the surge tank inlet hose to the radiator. Use J 38185 to position the hose clamp to secure the hose.
6. Install the radiator/condenser upper support.
7. Install the radiator support brackets.

Caution: Refer to Fastener Caution in the Preface section.

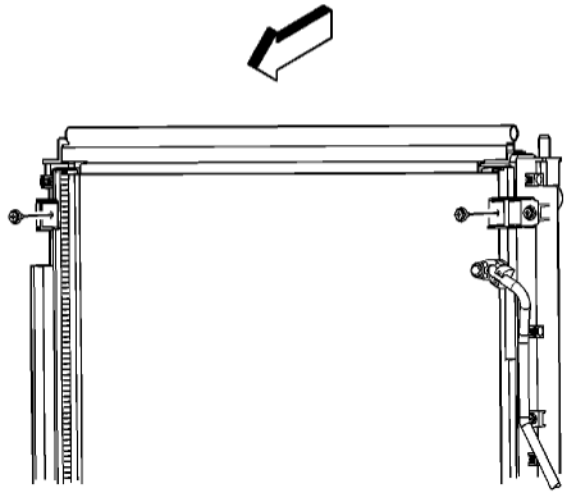
8. Install the radiator support bracket bolts and tighten to **9 N·m (80 lb in)**.
9. Raise and support the vehicle.



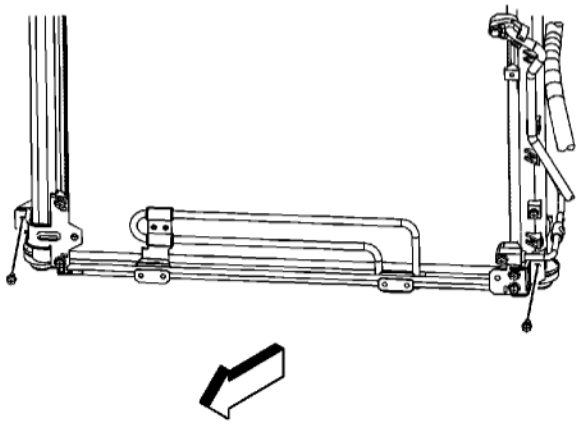
10. Connect the lower retainer pins of the side air baffle to the radiator.



11. Install the transmission oil cooler mounting bolts and tighten to **5 N·m (44 lb in)**.

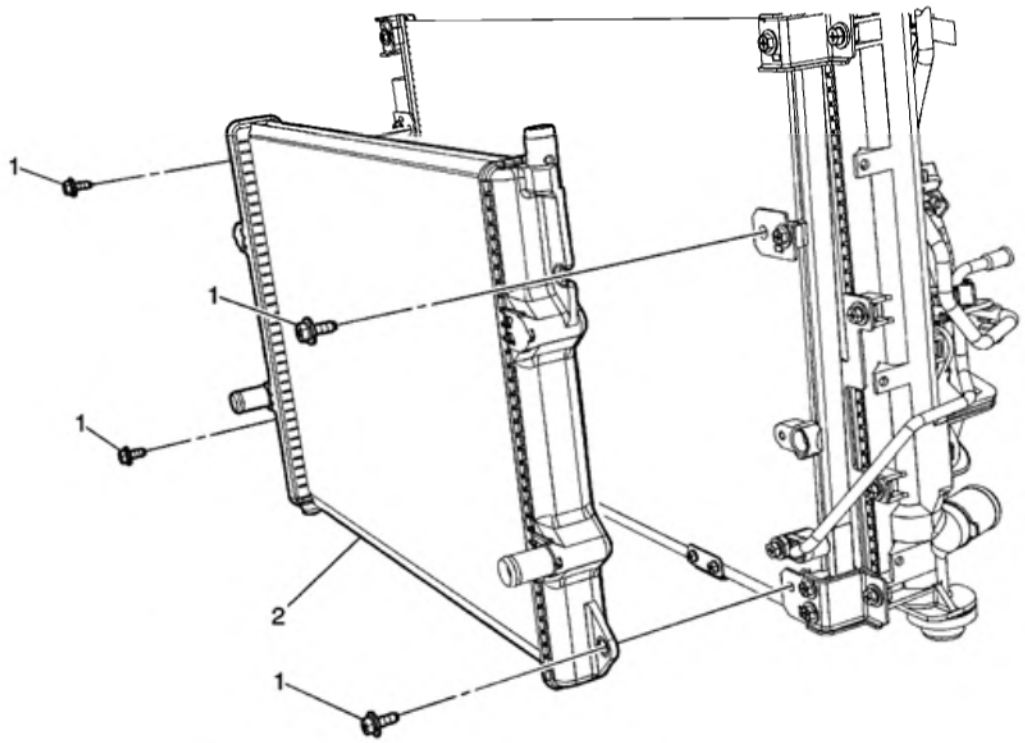


12. Install the upper condenser mounting bolts and tighten to **5.4 N·m (48 lb in)**.



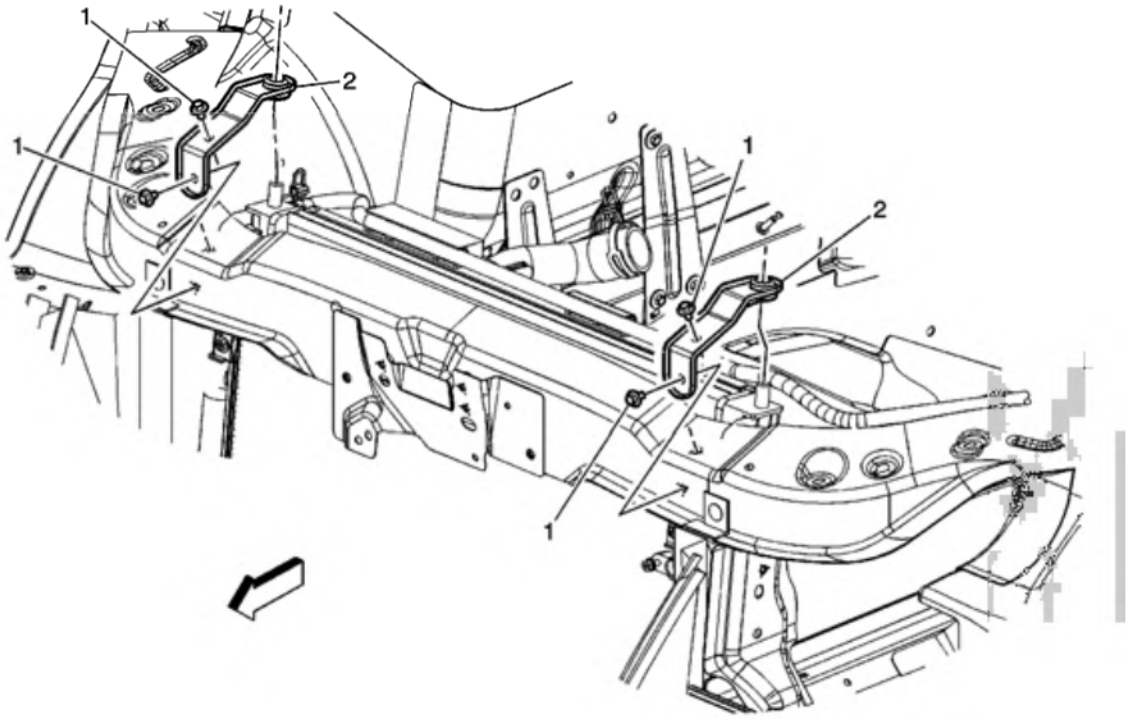
13. Install the lower condenser mounting bolts and tighten to **5.4 N·m (48 lb in)**.
14. Lower the vehicle.
15. Install the electric cooling fan assembly. Refer to Engine Coolant Fan Replacement.
16. Fill the cooling system. Refer to Cooling System Draining and Filling.

Charge Air Cooler Radiator Replacement



Callout	Component Name
Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling 2. Remove the front bumper fascia. Refer to Front Bumper Fascia Replacement. 3. Remove the charged air cooler coolant hose radiator to pump. Refer to Charge Air Cooler Coolant Hose Replacement - Radiator to Pump. 4. Remove the charged air cooler coolant hose radiator to pump. Refer to Charge Air Cooler Coolant Hose Replacement - Radiator to Pipe.	
1	Charged Air Cooler Coolant Radiator Bolt (Qty: 4) **Tighten** 16 N·m (12 lb ft)
2	Charged Air Cooler Coolant Radiator

Radiator Support Bracket Replacement

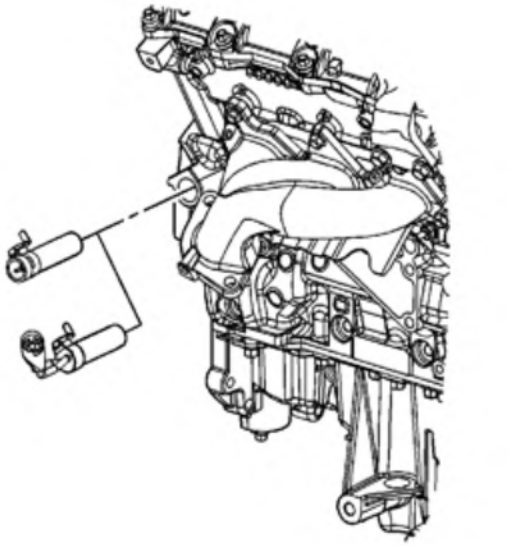


Callout	Component Name
Preliminary Procedures Remove the front compartment sight shield. Refer to Front Compartment Sight Shields Replacement.	
1	Radiator Support Bracket Bolt (Qty: 4) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 10 N·m (89 lb in)
2	Radiator Support Bracket (Qty: 2)

Coolant Heater Replacement (V6)

Removal Procedure

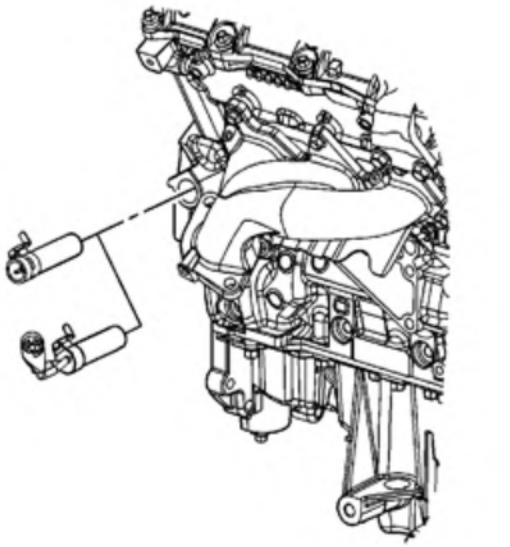
1. Turn the ignition OFF.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
3. Disconnect the coolant heater cord from the coolant heater.





4. Remove the coolant heater.

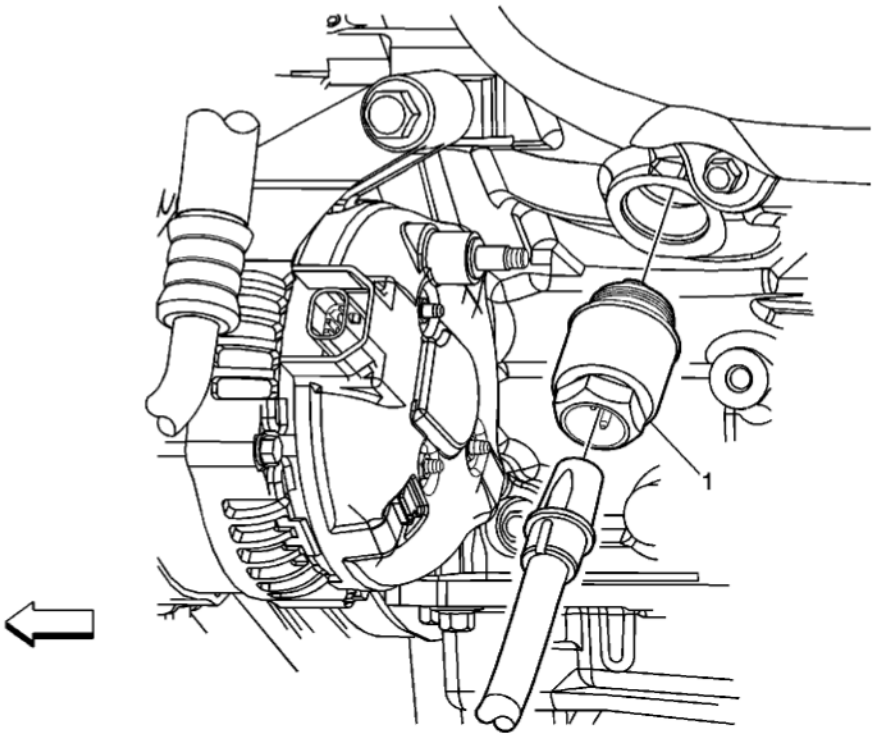
Installation Procedure





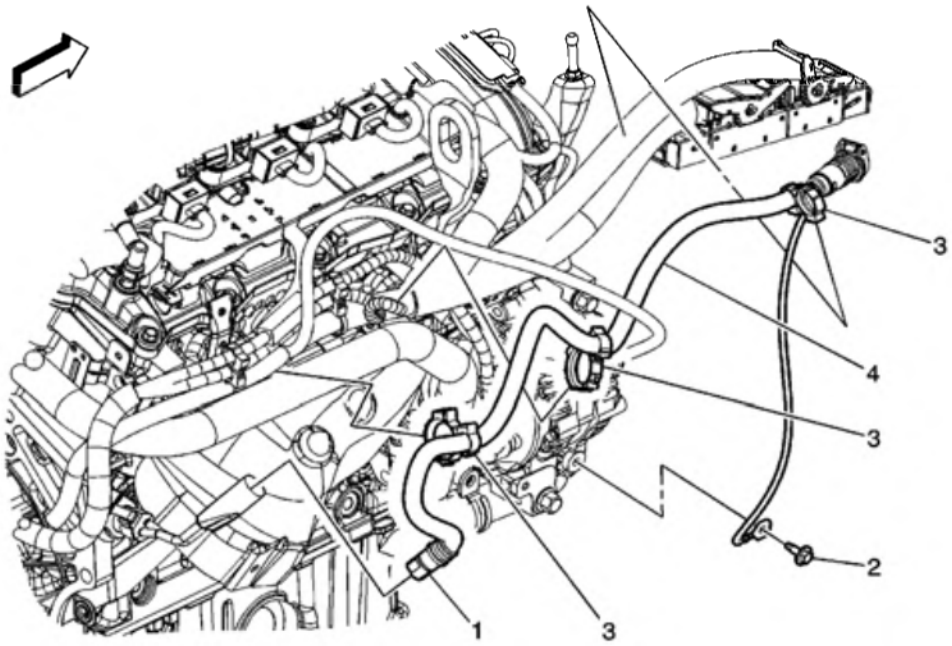
1. Install the coolant heater.
2. Connect the coolant heater cord to the coolant heater.
3. Lower the vehicle.

Coolant Heater Replacement (V8)



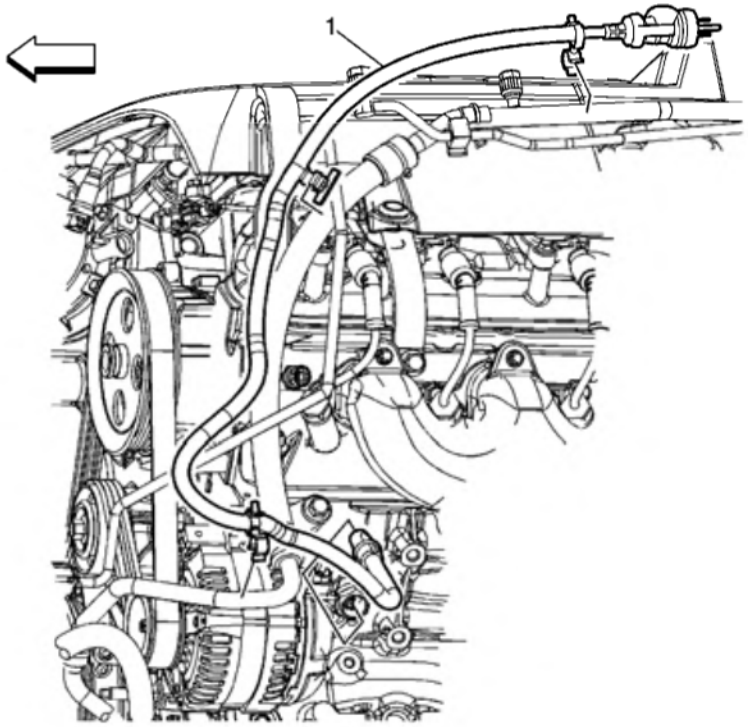
Callout	Component Name
Preliminary Procedure 1. Drain the cooling system. Refer to Cooling System Draining and Filling. 2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle. 3. Remove the left front wheel. Refer to Tire and Wheel Removal and Installation.	
1	Coolant Heater **Caution:** Refer to Fastener Caution in the Preface section. **Procedure** **Note:** Work through the wheel well opening. Disconnect the coolant heater cord from the coolant heater. **Tighten** 50 N·m (37 lb ft)

Coolant Heater Cord Replacement (V6)



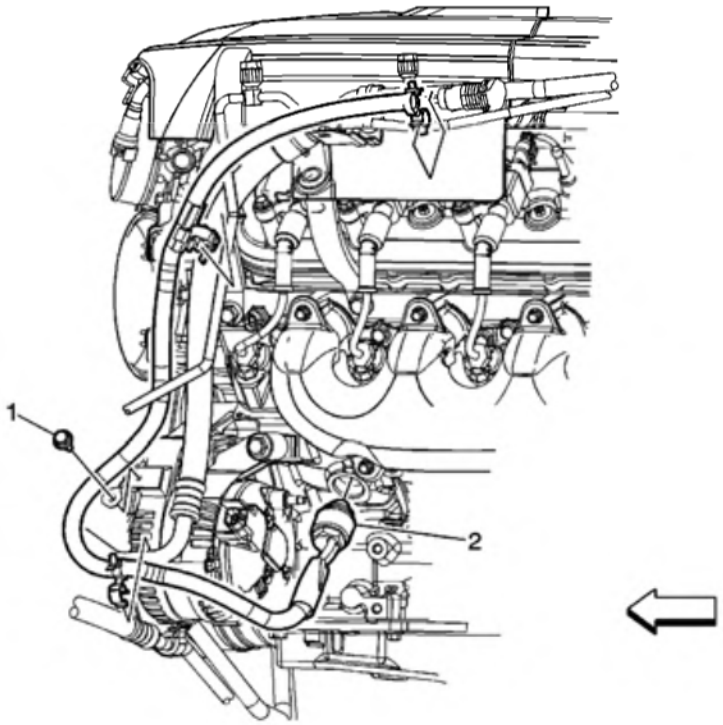
Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.	
1	Engine Heater Cord Female Connector
2	Ground Wire Bolt **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 12 N·m (106 lb in)
3	Plastic Clip (Qty: 3)
4	Coolant Heater Cord

Coolant Heater Cord Replacement (V8 With 110 Volt)



Callout	Component Name
Preliminary Procedure 1. Remove the Air Cleaner Resonator outlet duct. Refer to Air Cleaner Resonator Outlet Duct Replacement. 2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle. 3. Remove the left front wheel. Refer to Tire and Wheel Removal and Installation.	
1	Coolant Heater Cord **Procedure** **Note:** Work through the left wheel well opening. 1. Disconnect the coolant heater cord from the coolant heater. 2. Disconnect the three coolant heater cord retainers from the air conditioning compressor suction hose.

Coolant Heater Cord Replacement (V8 With 240 Volt)



Callout	Component Name
Preliminary Procedure 1. Remove the Air Cleaner Resonator outlet duct. Refer to Air Cleaner Resonator Outlet Duct Replacement. 2. Drain the cooling system. Refer to Cooling System Draining and Filling. 3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle. 4. Remove the left front wheel. Refer to Tire and Wheel Removal and Installation.	
1	Coolant Heater Cord fastener **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 10 N·m (89 lb in)
2	Coolant Heater Cord **Procedure** **Note:** Work through the left wheel well opening.

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	1. Disconnect the coolant heater cord from the coolant heater. 2. Disconnect the three coolant heater cord retainers from the air conditioning compressor suction hose. **Tighten** 50 N·m (37 lb ft)